Ford Motor Company
Kingsford Products Company

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Former Southwest Pit Area
Interim Response Action Plan

Ford-Kingsford Products Facility
(Court Case Number 04-1427-CE)
Kingsford, Michigan

July 2003

ARCADIS

FORD MOTOR COMPANY
THE KINGSFORD PRODUCTS COMPANY

FORMER SOUTHWEST PIT AREA INTERIM RESPONSE ACTION PLAN

FORD/KINGSFORD SITE,
KINGSFORD, MICHIGAN

July 2003

ARCADIS

Infrastructure, buildings, environment, communications

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Former Southwest Pit Area Interim Response Action Plan

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Introduction

ARCADIS, on behalf of Ford Motor Company (Ford) and The Kingsford Products Company (KPC), has prepared this revised Interim Response Action Plan (IRAP) for the Former Southwest Pit (SW Pit) Area of the Ford/Kingsford Site in Kingsford, Michigan. A Remedial Investigation (RI) of the Ford/Kingsford Site was performed by ARCADIS from 1997 through 2000. The Draft RI Report was subsequently prepared and submitted to the Michigan Department of Environmental Quality (MDEQ) in May 2000, and a revised version was submitted in June 2002. The Draft RI Report identified the SW Pit as an area requiring response activities to be undertaken. The SW Pit itself is defined as the southwestern portion of two former interconnected depressions (which are now filled in), used by Ford and KPC for the disposal of wastes from historic plant operations. For the purposes of this IRAP, the SW Pit Area is defined by the property boundaries of Lodal Park, and the SW Pit is defined horizontally by the areal extent of the former pit depression and vertically by the depth to groundwater, which is approximately 50 feet below ground surface.

This IRAP has been prepared to evaluate potential exposure pathways and propose an interim response action for the SW Pit. The initial SW Pit IRAP was submitted to the MDEQ in May 2002. This current SW Pit IRAP has been revised based on comments received from the MDEQ in a letter dated October 14, 2002, and revision to the Part 201 Rules in December 2002. Stratigraphic and construction logs for early investigation work are included in the RI Report and are not reproduced in this document.

ARCADIS is requesting approval from the MDEQ of this IRAP for the SW Pit, which will ultimately be incorporated into a final Remedial Action Plan (RAP) for the Ford/Kingsford Site. The final RAP will address broader issues relevant to additional parts of the Ford/Kingsford Site. Separate IRAPs have been completed for the Former Northeast Pit (NE Pit) Area and the Riverside Disposal Area. This IRAP is intended to satisfy the requirements for the Limited Residential Closure category. This IRAP addresses the SW Pit only; it does not address groundwater beneath the SW Pit, nor does it address any environmental media beyond the boundaries of the former SW Pit depression. This IRAP proposes using the existing soil vapor extraction (SVE) system, expanded as needed, and a permeable surface cover, with a restrictive covenant and institutional controls.

Site Background

The SW Pit is located in the southeast quarter of Section 2, Township 39N, Range 31W, in southwestern Dickinson County, in the south-central part of Michigan Upper Peninsula. The center point of the SW Pit is located approximately 1,100 feet north of Breitung Avenue and approximately 1,500 feet west of Balsam Street (Figure 1). The SW Pit is located on a topographic feature called the Upper Terrace, at an elevation of approximately 1,120 feet above mean sea level. The size of the SW Pit, which was historically a glacially-derived depression, is approximately 1.5 acres.

Two surface water bodies are located within 1 mile of the SW Pit. These include the Menominee River, approximately 3,000 feet to the west, and Crystal/Mud Lake, approximately 1 mile northeast. Hydraulically, the Menominee River is located downgradient and Crystal/Mud Lake is located upgradient of the SW Pit.

In addition, there are three other surface water bodies present in the Kingsford Area. Cowboy Lake is located 1.5 miles to the northwest, the water filled Chapin Mine is located 2.2 miles to the northeast, and Lake Antoine is located 3.3 miles to the northeast of the SW Pit. These three surface water bodies are upgradient from the SW Pit. The nearest public water supply wells (located near the Ford Airport, approximately 1.2 miles northwest of the SW Pit) are hydraulically sidegradient from the SW Pit.

Historic aerial photographs and records indicate that waste disposal at the SW Pit location occurred from the 1920s. Waste products included wood pieces, wood sawdust, wood bark chips, and charcoal that were reportedly disposed of in the SW Pit, along with wastewater containing dissolved organics from wood pyrolysis processes.

Land use proximal to the SW Pit is a mix of commercial and residential. The SW Pit is bordered by wooded areas to the west, vacant land to the north, the former NE Pit to the northeast, commercial businesses to the east and southeast, and Breitung Avenue to the south. The SW Pit is currently located in a recreational area known as Lodal Park, which is owned by the City of Kingsford and zoned for singe-family residential use. Zoning for single-family residential includes publicly owned and operated parks and recreational facilities (see Appendix A). A baseball diamond (east), a football field (west), and grass-covered areas are located in Lodal Park and partly over the SW Pit. A legal description for Lodal Park is provided in Appendix B.

Based on investigations completed to date, the SW Pit is believed to have been approximately 30 feet deep at its deepest point and was connected via a channel to the NE Pit. In the channel connecting the NE and SW Pits, there is a wide spot in the channel midway between the two pits. For purposes of this IRAP, the SW Pit includes a small portion of the channel contained within the Lodal Park fence that surrounds all sides of the park. The area of the channel north and east of the fence is considered to be part of the NE Pit (Figure 2). Response actions for the NE Pit have been developed in a separate document titled "Former Northeast Pit Interim Response Action Plan" dated January 9, 2003 and an addendum dated May 14, 2003.

Regulatory Framework

Investigation activities at the Ford/Kingsford Site have been conducted in accordance with Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act (1994 PA 451, as amended). The following categories of Part 201 Criteria were used to evaluate historical and current data for soils and waste material:

1. Residential and Commercial I, Direct Contact Criteria (DCC).

2. Residential and Commercial I, Groundwater Protection, Drinking Water Protection Criteria (DWPC).

3. Residential and Commercial I, Indoor Air, Soil Volatilization to Indoor Air Inhalation Criteria (SVIAIC).

4. Residential and Commercial I, Ambient Air, Particulate Soil Inhalation Criteria (PSIC) and Infinite Source Volatile Soil Inhalation Criteria (ISVSIC) for surface and subsurface material, respectively.

5. Residential and Commercial I, Groundwater Protection, Groundwater/Surface Water Interface Protection Criteria (GSIPC).

Groundwater is not included in this listing, as a deed restriction will prohibit the use of groundwater below the area and eliminate the potential for groundwater contact.

The SW Pit is currently zoned residential and used as a recreational park. Future use of the area will be restricted to similar recreational use by the City of Kingsford. As part of the SW Pit characterization, exposure pathways were identified and a comparison of the site analytical data to applicable criteria was made. Potential exposure pathways are discussed further in a following section titled "*Risk Evaluation for Soil and Vapor*."

The site characterization data indicate that various constituent concentrations are above the unrestricted residential criteria. Ford and KPC are proposing a Limited Residential Closure for the SW Pit.

Investigative Activities and Removals

Several previous investigations of the Ford/Kingsford Site have included the SW Pit. These investigations included the sampling of subsurface material by EWA Engineers (EWA) from 1985 through 1987, surface soil sampling by Ecology and Environment, Inc. (E&E) in 1988, the completion of soil borings and material sampling by the MDEQ in 1996, and the completion of soil borings, soil gas probes, surface and subsurface sampling, and test pit excavation by ARCADIS from 1997 to 2001. Results of the surface and subsurface sampling are included in Tables 1 and 2, respectively.

EWA 1985 and 1987

An initial Phase I site investigation was conducted by EWA from June through August 1985 (EWA, 1986). As part of the initial field investigation, four soil borings (SB-10 through SB-13) were completed in the SW Pit (Figure 2). In addition, two soil borings (SB-10B and SB-11B) were completed for additional soil sampling and analysis. A total of 17 subsurface samples from these borings were submitted for laboratory analysis of most United States Environmental Protection Agency (U.S. EPA) Priority Pollutants, including select volatile organic compounds (VOCs) and metals (Table 2).

The analytical results for the 17 subsurface soil samples indicate that VOCs were detected in nine of the 17 samples. Acetone and methylene chloride were detected at a concentration above the DWPC. Acetone was also detected at a concentration above the GSIPC, in one sample from Soil Boring SB-12. Inorganics, including naturally occurring common elements, were detected in all of the subsurface samples. Chromium was the only constituent present at a concentration above the GSIPC and DWPC. Mercury and selenium concentrations were detected above the GSIPC in one soil sample from Soil Boring SB-12.

A Phase II site investigation was conducted by EWA from June 1986 to February 1987 (EWA, 1987). One soil boring (SB-21) was completed to a depth of 120 feet below land surface (ft bls) within the SW Pit (Figure 2). A total of seven subsurface samples were collected during advancement of the soil boring. The samples were analyzed for select VOCs, barium, chromium, copper, and lead (Table 2). There were no detections of VOCs in any of the seven subsurface soil samples. Chromium, above GSIPC, was the only inorganic constituent detected at a concentration above criteria.

E&E 1988

E&E performed a Site Screening Inspection in the area of the SW Pit in May 1988 (E&E, 1989). One surface soil sample (S-6) was collected and submitted for chemical analyses to determine the concentrations of U.S. EPA target compound list VOCs, semi-volatile organic compounds (SVOCs), and target analyte list metals present in the sample (Table 1).

Laboratory analytical results for Surface Sample S-6 indicated the presence of only one VOC (2-butanone) and one SVOC (bis(2-ethylhexyl)phthalate). Inorganics were also detected, which included common soil constituents. Aluminum, cobalt, iron, and manganese were detected at concentrations above the DWPC, while chromium, cobalt, and selenium were detected at concentrations above the GSIPC.

MDEQ 1996

The MDEQ completed two soil borings (PB-4 and PB-6) and collected two surface soil samples (SS-32 and SS-33) in the SW Pit, as part of an Integrated Assessment Report (MDEQ, 1997). A total of seven samples (two surface material and five subsurface material) were collected between May 6 through 17, and June 3 through 7, 1996 and submitted for laboratory analyses. The analytical results are presented in Tables 1 and 2.

The analytical results for the two surface samples indicated the presence of VOCs and SVOCs, although the detected concentrations were all below the Part 201 Residential Criteria. Inorganics including aluminum, cobalt, iron, and manganese, were detected at concentrations above the DWPC. Chromium, cobalt, and mercury were detected at concentrations above the GSIPC.

The analytical results for the five subsurface samples showed that although several VOCs were detected, only methylene chloride was detected at a concentration above the DWPC. Methylene chloride is a common laboratory constituent and its presence may be attributable to laboratory contamination. Several SVOCs, 2,4-dimethylphenol, 2-methylphenol, and 4-methylphenol, were detected at concentrations above the

DWPC. In addition, SVOCs were detected at concentrations above the GSIPC for 2,4-dimethylphenol, 2-methylphenol, 4-methylphenol, dibenzofuran, naphthalene, and phenanthrene. Inorganics including aluminum, antimony, chromium, cobalt, iron, manganese, mercury, nickel, and selenium were present at concentrations above either the DWPC or GSIPC, while arsenic was detected at one location at a concentration above the DCC (Soil Boring PB-4). Several pesticides and polychlorinated biphenyls (PCBs) were detected, but at concentrations below the Part 201 Residential Criteria.

ARCADIS 1997-2001

Investigations conducted by ARCADIS (Geraghty & Miller, Inc., 1997a, 1997b, 1997c; ARCADIS G&M, Inc., 1998a, 1998b, 2000) focused on surface soils, the delineation of waste material, and on the potential for waste material to leach constituents to groundwater. The investigations included the following:

- The installation and sampling of one deep soil boring (GMSB-2) to bedrock within the SW Pit. One composite waste sample, 21 subsurface material samples, and three groundwater-grab samples were collected and submitted for laboratory analyses. Samples from the soil boring were collected at various depths from 5 to 355 ft bls and analyzed for VOCs, SVOCs, total organic carbon (TOC), select metals, pesticides, and PCBs. In addition, the ability of these materials to potentially leach constituents to groundwater was evaluated through toxicity characteristic leaching procedure (TCLP) extraction analyses. The groundwater grab samples were analyzed for VOCs, SVOCs, TOC, chemical oxygen demand (COD), dissolved gases, and biochemical oxygen demand.

- The excavation of one test pit (TP-11), through the channel that connected the SW Pit to the NE Pit, to delineate the width of the channel and to characterize the waste present.

- The completion and sampling of six soil borings (GMSB-43 through GMSB-48) in the SW Pit, to determine the extent and thickness of waste material.

- Installation of eight soil-gas probes (GMSG-14 through GMSG-16, and GMSG-29 through GMSG-33) to monitor methane present in the vicinity of the SW Pit.

- The collection and analysis of 14 surface soil samples (SSLP-1 through SSLP-13 and SSNE-3) for VOCs, SVOCs, and select metals.

The sampling locations are illustrated on Figure 2. A summary of the laboratory analytical results is provided in Tables 1 through 5. A discussion of the analytical results for the samples collected by ARCADIS, as well as historical sample results, is provided in the following sections.

SW Pit Characterization

Waste/Fill Delineation

Source delineation and waste characterization activities performed during the RI in the SW Pit included the completion of one test pit, six soil borings, and the collection and analysis of five subsurface samples of waste material encountered in the soil borings.

Based on the results of the soil borings, the waste material is characterized as predominately wood, wood products, sawdust, charred wood fragments, fibrous wood pieces, and charcoal fragments. Grass clippings and shrub/tree trimmings are also abundant above the previously described waste material. As opposed to the NE Pit, no wood tar or wood sludge material was encountered in the soil borings or in the test pit completed in or around the SW Pit. The waste material has been covered with a surface unit of fill comprised of fine-grain to coarse-grain sand with some silt that ranges from 0.2- to 15-feet thick. The underlying waste material ranges from 4 to 25 feet thick, where encountered within the SW Pit, and is underlain by native silt and sand. The data collected during the investigations were used to construct isopach maps of the thickness of waste/fill material (Figure 3).

Cross-sections of the SW Pit were prepared from soil boring data to illustrate the surface cover and estimated subsurface extent of waste/fill material. The inferred depth of groundwater (based on data collected in June 1999 from Monitoring Well GM-19) underlying the wastes in this area is also shown. The locations of the cross-sections are shown on Figure 4, and the cross-sections are shown on Figures 5 and 6. Based on these cross-sections and the isopach map of the thickness of waste/fill material (Figure 3), the estimated total volume of waste/fill material in the SW Pit is approximately 34,000 cubic yards. Of this total volume, approximately 70 percent is wood material and 30 percent is a combination of wood and charcoal fragments.

The base of the SW Pit is approximately 30 ft bls. Groundwater in the area of the SW Pit ranges from approximately 40 to 55 ft bls, well below the base of the SW Pit. Based on the groundwater elevation data, the horizontal component of groundwater flow in the vicinity of the SW Pit is generally to the west, towards the Menominee River. The westward groundwater flow has a horizontal gradient ranging from approximately 0.009 to 0.02 foot per foot (ft/ft). The groundwater data collected during the RI, from Monitoring Well Nest GM-62, indicates that the vertical component of the groundwater gradient is downward, at approximately 0.086 ft/ft.

Surface Material

A layer of fine-grain to coarse-grain sand with some silt covers the SW Pit. This layer of sandy soil and some silt is present from the ground surface to a depth of approximately 2 to 3 ft bls, across much of the SW Pit. A total of 17 surface material samples have been collected in the area of the SW Pit, to determine the quality of the surface material. Fourteen surface soil samples (SSLP-1 through SSLP-13, and SSNE-3) were collected during the RI, and analyzed for VOCs, SVOCs, and select metals. E&E and the MDEQ collected the three additional surface samples, during investigations in 1988 and 1996, respectively. These three surface samples were analyzed for VOCs, SVOCs, and select metals. The locations of the surface soil samples collected are shown on Figure 2. A summary of all the surface soil samples and associated analytical results are provided in Table 1.

The following sections describe the analytical results of the surface samples, and compare the results to the Part 201 Residential Criteria for soil.

DCC

There were no constituents detected in the surface material at concentrations above the DCC.

DWPC

The analytical results indicate that concentrations of seven constituents were above the DWPC in the surface material including: aluminum, cobalt, iron, manganese, magnesium, and silver. All of the surface samples contained concentrations of aluminum, cobalt, iron, and manganese that were above the DWPC. Magnesium and silver were present at concentrations above the DWPC in Surface Soil Samples SSLP-11 and SSLP-9, respectively. It should be noted that with the exception of the one silver concentration detected, all the concentrations of the metals detected in the surface material samples are near or below the Michigan state default background concentrations for the metals. Except for Surface Soil Sample S-6, all of the surface soil sample material should be representative of clean local native material, imported to the area for cover.

Indoor Air SVIAIC

There were no constituents detected in the surface material at a concentration above the SVIAIC.

Ambient Air PSIC

There were no constituents detected in the surface material at a concentration above the PSIC.

GSIPC

Eight constituents were detected at concentrations above the GSIPC, including chromium, cobalt, copper, manganese, mercury, selenium, silver, and zinc. All of the surface soil samples contained concentrations of chromium, cobalt, and manganese above the GSIPC. Mercury was detected at concentrations above the GSIPC in five surface soil samples (SS-33, SSLP-5, SSLP-8, SSLP-9, and SSLP-13), and silver was also detected at concentrations above the GSIPC in five surface soils samples (SSLP-3, SSLP-5, SSLP-8, SSLP-9, SSLP-13). Copper and zinc were detected at concentrations above the GSIPC in two surface soil samples (S-6 and SSPL-9). Selenium was present at a concentration above the GSIPC in only Surface Soil Sample S-6. With the exceptions of the detected copper, zinc, and several silver concentrations above the GSIPC, the detected concentrations of all the other metals are near or below the Michigan state default background concentration for the metal.

Subsurface Soil and Waste Material

A total of 61 subsurface soil and waste samples were collected at the SW Pit. Subsurface sampling took place from depths greater than 1 foot below land surface. A summary of the subsurface soil and waste sample analytical results are provided in Table 2, and soil boring locations are shown on Figure 2. ARCADIS collected five subsurface waste samples during the RI (1998) and 21 subsurface soil and waste samples during the Engineering Evaluation/Cost Analysis (EE/CA, 1997). The RI samples were analyzed for VOCs, SVOCs, TOC, acetic acid, alcohols, aldehydes, and select metals. The EE/CA samples were analyzed for VOCs, SVOCs, select metals, pesticides, and PCBs. In addition, all of the waste samples from the RI were subjected to TCLP and Synthetic Precipitation Leaching Procedures (SPLP) extraction analysis (Table 3).

The remaining 35 subsurface soil and waste samples were collected by other organizations, including EWA, E&E, and the MDEQ from 1985 through 1996. These historical samples were analyzed for VOCs, SVOCs, select metals, pesticides, and PCBs.

The following sections describe the analytical results of the subsurface samples and compare the results to the Part 201 Residential Criteria for soil. The depths from which the subsurface material samples were collected at in the soil borings are included in Table 2.

DCC

Arsenic and lead were detected in waste at concentrations above the DCC at the SW Pit. Twowaste samples collected from Soil Borings GMSB-47 (at 15 ft bls) and PB-4 (between 8 ft to 12 ft bls) contained concentrations of arsenic above the DCC. Two waste samples from Soil Borings GMSB-47 (at 15 ft bls) and GMSB-2 (between 13 to 14.5 ft bls) contained concentrations of lead above the DCC.

DWPC

A total of 22 constituents were detected at concentrations above of the DWPC, including, acetone, benzene, ethylbenzene, methylene chloride, xylenes (total), 2,4-dimethylphenol, 2-methylphenol, 3-methylphenol/4-methylphenol, 4-methylphenol, n-nitrosodimethylamine, acetaldehyde, formaldehyde, aluminum, antimony, chromium, cobalt, iron, lead, magnesium, manganese, molybdenum, and nickel. VOCs were only detected at concentrations above the DWPC in subsurface soil samples collected from Soil Borings GMSB-2, PB-6 and SB-12. Samples collected from Soil Borings GMSB-47, GMSB-2, PB-4, and PB-6 contained all of the concentrations of SVOCs above the DWPC.

Metals were present at concentrations above the DWPC in one or more of the following soil borings: GMSB-2, GMSB-43, GMSB-44, GMSB-45, GMSB-47, GMSB-48, PB-3, PB-4, PB-6, SB-11, SB-11B, and SB-12. Aluminum, iron, and manganese were most commonly present in concentrations above the DWPC, followed by antimony, chromium, cobalt, and molybdenum. Lead was present in only two of the soil borings (GMSB-2 and GMSB-47) at concentrations above the DWPC.

Magnesium and nickel each were present in a concentration above the DWPC in only one location (Soil Boring GMSB-2 and Soil Boring PB-4, respectively). Even though some of the metal concentrations above the DWPC were found in waste material samples, the metal concentrations were similar to or below the Michigan state default background concentration for the metal.

The two aldehydes (acetaldehyde and formaldehyde) were detected at a concentration above the DWPC in Soil Borings GMSB-43, GMSB-45, and GMSB-48.

SVIAIC

Only one constituent, formaldehyde, was detected at a concentration above the SVIAIC in two waste samples collected from Soil Borings GMSB-43 at 3 ft bls and GMSB-48 at 22 ft bls. Table 2 provides information regarding the comparison to SVIAIC.

Ambient Air ISVSIC

One constituent, formaldehyde, was detected at a concentration above the ISVSIC in the waste samples collected from Soil Borings GMSB-43 and GMSB-48. There is other "Finite" Volatile Soil Inhalation Criteria (FVSIC) that can be used when the thickness of impacted material is known. Two sets of FVSIC exist, for a 2-meter (6.56 feet) or 5-meter (16.4 feet) source thickness. Depending on the waste/fill material thickness, either the 2-meter (6.56 feet) or the 5-meter (16.4 feet) FVSIC were used to screen the detections of the constituents.

The soil analytical results presented in Table 2 indicate a concentration of 14,000 micrograms per kilogram (µg/kg) for formaldehyde at a depth of 3 feet in Soil Boring GMSB-43, which is above the ISVSIC criteria. The Sample/Core Log for Soil Boring GMSB-43 indicates approximately 2.5 feet of waste is present at this depth. Therefore, the FVSIC for a 2-meter source thickness should be applied. The detected concentration of formaldehyde using this criterion is below the 2-meter FVSIC. Table 2 is footnoted to indicate this evaluation.

Soil Boring GMSB-48 also contained formaldehyde at a concentration of 50,000 µg/kg at a depth of 22 ft bls which is above the ISVSIC. The Sample/Core Log for this boring indicates that approximately 4 feet of sawdust and/or charcoal are present at this depth. Therefore, the 2-meter source thickness FVSIC should again be applied. The detected concentration of formaldehyde in Soil Boring GMSB-48 is below the 2-meter FVSIC. Table 2 is footnoted to indicate this evaluation.

GSIPC

A total of 32 constituents were detected in the subsurface material samples at concentrations above the GSIPC, including 1,2,4-trimethylbenzene, acetone, ethylbenzene, naphthalene, toluene, xylenes (total) 2,4-dimethylphenol, 2-methylphenol, 3-methylphenol/4-methylphenol, 4-methylphenol, carbazole, diethylphthalate, dibenzofuran, fluoranthene, fluorene, phenanthrene, phenol, acetaldehyde, formaldehyde, methanol, barium, cadmium, chromium, cobalt, copper, cyanide, nickel, manganese, mercury, selenium, silver, and zinc. The samples and locations of these constituents above the GSIPC are shown in Table 2.

Fourteen of the constituents (1,2,4-trimethylbenzene, acetone, ethylbenzene, toluene, carbazole, diethylphthalate, fluoranthene, fluorene, methanol, phenanthrene, phenol, cadmium, cyanide and silver) were detected only once at a concentration above the GSIPC. The most common constituents that were detected at concentrations above the GSIPC were chromium, cobalt, copper, manganese, and selenium. The subsurface samples collected from Soil Borings GMSB-2, GMSB-45, GMSB-47, PB-4, and PB-6 contained the highest number of constituents with concentrations above the GSIPC. As indicated above, many of the metal concentrations detected were similar to or below the Michigan state default background concentration for the metal. The depths at which the soil samples were collected in the soil borings are included in Table 2.

TCLP/SPLP Analyses

A composite sample of waste material was collected from Soil Boring GMSB-2, in the depth interval from 5 to 25 ft bls, and was submitted for TCLP extraction analysis to evaluate the potential for the waste material to leach constituents. Waste samples from Soil Borings GMSB-43, GMSB-44, GMSB-45, GMSB-47, and GMSB-48, representative of the various types of waste material found, were also submitted for TCLP and SPLP extraction analysis. The results of the TCLP and SPLP analyses are summarized in Table 3, along with the depths from where the samples were collected.

A comparison of the TCLP results with Federal Standards found in 40 CFR Part 261.30 (which identifies maximum concentrations of constituents for the toxicity characteristics of a hazardous waste) was performed. This comparison indicates that the constituent concentrations detected in the extract of the waste material are not above the levels for defining the material as a hazardous waste.

Potential for Leaching to Groundwater

An assessment of the potential for leaching constituents to groundwater from the waste/fill materials in the SW Pit was completed through the following sample collection and analysis:

- Leaching tests performed on a composite waste sample from Soil Boring GMSB-2.

- Leaching tests performed on samples collected from representative waste materials including sawdust (Soil Boring GMSB-43), wood (Soil Borings GMSB-44 and GMSB-47), and wood/charcoal (Soil Borings GMSB-45 and GMSB-48).

- Shallow and deep groundwater grab samples collected during the drilling of Soil Boring GMSB-2.

- Subsurface soil samples collected from Soil Borings GMSB-2 and SB-21.

A TCLP test was performed on a waste sample collected from Soil Boring GMSB-2 from a depth of 5 to 25 ft bls (Table 3). The extract from the TCLP test was analyzed for TOC, COD, and limited SVOCs. The extract from the TCLP test contained 7.8 micrograms per liter (μg/L) of 2-methylphenol, 26 milligrams per liter (mg/L) of TOC, and 34 mg/L of COD.

TCLP tests were also performed on waste samples collected from Soil Borings GMSB-43, GMSB-44, GMSB-45, GMSB-47, and GMSB-48. The extracts from these TCLP tests were analyzed for VOCs, SVOCs, select metals, alcohols, and aldehydes. In addition to the TCLP tests, SPLP tests were performed on waste samples collected from Soil Borings GMSB-45 and GMSB-48. The extracts from the SPLP tests were analyzed for VOCs, SVOCs, select metals, alcohols, aldehydes, TOC, COD, and acetic acid. For Soil Borings GMSB-45 and GMSB-48, TOC analyses were also performed. The results of the laboratory analyses of the TCLP and SPLP extracts of the waste samples are presented in Table 3.

The results of the TCLP test performed on a sample of the sawdust waste material collected from Soil Boring GMSB-43 (3 ft bls) indicates that VOCs or SVOCs were not detected in the extract. Formaldehyde was detected in the extract at a concentration of 370 μg/L.

The results of the TCLP tests performed on two samples of the wood material collected from Soil Borings GMSB-44 (15 ft bls) and GMSB-47 (15 ft bls) show that only low, estimated VOC concentrations were detected in either sample (2.2 µg/L chloromethane in Soil Boring GMSB-44 and 3.0 µg/L carbon disulfide in Soil Boring GMSB-47). No SVOCs or aldehydes were detected in the sample from Soil Boring GMSB-44. Several SVOCs and aldehydes were detected in the sample from Soil Boring GMSB-47, including 2,4-dimethylphenol (80 µg/L), 2-methylphenol (49 µg/L), 2-picoline (8.9 µg/L, estimated), 3-methylphenol/4-methylphenol (180 µg/L), acetaldehyde (250 µg/L), and formaldehyde (220 µg/L).

The results from the TCLP and SPLP tests performed on two samples of the wood/charcoal materials collected from Soil Borings GMSB-45 (10 ft bls) and GMSB-48 (22 ft bls) indicate that VOCs were not detected, with the exception of 1,2,4-trimethylbenzene estimated at 0.57 µg/L in the Soil Boring GMSB-45 sample. SVOCs were detected in both samples at low concentrations including 2,4-dimethylphenol (20 and 12 µg/L), 2-methylphenol (35 and 6.4 µg/L), 3-methylphenol/4-methylphenol (50 and 11µg/L) and phenol (74 and 20 µg/L). One alcohol, methanol was detected in the sample from Soil Boring GMSB-45, at an estimated concentration of 3,200 µg/L. Aldehydes were detected in both samples, including acetaldehyde (480 and 160 µg/L) and formaldehyde (120 and 970 µg/L). Acetic acid was also detected in both samples at concentrations ranging from 2.6 to 39 mg/L. As discussed in the RI Report, the analytical results for acetic acid represent acetic acid plus acetate, so therefore overstate the acetic acid present.

The results from the TCLP and SPLP tests for the different materials identified in the SW Pit showed that the potential for these materials to leach constituents is low. In order to understand any impacts to shallow groundwater due to leaching of constituents from the SW Pit material, groundwater data collected during the installation of Soil Boring GMSB-2 (Table 4) was used for comparison to the waste extract data. The groundwater grab sample was collected from Soil Boring GMSB-2 at a depth of 93 ft bls, from a coarse sand that is the predominant geologic material from the base of the SW Pit down to 93 ft bls. This groundwater grab sample was analyzed for VOCs, SVOCs, TOC, COD, BOD, and methane. The sample contained very low concentrations of VOCs (highest concentration detected, 2.9 µg/L of carbon disulfide) and SVOCs (highest concentration detected, 18 µg/L of 2,4-dimethylphenol). The TOC concentration in the sample from 93 ft bls was 14 mg/L.

In comparison, a groundwater sample collected from Soil Boring GMSB-2 from a depth of 265 ft bls contained SVOC concentrations ranging from a low of 3,900 µg/L for 2,4-dimethylphenol to a high of 13,000 µg/L for 4-methylphenol, and a groundwater sample collected from a depth of 345 ft bls contained SVOC concentrations ranging from a low of 3,000 µg/L for 2,4-dimethylphenol to a high of 14,000 µg/L for 4-methylphenol. Comparison of this groundwater data to the above-referenced concentrations in the TCLP and SPLP extracts shows that the concentrations of SVOCs in the deep groundwater system beneath the SW Pit are much higher than could possibly be produced by leaching from the SW Pit waste material. This also indicates that the constituents in the deeper groundwater beneath the SW Pit are the result of historic liquid disposal in the upgradient NE Pit.

In addition to the groundwater data, a review of subsurface soil data from soil borings completed through the SW Pit indicates that any constituents potentially leached from the material within the SW Pit (minimal, if at all) are not migrating beyond the material within the SW Pit. Concentrations of VOCs and SVOCs are higher within the waste material and in the soil immediately below the SW Pit to a depth of 35 to 40 ft bls than in the deeper soil. These concentrations decrease (and eventually reach non detect) below 40 feet to a depth of approximately 150 ft bls. At depths greater than 150 ft bls, constituent concentrations are again higher than those between 40 to 150 ft bls. The subsurface soil data is presented in Table 2. The transition from higher constituent concentrations within the SW Pit material to minimal concentrations immediately beneath the SW Pit (35 to 40 ft bls) is specifically supported by subsurface soil data from Soil Borings SB-10B, SB-11B, SB-13, and SB-21.

The organic vapor analyzer (OVA) data from Soil Boring GMSB-2 also indicate that the material in the SW Pit is not significantly leaching constituents to groundwater. OVA readings (often greater than 10,000 ppm) from Soil Boring GMSG-2 from within and immediately beneath the SW Pit material decrease dramatically at the water table and generally remain below 1,000 ppm until depths greater than 150 ft bls. If the material within the SW Pit were leaching any significant amount of constituents to shallow groundwater, continuous OVA readings well above 1,000 ppm would be expected in the shallow groundwater, which is not the case. The leachability data from the waste and fill material within the SW Pit indicates that there is a potential for insignificant leaching of constituents from some of the SW Pit material. However, subsurface soil samples, OVA readings, and shallow groundwater data collected at 93 ft bls from Soil Boring GMSB-2 indicate that any minimal leaching that is occurring is not affecting groundwater immediately beneath the SW Pit. Concentrations of organic material found in the deeper groundwater beneath the SW Pit (i.e. below 150 ft bls) are from historic liquid releases to the NE Pit, rather than leaching from the waste material currently within the SW Pit.

Methane

The gas-phase methane detected in the waste material and in the native soil surrounding the SW Pit is likely generated from the decomposition of the wood waste material within the SW Pit, rather than from organic material in the groundwater system or migration of gas-phase methane from areas outside of the SW Pit. The low concentrations and low pressures of gas-phase methane found outside of the waste material at the SW Pit suggest that the gas-phase methane in this area generates slowly and does not accumulate in significant concentrations outside of the waste/fill material. As determined during the remedial investigation, the limited distribution of gas-phase methane in the subsurface native soil outside of the waste/fill material and the methane/carbon dioxide/oxygen ratios are evidence that gas-phase methane in the subsurface is being biodegraded by aerobic processes, when oxygen is present. An SVE system operating within the SW Pit addresses subsurface gas-phase methane generated from the SW Pit via active venting. A description of the SW Pit SVE system is included in a subsequent section of this IRAP.

Risk Evaluation for Soil and Vapor

Risk pathways were identified previously in this document in the comparison of surface and subsurface analytical results with Part 201 criteria. This section of the document details the pathway(s) and potential receptor(s) where concentrations were above Part 201 criteria, so that a response action(s) may be determined that eliminates or minimizes the risk posed by that pathway.

A summary of the comparison of surface and subsurface results with Part 201 criteria, indicates that surface material did not contain constituents above the DCC, SVIAIC, or PSIC. There were constituents above the DWPC and GSIPC. Subsurface soil and waste material did not contain constituents above the Ambient Air FVSIC. However, the subsurface soil and waste material did contain constituents above the DCC, DWPC, SVIAIC, and GSIPC. Evaluation of the TCLP and SPLP results, along with shallow groundwater data, shows that the SW Pit is not a significant source of leaching to groundwater and therefore the GSI pathway is not significant at the SW Pit.

The potential pathways for exposure to impacted materials at the SW Pit include:

1. Direct contact with subsurface waste/fill materials via unauthorized excavation or construction activities.

2. Inhalation of vapors volatilized to air within confined structures.

3. Flammability or explosivity of vapors that have been contained within a confined space. No confined space currently exists over the SW Pit

A discussion of the pathways grouped by media type and how they will be addressed by response actions is included below.

Response Action Objectives

Site-specific response objectives for soil and air are provided below.

Soil

The objective for soil is to prevent contact with buried waste materials, and minimization (if necessary) of accumulation of methane vapors from the waste materials in confined structures.

Air

The objective for air is to prevent to the accumulation of methane in confined buildings and minimize or eliminate the potential for flammability or explosivity of accumulated methane vapors.

SW Pit Response Action Evaluation

Response actions for the SW Pit were evaluated to address the IRAP objectives. The response options evaluated include permeable cover systems, low-permeability cover systems, excavation and off-site disposal of waste material, and restrictive covenant and institutional controls. Presented below is an evaluation of these response options.

Permeable Cover System

A permeable cover system for the SW Pit would consist of upgrading the existing soil cover system overlying the SW Pit by the addition of common fill to create a soil cover that is a minimum of 30-inches thick. The area requiring the installation of additional fill is identified on Figure 7. Following placement of the additional fill material, the final surface would be re-vegetated to provide a vegetative protective layer for the soil cover. The permeable cover system would comprise an area of approximately 1.5

acres overlying the footprint of the SW Pit. The location and extent for a permeable cover system at the SW Pit is shown on Figure 7. The final grading of a permeable cover system would be designed to prevent erosion and surface-water ponding. In addition, the existing SVE system would be maintained to control the migration of gas-phase methane away from the SW Pit. The existing SVE system would also be expanded, or a temporary system installed, to address the area around Soil Vapor Probe GMSG-14, if warranted.

The installation of storm water/erosion controls would likely require the management of some impacted soils and waste. A long-term maintenance plan for a permeable cover system would also be prepared to maintain the efficacy of this response action. The estimated cost for a permeable cover system response action for the SW Pit is provided in Table 7.

Low-Permeability Cover System

A low-permeability cover system for the SW Pit would consist of a 40 to 60-mil, high-density polyethylene liner or linear low density polyethylene or equal material, a sand drainage layer, a protective soil layer above the sand drainage layer, and a vegetative or other appropriate cover at the surface level. The sand drainage layer would serve to prevent the buildup of infiltrate on the liner surface. The sand drainage layer and liner would be gently sloped to route infiltrate away from the waste material to a point beyond the horizontal extent of waste material. The construction of a low-permeability cover system requires preparation and clearing of the area planned for construction. Additionally, the existing soil vapor extraction system, with possible modifications, would be installed beneath the liner for management of methane. It would also be expanded, or a temporary system installed, to address the area around Soil Vapor Probe GMSG-14, if warranted.

The footprint of a low-permeability cover system would extend slightly beyond the boundaries for a permeable cover system, which is shown on Figure 7. The synthetic liner associated with a low-permeability cover system liner would be buried at a depth of approximately 3 ft bls.

Similar to a permeable cover system response action, the removal of some impacted soil and waste may likely be required during the installation of storm water/erosion controls. A long-term maintenance plan for a low-permeability cover system would be prepared to maintain the efficacy of this response action. The estimated cost for a low-permeability cover system response action for the SW Pit is provided in Table 8.

Excavation and Off-Site Disposal of Waste Material

An excavation and off-site disposal of waste material response action for the SW Pit would require the excavation of all of the waste material at the SW Pit, transportation off site for disposal at an appropriate facility, and installation of an SVE system to address methane accumulations around Soil Vapor Probe GMSG-14, if warranted. The areal and vertical extents of the waste material were determined during the SW Pit investigation. Based on the data collected, the volume of material for removal and disposal is approximately 34,000 cubic yards. The waste material is non-hazardous, and would be disposed at an appropriate landfill facility. The estimated cost for an excavation and off-site disposal of waste material response action for the SW Pit is provided in Table 9.

Institutional Controls and Restrictive Covenant

This response action for the SW Pit would include, but may not be limited to, a restrictive covenant on the SW Pit property (Lodal Park). A restrictive covenant and a City of Kingsford ordinance would prohibit the use of groundwater located beneath Lodal Park. For areas both within and outside of Lodal Park, a well ordinance that has been submitted to the City of Kingsford would restrict construction of, or use of, drinking or irrigation wells within the Study Area for the Ford/Kingsford Site, which includes the SW Pit. A restrictive covenant will also prohibit such uses of groundwater. The well ordinance and restrictive covenant will prevent the ingestion of groundwater at the SW Pit; therefore, eliminating the risk for this pathway. If a cover system is the selected response action, then a restrictive covenant would also be included in the response action and written to:

- Limit the use of Lodal Park property to park and recreational purposes.

- Prohibit the removal, disturbance or manipulation of the selected cover system, unless performed in accordance with a cover system maintenance plan. The restrictive covenant would direct construction works to the appropriate precautions and will minimize the potential for direct contact with soil or waste.

- Allow an authorized person to penetrate the selected cover system only under controlled, temporary conditions, and under provisions that would restore the integrity of the cover system.

- Require maintenance of the selected cover system.

- Require the installation and maintenance of permanent site boundary markers.

- Require the use of a vapor barrier for future buildings with confined space constructed at the site. No confined structures currently exist at the site in which vapors could accumulate. The potential for flammability and explosivity is minimized through use of this protective measure.

Comparison of Response Actions

A response action for the Lodal Park property consisting solely of restrictive covenant/institutional controls would not meet the response action objectives of preventing contact with certain buried and surface waste material and for preventing the potential for methane gas to move into confined structures. Therefore, institutional controls could only be used, where needed, to support the other three response actions evaluated: permeable and low-permeability cover systems, and excavation and off-site disposal of waste material.

All of these response actions evaluated would achieve the response action objective of preventing contact with certain waste material. The permeable and low-permeability cover system response actions achieve this objective by installing a soil barrier to prevent direct contact with underlying waste material. A restrictive covenant could be used to maintain the integrity of either of these cover systems. Both the permeable and low-permeability cover systems would not disturb the waste material. A permeable cover system could be easily implemented at the SW Pit since it would only require the placement additional fill material in a localized area that is situated primarily between the football and baseball fields. A low-permeability cover system would be more difficult to implement because the existing soil cover would need to be removed and fill material imported to provide a 3-foot protective soil layer over the synthetic liner. The area would be disturbed during construction for a significant period of time, during which the community would not have access to this portion of the park.

There is a lengthy history of effective application of the permeable cover system technology at similar sites, and the technology itself poses no additional exposure pathway to the public or environment. Future use of the SW Pit for recreational purposes could be integrated into a cover system design that could provide a benefit to the community.

As a low-permeability cover system is generally applicable where the underlying waste material is impacting groundwater, this type of cover system is not needed at the SW

Pit, because groundwater quality in the vicinity of the SW Pit has been impacted primarily by an up-gradient source, the NE Pit, and the SW Pit is not a significant continuing source of leaching to groundwater. Therefore, of the two types of cover systems; a permeable cover system would achieve the objective and is a more cost-effective response for the SW Pit.

An excavation and off-site disposal of waste material response action would also achieve the response action objective, since waste material would no longer remain at the SW Pit. Excavation of the waste material would disturb the waste and require management of these waste materials during construction and transportation to an off-site disposal facility. Air and particulate monitoring may be required, as appropriate, during the construction process. The area would be disturbed during construction for a significant period of time, during which the community would not have access to this portion of the park including the baseball and football fields.

Off-site transport of the approximately 34,000 cubic yards of waste material would require utilizing an estimated 1,900 truck loads to transport the waste material to an appropriate landfill facility. The truck traffic would have a significant impact on the community roadways and traffic. After completion of the excavation activity, the remaining open 35-foot deep excavation area would have little potential for beneficial reuse by the community.

SW Pit Interim Response Action

A permeable cover and SVE system with a restrictive covenant and institutional controls has been selected as the interim response action for the SW Pit, due to minimization of disturbance to the waste material, ease of implementation, and minimal impacts to the community. This response option is the most cost-effective option, and achieves the response action objectives for the SW Pit by addressing relevant exposure pathways. Future use of the SW Pit for recreational purposes will be integrated into the permeable cover system design, which will provide a benefit to the community and achieve response action objectives in a cost-effective manner. The response action selected includes the following elements:

- Permeable surface cover consisting of the existing soil cover augmented by additional clean cover material, where necessary to achieve a minimum cover thickness of 30 inches.

- Installation of storm water/erosion controls. May require the potential removal and handling of some soil and/or waste material to achieve appropriate sloping.

- Continued SVE system operation (installed in June 2000) and expansion of the system, or installation of a temporary system to address the area around Soil Vapor Probe GMSG-14, if warranted.

- A restrictive covenant/institutional controls.

- Permanent markers (Appendix C).

The restrictive covenant for the SW Pit is attached as Appendix D, and includes:

- Vapor barrier construction required for confined structures potentially installed in the future at the SW Pit area.

- Prohibition of groundwater use beneath the property.

- The Lodal Park property shall be used only for park and recreational purposes.

- Future construction in the SW Pit area to conform to the requirements specified in the Construction Health and Safety Plan (CHASP) and Waste Management Plan (WMP) for the site. A copy of the CHASP is included as Appendix E and the WMP is included as Appendix F.

- Require cover maintenance in perpetuity or until the waste material is sufficiently biodegraded, in accordance with the Operation & Maintenance (O&M) Plan. A copy of the O&M Plan is included as Appendix G.

- Installation and maintenance of permanent markers (Appendix C) that describe the restricted areas of the SW Pit and the nature of the restrictions.

Permeable cover systems have a long history of effectiveness and can be implemented at the SW Pit. Traditional environmental construction practices according to a site-specific health and safety plan will be more than sufficient to execute this response action. There are no unusual physical features at the SW Pit that would preclude the use of a permeable cover system.

The existing cover has vegetated and non-vegetated areas. Vegetation at the surface provides protection against erosion of the cover. The vegetation encompasses the SW Pit, including the area between the existing football field and baseball diamond, and bordering Lodal Park Drive on the south. The historical extent of the SW Pit appears to include a small area south of Lodal Park Drive. This area is also appropriately covered and vegetated. The areas that are non-vegetated, the baseball diamond and Lodal Park Drive (paved), are areas that will see normal surface maintenance in the course of their use and upkeep. The areas around the playing fields are vegetated with grass and maintained. The existing surface cover will be restored after the minimum thickness of the cover system has been achieved. Future changes in the surface cover may occur with changes in the recreational use of Lodal Park. As these changes occur, the minimum 30-inch thickness of the cover system will be maintained.

Institutional controls are intended as part of the long-term response action. Also, a restrictive covenant will limit the use of the site to current or similar usage. Additionally, the restrictive covenant will require future confined structures with foundations to account for the potential presence and accumulation of methane by installation of a vapor barrier and associated venting system, if methane is still present.

The present cover system will require minimal modifications and the SVE system has already been implemented at the site. The SVE system may need to be expanded to address the area around Soil Vapor Probe GMSG-14. This response action will be effective in minimizing direct contact with impacted soil and waste and in preventing vapors from migrating to confined structures. Therefore, the response action is considered effective for constituents found in concentrations above the Michigan Part 201 Generic Residential Soil Criteria.

The City of Kingsford, the current owner of the SW Pit property, concurs with the proposed response action of a permeable cover system, SVE system, and restrictive covenant/institutional controls for the SW Pit area. Documentation of this concurrence is included in Appendix H.

Response Action Design

A permeable cover system, SVE system, and restrictive covenant/institutional controls have been selected as the interim response action for the SW Pit. Conceptual design for the response action is described in the following section. A permeable cover system for the SW Pit is recommended to give maximum future usefulness and achieve response action objectives in a cost-effective manner.

Cover layer fill depths and suitable compaction standards will be used to provide sufficient strength for compaction and load bearing and will be identified in the response action design. Multi-year observation at the SW Pit has not indicated that there is a significant subsidence problem at the SW Pit, and it is not considered to be problematic for long-term maintenance of the permeable cover system.

The following design elements will be used in preparing plans and specifications for implementation of the selected response action:

- The area of the SW Pit requiring additional fill material, as shown on Figure 7, will first be cleared. During these activities, care will be taken to minimize the generation of airborne particles.

- Installation of storm water/erosion controls and, if required, expansion of the SVE system to the area around Soil Vapor Probe GMSG-14, may require the removal and appropriate disposal of soil and/or waste material. Any waste encountered will be handled in accordance with the Waste Management Plan (Appendix F) and the Construction Health and Safety Plan Guideline (Appendix E). Ambient air monitoring will be implemented as appropriate.

- Common fill will be added to this area to achieve at least a 24-inch thick layer. Additional common fill material may be placed as necessary to promote proper drainage.

- Topsoil or a topsoil/sand mixture will be placed over the common fill layer at a minimum thickness of 6 inches. Therefore, a minimum of 30 inches of cover material (common fill layer and topsoil layer) will be maintained over the entire SW Pit.

- The topsoil will be seeded, fertilized, and mulched.

- A restrictive covenant will be implemented for the SW Pit. Restrictions for the area are generally described below, and a copy of the restrictive covenant is provided in Appendix D.

  - Future construction activities must restore the integrity of the cover system if the cover system is negatively affected by the construction.

- Any construction activity that may encounter waste below the cover must follow the Waste Management Plan (Appendix F) and the Construction Health and Safety Plan Guideline (Appendix E).

- Vapor barrier construction required for confined structures potentially installed in the future at the SW Pit area.

- The use of any groundwater located beneath Lodal Park for any purpose is prohibited.

- Permanent markers that describe the restricted area and the nature of the restrictions will be installed and maintained (Appendix C).

- The cover will be maintained according to the Operation and Maintenance Plan (Appendix G).

Following area preparation, upgrade of the permeable cover system, where required, will commence. The common fill layer will be incorporated before the topsoil layer is placed. Following final grading of the surface layer, to blend in with the surrounding area, surface vegetation will be established to control surface-water run-off, erosion, and ponding.

Any construction work that penetrates through the permeable cover system to waste will follow the Construction Health and Safety Plan Guideline and the Waste Management Plan developed for the SW Pit. All workers involved with future construction in the SW Pit will follow the Construction Health and Safety Plan Guideline if waste material beneath the permeable cover system will be encountered. Any soil/waste material that is excavated during future construction activities will need to be managed in accordance with the Waste Management Plan. After any future construction activities are complete, any portion of the permeable cover system that was disturbed will need to be restored to pre-construction conditions. This includes adding common fill and 6 inches of topsoil to maintain at least a 30-inch cover. The disturbed area will be checked for settlement after construction activities. If settling has occurred, the permeable cover system will be inspected to ensure that it still meets the original specifications.

Soil Vapor Extraction System Design

A SVE system was installed at the SW Pit in June 2000. The SVE system consists of a 10 horsepower explosion-proof regenerative blower, a 55-gallon moisture separator for condensate, an exhaust muffler, and an airflow meter. The SVE system is housed in an 8 feet by 12 feet treatment building that is connected to four vapor extraction points (Soil Gas Probes GMSG-29, GMSG-31, GMSG-32, and GMSG-33). The gas probes were constructed of 2-inch diameter polyvinyl chloride (PVC) with a slotted PVC screen. Soil Gas Probe GMSG-29 is screened from approximately 15 to 25 ft bls, and Soil Gas Probes GMSG-31, GMSG-32, and GMSG-33 are screened from 5 to 22 ft bls. Vapor extraction point locations, system piping, and the treatment system building are illustrated on Figure 8. The SVE system layout is depicted on Figure 9.

The SVE system operates at an air flow rate of approximately 250 cubic feet per minute with a vacuum of approximately 40 inches of water. Within the first month of system operation, methane concentrations decreased to less than 1 percent. The SVE system will be expanded to include the area around Soil Vapor Probe GMSG-14 if warranted, and will operate on a periodic basis to prevent any potential off-site migration of methane. SVE system operation data is summarized in Table 6.

Permanent Markers

Survey reference markers will be placed at the corners of the permeable cover system. The survey reference markers will be used to delineate the areal extent of the SW Pit. In addition, permanent markers will be installed at MDEQ-approved locations, which will describe the restricted areas of the SW Pit and the nature of the restrictions. Details concerning the permanent markers are provided in Appendix C. The survey reference markers and permanent markers will be inspected annually.

Inspections

The SW Pit will be inspected on a periodic basis in accordance with the O&M Plan (Appendix G) to ensure compliance with the IRAP. These inspections will be recorded in a dedicated logbook and appropriate inspection forms.

Response Action Implementation and Schedule

Construction at the SW Pit will begin the first construction season after approval of this IRAP. Based on an assumed approval date of early summer 2003, key dates for the implementation of the SW Pit IRAP are tentatively identified below.

Project Phase	Date
SW Pit IRAP Construction Initiated	August 2003
Submittal of Construction Report	March 2004

This schedule is contingent on reasonable and expected weather conditions. Every practical effort will be made to achieve the established schedule.

References

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	Surface Soil	Surface Soil	Surface Waste	Surface Soil	Surface Soil	Surface Soil	Surface Soil
Depth	0.5'	0-1'	0.2-0.7'	6"-12"	6"-12"	6"-12"	6"-12"
Sample Date	05/04/88	05/15/96	05/15/96	08/10/99	08/10/99	08/10/99	08/10/99
Sample Name	S-6	SS-32	SS-33	SSLP-1	SSLP-2	SSLP-3	SSLP-4
VOC							
2-Butanone (MEK)	37 J	<12	<11	<2,700	<2,800	<3,000	<2,700
Acetone	<1,000	<12	5 J	R	R	R	R
Toluene	<500	<12	<11	<110	<110	<120	<110
SVOC							
4-Chloroaniline	<430	<360	<360	<360	<380	<390	<360
Benzo(a)anthracene	<430	65 J	130 J	<360	<380	<390	<360
Benzo(a)pyrene	<430	<360	98 J	<360	<380	<390	<360
Benzo(b)fluoranthene	<430	100 J	140 J	<360	<380	<390	<360
Benzo(g,h,i)perylene	<430	36 J	79 J	<360	<380	<390	<360
Benzo(k)fluoranthene	<430	53 J	130 J	<360	<380	<390	<360
bis(2-Ethylhexyl)phthalate	2,000	<360 BJ	<360 BJ	<360	<380	<390	<360
Chrysene	<430	69 J	140 J	<360	<380	<390	<360
Fluoranthene	<430	100 J	350 J	<360	<380	<390	<360
Indeno(1,2,3-c,d)pyrene	<430	40 J	73 J	<360	<380	<390	<360
Phenanthrene	<430	53 J	94 J	<360	<380	<390	<360
Pyrene	<430	89 J	290 J	<360	<380	<390	<360
Metals							
Aluminum	**3,950,000**	**3,580,000**	**5,100,000**	**6,400,000**	**5,400,000**	**6,700,000**	**6,300,000**
Arsenic	3,600 N	2,100 B	2,600	2,400	1,700	1,700	1,400
Barium	163,000	16,900 B	30,100 B	47,000	34,000	67,000	32,000
Beryllium	390 B	<130	<120	250	230	240	230
Cadmium	1,100 B	290 B	220 B	89 J	93 J	260 J	42 J
Calcium	12,100,000	3,890,000	1,090,000	1,800,000 J	2,200,000 J	2,500,000 J	1,200,000 J
Chromium	16,200	11,300	10,900	14,000	24,000	18,000	15,000
Cobalt	**4,400 B**	**4,500 B**	**4,800 B**	**6,000**	**5,300**	**5,700**	**5,400**
Copper	48,800 *	19,100	27,100	32,000	23,000	33,000	23,000
Iron	**12,400,000**	**7,710,000**	**8,340,000**	**16,000,000 ***	**14,000,000 ***	**15,000,000 ***	**13,000,000 ***
Lead	63,500	92,100	30,500	8,300	10,000	34,000	8,800

Footnotes on Page 9.

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	**Surface Soil**	**Surface Soil**	**Surface Waste**	**Surface Soil**	**Surface Soil**	**Surface Soil**	**Surface Soil**
Depth	**0.5'**	**0-1'**	**0.2-0.7'**	**6"-12"**	**6"-12"**	**6"-12"**	**6"-12"**
Sample Date	**05/04/88**	**05/15/96**	**05/15/96**	**08/10/99**	**08/10/99**	**08/10/99**	**08/10/99**
Sample Name	**S-6**	**SS-32**	**SS-33**	**SSLP-1**	**SSLP-2**	**SSLP-3**	**SSLP-4**
Magnesium	3,120,000	3,870,000	1,940,000	3,300,000 *	3,000,000 *	3,300,000 *	2,600,000 *
Manganese	**423,000 ***	**127,000 N**	**148,000 N**	**770,000**	**210,000**	**290,000**	**270,000**
Mercury	<120	80 B	140	25 J	18 J	68 J	10 J
Molybdenum	NA	NA	NA	<420 J	210 J	<420 J	<170 J
Nickel	11,600	8,800	9,200	17,000	14,000	13,000	13,000
Potassium	914,000 B	386,000 B	353,000 B	840,000 J	470,000 J	480,000 J	570,000 J
Selenium	800 BW	<670	<620	<1,000 WN	<1,000 WN	<450 WN	<1,000 WN
Silver	<1,000 N	<730	<680	120 J	<570	590 J	<540
Sodium	95,300 B	55,300 B	35,400 B	130,000	57,000	72,000	71,000
Titanium	NA	NA	NA	480,000 J	420,000 J	390,000 J	440,000 J
Vanadium	16,800	13,500	14,900	28,000	23,000	31,000	34,000
Zinc	757,000 *E	41,500	33,400	39,000 N	27,000 N	63,000 N	24,000 N

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil
Depth	6"-12"	6"-12"	6"-12"	6"-12"	6"-12"	6"-12"	6"-12"
Sample Date	08/10/99	08/10/99	08/10/99	08/10/99	08/10/99	08/10/99	08/10/99
Sample Name	SSLP-5	SSLP-6	SSLP-7	SSLP-8	SSLP-99 (SSLP-8)	SSLP-9	SSLP-10
VOC							
2-Butanone (MEK)	<2,900	<2,800	<2,700	<2,800	<2,900	<2,900	<2,700
Acetone	R	R	R	R	R	R	R
Toluene	<120	<110	<110	86 J	<110	<110	<110
SVOC							
4-Chloroaniline	<390	<380	<360	230 J	220 J	350 J	<350
Benzo(a)anthracene	<390	<380	<360	<370	<380	<380	<350
Benzo(a)pyrene	<390	<380	<360	<370	<380	110 J	<350
Benzo(b)fluoranthene	<390	<380	<360	<370	<380	120 J	<350
Benzo(g,h,i)perylene	<390	<380	<360	<370	<380	100 J	<350
Benzo(k)fluoranthene	<390	<380	<360	<370	<380	<380	<350
bis(2-Ethylhexyl)phthalate	110	<380	<360	<370	250 J	210 J	<350
Chrysene	<390	<380	<360	<370	<380	<380	<350
Fluoranthene	<390	<380	<360	320 J	<380	<380	<350
Indeno(1,2,3-c,d)pyrene	<390	<380	<360	<370	<380	110 J	<350
Phenanthrene	<390	<380	<360	280 J	<380	<380	<350
Pyrene	<390	<380	<360	250 J	<380	<380	<350
Metals							
Aluminum	**6,700,000**	**5,700,000**	**7,400,000**	**7,500,000**	**6,600,000**	**9,300,000**	**5,600,000**
Arsenic	1,700	1,600	1,100	1,400	3,500	3,300 WS	2,600
Barium	110,000	27,000	23,000	130,000	120,000	170,000	24,000
Beryllium	230 J	190 J	250	260	220 J	280	210 J
Cadmium	530 J	80 J	<27 J	520 J	630 J	1,100 J	38 J
Calcium	3,700,000 J	1,900,000 J	2,200,000 J	2,200,000 J	1,900,000 J	4,900,000 J	2,400,000 J
Chromium	17,000	18,000	18,000	20,000	17,000	23,000	16,000
Cobalt	**4,000**	**4,700**	**7,800**	**5,900**	**4,600**	**4,500**	**5,200**
Copper	40,000	20,000	23,000	46,000	45,000	60,000	25,000
Iron	**11,000,000 ***	**13,000,000 ***	**16,000,000 ***	**16,000,000 ***	**12,000,000 ***	**14,000,000 ***	**12,000,000 ***
Lead	26,000	9,400	3,200	53,000	56,000	38,000	4,200

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	**Surface Soil**	**Surface Soil**	**Surface Soil**	**Surface Soil**	**Surface Soil**	**Surface Soil**	**Surface Soil**
Depth	**6"-12"**	**6"-12"**	**6"-12"**	**6"-12"**	**6"-12"**	**6"-12"**	**6"-12"**
Sample Date	**08/10/99**	**08/10/99**	**08/10/99**	**08/10/99**	**08/10/99**	**08/10/99**	**08/10/99**
Sample Name	**SSLP-5**	**SSLP-6**	**SSLP-7**	**SSLP-8**	**SSLP-99 (SSLP-8)**	**SSLP-9**	**SSLP-10**
Magnesium	2,100,000 *	3,000,000 *	4,700,000 *	3,200,000 *	2,500,000 *	2,700,000 *	3,500,000 *
Manganese	**240,000**	**210,000**	**260,000**	**420,000 J**	**280,000 J**	**230,000**	**280,000**
Mercury	180	11 J	<110	170	220	600 B	5.6 J
Molybdenum	600 J	<200 J	<160 J	950 J	760 J	870	<130 J
Nickel	10,000	15,000	17,000	15,000	13,000	13,000	13,000
Potassium	350,000 J	460,000 J	580,000 J	370,000 J	390,000 J	390,000 J	580,000 J
Selenium	<470 WN	<1,000 WN	<1,000 WN	<1,100 WN	<1,100 WN	<1,000 WN	<1,100 WN
Silver	2,600	<570	<550	2,800	2,400	**5,100**	<540
Sodium	58,000	74,000	73,000	56,000	67,000	54,000	97,000
Titanium	270,000 J	410,000 J	570,000 J	390,000 J	310,000 J	280,000 J	380,000 J
Vanadium	22,000	26,000	27,000	26,000	22,000	27,000	24,000
Zinc	92,000 N	22,000 N	19,000 N	100,000 N	98,000 J	120,000 N	25,000 N

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	**Surface Soil**	**Surface Soil**	**Surface Soil**	**Surface Soil**	**Criteria**	
Depth	**6"-12"**	**6"-12"**	**6"-12"**	**6"-12"**	**Particulate**	
Sample Date	**08/10/99**	**08/10/99**	**08/10/99**	**08/05/99**	**Soil**	**Direct**
Sample Name	**SSLP-11**	**SSLP-12**	**SSLP-13**	**SSNE-3**	**Inhalation**	**Contact**
VOC						
2-Butanone (MEK)	<2,800	<2,800	<2,900	<2,600	67,000,000,000 (I)	27,000,000 (I) C,DD
Acetone	R	R	R	<5,200	390,000,000,000 (I)	23,000,000 (I)
Toluene	<110	<110	<110	<100	27,000,000,000 (I)	250,000 (I) C
SVOC						
4-Chloroaniline	<380	<370	<380	<340	NE	NE
Benzo(a)anthracene	<380	<370	<380	<340	(Q) ID	20,000 (Q)
Benzo(a)pyrene	<380	<370	<380	<340	1,500,000 (Q)	2,000 (Q)
Benzo(b)fluoranthene	<380	<370	<380	<340	(Q) ID	20,000 (Q)
Benzo(g,h,i)perylene	<380	<370	<380	<340	800,000,000	2,500,000
Benzo(k)fluoranthene	<380	<370	<380	<340 J	(Q) ID	200,000 (Q)
bis(2-Ethylhexyl)phthalate	<380	<370	<380	<340	700,000,000	2,800,000
Chrysene	<380	<370	<380	<340	(Q) ID	2,000,000 (Q)
Fluoranthene	<380	<370	<380	<340	9,300,000,000	46,000,000
Indeno(1,2,3-c,d)pyrene	<380	<370	<380	<340	(Q) ID	20,000 (Q)
Phenanthrene	<380	<370	<380	<340	6,700,000	1,600,000
Pyrene	<380	<370	<380	<340	6,700,000,000	29,000,000
Metals						
Aluminum	**8,900,000**	**6,800,000**	**8,000,000**	NA	(B) ID	50,000,000 (B) DD
Arsenic	3,000	1,800	2,200	NA	720,000	7,600
Barium	56,000	47,000	100,000	NA	330,000,000 (B)	37,000,000 (B)
Beryllium	280	230	270	NA	1,300,000	410,000
Cadmium	140 J	220 J	410 J	NA	1,700,000 (B)	550,000 (B)
Calcium	34,000,000 J	2,100,000 J	2,500,000 J	NA	NE	NE
Chromium	21,000	20,000	17,000	NA	260,000 total/dissolved	2,500,000 total/dissolved
Cobalt	**6,700**	**5,600**	**4,400**	NA	13,000,000	2,600,000
Copper	27,000	31,000	36,000	NA	130,000,000 (B)	20,000,000 (B)
Iron	**16,000,000 ***	**15,000,000 ***	**12,000,000 ***	NA	(B) ID	160,000,000 (B)
Lead	13,000	19,000	23,000	NA	100,000,000 (B)	400,000 (B)

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Criteria	
Depth	6"-12"	6"-12"	6"-12"	6"-12"	Particulate	
Sample Date	08/10/99	08/10/99	08/10/99	08/05/99	Soil	Direct
Sample Name	SSLP-11	SSLP-12	SSLP-13	SSNE-3	Inhalation	Contact
Magnesium	**22,000,000 ***	4,000,000 *	2,400,000 *	NA	6,700,000,000 (B)	1,000,000,000 (B) D
Manganese	**530,000**	**250,000**	**320,000**	NA	3,300,000 (B)	25,000,000 (B)
Mercury	13 J	43 J	120	NA	20,000,000 (B,Z) (total)	160,000 (B,Z) (total)
Molybdenum	<300 J	<300 J	660 J	NA	(B) ID	2,600,000 (B)
Nickel	16,000	15,000	11,000	NA	13,000,000 (B)	40,000,000 (B)
Potassium	1,000,000 J	470,000 J	520,000 J	NA	NE	NE
Selenium	<1,000 WN	<1,000 WN	<1,100 WN	NA	130,000,000 (B)	2,600,000 (B)
Silver	<570	210 J	2,200	NA	6,700,000 (B)	2,500,000 (B)
Sodium	140,000	87,000	57,000	NA	ID	1,000,000,000 D
Titanium	530,000 J	430,000 J	380,000 J	NA	NE	NE
Vanadium	37,000	29,000	26,000	NA	ID	750,000 DD
Zinc	52,000 N	92,000 N	68,000 N	NA	(B) ID	170,000,000 (B)

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring Depth Sample Date Sample Name	Criteria Drinking Water Protection	Groundwater/ Surface Water Interface	Soil Volatilization to Indoor Air Inhalation
VOC			
2-Butanone (MEK)	260,000 (I)	44,000 (I)	27,000,000 (I) C
Acetone	15,000 (I)	34,000 (I)	110,000,000 (I) C
Toluene	16,000 (I)	2,800 (I)	250,000 (I) C
SVOC			
4-Chloroaniline	NE	NE	NE
Benzo(a)anthracene	(Q) NLL	(Q) NLL	(Q) NLV
Benzo(a)pyrene	(Q) NLL	(Q) NLL	(Q) NLV
Benzo(b)fluoranthene	(Q) NLL	(Q) NLL	(Q) ID
Benzo(g,h,i)perylene	NLL	NLL	NLV
Benzo(k)fluoranthene	(Q) NLL	(Q) NLL	(Q) NLV
bis(2-Ethylhexyl)phthalate	NLL	NLL	NLV
Chrysene	(Q) NLL	(Q) NLL	(Q) ID
Fluoranthene	730,000	5,500	1,000,000,000 D
Indeno(1,2,3-c,d)pyrene	(Q) NLL	(Q) NLL	(Q) NLV
Phenanthrene	56,000	5,300	2,800,000
Pyrene	480,000	ID	1,000,000,000 D
Metals			
Aluminum	1,000 (B)	(B) NA	(B) NLV
Arsenic	23,000	70,000 X	NLV
Barium	1,300,000 (B)	260,000 (B) G,X	(B) NLV
Beryllium	51,000	24,000 G	NLV
Cadmium	6,000 (B)	2,500 (B) G,X	(B) NLV
Calcium	NE	NE	NE
Chromium	30,000 total/dissolved	3,300 total/dissolved	total/dissolved NLV
Cobalt	800	2,000	NLV
Copper	5,800,000 (B)	48,000 (B) G	(B) NLV
Iron	6,000 (B)	(B) NE	(B) NLV
Lead	700,000 (B)	1,700,000 (B) G,M,X	(B) NLV

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring Depth Sample Date Sample Name	Criteria: Drinking Water Protection	Criteria: Groundwater/ Surface Water Interface	Criteria: Soil Volatilization to Indoor Air Inhalation
Magnesium	8,000,000 (B)	(B) NE	(B) NLV
Manganese	1,000 (B)	36,000 (B) G,X	(B) NLV
Mercury	1,700 (B,Z) (total)	100 (B,Z) (total) M	48,000 (B,Z) (total)
Molybdenum	1,500 (B)	16,000 (B) X	(B) NLV
Nickel	100,000 (B)	50,000 (B) G	(B) NLV
Potassium	NE	NE	NE
Selenium	4,000 (B)	400 (B)	(B) NLV
Silver	4,500 (B)	500 (B) M	(B) NLV
Sodium	2,500,000	NE	NLV
Titanium	NE	NE	NE
Vanadium	72,000	190,000	NLV
Zinc	2,400,000 (B)	110,000 (B) G	(B) NLV

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Table 1. Summary of Constituents Detected in Surface Material Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

All results are in micrograms per kilogram (µg/kg).

Bold	Above the Residential and Commercial I Drinking Water Protection Criteria (Part 201, December 2002).
Italics	Above the Residential and Commercial I Soil Volatilization to Indoor Air Inhalation Criteria (Part 201, December 2002).
Underline	Above the Residential and Commercial I Groundwater/Surface Water Interface Protection Criteria (Part 201, December 2002).
(shaded)	Above the Residential and Commercial I Particulate Soil Inhalation Criteria (Part 201, December 2002).
(boxed)	Above the Residential and Commercial I Direct Contact Criteria (Part 201, December 2002).
<	Less than detection limit.
*	Duplicate analysis was not within control limits.
B	Constituent was also detected in laboratory blank.
E	Analyte was detected at a concentration greater than the calibration range, and is therefore estimated.
J	Estimated result.
N	Spike sample recovery is not within control limits.
NA	Not analyzed.
R	Rejected result.
S	Value was determined by Method of Standard Additions.
SVOCs	Semi-volatile organic compounds.
VOCs	Volatile organic compounds.
W	Post-digestion spike for furnace A-A analysis is out of control limits while sample absorbance is less than 50% of spike absorbance.

Criteria Footnotes:

AD	Substance causes developmental effects. Residential and Commercial I direct contact criteria are protective of both prenatal and postnatal exposure.
B	Background may be substituted if higher than the calculated cleanup criteria.
C	Value presented is a screening level based on the chemical specific generic soil saturation concentration (Csat) since the calculated risk-based criterion is greater than Csat.
D	Calculated criterion exceeds 100%, hence it is reduced to 100%.
G	GSI criterion is hardness dependent.
I	Chemical may exhibit the characteristic of ignitability, as defined in 40 CFR 261.21.
ID	Insufficient data.
INO	Inorgranic.
M	Calculated criterion is below the target detection limit (TDL), therefore, the criterion defaults to the TDL.
NE	Not established.
NLL	Chemical is not likely to leach under most soil conditions.
NLV	Chemical is not likely to volatilize under most soil conditions.
Q	Criterion for carcinogenic polycyclic aromatic hydrocarbons (PAHs) were developed using "relative potential potenicies" (RPPs) to benzo(a)pyrene.
X	The GSI criterion is not protective for surface water that is used as a drinking water source.

Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2						
Sample Depth	5-25'	35'	60'	85'	110'	110'	135'
Sample Date	05/17/97	05/17/97	05/17/97	05/17/97	05/19/97	05/19/97	05/19/97
Sample Name	GMSB-2/0525	GMSB-2/35	GMSB-2/60	GMSB-2/85	GMSB-2/110	GMSB-2/110 DUP	GMSB-2/135
Type	Wood/Char	Soil	Soil	Soil	Soil	Soil	Soil
VOC							
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	48 J	47 J	NA	NA	<61 J	NA	NA
2-Hexanone	<97	<55	NA	NA	<61 J	NA	NA
4-Methyl-2-pentanone (MIBK)	<97	<55	NA	NA	<61 J	NA	NA
Acetone	79 J	71	NA	NA	<61 J	NA	NA
Benzene	7.5 J	<5.5	NA	NA	<6.1 J	NA	NA
Carbon disulfide	<9.7	3.2 J	NA	NA	<6.1 J	NA	NA
Chloromethane	<9.7	<5.5	NA	NA	<6.1 J	NA	NA
Ethylbenzene	18	<5.5	NA	NA	<6.1 J	NA	NA
Methylene chloride	<9.7	<5.5	NA	NA	<6.1 J	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA
Toluene	14	<5.5	NA	NA	<6.1 J	NA	NA
Trichloroethene	<9.7	<5.5	NA	NA	<6.1 J	NA	NA
Xylene, o	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	190	<5.5	NA	NA	<6.1 J	NA	NA
Xylenes, m+p	NA	NA	NA	NA	NA	NA	NA
SVOC							
2,4-Dimethylphenol	<4,000	230	NA	NA	<200	NA	NA
2-Methylnaphthalene	5,200	<180	NA	NA	<200	NA	NA
2-Methylphenol	2,200 J	300	NA	NA	<200	NA	NA
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	5,100	1,500	NA	NA	<200	NA	NA
Acenaphthene	<4,000	<180	NA	NA	<200	NA	NA
Anthracene	1,400 J	<180	NA	NA	<200	NA	NA
Benzo(a)anthracene	1,400 J	<180	NA	NA	<200	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2						
Sample Depth	5-25'	35'	60'	85'	110'	110'	135'
Sample Date	05/17/97	05/17/97	05/17/97	05/17/97	05/19/97	05/19/97	05/19/97
Sample Name	GMSB-2/0525	GMSB-2/35	GMSB-2/60	GMSB-2/85	GMSB-2/110	GMSB-2/110 DUP	GMSB-2/135
Type	Wood/Char	Soil	Soil	Soil	Soil	Soil	Soil
SVOC (continued)							
Benzo(a)pyrene	<4,000	<180	NA	NA	<200	NA	NA
Benzo(b)fluoranthene	900 J	<180	NA	NA	<200	NA	NA
Benzo(g,h,i)perylene	<4,000	<180	NA	NA	<200	NA	NA
Benzo(k)fluoranthene	<4,000	<180	NA	NA	<200	NA	NA
bis(2-Ethylhexyl)phthalate	<4,000	<180	NA	NA	<200	NA	NA
Butylbenzylphthalate	<4,000	<180	NA	NA	<200	NA	NA
Carbazole	1,100 J	<180	NA	NA	<200	NA	NA
Chrysene	1,400 J	<180	NA	NA	<200	NA	NA
Dibenzofuran	1,500 J	<180	NA	NA	<200	NA	NA
Diethylphthalate	<4,000	<180	NA	NA	<200	NA	NA
Di-n-butylphthalate	<4,000	<180	NA	NA	<200	NA	NA
Di-n-octylphthalate	<4,000	<180	NA	NA	<200	NA	NA
Fluoranthene	4,100	<180	NA	NA	<200	NA	NA
Fluorene	2,000 J	<180	NA	NA	<200	NA	NA
Naphthalene	3,900 J	<180	NA	NA	<200	NA	NA
n-Nitrosodimethylamine	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	3,000 J	<180	NA	NA	<200	NA	NA
Phenanthrene	7,600	<180	NA	NA	<200	NA	NA
Phenol	2,000 J	340	NA	NA	<200	NA	NA
Pyrene	2,700 J	<180	NA	NA	<200	NA	NA
Metals							
Aluminum	**484,000**	**4,210,000**	NA	NA	NA	NA	NA
Antimony	**5,410**	488	NA	NA	NA	NA	NA
Arsenic	1,880 Wa	1,000	NA	NA	NA	NA	NA
Barium	261,000	13,100	NA	NA	NA	NA	NA
Beryllium	<971	<553	NA	NA	NA	NA	NA
Cadmium	394	<27.6 Wa	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2						
Sample Depth	5-25'	35'	60'	85'	110'	110'	135'
Sample Date	05/17/97	05/17/97	05/17/97	05/17/97	05/19/97	05/19/97	05/19/97
Sample Name	GMSB-2/0525	GMSB-2/35	GMSB-2/60	GMSB-2/85	GMSB-2/110	GMSB-2/110 DUP	GMSB-2/135
Type	Wood/Char	Soil	Soil	Soil	Soil	Soil	Soil
Metals (continued)							
Calcium	2,840,000	927,000	NA	NA	NA	NA	NA
Chromium	29,000	9,470	NA	NA	NA	NA	NA
Cobalt	<9,710	<5,530	NA	NA	NA	NA	NA
Copper	646,000	13,800	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA
Iron	**4,460,000**	**5,950,000**	NA	NA	NA	NA	NA
Lead	276,000	1,990	NA	NA	NA	NA	NA
Magnesium	<971,000	2,240,000	NA	NA	NA	NA	NA
Manganese	**86,900**	**54,900**	NA	NA	NA	NA	NA
Mercury	304	<55.3	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA
Nickel	4,960	13,500	NA	NA	NA	NA	NA
Potassium	<971,000	<553,000	NA	NA	NA	NA	NA
Selenium	<486	<276	NA	NA	NA	NA	NA
Silver	<486	<276	NA	NA	NA	NA	NA
Sodium	<971,000	<553,000	NA	NA	NA	NA	NA
Thallium	<486	<276	NA	NA	NA	NA	NA
Titanium	NA	NA	NA	NA	NA	NA	NA
Vanadium	3,460	12,400	NA	NA	NA	NA	NA
Zinc	322,000 MBB	19,900 MBD	NA	NA	NA	NA	NA
Alcohols							
1-Propanol	NA	NA	NA	NA	NA	NA	NA
Ethanol	NA	NA	NA	NA	NA	NA	NA
Ethylacetate	NA	NA	NA	NA	NA	NA	NA
Methanol	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	**GMSB-2**						
Sample Depth	**5-25'**	**35'**	**60'**	**85'**	**110'**	**110'**	**135'**
Sample Date	**05/17/97**	**05/17/97**	**05/17/97**	**05/17/97**	**05/19/97**	**05/19/97**	**05/19/97**
Sample Name	**GMSB-2/0525**	**GMSB-2/35**	**GMSB-2/60**	**GMSB-2/85**	**GMSB-2/110**	**GMSB-2/110 DUP**	**GMSB-2/135**
Type	**Wood/Char**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Aldehydes							
Acetaldehyde	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs							
4,4'-DDE	<32	<3.6	NA	NA	NA	NA	NA
Aldrin	<16	<1.9	NA	NA	NA	NA	NA
Aroclor 1254	<320	<36	NA	NA	NA	NA	NA
Chlordane (gamma)	<16	<1.9	NA	NA	NA	NA	NA
Dieldrin	<32	<3.6	NA	NA	NA	NA	NA
Endrin	<32	<3.6	NA	NA	NA	NA	NA
Endrin aldehyde	<32	<3.6	NA	NA	NA	NA	NA
Endrin ketone	<32	<3.6	NA	NA	NA	NA	NA
Heptachlor	<16	<1.9	NA	NA	NA	NA	NA
Heptachlor epoxide	<16	<1.9	NA	NA	NA	NA	NA
Acetic Acid	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	27,000,000	1,900,000	1,400,000	800,000	2,400,000	2,400,000	1,100,000
Percent Solids	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)						
Sample Depth	160'	185'	215'	245'	300'	300'	323'
Sample Date	05/19/97	05/19/97	05/19/97	05/20/97	05/20/97	05/20/97	05/30/97
Sample Name	GMSB-2/160	GMSB-2/185	GMSB-2/215	GMSB-2/245'	GMSB-2/300'	GMSB-2/300' DUP	GMSB-2/323
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
VOC							
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	11 J	92	NA	<57 J
2-Hexanone	NA	NA	NA	<59	14 J	NA	<57 J
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	<59	<56	NA	<57 J
Acetone	NA	NA	NA	10 J	76	NA	<57 J
Benzene	NA	NA	NA	<5.9	<5.6	NA	<5.7 J
Carbon disulfide	NA	NA	NA	<5.9	<5.6	NA	<5.7 J
Chloromethane	NA	NA	NA	<5.9	<5.6	NA	<5.7 J
Ethylbenzene	NA	NA	NA	<5.9	<5.6	NA	<5.7 J
Methylene chloride	NA	NA	NA	<5.9	<5.6	NA	<5.7 J
Naphthalene	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	<5.9	<5.6	NA	<5.7 J
Trichloroethene	NA	NA	NA	<5.9	<5.6	NA	<5.7 J
Xylene, o	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	<5.9	<5.6	NA	<5.7 J
Xylenes, m+p	NA	NA	NA	NA	NA	NA	NA
SVOC							
2,4-Dimethylphenol	NA	NA	NA	46 J	190	NA	<190
2-Methylnaphthalene	NA	NA	NA	<200	<180	NA	<190
2-Methylphenol	NA	NA	NA	120 J	360	NA	<190
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	280	1,600	NA	<190
Acenaphthene	NA	NA	NA	<200	<180	NA	<190
Anthracene	NA	NA	NA	<200	<180	NA	<190
Benzo(a)anthracene	NA	NA	NA	<200	<180	NA	<190

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)						
Sample Depth	160'	185'	215'	245'	300'	300'	323'
Sample Date	05/19/97	05/19/97	05/19/97	05/20/97	05/20/97	05/20/97	05/30/97
Sample Name	GMSB-2/160	GMSB-2/185	GMSB-2/215	GMSB-2/245'	GMSB-2/300'	GMSB-2/300' DUP	GMSB-2/323
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SVOC (continued)							
Benzo(a)pyrene	NA	NA	NA	<200	<180	NA	<190
Benzo(b)fluoranthene	NA	NA	NA	<200	<180	NA	<190
Benzo(g,h,i)perylene	NA	NA	NA	<200	<180	NA	<190
Benzo(k)fluoranthene	NA	NA	NA	<200	<180	NA	<190
bis(2-Ethylhexyl)phthalate	NA	NA	NA	<200	<180	NA	<190
Butylbenzylphthalate	NA	NA	NA	<200	<180	NA	<190
Carbazole	NA	NA	NA	<200	<180	NA	<190
Chrysene	NA	NA	NA	<200	<180	NA	<190
Dibenzofuran	NA	NA	NA	<200	<180	NA	<190
Diethylphthalate	NA	NA	NA	<200	<180	NA	<190
Di-n-butylphthalate	NA	NA	NA	<200	<180	NA	<190
Di-n-octylphthalate	NA	NA	NA	<200	<180	NA	<190
Fluoranthene	NA	NA	NA	<200	<180	NA	<190
Fluorene	NA	NA	NA	<200	<180	NA	<190
Naphthalene	NA	NA	NA	<200	<180	NA	<190
n-Nitrosodimethylamine	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	<200	<180	NA	<190
Phenanthrene	NA	NA	NA	<200	<180	NA	<190
Phenol	NA	NA	NA	270	900	NA	<190
Pyrene	NA	NA	NA	<200	<180	NA	<190
Metals							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)						
Sample Depth	160'	185'	215'	245'	300'	300'	323'
Sample Date	05/19/97	05/19/97	05/19/97	05/20/97	05/20/97	05/20/97	05/30/97
Sample Name	GMSB-2/160	GMSB-2/185	GMSB-2/215	GMSB-2/245'	GMSB-2/300'	GMSB-2/300' DUP	GMSB-2/323
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Metals (continued)							
Calcium	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA
Titanium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA
Alcohols							
1-Propanol	NA	NA	NA	NA	NA	NA	NA
Ethanol	NA	NA	NA	NA	NA	NA	NA
Ethylacetate	NA	NA	NA	NA	NA	NA	NA
Methanol	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)						
Sample Depth	160'	185'	215'	245'	300'	300'	323'
Sample Date	05/19/97	05/19/97	05/19/97	05/20/97	05/20/97	05/20/97	05/30/97
Sample Name	GMSB-2/160	GMSB-2/185	GMSB-2/215	GMSB-2/245'	GMSB-2/300'	GMSB-2/300' DUP	GMSB-2/323
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Aldehydes							
Acetaldehyde	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs							
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA	NA
Chlordane (gamma)	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA
Acetic Acid	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	620,000	1,600,000	3,300,000	550,000	860,000	760,000	14,000,000
Percent Solids	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)							
Sample Depth	355'	13-14.5'	23.5-24.5'	23.5-24.5'	26.5-27.5'	26.5-27.5'	43.5-44.5'	83-85'
Sample Date	05/30/97	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97
Sample Name	GMSB-2/355	SB2-SS11	SB2-SS12	SB2-SS12-RE	SB2-SS13	SB2-SS13-RE	SB2-SS14	SB2-SS15
Type	Soil	NA	NA	NA	NA	NA	Soil	Soil
VOC								
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	50 J	<2,000	180	220 J	3,500	2,000 J	18	<12
2-Hexanone	<60 J	<2,000	<27 J	<27 J	280	<5,000	<11	<12
4-Methyl-2-pentanone (MIBK)	<60 J	<2,000	<27 J	<27 J	240	<5,000	<11	<12
Acetone	44 J	2,200 J	420 J	510 J	4,600 J	3,400 J	<49 J	<35 J
Benzene	<6 J	**570 J**	14 J	18 J	**140**	<5,000	<11	<12
Carbon disulfide	<6 J	<2,000	<27	<27 J	<42 J	<5,000	<11	<12
Chloromethane	<6 J	<2,000	<27	<27 J	<42	<5,000	<11	<12
Ethylbenzene	<6 J	**2,000**	<27 J	<27 J	70 J	<5,000	<11	<12
Methylene chloride	<6 J	<2,000	<27 J	<27 J	<42 J	<5,000	<11 J	<12 J
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	<6 J	1,000 J	<27	<29 J	9,600 J	6,400	<11	<12
Trichloroethene	<6 J	<2,000	4 J	<27 J	<42	<5,000	<11	<12
Xylene, o	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	<6 J	**20,000**	44 J	61 J	57	<5,000	<11	<12
Xylenes, m+p	NA	NA	NA	NA	NA	NA	NA	NA
SVOC								
2,4-Dimethylphenol	440	**26,000**	**13,000**	**14,000 J**	**36,000 J**	NA	47 J	<390
2-Methylnaphthalene	<200	19,000 J	7,500	8,000	<42,000	NA	21 J	<390
2-Methylphenol	750	**27,000**	**12,000**	**13,000 J**	**71,000**	NA	19 J	<390
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	2,400	**42,000**	**21,000**	**22,000 J**	**330,000**	NA	<380	<390
Acenaphthene	<200	<22,000	540 J	560 J	<42,000	NA	<380	<390
Anthracene	<200	5,000 J	57 J	<4,600	<42,000	NA	<380	<390
Benzo(a)anthracene	<200	4,200 J	<920	<4,600	<42,000	NA	<380	<390

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	**GMSB-2 (continued)**							
Sample Depth	**355'**	**13-14.5'**	**23.5-24.5'**	**23.5-24.5'**	**26.5-27.5'**	**26.5-27.5'**	**43.5-44.5'**	**83-85'**
Sample Date	**05/30/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**
Sample Name	**GMSB-2/355**	**SB2-SS11**	**SB2-SS12**	**SB2-SS12-RE**	**SB2-SS13**	**SB2-SS13-RE**	**SB2-SS14**	**SB2-SS15**
Type	**Soil**	**NA**	**NA**	**NA**	**NA**	**NA**	**Soil**	**Soil**
SVOC (continued)								
Benzo(a)pyrene	<200	1,700 J	<920	<4,600	<42,000	NA	<380	<390
Benzo(b)fluoranthene	<200	1,300 J	<920	<4,600	<42,000	NA	<380	<390
Benzo(g,h,i)perylene	<200	1,600 J	<920	<4,600	<42,000	NA	<380	<390
Benzo(k)fluoranthene	<200	1,400 J	<920	<4,600	<42,000	NA	<380	<390
bis(2-Ethylhexyl)phthalate	<200	<22,000	<920	<4,600	<42,000	NA	<380	<390
Butylbenzylphthalate	<200	<22,000	<920	<4,600	<42,000	NA	<380	<390
Carbazole	<200	3,600 J	<920	<4,600	<42,000	NA	<380	<390
Chrysene	<200	5,300 J	94 J	<4,600	<42,000	NA	<380	<390
Dibenzofuran	<200	5,200 J	1,700	1,900 J	<42,000	NA	<380	<390
Diethylphthalate	<200	12,000 J	<920	<4,600	<42,000	NA	<380	<390
Di-n-butylphthalate	<200	<22,000	240 J	260 J	<42,000	NA	<380	<390
Di-n-octylphthalate	<200	<24,000	<920	<4,600	<42,000	NA	<380	<390
Fluoranthene	<200	9,700 J	<920	<4,600	<42,000	NA	<380	<390
Fluorene	<200	8,500 J	1,700	1,700 J	<42,000	NA	<380	<390
Naphthalene	<200	16,000 J	4,100	4,300 J	<42,000	NA	27 J	<390
n-Nitrosodimethylamine	NA	**80,000**	<920	<4,600	<42,000	NA	<380	<390
n-Nitrosodiphenylamine	<200	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	<200	26,000	160 J	<4,600	<42,000	NA	<380	<390
Phenol	2,100	20,000 J	15,000	17,000 J	73,000	NA	31 J	23 J
Pyrene	<200	10,000 J	97 J	<4,600	3,600 J	NA	<380	<390
Metals								
Aluminum	NA	**199,000 J**	**47,000 J**	NA	**1,650,000 J**	NA	**1,330,000 J**	**2,440,000 J**
Antimony	NA	**7,700 J**	**4,400 J**	NA	R	NA	R	R
Arsenic	NA	1,200	<1,000	NA	<1,600	NA	<500	<500
Barium	NA	198,000	66,600	NA	63,700	NA	3,200	6,900
Beryllium	NA	<40	<50	NA	<80	NA	60	100
Cadmium	NA	<500	<600	NA	<900	NA	<300	<300

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)							
Sample Depth	355'	13-14.5'	23.5-24.5'	23.5-24.5'	26.5-27.5'	26.5-27.5'	43.5-44.5'	83-85'
Sample Date	05/30/97	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97
Sample Name	GMSB-2/355	SB2-SS11	SB2-SS12	SB2-SS12-RE	SB2-SS13	SB2-SS13-RE	SB2-SS14	SB2-SS15
Type	Soil	NA	NA	NA	NA	NA	Soil	Soil
Metals (continued)								
Calcium	NA	3,830,000	2,530,000	NA	6,540,000	NA	513,000	1,090,000
Chromium	NA	12,600	4,200	NA	<3,700	NA	4,400	3,900
Cobalt	NA	<700	<800	NA	<1,300	NA	**1,700**	**1,800**
Copper	NA	625,000 J	1,840,000 J	NA	7,000 J	NA	10,100 J	5,800 J
Cyanide	NA	700 J	900 J	NA	800 J	NA	70 J	100 J
Iron	NA	**4,500,000**	**997,000**	NA	**1,070,000**	NA	**3,440,000**	**3,180,000**
Lead	NA	**1,240,000 J**	104,000 J	NA	1,800 J	NA	5,600 J	2,300 J
Magnesium	NA	728,000 J	400,000 J	NA	504,000 J	NA	880,000 J	1,020,000 J
Manganese	NA	**100,000**	**136,000**	NA	**156,000**	NA	**22,500**	**31,000**
Mercury	NA	400	<100	NA	<200	NA	<50	<60
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	3,000	<2,500	NA	<4,000	NA	4,200	4,500
Potassium	NA	914,000 J	189,000 J	NA	421,000 J	NA	238,000 J	362,000 J
Selenium	NA	<1,000	<1,200	NA	<1,900	NA	<500	<600
Silver	NA	600	<400	NA	<700	NA	200	<200
Sodium	NA	287,000	138,000	NA	298,000	NA	63,700	89,700
Thallium	NA	<1,000	<1,200	NA	<1,900	NA	<500	<600
Titanium	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	3,000	<1,300	NA	2,800	NA	6,200	9,300
Zinc	NA	49,500	26,300	NA	26,200	NA	8,500	16,500
Alcohols								
1-Propanol	NA	NA	NA	NA	NA	NA	NA	NA
Ethanol	NA	NA	NA	NA	NA	NA	NA	NA
Ethylacetate	NA	NA	NA	NA	NA	NA	NA	NA
Methanol	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	**GMSB-2 (continued)**							
Sample Depth	**355'**	**13-14.5'**	**23.5-24.5'**	**23.5-24.5'**	**26.5-27.5'**	**26.5-27.5'**	**43.5-44.5'**	**83-85'**
Sample Date	**05/30/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**
Sample Name	**GMSB-2/355**	**SB2-SS11**	**SB2-SS12**	**SB2-SS12-RE**	**SB2-SS13**	**SB2-SS13-RE**	**SB2-SS14**	**SB2-SS15**
Type	**Soil**	**NA**	**NA**	**NA**	**NA**	**NA**	**Soil**	**Soil**
Aldehydes								
Acetaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs								
4,4'-DDE	NA	<59 J	<9.2 J	NA	<14 J	NA	<3.8 J	<3.3 J
Aldrin	NA	240 J	<4.7 J	NA	<7.1 J	NA	<1.9 J	<1.7 J
Aroclor 1254	NA	<590	<92	NA	<140	NA	<38	<33
Chlordane (gamma)	NA	30 J	<4.7 J	NA	<7.1 J	NA	<1.9 J	<1.7 J
Dieldrin	NA	54 J	<9.2	NA	<14	NA	<3.8	<3.3
Endrin	NA	230	<9.2	NA	<14	NA	<3.8	<3.3
Endrin aldehyde	NA	59 J	<9.2 J	NA	<14 J	NA	<3.8 J	<3.3 J
Endrin ketone	NA	130 J	<9.2 J	NA	<14 J	NA	<3.8 J	<3.3 J
Heptachlor	NA	<30	<4.7	NA	<7.1	NA	<1.9	<1.7
Heptachlor epoxide	NA	55 J	<4.7 J	NA	<7.1 J	NA	<1.9 J	<1.7 J
Acetic Acid	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	900,000	NA	NA	NA	NA	NA	NA	NA
Percent Solids	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)						GMSB-43
Sample Depth	133-134'	161-162'	161-162'	224-225'	224-225'	284-285'	3
Sample Date	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97	10/21/99
Sample Name	SB2-SS16	SB2-SS17	SB2-SS17 -RE	SB2-SS18	SB2-SS18 -RE	SB2-SS19	GMSB-43/3
Type	Soil	Soil	Soil	Soil	Soil	Soil	Sawdust
VOC							
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	<57
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	<57
2-Butanone (MEK)	13	550 J	NA	820	NA	120	<280
2-Hexanone	<12	27 J	NA	28 J	NA	15	<280
4-Methyl-2-pentanone (MIBK)	<12	<61	NA	<120	NA	<12	<280
Acetone	<41 J	480 J	NA	1,000 J	NA	<140 J	<570
Benzene	<12	<61	NA	<120	NA	<12	<57
Carbon disulfide	<12	<61	NA	<120	NA	<12	330
Chloromethane	<12 J	<61 J	NA	<120 J	NA	<12 J	57 J
Ethylbenzene	<12	<61	NA	<120	NA	<12	<57
Methylene chloride	<12 J	<61 J	NA	<120 J	NA	<31 J	<57
Naphthalene	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	<57
Toluene	<12	9 J	NA	<120	NA	<12	<57
Trichloroethene	<12	<61	NA	<120	NA	<12	<57
Xylene, o	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	<12	7 J	NA	<120	NA	<12	<110
Xylenes, m+p	NA	NA	NA	NA	NA	NA	NA
SVOC							
2,4-Dimethylphenol	110 J	1,000	940 J	2,600	2,700 J	440	<750
2-Methylnaphthalene	29 J	<410	<1,200	<410	<4,100	<390	<750
2-Methylphenol	<410	1,800	1,700	**5,600**	**5,700**	690	<750
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA	NA	<750
4-Methylphenol	<410	2,900	2,800	**8,600**	**9,100**	2,200	NA
Acenaphthene	<410	<410	<1,200	<410	<4,100	<390	<750
Anthracene	<410	<410	<1,200	<410	<4,100	<390	<750
Benzo(a)anthracene	<410	<410	<1,200	<410	<4,100	<390	<750

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	**GMSB-2 (continued)**						**GMSB-43**
Sample Depth	**133-134'**	**161-162'**	**161-162'**	**224-225'**	**224-225'**	**284-285'**	**3**
Sample Date	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**10/21/99**
Sample Name	**SB2-SS16**	**SB2-SS17**	**SB2-SS17 -RE**	**SB2-SS18**	**SB2-SS18 -RE**	**SB2-SS19**	**GMSB-43/3**
Type	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Sawdust**
SVOC (continued)							
Benzo(a)pyrene	<410	<410	<1,200	<410	<4,100	<390	<750
Benzo(b)fluoranthene	<410	<410	<1,200	<410	<4,100	<390	<750
Benzo(g,h,i)perylene	<410	<410	<1,200	<410	<4,100	<390	<750
Benzo(k)fluoranthene	<410	<410	<1,200	<410	<4,100	<390	<750
bis(2-Ethylhexyl)phthalate	<410	<410	<1,200	1,500	<4,100	<390	7,400
Butylbenzylphthalate	<410	<410	<1,200	<410	<4,100	<390	<750
Carbazole	<410	<410	<1,200	<410	<4,100	<390	<750
Chrysene	<410	<410	<1,200	<410	<4,100	<390	<750
Dibenzofuran	<410	<410	<1,200	<410	<4,100	<390	<750
Diethylphthalate	<410	<410	<1,200	<410	<4,100	<390	<750
Di-n-butylphthalate	<410	24 J	<1,200	23 J	<4,100	<390	<750
Di-n-octylphthalate	<410	<410	<1,200	44 J	<4,100	<390	<750
Fluoranthene	<410	<410	<1,200	<410	<4,100	<390	<750
Fluorene	<410	<410	<1,200	<410	<4,100	<390	<750 J
Naphthalene	21 J	<410	<1,200	<410	<4,100	<390	<750
n-Nitrosodimethylamine	<410	<410	<1,200	<410	<4,100	<390	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	<750
Phenanthrene	<410	<410	<1,200	<410	<4,100	<390	<750
Phenol	<410	3,800	3,600	12,000	13,000	1,900	<750
Pyrene	<410	<410	<1,200	37 J	<4,100	<390	<750 J
Metals							
Aluminum	**1,150,000 J**	**4,580,000 J**	NA	**7,480,000 J**	NA	**1,120 J**	**3,300,000 J**
Antimony	R	R	NA	R	NA	R	<5,700 J
Arsenic	500 J	1,000 J	NA	3,600 J	NA	0.50 J	2,100 J
Barium	5,200	23,500	NA	47,400	NA	6.8	39,000
Beryllium	70	300	NA	400	NA	0.1	120 B
Cadmium	<300	<300	NA	<300	NA	<0.30	270 J

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)						GMSB-43
Sample Depth	**133-134'**	**161-162'**	**161-162'**	**224-225'**	**224-225'**	**284-285'**	3
Sample Date	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**06/01/97**	**10/21/99**
Sample Name	**SB2-SS16**	**SB2-SS17**	**SB2-SS17 -RE**	**SB2-SS18**	**SB2-SS18 -RE**	**SB2-SS19**	**GMSB-43/3**
Type	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Sawdust**
Metals (continued)							
Calcium	795,000	12,900,000	NA	18,900,000	NA	4,170	6,200,000
Chromium	2,800	9,800	NA	13,600	NA	2.5	23,000
Cobalt	**1,100**	**3,800**	NA	**6,100**	NA	1.1	**2,700**
Copper	6,500	12,400	NA	20,900	NA	4.9	40,000
Cyanide	100 J	100 J	NA	100 J	NA	0.20 J	NA
Iron	**2,570,000**	**8,070,000**	NA	**12,600,000**	NA	2,520	**23,000,000**
Lead	1,500 J	2,800	NA	3,900	NA	1.4 J	18,000
Magnesium	598,000	7,680,000	NA	**10,200,000**	NA	2010	1,100,000
Manganese	**21,500**	**180,000**	NA	**340,000**	NA	57.6	**270,000**
Mercury	<60	<60	NA	<60	NA	<0.060	<230
Molybdenum	NA	NA	NA	NA	NA	NA	**1,600 B**
Nickel	NA	9,000	NA	14,700	NA	2.5	8,100
Potassium	164,000	837,000	NA	1,470,000	NA	279	320,000
Selenium	<600 J	<600 J	NA	<600 J	NA	<0.50 J	R
Silver	<200	<200	NA	<200	NA	<0.20	<1,100
Sodium	61,800	131,000	NA	254,000	NA	72	31,000
Thallium	<600	<600	NA	<600	NA	<0.50	<2,300
Titanium	NA	NA	NA	NA	NA	NA	240,000
Vanadium	8,600	19,900	NA	27,400	NA	6.6	14,000
Zinc	8,700	21,000	NA	29,400	NA	8.5	53,000
Alcohols							
1-Propanol	NA	NA	NA	NA	NA	NA	<2,300
Ethanol	NA	NA	NA	NA	NA	NA	970 J
Ethylacetate	NA	NA	NA	NA	NA	NA	<11,000
Methanol	NA	NA	NA	NA	NA	NA	<10,000

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)						GMSB-43
Sample Depth	133-134'	161-162'	161-162'	224-225'	224-225'	284-285'	3
Sample Date	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97	06/01/97	10/21/99
Sample Name	SB2-SS16	SB2-SS17	SB2-SS17 -RE	SB2-SS18	SB2-SS18 -RE	SB2-SS19	GMSB-43/3
Type	Soil	Soil	Soil	Soil	Soil	Soil	Sawdust
Aldehydes							
Acetaldehyde	NA	NA	NA	NA	NA	NA	<4,000
Formaldehyde	NA	NA	NA	NA	NA	NA	**14,000**
Pesticides/PCBs							
4,4'-DDE	<4.1 J	<4.1 J	NA	<4.1 J	NA	<3.9 J	NA
Aldrin	<2.1 J	<2.1 J	NA	<2.1 J	NA	<2.0 J	NA
Aroclor 1254	<41	<41	NA	<41	NA	<39	NA
Chlordane (gamma)	<2.1 J	<2.1 J	NA	<2.1	NA	<2.0 J	NA
Dieldrin	<4.1	<4.1	NA	<4.1	NA	<3.9	NA
Endrin	<4.1	<4.1	NA	<4.1	NA	<3.9	NA
Endrin aldehyde	<4.1 J	<4.1 J	NA	<4.1 J	NA	<3.9 J	NA
Endrin ketone	<4.1 J	<4.1 J	NA	<4.1 J	NA	<3.9 J	NA
Heptachlor	<2.1	<2.1	NA	0.70 J	NA	<2.0	NA
Heptachlor epoxide	<2.1 J	<2.1 J	NA	<2.1 J	NA	<2.0 J	NA
Acetic Acid	NA	NA	NA	NA	NA	NA	18,000
Nitrogen, Nitrate	2,400	NA	NA	NA	NA	NA	NA
Total Organic Carbon	NA	NA	NA	NA	NA	NA	340,000,000
Percent Solids	NA	NA	NA	NA	NA	NA	51

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-44	GMSB-45	GMSB-47	GMSB-48	PB3		
Sample Depth	15	10	15	22	24'	4-8'	8-12'
Sample Date	10/21/99	10/21/99	10/22/99	10/22/99	05/15/96	05/15/96	05/15/96
Sample Name	GMSB-44/15	GMSB-45/10	GMSB-47/15	GMSB-48/22	PB3	SS-6	SS-8
Type	Wood	Wood/Char	Wood	Wood/Char	Soil	Soil	Soil
VOC							
1,2,4-Trimethylbenzene	<42	13	810	<13	1 J	NA	NA
1,3,5-Trimethylbenzene	<42	<13	260	<13	<1.1	NA	NA
2-Butanone (MEK)	<210	130	290 J	<66	4.2 J	5 J	<11
2-Hexanone	<210	<64	<310	<66	2.1 J	<11	<11
4-Methyl-2-pentanone (MIBK)	<210	<64	<310	<66	<2.2	<11	<11
Acetone	260 J	520	660	<130	8.1	25 B	18
Benzene	<42	<13	<62	<13	<1.1	<11	<11
Carbon disulfide	<42	<13	1,500	<13	<1.1	<11	7 J
Chloromethane	<85	<26	<120 J	<26	<1.1	<11	<11
Ethylbenzene	<42	<13	74	<13	<1.1	<11	<11
Methylene chloride	<42	<13	<62 J	<13	<1.1	<33 B	12
Naphthalene	NA	NA	NA	NA	3.4	NA	NA
n-Propylbenzene	<42	<13	120	<13	<1.1	NA	NA
Toluene	<42	15	170	<13	<1.1	<11	<11
Trichloroethene	<44	<13	<62	<13	<1.1	<11	<11
Xylene, o	NA	NA	NA	NA	.4 J	NA	NA
Xylenes (total)	<85	<26	760	<26	NA	<11	<11
Xylenes, m+p	NA	NA	NA	NA	.8 J	NA	NA
SVOC							
2,4-Dimethylphenol	<3,400	<4,900	4,600 J	<5,100	<380	78 J	<390
2-Methylnaphthalene	<3,400	<4,900	13,000	<5,100	<380	54 J	<390
2-Methylphenol	<3,400	2,600 J	<5,000	<5,100	<380	<370	<390
3-Methylphenol/4-Methylphenol(m&p-cresol)	<3,400	3,400 J	**8,300**	<5,100	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	<380	140 J	<390
Acenaphthene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Anthracene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Benzo(a)anthracene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-44	GMSB-45	GMSB-47	GMSB-48	PB3		
Sample Depth	15	10	15	22	24'	4-8'	8-12'
Sample Date	10/21/99	10/21/99	10/22/99	10/22/99	05/15/96	05/15/96	05/15/96
Sample Name	GMSB-44/15	GMSB-45/10	GMSB-47/15	GMSB-48/22	PB3	SS-6	SS-8
Type	Wood	Wood/Char	Wood	Wood/Char	Soil	Soil	Soil
SVOC (continued)							
Benzo(a)pyrene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Benzo(b)fluoranthene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Benzo(g,h,i)perylene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Benzo(k)fluoranthene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
bis(2-Ethylhexyl)phthalate	<3,400	<4,900	<5,000	<5,100	73 JB	<370 BJ	<390 BJ
Butylbenzylphthalate	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Carbazole	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Chrysene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Dibenzofuran	<3,400	<4,900	3,900 J	<5,100	<380	<370	<390
Diethylphthalate	<3,400	<4,900	<5,000	<5,100	450 B	<370	<390
Di-n-butylphthalate	<3,400	<4,900	<5,000	<5,100	1,100 B	<370	<390
Di-n-octylphthalate	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Fluoranthene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Fluorene	<3,400	<4,900	<5,000 J	<5,100 J	<380	<370	<390
Naphthalene	<3,400	<4,900	6,600	<5,100	<380	60 J	<390
n-Nitrosodimethylamine	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Phenanthrene	<3,400	<4,900	<5,000	<5,100	<380	<370	<390
Phenol	<3,400	3,600 J	<5,000	<5,100	<380	<370	<390
Pyrene	<3,400	<4,900	<5,000 J	<5,100 J	<380	<370	<390
Metals							
Aluminum	**930,000 J**	**230,000 J**	**1,000,000 J**	**180,000 J**	NA	**7,140,000**	**6,670,000**
Antimony	**2,700 BJ**	**740 BJ**	**13,000 J**	**610 BJ**	NA	<2,700	<2,700
Arsenic	1,600 J	1,300 J	12,000 J	720 J	NA	1,700 B	1,500 B
Barium	320,000	130,000	320,000	94,000	NA	46,000	24,800 B
Beryllium	43 B	<1,200	50 B	31 B	NA	<130	<130
Cadmium	140 J	R	3,900 J	R	NA	210 B	<200

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-44	GMSB-45	GMSB-47	GMSB-48	PB3		
Sample Depth	15	10	15	22	24'	4-8'	8-12'
Sample Date	10/21/99	10/21/99	10/22/99	10/22/99	05/15/96	05/15/96	05/15/96
Sample Name	GMSB-44/15	GMSB-45/10	GMSB-47/15	GMSB-48/22	PB3	SS-6	SS-8
Type	Wood	Wood/Char	Wood	Wood/Char	Soil	Soil	Soil
Metals (continued)							
Calcium	2,600,000	3,900,000	7,400,000	5,000,000	NA	1,100,000	298,000 B
Chromium	14,000	6,000	**43,000**	1,500	NA	14,900	13,700
Cobalt	400 B	<1200	**22,000**	<1,200	NA	**5,700 B**	**5,600 B**
Copper	150,000	89,000	4,900,000	2,000,000	NA	28,100	14,800
Cyanide	NA	NA	NA	NA	NA	<120	<130
Iron	**3,500,000**	**430,000**	**8,300,000**	**730,000**	NA	**10,700,000**	**7,170,000**
Lead	130,000	23,000	**1,700,000**	6,900	NA	5,300	4,500
Magnesium	560,000	630,000	1,500,000	620,000	NA	1,870,000	2,010,000
Manganese	**180,000**	**190,000**	**240,000**	**310,000**	NA	**255,000 N**	**50,400 N**
Mercury	140 B	21 B	210 B	<220	NA	90 B	90 B
Molybdenum	**1,600 B**	780 B	**6,500 B**	480 B	NA	NA	NA
Nickel	1,300 B	<2,300	94,000	350 B	NA	10,300	9,300
Potassium	380,000	520,000	500,000	750,000	NA	392,000 B	276,000 B
Selenium	1,300 J	2,600 J	1,200 BJ	740 BJ	NA	<680	<680
Silver	140 B	<1,200	540 B	<1,200	NA	<740	<740
Sodium	41,000	42,000	47,000	53,000	NA	43,100 B	37,600 B
Thallium	<1,500	<2,300	<2,500	<2,400	NA	<720	<720
Titanium	270,000	100,000	410,000	50,000	NA	NA	NA
Vanadium	4,600	770 B	6,900	800 B	NA	23,700	19,400
Zinc	28,000	36,000	200,000	29,000	NA	26,600	17,400
Alcohols							
1-Propanol	<1,700	800 J	750 J	<2,600	NA	NA	NA
Ethanol	970 J	13,000	1,100 J	1,300 J	NA	NA	NA
Ethylacetate	<8,500	<13,000	700 J	<13,000	NA	NA	NA
Methanol	<7,400	18,000 B	<12,000	<12,000	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-44	GMSB-45	GMSB-47	GMSB-48		PB3	
Sample Depth	15	10	15	22	24'	4-8'	8-12'
Sample Date	10/21/99	10/21/99	10/22/99	10/22/99	05/15/96	05/15/96	05/15/96
Sample Name	GMSB-44/15	GMSB-45/10	GMSB-47/15	GMSB-48/22	PB3	SS-6	SS-8
Type	Wood	Wood/Char	Wood	Wood/Char	Soil	Soil	Soil
Aldehydes							
Acetaldehyde	<2,000	**20,000**	12,000	8,000	NA	NA	NA
Formaldehyde	<2,000	7,800	11,000	**50,000**	NA	NA	NA
Pesticides/PCBs							
4,4'-DDE	NA	NA	NA	NA	NA	<3.7	<3.9
Aldrin	NA	NA	NA	NA	NA	<1.9	<2
Aroclor 1254	NA	NA	NA	NA	NA	<37	<39
Chlordane (gamma)	NA	NA	NA	NA	NA	<1.9	<2
Dieldrin	NA	NA	NA	NA	NA	<3.7	<3.9
Endrin	NA	NA	NA	NA	NA	<3.7	<3.9
Endrin aldehyde	NA	NA	NA	NA	NA	<3.7	<3.9
Endrin ketone	NA	NA	NA	NA	NA	<3.7	<3.9
Heptachlor	NA	NA	NA	NA	NA	<1.9	<2
Heptachlor epoxide	NA	NA	NA	NA	NA	<1.9	<2
Acetic Acid	7,000	220,000	32,000	94,000	NA	NA	NA
Nitrogen, Nitrate	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	86,000,000	270,000,000	230,000,000	150,000,000	NA	NA	NA
Percent Solids	78	40	40	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	PB3 (continued)		PB4				PB6	
Sample Depth	12-16'	16-20'	8-12'	8-12'	12-16'	16-20'	26'	16-19'
Sample Date	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96
Sample Name	SS-7	SS-31	SS-9	SS-9RE	SS-10	SS-11	PB6	SS-14
Type	Soil	Soil	NA	NA	NA	NA	Soil	Soil
VOC								
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	<1.1	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	<1.1	NA
2-Butanone (MEK)	<11	<11	<19	<19	80	<11	3.2 J	29
2-Hexanone	<11	<11	<19	<19	<48	<11	<2.3	<16
4-Methyl-2-pentanone (MIBK)	<11	<11	<19	<19	<48	<11	<2.3	<16
Acetone	11	34	270	36	220	<11 BJ	11	94 B
Benzene	<11	<11	14 J	<19	<48	<11	<1.1	5 J
Carbon disulfide	<11	<11	<19	<19	<48	3 J	<1.1	2 J
Chloromethane	<11	<11	<19	<19	<48	<11	<1.1	<16
Ethylbenzene	<11	<11	<19	<19	<48	<11	<1.1	<16
Methylene chloride	21	36	69	<43 B	<130 B	<34 B	<1.1	<38 B
Naphthalene	NA	NA	NA	NA	NA	NA	6.7	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	<1.1	NA
Toluene	<11	<11	6 J	<19	6 J	<11	<1.1	140
Trichloroethene	<11	<11	<19	<19	<48	<11	<1.1	<16
Xylene, o	NA	NA	NA	NA	NA	NA	<1.1	NA
Xylenes (total)	<11	<11	4 JX	<19	12 J	2 J	NA	5 J
Xylenes, m+p	NA	NA	NA	NA	NA	NA	.4 J	NA
SVOC								
2,4-Dimethylphenol	<360	<370	1,900 J	NA	**14,000**	260 J	<370	**15,000 J**
2-Methylnaphthalene	<360	<370	3,600 J	NA	7,400	210 J	390	8,000 J
2-Methylphenol	<360	<370	960 J	NA	**10,000**	55 J	<370	**5,900 J**
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	<360	<370	1,500 J	NA	**18,000**	80 J	<370	**6,600 J**
Acenaphthene	<360	<370	<5,400	NA	<5,900	<370	87 J	<22,000
Anthracene	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000
Benzo(a)anthracene	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	**PB3 (continued)**		**PB4**				**PB6**	
Sample Depth	**12-16'**	**16-20'**	**8-12'**	**8-12'**	**12-16'**	**16-20'**	**26'**	**16-19'**
Sample Date	**05/15/96**	**05/15/96**	**05/15/96**	**05/15/96**	**05/15/96**	**05/15/96**	**05/15/96**	**05/15/96**
Sample Name	**SS-7**	**SS-31**	**SS-9**	**SS-9RE**	**SS-10**	**SS-11**	**PB6**	**SS-14**
Type	**Soil**	**Soil**	**NA**	**NA**	**NA**	**NA**	**Soil**	**Soil**
SVOC (continued)								
Benzo(a)pyrene	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000
Benzo(b)fluoranthene	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000
Benzo(g,h,i)perylene	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000
Benzo(k)fluoranthene	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000
bis(2-Ethylhexyl)phthalate	<520 B	<370 BJ	<5,400	NA	<5,900	<370 BJ	78 JB	<22,000
Butylbenzylphthalate	<360	<370	<5,400	NA	<5,900	66 J	<370	<22,000
Carbazole	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000
Chrysene	<360	<370	<5,400	NA	<5,900	<370	32 J	<22,000
Dibenzofuran	<360	<370	730 J	NA	1,700 J	40 J	38 J	4,100 J
Diethylphthalate	<360	<370	<5,400	NA	<5,900	<370	470 B	<22,000
Di-n-butylphthalate	<360	<370	<5,400	NA	<5,900	<370	1,300 B	<22,000
Di-n-octylphthalate	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000
Fluoranthene	<360	<370	<5,400	NA	<5,900	<370	46 J	<22,000
Fluorene	<360	<370	<5,400	NA	1,400 J	<370	<370	2,800 J
Naphthalene	<360	<370	2,400 J	NA	5200 J	160 J	4,200	4,600 J
n-Nitrosodimethylamine	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	<360	<370	<5,400	NA	<5,900	<370	<370	<22,000
Phenanthrene	<360	<370	770 J	NA	840 J	<370	82 J	2,600 J
Phenol	<360	<370	<5,400	NA	3,100 J	<370	<370	3,600 J
Pyrene	<360	<370	<5,400	NA	<5,900	<370	37 J	4,000 J
Metals								
Aluminum	**2,840,000**	**1,590,000**	**2,940,000**	NA	**1,600,000**	**301,000**	NA	**7,210,000**
Antimony	<2,500	<2,700	**6,100 B**	NA	**10,000 B**	<2,600	NA	<3,000
Arsenic	1,100 B	<810	18,100	NA	2,800 B	920 B	NA	2,200 B
Barium	10,600 B	6,800 B	261,000	NA	202,000	33,900 B	NA	48,300 B
Beryllium	<120	<130	<170	NA	<190	<130	NA	<150
Cadmium	240 B	250 B	910 B	NA	620 B	360 B	NA	<220

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	PB3 (continued)		PB4				PB6	
Sample Depth	12-16'	16-20'	8-12'	8-12'	12-16'	16-20'	26'	16-19'
Sample Date	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96
Sample Name	SS-7	SS-31	SS-9	SS-9RE	SS-10	SS-11	PB6	SS-14
Type	Soil	Soil	NA	NA	NA	NA	Soil	Soil
Metals (continued)								
Calcium	542,000 B	362,000 B	6,490,000	NA	12,800,000	237,000 B	NA	990,000 B
Chromium	4,100	6,000	**42,500**	NA	23,200	4,200	NA	13,500
Cobalt	**3,600 B**	**2,300 B**	**6,300 B**	NA	**2,800 B**	**1,600 B**	NA	**4,700 B**
Copper	67,300	24,600	265,000	NA	2,210,000	57,900	NA	20,600
Cyanide	<120	<120	<160	NA	<170	<120	NA	<140
Iron	**4,930,000**	**2,840,000**	**84,800,000**	NA	**7,050,000**	**1,030,000**	NA	**9,420,000**
Lead	4,400	2,500	190,000	NA	219,000	19,100	NA	23,000
Magnesium	1,330,000	800,000 B	2,940,000	NA	3,190,000	62,200 B	NA	1,730,000
Manganese	**36,900 N**	**25,600 N**	**647,000**	NA	**228,000 N**	**8,400 N**	NA	**251,000 N**
Mercury	60 B	70 B	360	NA	920	60 B	NA	220
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8,000 B	66,300	**101,000**	NA	86,000	13,400	NA	17,400
Potassium	248,000 B	208,000 B	332,000 B	NA	482,000 B	195,000 B	NA	366,000 B
Selenium	<620	<670	1,300 B	NA	1,200 B	<650	NA	<760
Silver	<680	<740	<940	NA	<1,100	<720	NA	<830
Sodium	37,300 B	38,300 B	67,100 B	NA	87,000 B	33,500 B	NA	34,200 B
Thallium	<660	<720	2,200 B	NA	<1,000	<700	NA	<810
Titanium	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	11,000	5,200 B	9,900 B	NA	7,200 B	1,800 B	NA	21,800
Zinc	9,900	5,100	116,000	NA	131,000	10,800	NA	26,900
Alcohols								
1-Propanol	NA	NA	NA	NA	NA	NA	NA	NA
Ethanol	NA	NA	NA	NA	NA	NA	NA	NA
Ethylacetate	NA	NA	NA	NA	NA	NA	NA	NA
Methanol	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	PB3 (continued)		PB4				PB6	
Sample Depth	12-16'	16-20'	8-12'	8-12'	12-16'	16-20'	26'	16-19'
Sample Date	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96
Sample Name	SS-7	SS-31	SS-9	SS-9RE	SS-10	SS-11	PB6	SS-14
Type	Soil	Soil	NA	NA	NA	NA	Soil	Soil
Aldehydes								
Acetaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs								
4,4'-DDE	<3.6	<3.7	<5.4	NA	13 P	<3.7	NA	15
Aldrin	<1.8	<1.9	<2.8	NA	<3	<1.9	NA	<5.4 P
Aroclor 1254	<36	<37	95	NA	120 P	<37	NA	110 P
Chlordane (gamma)	<1.8	<1.9	<2.8	NA	<3	<1.9	NA	<2.3
Dieldrin	<3.6	<3.7	<5.4	NA	<5.9	<3.7	NA	<4.4
Endrin	<3.6	<3.7	26 P	NA	14 P	<3.7	NA	16 P
Endrin aldehyde	<3.6	<3.7	<5.4	NA	<5.9	<3.7	NA	<4.4
Endrin ketone	<3.6	<3.7	8.8 P	NA	<5.9	<3.7	NA	<4.4
Heptachlor	<1.8	<1.9	<2.8	NA	<3	<1.9	NA	<2.3
Heptachlor epoxide	<1.8	<1.9	<2.8	NA	<3	<1.9	NA	<2.3
Acetic Acid	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	PB6 (continued)	SB10		SB10-B		SB11	
Sample Depth	16-19'	40'	50'	40'	50'	35'	45'
Sample Date	05/15/96	07/27/85	11/10/85	11/10/85	11/10/85	07/27/85	07/27/85
Sample Name	SS-14RE	SB10 (40')	SB10 (50')	SB10-B (40')	SB10-B (50')	SB11 (35')	SB11 (45')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
VOC							
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	39	NA	NA	240	ND	NA	NA
2-Hexanone	<16	NA	NA	12	ND	NA	NA
4-Methyl-2-pentanone (MIBK)	<16	NA	NA	NA	NA	NA	NA
Acetone	140 B	NA	NA	200	ND	NA	NA
Benzene	2 J	NA	NA	14	ND	NA	NA
Carbon disulfide	<16	NA	NA	71	ND	NA	NA
Chloromethane	<16	NA	NA	NA	NA	NA	NA
Ethylbenzene	<16	NA	NA	ND	ND	NA	NA
Methylene chloride	**110 B**	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA
Toluene	11 J	NA	NA	31	ND	NA	NA
Trichloroethene	<16	NA	NA	NA	NA	NA	NA
Xylene, o	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	2 J	NA	NA	58	ND	NA	NA
Xylenes, m+p	NA	NA	NA	NA	NA	NA	NA
SVOC							
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	PB6 (continued)	SB10		SB10-B		SB11	
Sample Depth	16-19'	40'	50'	40'	50'	35'	45'
Sample Date	05/15/96	07/27/85	11/10/85	11/10/85	11/10/85	07/27/85	07/27/85
Sample Name	SS-14RE	SB10 (40')	SB10 (50')	SB10-B (40')	SB10-B (50')	SB11 (35')	SB11 (45')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SVOC (continued)							
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA
Metals							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA
Barium	NA	8,800	4,900	44,000	15,000	26,000	130,000
Beryllium	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	PB6 (continued)	SB10		SB10-B		SB11	
Sample Depth	16-19'	40'	50'	40'	50'	35'	45'
Sample Date	05/15/96	07/27/85	11/10/85	11/10/85	11/10/85	07/27/85	07/27/85
Sample Name	SS-14RE	SB10 (40')	SB10 (50')	SB10-B (40')	SB10-B (50')	SB11 (35')	SB11 (45')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Metals (continued)							
Calcium	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	6,200	2,900	5,800	6,600	8,400	**90,000**
Cobalt	NA	NA	NA	NA	NA	NA	NA
Copper	NA	10,000	5,800	150,000	26,000	23,000	51,000
Cyanide	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	NA	<8,400	12,000	<6,900	<6,100	24,000	22,000
Magnesium	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA
Titanium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA
Alcohols							
1-Propanol	NA	NA	NA	NA	NA	NA	NA
Ethanol	NA	NA	NA	NA	NA	NA	NA
Ethylacetate	NA	NA	NA	NA	NA	NA	NA
Methanol	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	PB6 (continued)	SB10		SB10-B		SB11	
Sample Depth	16-19'	40'	50'	40'	50'	35'	45'
Sample Date	05/15/96	07/27/85	11/10/85	11/10/85	11/10/85	07/27/85	07/27/85
Sample Name	SS-14RE	SB10 (40')	SB10 (50')	SB10-B (40')	SB10-B (50')	SB11 (35')	SB11 (45')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Aldehydes							
Acetaldehyde	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs							
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA	NA
Chlordane (gamma)	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA
Acetic Acid	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	NA	NA	NA	NA	NA	NA	NA
Percent Solids	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB11-B		SB12					
Sample Depth	40'	45'	05'	10'	15'	20'	25'	30'
Sample Date	11/11/85	11/11/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85
Sample Name	SB11-B (40')	SB11-B (45')	SB12 (05')	SB12 (10')	SB12 (15')	SB12 (20')	SB12 (25')	SB12 (30')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
VOC								
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	ND	ND	ND	ND	ND	160	130	240
2-Hexanone	ND	ND	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	ND	ND	ND	10	ND	7
Acetone	ND	ND	8,000	2,100	450	**44,000**	**24,000**	**29,000**
Benzene	ND	ND	ND	ND	ND	5	ND	5
Carbon disulfide	ND	ND	ND	ND	ND	90	13	11
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	ND	ND	ND	ND	ND	25	ND	ND
Methylene chloride	NA	NA	ND	ND	**180**	**110**	ND	ND
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	ND	ND	ND	ND	6	27	5	7
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Xylene, o	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	15	ND	ND	ND	6	290	42	26
Xylenes, m+p	NA	NA	NA	NA	NA	NA	NA	NA
SVOC								
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB11-B		SB12					
Sample Depth	40'	45'	05'	10'	15'	20'	25'	30'
Sample Date	11/11/85	11/11/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85
Sample Name	SB11-B (40')	SB11-B (45')	SB12 (05')	SB12 (10')	SB12 (15')	SB12 (20')	SB12 (25')	SB12 (30')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SVOC (continued)								
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Metals								
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	<12000	<11000	<15000	<23000	<32000	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA
Barium	85,000	13,000	46,000	28,000	240,000	260,000	320,000	NA
Beryllium	NA	NA	<2400	<2200	2,900	<4600	<6400	NA
Cadmium	NA	NA	<2400	<2200	<2900	<4600	<6400	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB11-B		SB12					
Sample Depth	40'	45'	05'	10'	15'	20'	25'	30'
Sample Date	11/11/85	11/11/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85
Sample Name	SB11-B (40')	SB11-B (45')	SB12 (05')	SB12 (10')	SB12 (15')	SB12 (20')	SB12 (25')	SB12 (30')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Metals (continued)								
Calcium	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	20,000	**32,000**	8,300	11,000	19,000	**32,000**	19,000	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Copper	31,000	44,000	3,600	11,000	120,000	4,200,000	3,200,000	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Lead	12,000	<6700	12,000	44,000	43,000	350,000	180,000	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	<450	<420	<280	1,300	870	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	<2400	5,600	5,900	7,000	9,700	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	240	220	<290	460	<640	NA
Silver	NA	NA	<1200	<1100	<1500	<2300	<3200	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	<12000	<11000	<15000	<23000	<32000	NA
Titanium	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	56,000	27,000	37,000	81,000	39,000	NA
Alcohols								
1-Propanol	NA	NA	NA	NA	NA	NA	NA	NA
Ethanol	NA	NA	NA	NA	NA	NA	NA	NA
Ethylacetate	NA	NA	NA	NA	NA	NA	NA	NA
Methanol	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB11-B		SB12					
Sample Depth	40'	45'	05'	10'	15'	20'	25'	30'
Sample Date	11/11/85	11/11/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85
Sample Name	SB11-B (40')	SB11-B (45')	SB12 (05')	SB12 (10')	SB12 (15')	SB12 (20')	SB12 (25')	SB12 (30')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Aldehydes								
Acetaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs								
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane (gamma)	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA
Acetic Acid	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB12 (continued)	SB13		SB-21			
Sample Depth	35'	50'	54'	45'	55'	80'	93'
Sample Date	06/19/85	07/25/85	07/25/85	06/01/86	06/01/86	06/01/86	06/01/86
Sample Name	SB12 (35')	SB13 (50')	SB13 (54')	SB-21 (45')	SB-21 (55')	SB-21 (80')	SB-21 (93')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
VOC							
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	590	ND	ND	NA	NA	NA	NA
2-Hexanone	NA	ND	ND	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	23	NA	NA	NA	NA	NA	NA
Acetone	**100,000**	ND	ND	NA	NA	NA	NA
Benzene	6	ND	ND	ND	ND	ND	ND
Carbon disulfide	26	ND	ND	NA	NA	NA	NA
Chloromethane	NA	NA	NA	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	NA	NA	ND	ND	ND	ND
Naphthalene	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA
Toluene	9	ND	ND	ND	ND	ND	ND
Trichloroethene	NA	NA	NA	ND	ND	ND	ND
Xylene, o	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	24	ND	ND	NA	NA	NA	NA
Xylenes, m+p	NA	NA	NA	NA	NA	NA	NA
SVOC							
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB12 (continued)	SB13		SB-21			
Sample Depth	35'	50'	54'	45'	55'	80'	93'
Sample Date	06/19/85	07/25/85	07/25/85	06/01/86	06/01/86	06/01/86	06/01/86
Sample Name	SB12 (35')	SB13 (50')	SB13 (54')	SB-21 (45')	SB-21 (55')	SB-21 (80')	SB-21 (93')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SVOC (continued)							
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA
Metals							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Antimony	<305000	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA
Barium	200,000	16,000	16,000	12,000	7,800	12,000	14,000
Beryllium	<6100	NA	NA	NA	NA	NA	NA
Cadmium	<6100	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB12 (continued)	SB13		SB-21			
Sample Depth	35'	50'	54'	45'	55'	80'	93'
Sample Date	06/19/85	07/25/85	07/25/85	06/01/86	06/01/86	06/01/86	06/01/86
Sample Name	SB12 (35')	SB13 (50')	SB13 (54')	SB-21 (45')	SB-21 (55')	SB-21 (80')	SB-21 (93')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Metals (continued)							
Calcium	NA	NA	NA	NA	NA	NA	NA
Chromium	12,000	8,400	7,400	12,000	4,200	10,000	16,000
Cobalt	NA	NA	NA	NA	NA	NA	NA
Copper	970,000	24,000	7,800	19,000	5,600	8,400	44,000
Cyanide	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	85,000	<2500	<820	ND	ND	ND	22,000
Magnesium	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA
Mercury	1,000	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA
Nickel	9,100	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA
Selenium	610	NA	NA	NA	NA	NA	NA
Silver	<3000	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA
Thallium	<30000	NA	NA	NA	NA	NA	NA
Titanium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	64,000	NA	NA	NA	NA	NA	NA
Alcohols							
1-Propanol	NA	NA	NA	NA	NA	NA	NA
Ethanol	NA	NA	NA	NA	NA	NA	NA
Ethylacetate	NA	NA	NA	NA	NA	NA	NA
Methanol	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB12 (continued)	SB13		SB-21			
Sample Depth	35'	50'	54'	45'	55'	80'	93'
Sample Date	06/19/85	07/25/85	07/25/85	06/01/86	06/01/86	06/01/86	06/01/86
Sample Name	SB12 (35')	SB13 (50')	SB13 (54')	SB-21 (45')	SB-21 (55')	SB-21 (80')	SB-21 (93')
Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Aldehydes							
Acetaldehyde	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs							
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA	NA
Chlordane (gamma)	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA
Acetic Acid	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	NA	NA	NA	NA	NA	NA	NA
Percent Solids	NA	NA	NA	NA	NA	NA	NA

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB-21 (continued)			Criteria	
Sample Depth	101'	106'	65'	Infinite	
Sample Date	06/01/86	06/01/86	06/01/86	Source	
Sample Name	SB-21 (101')	SB-21 (106')	SB-21 65'	Volatile Soil	Direct
Type	Soil	Soil	Soil	Inhalation	Contact
VOC					
1,2,4-Trimethylbenzene	NA	NA	NA	21,000,000 (I)	110,000 (I) C
1,3,5-Trimethylbenzene	NA	NA	NA	16,000,000 (I)	94,000 (I) C
2-Butanone (MEK)	NA	NA	NA	29,000,000 (I)	27,000,000 (I) C,DD
2-Hexanone	NA	NA	NA	1,100,000	2,500,000 C
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	45,000,000 (I)	2,700,000 (I) C
Acetone	NA	NA	NA	130,000,000 (I)	23,000,000 (I)
Benzene	ND	ND	ND	13,000 (I)	180,000 (I)
Carbon disulfide	NA	NA	NA	1,300,000 (I,R)	280,000 (I,R) C,DD
Chloromethane	ND	ND	ND	40,000 (I)	1,100,000 (I) C
Ethylbenzene	ND	ND	ND	720,000 (I)	140,000 (I) C
Methylene chloride	ND	ND	ND	210,000	1,300,000
Naphthalene	NA	NA	NA	300,000	16,000,000
n-Propylbenzene	NA	NA	NA	(I) ID	2,500,000 (I)
Toluene	ND	ND	ND	2,800,000 (I)	250,000 (I) C
Trichloroethene	ND	ND	ND	78,000	500,000 C,DD
Xylene, o	NA	NA	NA	46,000,000 (I) J	150,000 (I) C J
Xylenes (total)	NA	NA	NA	46,000,000 (I)	150,000 (I) C
Xylenes, m+p	NA	NA	NA	46,000,000 (I) J	150,000 (I) C J
SVOC					
2,4-Dimethylphenol	NA	NA	NA	NLV	11,000,000
2-Methylnaphthalene	NA	NA	NA	ID	8,100,000
2-Methylphenol	NA	NA	NA	NLV	11,000,000 J
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NLV	11,000,000 J
4-Methylphenol	NA	NA	NA	NLV	11,000,000 J
Acenaphthene	NA	NA	NA	81,000,000	41,000,000
Anthracene	NA	NA	NA	1,400,000,000	230,000,000
Benzo(a)anthracene	NA	NA	NA	(Q) NLV	20,000 (Q)

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB-21 (continued)			Criteria	
Sample Depth	101'	106'	65'	Infinite	
Sample Date	06/01/86	06/01/86	06/01/86	Source	
Sample Name	SB-21 (101')	SB-21 (106')	SB-21 65'	Volatile Soil	Direct
Type	Soil	Soil	Soil	Inhalation	Contact
SVOC (continued)					
Benzo(a)pyrene	NA	NA	NA	(Q) NLV	2,000 (Q)
Benzo(b)fluoranthene	NA	NA	NA	(Q) ID	20,000 (Q)
Benzo(g,h,i)perylene	NA	NA	NA	NLV	2,500,000
Benzo(k)fluoranthene	NA	NA	NA	(Q) NLV	200,000 (Q)
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NLV	2,800,000
Butylbenzylphthalate	NA	NA	NA	NLV	310,000 C
Carbazole	NA	NA	NA	NLV	530,000
Chrysene	NA	NA	NA	(Q) ID	2,000,000 (Q)
Dibenzofuran	NA	NA	NA	ID	ID
Diethylphthalate	NA	NA	NA	NLV	740,000 C
Di-n-butylphthalate	NA	NA	NA	NLV	760,000 C
Di-n-octylphthalate	NA	NA	NA	NLV	6,900,000
Fluoranthene	NA	NA	NA	740,000,000	46,000,000
Fluorene	NA	NA	NA	130,000,000	27,000,000
Naphthalene	NA	NA	NA	300,000	16,000,000
n-Nitrosodimethylamine	NA	NA	NA	NLV	1,700,000
n-Nitrosodiphenylamine	NA	NA	NA	NLV	1,700,000
Phenanthrene	NA	NA	NA	160,000	1,600,000
Phenol	NA	NA	NA	NLV	12,000,000 C,DD
Pyrene	NA	NA	NA	650,000,000	29,000,000
Metals					
Aluminum	NA	NA	NA	(B) NLV	50,000,000 (B) DD
Antimony	NA	NA	NA	NLV	180,000
Arsenic	NA	NA	NA	NLV	7,600
Barium	14,000	7,000	9,600	(B) NLV	37,000,000 (B)
Beryllium	NA	NA	NA	NLV	410,000
Cadmium	NA	NA	NA	(B) NLV	550,000 (B)

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB-21 (continued)			Criteria	
Sample Depth	101'	106'	65'	Infinite	
Sample Date	06/01/86	06/01/86	06/01/86	Source	
Sample Name	SB-21 (101')	SB-21 (106')	SB-21 65'	Volatile Soil	Direct
Type	Soil	Soil	Soil	Inhalation	Contact
Metals (continued)					
Calcium	NA	NA	NA	NE	NE
Chromium	6,100	3,000	18,000	total/dissolved NLV	2,500,000 total/dissolved
Cobalt	NA	NA	NA	NLV	2,600,000
Copper	20,000	5,400	10,000	(B) NLV	20,000,000 (B)
Cyanide	NA	NA	NA	(P,R) NLV	12,000 (P,R)
Iron	NA	NA	NA	(B) NLV	160,000,000 (B)
Lead	46,000	ND	ND	(B) NLV	400,000 (B)
Magnesium	NA	NA	NA	(B) NLV	1,000,000,000 (B) D
Manganese	NA	NA	NA	(B) NLV	25,000,000 (B)
Mercury	NA	NA	NA	52,000 (B,Z) (total)	160,000 (B,Z) (total)
Molybdenum	NA	NA	NA	(B) NLV	2,600,000 (B)
Nickel	NA	NA	NA	(B) NLV	40,000,000 (B)
Potassium	NA	NA	NA	NE	NE
Selenium	NA	NA	NA	(B) NLV	2,600,000 (B)
Silver	NA	NA	NA	(B) NLV	2,500,000 (B)
Sodium	NA	NA	NA	NLV	1,000,000,000 D
Thallium	NA	NA	NA	(B) NLV	35,000 (B)
Titanium	NA	NA	NA	NE	NE
Vanadium	NA	NA	NA	NLV	750,000 DD
Zinc	NA	NA	NA	(B) NLV	170,000,000 (B)
Alcohols					
1-Propanol	NA	NA	NA	(I) NLV	13,000,000 (I) DD
Ethanol	NA	NA	NA	(I) NLV	110,000,000 (I) C,DD
Ethylacetate	NA	NA	NA	49,000,000 (I)	7,500,000 (I) C
Methanol	NA	NA	NA	31,000,000	3,100,000 C

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	SB-21 (continued)			Criteria	
Sample Depth	101'	106'	65'	Infinite	
Sample Date	06/01/86	06/01/86	06/01/86	Source	
Sample Name	SB-21 (101')	SB-21 (106')	SB-21 65'	Volatile Soil	Direct
Type	Soil	Soil	Soil	Inhalation	Contact
Aldehydes					
Acetaldehyde	NA	NA	NA	170,000 (I)	29,000,000 (I)
Formaldehyde	NA	NA	NA	13,000	41,000,000
Pesticides/PCBs					
4,4'-DDE	NA	NA	NA	NLV	45,000
Aldrin	NA	NA	NA	58,000	1,000
Aroclor 1254	NA	NA	NA	240,000 (J,T)	(PCBs) (J,T) T
Chlordane (gamma)	NA	NA	NA	1,200,000 (J)	31,000 (J)
Dieldrin	NA	NA	NA	19,000	1,100
Endrin	NA	NA	NA	NLV	65,000
Endrin aldehyde	NA	NA	NA	NE	NE
Endrin ketone	NA	NA	NA	NE	NE
Heptachlor	NA	NA	NA	62,000	5,600
Heptachlor epoxide	NA	NA	NA	NLV	3,100
Acetic Acid	NA	NA	NA	NLV	130,000,000
Nitrogen, Nitrate	NA	NA	NA	(B,N) NLV	(B,N) ID
Total Organic Carbon	NA	NA	NA	NE	NE
Percent Solids	NA	NA	NA	NE	NE

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring Sample Depth Sample Date Sample Name Type	Criteria (continued) Drinking Water Protection	Groundwater Surface Water Interface Protection	Soil Volatilization to Indoor Air Inhalation
VOC			
1,2,4-Trimethylbenzene	2,100 (I)	570 (I)	110,000 (I) C
1,3,5-Trimethylbenzene	1,800 (I)	1,100 (I)	94,000 (I) C
2-Butanone (MEK)	260,000 (I)	44,000 (I)	27,000,000 (I) C
2-Hexanone	20,000	NA	990,000
4-Methyl-2-pentanone (MIBK)	36,000 (I)	(I) ID	2,700,000 (I) C
Acetone	15,000 (I)	34,000 (I)	110,000,000 (I) C
Benzene	100 (I)	4,000 (I) X	1,600 (I)
Carbon disulfide	16,000 (I,R)	(I,R) ID	76,000 (I,R)
Chloromethane	5,200 (I)	(I) ID	2,300 (I)
Ethylbenzene	1,500 (I)	360 (I)	87,000 (I)
Methylene chloride	100	19,000 X	45,000
Naphthalene	35,000	870	250,000
n-Propylbenzene	1,600 (I)	(I) NA	(I) ID
Toluene	16,000 (I)	2,800 (I)	250,000 (I) C
Trichloroethene	100	4,000 X	7,100
Xylene, o	5,600 (I) J	700 (I) J	150,000 (I) C J
Xylenes (total)	5,600 (I)	700 (I)	150,000 (I) C
Xylenes, m+p	5,600 (I) J	700 (I) J	150,000 (I) C J
SVOC			
2,4-Dimethylphenol	7,400	7,600	NLV
2-Methylnaphthalene	57,000	ID	ID
2-Methylphenol	7,400 J	1,400 J	NLV
3-Methylphenol/4-Methylphenol(m&p-cresol)	7,400 J	1,400 J	NLV
4-Methylphenol	7,400 J	1,400 J	NLV
Acenaphthene	300,000	4,400	190,000,000
Anthracene	41,000	ID	1,000,000,000 D
Benzo(a)anthracene	(Q) NLL	(Q) NLL	(Q) NLV

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring Sample Depth Sample Date Sample Name Type	Criteria (continued) Drinking Water Protection	 Groundwater Surface Water Interface Protection	 Soil Volatilization to Indoor Air Inhalation
SVOC (continued)			
Benzo(a)pyrene	(Q) NLL	(Q) NLL	(Q) NLV
Benzo(b)fluoranthene	(Q) NLL	(Q) NLL	(Q) ID
Benzo(g,h,i)perylene	NLL	NLL	NLV
Benzo(k)fluoranthene	(Q) NLL	(Q) NLL	(Q) NLV
bis(2-Ethylhexyl)phthalate	NLL	NLL	NLV
Butylbenzylphthalate	310,000 C	26,000 X	NLV
Carbazole	9,400	1,100	NLV
Chrysene	(Q) NLL	(Q) NLL	(Q) ID
Dibenzofuran	ID	1,700	ID
Diethylphthalate	110,000	2,200	NLV
Di-n-butylphthalate	760,000 C	11,000	NLV
Di-n-octylphthalate	100,000,000	ID	NLV
Fluoranthene	730,000	5,500	1,000,000,000 D
Fluorene	390,000	5,300	580,000,000
Naphthalene	35,000	870	250,000
n-Nitrosodimethylamine	5,400	NA	NLV
n-Nitrosodiphenylamine	5,400	NA	NLV
Phenanthrene	56,000	5,300	2,800,000
Phenol	88,000	4,200	NLV
Pyrene	480,000	ID	1,000,000,000 D
Metals			
Aluminum	1,000 (B)	(B) NA	(B) NLV
Antimony	500 M	94,000	NLV
Arsenic	23,000	70,000 X	NLV
Barium	1,300,000 (B)	260,000 (B) G,X	(B) NLV
Beryllium	51,000	24,000 G	NLV
Cadmium	6,000 (B)	2,500 (B) G,X	(B) NLV

Footnotes on Page 45.

Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring Sample Depth Sample Date Sample Name Type	Criteria (continued) Drinking Water Protection	 Groundwater Surface Water Interface Protection	 Soil Volatilization to Indoor Air Inhalation
Metals (continued)			
Calcium	NE	NE	NE
Chromium	30,000 total/dissolved	3,300 total/dissolved	total/dissolved NLV
Cobalt	800	2,000	NLV
Copper	5,800,000 (B)	480,000 (B) G	(B) NLV
Cyanide	4,000 (P,R)	200 (P,R) M	(P,R) NLV
Iron	6,000 (B)	(B) NE	(B) NLV
Lead	700,000 (B)	1,700,000 (B) G,M,X	(B) NLV
Magnesium	8,000,000 (B)	(B) NE	(B) NLV
Manganese	1,000 (B)	36,000 (B) G,X	(B) NLV
Mercury	1,700 (B,Z) (total)	100 (B,Z) (total) M	48,000 (B,Z) (total)
Molybdenum	1,500 (B)	16,000 (B) X	(B) NLV
Nickel	100,000 (B)	50,000 (B) G	(B) NLV
Potassium	NE	NE	NE
Selenium	4,000 (B)	400 (B)	(B) NLV
Silver	4,500 (B)	500 (B) M	(B) NLV
Sodium	2,500,000	NE	NLV
Thallium	2,300 (B)	4,200 (B) X	(B) NLV
Titanium	NE	NE	NE
Vanadium	72,000	190,000	NLV
Zinc	2,400,000 (B)	110,000 (B) G	(B) NLV
Alcohols			
1-Propanol	28,000 (I)	(I) NE	(I) NLV
Ethanol	38,000,000 (I)	(I) NE	(I) NLV
Ethylacetate	130,000 (I)	(I) NE	7,500,000 (I) C
Methanol	74,000	9,600	3,100,000 C

Footnotes on Page 45.

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Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring Sample Depth Sample Date Sample Name Type	Criteria (continued) Drinking Water Protection	Groundwater Surface Water Interface Protection	Soil Volatilization to Indoor Air Inhalation
Aldehydes			
Acetaldehyde	19,000 (I)	2,600 (I)	220,000 (I)
Formaldehyde	26,000	2,400	12,000
Pesticides/PCBs			
4,4'-DDE	NLL	NLL	NLV
Aldrin	NLL	NLL	1,300,000
Aroclor 1254	(PCBs) (J,T) NLL	(PCBs) (J,T) NLL	3,000,000 (J,T)
Chlordane (gamma)	(J) NLL	(J) NLL	11,000,000 (J)
Dieldrin	NLL	NLL	140,000
Endrin	NLL	NLL	NLV
Endrin aldehyde	NE	NE	NE
Endrin ketone	NE	NE	NE
Heptachlor	NLL	NLL	350,000
Heptachlor epoxide	NLL	NLL	NLV
Acetic Acid	900,000 M	900,000 M	NLV
Nitrogen, Nitrate	200,000 (B,N) N	(B,N) NA	(B,N) NE
Total Organic Carbon	NE	NE	NE
Percent Solids	NE	NE	NE

Footnotes on Page 45.

Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

All results are in micrograms per kilogram (µg/kg).

Bold	Above the Residential and Commercial I Drinking Water Protection Criteria (Michigan Part 201, December 2002).
Italics	Exceeds the Residential and Commercial I Soil Volatilization to Indoor Air Inhalation Criteria (Michigan Part 201, December 2002).
Underline	Above the Residential and Commerical I Groundwater Surface Water Interface Protection Criteria (Michigan Part 201, December 2002).
(shaded)	Above the Residential and Commercial I Infinite Source Volatile Soil Inhalation Criteria (VISC) (Michigan Part 201, December 2002).
(boxed)	Above the Residential and Commercial I Direct Contact Criteria (Michigan Part 201, December 2002).
<	Less than detection limit.
*	Duplicate analysis was not within control limits.
#	This sample was evaluated according to finite VSIC Criteria. Part 201 standards were not exceeded with respect to 2 meter finite VSIC evaluation.
B	Constituent was also detected in laboratory blank.
J	Estimated result.
MBB	This analyte is present at a reportable level in the associated method blank but is less than 5 percent of the sample amount.
MBD	This analyte is present in the associated method blank at an amount that is less than two times the reporting limit.
N	Spike sample recovery is not within control limits.
NA	Not analyzed.
ND	Not detected.
P	Greater than 25% RPD between two columns for pesticide or PCB.
R	Rejected result.
SVOCs	Semi volatile organic compounds.
VOCs	Volatile organic compounds.
Wa	Matrix interference reported by laboratory.

Criteria Footnotes:

A	State of Michigan Drinking Water Standard.
AD	Substance causes developmental effects. Residential and Commercial I direct contact criteria are protective of both prenatal and postnatal exposure.
B	Background may be substituted if higher than the calculated cleanup criteria.
C	Value presented is a screening level based on the chemical specific generic soil saturation concentration (Csat) since the calculated risk-based criterion is greater than Csat.
D	Calculated criterion exceeds 100%, hence it is reduced to 100%.
DD	Hazardous substance causes developmental effects.
G	GSI criterion is hardness dependent.
I	Chemical may exhibit the characteristic of ignitability, as defined in 40 CFR 261.21.
ID	Insufficient data.
INO	Inorganic.

Table 2. Summary of Constituents Detected in Subsurface Soil and Waste Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

J	Chemical may be present in several isomer forms. Isomer specific concentrations must be added together for comparison to criteria.
M	Calculated criterion is below the target detection limit (TDL), therefore, the criterion defaults to the TDL.
N	The concentrations of all potential sources of nitrate-nitrogen (e.g., ammonia-N, nitrate-N, nitrite-N) must be added together and compared to nitrate criteria. Contact an ERD toxicologist if further direction is needed.
NA	Not analyzed.
NE	Not established.
NLL	Chemical is not likely to leach under most soil conditions.
NLV	Chemical is not likely to volatilize under most soil conditions.
P	Amenable or Method OIA-1677 analysis are used to quanitfy cyanide concentrations for compliance with all groundwater criteria.
Q	Criterion for carcinogenic polycyclic aromatic hydrocarbons (PAHs) were developed using "relative potential potenicies" (RPPs) to benzo(a)pyrene.
R	Hazardous substance may exhibit the characteristic of reactivity as defined in 40 CFR 261.23.
T	Refer to Toxic Substances Control Act (TSCA), 40 CFR 761, Subparts D and G, as ammended.
X	The GSI criterion is not protective for surface water that is used as a drinking water source.

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Table 3. Summary of Constituents Detected in Soil and Waste Samples TCLP/SPLP Extracts, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2	GMSB-43		GMSB-44
Depth	5-25'	3'	3'	15'
Sample Date	05/17/97	10/21/99	10/21/99	10/21/99
Sample Name	GMSB-2/0525 (TCLP)	GMSB-43/3 (SPLP)	GMSB-43/3 (TCLP)	GMSB-44/15 (SPLP)
Type	Waste	Waste	Waste	Waste
VOC				
1,2,4-Trimethylbenzene	NA	NA	<4	NA
Carbon disulfide	NA	NA	<20	NA
Chloromethane	NA	NA	<4	NA
SVOC				
2,4-Dimethylphenol	NA	NA	<25	NA
2-Methylphenol	7.8 J	NA	<25	NA
2-Picoline	NA	NA	<50	NA
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	<25	NA
4-Methylphenol	<50	NA	NA	NA
Phenol	NA	NA	<25	NA
Metals				
Aluminum	NA	NA	<2,000	NA
Barium	NA	NA	<1,000	NA
Calcium	NA	NA	93,000	NA
Chromium	NA	NA	<200	NA
Cobalt	NA	NA	2,500	NA
Copper	NA	NA	<200	NA
Iron	NA	NA	67,000	NA
Lead	NA	NA	<200	NA
Magnesium	NA	NA	<5,000	NA
Manganese	NA	NA	4,100	NA
Molybdenum	NA	NA	<100	NA

Footnotes on Page 2.

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Table 3. Summary of Constituents Detected in Soil and Waste Samples TCLP/SPLP Extracts, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2	GMSB-43		GMSB-44
Depth	5-25'	3'	3'	15'
Sample Date	05/17/97	10/21/99	10/21/99	10/21/99
Sample Name	GMSB-2/0525 (TCLP)	GMSB-43/3 (SPLP)	GMSB-43/3 (TCLP)	GMSB-44/15 (SPLP)
Type	Waste	Waste	Waste	Waste
Metals (continued)				
Potassium	NA	NA	<10,000	NA
Sodium	NA	NA	NA	NA
Titanium	NA	NA	<100	NA
Zinc	NA	NA	270	NA
Alcohols				
Methanol	NA	NA	R	NA
n-Butanol	NA	NA	R	NA
Aldehydes				
Acetaldehyde	NA	NA	<100	NA
Formaldehyde	NA	NA	370	NA
Acetic Acid	NA	<2,500	NA	<2,500
Chemical Oxygen Demand	34,000 J	NA	NA	NA
Total Organic Carbon	26,000	NA	NA	NA

Results are in micrograms per liter (µg/L).

<	Less than detection limit.
B	Constituent was also detected in laboratory blank.
J	Estimated result.
NA	Not analyzed.
R	Rejected result.
SPLP	Synthetic Precipitation Leaching Procedures.
SVOCs	Semi volatile organic compounds.
TCLP	Toxicity Characteristic Leaching Procedures.
VOCs	Volatile Organic Compounds.

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Table 3. Summary of Constituents Detected in Soil and Waste Samples TCLP/SPLP Extracts, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-44	GMSB-45		GMSB-47
Depth	15'	10'	10'	15'
Sample Date	10/21/99	10/21/99	10/21/99	10/22/99
Sample Name	GMSB-44/15 (TCLP)	GMSB-45/10 (SPLP)	GMSB-45/10 (TCLP)	GMSB-47/15 (SPLP)
Type	Waste	Waste	Waste	Waste
VOC				
1,2,4-Trimethylbenzene	<4	0.57 J	<4	NA
Carbon disulfide	<20	<5.0	<20	NA
Chloromethane	2.2 J	<1.0	<4	NA
SVOC				
2,4-Dimethylphenol	<25	20	<25	NA
2-Methylphenol	<25	35	<25	NA
2-Picoline	<50	<10	<50	NA
3-Methylphenol/4-Methylphenol(m&p-cresol)	<25	50	40	NA
4-Methylphenol	NA	NA	NA	NA
Phenol	<25	74	<25	NA
Metals				
Aluminum	<2,000	99 B	<2,000	NA
Barium	2,300	15	<1,000	NA
Calcium	48,000	3,000	18,000	NA
Chromium	<200	0.94 B	<200	NA
Cobalt	<100	<10	<100	NA
Copper	<200	85	<200	NA
Iron	1,500	170	<500	NA
Lead	<200	<5.0	<200	NA
Magnesium	7,200	750	<5,000	NA
Manganese	2,700	28	310	NA
Molybdenum	<100	<10	<100	NA

Footnotes on Page 4.

Table 3. Summary of Constituents Detected in Soil and Waste Samples TCLP/SPLP Extracts, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-44	GMSB-45		GMSB-47
Depth	15'	10'	10'	15'
Sample Date	10/21/99	10/21/99	10/21/99	10/22/99
Sample Name	GMSB-44/15 (TCLP)	GMSB-45/10 (SPLP)	GMSB-45/10 (TCLP)	GMSB-47/15 (SPLP)
Type	Waste	Waste	Waste	Waste
Metals (continued)				
Potassium	<10,000	2,900	<10,000	NA
Sodium	NA	2,000	NA	NA
Titanium	<100	8.5 B	<100	NA
Zinc	<200	7.8 B	<200	NA
Alcohols				
Methanol	R	<1,000 J	3,200 J	NA
n-Butanol	R	<1,000	R	NA
Aldehydes				
Acetaldehyde	<100	410	410	NA
Formaldehyde	<100	120	150	NA
Acetic Acid	NA	39,000	NA	3,700
Chemical Oxygen Demand	NA	NA	NA	NA
Total Organic Carbon	NA	43,000	NA	NA

Results are in micrograms per liter (µg/L).
< Less than detection limit.
B Constituent was also detected in laboratory blank.
J Estimated result.
NA Not analyzed.
R Rejected result.
SPLP Synthetic Precipitation Leaching Procedures.
SVOCs Semi volatile organic compounds.
TCLP Toxicity Characteristic Leaching Procedures.
VOCs Volatile Organic Compounds.

Table 3. Summary of Constituents Detected in Soil and Waste Samples TCLP/SPLP Extracts, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-47 (continued)	GMSB-48	
Depth	15'	22'	22'
Sample Date	10/22/99	10/22/99	10/22/99
Sample Name	GMSB-47/15 (TCLP)	GMSB-48/22 (SPLP)	GMSB-48/22 (TCLP)
Type	Waste	Waste	Waste
VOC			
1,2,4-Trimethylbenzene	<4	<1.0	<4
Carbon disulfide	3 J	<5.0	<20
Chloromethane	<4	<1.0	<4
SVOC			
2,4-Dimethylphenol	80	12	<25
2-Methylphenol	49	6.4	<25
2-Picoline	8.9 J	<10	<50
3-Methylphenol/4-Methylphenol(m&p-cresol)	180	11	<25
4-Methylphenol	NA	NA	NA
Phenol	<25	20	<25
Metals			
Aluminum	<2,000	54 B	<2,000
Barium	<1,000	7.1 B	<1,000
Calcium	61,000	5,100	20,000
Chromium	<200	<10	<200
Cobalt	<100	<10	<100
Copper	240	110	2,800
Iron	1,700	56	590
Lead	200	<5.0	<200
Magnesium	14,000	890	<5,000
Manganese	770	150	890
Molybdenum	<100	2.5 B	<100

Footnotes on Page 6.

Table 3. Summary of Constituents Detected in Soil and Waste Samples TCLP/SPLP Extracts, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-47 (continued)	GMSB-48	
Depth	15'	22'	22'
Sample Date	10/22/99	10/22/99	10/22/99
Sample Name	GMSB-47/15 (TCLP)	GMSB-48/22 (SPLP)	GMSB-48/22 (TCLP)
Type	Waste	Waste	Waste
Metals (continued)			
Potassium	<10,000	2,100	<10,000
Sodium	NA	2,700	NA
Titanium	<100	0.70 B	<100
Zinc	<200	3.3 B	<200
Alcohols			
Methanol	R	R	R
n-Butanol	R	<1,000	R
Aldehydes			
Acetaldehyde	250	480	160
Formaldehyde	220	460	970
Acetic Acid	NA	2,600	NA
Chemical Oxygen Demand	NA	NA	NA
Total Organic Carbon	NA	12,000	NA

Results are in micrograms per liter (µg/L).

<	Less than detection limit.
B	Constituent was also detected in laboratory blank.
J	Estimated result.
NA	Not analyzed.
R	Rejected result.
SPLP	Synthetic Precipitation Leaching Procedures.
SVOCs	Semi volatile organic compounds.
TCLP	Toxicity Characteristic Leaching Procedures.
VOCs	Volatile Organic Compounds.

Table 4. Comparison of Leaching Data from Waste Samples and Groundwater Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-48		GMSB-2			
	SPLP	TCLP	TCLP			
Depth	22'	22'	5 - 25'	93'	265'	345'
Sample Matrix	Wood/Charcoal	Wood/Charcoal	Wood/Charcoal	Groundwater	Groundwater	Groundwater
VOCs						
2-Butanone (MEK)	<50	<200	NA	<10	2,300	1,700
2-Hexanone	<50	<200	NA	<10	1,100	590
Acetone	<100	<400	NA	<10	1,500	1,000 J
SVOCs						
2,4-DMP	12	<25	NA	18	3,900	3,000
2-MP	6.4	<25	7.8 J	40	7,500	5,300
4-MP	11	<25	<50	8.7 J	13,000	14,000
Phenol	20	<25	NA	40	12,000	9,200
Acetic Acid	2,600	NA	NA	NA	NA	NA
TOC	12,000	NA	26,000	14,000	2,300,000	1,700,000

Results in micrograms per liter (µg/L).

<	Less than detection limit.
2,4-DMP	2,4-Dimethylphenol.
2-MP	2-Methylphenol.
4-MP	4-Methylphenol.
J	Estimated result.
NA	Not available.
SPLP	Synthetic Precipitation Leaching Procedures.
SVOCs	Semi-volatile organic compounds.
TCLP	Toxicity Characteristic Leaching Procedures.
VOCs	Volatile organic compounds.

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Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GM-62A	GM-62B		GM-62C	GMSB-1	
Top of Screen Depth	90'	195'	195'	315'	85'	135'
Sample Date	08/23/99	08/24/99	08/24/99	08/24/99	05/16/97	05/17/97
Sample Name	GWGM-62A	GWGM-62B	GWGM-82	GWGM-62C	GBGMSB-1/85'	GBGMSB-1/135'
VOC						
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<12	0.52 J
1,2,4-Trimethylbenzene	0.60 J	2	2	2.3	NA	NA
2-Butanone (MEK)	<50	1,300	1,300 D	780	1,600	<10
2-Hexanone	<50	<50	<50	<50	160	<10
4-Methyl-2-pentanone (MIBK)	<50	130	130	160	<120	<10
Acetone	<100	940	940	690	2,000	<10
Benzene	1.2	13	13	9.1	11 J	<1
Carbon disulfide	<5.0	<5.0	<5.0	<5.0	8.1 J	<1
Carbon tetrachloride	<1.0	<1.0	<1.0	<1.0	<12	<1
Chloromethane	<1.0	3.5	3.7	3.6	<12	<1
cis-1,2-Dichloroethene	<1.0	<1.0	0.67 J	0.53 J	8.6 J	<1
Ethylbenzene	0.85 J	2.6	2.6	6.4	<12	<1
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0	<12	<1
Toluene	1.6	16	16	15	12	0.69 J
Trichloroethene	<1.0	1	1.1	2.5	6.2 J	<1
Xylenes (total)	2.4 J	12	13	15	<12	<1
SVOC						
2,4-Dimethylphenol	<5.0	1,300 J	970 J	1,300	1,100	2.3 J
2-Methylnaphthalene	<5.0	<100	<100	<200	<500	4.0 J
2-Methylphenol	<5.0	2,100 J	1,600 J	490	1,000	<5
3-Methylphenol/4-Methylphenol(m&p-cresol)	<5.0	6,100 J	4,600 J	6,700	NA	NA
4-Methylphenol	NA	NA	NA	NA	5,600	<5
bis(2-Ethylhexyl)phthalate	<5.0	<100	<100	<200	<500	3.2 J
Butylbenzylphthalate	<5.0	<100	<100	<200	<500	<5
Di-n-butylphthalate	<5.0	<100	<100	<200	<500	<5
Naphthalene	<5.0	<100	<100	<200	<500	4.2 J
Phenol	<5.0	3,300	2,600	1,800	2,000	<5

Footnotes on Page 3.

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Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GM-62A	GM-62B		GM-62C	GMSB-1	
Top of Screen Depth	90'	195'	195'	315'	85'	135'
Sample Date	08/23/99	08/24/99	08/24/99	08/24/99	05/16/97	05/17/97
Sample Name	GWGM-62A	GWGM-62B	GWGM-82	GWGM-62C	GBGMSB-1/85'	GBGMSB-1/135'
Metals						
Aluminum	20 B	68 B	77 B	55 B	NA	NA
Antimony	2.2 B	4.1 B	3.4 B	8.7 B	NA	NA
Arsenic	16 B	59	63	110	NA	NA
Barium	160	1,100	1,100	950	NA	NA
Beryllium	<1.0	<1.0	<1.0	0.44 B	NA	NA
Calcium	160,000 J	650,000 J	680,000 J	470,000 J	NA	NA
Chromium	6.7	30	31	22	NA	NA
Cobalt	2.5 B	16	17	5.6 B	NA	NA
Copper	<25	4.7 B	2.6 B	3.9 B	NA	NA
Iron	12,000	48,000	50,000	63,000	NA	NA
Lead	<3.0	<3.0	<3.0	5.6	NA	NA
Magnesium	71,000	280,000	290,000	320,000	NA	NA
Manganese	1,600	4,900	5,200	380	NA	NA
Molybdenum	14 J	4.5 J	5.0 J	11 J	NA	NA
Nickel	4.5 B	9.4 B	10 B	7.5 B	NA	NA
Potassium	15,000 J	9,100 J	9,300 J	8,500 J	NA	NA
Silver	0.14 B	<0.20	<0.20	<0.20	NA	NA
Sodium	11,000	29,000	31,000	30,000	NA	NA
Titanium	5.3 B	240	250	340	NA	NA
Vanadium	7.4 B	83	85	16 B	NA	NA
Zinc	1.8 B	20 B	13 B	11 B	NA	NA
Alcohols						
1-Propanol	<1,000	110 J	140 J	110 J	NA	NA
Ethanol	<1,000	120 J	73 J	<1,000	NA	NA
Ethylacetate	<5,000	1100 J	980 J	820 J	NA	NA
Isopropanol	<1,000	220 J	200 J	320 J	NA	NA
Methanol	<1,000	10,000 BJ	9,700 BJ	<1,000	NA	NA
n-Butanol	<1,000	R	R	<1,000	NA	NA

Footnotes on Page 3.

Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GM-62A	GM-62B		GM-62C	GMSB-1	
Top of Screen Depth	90'	195'	195'	315'	85'	135'
Sample Date	08/23/99	08/24/99	08/24/99	08/24/99	05/16/97	05/17/97
Sample Name	GWGM-62A	GWGM-62B	GWGM-82	GWGM-62C	GBGMSB-1/85'	GBGMSB-1/135'
Aldehydes						
Acetaldehyde	<100	1,100	940	1,100	NA	NA
Formaldehyde	<100	210	130	120	NA	NA
Pentanal	<100	410	370	420	NA	NA
Inorganic						
Alkalinity	440,000	2,000,000	2,000,000	2,100,000	NA	NA
Chloride	14,000	23,000	22,000	23,000	NA	NA
Nitrogen, (Ammonia)	<150	86	71	<60	NA	NA
Phosphorus	130	<100	<100	<100	NA	NA
Sulfate	130,000	<5,000	<5,000	<5,000	NA	NA
Sulfide	<100	<100	<100	110	NA	NA
Acetic Acid	<500	1,420,000	905,000	738,000	NA	NA
Biochemical Oxygen Demand	<2,000	2,300,000	2,700,000	1,000,000	1,300,000 J	3,000 J
Chemical Oxygen Demand	93,000	4,100,000	3,700,000	1,900,000	3,100,000	33,000
Methane	8,470	66,200	134,000	298,000	NA	7,400
Total Organic Carbon	37,000	1,700,000	1,700,000	820,000	1,100,000	18,000
Density	NA	NA	NA	NA	NA	NA

All results are reported in micrograms per liter (µg/L).

<	Less than detection limit.
B	Constituent was also detected in laboratory blank.
D	Result was obtained from analysis of a dilution.
J	Estimated result.
NA	Not analyzed.
R	Rejected result.

Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-1 (continued)			GMSB-2	
Top of Screen Depth	215'	275'	325'	93'	265'
Sample Date	05/18/97	05/19/97	06/02/97	05/18/97	05/20/97
Sample Name	GBGMSB-1/215'	GBGMSB-1/275'	GBGMSB-1/325'	GBGMSB-2/93'	GBGMSB-2/265'
VOC					
1,1,2-Trichloroethane	<3.1	<5 J	<1	<1	<5
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA
2-Butanone (MEK)	920	<50 J	<10	<10	1,100
2-Hexanone	210	<50 J	<10	<10	85
4-Methyl-2-pentanone (MIBK)	32	<50 J	<10	<10	<50
Acetone	1,100	<50 J	16	<10	1,500
Benzene	20	5.7 J	2.8	0.50 J	10
Carbon disulfide	3.5	84 J	17	2.9	62
Carbon tetrachloride	<3.1	<5 J	0.12 J	0.55 J	<5
Chloromethane	<3.1	<5 J	<1	<1	<5
cis-1,2-Dichloroethene	4.8	<5 J	0.21 J	<1	<5
Ethylbenzene	6.3	<5 J	1.2	0.76 J	3.2 J
Tetrachloroethene	<3.1	2.8 J	<1	<1	<5
Toluene	30	5.0 J	2.7	1	13
Trichloroethene	11	<5 J	0.70 J	<1	<5
Xylenes (total)	32	4.6 J	3.8	1.3	15
SVOC					
2,4-Dimethylphenol	2,500	130	100	18	3,900
2-Methylnaphthalene	<1,000	<12	<10	<5	<1,000
2-Methylphenol	2,800	<12	<10	<5	7,500
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA	NA	NA	NA
4-Methylphenol	11,000	<12	8.7 J	<5	13,000
bis(2-Ethylhexyl)phthalate	<1,000	<12	14	1.8 J	<1,000
Butylbenzylphthalate	<1,000	<12	<10	3.0 J	<1,000
Di-n-butylphthalate	<1,000	<12	<10	1.8 J	<1,000
Naphthalene	<1,000	<12	<10	2.0 J	<1,000
Phenol	3,300 J	<12	<10	<5	12,000

Footnotes on Page 6.

Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-1 (continued)			GMSB-2	
Top of Screen Depth	215'	275'	325'	93'	265'
Sample Date	05/18/97	05/19/97	06/02/97	05/18/97	05/20/97
Sample Name	GBGMSB-1/215'	GBGMSB-1/275'	GBGMSB-1/325'	GBGMSB-2/93'	GBGMSB-2/265'
Metals					
Aluminum	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA
Titanium	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA
Alcohols					
1-Propanol	NA	NA	NA	NA	NA
Ethanol	NA	NA	NA	NA	NA
Ethylacetate	NA	NA	NA	NA	NA
Isopropanol	NA	NA	NA	NA	NA
Methanol	NA	NA	NA	NA	NA
n-Butanol	NA	NA	NA	NA	NA

Footnotes on Page 6.

Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-1 (continued)			GMSB-2	
Top of Screen Depth	215'	275'	325'	93'	265'
Sample Date	05/18/97	05/19/97	06/02/97	05/18/97	05/20/97
Sample Name	GBGMSB-1/215'	GBGMSB-1/275'	GBGMSB-1/325'	GBGMSB-2/93'	GBGMSB-2/265'
Aldehydes					
Acetaldehyde	NA	NA	NA	NA	NA
Formaldehyde	NA	NA	NA	NA	NA
Pentanal	NA	NA	NA	NA	NA
Inorganic					
Alkalinity	NA	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA
Nitrogen, (Ammonia)	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA
Acetic Acid	NA	NA	NA	NA	NA
Biochemical Oxygen Demand	1,200,000	44,000 J	6,000	3,000	>4,200,000
Chemical Oxygen Demand	2,700,000	180,000	73,000	48,000	6,200,000
Methane	87,200	NA	34,000	3,600	155,000
Total Organic Carbon	1,000,000	68,000	33,000	14,000	2,300,000
Density	NA	NA	1,000	NA	NA

All results are reported in micrograms per liter (µg/L).

<	Less than detection limit.
B	Constituent was also detected in laboratory blank.
D	Result was obtained from analysis of a dilution.
J	Estimated result.
NA	Not analyzed.
R	Rejected result.

Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)	
Top of Screen Depth	345'	345'
Sample Date	05/31/97	05/31/97
Sample Name	GBGMSB-2/345'	GBGMSB-2/345' DUP
VOC		
1,1,2-Trichloroethane	<25 J	NA
1,2,4-Trimethylbenzene	NA	NA
2-Butanone (MEK)	590	NA
2-Hexanone	<250 J	NA
4-Methyl-2-pentanone (MIBK)	<250 J	NA
Acetone	1000 J	NA
Benzene	5.8 J	NA
Carbon disulfide	13 J	NA
Carbon tetrachloride	<25 J	NA
Chloromethane	<25 J	NA
cis-1,2-Dichloroethene	<25 J	NA
Ethylbenzene	<25 J	NA
Tetrachloroethene	<25 J	NA
Toluene	6.6 J	NA
Trichloroethene	<25 J	NA
Xylenes (total)	<25 J	NA
SVOC		
2,4-Dimethylphenol	3,000	NA
2-Methylnaphthalene	<1,000	NA
2-Methylphenol	5,300	NA
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NA
4-Methylphenol	14,000	NA
bis(2-Ethylhexyl)phthalate	<1,000	NA
Butylbenzylphthalate	<1,000	NA
Di-n-butylphthalate	<1,000	NA
Naphthalene	<1,000	NA
Phenol	9,200	NA

Footnotes on Page 9.

Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)	
Top of Screen Depth	345'	345'
Sample Date	05/31/97	05/31/97
Sample Name	GBGMSB-2/345'	GBGMSB-2/345' DUP
Metals		
Aluminum	NA	NA
Antimony	NA	NA
Arsenic	NA	NA
Barium	NA	NA
Beryllium	NA	NA
Calcium	NA	NA
Chromium	NA	NA
Cobalt	NA	NA
Copper	NA	NA
Iron	NA	NA
Lead	NA	NA
Magnesium	NA	NA
Manganese	NA	NA
Molybdenum	NA	NA
Nickel	NA	NA
Potassium	NA	NA
Silver	NA	NA
Sodium	NA	NA
Titanium	NA	NA
Vanadium	NA	NA
Zinc	NA	NA
Alcohols		
1-Propanol	NA	NA
Ethanol	NA	NA
Ethylacetate	NA	NA
Isopropanol	NA	NA
Methanol	NA	NA
n-Butanol	NA	NA

Footnotes on Page 9.

Table 5. Summary of Constituents Detected in Groundwater and Groundwater Grab Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSB-2 (continued)	
Top of Screen Depth	345'	345'
Sample Date	05/31/97	05/31/97
Sample Name	GBGMSB-2/345'	GBGMSB-2/345' DUP
Aldehydes		
Acetaldehyde	NA	NA
Formaldehyde	NA	NA
Pentanal	NA	NA
Inorganic		
Alkalinity	NA	NA
Chloride	NA	NA
Nitrogen, (Ammonia)	NA	NA
Phosphorus	NA	NA
Sulfate	NA	NA
Sulfide	NA	NA
Acetic Acid	NA	NA
Biochemical Oxygen Demand	930,000 J	NA
Chemical Oxygen Demand	4,000,000	NA
Methane	23,200	NA
Total Organic Carbon	1,700,000	NA
Density	1,000	1,000

All results are reported in micrograms per liter (µg/L).

< Less than detection limit.
B Constituent was also detected in laboratory blank.
D Result was obtained from analysis of a dilution.
J Estimated result.
NA Not analyzed.
R Rejected result.

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Table 4. Comparison of Leaching Data from Waste Samples and Groundwater Samples, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Well/Boring	GMSG-43		GMSB-44		GMSB-45		GMSB-47	
	TCLP	SPLP	TCLP	SPLP	SPLP	TCLP	TCLP	SPLP
Depth	3'	3'	15'	15'	10'	10'	15'	15'
Sample Matrix	Sawdust	Sawdust	Wood	Wood	Wood/Charcoal	Wood/Charcoal	Wood	Wood
VOCs								
2-Butanone (MEK)	<200	NA	<200	NA	<50	<200	<200	NA
2-Hexanone	<200	NA	<200	NA	<50	<200	<200	NA
Acetone	<400	NA	<400	NA	<100	<400	<400	NA
SVOCs								
2,4-DMP	<25	NA	<25	NA	20	<25	80	NA
2-MP	<25	NA	<25	NA	35	<25	49	NA
4-MP	<25	NA	<25	NA	50	40	180	NA
Phenol	<25	NA	<25	NA	74	<25	<25	NA
Acetic Acid	NA	<2,500	NA	<2,500	39,000	NA	NA	3,700
TOC	NA	NA	NA	NA	43,000	NA	NA	NA

Results in micrograms per liter (µg/L).

<	Less than detection limit.
2,4-DMP	2,4-Dimethylphenol.
2-MP	2-Methylphenol.
4-MP	4-Methylphenol.
J	Estimated result.
NA	Not available.
SPLP	Synthetic Precipitation Leaching Procedures.
SVOCs	Semi-volatile organic compounds.
TCLP	Toxicity Characteristic Leaching Procedures.
VOCs	Volatile organic compounds.

Table 6. Soil Vapor Extraction System Operation, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Measurement Date and Time	Influent Pressure (in. H_2O)	Effluent (CH_4 %)	Effluent (CO_2 %)	Effluent (O_2 %)	Flow (scfm)	Methane Throughput (lbs/hr)
2/7/01 10:25 AM	-37	6.6	13.6	7.2	245	43
2/8/01 8:35 AM	-36	3.7	11.3	9.8	231	23
2/10/01 12:00 AM	-41	1.7	10.3	9.9	245	11
2/13/01 12:27 PM	-41	0.8	9.0	10.5	254	5
2/23/01 9:54 AM	-43	1.1	5.8	13.3	252	8
3/6/01 10:15 AM	-43	0.3	4.4	14.2	252	2
3/13/01 12:00 AM	-41	0.2	4.2	14.5	252	1
6/28/01 4:49 PM	-40	0.0	5.7	15.0	238	0
7/19/01 12:13 PM	-39	0.0	4.3	15.4	240	0
8/9/01 10:47 AM	-39	0.0	4.5	15.2	245	0
9/10/01 12:25 PM	-38	0.0	5.1	14.4	245	0

Methane Throughput = (%Methane)(Airflow)(Mass Conversion)

in. H_2O Inches of water column.

scfm Standard cubic feet per minute.

Table 7. Response Option 1: Permeable Cover System, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

CAPITAL COSTS

CAPITAL COST	Quantity	Unit	Cost per Unit	Total
DIRECT CAPITAL COST				
EQUIPMENT				
Construction Storm Water Controls	1	LS	$1,500	$1,500
Stormwater Mgt	1	Month	$1,000	$1,000
Excavation	2,342	CY	$4.00	$9,400
Waste Relocation to NE Pit	1,000	CY	$5.00	$5,000
On-Site Soil Placement	1,238	CY	$4.00	$5,000
Import Clean Fill and Place	954	CY	$6.00	$5,700
Replace Topsoil (Storm Water Area)	104	CY	$4.00	$400
Import Topsoil (6" thick, 0.7 acres)	565	CY	$16.00	$9,000
Storm Water Rock (1.5" - 3" diameter)	1,063	CY	$12.00	$12,800
Catch Basin (24")	1	LS	$600	$600
Storm Sewer Piping (12" RCP)	350	LF	$12	$4,200
Storm Water Fabric	18,380	SF	$0.10	$1,800
Seed, Fertilizer, Mulch, Tack	0.7	Acre	$1,000	$700
Permanent Markers	1	Ea	$500	$500
SUBTOTAL EQUIPMENT COST				$57,600
LABOR AND INSTALLATION				
Mob/Demob	1	LS	$15,000	$15,000
Construction Storm Water Controls	1	LS	$2,500	$2,500
Stormwater Mgt	1	Month	$500	$500
Excavation	2,342	CY	$4.00	$9,400
On-Site Soil Placement	1,238	CY	$4.00	$5,000
Import Clean Fill and Place	954	CY	$5.00	$4,800
Replace Topsoil (Storm Water Area)	104	CY	$4.00	$400
Import Topsoil (6" thick, 0.7 acres)	565	CY	$4.00	$2,300
Storm Water Rock (1.5" - 3" diameter)	1,063	CY	$8.00	$8,500
Catch Basin (24")	1	LS	$550	$600
Storm Sewer Piping (12" RCP)	350	LF	$8	$2,800
Storm Water Fabric	18,380	SF	$0.14	$2,600
Venting Piping Replumbing	1	LS	$10,000	$10,000
Seed, Fertilizer, Mulch, Tack	0.7	Acre	$1,000	$700
Permanent Markers	1	Ea	$500	$500
Waste Relocation to NE Pit	1,000	CY	$5.50	$5,500

OPERATIONS AND MAINTENANCE COSTS

ANNUAL O&M COST	Quantity	Unit	Cost per Unit	Total
DIRECT ANNUAL O&M COST				
Long Term Maintenance	1	LS	$3,000	$3,000
Annual Inspection	1	LS	$2,500	$2,500
Vapor Monitoring	1	LS	$2,500	$2,500
Reporting	1	LS	$4,000	$4,000
SUBTOTAL ANNUAL O&M COST				*$12,000*
INDIRECT ANNUAL O&M COST				
Project Management	10%			$1,200
Contingency	0%			$0
SUBTOTAL INDIRECT ANNUAL O&M COST				*$1,200*
TOTAL ANNUAL O&M COST				***$13,200***
PRESENT WORTH OF NEXT 30 YEARS OF O&M				**$203,000**

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Table 7. Response Option 1: Permeable Cover System, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

CAPITAL COSTS

CAPITAL COST	Quantity	Unit	Cost per Unit	Total
Waste Transportation & Disposal	100	TN	$70	$7,000
Surveying	1	LS	$5,000	$5,000
Geotechnical Testing	1	LS	$1,000	$1,000
SUBTOTAL LABOR AND INSTALLATION				$84,100
SUBTOTAL DIRECT CAPITAL COST				*$141,700*
INDIRECT CAPITAL COST				
Engineering and Design	15%			$21,300
Health & Safety	3%			$4,300
Construction Oversight	15%			$21,300
Contingency	25%			$35,400
Closure Report				$25,000
SUBTOTAL INDIRECT CAPITAL COST				*$107,300*
TOTAL CAPITAL COSTS				**$249,000**

OPERATIONS AND MAINTENANCE COSTS

ANNUAL O&M COST	Quantity	Unit	Cost per Unit	Total

NET PRESENT COST OF SYSTEM **$452,000**

ford/wi0637/2003/tables/swpit_irap_costs.xls (permeable cover)
06/25/03 11:06 AM

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Table 8. Response Option 2: Low-Permeability Cover System, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

CAPITAL COSTS

CAPITAL COST	Quantity	Unit	Cost per Unit	Total
DIRECT CAPITAL COST				
EQUIPMENT				
Construction Storm Water Controls	1	LS	$3,000	$3,000
Stormwater Mgt	3	Month	$2,000	$6,000
Excavation of Cover	7,113	CY	$4.00	$28,500
Cover Soil Placement	7,113	CY	$4.00	$28,500
Import Topsoil (6" thick, 1.5 acres)	1,210	CY	$16.00	$19,400
Sand Drainage Layer (6" thick, 1.5 acres)	1,210	CY	$10.00	$12,100
HDPE Synthetic Liner (1.5 acres)	71,874	SF	$0.38	$27,300
Geofabric (1.5 acres - 3 layers)	215,622	SF	$0.10	$21,600
Geogrid	71,874	SF	$0.36	$25,900
Storm Water Rock (1.5" - 3" diameter)	1,063	CY	$12.00	$12,800
Catch Basin (24")	1	LS	$600	$600
Storm Sewer Piping (12" RCP)	350	LF	$12	$4,200
Storm Water Fabric	18,380	SY	$0.1	$1,800
Seed, Fertilizer, Mulch, Tack	1.5	Acre	$1,000	$1,500
Permanent Markers	4	Ea	$500	$2,000
SUBTOTAL EQUIPMENT COST				$195,200
LABOR AND INSTALLATION				
Mob/Demob	1	LS	$50,000	$50,000
Construction Storm Water Controls	1	LS	$5,000	$5,000
Stormwater Mgt	3	Month	$500	$1,500
Excavation of Cover	7,113	CY	$4.00	$28,500
Cover Soil Placement	7,113	CY	$4.00	$28,500
Topsoil (6" thick, 1.5 acres)	1,210	CY	$4.00	$4,800
Sand Drainage Layer (6" thick, 1.5 acres)	1,210	CY	$4.00	$4,800
HDPE Synthetic Liner (1.5 acres)	71,874	SF	$0.23	$16,500
Geofabric (1.5 acres - 3 layers)	215,622	SF	$0.14	$30,200
Geogrid	71,874	SF	$0.14	$10,100
Storm Water Rock (1.5" - 3" diameter)	1,063	CY	$8.00	$8,500
Catch Basin (24")	1	LS	$550	$600
Storm Sewer Piping (12" RCP)	350	LF	$8	$2,800
Storm Water Fabric	18,380	SF	$0.14	$2,600
Venting Piping Replumbing	1	LS	$10,000	$10,000

OPERATIONS AND MAINTENANCE COSTS

ANNUAL O&M COST	Quantity	Unit	Cost per Unit	Total
DIRECT ANNUAL O&M COST				
Long Term Maintenance	1	LS	$10,000	$10,000
Annual Inspection	1	LS	$2,500	$2,500
Vapor Monitoring	1	LS	$2,500	$2,500
Reporting	1	LS	$5,000	$5,000
SUBTOTAL ANNUAL O&M COST				*$20,000*
INDIRECT ANNUAL O&M COST				
Project Management	10%			$2,000
Contingency	0%			$0
SUBTOTAL INDIRECT ANNUAL O&M COST				*$2,000*
TOTAL ANNUAL O&M COST				***$22,000***
PRESENT WORTH OF NEXT 30 YEARS OF O&M				**$338,000**

Table 8. Response Option 2: Low-Permeability Cover System, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

CAPITAL COSTS					OPERATIONS AND MAINTENANCE COSTS				
CAPITAL COST	Quantity	Unit	Cost per Unit	Total	ANNUAL O&M COST	Quantity	Unit	Cost per Unit	Total
Seed, Fertilizer, Mulch, Tack	1.5	Acre	$1,000	$1,500					
Permanent Markers	4	Ea	$500	$2,000					
Waste Transportation & Disposal	100	TN	$70	$7,000					
Surveying	1	LS	$30,000	$30,000					
Geotechnical Testing	1	LS	$15,000	$15,000					
SUBTOTAL LABOR AND INSTALLATION				$259,900					
SUBTOTAL DIRECT CAPITAL COST				*$455,100*					
INDIRECT CAPITAL COST									
Engineering and Design	15%			$68,300					
Health & Safety	5%			$22,800					
Construction Oversight	15%			$68,300					
Contingency	25%			$113,800					
Closure Report				$25,000					
SUBTOTAL INDIRECT CAPITAL COST				*$298,200*					
TOTAL CAPITAL COSTS				**$753,300**					
					NET PRESENT COST OF SYSTEM			**$1,091,000**	

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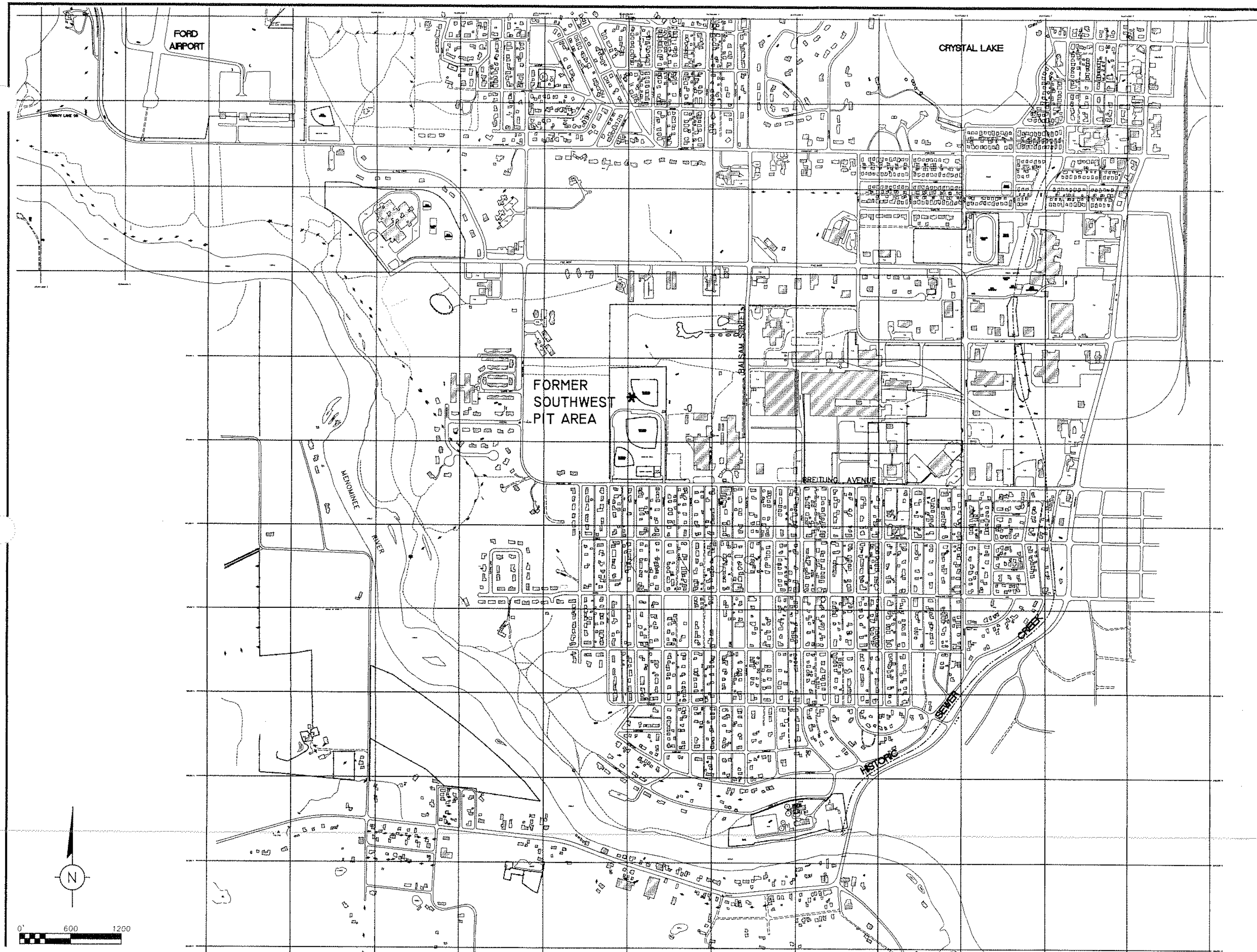
Table 9. Response Option 3: Excavation and Offsite Disposal of Waste Material, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

CAPITAL COSTS

CAPITAL COST	Quantity	Unit	Cost per Unit	Total
DIRECT CAPITAL COST				
EQUIPMENT				
Construction Storm Water Controls	1	LS	$7,500	$7,500
Stormwater Mgt	10	Month	$3,130	$31,300
Excavation of Cover	6,050	CY	$4.00	$24,200
Excavation of Waste	34,000	CY	$5.00	$170,000
Cover Soil Placement	6,050	CY	$4.00	$24,200
Seed, Fertilizer, Mulch, Tack	1.5	Acre	$1,000	$1,500
		SUBTOTAL EQUIPMENT COST		$258,700
LABOR AND INSTALLATION				
Mob/Demob	1	LS	$50,000	$50,000
Construction Storm Water Controls	1	LS	$12,500	$12,500
Stormwater Mgt	5	Month	$500	$2,500
Excavation of Cover	6,050	CY	$4.00	$24,200
Excavation of Waste	34,000	CY	$5.50	$187,000
Cover Soil Placement	6,050	CY	$4.00	$24,200
Seed, Fertilizer, Mulch, Tack	1.5	Acre	$1,000	$1,500
Verification Sampling	20	LS	$1,405	$28,100
Existing Soil Verification Sampling	7	LS	$1,405	$9,800
Waste Transportation & Disposal	51,000	TN	$100	$5,100,000
Surveying	1	LS	$5,000	$5,000
		SUBTOTAL LABOR AND INSTALLATION		$5,444,800
		SUBTOTAL DIRECT CAPITAL COST		*$5,703,500*
INDIRECT CAPITAL COST				
Engineering and Design	2%			$114,100
Health & Safety	5%			$285,200
Construction Oversight	5%			$285,200
Contingency	25%			$1,425,900
Closure Report				$25,000
		SUBTOTAL INDIRECT CAPITAL COST		*$2,135,400*
		TOTAL CAPITAL COSTS		**$7,838,900**
		NET PRESENT COST OF SYSTEM		**$7,839,000**



NOTES

1. HORIZONTAL DATUM BASED ON MICHIGAN STATE PLANE COORDINATE SYSTEM.
   DATE OF PHOTOGRAPHY: 05/04/97
   ABRAMS AERIAL SURVEY CORPORATION # 26994.2
2. ACCURACIES NOT GUARANTEED IN OBSCURED AREAS SHOWN BY DASHED CONTOURS AND UNDERLINED ELEVATIONS

NO.	DATE	REVISION DESCRIPTION	BY	CKD

ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

FORMER SOUTHWEST PIT IRAP

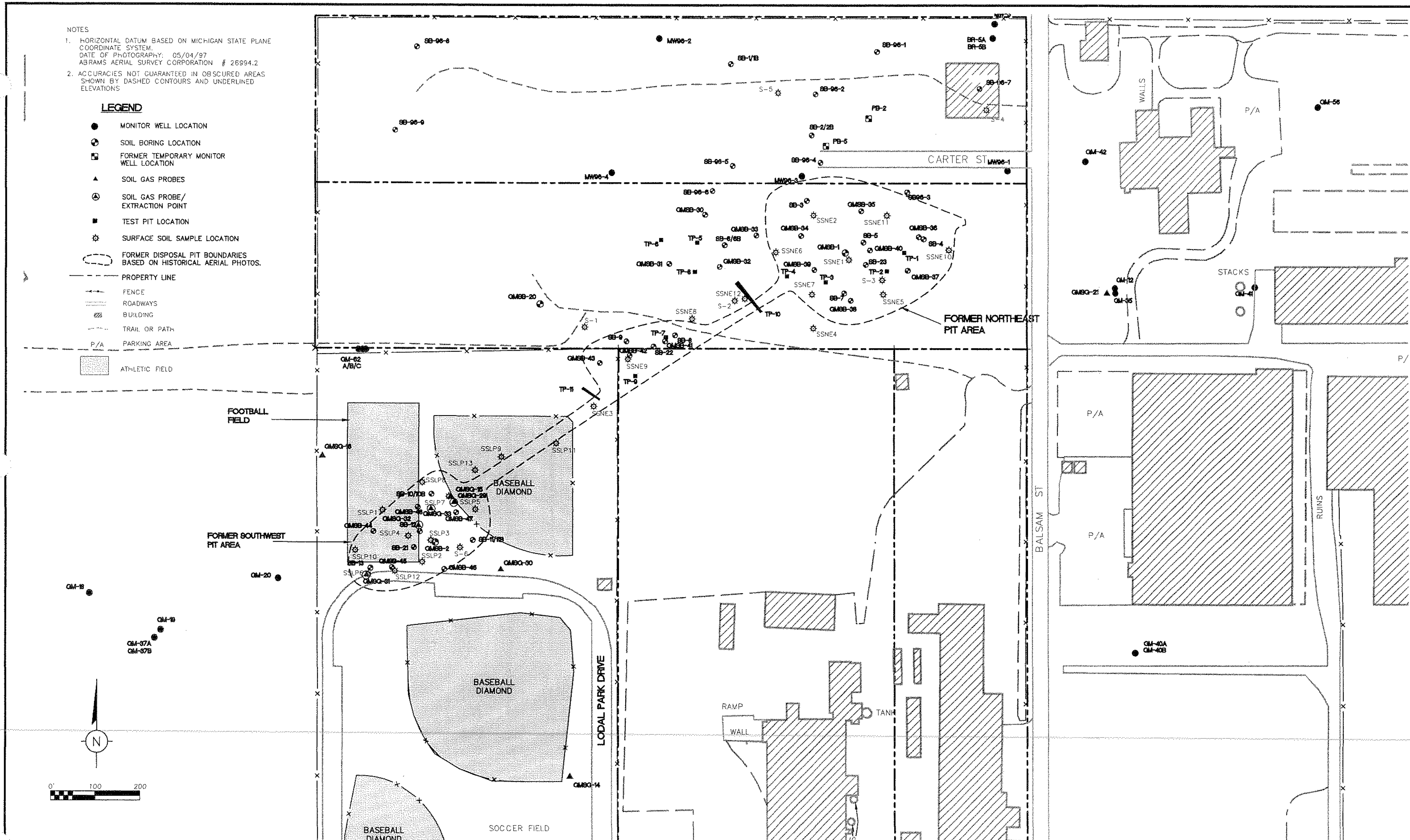
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

DRAWN	DATE
BJH	8/4/2000

SITE LOCATION MAP

PROJECT MANAGER	DEPARTMENT MANAGER
EC	BE
LEAD DESIGN PROF.	CHECKED
BE	BE
PROJECT NUMBER	FIGURE
WI00950.0005	1

HP LaserJet 4V/4MV PostScript



G:\CAD\Ford\REMEDIAL ACTION\01-02\FIG2-1-2.DWG, 1/23/2003 4:32:59 PM, \\WI1fpex1\WI1P03 - HP LaserJet 4V/4MV PostScript

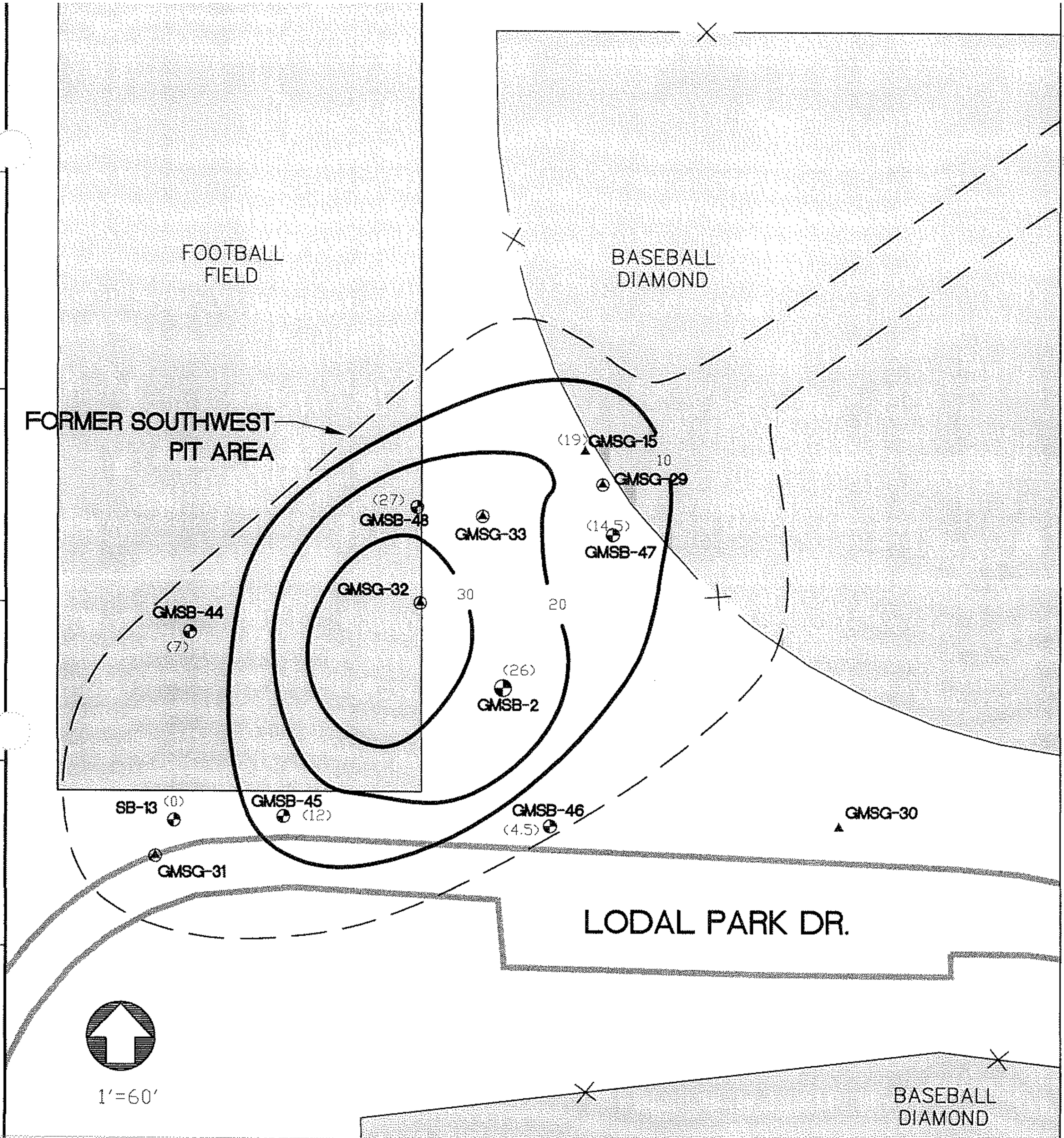
NO.	DATE	REVISION DESCRIPTION	BY	CKD

ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

FORMER SOUTHWEST PIT IRAP

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

DRAWN	DATE	PROJECT MANAGER	DEPARTMENT MANAGER
CES	1/10/2002	EC	BE
SAMPLE LOCATIONS		LEAD DESIGN PROF. BE	CHECKED BE
		PROJECT NUMBER WI00950.0005	FIGURE 2



LEGEND

- SOIL BORING LOCATION
- SOIL GAS PROBE/ EXTRATION POINTS
- SOIL GAS PROBES
- (27) THICKNESS IN FEET OF WASTE/FILL BELOW SAND COVER
- ATHLETIC FIELD
- 30" THICKNESS CONTOUR
- APPROXIMATE EXTENT OF FORMER SOUTHWEST PIT AREA BASED ON AREAL PHOTOS
- X FENCE
- ISOPACH CONTOUR INTERVAL IS 10 FEET

g:\cad\ford\remedial action01-02\fig3-1-2.dwg

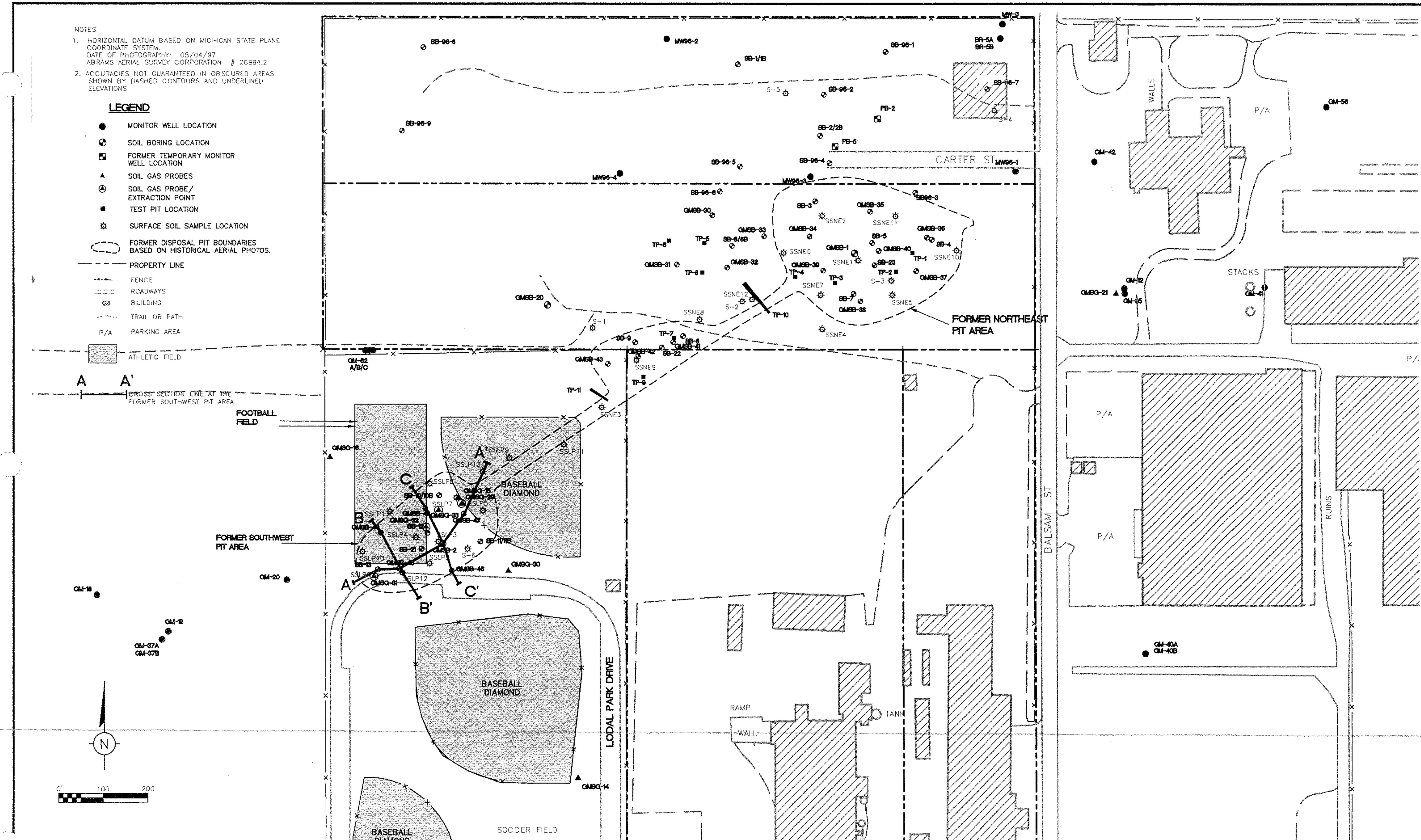
DRAFTER: CES
APPROVED: EC
CHECKED: BE
FILE NO.: FORD
DRAWING: FIG3-1-2.DWG
PRJCT NO.: WI00950.0005
DWG DATE: 5/06/02

ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

ISOPACH MAP OF THE WASTE/FILL THICKNESS

INTERIM RESPONSE ACTION PLAN
FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE 3



Copyright © 2002

G:\CAD\Ford\REMEDIAL ACTION\01-02\FIG4-1-2.DWG

NO.	DATE	REVISION DESCRIPTION	BY	CKD

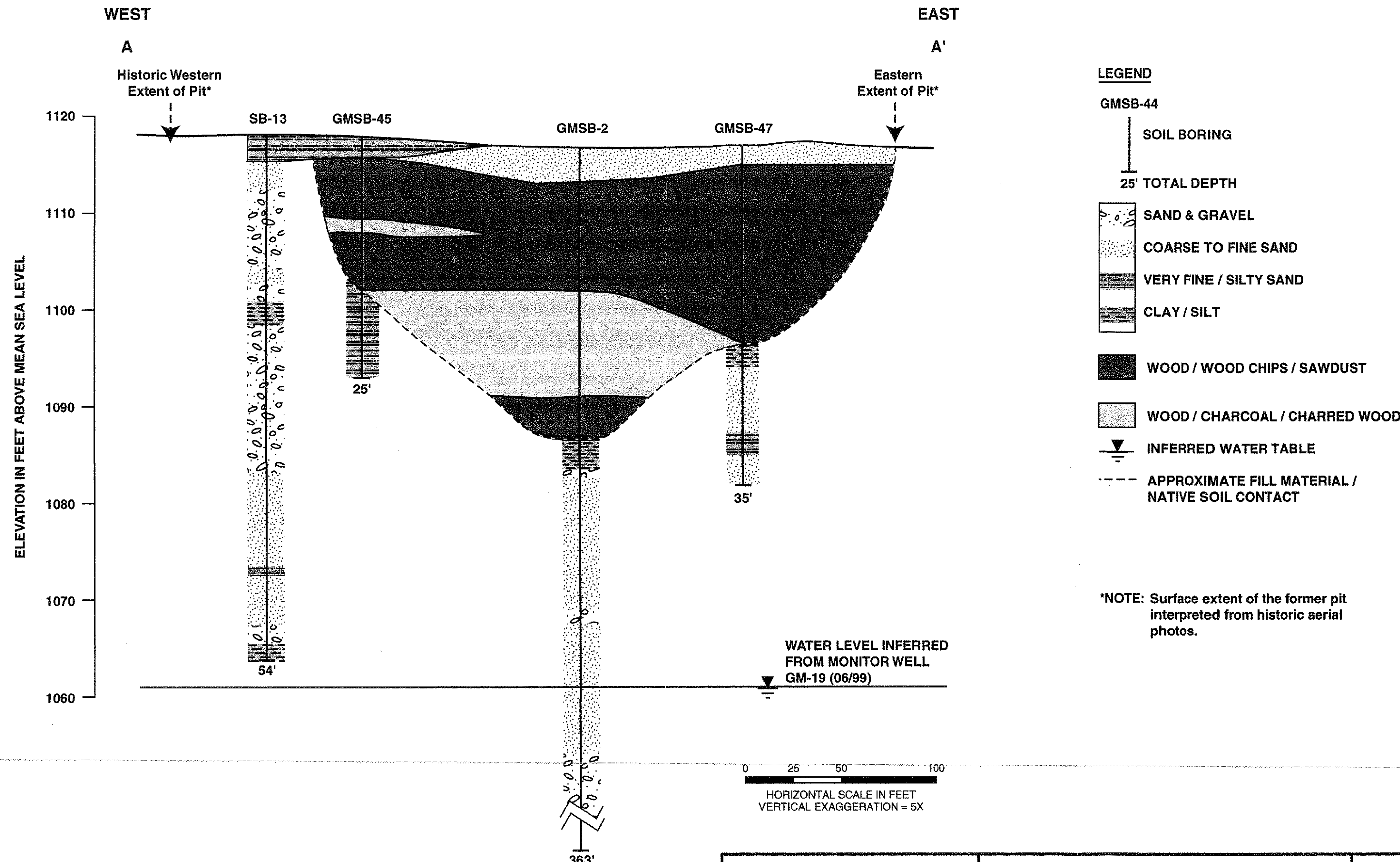
ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

FORMER SOUTHWEST PIT IRAP

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

LOCATION OF GEOLOGIC CROSS SECTIONS

DRAWN BJH	DATE 5/3/2000	PROJECT MANAGER EC	DEPARTMENT MANAGER BE
		LEAD DESIGN PROF. BE	CHECKED BE
		PROJECT NUMBER WI00950.0005	FIGURE 4



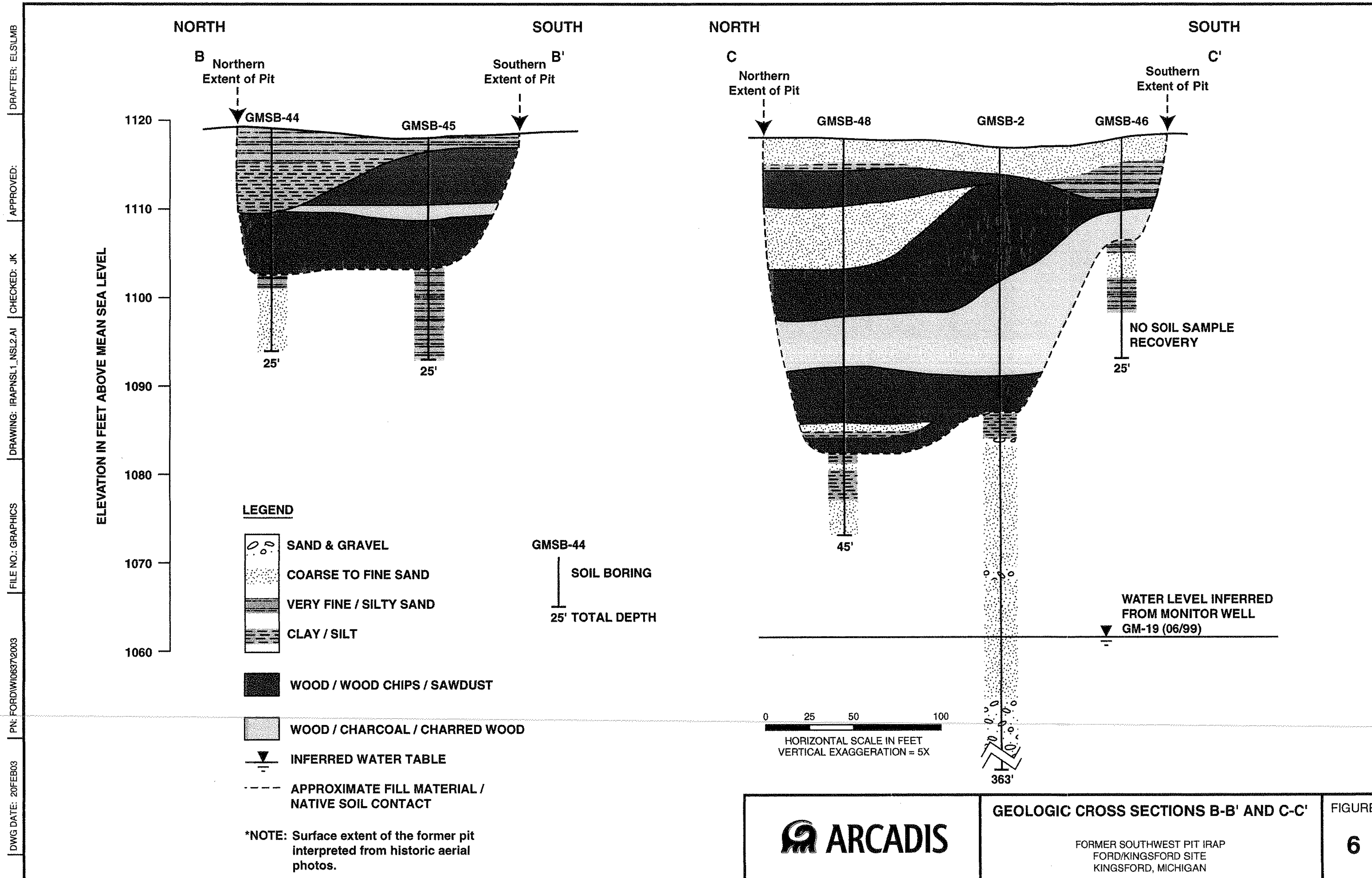
DRAFTER: ELP/LMB | APPROVED: | CHECKED: WLM | DRAWING: IRAP_EWL1.AI | FILE NO.: GRAPHICS | PN: FORDWI0637\2003 | DWG DATE: 20FEB03

ARCADIS

GEOLOGIC CROSS SECTION A-A'

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE 5

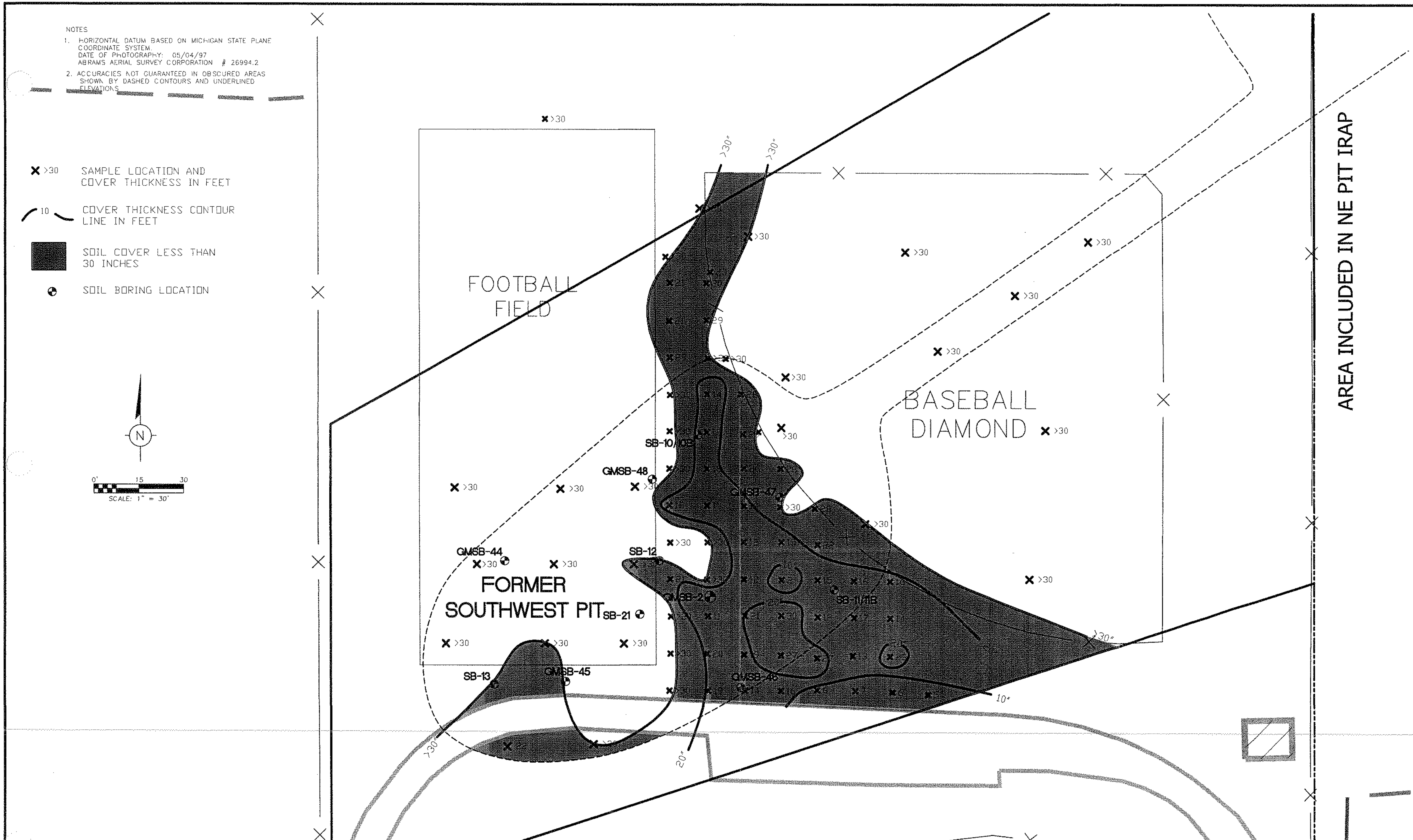


ARCADIS

GEOLOGIC CROSS SECTIONS B-B' AND C-C'

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE 6



G:\CAD\Ford\IRAP2001\fig7SWPIT.dwg, 6/19/2003 11:02:49 AM, \\WI1fpex1\WI1P03 - HP LaserJet 4V/4MV PostScript

NO.	DATE	REVISION DESCRIPTION	BY	CKD

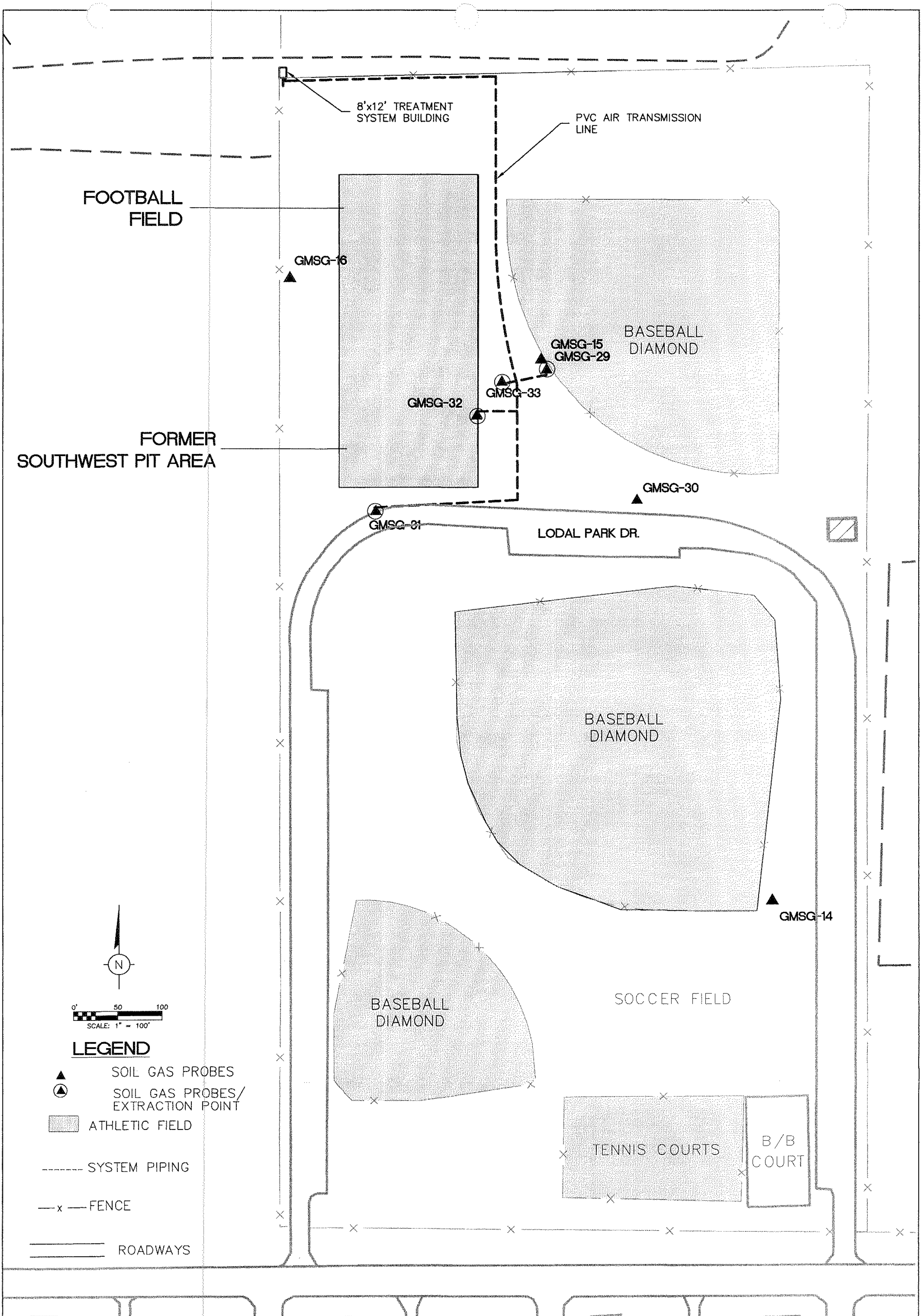
ARCADIS GERAGHTY&MILLER
3903 Northdale Blvd., Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

FORMER SW PIT IRAP

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

ISOPACH MAP OF COVER MATERIAL THICKNESS

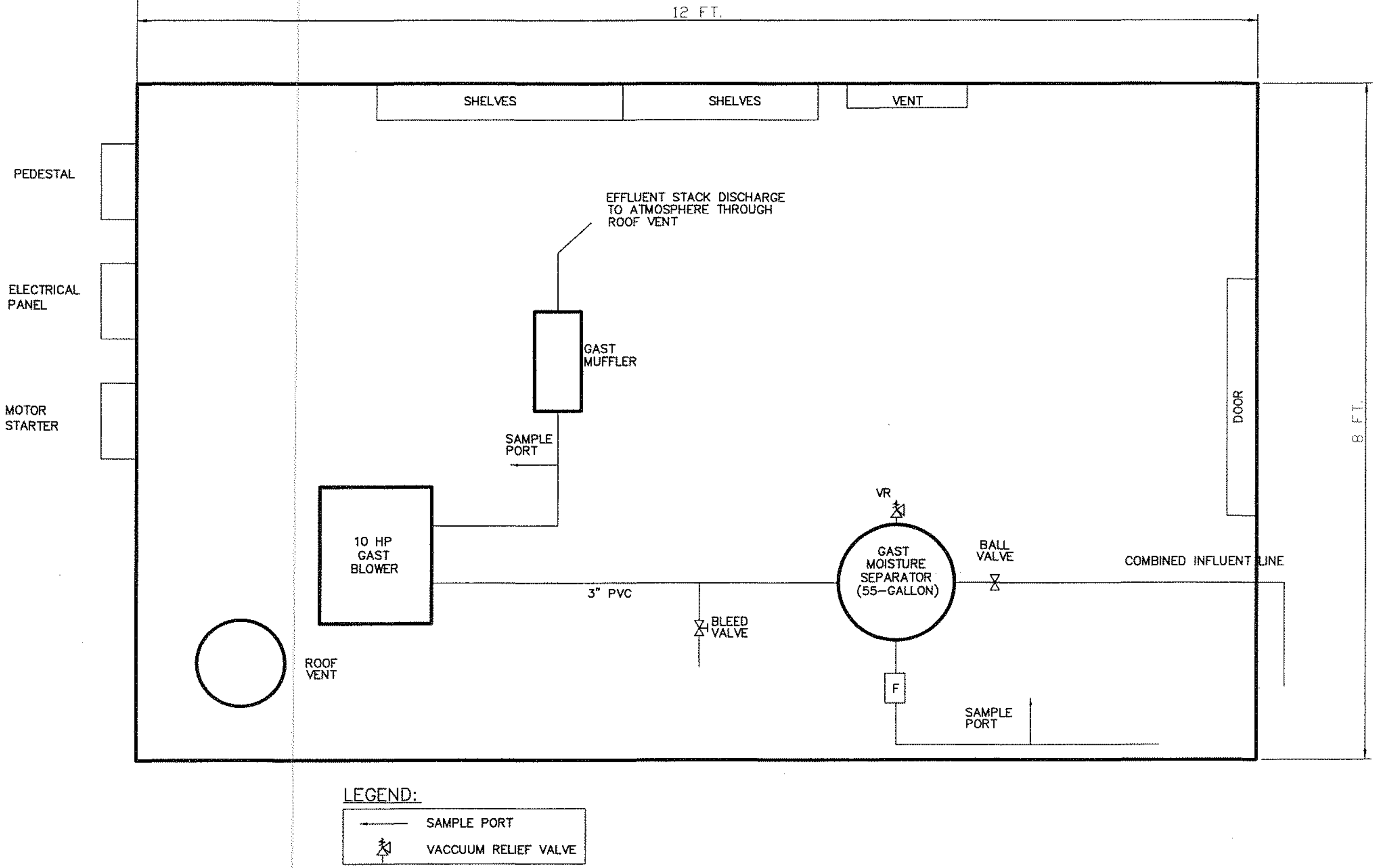
DRAWN: BJH	DATE: 5/3/2000	PROJECT MANAGER: EC	DEPARTMENT MANAGER: BE
		LEAD DESIGN PROF.: BE	CHECKED: BE
		PROJECT NUMBER: WI00770.0001	FIGURE: 7



ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

DATE 01/10/2002	PROJECT MANAGER BZ	PROJECT OFFICER EC	FIGURE NUMBER
DRAWN CES	LEAD DESIGN PROF. BZ	CHECKED BZ	8
CADD FILE NAME fig7-1-2.DWG	PROJECT NUMBER WI00950.0001		

SOIL VAPOR EXTRACTION SYSTEM PIPING
FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN



SVE SYTEM LAYOUT

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

DATE 10/24/2001	PROJECT MANAGER JSD	PROJECT OFFICER JMB
DRAWN CES	LEAD DESIGN PROF. JSD	CHECKED JSD
CADD FILE NAME	PROJECT NUMBER WI000860.0005	

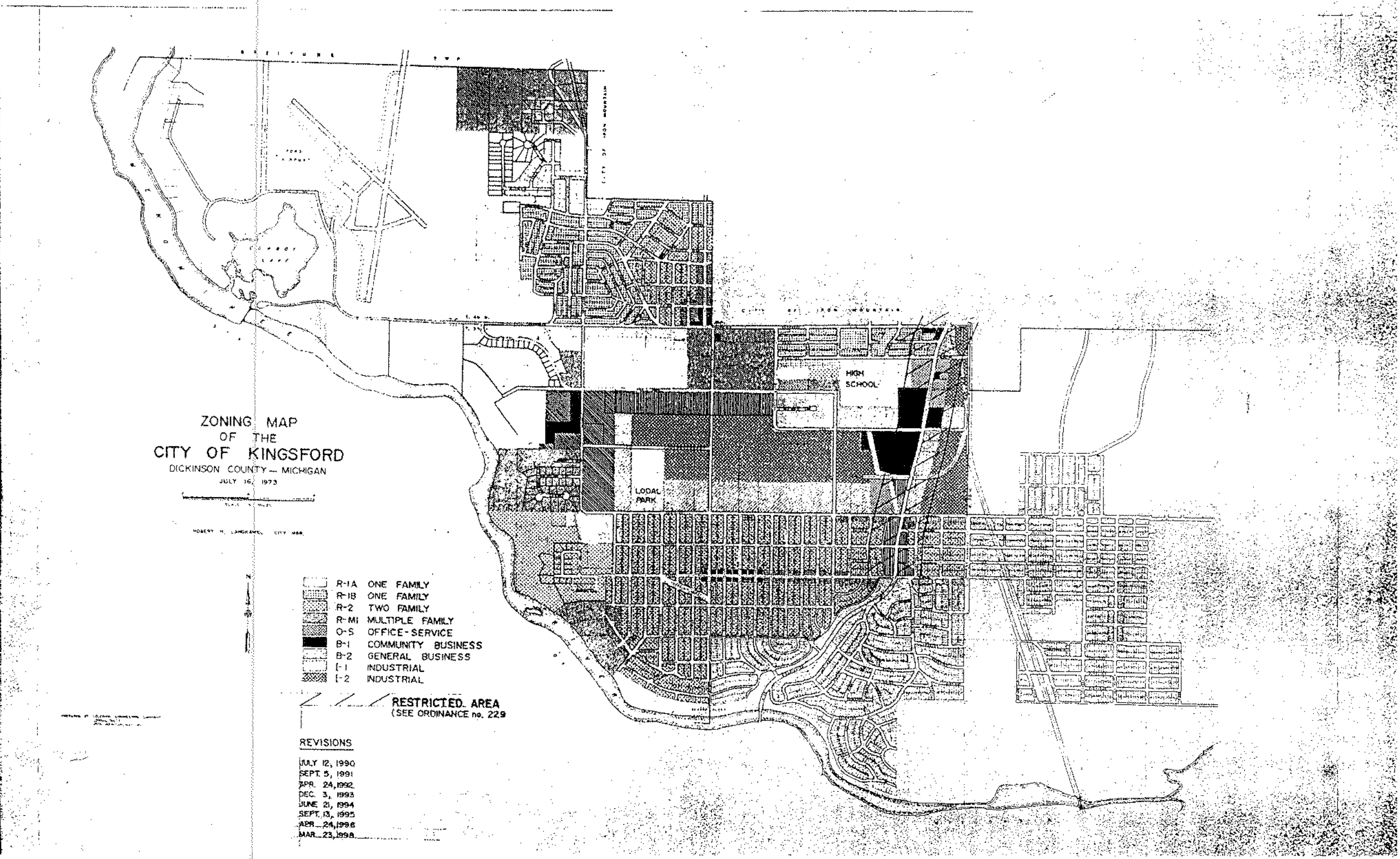
FIGURE NUMBER 9

ARCADIS GERAGHTY&MILLER
14497 North Dale Mabry Hwy., Suite 115
Tampa, Florida 33618

ARCADIS

Appendix A

Zoning Ordinance


ZONING MAP
OF THE
CITY OF KINGSFORD
DICKINSON COUNTY — MICHIGAN
JULY 16, 1973
HIGH SCHOOL
LODAL PARK
CITY OF IRON MOUNTAIN
R-1A ONE FAMILY
R-1B ONE FAMILY
R-2 TWO FAMILY
R-M1 MULTIPLE FAMILY
O-S OFFICE-SERVICE
B-1 COMMUNITY BUSINESS
B-2 GENERAL BUSINESS
I-1 INDUSTRIAL
I-2 INDUSTRIAL
RESTRICTED AREA
(SEE ORDINANCE no. 229
REVISIONS
JULY 12, 1990
SEPT. 5, 1991
APR. 24, 1992
DEC. 3, 1993
JUNE 21, 1994
SEPT. 13, 1995
APR. 24, 1996
MAR. 23, 1998

ARTICLE IV

R - 1 A and R - 1 B

ONE-FAMILY RESIDENTIAL DISTRICTS

SECTION 400. Intent: The R-1 One-Family Residential Districts are designed to provide for an environment of predominantly low-density, one-family detached dwellings along with other residentially related facilities which serve the residents in the District.

SECTION 401. Principal Uses Permited: No building or land shall be used and no building shall be erected except for one or more of the following specified uses:

1. One-family detached dwellings.
2. Publicly owned and operated libraries, parks, parkways and recreational facilities.
3. Cemeteries which lawfully occupied land at the time of adoption of this Ordinance.
4. Public, parochial and other private elemetary, intermediate and secondary schools, offering courses in general education, and not operated for profit.
5. Agriculture on those parcels of land outside the boundaries of a platted subdivision.
6. Day nursery schools and child care centers without a dormitory.

SECTION 402. Principal Uses Permitted Subject To Special Conditions: The following uses shall be permitted, subject to the conditions hereinafter imposed for each use and subject further to the review and approval of the City Council:

1. Churches, non-profit colleges and other facilities normally incidental thereto, provided the site shall be so located as to have at least one (1) property line abutting a collector street or major thoroughfare as designated on the Thoroughfare Plan.

2. Utility and public service buildings and uses (without storage yards) when operating requirements necessitate the locating of said building within the district to serve the immediate vicinity.

3. Private non-commercial recreational areas; institutional or community recreation center, non-profit swimming pool club, all subject to a public hearing and the following conditions:

   a. The proposed site for uses permitted herein which would serve areas beyond the immediate neighborhood shall have primary access from a planned collector street or a major thoroughfare.

   b. Front, side, and rear yards required for the District shall be at least twenty-five (25) feet wide, and landscaped. There shall be no parking or structure permitted in these yards, except walls or fences used to obscure the use from abutting residential districts.

   c. Off-street parking is provided.

4. Golf courses, (except mini-golf) which may or may not be operated for profit, provided: All principal or accessory buildings, except minor rain shelters, shall be at least two hundred (200) feet from any property line abutting residentially zoned lands.

5. Private swimming pools shall be permitted as an accessory use within the rear yard only, provided they meet the following:

a. There shall be a distance of not less than: four (4) feet between the outside pool wall and any building located on the same lot, thirty-five (35) feet from any front lot line, ten (10) feet from any property line.

b. Outdoor swimming pools shall be enclosed by a fence not less than five (5) feet in height. The gate shall be of a self-closing and latching type, with the latch on the inside of the gate to protect children. Gates shall be capable of being securely locked. If the entire premises of the residence is enclosed, then this provision may be waived by the Administrative Officer upon inspection and approval.

ARCADIS

Appendix B

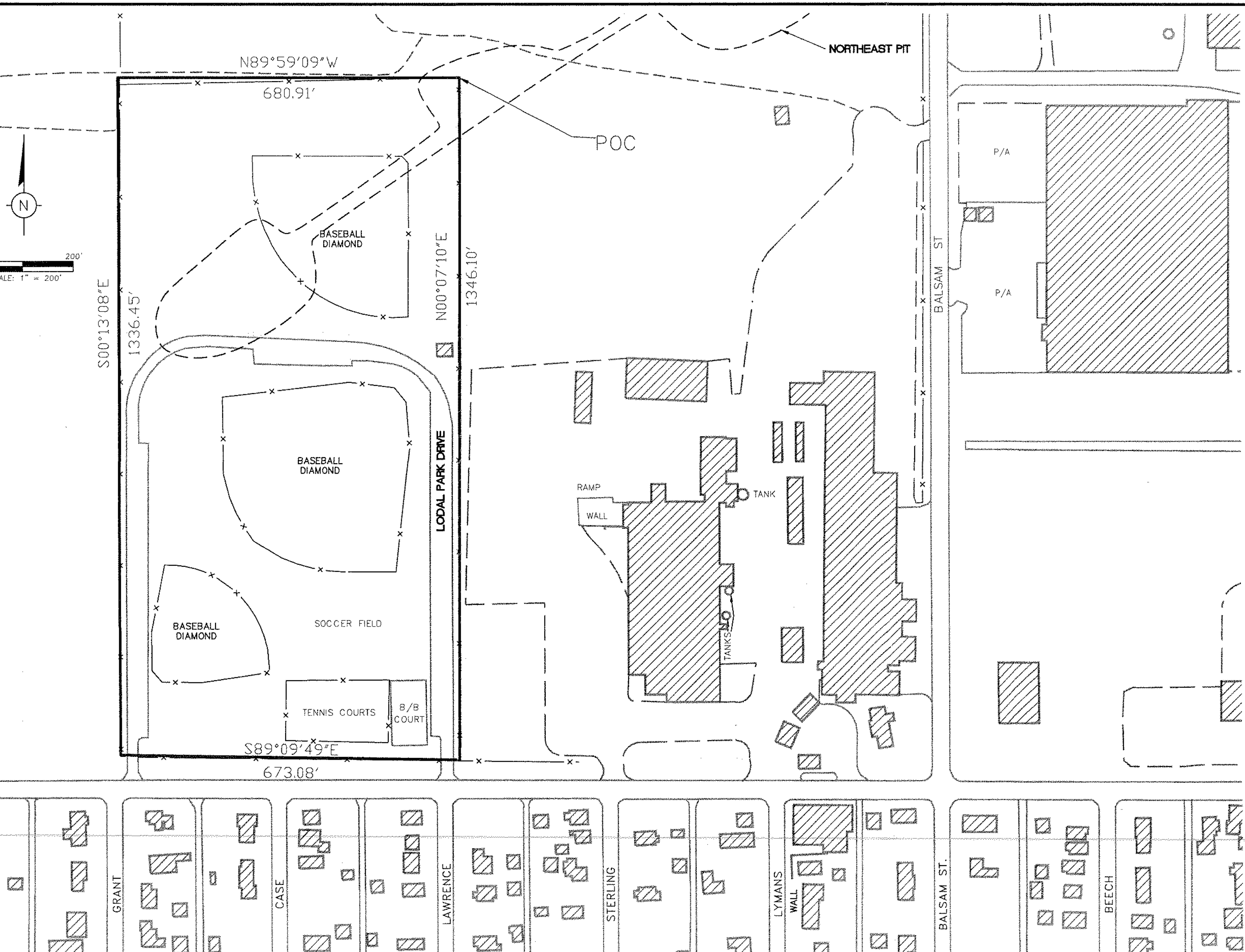
Legal Description Lodal Park

NOTES

1. HORIZONTAL DATUM BASED ON MICHIGAN STATE PLANE COORDINATE SYSTEM.
DATE OF PHOTOGRAPHY: 05/04/97
ABRAMS AERIAL SURVEY CORPORATION # 26994.2

LEGEND

- FORMER DISPOSAL PIT BOUNDARIES BASED ON HISTORICAL PHOTOS AERIAL
- FENCE
- ROADWAYS
- TRAIL OR PATH
- PROPERTY LINE
- FOOT PRINT OF COVER SYSTEM



A PARCEL OF LAND LOCATED IN THE SOUTH HALF OF SECTION 2 TOWNSHIP 39 NORTH, RANGE 31 WEST, CITY OF KINGSFORD, COUNTY OF DICKINSON, STATE OF MICHIGAN MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF TWO BOUNDARY LINES THENCE NORTH 89°59'09" WEST A DISTANCE OF 680.91 FEET, THENCE SOUTH 00°13'08" WEST A DISTANCE OF 1336.45', THENCE SOUTH 89°09'49" EAST A DISTANCE OF 673.08 FEET, THENCE NORTH 00°07'10" EAST A DISTANCE OF 1346.10' TO THE POINT OF COMMENCEMENT.

This Legal is subject to change based upon pending Survey

NO.	DATE	REVISION DESCRIPTION	BY CKD

ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

FORMER SOUTHWEST PIT IRAP

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

DRAWN: CES	DATE: 11/07/02

LEGAL DESCRIPTION
RESTRICTIVE COVENANT

PROJECT MANAGER: MS	DEPARTMENT MANAGER: JB
LEAD DESIGN PROF.: BZ	JB: BE
PROJECT NUMBER: WI00975.0005	FIGURE: B1

G:\CAD\Ford\LODAL Park\Legal description.dwg, \\WI1fpex1\WI1P03 - HP LaserJet 4V/4MV PostScript

ARCADIS

Appendix C

Permanent Markers

NOTES

1. HORIZONTAL DATUM BASED ON MICHIGAN STATE PLANE COORDINATE SYSTEM.
DATE OF PHOTOGRAPHY: 05/04/97
ABRAMS AERIAL SURVEY CORPORATION # 26994.2

LEGEND

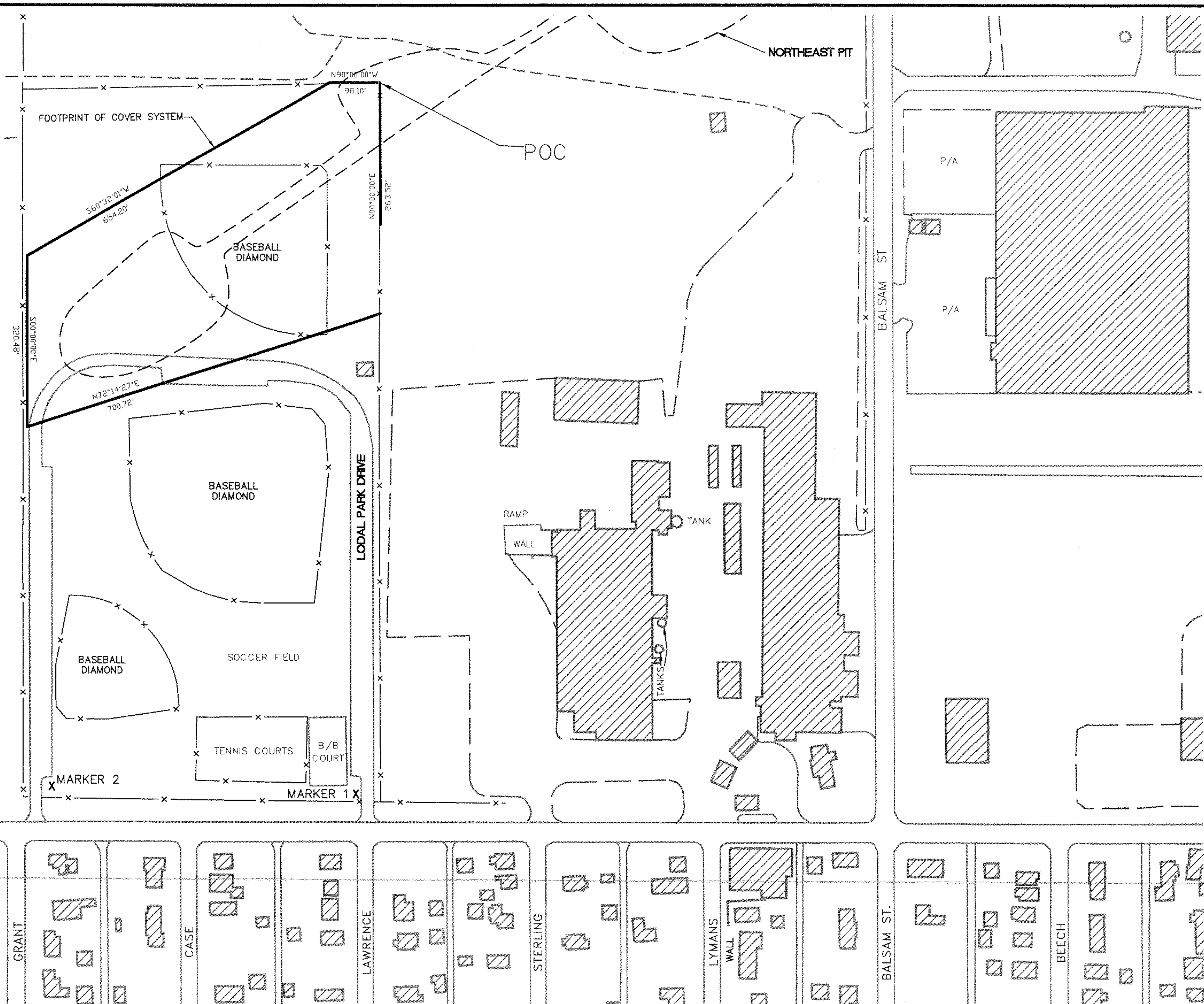
- FORMER DISPOSAL PIT BOUNDARIES BASED ON HISTORICAL PHOTOS AERIAL
- FENCE
- ROADWAYS
- TRAIL OR PATH
- PROPERTY LINE
- FOOT PRINT OF COVER SYSTEM

0' 200'
SCALE: 1" = 200'

A PARCEL OF LAND LOCATED IN THE SOUTH HALF OF SECTION 2 TOWNSHIP 39 NORTH, RANGE 31 WEST, CITY OF KINGSFORD, COUNTY OF DICKINSON, STATE OF MICHIGAN MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF TWO BOUNDARY LINES THENCE NORTH 90°00'00" WEST A DISTANCE OF 98.10 FEET, THENCE SOUTH 60°92'01" WEST A DISTANCE OF 654.20', THENCE SOUTH 00°00'00" EAST A DISTANCE OF 320.48 FEET, THENCE NORTH 72°14'27" EAST A DISTANCE OF 700.72 FEET, THENCE NORTH 00°00'00" EAST A DISTANCE OF 263.52' TO THE POINT OF COMMENCEMENT.

This Legal is subject to change based upon pending Survey



NO.	DATE	REVISION DESCRIPTION	BY	CKD

ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

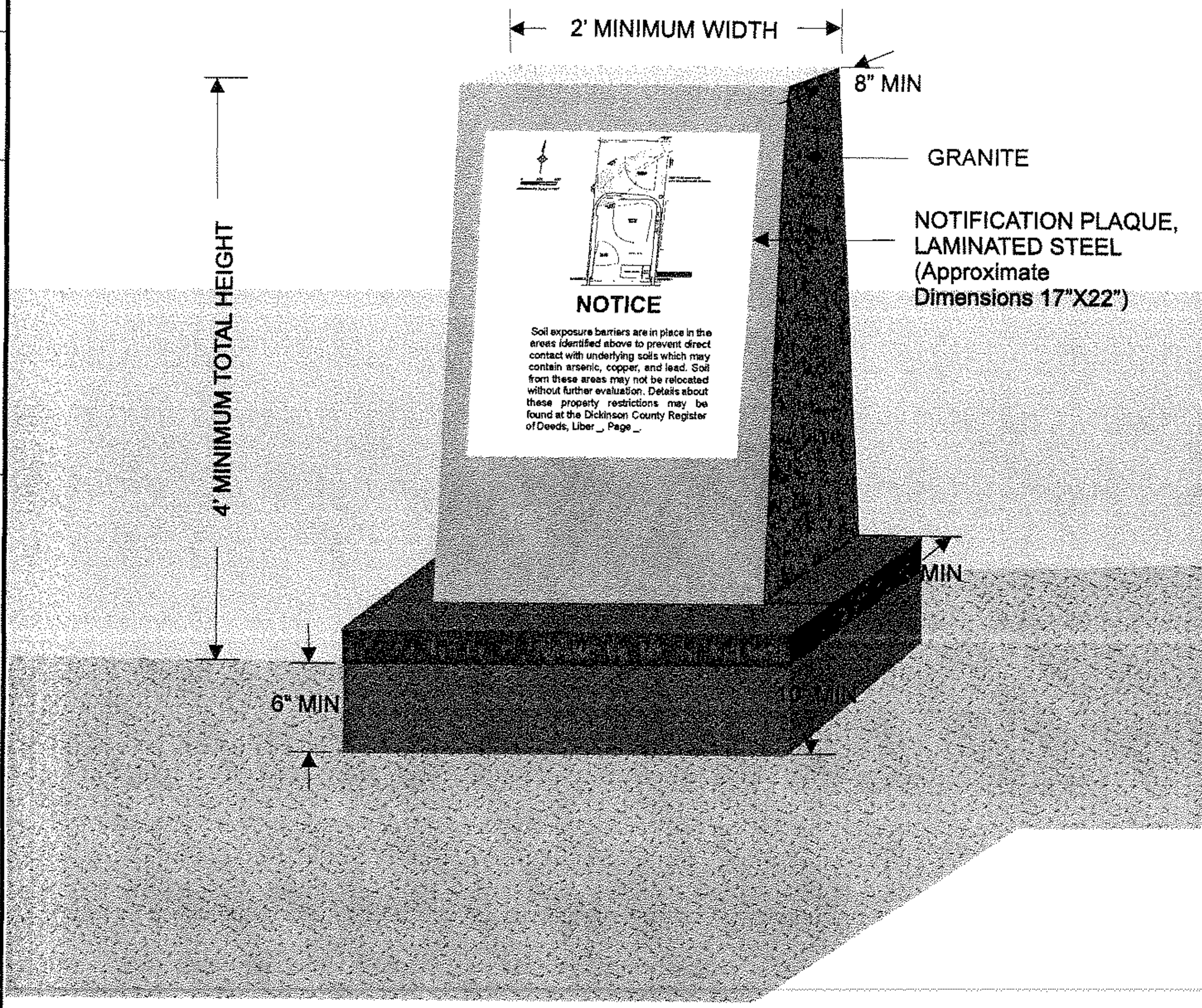
FORMER SOUTHWEST PIT IRAP

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

DRAWN	DATE	PROJECT MANAGER	DEPARTMENT MANAGER
CES	11/07/02	MS	JB
		LEAD DESIGN PROF. BZ	CHECKED BE
		PROJECT NUMBER WI00975.0005	FIGURE C1

LEGAL DESCRIPTION
SW PIT COVER FOOTPRINT

G:\CAD\Ford\LODAL Park\legal description.dwg, 11/7/2002 — \\WI1fpex1\WI1P03 - HP LaserJet 4V/4MV PostScript



NOT TO SCALE

ARCADIS

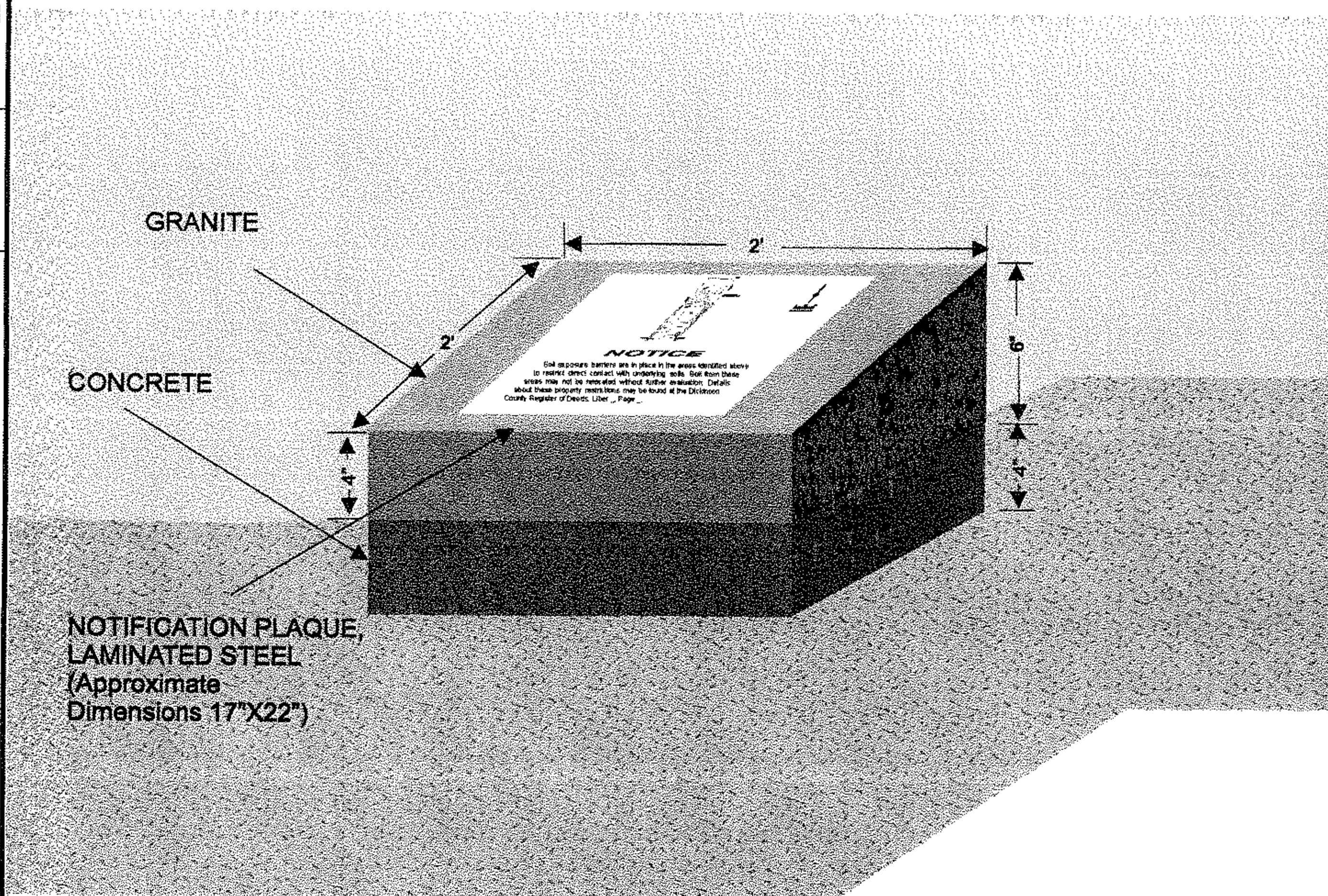
PERMANENT MARKER DESIGN

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE

C-2

DRAFTER: DKN/MJC | APPROVED: RS | CHECKED: BZ | DRAWING: MARKER DESIGN-REV.CDR | PN: WI0975/SW pit/markers/marker design.cdr | DWG DATE: 21JAN03



NOT TO SCALE

ARCADIS

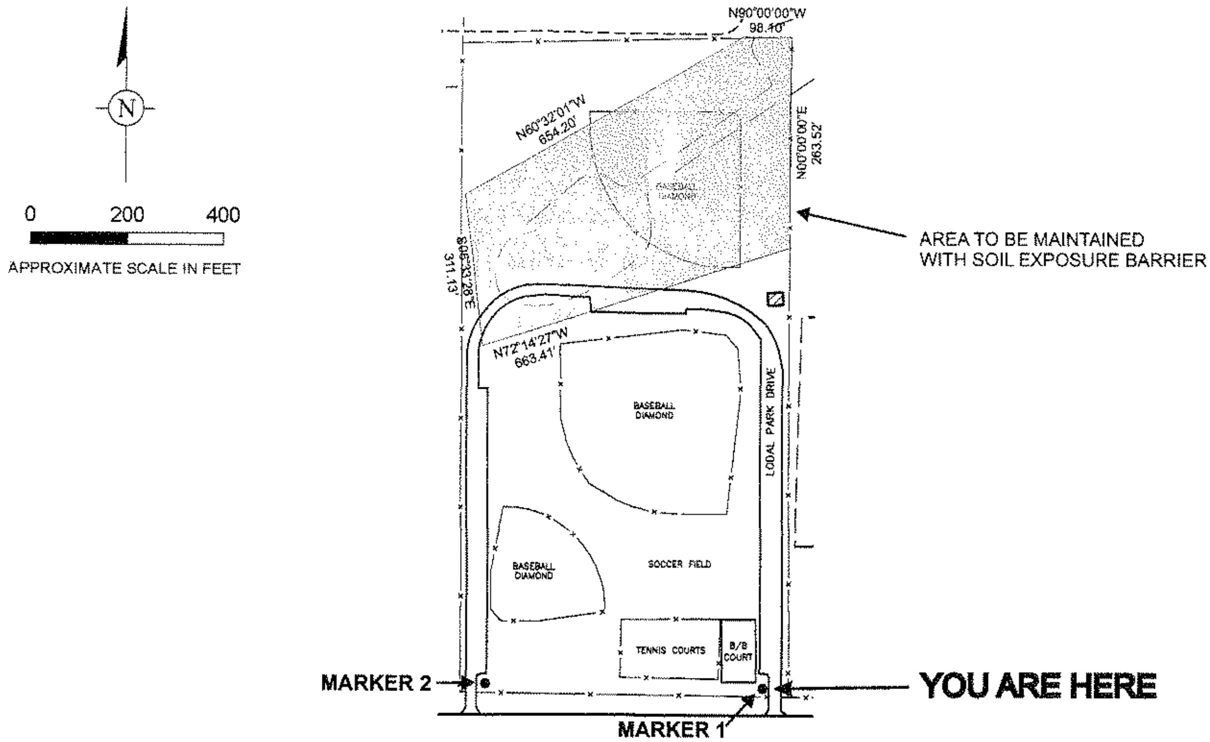
SMALL MARKER DESIGN

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE

C-2A

DWG DATE: 21JAN03 | PN: WI0975/SW pit/Markers/MARKER DESIGN-SMALL.CDR | CHECKED: BZ | APPROVED: RS | DRAFTER: DKN/MJC



NOTICE

Soil exposure barriers are in place in the areas identified above to prevent direct contact with underlying soils. Soil from these areas may not be relocated without further evaluation. Details about these property restrictions may be found at the Dickinson County Register of Deeds, Liber _, Page _.

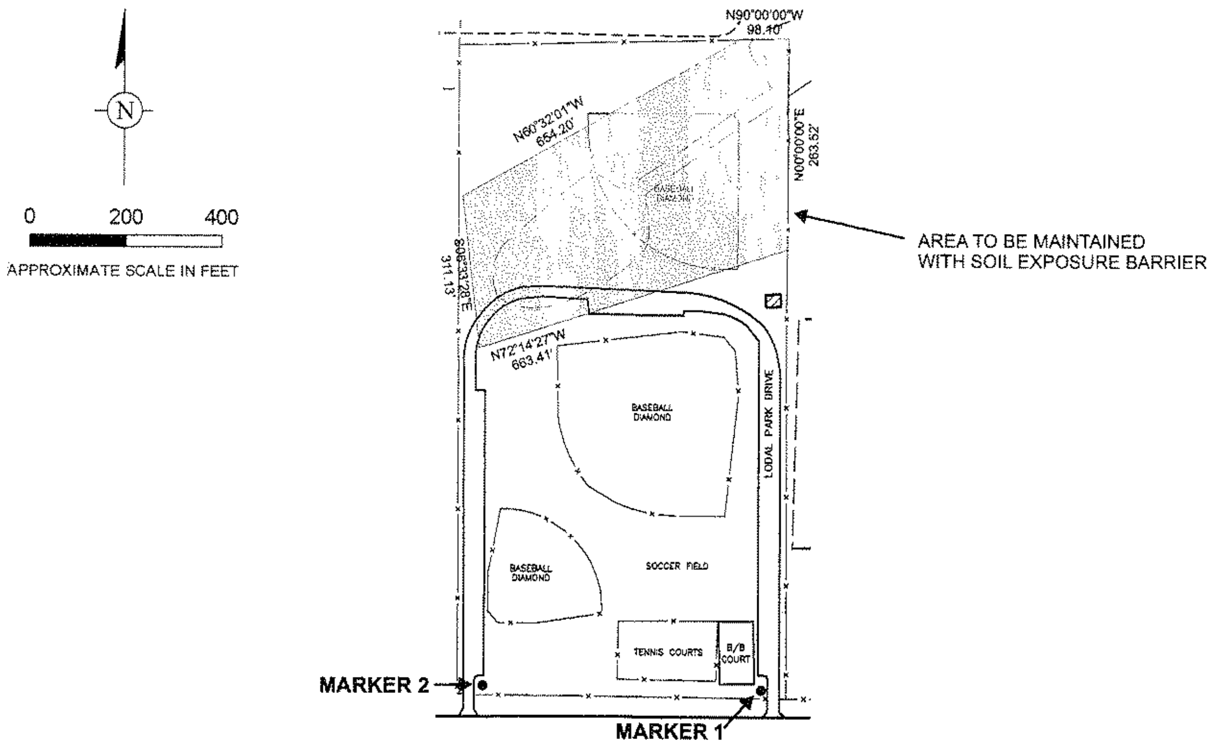
ARCADIS

NOTIFICATION SIGN DISPLAY

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE
C-3

DWG DATE: 21JAN03 | PN: WI0975\SW pit\Markers\Marker Display.cdr | DRAWING: MARKER DISPLAY.CDR | CHECKED: BZ | APPROVED: RS | DRAFTER: MJC



NOTICE

Soil exposure barriers are in place in the areas identified above to prevent direct contact with underlying soils. Soil from these areas may not be relocated without further evaluation. Details about these property restrictions may be found at the Dickinson County Register of Deeds, Liber _, Page _.

ARCADIS

NOTIFICATION SIGN DISPLAY

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE
C-3A

DWG ...E: 21JAN03 | PN: WI0975\SW pit\Markers\Marker Display-2.cdr | DRAWING: MARKER DISPLAY-2.CDR | CHECKED: BZ | APPROVED: RS | DRAFTER: MJC

Appendix D

Declaration of Restrictive Covenant

DECLARATION OF RESTRICTIVE COVENANT

This Restrictive Covenant has been recorded with the Dickinson County Register of Deeds for the purpose of protecting the public health, safety and welfare, and the environment.

The City of Kingsford (the "City"), located in the County of Dickinson and the State of Michigan, has received notice of approval from the Michigan Department of Environmental Quality ("MDEQ") for an Interim Response Action Plan ("IRAP") dated __________________________________, that includes land use-based cleanup criteria as defined and set forth in Section 20120a(1)(f), limited residential of Part 201 of the Natural Resources and Environmental Protection Act ("NREPA"), 1994 PA 451, as amended, MCL 324.20101 *et seq.*, for the environmental response associated with property located in the City of Kingsford, County of Dickinson, State of Michigan, which property is often referred to as the Southwest Pit Area and Lodal Park (the "Property") located on Breitung Ave. Please see Exhibit A for a legal description of the Property. The tax identification number for the Property is __________________________.

A portion of the Property has a Cover constructed upon it. Please see Figure 1, which illustrates the Property, including the Cover. The City is the current owner of the Property. As used herein, the term "Owner" shall mean at any given time the then current titleholder of the Property or any parcels of the Property.

NOW THEREFORE, the Owner hereby imposes restrictions on the Property and covenants and agrees that:

1. The Property shall be used for park and recreational purposes only.

2. The Cover shall not be removed, all or in part, unless performed in accordance with the restrictions in this Restrictive Covenant, or unless otherwise approved by the MDEQ.

3. For the entire Property, the Owner declares the following restrictions:

- The use of any groundwater located beneath the Property for any purpose is prohibited.
- The cover overlying a portion of the Property shall be maintained in perpetuity or until waste is sufficiently biodegraded, in accordance with the Operation and Maintenance Plan, attached as Exhibit B.
- All excavation and digging activities on the Property shall be conducted in accordance with the Property's Construction Health and Safety Plan and Waste Management Plan, attached as Exhibits C and D, respectively.
- Construction of any future structures that contain confined space shall be completed with a vapor barrier to minimize the potential for migration of subsurface vapors into the structure.
- Permanent markers shall be maintained that describe the restricted area of the Property and the nature of the restrictions.

4. The Owner shall restrict activities on the Property that may interfere with the response action in the IRAP, operation and maintenance activities, monitoring activities, or other measures necessary to assure the effectiveness and integrity of the response action in the IRAP.

5. The Owner shall provide notice to the MDEQ of the Owner's intent to convey any interest in the Property fourteen (14) days prior to consummating the conveyance. A conveyance of title, an easement, or other interest in the Property shall not be consummated by the Owner without adequate and complete provision for compliance with the terms and conditions of this Covenant.

6. The Owner shall grant to the MDEQ, and its designated representatives, the right to enter the Property at reasonable times for the purpose of determining and monitoring compliance with the IRAP, including the right to take samples, inspect the operation of the response action measures in the IRAP, and inspect records.

The state may enforce the restrictions set forth in this Restrictive Covenant by legal action in a court of appropriate jurisdiction.

This Restrictive Covenant shall be perpetual, shall run with the land, and shall be binding upon the future owners, successors, lessees or assigns and their authorized agents, employees, or persons acting under their direction and control, of all or any portion of each of the parcels which comprise the Property. It shall be the obligation of each and every Owner of any portion of the Property to provide a copy of this Restrictive Covenant to all of its heirs, successors, lessees, assigns and transferees. This Restrictive Covenant may be terminated, in whole or in part, if the Owner obtains written approval from MDEQ. In the event of a complete or partial termination, a document evidencing same shall be recorded with the Dickinson County Register of Deeds.

The Owner may amend this Restrictive Covenant by sending written notice to the MDEQ of such proposed amended Restrictive Covenant. If the MDEQ does not object to the amendment within thirty (30) days after receipt of such notice, then the amended Restrictive Covenant may be recorded and shall take effect immediately upon recording.

If any provision of this Restrictive Covenant is held to be invalid by any court of competent jurisdiction, the invalidity of such provision shall not affect the validity of any other provisions hereof. All such other provisions shall continue unimpaired in full force and effect.

The undersigned person executing this Restrictive Covenant has the express written permission of the Owner and represents and certifies that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

IN WITNESS WHEREOF, the said Owner of the above-described Property has caused this Restrictive Covenant to be executed on this ___ day of ________________, 2003.

Signed in the presence of:	The City of Kingsford, a Michigan municipal corporation
______________________________ Name:__________________________	By:______________________________ Name:____________________________
______________________________ Name:__________________________	Its:______________________________

ACKNOWLEDGMENT

STATE OF ______________)
) SS.

COUNTY OF _______________)

The foregoing instrument was acknowledged before me this ____ day of ___________, 2003, by __________________________, the ____________________ of the City of Kingsford, Michigan, on its behalf.

____
Notary Public, ____________________________
County of ________________________________
State of _________________________________
My commission expires: ___________________

Prepared by and when recorded return to:
Suzanne T. Croissant
Dickinson Wright PLLC
38525 Woodward Avenue, Suite 2000
Bloomfield Hills, Michigan 48304

EXHIBIT A

LEGAL DESCRIPTION OF THE PROPERTY

EXHIBIT B

OPERATION AND MAINTANENCE PLAN FOR THE PROPERTY

EXHIBIT C

CONSTRUCTION HEALTH AND SAFETY PLAN FOR THE PROPERTY

EXHIBIT D

WASTE MANAGEMENT PLAN FOR THE PROPERTY

FIGURE 1

MAP OF THE PROPERTY, INCLUDING THE COVER SYSTEM

ARCADIS

Appendix E

Construction Health and Safety
Plan Guideline

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Appendix E
Former Southwest Pit Area
Construction Health and Safety Plan
Guideline

Ford/Kingsford Site,
Kingsford, Michigan

Tables

Figures

1. Introduction

This Construction Health and Safety Plan (CHASP) Guideline has been prepared for future use in conjunction with an Interim Response Action Plan (IRAP) for the Former Southwest Pit Area (SW Pit) at the Ford/Kingsford Site located in Kingsford, Michigan. This document presents requirements that must be incorporated into a contractor-generated CHASP (Contractor CHASP) when conducting construction activities that could potentially disturb the cover system and expose personnel to waste materials. The contractor will generate the Contractor CHASP as part of their work for the identified site conditions, scope of work, and necessary personnel in accordance with the guidelines presented here. The contractors may include additional content consistent with this CHASP Guideline and their own corporate health and safety guidelines or procedures. The responsibility for the development, implementation, and enforcement of the Contractor HASP lies solely with the contractor, not Ford Motor Company (Ford) or The Kingsford Products Company.

The elements of this CHASP are based upon the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (October 1985 and March 1989) and the Michigan Occupational Safety and Health Act (MiOSHA) and its Rules. These guidelines have been supplemented by information obtained during site visits. All reasonable precautions will be taken by the selected contractor and its subcontractors to protect the safety and health of workers and the general public. All work will be performed in accordance with applicable federal, state, and local regulations.

The objective of this CHASP is to structure and maintain safe working conditions at the site and to develop a plan of action in the case of a site emergency during field activities. The safety organization and procedures have been established based on an analysis of potential hazards, and personal protection measures have been selected in response to these potential hazards.

Elements of this plan address the following topics:

- Project Organization.
- Site History and Project Description.
- Training.

- Potential Hazards of Site Contaminants.
- Activity Hazard Analysis.
- Safety Considerations for Site Operations.
- Protective Equipment.
- Monitoring Requirements.
- Site Control Zones and Communication.
- Medical Surveillance.
- Decontamination and Waste Disposal.
- Emergency Response Plan.

2. Contractor Organization and Responsibilities

The contractor will be responsible for its employees and subcontractors and their adherence to the Contractor CHASP during construction activities that have the potential to disturb the cover system and expose personnel to waste material. The Contractor CHASP will adhere to the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (October 1985 and March 1989) prepared by the National Institute for Occupational Safety and Health, Occupational Safety and Health Administration (OSHA), US Coast Guard, and U.S. Environmental Protection Agency (U.S. EPA) regulations. The Contractor CHASP will also adhere to MiOSHA and its Rules. Trained staff will supervise the work in accordance with the health and safety requirements described herein, the current edition of the Michigan regulations for hazardous waste operations, and all applicable federal, state, and local health and safety regulations.

2.1 Organizational Structure

Proper planning and careful Contractor CHASP implementation is essential to carrying out the proposed construction activities at the site. An organizational structure detailing personnel requirements and responsibilities is presented in this section. The organizational structure defines the chain of command and identifies the person responsible for directing activities related to the project. Necessary personnel for project implementation will be identified as well as their general functions and responsibilities. This structure also identifies lines of authority, responsibility, and communication among the project team and indicates the person(s) responsible for communicating with the emergency response community. A typical organization and reporting chart is shown on Figure E2-1.

An overall project manager (PM) and a project superintendent (PS) and site safety officer (SSO) will be called out by the contractor in the plan, and an alternate project manager and project superintendent will be identified. Their responsibilities include:

- Having the authority to direct all activities.
- Ensuring the implementation of the Contractor CHASP and effective loss control principles.
- Ensuring that safe work rules and practices are enforced.

- Performing on-site inspections to make certain the Contractor CHASP is being followed.

- Implementing corrective actions following audits, inspections, incident investigations, etc.

- Ensuring that resources are available for all health and safety requirements.

- Assigning trained and qualified personnel to project tasks.

- Providing the appropriate monitoring and safety equipment necessary for implementing the Contractor CHASP.

The PM and PS have the ability to authorize the following safety-related suspensions:

- Temporary suspension of field activities if the health and safety of personnel are endangered.

- Temporary suspension of an individual from field activities for infraction of the Contractor CHASP.

The PM and PS will have ready access to occupational health and safety professionals, including an industrial hygienist.

2.2 Record Keeping Requirements

The PS shall ensure that all health and safety record keeping requirements mandated by Rule 408.22101 et seq., Rule 324.52101 et seq. under MiOSHA, and any other applicable standards are met. An administrative area will be designated for maintenance of such records including MiOSHA certifications, exposure monitoring records, training certificates, and health and safety field logbooks. Additional records to be kept, when applicable, may include the following:

- Daily Health and Safety Meeting Form (Figure E2-2).

- Field Team Review Sheet (Figure E2-3).

- Visitor Review of Site Health and Safety Plan (Figure E2-4).
- Qualification and testing for respirator use and fit test.
- Emergency Medical Data Sheets (Figure E2-5).
- Calibration logs as described in Section 7.3.
- Monitoring logs for volatile organic compounds (VOCs), oxygen levels, particulates, and any other monitored parameter.
- Perimeter monitoring charts, data, and calculation sheets.
- Personal protective equipment (PPE) log for levels of protection greater than Level D with date, type of PPE, time and duration of PPE use.
- Exposure and incident reports.
- Emergency Report Form (Figure E2-6).
- Work stoppage and work re-start reports.
- Copies of the Contractor CHASP with appropriate signatures, CHASP Approvals (Figure E2-7).

2.3 Training

It will be the responsibility of the PM, PS and SSO to ensure that properly trained personnel are assigned to each work task. Members of the project team performing tasks that could potentially result in exposure to waste materials will have satisfied the training requirements of Rule 325.52101 et seq. (MiOSHA regulation of hazardous waste site activities). MiOSHA certificates for these members should be current and available. These employees will also be subject to appropriate medical surveillance in accordance with Rule 325.52101 et seq. Site-specific training will be provided as necessary for those workers, including subcontractors, and will include a discussion of the following topics:

- Names of all health and safety related personnel and alternates.

- Health and safety organization.
- Locations where Contractor CHASP will be stored.
- Nature of anticipated hazards.
- Recognition and guidance of hazards at the site.
- Safe use of engineering controls and equipment on the site.
- Hazard communication.
- Exposure risk.
- Safe work practices.
- PPE to be used.
- Personnel and equipment decontamination procedure.
- Air monitoring.
- Emergency procedures and on-site First Aid Station and Procedures.
- Rules and regulations for vehicle use.
- Safe use of field equipment.
- Handling, storage, and transportation of hazardous materials.
- Employee rights and responsibilities.

Additionally, field personnel will be responsible for knowing and understanding the information contained in the Contractor CHASP. The Field Team Review Sheet (Figure E2-3) will be signed by site workers after familiarization with the Contractor CHASP prior to site access. Anyone refusing to sign the form will be prohibited from working at the site.

When a new employee has been assigned to the site, the PS and SSO must present a briefing before the new employee participates in any field activities. All new employees must sign the Field Team Review Sheet after receiving training and before beginning fieldwork.

2.4 Health and Safety Meeting

Prior to initiating site work, site personnel will be required to attend an orientation session given by the PS and SSO as outlined in Figure E2-2. This session will take place at the site prior to the start of work and may include, but is not limited to, the following topics:

- Site history.
- Scope of fieldwork.
- Specific hazards (toxicological data, heat stress/exposure, other physical hazards).
- Hazard recognition.
- Standard operation procedures and injury prevention, including no smoking and no hand-to-mouth contact within the exclusion zones or prior to completing decontamination.
- Decontamination (personnel and equipment).
- Emergency procedures.
- Potential respirator use.

Field personnel must attend this meeting, the minutes of which shall be documented in the site logbook and maintained as indicated in Section 2. In addition, a safety meeting will be conducted before each workday.

2.5 Health Monitoring and Surveillance

A health monitoring and surveillance program will be established to verify that the worker is physically fit to perform the necessary tasks. The monitoring program will be performed in accordance with MiOSHA requirements. An initial screening of the worker will be performed in accordance with OSHA 29 CFR 1910 guidelines prior to site placement to document current level of health and ability to wear protective gear. The initial health screening should focus on examination of the kidneys, heart, and lungs, and should include the following physical examinations:

1. Height, weight, temperature, pulse respiration, and blood pressure.
2. Head, nose, and throat.
3. Eyes. Including vision tests that measure refraction, depth perception, and color vision.
4. Ears. Requirements for this test are listed in 29 CFR 1910.95.
5. Chest (heart and lungs), including pulmonary function and electrocardiogram testing.
6. Peripheral vascular system.
7. Abdomen and rectum (including hernia exam).
8. Spine and other components of the musculoskeletal system.
9. Genitourinary system.
10. Skin.
11. Nervous system.

The following tests should also be performed during the pre-employment examination:

- Blood (including complete blood count with differential, comprehensive metabolic panel, cadmium, mercury, and serum polychlorinated biphenyls [PCBs]).
- Urine.
- Chest X-rays.

Periodic medical exams should also be part of the Contractor's Corporate Medical Monitoring Program in accordance with 29 CFR 1910. Annual exams are acceptable; however, more frequent examinations may be necessary depending on the types of chemicals the worker has been exposed to, the duration of the assignment, and the potential or actual exposure levels.

In addition, testing is necessary to confirm that the worker is capable of completing the work tasks while wearing protective equipment. Medical records for each team must be maintained on-site as stated in Section 2.2 to include the following information:

- Qualification statement for hazardous waste work.
- Qualification for respirator use.
- Respirator fit test results.
- Emergency Medical Data Sheet (Figure E2-5).

The contractor will provide in the Contractor CHASP the components of their active medical monitoring program, including a detailed plan of health signs and symptoms to be monitored throughout the workday. A record of these monitoring reports should be maintained on site along with each worker's health history record.

3. Background

3.1 Site Description

The City of Kingsford is located in southwestern Dickinson County, in the western part of Michigan's Upper Peninsula. The City is bounded by the Menominee River on the west and south, by the City of Iron Mountain on the north, and Highway M-95 (Carpenter Avenue) to the east. The SW Pit (center point) is located approximately 1,100 feet north of Breitung Avenue and approximately 1,500 feet west of Balsam Street in the central portion of the city as shown on Figure E3-1. A plan view of the SW Pit Area is shown on Figure E3-2.

3.2 Site History

Aerial photographs and historic records indicate that disposal at the SW Pit occurred since the 1920s. Wood pieces, wood sawdust, wood bark chips, and charcoal were reportedly disposed of in the SW Pit, along with industrial waste and wastewater containing dissolved organics from pyrolysis processes. Aerial photographs show continued disturbances to the surface of the area and disposal from unidentified sources to at least 1981.

3.3 Interim Response Action Summary

The primary focus of the SW Pit IRAP is to prevent direct contact with waste materials, except under controlled conditions, and allow future use of the present area overlying the SW Pit. The SW Pit IRAP includes the use of a permeable cover system, operation of a soil vapor extraction system, and creation of a restrictive covenant/institutional controls. Additional details are provided in the SW Pit IRAP.

4. Chemical Constituent Descriptions

Laboratory analytical data compiled for soil samples within the SW Pit indicate that low levels of VOCs, semi-volatile organic compounds (SVOCs), alcohols, aldehydes, metals, and pesticides/PCBs have been detected in samples at concentrations above background levels. Any chemical constituent detected in the soil or waste material at the SW Pit is listed below. Exposure limits, explosive limits (if applicable), and potential exposure routes for these chemical constituents of potential concern are listed in Table E4-1. Monitoring and Contractor designation of action levels will be discussed in Section 7.

VOCs:

- Acetone.
- Benzene.
- 2-Butanone.
- Carbon disulfide.
- Chloromethane.
- Ethylbenzene.
- 2-Hexanone.
- Methylene chloride.
- 4-Methyl-2-pentanone.
- Naphthalene.
- N-Propylbenzene.
- Toluene.
- Trichloroethene.

- 1,2,4-Trimethylbenzene.
- 1,3,5-Trimethylbenzene.
- Xylenes (total).

SVOCs:

- Acenaphthene.
- Anthracene.
- Benzo(a)anthracene.
- Benzo(a)pyrene.
- Benzo(b)fluoranthene.
- Benzo(g,h,i)perylene.
- Benzo(k)fluoranthene.
- BHC (alpha).
- BHC (gamma).
- Bis(2-ethylhexyl)phthalate.
- Butylbenzenephthalate.
- Carbazole.
- 4-Chloroaniline.
- Chrysene.
- Dibenzofuran.

- Diethylphthalate.
- Di-n-butylphthalate.
- 2,4-Dimethylphenol.
- Di-n-octylphthalate.
- Fluoranthene.
- Fluorene.
- Ideno(1,2,3-cd)pyrene.
- Methoxychlor.
- 2-Methylnaphthalene.
- 2-Methylphenol.
- 3-Methylphenol.
- 4-Methylphenol.
- Naphthalene.
- N-Nitrodimethylamine.
- N-Nitrosodiphenylamine.
- 2-Picoline.
- Phenanthrene.
- Phenol.
- Pyrene.

Alcohols:

- 1-Propanol.
- Ethanol.
- Ethylacetate.
- Methanol.
- N-Butanol.

Aldehydes:

- Acetaldehyde.
- Formaldehyde.
- Inorganic Nitrogen, Nitrate.

Metals:

- Aluminum.
- Antimony.
- Arsenic.
- Barium.
- Beryllium.
- Cadmium.
- Calcium.
- Chromium.

- Cobalt.
- Copper.
- Cyanide.
- Iron.
- Lead.
- Magnesium.
- Manganese.
- Mercury.
- Molybdenum.
- Nickel.
- Potassium.
- Selenium.
- Silver.
- Sodium.
- Thallium.
- Titanium.
- Vanadium.
- Zinc.

Pesticides/PCBs:

- 4,4'-DDE.
- Aldrin.
- Aroclor 1254.
- Chlordane (gamma).
- Dieldrin.
- Endrin.
- Endrin aldehyde.
- Endrin ketone.
- Heptachlor.
- Heptachlor epoxide.

In addition, the presence of potentially explosive concentrations of methane gas exist at the SW Pit. Since methane gas is lighter than air, it will rise into the vadose zone in the absence of silt or clay layers, or become trapped below these layers if they are present. Historical investigations have shown the presence of methane gas in the waste material and the native soil surrounding the SW Pit. Provisions must be included in the Contractor CHASP for occurrence of methane gas in the vadose zone.

5. Potential Exposure Pathways and Hazard Evaluation

Hazards that exist at the SW Pit can be classified as either chemical or physical. Chemical hazards are site-specific and consist of the contaminants of concern and the potential routes of exposure. Physical hazards can vary depending on the type of construction activity. A discussion of the exposure pathways and hazards follow in the subsequent sections.

5.1 Chemical Hazards

Chemical hazardous consist of the various contaminants identified at the SW Pit. Workers can be exposed to these contaminants through various exposure pathways. These exposure pathways and other chemical hazards that may affect the health and safety of the on-site personnel are listed below.

The following potential exposure and chemical hazard pathways may be encountered during fieldwork at the site:

- Ingestion of affected surface soils or material.
- Dermal contact with affected particles, vapors, or gases.
- Inhalation of vapors or gases.
- Inhalation of dust/particulates.
- Dermal contact with contaminated storm water during construction.

These exposure pathways will be minimized by following the protocol for the designated working level of protection as described in Section 6.0 (Personnel Protection Program). Toxicological data for the major constituents detected at the site are listed in Table E4-1.

5.2 Physical Hazards

Field personnel may be exposed to physical hazards during this project. Physical hazards that may be encountered include:

- Explosive Hazards.
- Noise.
- Heat/cold stress.
- Lacerations and contusions.
- Insects and wildlife.
- Lifting hazards.
- Packaging and shipping.

General considerations are discussed below; specific comments are presented in Section 5.3.

5.2.1 Flammability and Explosivity of Vapors

Methane vapors are known to be present, at the SW Pit. Air monitoring for methane gas will be conducted during the field activities at the site, as well as measuring the lower explosive limit and oxygen concentrations within the breathing zone.

5.2.2 Construction Explosive Hazards

Other explosive hazards associated with construction activities include storage of vehicle fuel and calibration gases for measuring devices.

5.2.3 Noise Exposure

Construction crews may be exposed to loud noise levels from construction equipment. Hearing protection may be necessary.

5.2.4 Heat/Cold Stress

Workers may be required to wear protective clothing that insulates the body. A hazard may exist if workers wear protective clothing in temperatures exceeding 90°F. In addition to heat stress, exposure to temperatures at or below freezing may result in frostbite and/or hypothermia. A monitoring program will be in place during use of protective gear.

5.2.5 Lacerations and Contusions

Earthwork and excavation activities usually involve contact with moving machinery and physical objects. If the field team is cut or bruised during this project, the PS will be prepared to deal with cuts and bruises and a first aid kit will be present during all site operations.

5.2.6 Insect and Wildlife Hazards

If construction activities require workers to enter areas of overgrown vegetation, potential exposure to insect bites and ticks exist. Workers will pay special attention to the presence of wildlife and inspect themselves at the end of each field day. The first aid kit will contain medications for insect bites.

5.2.7 Lifting Hazards

Construction activities may involve heavy lifting. Field team members should be trained in the proper methods to lift heavy objects, and cautioned against lifting objects that are too heavy for one person to handle safely.

5.2.8 Packaging and Shipping Hazards

After the samples have been collected in sampling jars, the samples will be properly packaged in such a manner as to protect shipping personnel from potential exposure to constituents. There is no particular hazard in performing the packaging operation, yet if this operation is not done properly, unsuspecting individuals may be exposed if the containers leak or break. Preservation of water samples may involve the use of acids or bases to adjust sample pH. Precautions will be taken to avoid contact with these reagents.

5.3 Field Activities/Physical Hazards

Listed below are potential construction activities that may be performed following implementation of the SW Pit IRAP.

5.3.1 Hazard Analysis: Excavation

Excavation activities conducted at the site may expose field personnel to the physical hazards listed below.

Physical Hazards:

- Being hit by equipment.
- Being struck by falling objects.
- Exposure to loud noise.
- Exposure to extreme outside temperatures.
- Confined space

A permeable soil cover system exists over waste areas at the SW Pit. Should excavation to depths greater than 2 feet below land surface be necessary within the cover area, these construction activities may expose field personnel to the chemical hazards listed below:

Chemical Hazards:

- Exposure to explosive vapors.
- Inhalation of vapors.
- Inhalation of dust particles.
- Dermal contact with chemical constituents in affected soil or waste material present below the protective cover.

In addition, should excavations greater than 30 inches below land surface (in bls) be required, field personnel could be exposed to confined space conditions. Any excavation greater than 30 in bls will follow the procedures identified by the OSHA Construction Code 29CFR1926 for excavation sloping/shoring/benching.

5.3.2 Hazard Analysis: Restoring the Protective Cover

Following disturbance of the cover system, construction activities will need to be conducted to repair/restore the protective cover. These activities may expose field personnel to the chemical and physical hazards listed below:

Chemical Hazards:

- Exposure to explosive vapors.
- Inhalation of vapors.
- Inhalation of dust particles.
- Dermal contact with chemical constituents in affected soil or waste material.

Physical Hazards:

- Being hit by equipment.
- Being struck by falling objects.
- Exposure to loud noise.
- Exposure to extreme outside temperatures.

5.3.3 Hazard Analysis: Collecting Soil Samples for Laboratory Analysis

Following the implementation of the IRAP, a 30-inch thick permeable soil cover will exist over the waste areas at the SW Pit. Should it be necessary to collect soil samples at depths greater than 30 in bls in the cover area, these activities may expose field personnel to the chemical and physical hazards listed below:

Chemical Hazards:

- Inhalation of particulates.
- Dermal contact with chemical constituents in affected soil or waste material.

After the samples have been collected in sampling jars, the samples will be properly packaged to protect shipping personnel from potential exposure to constituents. There is no particular hazard in performing the packaging operation, yet if this operation is not done properly, unsuspecting individuals may be exposed if the containers leak or break. Preservation of water samples may involve the use of acids or bases to adjust sample pH. Precautions will be taken to avoid contact with these reagents.

5.3.4 Hazard Analysis: Geotechnical Sampling as Required During Construction

A permeable soil cover system exists over waste material at the SW Pit. Should geotechnical borings/samples be required at depths greater than 30 in bls in the cover system, these construction activities may expose field personnel to the chemical and physical hazards listed below:

Chemical Hazards:

- Inhalation of particulates.
- Dermal contact with chemical constituents in affected soil or waste material.

Physical Hazards:

- Falling objects.
- Exposure to loud noise.
- Exposure to extreme outside temperatures.

6. Personnel Protection Program

A Personnel Protection Program will be established in the Contractor CHASP to be maintained for personnel working at the site and conducting construction activities that could potentially disturb the cover system and expose personnel to waste materials present below the cover. The Personnel Protection Program will provide necessary health and safety training to the contractor personnel assigned to perform or oversee work, health and safety, security, administrative duties, or any other related functions at the site. Site safety meetings will be held before work begins each day or as specified by the PS. Separate protocol will be followed for site visitors as described in a later section.

Personnel shall wear PPE during any of the following conditions: (1) field activities involving the potential for exposure to contaminants, (2) site activities that may generate vapors, gases, particulates, mists, or aerosols, or (3) direct contaminant contact with skin. The type of required PPE is categorized by a level of protection as described below. Any respiratory protection plan implemented during on-site activities will be done in accordance with 29 CFR Part 1910.134.

The levels of protection and the equipment utilized are defined as follows:

6.1 Level D Protection

The following PPE shall be considered typical Level D protection:

- Coveralls.
- Leather or chemical-resistant boots with a steel toe and shank.
- Work gloves.
- Safety glasses, chemical splash goggles, or face shield (as determined by the PS).
- Hard hat.
- Hearing protection (as determined by the PS).
- Outer latex disposable boots (optional).

6.2 Level D Modified Protection

Level D Modified protection shall be used when an increased need for dermal protection is recognized but respiratory protection is not indicated. The following equipment shall be used for Level D Modified protection:

- Chemical-resistant clothing (Tyvek coveralls for particulate hazard or Saranex coveralls or rubber outer gear for liquid hazard).
- Disposable nitrile or butyl outer gloves (glove selection will be based on the site-specific contaminant hazard).
- Nitrile or latex inner gloves (glove selection will be based on the site-specific contaminant hazard).
- Polyvinyl chloride (PVC) boots (chemical-resistant) with a steel toe and shank.
- Hard hat.
- Hearing protection (as determined by the PS).
- Latex outer booties (optional).
- Safety glasses, chemical splash goggles or face shield (as determined by the PS).

6.3 Level C Protection

The following PPE shall be considered Level C protection:

- Full-face piece air-purifying respirator (APR) with organic vapor/high-efficiency particulate filter cartridges (as site conditions warrant, a different APR cartridge may be specified in site specific addenda).
- Chemical-resistant clothing (Tyvek coveralls for particulate hazard or Saranex coveralls or rubber outer gear for liquid hazard).
- Disposable nitrile or butyl outer gloves (glove selection will be based on the site-specific contaminant hazard).

- Nitrile or latex inner gloves (glove selection will be based on the site-specific contaminant hazard).
- PVC boots (chemical-resistant) with a steel toe and shank.
- Hard hat.
- Hearing protection (as required).
- Latex outer booties (optional).
- Two-way radio communications.

The use of a full-face piece APR is approved only if the following applies:

- Substances are identified and their concentrations measured.
- Substances have adequate warning properties.
- Individual passes a qualitative fit test for the assigned respirator.
- An appropriate cartridge is selected based on the hazard.

It is particularly important that the air monitoring is effectively implemented when personnel are wearing Level C protection. No changes to the specified level of protection shall be made without the approval of the PS.

Verbal communication on site may be impeded by background noise caused by heavy equipment or the use of PPE. Accordingly, hand held radios shall be made available. If radios are not available, all individuals shall remain within sight of the project leader and hand signals shall be used between personnel within the work zone. Communications requirements shall be reviewed during the site safety meetings.

The following hand signals shall be used in the event of an emergency where audible communication is not possible:

Hand Signal	Meaning
Hand gripping throat	Out of air, cannot breath
Gripping partner's wrist or both hands on waist	Leave area now, no debate
Hands on top of head	Need assistance
Thumbs Up	OK, I'm all right, I understand
Thumbs Down	No, Negative

6.4 Decontamination Procedures

It is the responsibility of the PS to make certain that all personnel and pieces of equipment leaving the site are properly decontaminated according to the procedures outlined in this section. All personnel exiting controlled work zones must follow decontamination procedures. Only during an emergency evacuation will personnel be allowed to leave the site before decontamination.

6.4.1 Level D Decontamination Procedures

The general decontamination procedures for workers in Level D Protection are illustrated on Figure E6-1. Gloves and outer boot covers will be washed and rinsed, if required. Steel-toed boots will also be scrubbed with decontamination solution, if required. Outer garments and Tyvek will be removed and deposited in plastic bags once they exit the hotline and prior to exiting the contamination control line. Hands and face will be washed as soon as possible.

6.4.2 Level C Decontamination Procedures

A sample decontamination procedure for workers wearing Level C Protection is illustrated on Figure E6-2. Equipment used in the exclusion zone (tools, sampling devices and containers, monitoring instruments, radios, clip boards, etc.) will be deposited on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. Various size containers, plastic liners, and plastic drop cloths will be required for this task. Outer boots and gloves will be cleaned with the proper decontamination solution (hexane or methanol) and detergent/water. The outer gloves and boots will be rinsed and the rinse water should be contained in plastic bucket. Boots, gloves, and outer garments are removed followed by removal of respirator. Once the respirator is cleaned for storage or placed in an appropriate container, inner gloves may be removed. Workers will wash hands and face as soon as possible.

If a worker leaves the exclusion zone to change a respirator cartridge, it is not necessary to proceed through the entire contamination reduction zone. Once the worker's cartridge is exchanged, the outer glove and boot covers are donned with joints taped, the worker may return to the exclusion zone.

At a minimum, disposable items (e.g., Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis. Decontamination solutions will be changed daily or as conditions require.

Small equipment shall be protected from contamination by draping, masking, or otherwise covering as much of the instrument as possible with plastic, without hindering the operation of the unit. Contaminated equipment will be taken from the drop area and the protective coverings removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. As necessary, air monitoring equipment will be placed in clear plastic bags that allow reading of the scale and operation of the knobs. The sensors or probes can be partially wrapped, keeping the sensor tip and discharge port clear.

To prevent trans-location of contaminants and inadvertent exposures to personnel, heavy equipment used in contaminated areas shall be decontaminated prior to moving to a new location and before leaving the facility. When decontaminating equipment, the following requirements will be implemented:

- The equipment will be inspected for gross debris. Where possible, contaminated soil deposits will be removed and containerized.

- After removal of gross debris, the equipment will be steam cleaned using a high-pressure washer (e.g., Hotsy Corporation Hot-Washer Pressure Washer).

- After steam cleaning, the equipment will be allowed to dry and will be reinspected. Any remaining visible debris will be re-cleaned through additional pressure washing.

- After all debris is removed according to the above procedure, the equipment will be released from the decontamination pad for use as necessary in other areas of the site. At the close-out of the exclusion zone activities or when a piece of equipment is to be demobilized from the project, the equipment will be given a final decontamination. Equipment wash rinsate will be containerized for proper disposal.

Inspections of equipment for release from the facility will be completed by the PM or PS. Inspections will consist of visual observations, wipe sampling and cleaning solution analysis. Inspection results will be documented in field logbooks.

The stockpile areas will be cleaned using a hot water, high-pressure washer. Decontamination wash water will be collected and sent to either the on-site water treatment system or an off-site permitted treatment / disposal facility.

6.5 Heat Stress Control and Monitoring

The PS will set work and break schedules depending on how heavy the workload is and the outside temperature. Generally, workers conducting activities in protective clothing need to break in the shade at least 10 minutes out of every hour during temperatures elevated above 70 degrees Fahrenheit (°F). Rest time will also include fluid replacement with electrolytes.

During conditions where the temperature, humidity, and solar radiation are high and the air movement is low, the following procedures will be implemented to prevent heat stress injury:

- Provide disposable cups and water. Urge workers to drink water regularly. Monitor for signs of heat stress.

- Make certain that adequate shelter is available to protect personnel against heat. If possible, set up a rest area in the shade.

- Workloads and/or duration of physical exertion will be less during the first days of exposure to heat and should be gradually increased to allow acclimatization.

- Heavy work will be scheduled during the cooler periods of the day (e.g., early morning), as possible.

- Alternate work and rest periods will be scheduled in heat stress conditions; in moderately hot conditions.

At the PS' discretion, monitoring activities for heat stress will be performed when workers are using protective clothing in elevated temperatures. Observation of the field team for signs and symptoms of heat stress which include, but are not limited to the following:

1. Pale, clammy skin progressing to hot, dry and red skin.

2. Profuse perspiration.

3. Cramps.

4. Dizziness.

5. Headaches.

6. Nausea.

7. Fainting.

Heat stress monitoring should be done at the discretion of the PS, when temperatures are greater than 90 °F or workers exhibit any indication of heat stress. A more detailed list of signs and symptoms of heat stress are summarized in Table E6-1.

6.6 Cold Stress Control and Monitoring

Persons working outdoors in temperatures at or below freezing or with increased wind chill may experience two types of cold weather-related injuries: frostbite and hypothermia. Ambient air temperature and the velocity of the wind are the two factors that influence the development of a cold weather-related injury.

Frostbite is a cold weather-related injury. Areas of the body that have high surface-area-to-volume ratios such as fingers, toes and ears, are most susceptible to frostbite. Frostbite of the extremities can be categorized into three types:

- **Frost nip or incipient frostbite:** This is characterized by skin blanching or whitening.

- **Superficial frostbite:** In this case, the skin has a waxy or white appearance and is firm to the touch, but the tissue beneath is resilient.

- **Deep frostbite:** When this occurs, the tissues are cold, pale and solid. Deep frostbite is an extremely serious injury.

Hypothermia is the second type of cold weather-related injury. Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperatures. Its symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness, and sometimes rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and 5) death.

The term "wind chill" is used to describe the chilling effect of moving air in combination with low temperature. For instance, an air temperature of 10°F with a wind of 15 miles per hour (mph) is the equivalent in chilling effect of air at -18°F. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Because of the effects of wind chill, there is a greater danger from cold-related injuries on cold, windy days, than on cold days where there is little or no wind.

Water conducts heat 240 times faster than air. Therefore, the body cools more quickly when damp or wet. Site personnel may become wet from: decontamination water, contact with on-site water (e.g., ponds, streams, etc.), precipitation or perspiration. Care should be taken to minimize the possibility of workers becoming damp or wet and if workers do become damp or wet, efforts should be made to minimize the time that the worker is exposed to the cold. If clothing beneath the PPE becomes damp, the PS will assess site specific weather conditions to determine if it is appropriate for site workers to remove protective clothing outdoors.

In general, the PS shall follow these procedures to reduce cold stress:

- Install heaters in the support zone and/or trailers to provide a warming area for site personnel if necessary.
- Rotate shifts of workers.
- Schedule work and rest periods.
- Monitor workers' physical conditions.

7. Air Monitoring

Air quality monitoring will be conducted for the identification and quantification of potential airborne contaminants generated during subsurface construction activities. Both direct-reading instruments and laboratory analysis of air samples may be used for air monitoring activities. Monitoring of methane gas, oxygen, and explosive levels in the breathing zone will be emphasized. General on-site monitoring will include visual inspection of the site to look for places where vapors may gather such as confined spaces, low-lying areas, and wind barriers such as hills or tall buildings.

7.1 Air Monitoring

Standard monitoring instruments that may be used for monitoring site conditions include combustible gas indicators (CGIs), photoionization detectors (PIDs), flame ionization detectors (FIDs), oxygen meters, colorimetric indicator tubes, and organic vapor analyzers. A MIE Data-RAM, or equivalent unit, can be used to monitor total suspended particulates. The contractor will identify specific monitoring instruments in their CHASP.

Upwind vapor levels and work zone levels should be obtained prior to initiation of activities, and should be repeated at pre-specified time intervals. An initial monitoring frequency of once per hour can be used. Once site conditions are characterized, monitoring frequency may be decreased to a frequency specified in the Contractor CHASP Monitoring Plan. Site monitoring should also be completed when site conditions change, for instance, when work begins on a different portion of the site, a different contaminant is being handled, or a different type of operation is begun.

7.2 Perimeter Monitoring

A plan for perimeter monitoring should be incorporated into the Contractor CHASP to be implemented only if on-site monitoring of activities indicates the presence of hazardous vapors. This will be used to ensure that airborne contaminants are not migrating beyond the site boundaries at concentrations harmful to human health. Initially, perimeter monitoring may be limited to particulates. If action levels for onsite monitoring with regard to particulates, VOCs, or SVOCs are exceeded, an evaluation will be made as to the extent of these impacts. If such impacts are determined to extend to the perimeter of the exclusion zone, perimeter monitoring will be expanded to analysis of VOCs and SVOCs, and engineering controls implemented.

7.3 Organic Vapor Monitoring

Air quality in the breathing zone will be evaluated by collecting readings of organic vapor levels. Air monitoring readings will be collected periodically as specified in the Contractor CHASP and at the discretion of the PS. Observation of wind direction during investigation activities will be emphasized. The contractor will select the most suitable instrument for air monitoring purpose, considering the presence of methane in the atmosphere. An FID requires methane filtration for an actual organic vapor reading, while a PID does not detect methane. To prevent confusion among work groups working at multiple locations, a single set of action levels for organic vapors will be used.

Based on the list of chemicals of concern provided in Table E4-1, the contractor will select the chemicals that require monitoring. A plan will be presented that will include the identification and quantification of the selected constituents prior to the beginning of construction activities. Draeger gas detectors can be used for gas identification and quantification. Following initial detection of gases, the Contractor CHASP will provide levels of organic vapors at which specified actions will be required. The plan will call out specific concentrations at which field personnel will change to a higher level of PPE, or at which engineering controls will be implemented. Typical action levels are provided in Table E7-1.

The PS must be responsible for monitoring, calibrating, and maintaining the instruments. Calibrations and maintenance for all instruments should be completed in accordance to the manufacturer's recommendations. Calibrations should be recorded and the following information should be recorded in the calibration logbook to be maintained according to Section 2:

- Instrument and instrument serial number.
- Calibrant gas and lot number.
- Initial reading.

- Final Reading.
- Any adjustments or maintenance.
- Name of the person performing the adjustments or maintenance.
- Date and time.

7.4 Combustible Gas/Oxygen Monitoring

The PS shall ensure that combustible gas indicator/oxygen levels (CGI/O_2) are measured prior to entry into open excavations, sumps, confined spaces, or other sites/conditions where a flammable, combustible, or oxygen-deficient atmosphere may be present. To ensure accurate measurements, the O_2 concentration should be measured before the lower explosive limit (LEL) concentration. The Contractor will present a schedule for CGI/O_2 monitoring based on known methane issues and the contaminants of concern list in Table E4-1.

Action levels for LEL and O_2 will be identified in the Contractor CHASP. When used, CGI/O_2 meters must be maintained and calibrated before use in accordance with manufacturers' instructions.

8. Site Control

The purpose of site control is to minimize potential worker exposure to contamination, protect the public from the site's hazards, and prevent vandalism when performing construction activities. Site control is essential in emergency situations. A plan for site control will include established work zones, site preparation, use of the buddy system, established and enforced decontamination procedures for personnel and equipment, site security measures, communication networks, and safe work practices.

8.1 Site Preparation

Prior to construction activities, the site will be prepared to account for onsite hazards, site access and security, and the development of work zones. Site preparation can also be dangerous and the following steps should be taken, when applicable:

- Construct roadways to provide ease of access and a sound roadbed for heavy equipment and vehicles.
- Arrange traffic flow patterns to ensure safe and efficient operations.
- Eliminate physical hazards from the work area as much as possible, including:
  - Ignition sources in flammable hazard area.
  - Exposed underground electrical wiring and low overhead wiring that may entangle equipment.
  - Sharp or protruding edges, such as glass, nails, and torn metal, which can puncture protective clothing and equipment and inflict puncture wounds.
  - Debris, holes, loose steps or flooring, protruding objects, slippery surfaces, or unsecured railings, which can cause falls, slips, and trips.
  - Unsecured objects, such as bricks and gas cylinders, near the edges of elevated surfaces such as rooftops and scaffolding, which may dislodge and fall on workers.
- Construct operation pads for mobile facilities and temporary structures.

- Construct loading docks, processing and staging areas, and decontamination pads.
- Provide adequate illumination for work activities. Equip temporary lights with guards to prevent accidental contact.
- Install all wiring and electrical equipment in accordance with the applicable code.

8.2 Work Zones

Prevention of exposure to and spread of contaminants by activities at the site will be achieved through the establishment of work zones. Three work zones will be used including: 1) Exclusion Zone (EZ); 2) Contaminant Reduction Zone (CRZ); and 3) Support Zone (SZ). Flagging will be used to delineate each of these three zones.

8.2.1 EZ

The EZ is the area where all earthwork and clearing activities are conducted and where chemical constituents and physical hazards are potentially present. Only properly trained individuals who are wearing appropriate PPE will be allowed to enter and work in this zone. Level D PPE will be required for workers in this zone. The size of the EZ incorporates the entire area where the cover system will potentially be disturbed and adequate space for movement of heavy equipment. Personnel in the EZ should remain within sight of the PS or have radio communication with the PS.

8.2.2 CRZ

The CRZ is a transitional corridor between the EZ and the SZ. This corridor may contain wash buckets, solid waste disposal containers, brushes, and equipment drop tarps. All decontamination activities will occur in the CRZ. The CRZ has a decreasing level of contamination, moving outward. The outer boundary of the CRZ is called the contamination control line, which separates the possibly low contamination area from the clean support zone. The CRZ is also the area where equipment resupply takes place, samples are prepared prior to transport to laboratory, where rest area(s) are designated for workers (including portable toilet facilities, bench/chair, liquids and shade), and storage of emergency response equipment.

8.2.3 SZ

The SZ is the area where the field team will be when not performing site work. This area is to be used for meal breaks, eating, clean equipment storage, and staging. This zone will be located in an unaffected area and as far upwind from the EZ as practical. The SZ is also the location for administrative personnel and office equipment. A portable first aid and eye wash station and toilets will be located here.

8.3 General Work Rules

Fieldwork will be conducted only during daylight hours unless adequate artificial lighting is provided. The "buddy" system will be observed at all times when site personnel are required to wear respiratory protection.

Entry into and from the EZ will be permitted only through designated access points, except during an emergency or as authorized by the PS. Personnel entering the exclusion zone must be wearing the required minimum PPE as specified in Section 6.0.

Hands and face must be thoroughly washed as soon as possible after leaving the work area and before eating or drinking. No excessive facial hair, which interferes with a satisfactory fit of the mask-to-face seal, is allowed on personnel required to wear respiratory protection. The PS will determine if facial hair presents such interference.

Personnel assigned for on-site activities must be adequately trained and briefed on anticipated hazards, instruction on handling hazardous materials, if applicable, instruction on harmful plants, animals or insects, if applicable, equipment to be worn, safety practices to be followed, emergency procedures, and communications. Daily safety meetings will be held with field personnel prior to the start of work.

Field activities will comply with OSHA 28 CFR 1926/1910 Safety and Health Standards for the Constructive Industry. Regular inspections of the site, materials and equipment will be made by the SSO to certify compliance with Subpart C (29 CFR 1926.20) General Safety and Health Provisions. The Contractor CHASP shall be available on the site for inspection.

8.3.1 Overhead Utilities

Any overhead wire shall be considered an energized line unless the person owning that line or the electrical utility authorities verify and provide documentation that it is not an energized line and that it has been visibly grounded.

A person shall be designated to observe excavation or other equipment and to give timely warning of all operations where it is difficult for the operator to maintain the desired clearance by visual means. Parameters for minimum clearance from energized overhead lines are presented in the following table. The only acceptable method of proving inactive or de-energized state is through an effectively implemented and documented control of a hazardous energy program. Electricity in all structures shall be considered to be on until proven inactive.

Minimum Clearance From Energized Overhead Electric Lines

Nominal System Voltage (Kilovolts)	Minimum Required Clearance (feet)
0 – 50	10
51 – 100	12
101 – 200	15
201 – 300	20
301 – 500	25
501 – 750	35
751 – 1,000	45

8.3.2 Inclement Weather

Natural phenomena, e.g., heat or cold, rain, snow, ice, and lightning, can affect work activities and increase risk. Additionally, extremes in temperature and moisture could affect the function of monitoring instrumentation and PPE. It is the responsibility of the SSO to recognize weather conditions and adjust site activities accordingly.

8.3.3 Manual Lifting

Personnel performing manual lifting shall abide by the following guidelines:

- **DO** design manual lifting and lowering out of the task and workplace. If manual lifting must be accomplished, perform it between knuckle and shoulder height.
- **DO** be in good physical shape. If you are not used to lifting and vigorous exercise, do not attempt to do difficult lifting or lowering tasks.
- **DO** think before acting. Place material conveniently within reach. Have handling aids available. Make sure sufficient space is cleared.
- **DO** get the load close to your body. Test the weight before trying to move it. If it is too bulky or heavy, get a mechanical lifting aid or somebody else to help, or both. Place your feet close to the load. Stand in a stable position with the feet pointing in the direction of movement. Lift mostly by straightening the legs.
- **DO NOT** twist the back or bend sideways.
- **DO NOT** lift or lower awkwardly.
- **DO NOT** hesitate to get mechanical help or help from another person.
- **DO NOT** continue lifting when the load is not of a manageable weight.

8.3.4 Portable Ladders

All portable ladders shall be used for their designated purposes only, and shall be constructed, maintained, and used in accordance with American National Standards Institute standards A-14.1 and A-14.2, OSHA 29 CFR 1926 Subpart X, and manufacturers' instructions. Before use, each ladder shall be inspected to verify that all parts are in good condition and all components function properly. Defective ladders shall be tagged "do not use" by the SSO.

In general, personnel shall follow these guidelines when using portable ladders:

- Set ladders on flat, firm surfaces.

- Contact both handrails of a straight ladder with the upper support.
- To prevent slippage of a straight ladder, use another person to hold the ladder in place or tie the ladder securely to the upper support.
- Retain a ratio of 4 to 1 regarding the height of extension related to the distance of the bottom of the ladder to the well or vertical plane (1 foot out for every 4 feet up).
- Extend the handrails of a straight ladder at least 36 inches above the upper support.
- Do not use metal ladders around electrical conductors.
- Do not allow a second person to use the same ladder that you are using.
- Do not stand on the top two rungs of ladder or within 3 feet of the top of the ladder.
- Position the ladder so that no more than half of your body extends beyond either handrail during the work activity.

Review ladder raising and usage techniques as applicable under the guidance of the PS.

8.3.5 Heavy Equipment Safety

Heavy equipment can present a variety of hazards. In general, the SSO shall observe the following procedures:

- Require subcontractors to provide equipment that meets the requirements of all relevant OSHA standards.
- Inspect equipment before use. At a minimum, guarding, hydraulics, hoisting, rigging, and overall condition should be reviewed. Correct deficiencies before equipment is used.
- Verify operator qualifications before beginning work.

- Conduct noise monitoring to ensure that personnel are adequately protected.
- Equip all equipment with operational backup alarms and a fire extinguisher.
- Review copies of all pertinent inspections before the start of work.
- Investigate any safety and health concerns arising during the course of work.

8.3.6 Driver Safety

During the performance of this work, all personnel using project vehicles shall possess a valid driver's license, passes any necessary permit, and obey all posted speed limits, traffic signs, and traffic signals.

8.3.7 Power and Hand Tools

Personnel shall use power and hand tools in accordance with the following procedures:

- Use tools only after being trained.
- Maintain tools in good condition and inspect them prior to use.
- Use electrical tools that are double-insulated or have a ground plug.
- Use tools for their intended purpose only.
- Remove unsafe tools from service.

8.3.8 Hand Protection

In addition to required PPE, field personnel shall wear protective gloves as needed when handling materials or performing other work that could result in hand injury.

8.3.9 Lockout/Tagout

In accordance with 29 CFR 1910.147, the site personnel shall use lockout/tagout procedures as necessary to control employee exposure to hazardous energy sources, particularly underground and aboveground utilities and services. Subcontractors shall present their lockout/tagout procedures to the SSO.

8.3.10 Traffic Control

The PS shall coordinate all activities impacting base traffic. Unauthorized vehicles shall be controlled through the use of barricades, cones, or other warning devices.

8.3.11 Material Storage

A strategy for storage of flammable and combustible liquids, compressed gasses, and corrosives shall be presented in the Contractor CHASP.

8.3.12 Fire Prevention

To prevent the occurrence of fires on the project, the following will be completed in accordance with 29 CFR 1926.151:

- Electrical installations shall meet the requirements of Rule 408.41701 et seq. of the Michigan Occupational Safety and Health Act 29 CFR 1926, Subpart K.
- Potential sources of fire ignition shall be located away from fuel sources.
- Flammable and combustible liquids and compressed gasses shall be stored in accordance with the Construction Waste Management Plan (WMP).
- Fire extinguishers will be provided for the job-site in accordance with applicable portions of Rule 408.41851 and Rule 408.41852.

8.3.13 Inspections

Contractor will be prepared for health and safety inspections by Michigan Department of Consumer and Industry Services, Construction Safety Division or any other county or city official with authoritative power.

8.4 Site Security

The Contractor CHASP will also call out a plan to maintain site security. Site security measures are necessary during and after normal working hours to:

- Prevent exposure of unauthorized, unprotected people to the site hazards.
- Prevent vandalism and increased hazards of persons trying to dispose other waste on the site.
- Prevent theft.
- Avoid interference with safe working practices.

Security protocol provided in the Contractor CHASP will include the following provisions:

- Assign the responsibility of enforcing security measures to a person who acknowledges that responsibility.
- An identification system to identify authorized persons as well as the limitations to their approved activities.
- Post signs around the perimeter of the site.
- Secure equipment for overnight storage.
- All site visitors must be approved, signed in, and given the proper PPE.

8.5 Site Visitors

Visitors to the site will be instructed to stay outside of the EZ and remain within the SZ during the extent of their stay. Visitors will be cautioned to avoid skin contact with potentially contaminated surfaces. During visitation, hand-to-mouth transfers will be reduced with special warnings not to eat, drink, smoke, or chew gum or tobacco. The use of alcohol during site visitation is prohibited.

Authorized visitors requiring observation of the work in the EZ must read the Contractor CHASP and sign a form stating that they have read and understand the safety protocol and will abide by it (Figure E2-4). All visitors entering the EZ must wear appropriate PPE. The Contractor CHASP should specify how site visitors will be controlled and what PPE will be provided. Access to the site by visitors shall be restricted as follows:

- All site visitors must notify the PS or his/her designee before obtaining access to a SZ.
- Site visitors entering controlled work zones will be strictly limited. The PS must approve entry and the visitor must demonstrate medical and training clearance to enter a controlled work zone and must be given site-specific training.
- All site visitor access must be clearly documented, and visitors must comply with all provisions of the Contractor CHASP.

8.6 Disposal of Material

Disposal of materials generated on-site should be in accordance with the WMP developed for the SW Pit IRAP.

9. Engineering Controls

Engineering controls are used to mitigate potential hazards that arise during construction activities. At a minimum, the following engineering controls will be included in the Contractor CHASP.

1. Water sprayers will be used to control excessive dust conditions. The Contractor CHASP will state at what levels dust suppression will be used.

2. An oxygen analyzer will be used to monitor oxygen content in the air within the EZ. If levels reduce to 19.5 percent oxygen or less in the breathing zone, work will be temporarily halted and industrial fans will be used for forced ventilation of the work area. Work cannot commence until oxygen levels in the breathing zone have normalized. In the event that oxygen concentrations increase to 23 percent or greater, work will be halted, but no ventilation will be applied. The work area will be allowed to ventilate naturally.

3. Ventilation of methane from the subsurface will be performed as described in the SW Pit IRAP.

Additional engineering control measures may be added to the Contractor CHASP where appropriate.

10. Emergency Procedures

Emergency procedures to be followed during construction activities are described in these sections. The PS will be notified of any on-site emergencies and be responsible for ensuring that the appropriate procedures are followed. An emergency report (Figure E2-6) will be completed and submitted to the site PS for each instance of employee injury or possible exposure.

10.1 Emergency Phone Numbers and Hospital Location

Emergency phone numbers (Table E10-1) will be posted at a conspicuous place in the SZ. Directions to Dickinson County Memorial Hospital are given in Table E10-1 and a map with the route to the hospital is presented as Figure E10-1. The PS will be responsible for making sure that all field personnel are familiar with the location of the hospital, and know where the emergency phone list and directions to the hospital are located.

10.2 Personnel Injury in the EZ

In the event of an injury in the EZ, all site personnel will assemble at the decontamination line. The PS will evaluate the nature of the injury and the affected person will be decontaminated to the extent possible prior to movement to the SZ. Appropriate first aid will be initiated, and contact will be made with the Dickinson County Memorial Hospital for an ambulance (if required) (Table E10-1). No person will re-enter the EZ until the cause of injury or symptoms are determined. An injury report will be created and submitted to the established authority for action (Figure E2-6).

10.3 Personnel Injury in the SZ

Upon notification of an injury in the SZ, the PM and PS will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, and the appropriate first aid and necessary follow-up, as stated above, will be initiated. An injury report will be created and submitted to the established authority for action (Figure E2-6). Approved first aid kits will be kept in appropriate places on the work site. The PS will be responsible for making sure personnel are familiar with the first aid kit locations. The PS will also be responsible for the maintenance of the first aid kits.

10.4 Fire/Explosion Emergency Procedures

The threat of fire/explosion on this work site is considered high because of reported concentrations of methane gas in the subsurface. In addition, fire hazards exist in the following activities:

- Equipment refueling.
- High pressure water cleaning, fuel storage, and refueling.
- Presence of solvent contamination.

The PS will check to see that each vehicle fire extinguisher is appropriate for the fire hazard present at this site. Generally, Type A, B, and C extinguishers are appropriate, however a combination extinguisher for all fire categories is preferred. The field team will be prepared to fight small fires with extinguishers. In the event of a large fire, the field team will contact the appropriate authorities and report the fire.

10.4.1 Emergency Procedures

In an emergency, the PS (or alternate PS) will assume total control and decision making on site. In the event of a chemical spill, the release reporting procedures as detailed in the SW Pit WMP will be followed and the PS will attempt to containerize the material. In the event of a fire or explosion, the PS will take the following actions:

- Notification of site personnel and appropriate authorities.
- Shutdown site activities.
- Account for site workers at decontamination corridor.
- Evacuate the site, if necessary.

Methane in the gas state is a dangerous fire and explosion hazard when exposed to heat or flame. Care will be taken to eliminate sources of potential ignition, such as smoking, and non-explosion-proof electrical and internal combustion equipment. The use of flame devices such as cutting torches or welding equipment will only be done with approval of the PS after combustible gas monitoring. In the event of a small methane fire, the field team will be prepared to control the fire using carbon dioxide or dry chemical.

Upon notification of an on-site fire or explosion, all site personnel shall assemble at the decontamination line. The fire department shall be alerted by calling 911 for response services. All site personnel will be moved a safe distance from the involved area.

If PPE worn by personnel fails or is otherwise altered in such a manner that the level of protection is affected, the workplace must be vacated. The person affected shall immediately leave the EZ. Re-entry shall not be permitted until the equipment has been repaired or replaced.

Field personnel must notify the PS when any on-site equipment fails to operate properly. The PS shall determine the effect of this failure on continuing operations on-site. If the failure affects the safety of personnel or prevents completion of assigned tasks, all personnel shall leave the EZ until the situation is evaluated and appropriate actions taken.

In all situations, when an onsite emergency results in evacuation, personnel shall not re-enter until:

1. The conditions resulting in emergency have been corrected.

2. The hazards have been reassessed.

3. The Contractor CHASP has been reviewed.

4. Site personnel have been briefed on any changes in the Contractor CHASP.

10.4.2 Emergency Medical Care

The following describes emergency procedures when it is suspected that a person has suffered from chemical exposure.

Dickinson County Memorial Hospital (Phone # 906-779-4555) will be contacted in an emergency. The hospital is located at 1721 Stephenson Avenue, Iron Mountain, Michigan, and a map of the route and alternate routes is attached as Figure E10-1. A local ambulance service is available by calling 911. First-aid equipment (including a first-aid kit, emergency eye wash and emergency shower) will be available on site.

Skin Contact

1. Flush with water.
2. Remove clothing, if necessary.
3. Wash and rinse affected area for at least 20 minutes. Decontaminate and provide appropriate medical attention.

Inhalation

1. Move person away from area.
2. Administer CPR as needed.
3. Decontaminate and transport to hospital for medical attention (Figure E10-1).

Ingestion

1. Decontaminate and transport to hospital for medical attention.

Eye Contact

1. Irrigate with water for at least 15 minutes.
2. Decontaminate and transport to hospital for medical attention (Figure E10-1).

In the event of a serious accident/injury, the PS shall make an immediate telephone report to the PM outlining all details of the accident/injury and action(s) taken. This reporting procedure will be accomplished using the Contractor's Accident/Incident Report. The report shall include at a minimum the following information:

- Chronological history of the incident.
- Facts concerning the incident and when they became available.

- Title and names of personnel involved.
- Actions (decisions made and by whom), orders given (to whom, by whom, and when), action taken (who did what, when, where, and how).
- Possible exposure(s) of site personnel.
- History of all injuries or illnesses during or as a result of the emergency.

In the event of a spill of hazardous materials on site, the PS shall control the spill and proceed to absorb and containerize the material. In addition, the PS may conduct air monitoring to characterize exposure hazards from the incident.

Tables

Table E4-1. Chemical Constituents of Potential Concern and Health and Safety Information, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

	Maximum Concentrations (mg/kg)	PEL	IDLH	Potential Exposure Route	Ionization Potential	UEL/LEL
ORGANICS						
VOCs						
Acetone	100	250 ppm	2,500 ppm	Inh, Ing, Con	9.69 eV	12.8%/2.5%
Benzene [1]	0.57	0.1 ppm	Ca 500 ppm	Inh, Abs, Ing, Con	9.24 eV	7.8%/1.2%
2-Butanone (MEK)	3.5	200 ppm	3,000 ppm	Inh, Ing, Con	9.54 eV	11.4%(200 F)/1.4%(200 F)
Carbon disulfide	1.5	1 ppm	500 ppm	Inh, Abs, Ing, Con	10.08 eV	50.0%/1.3%
Chloromethane	0.057	100 ppm	Ca 2000 ppm	Inh, Con (liq)	11.28 eV	17.4%/8.1%
Ethylbenzene	2	100 ppm	800 ppm	Inh, Ing, Con	8.76 eV	6.7%/0.8%
2-Hexanone	0.28	1 ppm	1,600 ppm	Inh, Abs, Ing, Con	9.34 eV	8%/ND
Methylene chloride	0.18	25 ppm	Ca 2,300 ppm	Inh, Abs, Ing, Con	11.32 eV	23%/13%
4-Methyl-2-pentanone (MIBK)	0.24	50 ppm	500 ppm	Inh, Ing, Con	9.30 eV	8.0%(200 F)/1.2%(200 F)
Naphthalene	0.93	10 ppm	250 ppm	Inh, Abs, Ing, Con	8.12 eV	5.9%/0.9%
n-Propylbenzene	0.12	None				
Toluene	9.6	100 ppm	500 ppm	Inh, Abs, Ing, Con	8.82 eV	7.1%/1.1%
Trichloroethene (also called Trichloroethylene)	0.004	25 ppm	CA 1,000 ppm	Inh, Abs, Ing, Con	9.45 eV	10.5%/8%
1,2,4-Trimethylbenzene	0.81	25 ppm	ND	Inh, Ing, Con	8.27 eV	6.4%/0.9%
1,3,5-Trimethylbenzene	0.26	25 ppm	ND	Inh, Ing, Con	8.39 eV	ND
m-Xylene	20	100 ppm	900 ppm	Inh, Abs, Ing, Con	8.56 eV	7.0%/1.1%
o-Xylene	20	100 ppm	900 ppm	Inh, Abs, Ing, Con	8.56 eV	6.7%/0.9%
p-Xylene	20	100 ppm	900 ppm	Inh, Abs, Ing, Con	8.44 eV	7.0%/1.1%
SVOCs						
Acenaphthene	0.56	None				
Anthracene	5	Ca 0.1 mg/m^3	Ca 80 mg/m^3	Inh, Con	varies	varies
Benzo(a)anthracene	4.2	None				
Benzo(a)pyrene	1.7	Ca 0.1 mg/m^3	Ca 80 mg/m^3	Inh, Con	varies	varies
Benzo(b)fluoranthene	1.3	None				
Benzo(g,h,I)perylene	1.6	None				
Benzo(k)fluoranthene	1.4	None				
bis(2-Ethylhexyl)phthalate	7.4	Ca 5 mg/m^3	Ca 5000 mg/m^3	Inh, Ing, Con	?	?/0.3%(474 F)
Butylbenzene-phthalate	0.066	None				

Footnotes on Page 4.

Table E4-1. Chemical Constituents of Potential Concern and Health and Safety Information, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

	Maximum Concentrations (µg/kg)	PEL	IDLH	Potential Exposure Route	Ionization Potential	UEL/LEL
SVOCs (continued)						
Carbazole	3.6	None				
4-Chloroaniline	0.35	None				
Chrysene	5.3	Ca 0.1 mg/m^3	Ca 80 mg/m^3	Inh, Con	varies	varies
Dibenzofuran	5.2	None				
Diethyl-phthalate	12	5 ppm	ND	Inh, Ing, Con	ND	ND/0.7%
2,4-Dimethylphenol	36	None				
Di-n-butyl-phthalate	1.3	None				
Di-n-octyl-phthalate	0.044	None				
Fluoranthene	9.7	None				
Fluorene	8.5	None				
Ideno(1,2,3-cd)pyrene	0.11	None				
2-Methylnaphthalene	19	None	None	Ing		ND
2-Methylphenol (also called o-Cresol)	71	2.3 ppm	250 ppm	Inh, Abs, Ing, Con	8.93 eV	ND/1.4%
3-Methylphenol (also called m-Cresol)	8.3	2.3 ppm	250 ppm	Inh, Abs, Ing, Con	8.98 eV	ND/1.1%
4-Methylphenol (also called p-Cresol)	8.3	2.3 ppm	250 ppm	Inh, Abs, Ing, Con	8.97 eV	ND/1.1%
Naphthalene	16	10 ppm	250 ppm	Inh, Abs, Ing, Con	8.12 eV	5.9%/0.9%
n-Nitrodimethylamine	80	None				
n-Nitrosodiphenylamine	3	None				
Phenanthrene	26	Ca 0.1 mg/m^3	Ca 80 mg/m^3	Inh, Con	varies	varies
Phenol	73	5 ppm	250 ppm	Inh, Abs, Ing, Con	8.50 eV	8.6%/1.6%
Pyrene	10	Ca 0.1 mg/m^3	Ca 80 mg/m^3	Inh, Con	varies	varies
Aldrin	0.24	0.25 mg/m^3	CA 0.25 mg/m^3	Inh, Abs, Ing, Con	ND	NA/NA
Chlorodane (gamma)	0.03	None				
4,4-DDE	0.015	None				
Dieldrin	0.054	None				
Endrin	0.23	0.1 mg/m^3	2 mg/m^3	Inh, Abs, Ing, Con	ND	NA/NA
Endrin aldehyde	0.059	None				
Endrin ketone	0.13	None				

Footnotes on Page 4.

Table E4-1. Chemical Constituents of Potential Concern and Health and Safety Information, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

	Maximum Concentrations (μg/kg)	PEL	IDLH	Potential Exposure Route	Ionization Potential	UEL/LEL
PESTICIDES/PCBs						
Heptachlor	0.0007	Ca 0.5 mg/m^3	Ca 35 mg/m^3	Inh, Abs, Ing, Con	?	NA/NA
Heptachlor epoxide	0.055	0.5 mg/m^3	CA 35 mg/m^3	Inh, Abs, Ing, Con	ND	NA/NA
ALCOHOLS						
Ethanol	13	1,000 ppm	3,300 ppm	Inh, Abs, Ing, Con	10.47 eV	19%/3.3%
Ethylacetate	0.7	400 ppm	2,000 ppm	Inh, Ing, Con	10.01 eV	11.5%/2.0%
Methanol	18	200 ppm	6,000 ppm	Inh, Abs, Ing, Con	10.84 eV	36%/6.0%
1-Propanol	0.8	None				
ALDEHYDES						
Acetaldehyde	20	200 ppm	CA 2,000 ppm	Inh, Ing, Con	10.22 eV	60%/4%
Formaldehyde	50	0.016 ppm	CA 20 ppm	Inh, Con	10.88 eV	73%/7.0%
Inorganic Nitrogen, Nitrate	2.4	None				
METALS						
Aluminum	9,300	2.0 ppm	ND	Inh, Ing, Con	Varies	ND
Antimony	13	0.5 ppm	50 ppm	Inh, Ing, Con	NA	ND
Arsenic	18.1	0.01 ppm	5 ppm	Inh, Abs, Ing, Con	NA	ND
Barium	320	None				
Beryllium	2.9	0.0005 mg/m^3	CA 4 mg/m^3	Inh, Con	NA	NA/NA
Cadmium	3.9	0.005 mg/m^3 (OSHA)	CA 9 mg/m^3	Inh, Ing	NA	NA/NA
Calcium	34,000	None				
Chromium	90	0.5 ppm	25 ppm	Inh, Ing, Con	NA	ND
Cobalt	22	0.05 ppm	20 ppm	Inh, Ing, Con	NA	ND
Copper	4,900	1.0 ppm	100 ppm	Inh, Ing, Con	NA	ND
Cyanide	0.9	None				
Iron	84,800	5.0 ppm	2,500 ppm	Inh	NA	ND
Lead	1,700	0.05 ppm	100 ppm	Inh, Ing, Con	NA	ND
Magnesium	22,000	15.0 ppm	750 ppm	Inh, Con	NA	ND
Manganese	770	1 ppm	500 ppm	Inh, Ing, Con	NA	ND
Mercury	1.3	0.05 mg/m^3	10 mg/m^3	Inh, Abs, Ing, Con	ND	NA/NA

Footnotes on Page 4.

Table E4-1. Chemical Constituents of Potential Concern and Health and Safety Information, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

	Maximum Concentrations (µg/kg)	PEL	IDLH	Potential Exposure Route	Ionization Potential	UEL/LEL
METALS (continued)						
Molybdenum	6.5	5.0 ppm	1,000 ppm	Inh, Ing, Con	NA	ND
Nickel	101	0.015 ppm	10 ppm	Inh, Ing, Con	NA	ND
Potassium	1,470	None				
Selenium	2.6	0.2 ppm	1.0 ppm	Inh, Ing, Con	NA	ND
Silver	5.1	0.01 mg/m^3	10 mg/m^3	Inh, Ing, Con	NA	NA/NA
Sodium	298	CA (2.0 ppm)	10 ppm	Inh, Ing, Con	NA	ND
Thallium	2.2	None				
Titanium	570	None				
Vanadium	37	0.05 mg/m^3	35 mg/m^3	Inh, Ing, Con	NA	NA/NA
Zinc	757	None				
Acetic Acid	220	10 ppm	50 ppm	Inh, Con	10.66 eV	19.9/4.0

1 Level of protection criteria for benzene obtained from OSHA 29 CFR 1910.1028/Benzene/Z/Toxic and Hazardous Substances.
? Property is unknown.
Abs Skin Absorption.
Ca Carcinogen.
CA NIOSH has recommended the substance be treated as a potential human carcinogen. IDLH not listed.
Con Skin or eye contact.
eV Electron volts.
F Degrees Fahrenheit.
IDLH Immediately Dangerous to Life or Health. In the event of respirator failure, one could escape within 30 minutes without experiencing any irreversible health effects.
Ing Ingestion.
Inh Inhalation.
LEL Lower Explosive Limit.
µg/kg Micrograms per kilogram.
NA Not Applicable.
ND Not Determined.
OSHA Occupational Safety & Health Administration .
PCBs Polychlorinated biphenyls.
PEL Based on 8 Hour Time-Weighted Averaged.
ppb Parts Per Billion = µg/L.
ppm Part Per Million = mg/L.
SVOCs Semi-Volatile Organic Compounds.
UEL Upper Explosive Limit.
VOCs Volatile Organic Compounds.

References:
NIOSH Pocket Guide to Chemical Hazards.
Groundwater Chemicals Desk Reference Montgomery and Welkom.
Dangerous Properties of Industrial Chemicals, Sat and Lewis.

Table E6-1. Signs and Symptoms of Chemcial Exposure and Heat Stress that indicate Potential Medical Emergencies, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Type of Hazard	Signs and Symptoms
Chemical Hazard	Behavioral changes
	Breathing difficulties
	Changes in complexion or skin color
	Coordination difficulties
	Coughing
	Dizziness
	Diarrhea
	Fatigue and/or weakness
	Irritability
	Irritation of eyes, nose, respiratory tract, skin, or throat
	Headache
	Light-headedness
	Nausea
	Sneezing
	Sweating
	Tearing
	Tightness in the chest
Heat Exhaustion	Clammy skin
	Confusion
	Dizziness
	Fainting
	Fatigue
	Heat rash
	Light-headedness
	Nausea
	Profuse sweating
	Slurred speech
	Weak pulse
Heat Stroke	Confusion
(may be fatal)	Convulsions
	Hot skin, high temperature (yet may feel chilled)
	Incoherent speech
	Staggering gait
	Sweating stops (yet residual sweat may be present)
	Unconsciousness

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Table E7-1. Action Levels, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Instrument	Reading	Action
PID	< 10 ppm or = 10 ppm	Level D
	>10 ppm, <50 ppm	Level C
	>50 ppm	Stop Work
MIE Miniram	<1.0 mg/m^3	Continue work
	>1.0 mg/m^3 < 2.5 mg/m^3	Level C or implement dust suppression
	>2.5 mg/m^3	Stop work
Combustible Gas Indicator	<20% or = 20% LEL	Continue Work
	>20% LEL	Stop Work. Allow to ventilate
Oxygen Analyzer	<19.5% or =19.5%	Stop work, raise oxygen content with forced ventilation
	> 23% or = 23%	Stop work, allow area to ventilate

LEL Lower explosive limit.
mg/m^3 Milligrams per cubic meter.
PID Photoionization detector.
ppm Parts per million.

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Table E10-1. Emergency Phone Numbers and Directions to Dickinson County Memorial Hospital, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michgian.

Area Code	906
Police Emergency	911
Police Non-Emergency	774-2525
Fire Emergency	911
Fire Non-Emergency	774-1265
Ambulance	911
Beacon Ambulance Service	779-5050
Rescue Squad	911
Dickinson County Sheriff	774-6262
Hospital Emergency	779-4555
Hospital Non-Emergency	774-1313
Poison Control Center	1 (800) 562-9781
Toxic Substances Center	1 (404) 452-4100
for Disease Control (CDC)	1 (202) 554-1404
CDC Hotline	1 (404) 329-2888
Contractor Project Manager	Insert Contact Numbers
ARCADIS Project Manager	Ric Studebaker (414) 276-7742
ARCADIS Coorporate Health & Safety Manager	Sam Moyers, (423) 481-3000
Contractor Corporate Health & Safety	Insert Contact Numbers
Miss Dig	1 (800) 482-7171

Dickinson County Memorial Hospital - South US Highway 2, Iron Mountain, Michigan.

Directions to Hospital:

East on Breitung Avenue to Hydraulic Falls Road. North (left) on Hydraulic Falls Road to US Highway 2 (Stephenson Avenue). South (right) on US Highway 2 for approximately 1 mile to Dickinson Memorial Hospital.

Figures

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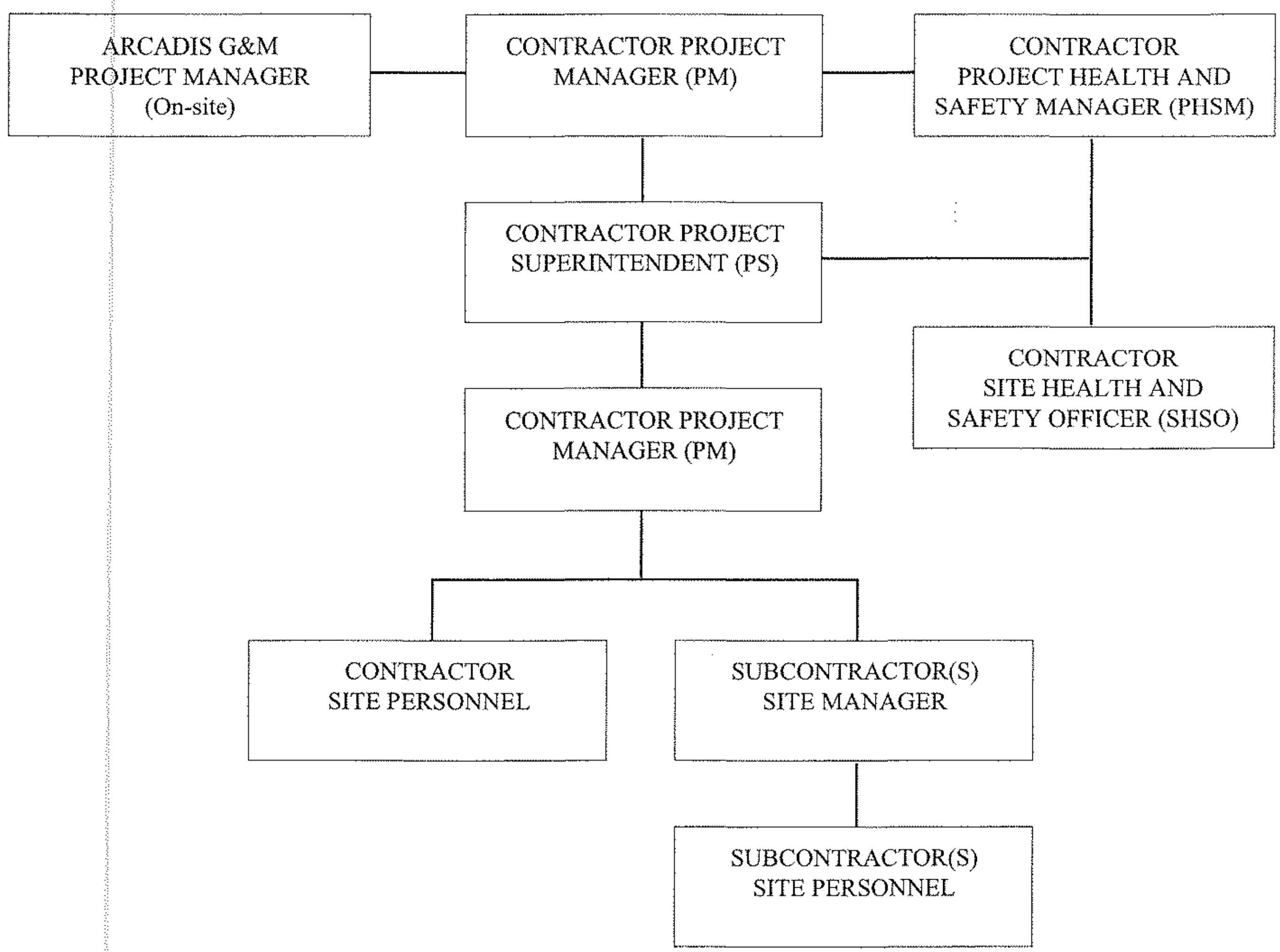

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PROJECT HEALTH AND SAFETY ORGANIZATION AND REPORTING

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE
E2-1

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Figure E2-2. Daily Health and Safety Meeting Form, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

SITE Ford/Kingsford LOCATION Kingsford, Michigan

WORK LOCATION AT SITE NE PIT

PREPARED BY ____________________

PROJECT MANAGER ____________________

TYPE OF WORK ____________________

SAFETY TOPICS PRESENTED

CHEMICAL HAZARDS AND EXPOSURE ROUTES ____________________

PHYSICAL HAZARDS AT SITE AND HAZARDS RELATED TO TYPE OF WORK ____________________

PROTECTIVE CLOTHING/MONITORING EQUIPMENT REQUIRED ____________________

____ STEEL TOE BOOTS

____ HARD HAT

____ SAFETY GLASSES/GOGGLES

____ SPECIAL EQUIPMENT

____ GLOVES (SPECIFIC TYPE)

____ TYVEK

____ RESPIRATOR (Specify Cartridge Selection)

EMERGENCY INFORMATION

AMBULANCE/PARAMEDIC PHONE (   )

HOSPITAL (   )

ROUTE TO HOSPITAL (Attach Map if Necessary) ____________________

ATTENDEES

MEETING GIVEN BY ________ DATE ________ TIME ________

SIGNATURES

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Figure E2-3. Field Team Review Sheet, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

I have been trained in the contents of the SW Pit Construction Health and Safety Plan and I have been advised of the locations of copies available for review. I will comply with the provisions contained therein.

NAME	DATE	NAME	DATE

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Figure E2-4. Visitor Review of Site Health and Safety Plan, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michgian.

The undersigned visitors of the SW Pit require entrance to the Exclusion Zone and have thoroughly read the Construction Health and Safety Plan, understand the potential hazards and the procedures to minimize exposure to the hazards, will follow the direction of the Site Health and Safety Officer, and will abide by the Construction Health and Safety Plan.

NAME	COMPANY	DATE	SIGNATURE

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Figure E2-5. Emergency Medical Data Sheet, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Project: ______________________________

Name: ______________________ Home Telephone ______________

Address: ______________________________

Age: ________ Height: ________ Weight: ________ Blood Type: ________

Emergency Contact: ______________________________

Drugs or other allergies: ______________________________

Particular sensitivities: ______________________________

____

Do you wear contacts? ______________________________

Provide checklist of previous illnesses. ______________________________

Have you ever had any previous exposures to hazardous chemicals? Please Detail. ______________

____

____

What medications are you currently using? ______________________________

____

____

Do you have any medical restrictions? Please detail. ______________________________

____

____

Name, address, and phone number of personal physician: ______________________________

____

____

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Figure E2-6. Emergency Report Form, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

1. DATE ______________________
2. TIME OF ACCIDENT ______________________
   CLIMATIC CONDITIONS ______________________
3. ON-SITE COORDINATOR ______________________
4. EMPLOYEE INJURED ______________________
5. COMPANY AFFILIATION ______________________
6. SOCIAL SECURITY NUMBER ______________________
7. INSURANCE COMPANY ______________________
8. NUMBER OF WORKERS AT SITE ______________________

NAMES OF WORKERS	COMPANY AFFILIATION
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________

9. CIRCUMSTANCES OF THE INJURY/EMERGENCY ACTION ______________________

____

____

10. EMERGENCY ACTIONS TAKEN ______________________

____

____

11. WAS FIRST AID PROVIDED? ______________________

____

____

12. WAS AN EMERGENCY PHONE CALL MADE TO THE PROJECT SAFETY OFFICER? ______________________
    IF SO, TIME: ______________________
13. AMBULANCE SEVICE USED ______________________
14. HOSPITAL USED ______________________
15. ATTENDING PHYSICIAN ______________________
16. COMPANY REPRESENTATIVE CONTACTED ______________________
17. CONTRACTOR REPRESENTATIVE CONTACTED ______________________

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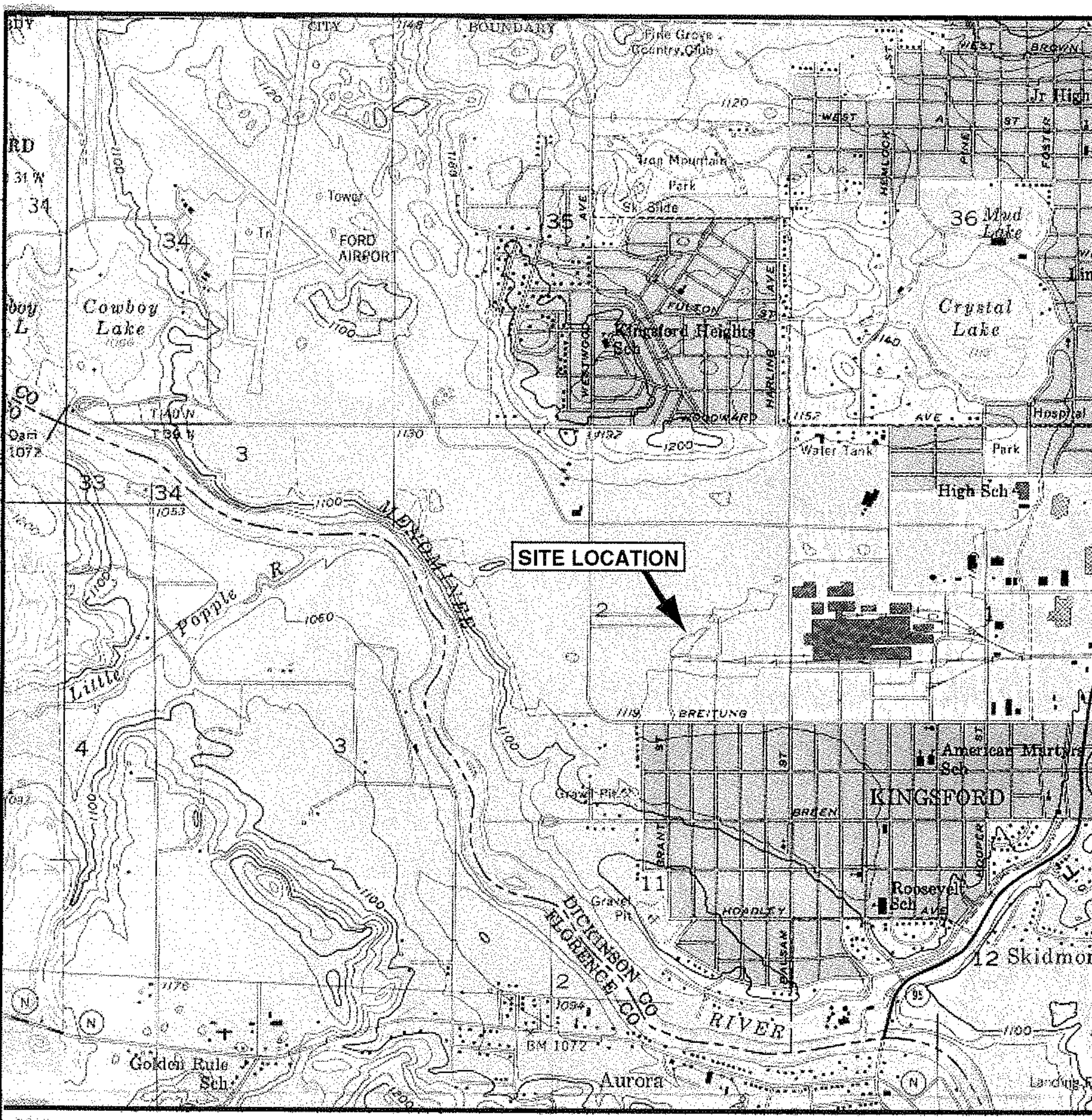
Figure E2-7. CHASP Approvals, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

By their signature, the undersigned certify that this CHASP is approved and will be utilized for operations to be conducted under this plan.

Contractor Project Manager	Date
Contractor Project Superintendent	Date
Contractor PHSM	Date
Ford Motor Company Project Manager	Date
Kingsford Products Company Project Manager	Date
Contractor Occupational Safety and Health Representative	Date



SOURCE: USGS 7.5 Minute Topographic Map, IRON MOUNTAIN, MICHIGAN Quadrangle, 1955 Photorevised 1982

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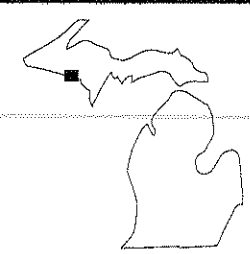

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SITE LOCATION MAP

FORMER SOUTHWEST PIT AREA
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE

E3-1

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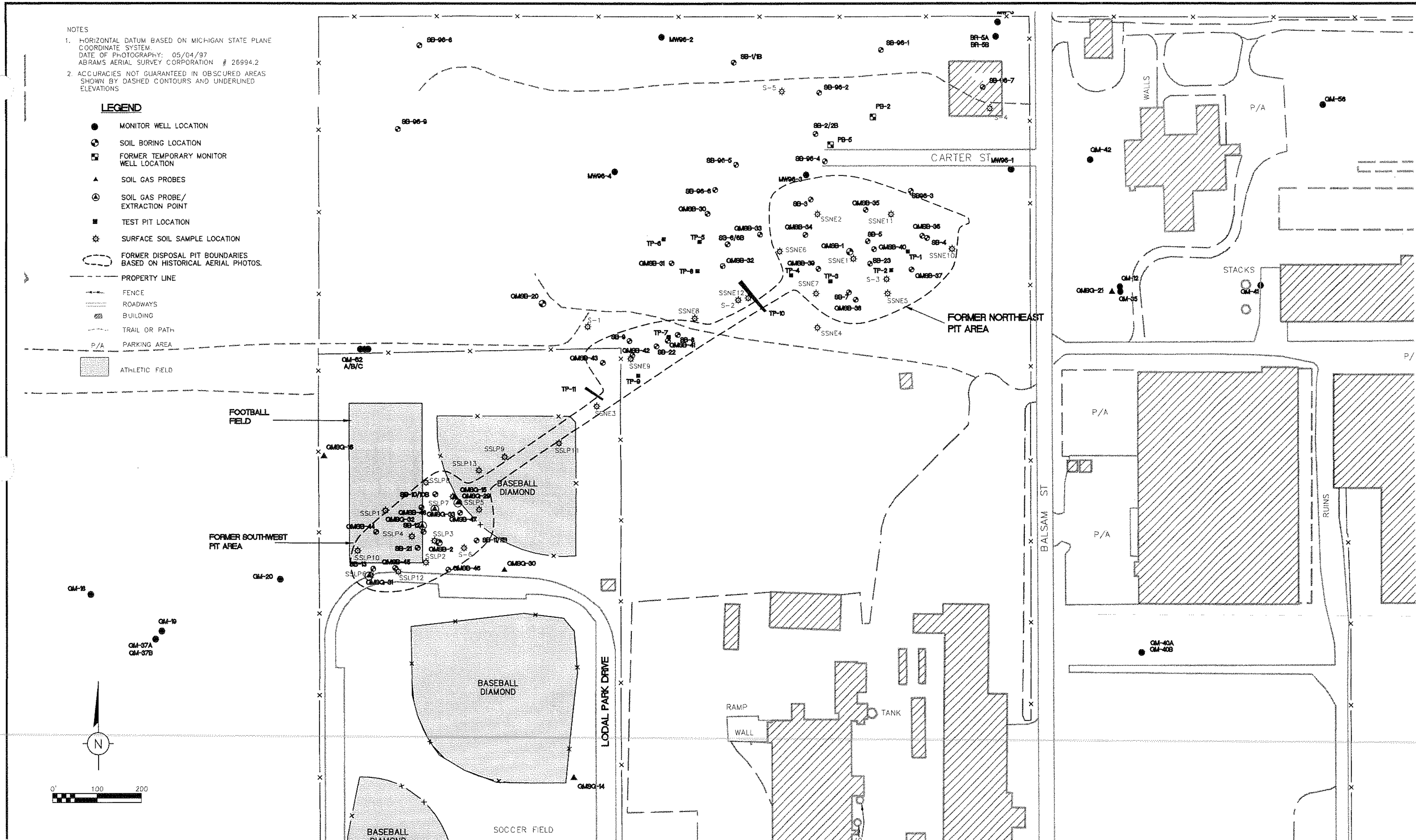

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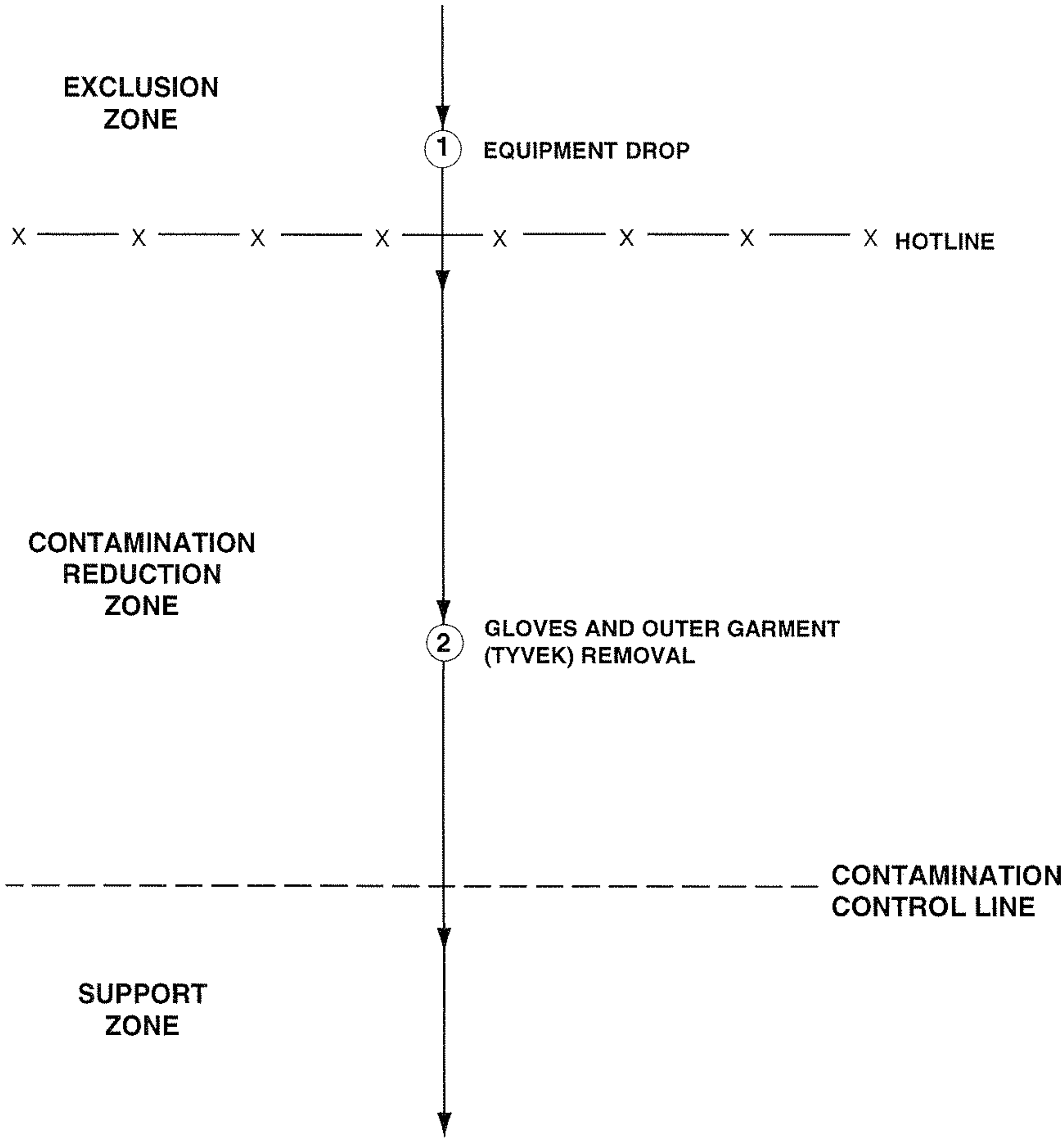
NO.	DATE	REVISION DESCRIPTION	BY	CKD

ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

FORMER SOUTHWEST PIT IRAP

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

DRAWN	DATE	PROJECT MANAGER	DEPARTMENT MANAGER
CES	1/10/2002	EC	BE
SITE PLAN VIEW		LEAD DESIGN PROF. BE	CHECKED BE
		PROJECT NUMBER WI00950.0005	FIGURE E3-2



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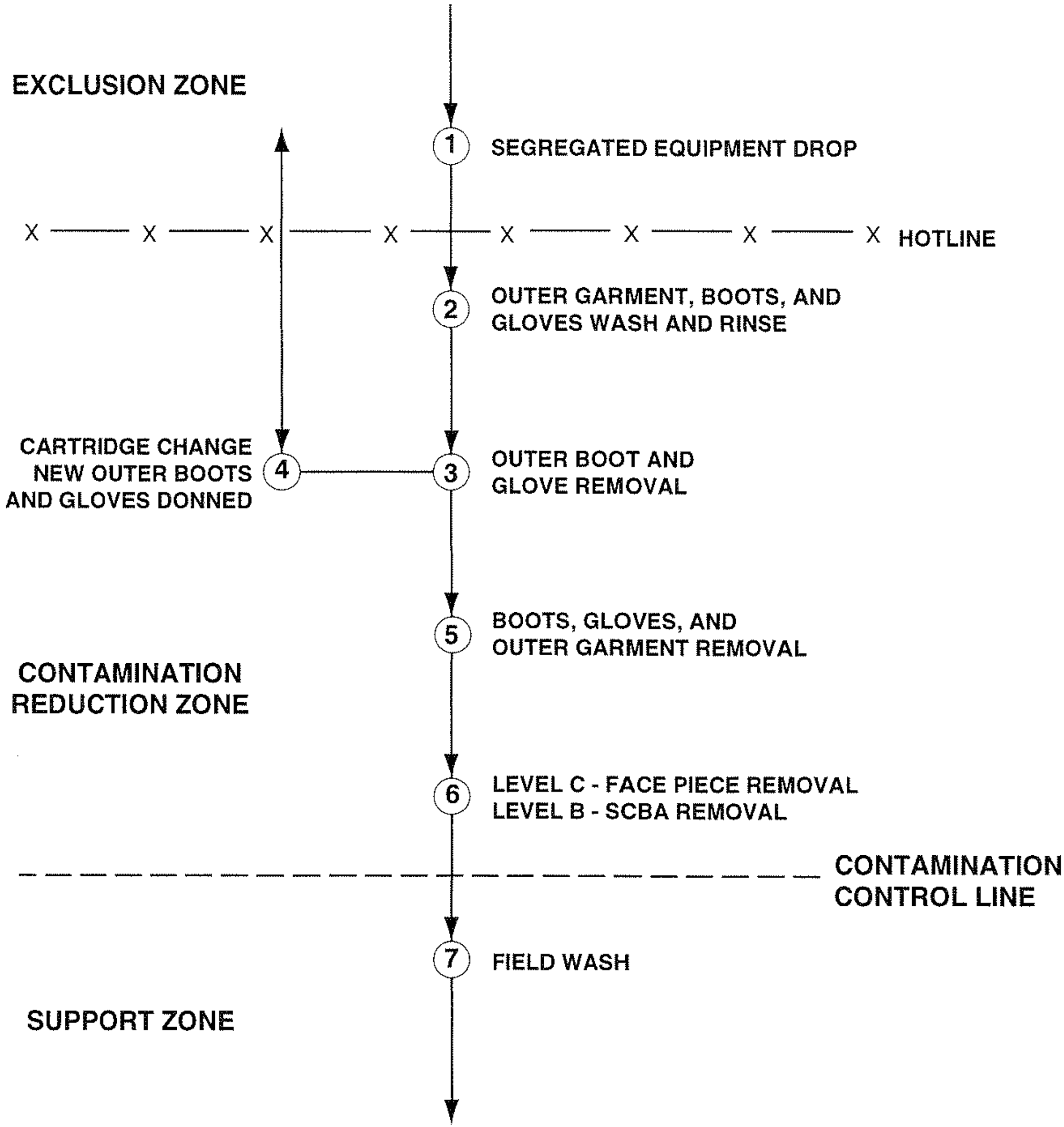
MINIMUM DECONTAMINATION LAYOUT
LEVEL D PROTECTION

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE

E6-1



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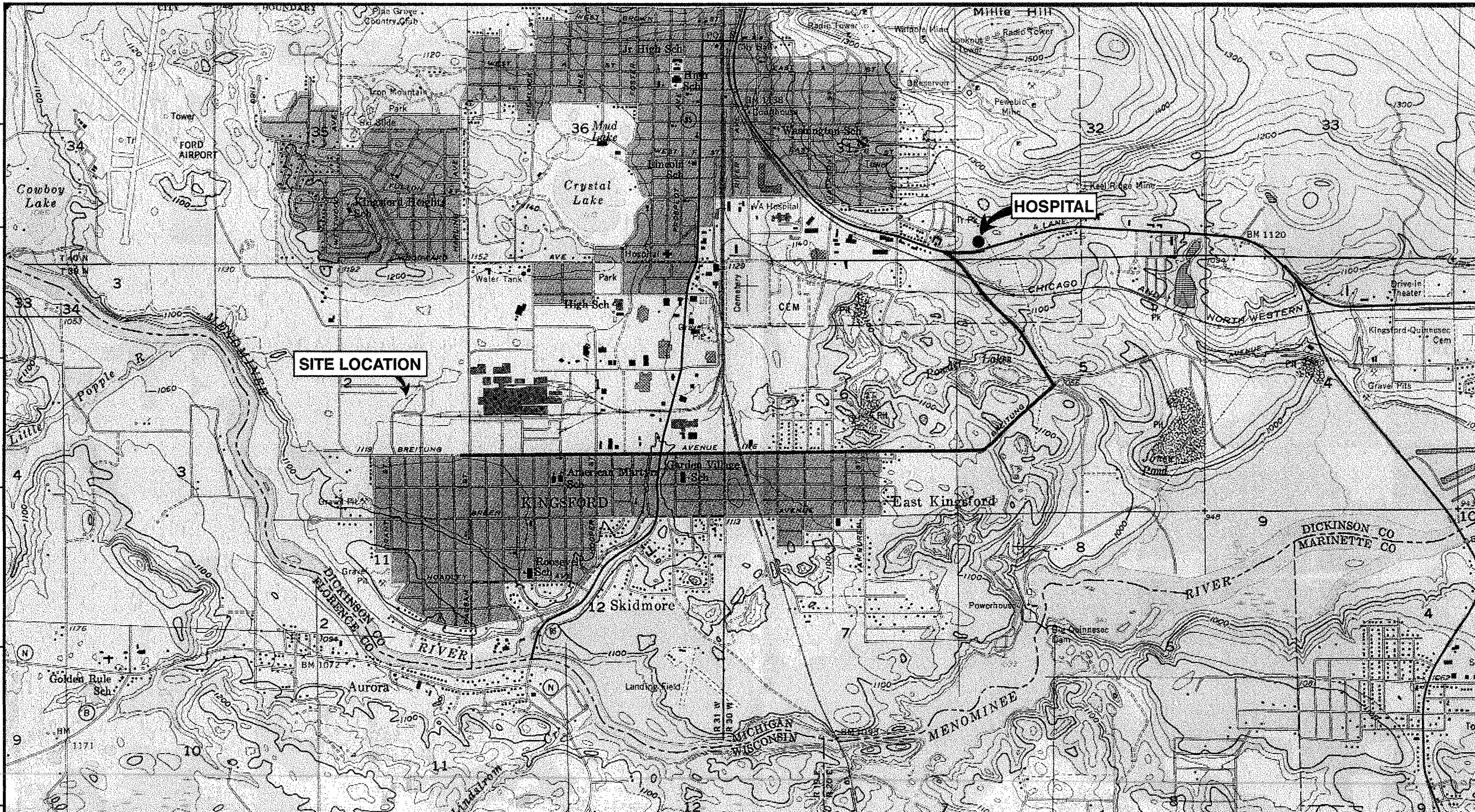
MINIMUM DECONTAMINATION LAYOUT
LEVEL C PROTECTION

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE **E6-2**

DRAFTER: ELS:LMB | APPROVED: | CHECKED: KML\BIKJG | DRAWING: LEVEL_C_B.AI | FILE NO.: GRAPHICS | PN: FORDWI0637\2003 | DWG DATE: 06FEB03



SOURCE: USGS 7.5 Minute Topographic Map, IRON MOUNTAIN, MICH.-WIS. Quadrangle, 1955, Photorevised 1982

Route to Hospital: East on Breitung Avenue to Hydraulic Falls Road.
North on Hydraulic Falls Road to U.S. Highway 2 (Stephenson Avenue).
South on U.S. Highway 2 to Dickinson County Memorial Hospital.

N

0 2000 4000 8000
SCALE IN FEET

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ROUTE TO HOSPITAL

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE
E10-1

DRAFTER: ELS:LMB
APPROVED:
CHECKED: KML/BK/JG
DRAWING: ROUTE.AI
FILE NO.: GRAPHICS
PN: FORDWI0637/2003
DWG DATE: 06FEB03

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Appendix F

Waste Management Plan

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Appendix F
Former Southwest Pit IRAP
Waste Management Plant

Ford/Kingsford Site
Kingsford, Michigan

Table

Figures

1. Introduction

This Waste Management Plan (WMP) has been prepared for use in conjunction with implementation of the Interim Response Action Plan (IRAP) for the Former Southwest Pit Area (SW Pit) at the Ford/Kingsford Site in Kingsford, Michigan. Waste generated at the SW Pit during any work conducted at this facility by any contractor or utility work team will be handled in accordance with this plan. This document is organized to provide background information for the site and the approach for management of wastes that may be encountered during construction activities. This WMP has been developed in compliance with Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended (Part 201). If conditions or scope of work covered by the plan change, a site-specific addendum will be generated prior to the beginning of the work. The work will be performed in accordance with applicable federal, state, and local regulations.

2. Objectives

The objective of this WMP is to provide guidance for the future management of waste generated from intrusive construction activities that disturb waste or impacted soil at the SW Pit (subsurface utility work, drilling, excavation, or construction). The depth at which there is the potential for soil and waste to be disturbed is greater than 30-inches. This WMP describes the methods and protocol that will be implemented for removal and disposal of waste, as set forth in Part 115, Solid Waste Management, and Part 91, Soil Erosion and Sedimentation Control, of the NREPA. The WMP is to be used in conjunction with the SW Pit Construction Health and Safety Plan (CHASP) and the SW Pit Operation and Maintenance Plan.

Elements of this WMP address the following:

- Excavation, Filling, and Grading.
- Disposal of Generated Waste.
- Stormwater, Sediment, and Erosion Control Practices.
- Safety, Health, and Emergency Response.
- Waste Management Team.

The WMP defines the manner that any waste generated from construction activities at the SW Pit will be managed. Specifically, this WMP addresses:

- Potential types of waste generated.
- Stormwater management approach.
- Spill prevention and response.

3. Background

3.1 Site Description

The City of Kingsford is located in southwestern Dickinson County, in the western part of Michigan's Upper Peninsula. The City is bounded by the Menominee River on the west and south, by the City of Iron Mountain on the north, and Highway M-95 (Carpenter Avenue) to the east. The SW Pit (center point) is located approximately 1,100 feet north of Breitung Avenue and approximately 1,500 feet west of Balsam Street in the central portion of the city as shown on Figure F3-1. A plan view of the SW Pit Area is shown on Figure F3-2.

3.2 Site History

Aerial photographs and historic records indicate that disposal at the SW Pit occurred since the 1920's. Wood pieces, wood sawdust, wood bark chips, and charcoal were reportedly disposed of in the SW Pit, along with industrial waste and wastewater containing dissolved organics from pyrolysis processes. Aerial photographs show continued disturbances to the surface of the area and disposal from unidentified sources to at least 1981.

3.3 Interim Response Action Summary

The primary focus of the SW Pit IRAP is to prevent direct contact with waste materials, except under controlled conditions, and allow future use of the present area overlying the SW Pit. The SW Pit IRAP includes the use of a permeable cover system, operation of a soil vapor extraction system, and creation of a restrictive covenant/institutional controls. Additional details are provided in the SW Pit IRAP.

4. Characterization of Wastes and Materials

The materials that may be generated during both the IRAP and future construction activities include excavated waste material and soil, water from dewatering operations, decontamination water and solids, stormwater and solids, and construction debris. Each of these wastes will be handled in accordance with this WMP. The management of excavation areas and minimization of contact between stormwater and waste is the responsibility of the contractor.

This section describes materials that may be encountered at the SW Pit during the course of IRAP implementation and any future construction activities. Waste management approaches are given for each type of material. Based on previous investigations at the SW Pit and the results of the laboratory analysis of the samples collected, any materials that may be generated from the SW Pit activities are expected to be non-hazardous.

4.1 Waste Management

Waste, excavated soil, and other expected and potential waste materials are described below.

4.1.1 SW Pit Waste Material

The waste material remaining within the SW Pit is a combination of various types of material. Waste materials encountered ranged from 4 to 25 feet in thickness and are underlain by native silt and sand. The depth to the base of the fill and waste material ranges from 0.2 to 15 feet below land surface. The waste material is characterized as predominantly wood, wood products, sawdust, charred wood fragments, fibrous wood pieces, and charcoal fragments.

4.1.2 Excavated Soil

Potentially impacted soil will be placed and stored in a manner that will prevent possible off-site migration of constituents. Soil is to be placed on a relatively impermeable surface. If no paved surfaces are available, the soil will be placed on plastic sheeting. The contractor should not allow direct precipitation or surface run-off or run-on from or onto the stockpiled soil, by covering the soil and providing acceptable diversions.

4.1.3 Water From Dewatering Operations

If dewatering is necessary for construction activities to proceed, the water will be collected and sampled to determine its final disposition and will be managed similarly to contact stormwater.

4.1.4 Stormwater-Related Waste Material

Stormwater-related waste will be minimized, to the extent practical, by preventing the stormwater from contacting the waste material. Any accumulated stormwater contacting waste, termed contact stormwater, will be contained and pumped from the excavation and placed in holding (fractionation) tanks. Contact stormwater that is collected will be treated in the existing biological treatment system or will be discharged directly to the Kingsford/Iron Mountain Publicly Owned Treatment Works (POTW). Direct discharge to the POTW would require approval by the Iron Mountain/Kingsford Sewage Board.

4.1.5 Decontamination Water and Solids

Decontamination of small equipment will be necessary if contact with the waste material occurs, and will take place in the contaminant reduction zone (CRZ). Large equipment decontamination will take place at a temporarily constructed decontamination pad located in the CRZ. The decontamination pad will be located as close as possible to excavation activities. This pad will be lined with a heavy (40-60 mil) plastic liner, and will be constructed so that rinsate generated during decontamination will drain to a lined sump. Collected water will be managed similar to contact stormwater.

In addition to decontamination liquids, a relatively small volume of decontamination solids will accumulate in decontamination pad sumps. The decontamination solids will be disposed at an appropriate off-site facility. Dedicated excavation and on-site transportation equipment will be used to excavate the waste to minimize the generation of decontamination rinse water, and to minimize the potential cross-contamination of soil and other environmental media. Construction equipment, monitoring equipment, non-disposable Personal Protective Equipment (PPE), and other construction materials will be decontaminated when exiting the exclusion zone. The volume of decontamination water generated is dependent upon decisions made by the contractor relative to crew size and work tasks. End of project equipment decontamination water must also be managed prior to final demobilization.

4.1.6 Personal Protective Equipment and Other Construction Related Material

Some disposable PPE and other construction related material will be generated during the project. The amounts and types of the material will be dependent on contractor decisions. This material will be drummed and disposed offsite at an appropriate facility.

4.1.7 Final Demobilization Material

There are several waste streams that will be generated only during the demobilization phase. Final demobilization wastes include, but are not limited to: haul road soil, potential stockpile base areas, and decontamination pad material. These materials will be sampled, if required, and if appropriate, will be disposed at an appropriate facility.

5. IRAP Implementation

The permeable cover system response action for the SW Pit will consist of upgrading the existing soil cover system overlying the SW Pit by the addition of common fill and topsoil to create a soil cover that is a minimum of 30-inches thick. All waste encountered during the IRAP implementation or future work will be handled in accordance with this waste management plan. Storm water management/erosion controls will be established as necessary during construction activities. Appropriate controls will be implemented in accordance with the requirements of Section 3.3 and 3.4 discussed below.

5.1 Excavation, Backfilling, and Grading

5.1.1 Clearing and Grubbing

Clearing and grubbing will be performed on an incremental basis and only in areas of active construction. Proper sediment controls will be implemented in all disturbed areas, as necessary, and disturbed areas will be restored as soon as possible after construction is complete. Surface vegetation encountered during clearing and grubbing activities that occur will be managed as clean material, as they have not contacted with the waste material.

5.1.2 Excavation and Backfilling

Prior to excavation activities, the appropriate stormwater controls will be chosen and utilized as described in Sections 3.3 and 3.4 of this document. Proper sediment controls will be implemented in disturbed areas, and disturbed areas will be backfilled and restored as soon as practicable following completion of the excavation activities. Temporary barriers will be constructed as necessary around the perimeter of the excavation. The barriers will be maintained during excavation and in the interim period between the completion of an excavation and backfilling to prevent surface run-off from entering the excavation. Excavated waste materials from under the cover will be managed as described in Section 3.2, Solid Waste.

5.2 Solid Waste

The following sections describe the methods that will be used to manage wastes generated during IRAP implementation and future activities that penetrate the cover system. The CHASP describes establishment of work zones, decontamination area, and recommended work practices if construction activities involve contact with the waste material. Proper personnel, equipment, material control, and management are essential to minimize cross-contamination and protect human health and the environment.

Past source delineation activities at the SW Pit have identified the waste material as predominately wood, wood products, sawdust, charred wood fragments, fibrous wood pieces, and charcoal fragments. Grass clippings and shrub/tree trimmings are also abundant above the waste material.

5.2.1 Waste Material

Handling of solid wastes with constituent concentrations above the Direct Contact Criteria may be required during implementation of the IRAP, or if future excavation takes place to depths greater than 30-inches below land surface. Ifwaste material is removed, it will be contained and transported to an appropriate off-site disposal facility. Future work encountering waste may require actions such as a temporary soil cover or drum containment (of small quantities) while the planning of permanent corrective actions and/or restoration of the cover takes place.

5.3 Stormwater Management

Engineering controls will be established to prevent water run-off and run-on during excavation and construction activities. Containment systems will be deployed as necessary to prevent soils and sediments associated with excavation from reaching stormwater drainage points at the site.

5.4 Construction Stormwater, Sediment, and Erosion Control Practices

Part 91 of the NREPA may require a Soil and Sedimentation Control Permit prior to construction depending on the amount of disturbed soil. Permit requirements and application are the responsibility of the contractor. Functional sediment and erosion controls must be constructed before commencing land disturbance activities. In individual construction areas, controls shall be constructed as soon as practicable after first disturbance of soil. Suggested erosion and sediment control practices include (but are not limited to):

- Sediment traps.
- Silt fences.
- Diversion ditches.
- Check dams.
- Temporary construction entrances.

These controls are designed to prevent erosion of soil during construction activities and to protect stormwater quality after construction is complete. Controls are also in place to trap eroded material before it enters the storm drainage system, and trap sediment before it leaves the site. All controls will be maintained in good condition and inspected periodically. The need for each of the controls will be determined based on the site conditions. Each control is discussed in greater detail in the following subsections.

5.4.1 Silt Fences

Silt fences are used for sediment and erosion control during construction wherever run-off is expected in the form of sheet flow. Specifically, silt fences will be installed around soil stockpiles, along the downslope perimeter of utility trenches, and along the downslope perimeters of construction areas. Silt fences decrease flow velocity and trap sediments where sheet flow conditions exist or where flow is through tiny rills that can be converted to sheet flow. Silt fences will not be used where flow is channelized. The silt fence shall be erected on relatively level ground a minimum distance of five feet from the toe of a slope. The bottom of the silt fences should be buried in the ground a minimum of 6-inches to prevent run-off from passing beneath the fence. Individual panels will be overlapped, and the ends of the silt fences will bend upslope to prevent water from flowing around the fence.

5.4.2 Diversion Ditches

Diversion ditches are used to carry sediment-laden run-off into a control structure or to carry clean run-off away from disturbed areas. The ditches provide permanent run-off control at the site. They are to be constructed on grade and act to intercept and transport channelized flows. Rip-rap check dams constructed along the lengths of the ditches on a regular spacing decrease flow velocity and facilitate settling-out of sediments by dissipating energy. Ditches that are to remain in place for longer than 30 days will be seeded and mulched, weather permitting. Sediment traps collect stormwater run-off from the diversion ditches for removal of soil particles prior to on-site discharge.

5.4.3 Check Dams

Check dams are constructed in diversion ditches to decrease flow velocity and facilitate settling-out of sediments by dissipating energy. The check dams provide run-off control during construction by causing sediment to settle out within the diversion ditches and by minimizing the amount of erosion by water flowing though the ditches. This minimizes the quantity of sediment being delivered to the sediment ponds. Temporary rock check dams may also be constructed in outlet channels to trap sediment that may enter the storm drainage system. A typical check dam is approximately 2 feet high and 2 feet wide at the top. The upslope rip-rap face of the check dams will be covered with 6 inches of washed stone.

5.4.4 Temporary Construction Entrances

Temporary construction entrances will consist of gravel pads constructed of coarse aggregate (2- to 3-inch stone). The pads will be constructed in areas found to have relatively dry, firm soil to minimize the amount of soil or mud that adheres to the truck tires and undercarriages. In this way, the construction entrances will provide temporary soil stabilization during construction. If temporary construction entrances are needed, geotextile fabric shall be placed over the subgrade beneath the pads in wet areas. Truck and heavy equipment traffic will be routed over the pads, minimizing the tracking of soils around and off the site. Trucks will be decontaminated by steam cleaning prior to exiting the site if in contact with waste material. The CHASP describes establishment of work zones and a decontamination area, if waste is encountered.

5.5 Equipment Decontamination

Heavy equipment used in contaminated areas will be decontaminated prior to moving to a clean location and before leaving the site. When decontaminating equipment, the following requirements will be implemented:

- The equipment will be inspected for gross debris.
- After removal of gross debris, the equipment will be steam cleaned using a high-pressure washer (i.e., Hotsy Corporation Hot-Washer Pressure Washer).
- After steam cleaning, the equipment will be allowed to dry and will be reinspected. Any remaining visible debris will be re-cleaned through additional pressure washing.

After any debris is removed, according to the above procedure, the equipment will be released from the decontamination pad for use as necessary in other areas of the site. At the closeout of the activities involving contact with waste material or when a piece of equipment is to be demobilized from the project, the equipment will be given a final decontamination. Equipment will be inspected prior to release from the facility and inspection results will be documented in field logbooks. Decontamination wash water will be collected and sent to either the wastewater treatment plant or treatment/disposal system. The CHASP contains information regarding management of work zones and decontamination.

6. Future Work

Future construction activities, including utility or roadwork, at the SW Pit will follow this WMP and the SW Pit CHASP if there is the possibility of dermal contact with impacted soils/waste materials beneath the cover as a result of the activities. Soil/waste materials that are excavated during future construction activities will need to be managed in accordance with this WMP.

After future construction activities are complete, any portion of the cover that was disturbed will need to be restored to pre-construction conditions. Waste materials encountered will be managed according to Section 3.2.1, Waste Material. The disturbed area will be checked for settlement after construction activities. If settling has occurred, the cover will be inspected for compliance with the specifications for the cover. If the cover does not meet the specifications, it will be re-constructed so that it does.

7. Employee Training

The employee-training program will inform project personnel of the components and objectives of the WMP, and the measures that will be implemented to ensure that these objectives are attained. Training will address each component of the plan, and will inform personnel as to why and how control practices are to be implemented. Topics will include, at a minimum, the following:

- Spill prevention and response.
- Good housekeeping practices.
- Equipment operations training.
- Material management practices.
- Inspection and maintenance of sediment and erosion control practices.

Certain employees will receive initial training at the start of construction and periodic refresher training thereafter, as necessary. Hazardous material training is discussed in the CHASP for the site. However, based on the analytical results of the material sampled at the SW Pit, hazardous materials are not expected to be encountered.

8. Emergency Response

The CHASP contains detailed health related emergency response procedures. A list of emergency contacts and phone numbers is in this WMP as Table F8-1, and a map showing the route from the site to Dickinson County Memorial Hospital is included in this WMP as Figure F8-1. The emergency information is also found in the SW Pit CHASP.

Should fire, explosion, a spill or leak of a hazardous substance, or release of waste or hazardous constituents occur, the contractor is required to contact the appropriate agency for both immediate emergency assistance, and for reporting purposes (if required).

8.1 Spill Prevention and Response

To prevent or minimize the potential for stormwater and groundwater contamination at fueling areas, the following general practices will be implemented:

- Leaks and spills shall be contained and cleaned-up as soon as possible using dry absorbent materials, and leaking equipment shall be removed from the site and repaired or replaced.

9. Implementation

Implementation of this WMP during construction will be the responsibility of the Waste Management person or team as provided by the construction contractor. The Waste Management person or team members shall be properly trained, as discussed in Section 4.0 of this document. A list of objectives and implementation procedures will be developed for each construction task, along with a preliminary task completion schedule. The Waste Management person or team shall also be responsible for ensuring stormwater, sediment and erosion control practices are in place at the appropriate time.

10. WMP Approvals

By their signature, the undersigned certify that this WMP is approved and will be utilized for operations to be conducted under this plan.

Contractor Project Manager	Date
Contractor Waste Management Team Leader	Date

Table

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Table F6-1. **Emergency Phone Numbers and Directions to Dickinson County Memorial Hospital, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.**

Area Code	906
Police Emergency	911
Police Non-Emergency	774-2525
Fire Emergency	911
Fire Non-Emergency	774-1265
Ambulance	911
Beacon Ambulance Service	779-5050
Rescue Squad	911
Dickinson County Sheriff	774-6262
Hospital Emergency	779-4555
Hospital Non-Emergency	774-1313
Poison Control Center	1 (800) 562-9781
Toxic Substances Center	1 (404) 452-4100
for Disease Control (CDC)	1 (202) 554-1404
CDC Hotline	1 (404) 329-2888
Contractor Project Manager	Insert Contact Numbers
Ford Motor Company	
David Miller	1 (313) 322-3761
Kingsford Products Company	1 (708) 728-4328
Daniel Musgrove	
Contractor Corporate Health & Safety	Insert Contact Numbers
Miss Dig	1 (800) 482-7171

Dickinson County Memorial Hospital - South US Highway 2, Iron Mountain, Michigan.

Directions to Hospital:

East on Breitung Avenue to Hydraulic Falls Road. North (left) on Hydraulic Falls Road to US Highway 2 (Stephenson Avenue). South (right) on US Highway 2 for approximately 1 mile to Dickinson Memorial Hospital.

Figures

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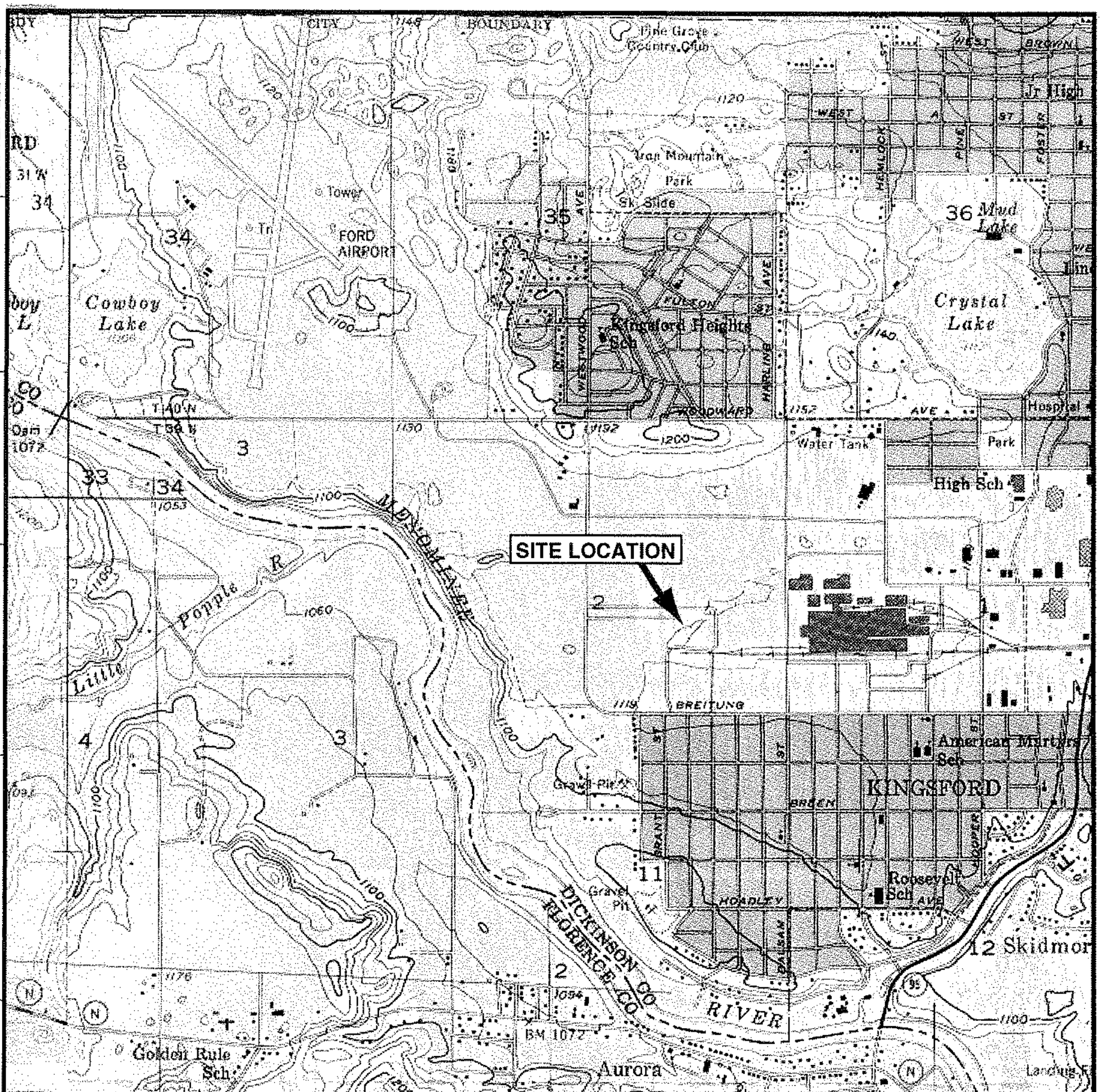
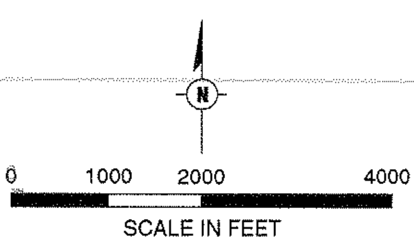
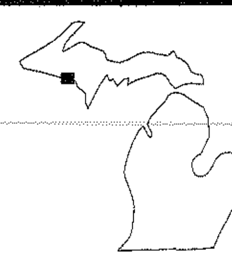


SOURCE: USGS 7.5 Minute Topographic Map, IRON MOUNTAIN, MICHIGAN Quadrangle, 1955 Photorevised 1982





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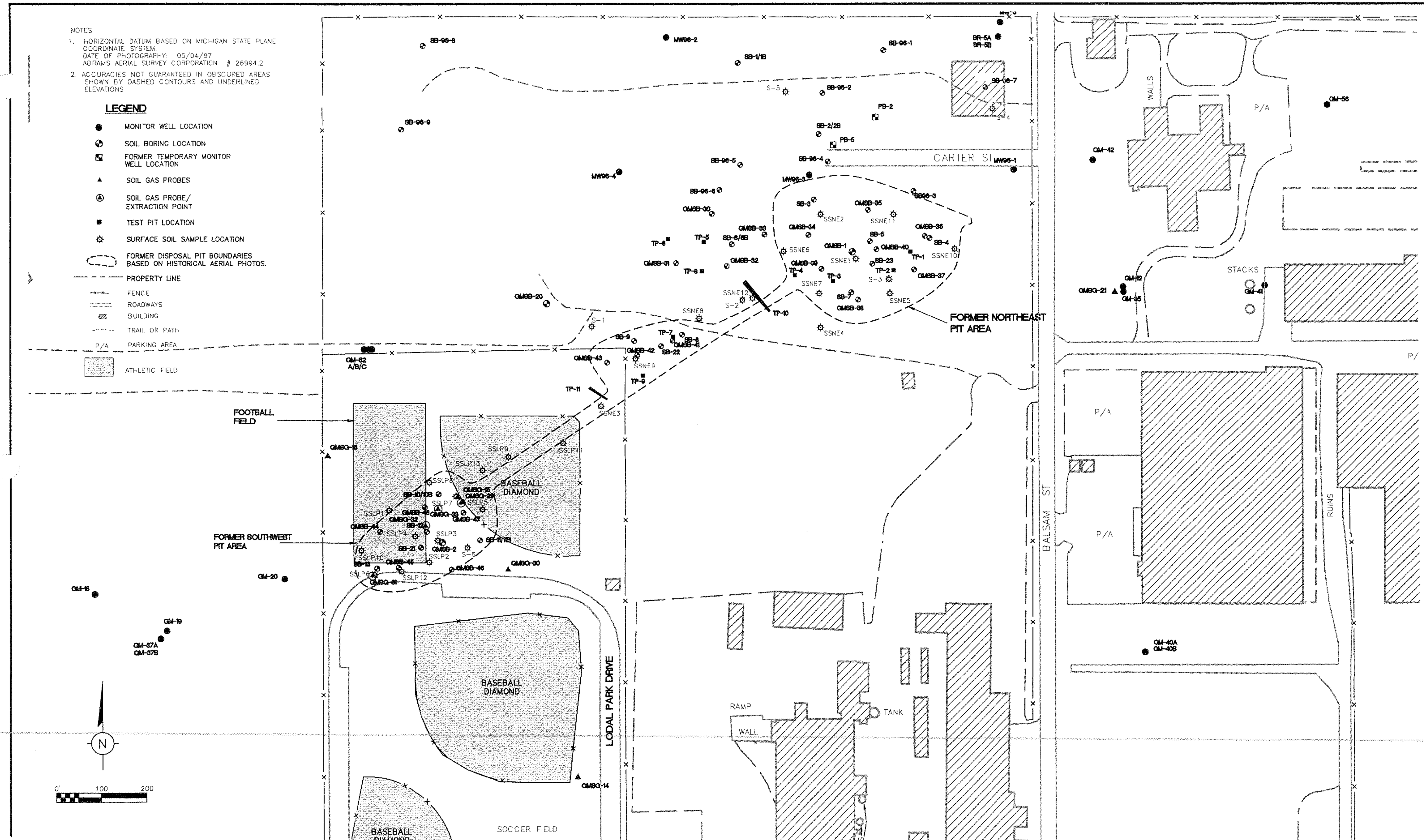
SITE LOCATION MAP

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE

F2-1



NO.	DATE	REVISION DESCRIPTION	BY / CKD

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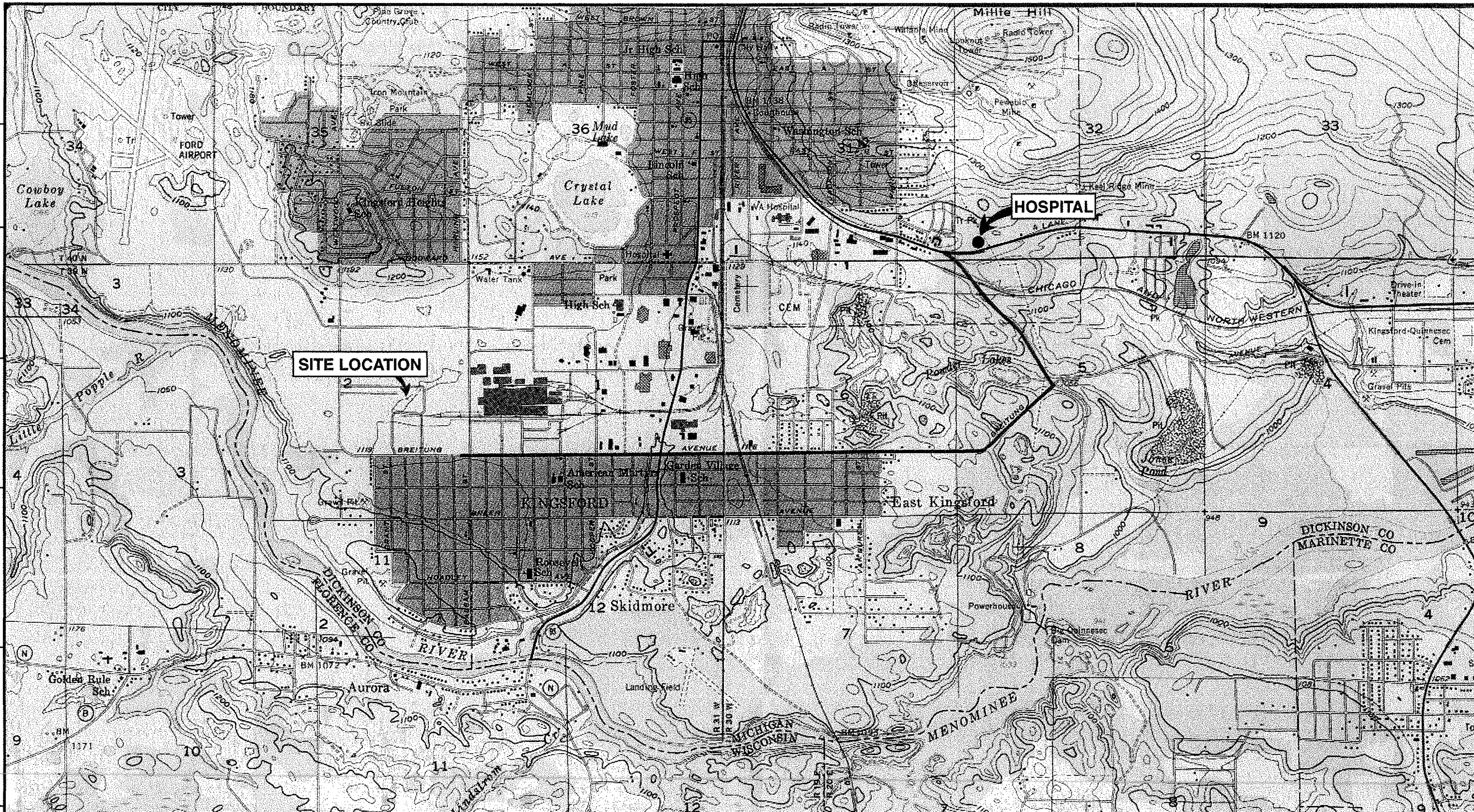
FORMER SOUTHWEST PIT IRAP

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

DRAWN: CES
DATE: 1/10/2002

SITE PLAN VIEW

PROJECT MANAGER: EC
DEPARTMENT MANAGER: BE
LEAD DESIGN PROF.: BE
CHECKED: BE
PROJECT NUMBER: WI00950.0005
FIGURE: F2-2



SOURCE: USGS 7.5 Minute Topographic Map, IRON MOUNTAIN, MICH.-WIS. Quadrangle, 1955, Photorevised 1982

Route to Hospital: East on Breitung Avenue to Hydraulic Falls Road.
North on Hydraulic Falls Road to U.S. Highway 2 (Stephenson Avenue).
South on U.S. Highway 2 to Dickinson County Memorial Hospital.

N

0 2000 4000 8000
SCALE IN FEET

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ROUTE TO HOSPITAL

FORMER SOUTHWEST PIT AREA
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE
F6-1

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APPROVED:
CHECKED: WLM
DRAWING: ROUTE_2.AI
FILE NO.: GRAPHICS
PN: FORDWI0637.2003
DWG DATE: 12FEB03

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Appendix G

Operation and Maintenance (O&M) Plan

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Appendix G
Former Southwest Pit IRAP Operation and Maintenance Plan

Ford/Kingsford Site,
Kingsford, Michigan

Table

Figures

Attachments

1. Introduction

This Operation and Maintenance (O&M) Plan has been prepared for the Former Southwest Pit Area (SW Pit) located at the Ford/Kingsford Site in Kingsford, Michigan. The O&M Plan describes the strategy for maintaining the integrity of the permeable cover and operation of the soil vapor extraction (SVE) system implemented in accordance with the Interim Response Action Plan (IRAP) for the SW Pit. This O&M Plan is an appendix to the SW Pit IRAP.

The primary focus of the SW Pit IRAP is to prevent direct contact with waste materials, except under controlled conditions, and allow future use of the present area overlying the SW Pit. The SW Pit IRAP includes the use of a permeable cover system, operation of a soil vapor extraction system, and creation of a restrictive conenant/institutional controls. Additional details are provided in the SW Pit IRAP.

2. Objectives

The objectives of this O&M Plan are to:

- Describe procedures for maintenance and monitoring of the permeable cover system at the SW Pit.
- Describe procedures for maintenance and monitoring of the SVE system at the SW Pit.
- Identify contingency plans regarding failure of the permeable cover and SVE system.

This plan is prepared to describe maintenance procedures for the permeable cover and SVE system, to maximize the effectiveness of the SW Pit IRAP. Implementation of the O&M Plan will assist in achieving the following objectives:

- Promote drainage and minimize erosion or abrasion of the cover system.
- Verify that the methane recovery system is functioning, as designed, to prevent off -site migration of methane gas from the SW Pit area.

Elements of this O&M Plan address the following:

- Site Background.
- Performance and Compliance Monitoring Program.
- Contingency Plan.
- Reporting Requirements.

3. Site Background

3.1 Site Description

The City of Kingsford is located in southwestern Dickinson County, in the western part of Michigan's Upper Peninsula. The City is bounded by the Menominee River on the west and south, by the City of Iron Mountain on the north, and Highway M-95 (Carpenter Avenue) to the east. The SW Pit (center point) is located approximately 1,100 feet north of Breitung Avenue and approximately 1,500 feet west of Balsam Street in the central portion of the city as shown on Figure G3-1. A plan view of the SW Pit Area is shown on Figure G3-2.

3.2 Site History

Aerial photographs and historic records indicate that disposal at the SW Pit occurred since the 1920s. Wood pieces, wood sawdust, wood bark chips, and charcoal were reportedly disposed of in the SW Pit, along with industrial waste and wastewater containing dissolved organics from pyrolysis processes. Aerial photographs show continued disturbances to the surface of the area and disposal from unidentified sources to at least 1981.

3.3 Interim Response Action Summary

The primary focus of the SW Pit IRAP is to prevent direct contact with waste materials, except under controlled conditions, and allow future use of the present area overlying the SW Pit. The SW Pit IRAP includes the use of a permeable cover system, operation of a soil vapor extraction system, and creation of institutional controls. Additional details are provided in the SW Pit IRAP.

4. Performance and Compliance Monitoring Plan

Routine care of the cover and SVE systems is required as part of the SW Pit IRAP. Maintenance of the permeable cover and O&M of the SVE system according to this O&M Plan will ensure satisfactory performance of the interim response action for the SW Pit.

4.1 Maintenance of the Existing Surface Cover

On-site care for the cover will include visual inspection of the area to identify disruptions of the surface cover, maintenance of the cover (dependent on the results of inspection), maintaining vegetation of the surface cover and adjacent areas, maintenance of improved surfaces (such as the baseball field and football field) that are part of the SW Pit, and erosion control.

4.1.1 Inspection

On-site inspection activities will be conducted to perform and document the activities identified in this O&M Plan. A site logbook will be maintained containing site visits, corrective action forms submitted, and any corrective actions taken. The appearance of the surface cover and SVE system will be recorded on a standard inspection form. For each inspection, forms will be used to record findings, unusual conditions, and corrective actions taken. An example of the inspection form and the Corrective Action Form is included in Attachment A. The example inspection form may change in format throughout the O&M period, however the general content will remain the same. Conditions requiring corrective action will be rectified and the repair will be documented on a Corrective Action Form. Table G4-1 summarizes the specific O&M activities and frequencies.

4.1.2 Erosion Prevention

Much of the SW Pit area has existing vegetation. The football field and baseball diamond have finished surfaces and grass, and the areas northeast of the baseball diamond and south of the recreation area are vegetated with grass and native plants. Vegetation will be re-established on those areas that are disturbed during implementation of the SW Pit IRAP. Erosion control will entail the confirmed maintenance of these surfaces, as required, to prevent breakdown or erosion.

Periodically, the permeable cover may be inspected following a period of heavy rain to observe the pattern of stormwater flow. Inspections may also be conducted after extreme weather events (e.g., tornadoes, 10-year/24-hour precipitation events).

Inspections of the permeable cover and its drainage features will include, but not be limited to the following: obstructions to stormwater flow, erosion, excessive siltation or debris, and inadequate vegetation. Should any vegetated area show significant washout or gullying (greater than 4 inches), the eroded area will be filled when the weather conditions permit or within 30 days, whichever occurs first. If results of the permeable cover inspection indicate that drainage patterns have changed resulting in ponding or excessive run-off, the affected area will be appropriately repaired to re-establish correct flow direction. Any sediment accumulation in the drainage system will be removed. If greater than 20 percent of the planned vegetated surface is devoid of vegetation, the area will be re-vegetated as weather conditions permit. If recreational surfaces show visible signs of breakdown, they will be repaired consistent with their design.

Steps will be taken to verify that drainage pathways are maintained throughout the O&M period. Vegetation shall be mowed at least annually at the cover perimeter during the growing season. Appropriate fertilizer application suitable for the finished surface, will be applied annually to maintain healthy vegetation and the intended surface barrier. Baiting for rodents and treating for burrowing animals will also be administered, if the need is observed during inspection.

4.1.3 Cover Effectiveness

As stated previously, the purpose of the response action is to prevent contact with subsurface waste material and to prevent off site migration of methane gas. The cover and SVE system provide this protection, when properly maintained and operated.

4.1.4 Maintenance Schedule

Inspections of the permeable cover will be performed annually (inspections may also be performed after extreme weather events). Active maintenance will be performed as necessary based on the observations reported during inspections of the surface cover.

4.2 O&M of the Soil Vapor Extraction System

Monitoring of the SVE system will include recording pertinent system operating data, such as wellhead vacuum readings at the vapor extraction points and at surrounding monitoring points, system airflow rate, and combined effluent methane concentration. These topics are discussed in further detail in the subsequent section. A layout of the SVE system extraction wells, piping, and equipment shed is presented on Figure G4-1.

4.2.1 O&M

O&M of the SVE system will include visual inspection of the SVE extraction wells and equipment shed, maintenance and troubleshooting of the treatment equipment, and obtaining and recording pertinent system data. The SVE system inspection and operating data will be recorded in the site logbook. This data will be used to track the SVE system efficiency and methane concentrations. Operational data will be recorded on a standard O&M form as provided in Attachment B, and include the following information:

1. Collect a system influent and effluent air sample for screening with a flame-ionization detector and a Lantech GA-90 Gas Analyzer (made by Landfill Control Technologies Corporation), or equivalents. Record the percentage of methane, carbon dioxide, and oxygen in the vapor stream.

2. Record pressure readings and percentage of methane, carbon dioxide, and oxygen at the four vapor extraction points (GMSG-29, GMSG-31, GMSG-32, GMSG-33) and at surrounding vapor-monitoring points (GMSG-14, GMSG-15, GMSG-16, GMSG-30).

3. Record the combined system effluent air flow rate.

4. Drain the moisture separator during each site visit and record the number of gallons obtained from the totalizing flowmeter at the moisture separator drain line.

5. Perform preventative maintenance on equipment, as needed.

The O&M Plan may be amended if any changes in the design, implementation of the selected interim response action, or other events occur during the O&M period that affects the monitoring requirements. Changes to the O&M Plan will require approval from the Michigan Department of Environmental Quality (MDEQ).

4.2.2 Maintenance and Monitoring Schedule

Monitoring of the SVE system will be performed monthly during periods of operation. Maintenance of the SVE system will occur annually or as needed to maintain system operation.

5. Contingency Plan

In the event it is determined that the surface cover or SVE system has failed, specific actions are necessary. This section provides direction regarding this potential in two sections, Contingency Plan -Response, and Contingency Plan - Procedures.

5.1 Contingency Plan – Response

Potential incidents that will require a contingency plan response include (1) release of waste and (2) the SVE system not controlling off site migration of methane gas in the unsaturated soil.

It has been demonstrated that the existing SVE system prevents methane gas in the subsurface in the vicinity of the SW Pit from migrating off site. Therefore it minimizes the possibility of the presence of methane gas that could accumulate in a confined structure located off site. The contingency plan would be to expand or modify the existing SVE system if it is determined that the SVE system was no longer preventing off site migration of methane gas from the SW Pit.

The permeable cover system over the SW Pit will have a minimum thickness of 30-inches. If unauthorized excavation activities extend through the cover system, waste/fill materials will likely be encountered. The potential routes of exposure include direct contact and inhalation of soil particulates and vapors. Restoration procedures will include replacing and compacting surface soil, to retain the cover system. Restoration activities will be preformed in accordance with the Waste Management Plan and Construction Health and Safety Plan that will be incorporated into the restrictive covenant. Additionally, dust suppression activities will be implemented, if necessary, to mitigate dust generation. Site workers will be trained and equipped with Personal Protective Equipment to prevent direct contact with the waste/fill. The area will be closed to the public until restoration activities are completed.

5.2 Contingency Plan – Procedures

Should there be physical or analytical evidence that the cover system has failed, activities will be undertaken to restore the integrity of the existing cover system including placement of additional clean fill to provide a protective barrier on top of the subsurface waste materials.

5.3 Identification of Hazardous Materials and Assessment of Possible Hazards

The materials that could potentially be released are impacted soil and waste, and vapors. The possible hazards associated with these materials are minimal, but include direct contact and inhalation of contaminated soil particulates. Based on the analytical results of the material sampled at the SW Pit, hazardous waste and vapors are not expected to be encountered.

5.4 Assessment and Control Procedures

In the unusual event of a release as a result of failure of the cover system, appropriate containment procedures and repairs would be implemented immediately. The City of Kingsford or their designee will take whatever measures are necessary to mitigate the release and provide a protective cover over waste material.

6. Reporting Requirements

6.1 Records Retainage

Ford/KPC or their designee shall manage the O&M records, which shall be maintained for a minimum of 3 years.

6.2 O&M Records

O&M activities for the cover system will be recorded in the appropriate logbook or computer database. Notations will be made when the cover system or SVE system is inspected, engineering measurements are taken, maintenance conducted, and when corrective measures are implemented. As indicated, inspection forms are included in Attachment A and B of this report. Corrective action forms will be completed upon completion of the corrective measures.

6.3 Reporting

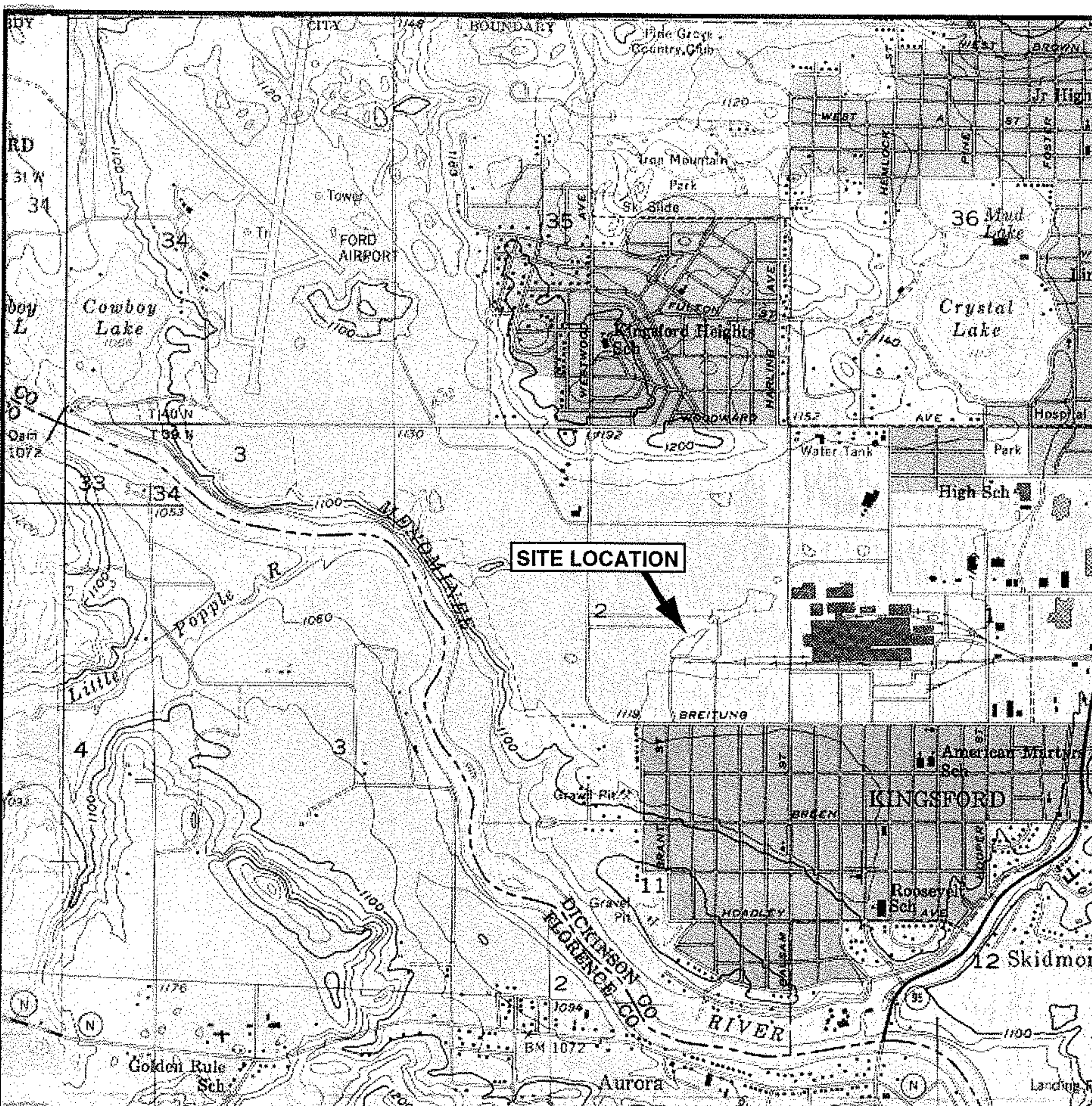
Records of inspection activities will be made available for review by the MDEQ at any time.

Table

Table G4-1. Facility Inspection Activities, Former Southwest Pit IRAP, Ford/Kingsford Site, Kingsford, Michigan.

Item	Operational Action or Type of Problems	Frequency of Inspection	Circumstance or Trigger Level (if applicable)	Corrective Action
Cover Vegetated/ Grade	Drying grass	Annually	Visual evidence	Apply fertilizer on grass and develop watering plan to allow for growth.
	Overgrowth of vegetation.	Annually	Visual evidence	Mow grass or remove unwanted vegetation.
	Erosion damage	Annually	Greater than 2 tons/acre/year erosion.	Repair and revegetate.
	Slumping or cracking in vegetative layer.	Annually	Visual evidence of discontinuity of surface by way of depressions or cracks.	Evaluate and prepare corrective action plan and submit to MDEQ.
	Rodents and burrowing animals.	Annually	Evidence of rodents or burrowing animals.	Remove animals by acceptable means.
	Baseball Diamond surface inspection.	Annually	Visual evidence of excessive wear or break in surface construction.	Evaluate and prepare corrective action plan and submit to MDEQ.
	Football Field surface inspection.	Annually	Visual evidence of excessive wear or break in surface construction.	Evaluate and prepare corrective action plan and submit to MDEQ.
Cover Perimeter Outlet/ Stormwater Drainage System	Erosion, obstructions to flow, deterioration, excessive siltation, inadequate protective vegetation.	Annually	Any obstructions to flow; silt buildup in excess of 50% of design freeboard; greater than 20% of area devoid of vegetation.	Remove obstruction and/or silt. Revegetate as required.
Soil Vapor Extraction System	Normal O&M.	Annually	Scheduled O&M	Normal O&M or troubleshoot the system. Evaluate and prepare corrective action plan and submit to MDEQ.

Figures



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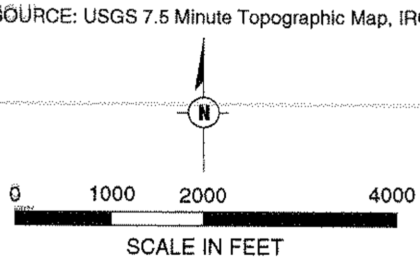

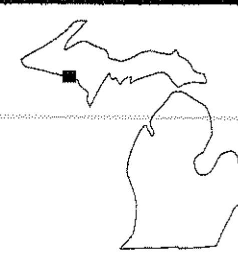

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SITE LOCATION MAP

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE

G3-1

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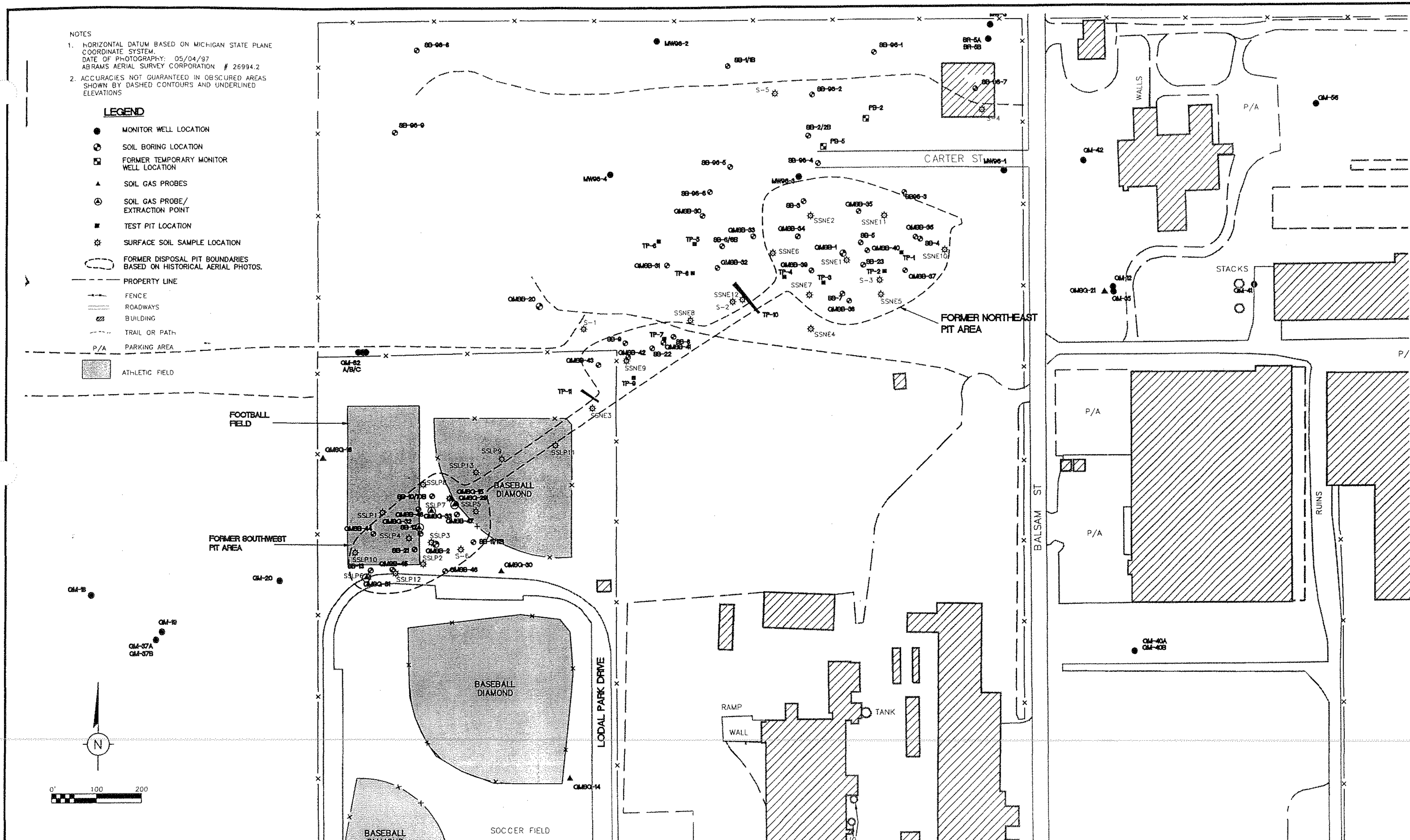

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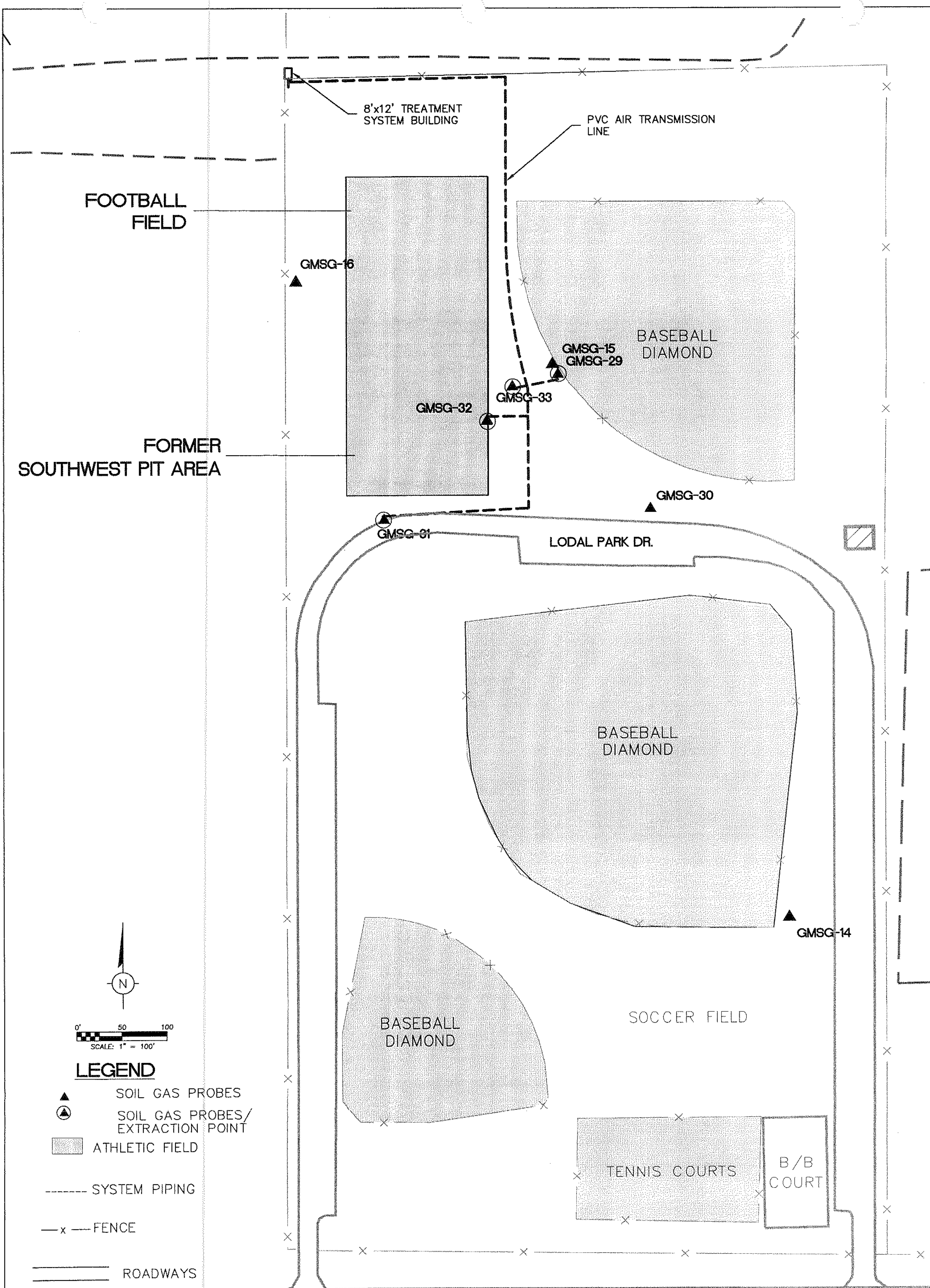
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

FORMER SOUTHWEST PIT IRAP

FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

SITE PLAN VIEW

DRAWN	DATE	PROJECT MANAGER	DEPARTMENT MANAGER
CES	1/10/2002	EC	BE
		LEAD DESIGN PROF. BE	CHECKED BE
		PROJECT NUMBER WI00950.0005	FIGURE G3-2



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ARCADIS GERAGHTY & MILLER
14497 North Dale Mabry Hwy., Suite 115
Tampa, Florida 33618
Tel: 813/961-1921 Fax: 813/961-2599

DATE 01/10/2002	PROJECT MANAGER BZ	PROJECT OFFICER EC
DRAWN CES	LEAD DESIGN PROF. BZ	CHECKED BZ
CADD FILE NAME G4-1	PROJECT NUMBER W00804.0001	

SOIL VAPOR EXTRACTION SYSTEM PIPING

FORMER SOUTHWEST PIT IRAP
FORD/KINGSFORD SITE
KINGSFORD, MICHIGAN

FIGURE NUMBER
G4-1

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Attachment A

Example Inspection Form and
Corrective Action Form

Example Inspection Form
Surface Cover
Former Southwest Pit IRAP
Ford/Kingsford Site, Kingsford, Michigan.
(Page 1 of 2)

Functional Group Assigned This Inspection Duty: ________________________
Inspector's Name: ____
Date of Inspection: ____
Time of Inspection: ____

Note: Perform this inspection annually and after extreme weather events to inspect erosion.

Inspection Checklist

1. Cover: Walk the entire cover and perimeter.

   - Are there dried grass spots or dead native plants on the vegetated surface cover?______________________
   - Are there any signs of uneven surfaces (depressions or bumps)? ________________
   - Are there any signs of excessive erosion of cover vegetated area? ___________________________
   - Are there any deep-rooted or woody plants established on the cover or at the perimeter?________________
   - Are there any signs of burrowing animals?__________________________
   - ___________________% of area devoid of vegetation.

2. Settlement or subsidence:

   - Are there any physical signs of settlement or subsidence? ______________

Date of Inspection: ____________________

Surface Cover
Former Southwest Pit IRAP
Ford/Kingsford Site. Kingsford, Michigan.
(Page 2 of 2)

3. Cover Stormwater Management Features

   Walk the cover stormwater management features.

   - Is there evidence of erosion? ____________________
   - Does silt accumulation prevent run-off? ____________________
   - Are there signs of ponding? ____________________

4. Any cover deficiencies? ____________________
   ____

5. Comments: ____________________
   ____
   ____

6. Cover system functioning as intended? ☐ Yes ☐ No

7. Corrective Action Required (Complete Corrective Action Form): __________
   ____
   ____
   ____

8. Inspector's Signature: ____________________

Send completed form to Ford/Kingsford for required records maintenance.

Date of Inspection: ______________________

Example Corrective Action Form
Former Southwest Pit IRAP
Ford/Kingsford Site, Kingsford, Michigan

Report Number: ______________________
Date of Initial Inspection: ______________
Name of Inspector: ____________________

Note: If Corrective Action cannot be completed within 60 days of the Initial Inspection Date, a Corrective Action Plan must be prepared and maintained in the operating record.

Corrective Action Work Order

Type of problem: ____

____

Required upgrade: ____

____

Corrective action assigned to: ______________________________ ____________

Name Date

Corrective Action Completion Report

Received on: _________________________ By: ____________________________
Completed on: ____
Comments: ____

____

By: ____ ____________

Name Date

Reinspection Report

Observations: ____

____

Comments: ____

____

Inspector: ____

Signature Date

Send completed form to Ford/Kingsford for required records maintenance.

Attachment B

Example Operation and Maintenance Field Form

Example Operation and Maintenance Field Form
Soil Vapor Extraction (SVE) System
Former Southwest Pit IRAP
Ford/Kingsford Site, Kingsford, Michigan

SVE System Operating Data

Record the following SVE system data.

Was the system operating upon arrival?		
System effluent air flow rate		cfm
Pressure at Blower (vent side)		in. H_2O
Vacuum at Blower (suction side)		in. H_2O
Was the system operating upon departure?		

Sample Point	Pressure (in. H_2O)	Flow (cfm)	CH_4 * (%)	CO_2 * (%)	O_2 * (%)
System Influent (vacuum)					
System Effluent (pressure)					

Vacuum Influence Data

Record the following soil probe data.

Sample Point	Vacuum (in. H_2O)	Flow (cfm)	CH_4 * (%)	CO_2 * (%)	O_2 * (%)
GMSG-14					
GMSG-15					
GMSG-16					
GMSG-29					
GMSG-30					
GMSG-31					
GMSG-32					
GMSG-33					

Record the number of gallons collected at the moisture separator (totalizing flowmeter). ____________ gallons

* Readings to be taken with a Lantech GA-90 Gas Analyzer, or equivalent.