LIST OF ACRONYMS

ACM	Asbestos-containing materials
AHI	Atwell-Hicks, Inc.
AMSL	Above mean sea level
AOC	Area of concern
APT	Above-ground process tanks
AST	Above-ground storage tank
BBL	Blasland, Bouck & Lee, Inc.
BDL	Below detection limit
bgs	Below ground surface
BLS	Below land surface
BTEX	Benzene, Ethyl benzene, Toluene, and Xylene
CAP	Corrective Action Plan
CAS	Chemical Abstract Service
CAT	Complete Auto Transit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm/s	centimeters per second
CRA	Conestoga-Rovers & Associates
CVO	Company Vehicle Operations
DAI	Direct Aqueous Injection
DCE	Dichloroethene
DCV	Direct Contact Values
DEC	Description of Existing Conditions
DPCA	Defense Plant Corporation of America
DQO	Data Quality Objectives
DWSD	Detroit Water and Sewer Department
E&E	Ecology and Environment
ECDC	East Carbon Development Corporation
ECI	Environmental Compliance, Inc.
EE/CA	Engineering Evaluation/Cost Analysis
ELPO	Electrodeposition Painting Operation
EOC	Extent of Contamination
EP	Extraction Procedure
ERD	Environmental Response Division
ESA	Environmental Site Assessment
ESI	Environmental Site Investigation
FAR	Final Assessment Report
FIT	USEPA Field Investigation Team
FOIA	Freedom of Information Act
FOW	Fons and Old Wayne
GB	Geoprobe Boring
GC	Gas Chromatograph
GCC	Groundwater Contact Criteria
GE	General Electric
GM	General Motors Corporation
GMAD	General Motors Assembly Division
GMRES	General Motors Research Division
GMWFG	General Motors Worldwide Facilities Group
gpd	gallons per day

LIST OF ACRONYMS

gpm	gallons per minute
GPR	Ground Penetrating Radar
GSI	Groundwater/surface water interface
GW	Geoprobe Well
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HRS	Hazardous Ranking System
HWMU	Hazardous Waste Management Unit
IPT	In-ground process tanks
KF	Kaiser-Frazer Company
LES	Laidlaw Environmental Services
LNAPL	Light Non-Aqueous Phase Liquid
LUST	Leaking underground storage tank
MCD	Mid-size Car Division
MDEQ	Michigan Department of Environmental Quality
MDL	Method Detection Limit
MDNR	Michigan Department of Natural Resources
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MPS	Michigan Pumping Service
MW	Monitoring Well
NAO	North American Operations
ND	Non-Detect
NHANES	National Health and Nutrition Examination Survey
NPDES	National Pollution Discharge Elimination System
NREPA	Natural Resources and Environmental Protection Act
OBG	O'Brien & Gere
OM	Operational Memorandum
OVA	Organic Vapor Analyzer
P.A.	Public Act
PA	Preliminary Assessment
PA/VSI	Preliminary Assessment/Visual Site Inspection
PAH	Polynuclear Aromatic Hydrocarbons
PAOC	Potential Area of Concern
PCB	Polychlorinated Biphenols
PCE	Tetrachloroethene
PID	Photoionization Detector
PNA	Polynuclear Aromatic Hydrocarbons
POTW	Publicly Owned Treatment Works
ppb	parts per billion
PRC	PRC Environmental Management, Inc.
PRG	Preliminary Remediation Goals
PSIC	Particulate Soil Inhalation Criteria
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance Quality Control
QAPP	Quality Assurance Project Plan
R&D	Research and Development
RA	Remedial Action
RAP	Remedial Action Plan
RBCA	Risk-Based Corrective Action

LIST OF ACRONYMS

RBSL	Risk-based Screening Levels
RCRA	Resource Conservation and Recovery Act
RDT	Regional Decision Team
RNA	Remediation by Natural Attenuation
SAA	Satellite Accumulation Areas
SACM	Superfund Accelerated Cleanup Model
SB	Soil Boring
SI	Site Investigation
SIC	Soil Inhalation Criteria
SOP	Standard Operating Procedures
SVOC	Semi-Volatile Organic Compounds
SWMU	Solid Waste Management Unit
SWP	Soil Water Partitioning
SWQD	Surface Water Quality Division
TAL	Target Analyte List
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leachate Procedure
TGI	The Traverse Group
TPH	Total Petroleum Hydrocarbons
tpy	tons per year
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage and Disposal Facility
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USPCI	United States Pollution Control, Incorporated
UST	Underground Storage Tank
USTD	Underground Storage Tank Division
VOC	Volatile Organic Compounds
VOH	Volatile Organic Halocarbons
VSI	Visual Site Inspection
VSIC	Volatile Soil Inhalation Criteria
WFG	Worldwide Facilities Group
WMD	Waste Management Division
WR	Willow Run Facility
WRC	Willow Run Creek
WRCG	Willow Run Creek Group
WRCS	Willow Run Creek Site
WRSL	Willow Run Sludge Lagoon
WWTP	Wastewater Treatment Plant
XRF	X-ray Fluorescence
YCUA	Ypsilanti County Utility Authority
YDN8	Ypsilanti Drain Number 8
μg/dl	micrograms per deciliter
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
μg/cm^2	micrograms per 100 square centimeters

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ATTACHMENT 1

1. Introduction

1.1 General

The purpose of this Description of Existing Conditions (DEC) Report is to comprehensively describe current and historical environmental issues associated with the General Motors Corporation (GM) Former Willow Run Plant Property (Willow Run). The portion of the original parcel formerly occupied by the Willow Run Assembly plant, a 126-acre property located at 2625 Tyler Road, Ypsilanti Township, Washtenaw County, Michigan has been sold. GM retains the southeast portion of the original parcel, currently occupied by Company Vehicle Operations (CVO), located at 2901 Tyler Road. The site location is shown in Figure 1-1. The site plan is shown in Figure 1-2.

1.2 Overview

The information presented in this report is based on the results of environmental site assessments of a parcel of real property. These environmental assessments were conducted with respect to petroleum products and hazardous substances as defined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Part 201 of Natural Resources and Environmental Protection Act (NREPA) using good commercial and customary practices. An appropriate level of inquiry was conducted through review of available records and performance of site reconnaissance, including the following sources:

- Environmental files, records, photographs, and engineering drawings at the facility and in corporate files at the GM Worldwide Facilities Group (WFG) - Environmental and Regulatory Support - Remediation office in Detroit, Michigan;

- Environmental files, records, photographs, and engineering drawings supplied by consultants who have performed extensive assessment, investigation, and remedial activities in the areas on and surrounding Willow Run;

- A review of regulatory agency files including Michigan Department of Environmental Quality (MDEQ), and County of Washtenaw offices including Metropolitan Planning Commission, Environmental and Infrastructures, and Equalization and Property Description offices;

- Reviews of historical photographs of the site and surrounding area found at Willow Run and WFG offices, the U.S. Department of Agriculture, Soil Conservation Services, Yankee Air Museum, and County of Washtenaw offices including Metropolitan Planning Commission and Equalization and Property Description offices;

- Interviews conducted with plant personnel involved with historical operations at the property, and with former employees with knowledge of the property; and

- Previous investigations and studies conducted at the site.

Environmental work conducted at Willow Run identified the following issues:

- Originally, as part of the sale of the assembly plant, Chester Environmental (Chester), in 1995; performed an environmental assessment and identified 15 potential areas of environmental concern (PAOCs), which

included three former Underground Storage Tank (UST) sites (two on the assembly plant and one at the CVO Property);

- Three former UST sites are currently being addressed under Michigan's Leaking Underground Storage Tank Act, Public Act 451, Part 213 (formerly known as Public Act 478 of 1988). The data findings are summarized in this DEC report for informational purpose where appropriate;

- Subsequent to the original findings, four additional PAOCs were identified, two on the assembly plant property identified during facility deactivation, and two on the CVO property that were not identified by Chester because the CVO property was not part of Chester's assessment because the CVO property was not for sale;

- The US Environmental Protection Agency (USEPA) conducted a Preliminary Assessment/Visual Site Inspection (PA/VSI) through a subcontractor, PRC Environmental, Inc. (PRC) and issued a report in November 1992. The PA/VSI identified eight Solid Waste Management Units (SWMUs) and two Areas of Concern (AOC);

- PAOCs #10 and #11, Tyler Pond and Former Fire Pump House, respectively, are being addressed as part of the Willow Run Creek Site (WRCS) cleanup under the amended Consent Judgement No. 95-79987-CE with the State of Michigan Attorney General's Office and MDEQ.

PAOCs identified at Willow Run include:

1. Former WWTP Lagoon Subsurface Soil
2. Former South Culvert Area
3. North Elevator Pit
4. Former Leaking UST Piping System
5. ELPO Tank Building Area
6. Former Aeration Basin
7. Former Kaiser-Frazer Cinder Storage Area
8. Research and Development (R&D) Remediation Site
9. Former North Tank Farm Area
10. Tyler Pond
11. Former Fire Pump House

Four PAOC locations potentially contain USTs:

12. Potential UST Location (one 20,000-gallon and two 50-gallon tanks associated with the former Haulaway Building)
13. Potential UST Location (three 12,000-gallon tanks located at Dock "P")
14. Potential UST Location (two 1,000-gallon tanks associated with the former company car garage)
15. Potential UST Location (1,000-gallon tank in Foam Storage Building)

Two PAOCs identified during facility deactivation:

16. South Hydraulic Elevator Pit
17. Pit 117

Three PAOCs identified on the CVO property:

18. Kaiser-Frazer Dump Area
19. VOH Plume at CVO Property
20. Former CAT Site VOC Plume

Figure 1-3 is a site map showing the locations of SWMUs, AOCs, and PAOCs.

1.3 Purpose

In February 1995, the Willow Run Creek Group (WRCG), including GM, Ford Motor Company, Wayne County, Ypsilanti Township, Ypsilanti Community Utilities Authority, and the University of Michigan, entered into a Consent Judgement with the State of Michigan to implement a response activity at Tyler Pond, the Willow Run Sludge Lagoon (WRSL), Edison Pond, and all connecting watercourses from the inlet to Tyler Pond to the Outlet of Edison Pond including Ypsilanti Drain No. 8, all known as the Facility. Section III.3.1(e) requires that GM and Wayne County submit a schedule to evaluate the necessity of response activities, if any, at additional areas identified in the Engineering Evaluation/Cost Analysis (EE/CA) dated September 30, 1994, pursuant to state law. These additional areas include portions of the South GM Pond (west of GM Powertrain Facility), GM Assembly Plant Property, and the Airport Landfill. This DEC Report serves as a description of condition at the GM Assembly Plant Property, only. Upon submittal and review of this document by the MDEQ, a schedule of necessary response activities, if any, will be submitted to the MDEQ.

1.4 Report Organization

This report is organized into seven sections. Section 2 presents the facility description, site history, environmental setting, and summarizes environmental permits. Section 3 discusses the Resource Conservation and Recovery Act (RCRA) regulatory history and the eight SWMUs identified in the PA/VSI report. Section 4 summarizes UST investigations performed during the environmental assessment process and leaking UST (LUST) under Part 213 of P.A.451 and previously reported to MDEQ Underground Storage Tank Division (USTD) in the Jackson District Office. Section 5 describes investigations of PAOCs identified in The Phase I Environmental Site Assessment [(ESA), Chester, 1995] and by others. Section 6 discusses approaches to developing site-specific cleanup goals. Section 7 is the report summary.

2. Property Description and History

2.1 Property Description

The subject Willow Run parcel consists of the former Willow Run Assembly Plant, located at 2625 Tyler Road, and the CVO property, located at 2901 Tyler Road, in Ypsilanti Township, Washtenaw County, Michigan. The site is zoned for industrial-commercial use, and is designated by the federal government as a free trade zone. The site location is shown in Figure 1-1. The subject site includes the former Assembly Plant property and the present location of the CVO property. The former assembly plant property was addressed by the Phase I ESA, (Chester, 1995), and subsequently by investigations conducted by Blasland, Bouck & Lee, Inc. (BBL). The portion of the facility addressed by these reports is bordered on the north by GM's Hydra-Matic Powertrain Facilities, on the west by the Willow Run By-Pass and a residential subdivision, on the south by Tyler Road, and on the east by the CVO property (formerly known as the Complete Auto Transit [CAT] Site).

The CVO property is bordered on the south by Tyler Road, the west and northwest by the Assembly Plant property, and on the east and north by Tyler Pond, a water body formed by damming a portion of the Willow Run Creek. Investigations at the CVO property include a Phase I Hydrogeological Investigation (1994, O'Brien & Gere) of a former UST farm, a Final Assessment Report (FAR) for the tank farm, delineation of a chlorinated solvent plume (Section 5.13) and a Phase III Extent of Contamination (EOC) study at the former Kaiser-Frazer Dump Area.

Structures currently located at the Willow Run facility include: the assembly building, a storm-water retention basin, a maintenance building, a railroad shipping building, and an attached Electrodeposition Painting Operation (ELPO) Tank Building. The assembly building has a total floor space of 2.1 million square feet. Support systems include a power house, wastewater pre-treatment plant, storage structures, paved access roads, railroad spurs and parking lots. An approximate 33,750 square-foot building used for company vehicle distribution and service is present on the CVO property.

2.1.1 Legal Description

The composite description of the GM Assembly Division Willow Run Plant Property (including the CVO property) for compliance with the Construction Lien Act of 1980 (Public Act 497) Ypsilanti Township, Washtenaw County, Michigan is:

> Part of the South ½ of Section 12, T, 3S, R 7E, Ypsilanti Township, Washtenaw County, Michigan, being more particularly described as follows: Beginning at a point on the South line of Section 12, T.3S., R7E, said point South 87 degrees 46 minutes 05 seconds West as measured along the South line of said Section 12, a distance of 935.33 feet from the Southeast corner of said Section 12; Proceeding thence from said point of beginning South 87 degrees 46 minutes 05 seconds West along the South line of said section, said line being also the centerline of Tyler Road, South 87 degrees 30 minutes 10 seconds West, a distance of 1500.79 feet to a point; thence North 00 degrees 01 minute 10 seconds West, a distance of 60.06 feet to a point on the Easterly line of the Willow Run Expressway (width varies); thence along the Easterly line of said Willow Run Expressway, the following courses and distances, North 79 degrees 42 minutes 20 seconds West, 274.82 feet to a point; thence North 54 degrees 27 minutes 00 seconds West, 250.00 feet to a point; thence North 25 degrees 08 minutes 20 seconds West, 250.14 feet to a point; thence North 00 degrees 02 minutes 30 seconds West, 1217.02 feet to a point of curve in said expressway line; thence along the arc of a curve, concave to the Southeast, a radius of 497.08 feet, a central angle of 90 degrees 02 minutes 30 seconds, (chord bears North 44 degrees 58 minutes 45

seconds East, 703.23 feet), an arc distance of 781.17 feet to a point of tangent; thence East, a distance of 888.86 feet to a point ; thence South 29 degrees 09 minutes 07 seconds East, a distance of 224.42 feet to a point on the approximate centerline of Willow Run Creek; thence along the centerline of said Willow Run Creek, the following courses and distances; South 48 degrees 18 minutes 00 seconds East, 140.67 feet to a point; thence South 51 degrees 59 minutes 20 seconds East, 181.27 feet to a point; thence South 49 degrees 51 minutes 00 seconds East, 325.75 feet to a point; thence South 66 degrees 19 minutes 45 seconds East, 159.41 feet to a point; thence South 54 degrees 59 minutes 50 seconds East, 411.42 feet to a point; thence South 44 degrees 03 minutes 10 seconds East, 171.14 to a point; thence South 16 degrees 47 minutes 55 seconds East, 276.81 feet to a point; thence South 42 degrees 09 minutes 05 seconds East, 284.61 feet to a point; thence South 86 degrees 11 minutes 10 seconds East, 300.66 feet to a point; thence South 74 degrees 06 minutes 15 seconds East, 157.00 feet to a point; thence North 83 degrees 10 minutes 55 seconds East, 185.31 feet to a point; thence South 82 degrees 54 minutes 10 seconds East, 250.92 feet to a point; thence South 45 degrees 40 minutes 10 seconds East, 181.68 feet to a point; thence South 04 degrees 51 minutes 50 seconds West, 188.68 feet to a point; thence leaving the approximate centerline of the Willow Run Creek on a course of South 61 degrees 16 minutes 45 seconds west, a distance of 232.01 feet to a point on the proposed North line of Tyler Road; thence South 01 degree 16 minutes 17 seconds East, a distance of 60.01 feet to the point of beginning.

Note: The purpose of this description was for compliance with the Construction Lien Act of 1980 only (Public Act 497). The data was compiled from municipal, county, and corporate records as well as previous surveys by David C. Adams & Son, Registered Land Surveyors, Inc. at this site. No field work was performed in conjunction with the preparation of this composite description. Easements, right of ways, etc. effecting this site, if any, have not been shown.

2.2 Surrounding Land Use

Other facilities close to the site include the Fons and Old Wayne (FOW) landfills which are being closed under P. A. 87 of 1965 and are being remediated under Part 201 of P.A. 451 as these landfills are approximately 1500 feet to the south-southwest located approximately 1.2 miles to the southeast is the Wayne Disposal, Inc. Landfill, which is a hazardous waste landfill. The Ypsilanti County Utility Authority (YCUA) Wastewater Treatment Plant (WWTP) is approximately 1300 feet to the south, while the Willow Run Airport is approximately 2500 feet to the east, and the GM Hydro-Matic Powertrain Plant is immediately north of the site where automatic transmissions are manufactured. A residential subdivision is present west of the Willow Run By-Pass.

The nearest surface water body, Willow Run Creek, borders the Willow Run facility on the north and east, where a dam creates Tyler Pond. Willow Run Creek flows southeast for approximately 1.5 miles and discharges into Belleville Lake, which is used for recreational purposes. Palustrine (growing in marshes) wetlands greater than two acres in size exist along the northern edge of Belleville Lake (U.S. Department of the Interior, Fish and Wildlife Service, 1981).

Groundwater in the area of the Willow Run facility reportedly is not used for drinking or any other purpose (CRA, 1995). There are no on-site production wells and the entire area is supplied by Detroit Water and Sewer Department (DWSD). Sensitive environmental areas such as wetlands are not present on the site except in the low-lying areas of Tyler Pond which will be mitigated as part of the Consent Judgement at WRCS. YCUA supplies the area with drinking water from its Belle Isle, Allen Park and Lake St. Clair Springwells plants. A representative of YCUA stated that the area has been supplied with Detroit River water since 1971 or 1972.

The entire area is utilized for industrial and commercial use.

2.3 Site History

The following is a summary of the various site uses prior to 1993 when automobile assembly operations were terminated. Excerpts from several historical documents are included. Since 1993, Willow Run has undergone deactivation activities including equipment removal and return of parts and chemicals to suppliers. The interior of the plant has been gutted and is presently being used as a parts storage warehouse and is not used to store hazardous materials or hazardous waste.

The CVO property is used to store and maintain GM owned company automobiles. The existing building was constructed in 1959 . Distribution of employees company cars is managed from this building. The building is also used for warranty service and preparation of vehicles from GM's Milford Proving Grounds for crushing and transport as scrap metal.

Prior to 1940, Ford Motor Company (Ford) owned a large section of land east of Ypsilanti, Michigan which included the Willow Run Site. In 1941, this land was purchased by the United States Defense Plant Corporation of America (DPCA). Under the direction of the DPCA, Ford constructed and operated a military aircraft manufacturing facility (the bomber plant, now the GM Hydro-Matic Powertrain Division Plant, north-northeast of the subject site), an airstrip (Willow Run Airport, east of the subject site), various support buildings, and a wastewater treatment plant (east of the subject site, across Tyler Pond). Aircraft were manufactured at the bomber plant from June 1941 to 1945.

The original structure on the Willow Run parcel was constructed in 1944 by Ford as a parts warehouse for the nearby bomber plant. The Kaiser-Frazer Company (Kaiser) leased the bomber plant from the War Asset Administration in November 1945, and purchased the facility in December 1948.

Kaiser refurbished the bomber plant and began production of automobiles, trucks, aircraft engines, and other military equipment and continued to manufacture automobiles until 1953. During that time, Kaiser used a building formerly used for spare parts as a warehouse for production operations. Additionally, Kaiser is believed to have constructed an administration building to house design and engineering facilities adjacent to the warehouse.

GM purchased the Willow Run property in December 1954. The original building served as a parts storage warehouse for the GM Parts Division until 1955 when Chevrolet Motor Division of GM took over operations at the property. On January 31, 1956, light truck assembly began.

In July 1958, GM began to expand and convert the facility into a Chevrolet Corvair assembly plant. During the construction period, a portion of the plant was operated by the Fisher Body Division and renovations began for producing the Corvair body. Between 1959 and 1971, both the Fisher Body Division and the Chevrolet Motor Division conducted building expansion programs. In 1971, General Motors Assembly Division (GMAD) took charge of the facility. The facility was assigned to the Chevrolet-Pontiac-Canada Group of GM in 1984, more recently to the mid-size car division (MCD) North American Operations (NAO) Group until 1995, and to the Worldwide Facilities Group until the sale in 1997.

From 1956 to July 1993, operations were typical of an automotive assembly plant. These operations included:

- assembly of sheet metal stampings into a complete body by welding, solder applications, metal finishing, and washing;
- body painting, including phosphate coating, ELPO, and exterior paint; and
- assembly of body interior equipment, using mechanical fasteners, sealers, and adhesives for final assembly.

Support operations included cleaning and maintenance of the plant and equipment and industrial wastewater pretreatment prior to discharge to YCUA sanitary sewer system. Following assembly operations, vehicles were distributed to dealers by both truck and railway systems. Production operations ceased in July 1993. Since that time, deactivation and decommissioning of the facility was completed between 1993 and 1997 to prepare the facility for sale in 1997.

2.4 Environmental Setting

2.4.1 Topography

Figure 1-1 is a portion of a 7.5 Minute United States Geological Survey (USGS) Topographic Map, Ypsilanti East Quadrangle, showing the terrain contours of the subject property and surrounding vicinity. The topography in the vicinity of the site is primarily level to mildly sloping.

2.4.2 Regional Geology

2.4.2.1 Overburden

Topography and overburden in the vicinity of the property are the result of glacial and post-glacial deposition and erosional processes.

During the Wisconsin glacial stage, ice sheets of the Huron-Erie glacial lobe advanced from the southeast across the area of the property. During the advance and retreat of this ice sheet, a series of end moraines (Fort Wayne and Defiance) and a thick sequence of ground moraine (glacial till) comprised of clay, silt and rock fragments were deposited in this area.

As the ice sheet retreated to the southeast, large volumes of meltwater formed glacial Lake Maumee between the Fort Wayne Moraine and the retreating glacier. The ice again advanced during the Illinoisan glacial stage, forming the Defiance Moraine and subsequently retreated, forming glacial Lake Arkona. The ancient Huron River then eroded through the Fort Wayne moraines to enter Lake Arkona. This resulted in the deposition of large amounts of sand and gravel which formed the surficial deltaic deposits which cover most of the area today.

The property is located in an area of surficial deltaic sands. In the area surrounding the property, the deltaic sands range in thickness from approximately 10 to 20 feet.

Directly below the deltaic surficial sands are a series of glacial tills and clays approximately 50-70 feet thick. These, in turn, overlie a lower sand unit which, in certain locations including the property, overlies a series of lower clays. The lower clays, or the lower sand unit, rest directly on the bedrock of the area. Total glacial drift thickness in the regional area surrounding the property ranges from 100 to 200 feet.

2.4.2.2 Bedrock

The Antrim Shale is the first bedrock formation encountered below the property. This shale is dark brown to black, bituminous, fissile and finely laminated. Located below the Antrim Shale are carbonate formations of the Traverse Group. The Tharerse Group is a generally undivided sequence of limestone and dolomite.

The property is in an area where bedrock is generally encountered between 550 and 600 feet above mean sea level (AMSL)(CRA, 1995). The USEPA Field Investigation Team (FIT) reconnaissance of the WRCS area, a series of boreholes were completed along Willow Run Creek that identified the Antrim Shale at an elevation of approximately 635 feet AMSL. The Antrim Shale is between 50 and 100 feet thick in the vicinity of the property.

The clay till at the base of the upper sand has a measured hydraulic conductivity on the order of 10^{-8} centimeters per second (cm/s) (CRA, 1995). This clay till unit vertical migration serves as a confining unit to the lower sand aquifer and prevents contaminants.

2.4.3 Regional Hydrogeology

Groundwater resources in the Huron River watershed are both plentiful and extensive, existing in both the glacial drift and the bedrock of the area. In the region surrounding the property, groundwater is encountered in three water-bearing units which are discussed in the following sub-sections:

2.4.3.1 Unconfined Water Table Zone

The upper sand of the area contains an unconfined water table which is influenced by seasonal precipitation, local drainage patterns and topography. The water table is located at a depth of approximately 4 to 15 feet below land surface (BLS) and the saturated thickness is approximately 5 to 12 feet. The unconfined water table zone is not used for water supply purposes. The use of this zone as a potable supply would generally be prohibited by Michigan Department of Public Health regulations (Part 127 of Act 368 [Groundwater Quality Control], 1978) because the regulation requires a minimum of 25 feet of casing, which could not be achieved in this unit on the real property.

Regionally, Ypsilanti Drain Number 8 (YDN8) and Willow Run Creek serve as discharge points for groundwater within the unconfined water table zone. As a result, YDN8 and Willow Run Creek serve as drainage divides within this zone precluding any substantial lateral migration of groundwater.

2.4.3.2 Lower Sand Aquifer

The lower sand aquifer generally is present below the glacial tills and clays which underlie the upper sand. The lower sand aquifer is confined, and is approximately 10 to 20 feet thick in the vicinity of the property. In the

vicinity of the property, the glacial tills and clay protect the lower sand aquifer from surface contamination events (CRA, 1995).

In the vicinity of the property, and in much of Washtenaw and Wayne Counties, the lower sand aquifer may be suitable for use as a potable water supply. In the area of Ypsilanti Township, a total of 37 glacial drift water supply wells were reported. These supply wells varied in depth from 25 to 268 feet. The top of the screened interval in the three wells located within 1.5 miles of the property is greater than 80 feet bls. The aquifers in this area are not sole source aquifers.

Groundwater in the lower sand aquifer may be connected to the more productive Huron River bedrock valley aquifer which is present to the south of the property.

2.4.3.3 Confined Bedrock Aquifer

The Antrim Shale is not considered water bearing and, as a result, constitutes a lower aquitard located above lower bedrock aquifers. In the vicinity of the property, the first usable bedrock aquifer exists in the Devonian carbonates of the Traverse Group. In Ypsilanti Township this aquifer has been encountered in wells at depths of as little as 150 feet bls.

2.4.4 Site-Specific Geology

The property specific geology was characterized from the soils collected during the installation of soil borings and monitoring wells. Soils beneath the asphalt or concrete were predominantly sands intercalated with sandy clays and gravels. The sandy clay appears to be more prevalent in the northern portion of the property, while gravels were generally present in the southern portion of the property. The regional dense clay was not penetrated in any of the wells or soil borings.

The water table in this area lies approximately 5 to 11 feet BLS.

2.4.5 Hydrology

Paved areas and building roofs are drained to a stormwater sewer system which flows into Tyler Pond through a series of outfalls. Surface runoff from the site flows to the stormwater retention basin and is discharged to Willow Run Creek in accordance with the Willow Run facility's National Pollution Discharge Elimination System (NPDES) permit. The NPDES permit is described in Section 2.5.1. Surface runoff from much of the surrounding area also flows to Willow Run Creek and Tyler Pond. Willow Run Creek originates north of the Willow Run Airport and flows through Tyler Pond west of the airport on the east border of the Willow Run site.

2.5 Summary of Environmental Permits

2.5.1 National Pollution Discharge Elimination System (NPDES) Permit

GM originally submitted the NPDES permit application on August 16, 1983 and NPDES permit MI0043826 was issued on September 25, 1985. The permit allows for the discharge of groundwater infiltration and storm-water runoff to Willow Run Creek through eleven of the fourteen outfalls. A permit was not required for the remaining

outfalls. The permit was amended December 7, 1989 to allow time for GM to retrofit drinking water fountains so they would discharge into the sanitary sewer system instead of the outfall. The permit required that the outfalls be monitored for flow on a weekly basis, visually observed on a daily basis, and grab sampled for oil and grease analysis on a weekly basis. GM re-evaluated permit requirements in November 1996, and requested an amendment so that routine sampling would no longer be required. However, MDEQ determined that a permit was not necessary because material exposed to runoff was no longer present at the property. GM submitted a request that the permit be revoked on December 2, 1996. The request was granted on January 8, 1997.

2.5.2 Ypsilanti County Utility Authority (YCUA) Permits

The Willow Run WWTP was permitted to discharge to the YCUA publicly owned treatment works (POTW). Effluent from the on-site remediation system (Section 4.1.2) and from sanitary sewers was also permitted for discharge to the POTW. However, the permits are no longer in force because operations have ceased at the WWTP and the remediation system has been removed.

2.5.3 Air Permits

In 1992, air permits were issued for 27 different emission units. The air permits limited emission of various volatile organic compounds (VOC) and particulates. According to the permits some particulate emissions are controlled by water wash and subsequent treatment at the Process Wastewater Treatment System (SWMU 5). Particulate management also included filtering. The filter wastes, which had been tested and determined to be nonhazardous, were disposed as general refuse. The facility operated one baghouse, which was deactivated in 1996 as part of facility deactivation. Air permits are no longer in force due to cessation of plant manufacturing activities.

2.5.4 RCRA Part A Permit

GM Willow Run submitted a RCRA Part A Permit Application on November 17, 1980 (GMAD 1980b). At that time, RCRA requirements and applicability were not fully understood because RCRA had just recently been authorized. On August 20, 1984 (USEPA 1984a), GM requested withdrawal of its Part A permit application because they did not think that TSDF classification was appropriate. USEPA denied the request on September 20, 1984, and indicated that container units used to store hazardous waste for greater than ninety days needed to undergo RCRA closure (USEPA, 1984). An amended notification letter was submitted to the USEPA on October 24, 1984 that indicated generator-only status at the site, and amended the Part A permit application by identifying the Indoor and Outdoor Drum Storage Areas as units formerly used to store hazardous waste in containers for greater than ninety days. A closure plan was concurrently submitted with the amendment (GM, 1984 b,c). The remaining SWMUs in the Part A permit did not manage hazardous waste. The USEPA approved the closures as RCRA storage units for both the Indoor and Outdoor Drum Storage Areas on June 27, 1985 (USEPA, 1985). From 1985 until facility deactivation and official closure of the storage area in May 1997, the plant was operating as a large-quantity generator and stored hazardous wastes on site for less than 90 days in the Outdoor Drum Storage Area. RCRA issues are fully discussed in Section 3.

3. RCRA Regulatory History

3.1 RCRA Part A Permit Application

GMAD submitted a Notification of Hazardous Waste Activity Form to the USEPA on July 14, 1980, identifying the Willow Run plant as a generator as well as a treatment, storage and disposal facility (GMAD, 1980a). GM Willow Run submitted a RCRA Part A Permit Application on November 17, 1980 (GMAD 1980b) as a protective filing. The Part A Permit Application listed the following process codes and capacities (GMAD, 1992):

- Container storage (S01); 154,280 gallons in the Outdoor Drum Storage Area (55-gallon drums), the former Indoor Drum Storage Area (55-gallon drums), and the former Process Wastewater Treatment System (a 15-cubic yard hopper).
- Tank storage (S02); 1,941,000 gallons in the storm water retention basin and a process fluids tank.
- Treatment in tanks (T01); 73,169,600 gallons per day (gpd) in the former Process Wastewater Treatment System and a paint line process unit.
- Treatment in surface impoundments (T02); 600,000 gpd in two surface impoundments in the former Process Wastewater Treatment System (later declassified, see Section 3.1.1).
- Sludge Processing (T04); 723,000 gpd in the former Process Wastewater Treatment System.

The permit identified the following as hazardous wastes managed on site:

F001, F002, F003, F004, F005, F006, F007, F008, F017, F018, U238, D001, D002, and D008.

3.1.1 Surface Impoundments (Wastewater Lagoons)

From 1980 to 1986, GM managed phosphating wastewaters in the WWTP lagoons (surface impoundments) as F006 hazardous waste because the USEPA definition of F006 did not specifically exclude phosphating wastewater. In July 1984, GM submitted a closure plan for the surface impoundments at the WWTP, which was approved by USEPA on September 20, 1984. On July 28, 1986, the USEPA notified GM that the wastes managed in these impoundments were not hazardous as originally thought (USEPA, 1986).

F006 hazardous waste is a listed hazardous waste from non-specific sources defined as "Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating carbon steel; and (6) chemical etching and milling of aluminum."

On December 2, 1986, USEPA published an interpretive rule clarifying that "the F006 listing is (and always has been) therefore, inclusive of wastewater treatment sludges from only the following processes: (1) Common and precious metals electroplating, except tin, zinc (segregated basis), aluminum, and zinc-aluminum plating on carbon steel; (2) anodizing, except sulfuric acid anodizing of aluminum; (3) chemical etching and milling, except when

performed on aluminum; and (4) cleaning and stripping, except when associated with tin, zinc, and aluminum plating on carbon steel (51 Federal Register 43351-43352, December 2, 1986)."

The effect of this interpretation is that wastes generated by GM at Willow Run were not F006 listed hazardous wastes, and the surface impoundments were no longer considered Hazardous Waste Management Units (HWMUs). Closure of the surface impoundments was completed, but because the waste was declassified, USEPA approval of closure was not required. The former surface impoundments were subsequently designated a PAOC and were investigated to determine whether soil or groundwater had been impacted (Section 5.4).

3.1.2 Permit Modification

On August 20, 1984 (USEPA 1984a), GM requested withdrawal of its Part A permit application because they did not think that Treatment, Storage, and Disposal Facility (TSDF) classification was appropriate. USEPA denied the request on September 20, 1984, and indicated that container units used to store hazardous waste for greater than ninety days needed to undergo RCRA closure (USEPA, 1984).

An amended notification letter was submitted to the USEPA on October 24, 1984 that stated that GM is a generator only, and amended the Part A permit application by identifying the Indoor and Outdoor Drum Storage Areas as units formerly used to store hazardous waste in containers for greater than ninety days. A closure plan was concurrently submitted with the amendment (GM, 1984 b,c). The remaining solid waste management units (SWMUs) in the Part A permit did not manage hazardous waste. The USEPA approved the closures as RCRA storage units for both the Indoor and Outdoor Drum Storage Areas on June 27, 1985 (USEPA,1985). Prior to facility deactivation in 1996, the plant was operating as a large-quantity generator storing hazardous wastes on site for less than 90 days in the Outdoor Drum Storage Area. Because the facility is no longer operating, RCRA closure of the Outdoor Drum Storage Area as a former generator is required.

On May 19, 1997, correspondence was submitted to MDEQ by BBL that documented generator closure of the Outdoor Drum Storage Area. The correspondence identified activities conducted to comply with 40 Code of Federal Regulations (CFR) 262.34(a)(1)(iv)(B). Accordingly, GM's status as a large-quantity generator at this facility should be considered closed, and there are no active RCRA issues at the facility.

3.2 Preliminary Assessment/Visual Site Inspection (PA/VSI)

On May 19, 1997, correspondence was submitted to MDEQ by BBL that documented generator closure of the Outdoor Drum Storage Area. The correspondence identified activities conducted to comply with 40 Code of Federal Regulations (CFR) 262.39(a)(1)(iv)(B). Accordingly, GM's status as a large quantity generator at this facility should be terminated, the outdoor drum accumulation area should be considered closed, and there are no active RCRA issues at the facility.

The USEPA Region 5 contractor, PRC, completed a preliminary assessment (PA) of the facility on May 18, 1992, and a visual site inspection (VSI) on May 21, 1992 (PRC, 1992). The purpose of the PA was to review relevant documents and files located at State offices and the USEPA Region 5 office and to provide the following: (1) identify SWMUs and areas of concern (AOCs) at the facility; (2) obtain historical operational information at the facility; (3) obtain information on releases from any units at the facility; and (4) identify additional information for the VSI.

The purpose of the VSI was to interview appropriate facility staff, inspect the entire facility, identify SWMUs and AOCs, photograph all visible SWMUs, identify evidence of releases, make a preliminary selection of sampling parameters and locations, obtain necessary additional information, and provide the following: (1) identify SWMUs and AOCs not discovered during the PA; (2) discover releases not discovered during the PA; (3) provide specific environmental setting descriptions; (4) provide information on release pathways and release materials to each medium; and (5) confirm information obtained during the PA. On November 30, 1992, PRC issued a report identifying eight SWMUs and two AOCs.

In 1996, BBL also reviewed USEPA and MDEQ files on the Willow Run property. USEPA Region V files contained documentation of the Part A permit history detailed in Section 3.1.

Information in MDEQ files included:

- Documentation of an oily discharge to Tyler Pond from outfall 004 in February 1993 and subsequent cleanup activities [Surface Water Quality Division (SWQD)].

- Documentation of two incidences of temporary non-compliance of Willow Run's NPDES Permit in March 1989 and March 1993 (SWQD).

- Documentation of MDNR facility inspections for RCRA Subtitle C compliance from 1982 through 1988. Willow Run was found to be in compliance from 1982 through 1984. Violations observed in subsequent years included hazardous waste containers not in good condition, improperly labeled waste, containers stored open or in standing water, incomplete hazardous waste manifests, lack of a device for emergency communication in a hazardous waste storage area, storage of waste over 90 days, and unavailability of training records for facility personnel. Documentation that GM addressed all deficiencies was in MDEQ files (Waste Management Division [WMD]).

- Documentation of an inspection to determine compliance with 40 CFR Part 761 PCB Regulations. The USEPA inspector noted "shortcomings in record keeping and storage area inspection" (WMD).

- Numerous reports in the USTD that are discussed in Section 4 of this document.

BBL conducted a site inspection in June 1996. A description of the SWMUs and AOCs along with a summary of wastes managed in each and observations recorded by PRC and BBL is provided in the following sections.

3.2.1 Solid Wastewater Management Unit (SWMU) #1 - Satellite Accumulation Areas (SAA)

Satellite accumulation areas were used to temporarily store waste at the point of generation. Each area consisted of a 55-gallon drum equipped with a funnel and situated on a concrete base. The PA/VSI identified four SAA's during their site visit:

1. Final product repair department
2. South Elevator
3. Urethane Mix Area
4. Mix Room

Waste paint and solvent (D001), waste sealer and paint solids (D001), obsolete cleaners (D002), waste cement and adhesives (nonhazardous), caustic salts (D002), methylene chloride (F002), lead dross (D008), and waste oil (nonhazardous) were formerly managed at these areas. The startup date of these SAAs is unknown, but could be as early as 1971 when GMAD began operations at this facility.

PRC observed evidence of spills on the drums and on the floor in the south elevator and urethane mix room. BBL observed stains on the floor of the mix room. There were no cracks observed in these areas, nor were there any documented historical releases to the environment.

3.2.2 SWMU #2 - Paint Mix Room

This room contained two 5,000-gallon steel tanks with secondary containment. The tanks were installed in the early 1980s and were used for less-than-90-day storage of waste paint and solvent prior to off-site disposal. Waste paint and solvent (D001) were managed at this SWMU. Some staining was noted during BBL's inspection but no evidence of a release to the environment has been documented.

Because hazardous waste was stored in these tanks, they were decontaminated during facility deactivation procedures, which are discussed in Section 6.

3.2.3 SWMU #3 - Outdoor Drum Storage Area

This area is a roofed, sheet metal structure with a concrete floor. Since at least 1980, this area was used to store 55-gallon drums of hazardous waste for less than 90 days. The unit measures about 100 feet by 75 feet and has a steel superstructure with open sides on the eastern, southern, and 1/3 of each of the northern and western exposures. In the southwestern corner is a secondary containment curb and a sump. In the southeastern corner is an elevated secondary containment area with a sign labeled "hazardous." The elevated secondary containment area is on a six-inch pad with a six-inch curb, and also has a sump. The remainder of the unit is a concrete pad sloped towards the center drain without complete secondary containment. Non-hazardous waste and empty drums were also stored here.

Waste sealer and paint solids (D001), waste cement and adhesives (nonhazardous), caustic salts (D002), methylene chloride (F002), lead (D008), and waste oil (nonhazardous) were formerly managed in this unit. USEPA approved RCRA closure of this area as a HWMU in 1985.

PRC observed no evidence of a release. No drums were stored in SWMU #8 at the time of BBL's inspection but GM representatives report that the pad was currently being used to store drums of waste for less than 90 days. BBL observed minor amounts of staining and dry residue on the concrete floor and minor amounts of cracking. The concrete was noted to be worn with extensive etching and gouges. Because there was no documentation or visual evidence of a release, this area was not designated a PAOC. As discussed in Section 3.1.2, documentation was submitted to MDEQ certifying that the Outdoor Drum Storage Area was closed in accordance with 40 CFR 265.111 and 265.114 under the requirements of 40 CFR 262.34 (a)(1)(iv)(B).

3.2.4 SWMU #4 - Former North Tank Farm Area/Waste Oil UST

This tank was installed in 1989 with cathodic protection. Piping connected to the tank is aboveground. Waste oil was stored here from 1989 to 1992. This tank was removed in 1994 along with the other 9 tanks in the North Tank Farm. Evidence of a previous release from a gasoline UST in this tank farm was observed when the tanks were removed. This release was addressed, originally under P.A.478, then under Part 213 of P.A.451; however, because there was no evidence of a release from the waste oil UST, soil verification samples collected during closure were not analyzed for the ten Michigan metals as required under Part 213. Closure of this tank farm is discussed in Section 4.1.1

At the time of PRC's inspection, a small pool of oil was observed on the concrete surface near the tank. However, this area was investigated in 1996 by BBL as part of the North Tank Farm Site (Section 4.1.1) investigation and no oil pool was observed.

3.2.5 SWMU #5 - Process Wastewater Treatment System

This system was used to treat process wastewater prior to discharge to the YCUA. The surface impoundments (Wastewater Lagoons), used in previous wastewater treatment operations (Section 3.1.1) and designated SWMU #8 (Section 3.2.8), were formerly located in this area. The unit consists of three 800,000-gallon above-ground, open-top steel wastewater batch treatment tanks; two above-ground open-top steel clarifiers; one above-ground open-top steel sludge-thickening tank; lamella units (plate separators); a filter press; and a 12-cubic-yard sludge collection hopper. The tanks are situated on concrete and are surrounded by four-feet high secondary containment walls. The treatment process included pH adjustment, addition of a polymeric flocculating agent, sludge processing, and sludge collection.

Nonhazardous process wastewater was managed in this unit, which began operating in 1985. The system was deactivated and cleaned following cessation of operations in 1993 (Section 6). There are no documented releases in this area. No evidence of a release was observed by either PRC or BBL during their inspections, or during facility deactivation procedures.

3.2.6 SWMU #6 - Storm Water Retention Basin

Solids were settled out and nonhazardous waste oil was separated from storm-water runoff in this basin since at least 1980. The basin is constructed of reinforced concrete and is equipped with an overflow weir.

No evidence of a release was observed by either PRC or BBL during their inspections, or during facility deactivation procedures.

3.2.7 SWMU #7 - Former Indoor Drum Storage Area

The indoor drum storage unit, located in the northwest corner of the facility, operated as a hazardous waste drum storage area from 1980 to 1985. Waste sealer and paint solids (D001), obsolete cleaners (D002), waste cement and adhesives (nonhazardous), caustic salts (D002), methylene chloride (F002), lead dross (D008), and waste oil (nonhazardous) were formerly managed in this unit. The unit was replaced with more recent Outdoor Drum Storage

Area (SWMU #3). The USEPA approved the RCRA closure plan in 1985; no wastes have been stored in the area since that time.

The former drum storage area is no longer present and there is no remaining evidence of the drum storage unit. At the time of BBL's inspection, the concrete pad was clean and there were empty packaging units stored on pallets in this area. No evidence of a release was observed by either PRC or BBL during their inspections, or during facility deactivation procedures.

3.2.8 SWMU #8 - Former Process Wastewater Treatment System

In 1955, GM constructed an on-site wastewater treatment plant (WWTP) consisting of wastewater collection lines connected to an aeration basin (Section 5.8). Treated water was discharged to Tyler Pond. This system was replaced in 1959 with a system that employed several chemical and physical processes for treating industrial wastewater. Holding tanks, a clarifier, and two wastewater lagoons were located in the area occupied by the present WWTP (SWMU #5). The indoor portion of the former WWTP housed sludge processing equipment and a 15-cubic yard hopper for sludge collection. At the time of BBL's inspection, maintenance equipment was stored in that area. This SWMU formerly managed nonhazardous process wastewater and wastewater treatment sludge thought at one time to be F006 waste (after 1980), but later determined to be nonhazardous (see Section 3.1.1)

Soil and groundwater sampling was conducted after the closure of the lagoon (Chester, 1985a,b). EP toxic levels of cadmium lead and nickel in soil exceeded background levels; however, no hazardous wastes or hazardous waste constituents were detected in groundwater samples taken during closure. This area was designated a PAOC in the *Phase I Environmental Site Assessment* (Chester, 1995) and a Phase II Environmental Site Investigation (ESI) was performed (Section 5.3).

BBL observed miscellaneous stains and cracks on the concrete flooring inside the building (indoor portion of SWMU #8).

3.3 Areas of Concern (AOCs)

The two AOCs identified during the PA/VSI concern former USTs.

3.3.1 AOC #1 - Outdoor UST Remediation Area (R&D Site)

A remediation system in this area consists of a groundwater extraction system and soil vapor extraction system. The system was installed in 1992 to address soil and groundwater impacts from a release detected when seven tanks were removed from the former Fisher Body tank farm. The R&D Site is discussed further in Section 4.1.2.

3.3.2 AOC #2 - Indoor UST Removal Area

PRC designated this location (the Chassis department) an AOC because analytical data from soil samples collected when two 750-gallon USTs were removed in 1991 was not available at the time of the VSI. The analytical data was subsequently located and provided to the USEPA. Chester reviewed the soil data for the Willow Run Phase I ESA and concluded that the area is not a PAOC. The Chassis department UST removal is discussed further in Section 4.2.

4. Summary of Underground Storage Tanks

4.1 Underground Storage Tanks (USTs)

Three former UST sites are currently being addressed under Michigan's Leaking Underground Storage Tank Act, Public Act 451, Part 213 (formerly known as Public Act 478 of 1988): the former North Tank Farm Area, the R & D Remediation Site, and the adjacent CAT Site (located on the CVO property). The R&D Site has also been designated AOC #1 in the PA/VSI report (Section 3.3.1), and includes PAOC #4 and PAOC #8, identified in the Phase I ESA (Section 5.1).

Soil and groundwater analytical data have been compared to Tier I industrial risk-based screening levels (RBSLs) presented in MDEQ USTD Operational Memorandum # 4 (OM #4). Soil concentrations have been compared to direct contact values (DCVs) because groundwater in the surficial water-bearing unit is not used as a potable water source (therefore leaching-to-groundwater soil criteria are not relevant). Groundwater concentrations have been compared to groundwater surface water interface (GSI) criteria, although Tyler Pond, the nearest surface-water body, is greater than 1,000 feet from either the R&D Site or the North Tank Farm. UST sites can be closed without limiting land use if soil and groundwater concentrations are below Tier I criteria.

4.1.1 North Tank Farm

The North Tank Farm was designated PAOC #9 in the Willow Run Phase I ESA (Chester, 1995). Ten underground storage tanks formerly located at the North Tank Farm, including two 20,000-gallon fuel oil tanks, one 12,000-gallon thinner tank, one 20,000-gallon antifreeze tank, three 20,000-gallon gasoline tanks, one 20,000-gallon transmission fluid tank, one 20,000-gallon power steering fluid tank, and one 20,000-gallon spill capture tank, were excavated on June 21, 1994. The tanks had passed tightness tests shortly before they were removed and leaks were not suspected. Three hundred cubic yards of soil were removed along with the tanks. Except for the vent piping, which was located within the excavated area and removed with the tanks, all piping associated with this tank farm was above ground.

A limited quantity of stained soil was observed during removal activities. The staining was possibly caused by spillage during tank filling. One soil sample was collected from the most visually stained area. Benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected in this sample below Tier 1 residential DCVs. The excavated soil was stockpiled on site and subsequently transported to the FONS Landfill for use as cap material (as approved by the MDEQ).

O'Brien & Gere (OBG) generated the Initial Abatement (20-Day), Initial Assessment (60-Day), and Phase I Hydrogeological (150-Day) Reports as required under Act 478 prior to June 1995. Geoprobe borings were performed to retrieve soil and groundwater samples during the Initial Assessment and Phase I Hydrogeological Field Investigations. The soil and groundwater samples were analyzed for VOC and semi-volatile organic compounds (SVOC) by USEPA Methods 8020/8310 (GP-1 through GP-10) and 8260/8270 (GP-11 through 13), respectively. Samples were also analyzed for lead by USEPA Method 239.2 or 7421 (despite the fact that leaded fuels were never stored in the North Tank Farm). Sample locations are shown on Figure 4-1.

Lead concentrations in all soil samples were below the current Tier 1 residential DCV. Concentrations of dissolved lead in groundwater ranged from 86 to 195 micrograms per liter (μg/L). These values were above the lead GSI criterion (6.6 μg/L). However, as stated above, the former North Tank Farm is greater than 1,000 feet from the

GSI. Monitoring wells have been installed at Willow Run in several locations adjacent to Tyler Pond, between the North Tank Farm location and Tyler Pond, to address lead concentrations in groundwater at the GSI, where these criteria are more appropriately applied (see Sections 5.3, 5.4, 5.8 and 5.9).

Concentrations of VOC and SVOC in soil samples were below current Tier 1 residential DCVs except for benzo(a)pyrene in a soil sample from GB-8. Concentrations of VOC and SVOC in groundwater samples were below detection levels except for BTEX in groundwater from GB-7. Groundwater concentrations of BTEX in GB-7 were above GSI criteria. It was OBG's conclusion that VOC and SVOC impacts in GB-8 and GB-7 were associated with the documented release at the adjacent R&D Site. These impacts are discussed in Section 4.1.2.

In June 1996, BBL collected additional soil verification samples to fully assess the floor and walls of the former tank excavation in accordance with the "Verification of Soil Remediation" guidance document. Three additional soil samples were collected from the former excavation bottom. Two additional soil samples were also collected in the approximate location of the former excavation's east and west sidewalls. Soil analytical data from OBG 1994 Geoprobe borings GB- 4 and GB-9 were used as soil verification samples from the north and south sides of the former excavation. Terry Hiske at MDEQ verified that the number of confirmation samples ordinarily required by the "Verification of Soil Remediation" guidance document were not needed at this site. Mr. Hiske had been on site at the time the tanks were removed and provided a letter approving the reduced number of confirmation samples.

The soil samples collected in 1996 were analyzed for VOCs and SVOCs by USEPA Methods 8260/8270 and the results were less than Tier 1 residential DCVs. Although one of the ten tanks contained antifreeze, soil and groundwater samples were not analyzed for glycols due to the following:

1. The tanks passed tightness tests prior to excavation;
2. No visual evidence of release of antifreeze was observed during excavation activities; and,
3. The half-lives of glycols range typically from 1-4 weeks in surface water, 2-8 weeks in groundwater, and 1-4 weeks in soil (Handbook of Environmental Degradation Rates, Howard, Philip H., 1991).

A Closure Report for this site was submitted to MDEQ on October 1, 1996.

4.1.2 Research and Development (R&D) Remediation Site

The R&D Site was designated PAOC #8 in the Phase I ESA (Chester, 1995) and AOC #1 in the PA/VSI (discussed in Section 3.3.1). In 1989, a petroleum hydrocarbon release from the underground tank farm at the R&D Remediation Site was discovered. Seven tanks were present (one 6,000-gallon, four 12,000-gallon, and two 20,000-gallon) containing gasoline, paint thinner, transmission fluid, power steering fluid, and antifreeze. Three tanks had previously been removed from this site, including a 20,000-gallon tank containing fuel oil. The tanks were connected to an adjacent dispenser island. In December 1989, the dispenser island and associated piping were removed and sheet piling was installed to the south, west, and northwest of the tank farm prior to removal of the tanks.

The Michigan Department of Natural Resources (MDNR) subsequently approved a work plan to characterize the geology and hydrogeology of the site and assess the contamination. The work plan was submitted by GM Research and Development as part of a bioremediation pilot study. From fall 1990 to spring 1991, 26 wells were installed

at 18 locations, soil and groundwater samples were collected for analysis, and the hydraulic conductivity was measured in soil cores. Based on the results of this assessment, groundwater recovery and soil vapor extraction systems were designed and installed to augment natural processes occurring at the site.

The interim remediation system began operation on November 15, 1992. The effectiveness of the R&D Site remediation system was documented in *Characterization of a Hydrocarbon-Contaminated Site and Pilot Demonstration of a Synergistic Remedial System* (GMRES, 1995). Laboratory analysis of groundwater samples collected from recovery wells in June 1996, indicated that the system had been effective at remediating the contamination in this area. Operation of the remediation system has been discontinued and the system was removed. Soil and groundwater contamination remains both south and west of the remediated area.

Groundwater contamination remains outside of the former tank farm area west of the sheet piling presumably because the remediation system could not capture it because of the sheet piling. Concentrations of BTEX had been present west of the sheet piling in 1992 prior to remediation system design. BTEX and SVOC impacts were also detected west of the sheet piling in soil, and BTEX constituents were detected in groundwater during the *Phase I Hydrogeologic Investigation* (OBG, 1994), as discussed in Section 4.1.1 (North Tank Farm). Because VOC and SVOC concentrations in soil and groundwater samples collected in locations further west and closer to the North Tank Farm were below detection limits, the impacts near the R&D site are considered to be associated with the R&D Site tanks. Figure 4-2 is a map of total VOA concentrations in soil based on field screening with an organic vapor analyzer (OVA). Contour maps of benzene, toluene, total xylenes, and tetrachloroethylene concentrations in groundwater are shown on Figures 4-3, 4-4, 4-5, and 4-6, respectively.

Groundwater contamination also remains outside of the former tank farm area south of the remediation area and southeast of the sheet piling. Leaking underground piping associated with the (R&D Site) tank farm formerly existed in this area, which was designated PAOC #4 during the Phase I ESA (Section 5.6). This system had been abandoned in the early 1970s when it became apparent that the pipes were leaking. In 1995, BBL defined the horizontal extent of concentrations of VOC in soil and groundwater using a hydraulic probe to collect samples. Samples were analyzed for BTEX, trichloroethene (TCE), and tetrachloroethene (PCE) with a field gas chromatograph (GC). VOC concentrations were detected in soil and groundwater. Five monitoring wells were installed in locations without VOC impacts. In 1996, BBL installed additional plume definition wells (MW-6 and MW-7) and one source well (MW-8).

A Corrective Action Plan (CAP) was submitted for this site with the Final Assessment Report on October 1, 1996 to address the remaining soil and groundwater impacts. The CAP requires quarterly sampling and analysis of groundwater to monitor the effectiveness of remediation by natural attenuation (RNA) and to determine whether RNA is occurring at a sufficient rate.

4.1.3 Complete Auto Transit Site (CAT Site)

The CAT Site (located on the CVO property) includes a building approximately 25,000 square feet in size surrounded by asphalt pavement. An UST farm consisting of two 10,000-gallon diesel USTs and one 550-gallon gasoline UST was located near the northwest corner of the building. Underground piping associated with the former diesel UST system extended to the north and east of the building. The USTs and the piping were removed in 1994. Two 3,000-gallon USTs formerly containing motor oil were removed from the east side of the building in 1995.

To address soil and groundwater impacts observed during tank removal activities, OBG performed a Phase I Hydrogeologic Investigation in September 1994. Soil and groundwater samples collected with a Geoprobe were analyzed for VOC, SVOC, and lead using USEPA Methods 8260, 8270, and 7421, respectively. Volatile organic halocarbons (VOH) and BTEX, were detected in soil and groundwater. SVOC were below Tier 1 GSI criteria in groundwater. The extent of BTEX impacts above RBSLs in the vicinity of the former tank and pipe system was defined. However, the extent of concentrations of VOH above RBSLs in groundwater sampled on the east side of the on-site building had not been defined. Concentrations of benzene and total VOA in groundwater are presented in Figure 4-10. All soil detections were below Tier I DCVs. Concentrations of benzene, total VOA, and lead in soil at the former CAT Site are shown on Figures 4-7, 4-8, and 4-9, respectively.

A geoprobe survey was conducted in April 1996 to determine the extent of the impacted groundwater. Groundwater samples from temporary wells were analyzed with a field GC for VOC. Permanent monitoring wells were installed at locations where GC analysis of the groundwater samples indicated that VOC were not present, thus bounding the outer edge of the plume. When groundwater samples from the newly-installed monitoring wells were analyzed at a laboratory, vinyl chloride and dichloroethene were detected at concentrations that exceeded Part 201 GSI criteria. Subsequently, the extent of VOH impacts was defined to the east and south. The impacts could not be defined to the north because they extend into Tyler Pond. Because VOH groundwater impacts not regulated under Part 213 encompass a majority of the site east of a building, this portion of the site will be addressed under Part 201 of the Natural Resources and Environmental Protection Act (NREPA), 1994 of Public Act (PA) 451. VOH impacts to groundwater at the CVO property were subsequently designated PAOC #19 and are discussed further in section 5.13 of this report. VOC impacts to groundwater originate separately from the VOH impacts, so they are designated as PAOC #20 (former CAT site VOC plume).

A CAP for the western portion of the site (impacted only by petroleum hydrocarbons and regulated under Part 213 of NREPA) was submitted with the Final Assessment Report on October 1, 1996. The CAP requires quarterly sampling and analysis of groundwater to monitor the effectiveness of natural attenuation at this site and to determine whether it is occurring at a sufficient rate.

4.2 1991 Tank Closure PAOC #2

This area, located in the Chassis Department (Figure 1-2), was designated an AOC during the PA/VSI because analytical data from soil samples was not available at the time of the site inspection. Documents associated with tank removal activities involving the closure of two 750-gallon USTS in 1991 were reviewed during the Phase I ESA. These documents included: State of Michigan UST registration forms, the Charter Township of Ypsilanti Fire Department UST Removal Report, and DiHydro Analytical Services Report, a K&D Industrial Services Field Report, and correspondence between GM and the regulatory agencies.

Analysis of five soil samples taken from the tank excavation revealed that total petroleum hydrocarbons (TPHs) were present at 92 mg/kg in one sample. All other samples had less than 50 mg/kg. Lead was detected in each of the five samples at concentrations ranging from 8.2 to 17 mg/kg, which are below the Tier I DCV. Volatiles were not detected. The Phase I ESA concluded that this area is not a PAOC.

4.3 Potential UST Search

The Phase I ESA also described four areas that potentially contained USTs (shown on Figure 4-11) discovered during the Phase I file review, as follows:

1. Potential UST Location (one 20,000-gallon and two 500-gallon tanks associated with the former Haulaway Building)

2. Potential UST Location (three 12,000-gallon tanks located at Dock P)

3. Potential UST Location (two 1,000-gallon tanks associated with the former company car garage)

4. Potential UST Location (1,000-gallon tank in Foam Storage Building)

These potential UST locations were determined through a review of plant construction drawings and were designated PAOCs. However, the existence of construction drawings does not necessarily mean that USTs were actually placed in these locations. Ground-penetrating radar (GPR) and geoprobe advancement were used to determine if the USTs were present. One 20,000-gallon UST was identified by GPR at location 1 and was registered with the MDNR. The other USTs could not identified by GPR survey or the advancement of geoprobes.

On September 20, 1995, the former Haulaway building location identified by the GPR as a potential UST study was excavated. Soil was removed from the immediate vicinity of the suspected UST location to a depth of ten feet. The excavation was abandoned and filled because an UST was not discovered. No visual indication of petroleum contamination or odors were present and borings advanced in the other three potential UST locations did not show evidence of petroleum contaminants or odors. Therefore, the four areas are no longer considered PAOCs.

5. Potential Areas of Environmental Concern (PAOCs)

This section discusses PAOCs identified in the Willow Run Phase I ESA (Chester, 1995) and Supplemental Phase I ESA (BBL, 1997), and includes three PAOCs (18, 19, and 20) at the CVO property identified in this report. The CVO property was outside the scope of the Phase I ESAs, which were performed for the sale of the Assembly Plant property. Results of the subsequent Phase II ESI, Supplemental Phase II ESI, and Phase III Extent of Contamination (EOC) Study conducted to evaluate those PAOCs are summarized in this report.

A PAOC is defined as an area with a documented release of hazardous substances or petroleum products that could pose an unacceptable risk to human health or the environment. A Phase I ESA is a non-intrusive investigation that identifies PAOCs. The determination that an area constitutes a PAOC is based on a review of available site records, interviews with site personnel, site reconnaissance, reasonable available public information, and knowledge of past and present site processes.

A Phase II ESI is an intrusive investigation performed to confirm or deny the existence of a release that could pose an unacceptable risk to human health or the environment. The horizontal and vertical extent of environmental contamination identified in a Phase II ESI are defined in a Phase III EOC Study.

PAOCs were identified during the performance of due diligence procedures and a determination regarding the impact on the area to human health and the environment was made using usual and customary practices.

5.1 Phase I ESA

The determination that an area constitutes a PAOC is based on a review of available site records, interviews with site personnel, site reconnaissance, reasonable available public information, and knowledge of past or present Site processes.

The scope of work for the Phase I ESA included: 1) visual site inspection, 2) review of facility and site records, 3) interviews with available facility and site personnel, and 4) review of available public records. Files reviewed for the Phase I ESA included:

- Environmental files, records, photographs, and architectural/engineering drawings maintained at GM's Willow Run and Argonaut offices.
- Aerial photographs of the property and surrounding area found at GM's Willow Run and Argonaut offices; the U.S. Department of Agriculture, Soil Conservation Services; Yankee Air Museum, County of Washtenaw offices, including: Metropolitan Planning Commission and Equalization and Property Description offices.
- Records of the State of MDEQ (formerly MDNR) , and County of Washtenaw.
- A Federal and State environmental database search was performed by Environmental Data resources.
- Interviews with Facility environmental and engineering personnel.
- Interviews with persons familiar with the history of the local area.

- .Interviews with public employees with knowledge of the facility.

The previous investigations, study reports, and remediation activities prior to May 1995 were reviewed and summarized in the Willow Run Phase I ESA (Chester, 1995). The Phase I ESA report summarized the following studies and reports:

- Remedial Action Plan (RAP) Willow Run Creek Site (CRA, 1995);
- Soils Investigation in Area of Historic Culvert at General Motors Willow Run Assembly Plant, Ypsilanti, Michigan (AHI, 1994);
- Phase I Hydrogeologic Investigation at the CAT Site (O'Brien & Gere, December 1994);
- Phase I Hydrogeologic Investigation at the North Tank Farm Site (O'Brien & Gere, December 1994);
- Limited Waste Removal Action, Willow Run Creek Bank Adjacent to Haulaway Yard (Weston 1994);
- Engineering Evaluation/Cost Analysis (EE/CA) Report - Willow Run Creek Site (Ecology and Environment, 1994);
- Preliminary Assessment/Visual Site Inspection (PA/VSI) Report (USEPA Region V, 1992);
- Closure of Two 750-gallon USTs in 1991 (Township of Ypsilanti, 1991);
- Study of the R & D Remediation Site (GMRES, 1991), and;
- Former Wastewater Treatment Plant Lagoon Closure (Chester, 1984).

Based on a review of these documents, available records, and site reconnaissance, Chester identified 11 PAOCs and 4 possible PAOCs, the locations potentially containing USTs discussed in Section 4.13. Two PAOCs were the Former North Tank Farm and the R&D Remediation Site, which were addressed under Part 213 and are discussed in Sections 4.1.1 and 4.1.2. Two other PAOCs, Tyler Pond and the Former Fire Pump House, are undergoing cleanup in accordance with Part 201 cleanup criteria under a Consent Judgement. The following 7 PAOCs were identified as requiring further investigation:

PAOC #1 - Former WWTP Lagoons Subsurface Soil
PAOC #2 - Former South Culvert Area
PAOC #3 - North Hydraulic Elevator Pit
PAOC #4 - Leaking Pipe System of Former Tank Area
PAOC #5 - ELPO Tank Building Area
PAOC #6 - Former Aeration Basin
PAOC #7 - Kaiser-Frazer Cinder Storage Area

Two additional PAOCs were identified during deactivation activities and subsequently described in the Willow Run Supplemental Phase I ESA:

PAOC #16 - South Hydraulic Elevator Pit
PAOC #17 - Pit #117

Although data from the CVO Property was discussed in the Phase I ESA, no PAOC determination was made because conditions there did not affect the pending sale of the Former Willow Run Assembly Plant property. Because the scope of this DEC Report also includes the adjacent CVO property, three additional PAOCs identified at the CVO property are discussed herein:

PAOC #18 - Kaiser-Frazer Dump Area
PAOC #19 - VOH Plume
PAOC #20 - Former CAT Site VOC Plume

The rationale for identifying each PAOC and the results of investigations performed in each area is presented in the following sections. PAOC locations are illustrated in Figure 2-1.

5.2 Applicable Regulatory Standards

The generic industrial and commercial cleanup criteria contained in OM #14 (Revision 2) are designed to be used as generic cleanup criteria for sites that can be appropriately and completely determined to maintain the designated land use. Future land use at Willow Run fits the criteria established for the industrial and commercial (subcategory II) exposure scenarios outlined in OM #14. During the Phase II ESI, analytical data from PAOC #s 2 and 3 is compared to OM #14 (Revision 2) generic industrial/commercial cleanup criteria to determine if there are exceedances and if further investigation is necessary.

The surficial water bearing unit beneath the property is not used as a source of drinking water (refer to Section 2.4.3); therefore, the Health Based and Aesthetic Drinking Water Values are not appropriate cleanup criteria for this property (see OM # 14, Revision 2). Groundwater data from locations adjacent to Tyler Pond are compared to the groundwater/surface water interface (GSI) values, and all groundwater data are compared to groundwater contact criteria (GCC). GCC were calculated using a utility worker exposure scenario.

Soil analytical data are compared to the industrial direct contact values (DCVs) and to soil inhalation criteria (SIC), both infinite source volatile soil inhalation criteria (VSIC) and particulate soil inhalation criteria (PSIC). Because groundwater data were collected, soil concentrations were not compared to soil water partitioning (SWP) criteria values.

5.3 Intrusive Investigation Technical Approach

5.3.1 Quality Assurance Project Plan (QAPP)

The QAPP was designed to ensure the implementation of appropriate data collection and analysis procedures and the collection of data of known accuracy and precision. The QAPP was prepared in accordance with USEPA Quality Assurance/Quality Control (QA/QC) guidelines, and the USEPA Region IV Standard Operating Procedures

(SOP) Manual. Data Quality Objectives (DQO) for this project included DQO levels I, II and III. Both field screening samples and samples for laboratory analysis were collected. Field analytical data reporting levels for this project corresponded to USEPA analytical levels I and II. Laboratory analytical data reporting levels for this project corresponded to USEPA analytical level III, with modifications to include surrogate, matrix spike, and matrix spike duplicate recoveries. All data was validated in accordance with USEPA Functional Data Validation Guidelines at the appropriate Analytical Data Level. All subsequent field investigations at Willow Run were performed in accordance with the QAPP. The QAPP is included as Appendix A.

5.3.2 Health and Safety Plan (HASP)

The Health and Safety Plan (HASP) was prepared to ensure that field personnel were adequately protected from injury due to physical hazards and exposure to hazardous substances above appropriate levels. The HASP was prepared in accordance with Title 29 Code of Federal Regulations (CFR) 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). All personnel entering the project area were required to read the HASP, and sign the HASP sign-off sheet. Air and personnel monitoring were conducted to determine potential exposure levels in accordance with procedures described in the HASP. Addenda to the HASP were prepared for subsequent field investigations, as appropriate.

5.3.3 Use of Field-Filter Samples in Determining Metals Concentrations in Groundwater

Historically, contaminant concentrations in groundwater venting to surface water from unfiltered samples must be compared to GSI criteria. However, monitoring wells that are completed in materials of low hydraulic conductivity or with a high clay content are difficult to properly develop, and it is equally difficult to obtain a water sample that is free of sediment. When water flows within unconsolidated sediments, the majority of particulates settle out because of the tortuosity of the flow path around the intergrannular porosity and gravitational effects. Although substantial research has documented that colloidal particles can travel notable distances in unconsolidated formations (Gschwend and Reynolds, 1987; Eicholtz et al, 1982; Enfield and Bengtsson 1988; Robertson, 1984), many researchers conclude that sediment produced from monitor wells in unconsolidated formations is due to sloughing of particulate material from the borehole under the turbulent flow conditions induced by well development and pumping, and only minimal colloidal matter in groundwater samples is from natural groundwater flow. In a Superfund Ground Water Issue Paper, Puls and Barcelona (1989) recommended using a 0.1-micron filter when collecting samples for estimates of the dissolved fraction; for estimates of contaminant mobility, filters with a pore size greater than or equal to 2 micron should be used. In practice, 0.45-micron filters are commonly used to balance between the objectives of isolating dissolved constituents and permitting reasonable use in the field. Hem (1989) concluded that there is good evidence that particulate metal hydroxides exist in most surface streams in the form of particulates smaller than 0.45 microns. Further, MDEQ toxicologist Chris Flaga stated that data from groundwater samples obtained using a low-flow pump should be comparable to that from groundwater samples field-filtered using a 0.45-micron filter. MDEQ toxicologist Jeff Crum provided formulae for determining GSI values for comparison to groundwater samples collected using a 0.45-micron filter. Therefore, BBL used 0.45-micron filters for collecting groundwater samples at Willow Run during the Phase II ESI (in addition to collecting unfiltered samples). Because low-flow pumps were not used when sampling monitoring wells at Willow Run, data from field-filtered samples were compared to GSI criteria.

Because use of a 0.45-micron filter was becoming a subject of debate, 1-, 5-, and 10-micron filters were used during various subsequent sampling events. The 10-micron filter was used after MDEQ OM #17 (Instructions for Obtaining Determinations on Mixing-Zone-Based Groundwater Surface Water Interface Criteria for Inclusion in Remedial Action Plans and Monitoring Compliance with Criteria for Discharges of Groundwater Contaminants to Surface Water) was issued in April, 1996. Site monitoring wells with GSI exceedances in some metals concentrations in unfiltered groundwater samples were resampled and analyzed for those metals. A 5-micron filter was used in field work performed in December 1996 because conversations with MDEQ toxicologists (Jeff Crum, personal communication) indicated that MDEQ was considering recommending a 5-micron filter for groundwater samples from the GSI to be analyzed for metals.

At Willow Run, data from two wells in the former South Culvert Area suggest that metals concentrations on colloidal size particles are not mobile in the surficial water-bearing unit. As is discussed in Section 5.5, Willow Run monitoring wells MW-2-12 A and MW-2-13A were both installed in locations with high lead soil concentrations in the Former South Culvert. Although the same size filter pack was used in constructing each well, development water from MW-2-12A was described as clean and clear, and that from MW-2-13A described as silty. This is consistent with descriptions of the purge water in subsequent sampling events. These wells were not sampled with a low-flow pump. As shown on Table 5-9, unfiltered groundwater samples from MW-2-13A usually had lead concentrations exceeding GSI, while those from MW-2-12A did not. This is evidence that lead concentrations truly are associated with the sediment content in the groundwater, and are not present in the dissolved phase. Although the construction details of the two wells were identical, MW-2-12A proved to be more successful as a point for obtaining representative groundwater samples.

5.3.4 Soil Borings and Soil Screening

Soil boring installation entailed the following:

- Mobilized to site and coordinated site access and control.
- Determined soil boring locations and coordinated concrete coring operations, if required.
- Calibrated Foxboro TVA-1000 OVA.
- Conducted health and safety meetings.
- Performed soil borings to the water table using a split spoon sampler or hydraulic probe.
- Described soils according to Burmister (1979) using the Unified Soil Classification System (USCS).
- Screened soil samples at 2-foot intervals to the water table with the TVA-1000 OVA to detect volatile organic compound constituents to augment visual observations and assist in subsequent soil boring location selection.
- Decontaminated equipment prior to, during, and after boring and sampling tasks at each boring/sampling point.
- Abandoned borings with bentonite and grout, after collection of groundwater samples, if required.

5.3.5 Temporary Well Installation

Temporary wells in PAOC # 17 were constructed of 2-inch diameter Schedule 40 PVC. Each temporary well point consisted of 5 feet of 0.010-inch slot PVC well screen and varying amounts of solid PVC riser depending on the depth to the water table. At least 2 feet of well screen were placed above the water table to intercept any LNAPL that may have been present. A 6/12 silica sand pack was placed around the remaining annular space of the borehole. Temporary well diagrams are included on the boring logs in Appendix B.

A hydraulic probe was used for groundwater sampling during the Phase II ESI in PAOCs 1 through 7, and in the Phase III EOC Studies in PAOCs 18 and 19.

5.3.6 Monitoring Well Installation

Permanent monitoring wells were installed in PAOC #s 1, 2, 3, 6, 7,16, 18, and 19 (Figure 5-1). Five wells were installed in background locations (Figure 5-1). All monitoring wells were constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC). The monitoring wells at Willow Run consist of 10 feet of 0.010-inch slot PVC well screen and varying amounts of solid PVC riser depending on the depth to the water table. Ten-foot screens were used instead of the five-foot screens recommended in the *Hydrogeologic Study Guidance Document* (MDNR, 1990) to ensure that the water table always intercepted the screened interval (to allow detection of any LNAPL present), and because determination of vertical variations in concentrations was not necessary. At least 2 feet of well screen was placed above the water table to intercept any LNAPL that may have been present. A 6/12 silica sand pack was placed around the remaining annular space of the borehole up to two feet above the well screen and sealed with 1 foot of bentonite. The remaining annular space to the surface was filled with bentonite cement slurry. The wells have PVC locking caps and flush-mount bolt-down protective covers embedded in concrete. Monitoring well construction diagrams are included in Appendix B.

5.3.7 Laboratory Sample Collection

Soil and groundwater samples were placed with ice prior to overnight shipping to Savannah Laboratories and Environmental Services, Inc. (Savannah), or pickup by Environmental Compliance, Inc. (ECI) or Brighton Analytical Laboratories (Brighton). Sample identification, date and time of sample collection, sample matrix type, and analyses to be performed were recorded on executed chain-of-custody forms that accompanied the samples.

Prior to sampling, monitoring wells were purged until successive measurements of temperature, pH, and conductivity stabilized, indicating that groundwater samples representative of the aquifer could be obtained. Stabilization of purge water parameters was indicated by successive readings being within 5 per cent. Aqueous samples for volatile organic compounds (VOC) analysis were preserved with hydrochloric acid. Aqueous samples for metals analysis were checked and adjusted in the field to a pH of less than 2.0 and preserved with nitric acid.

5.3.8 Quality Assurance/Quality Control

A site-specific QAPP (BBL, 1995) was developed and integrated into the site-specific project plan to ensure that appropriate data collection and analysis procedures were implemented, resulting in data of a known accuracy and precision. The QAPP identified DQO appropriate for the data use and field and laboratory data collection and analysis procedures required to generate data meeting the site-specific DQO.

QA/QC samples to determine the accuracy and precision of field sampling methods were collected and analyzed as follows:

- Equipment blanks were collected at a rate of 5 percent for each medium sampled. ;
- Duplicates were collected at a rate of 10 to 15 per cent; and
- Trip blanks accompanied all coolers containing VOC samples.

QA/QC procedures and reportables for laboratory analyses are specified in the QAPP. Laboratory data validation procedures for this project were developed in accordance with BBL's Quality Assurance Plan for environmental data collection and analysis, and followed practices specified in "Laboratory Data Validation Functional Guidelines","Contract Laboratory Program National Functional Guidelines for Organic Data Review" (USEPA 1993), and "Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (USEPA 1994). The objectives of the data validation procedures were to review the field and laboratory data and note any deviances from the procedures and limits defined in the QAPP and report on the effects of these deviances on the data reported. The QAPP is included as Appendix A. The results of the data validation are summarized in Section 5.15 and the data validation reports are included in Appendix C.

5.3.9 Phase II ESI

The Phase II ESI was implemented in accordance with the QAPP and site-specific HASP.

A summary of the requirements is presented in Table 5-1. The strategy used to determine the location and quantity of the sampling locations was as follows:

1. Determine the area of the PAOC;
2. Determine a reasonable grid size and sampling locations based on site features;
3. Project the grid system and sampling locations onto the PAOC area;
4. Project the number of sampling points and determine the area represented by a sampling point;
5. Determine if the grid size is appropriate for a reasonable confidence level;
6. Determine the proper distribution of vertical sampling based on geologic and hydrogeologic conditions; and
7. Bias sampling locations based on historical data to reduce the quantity of sampling locations required and still achieve the appropriate confidence levels.

Based on the data review for each PAOC, soil borings were placed in the areas most likely to have been the source or discharge point of the contamination. Soil samples were collected by advancing a stainless steel geoprobe split-spoon sampler with a polyethylene liner at 2-foot intervals to the water table. Groundwater samples were collected from the soil borings as appropriate with a peristaltic pump. Soil samples were screened using the following screening techniques:

- Field gas chromatography (GC) utilizing a photoionization detector (PID);
- X-ray fluorescence;
- Immunoassay techniques; and
- TVA-1000 Organic Vapor Analyzer.

Field screening of groundwater samples was not performed. Soil and groundwater samples were analyzed by appropriate laboratory analytical methods described in Table 5-1. Soil and groundwater sample locations are illustrated on Figure 5-2. Field screening data from the Phase II ESI is summarized on Figure 5-3. Field screening data are included as Appendix D. Based on the screening data collected in the field, samples were chosen for subsequent laboratory analysis in accordance with appropriate USEPA analytical methodologies and following the outline of the SAP. The laboratory analytical data was then used to determine impacts to the soils and groundwater at the site at levels that could pose an unacceptable risk to human health and the environment.

5.3.10 Supplemental Phase II

During the Supplemental Phase II ESI, permanent monitoring wells were installed at PAOCs where groundwater from temporary wells installed during the initial Phase II ESI contained dissolved metals concentrations above generic industrial criteria. Monitoring wells were placed adjacent to Tyler Pond to evaluate concentrations at the GSI. Soil and groundwater at two PAOCs (16 and 17) identified during facility deactivation procedures were also investigated. Table 5-2 summarizes investigation and for the Phase III EOC, which was conducted concurrently.

Five wells were also installed in background locations to evaluate metals concentrations in groundwater. Groundwater was analyzed for the metals that had been detected in samples field-filtered with a 0.45 micron filter in each PAOC during the initial Phase II ESI. Monitoring wells BG-1, BG-2, BG-3, BG-4, and BG-5 were installed in non-PAOC or SWMU locations (Figure 5-1). Filtered and unfiltered groundwater samples were collected and analyzed for cadmium, mercury, lead, and nickel.

5.3.11 Phase III EOC Study

The Phase III EOC Study field investigation of PAOC #s 2 (to delineate lead concentrations in soil) and 3 (to define the extent of LNAPL) was performed concurrently with the Supplemental Phase II ESI. These investigations are discussed in full in Sections 5.5.6 and 5.6.5, respectively. Phase III EOC Studies to investigate lead concentrations in soil at the Kaiser-Frazer Dump Area (PAOC #18) and the VOH groundwater plume at the CVO property (PAOC #19) are discussed in Sections 5.13.2 and 5.14.2, respectively.

5.4 PAOC #1 - Former Wastewater Treatment Plant Lagoon

In 1959, GM expanded its original WWTP system by installing two lagoons that supplemented an existing aeration basin. The area of each lagoon was approximately 160-feet by 270-feet. The system operated until 1984, when the lagoons were deactivated. PAOC #1 was also identified by PRC as SWMU #8.

As discussed in Section 3.1, GM submitted a Closure Plan in July 1984 for the lagoons that was approved by USEPA on September 20, 1984. The closure report was completed in March 1985 and submitted to USEPA. However, USEPA ruled that the waste managed in these units was not a hazardous waste; therefore, RCRA did not apply and this unit did not require USEPA approval of the closure.

Deactivation of the lagoons included the removal and disposal of sludge and contaminated subsoil. After visually clean soils were encountered, a minimum 6-inches of additional subsoil was removed. Soil samples were then taken from nine locations in each lagoon. Soil samples were collected at depths of 6, 12, and 24 inches at each location and submitted for EP Toxicity analysis. The analytical data showed that all of the soil samples were below the EP Toxicity standards for the characterization of hazardous waste. After closure of the lagoons, an expanded WWTP (the present structure) was constructed over the former lagoon areas.

This area was designated a PAOC because subsurface soils were not analyzed for total metals and analysis of the waste material indicated that the waste material was high in metals content. A Phase II ESI was conducted in June 1995 to determine whether metals were present in soil or groundwater at levels that could pose an unacceptable risk to human health or the environment at this location. Soil and groundwater sample locations are illustrated on Figure 5-2.

5.4.1 Contaminants of Concern

Chemicals used at the WWTP included anionic and cationic polymers, lime, sulfuric acid, and sodium hypochlorite. The contaminants of concern included all metals found in the waste industrial process waters treated in this plant. Although soil samples were collected beneath the former lagoon and were tested by EP Toxicity standards, they were not analyzed for total metals. As described in the Closure Certification Report (Chester, 1985), sludge samples tested for total metals during the lagoon closure indicated total lead concentrations of 430 to 26,000 mg/kg, total zinc concentrations of 7,800 to 16,000 mg/kg, and total chromium concentrations of 800 to 2,600 mg/kg.

Based on knowledge of process waters that were treated in this plant, the following metals compose the soil contaminants of concern in this area: aluminum, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, nickel, and zinc. The following are the groundwater contaminants of concern in this area: aluminum, cadmium, chromium, lead, mercury, nickel, and zinc.

5.4.2 Phase II ESI

5.4.2.1 Field Screening Rationale

Using a 100-foot grid pattern, four soil boring locations were chosen. Soil borings were advanced to depths ranging from 12 to 16 feet bgs, where the water table was encountered, and six to eight representative samples were collected from each two foot interval in each boring. A total of 28 soil samples were collected and screened for metals with an X-Ray fluorescence (XRF) analyzer.

5.4.2.2 Laboratory Analysis Rationale

Soil samples were collected during screening and submitted to the laboratory for analysis from three boring sections that exhibited the highest detections of screening analytes and from three boring sections that exhibited non-detectable concentrations of screening analytes. The soil samples were analyzed in the laboratory by USEPA Method 6010 for aluminum, arsenic, barium, chromium, nickel, selenium, and zinc; USEPA Method 7131 for cadmium; USEPA Method 7421 for lead; USEPA Method 7471 for mercury; and USEPA Method 7761 for silver.

One groundwater sample was collected with a hydraulic probe for metals analysis, and separated into two aliquots; one was filtered in the field through a 0.45 micron filter, and one was left unfiltered, to distinguish between total and dissolved metals. The samples were then submitted to the laboratory for analysis by USEPA Method 200.7 for aluminum, chromium, nickel, and zinc; USEPA Method 213.2 for cadmium; USEPA Method 220.2 for lead; and USEPA Method 245.1 for mercury.

5.4.2.3 Soil Results

The OM #14 DCVs and SIC were not exceeded in soils analyzed for metals. No OM #14 criteria were available to compare with the reported aluminum concentration, although the maximum concentration detected, 9,580 mg/kg, is well within the reported background concentrations for the eastern contiguous United States (USGS, 1984). Therefore, the Former WWTP Lagoons have been eliminated as a PAOC for soil. Soil analytical data from the Phase II ESI for PAOC #1are summarized in Table 5-3. Laboratory data from soil samples collected during the Phase II ESI are presented on Figure 5-4.

5.4.2.4 Groundwater Results

Cadmium, nickel, and lead were detected in groundwater samples at levels that exceeded OM #14 GSI criteria in both filtered and unfiltered samples; therefore, a permanent monitoring well (MW-1-5) was installed during a Supplemental Phase II ESI performed in April 1996. Groundwater analytical data from the Phase II ESI in PAOC #1are summarized in Table 5-4. MW-1-5 was resampled with a 10-micron filter in September 1996 because the MDEQ issued interim guidance for mixing zone calculations which required use of 10-micron filters for groundwater samples to be analyzed for metals content. Lead concentrations were BDL in all samples. There were no other metal concentrations detected above MDEQ GSI values at this PAOC. The location of MW-1-5 is shown on Figure 5-1. Laboratory data from groundwater samples collected during the Phase II ESI are presented on Figure 5-4.

5.4.3 Supplemental Phase II ESI

Monitoring well MW-1-5 was sampled on three consecutive days. Filtered (using a 1-micron filter) and unfiltered samples were collected for analysis to determine dissolved and total concentrations, respectively, of metals in groundwater. Concentrations of total lead exceeded the MDEQ GSI criterion of 6.6 (μg/L) in unfiltered groundwater samples from two of the three days. Dissolved lead concentrations were below detection limits (BDL, 5.0 μg/L) in all three samples. Therefore, the Former WWTP Lagoons are no longer considered a PAOC for groundwater. Groundwater analytical data from the Supplemental Phase II ESI in PAOC #1are summarized in Tables 5-5.

5.5 PAOC #2 - Former South Culvert Area

A portion of the Former South Culvert Area may have been used as a plating waste sludge disposal area between 1942 and 1944, according to a review of the historical documents (Chester, 1995). The capacity of the pond was approximately 5 million gallons. The entire South Culvert had been filled and graded by 1955. Investigations by Atwell-Hicks, Inc. in May 1994 revealed that the fill comprised a variety of materials, including brick, wood, copper wire, and sheet aluminum.

The filled and graded area was subsequently developed and is now covered by the eastern portion of the assembly building, concrete paved parking areas, the Detroit Edison's main electrical substation, and switch gear house. A Phase II ESI was conducted in June 1995 to determine whether regulated constituents were present in soil or groundwater at levels that could pose an unacceptable risk to human health or the environment at this location.

5.5.1 Contaminants of Concern

Investigations performed by Conestoga-Rovers & Associates (CRA 1995), and Atwell-Hicks, Inc. (AHI 1994) indicate that VOCs, SVOCs, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PNAs), and metals could potentially be present in the soils and groundwater. The particular metals of concern in the soil include aluminum, arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and zinc because these metals are associated with plating operations. The particular metals of concern in the groundwater included aluminum, cadmium, chromium, lead, mercury, nickel, and zinc.

5.5.2 Phase II ESI

5.5.2.1 Field Screening Rationale

This PAOC is approximately 300-feet wide in the north-south direction at its widest point near Tyler Pond by 1200-feet wide in the east-west direction. Using a 100-foot by 300-foot grid pattern, 15 soil boring locations were chosen. Soil borings were advanced to depths ranging from 5 to 16.5 feet bls, and up to seven representative samples were collected at each two foot interval at each boring. A total of 90 soil samples were collected for field screening. Samples were inspected to screen out those potentially contaminated based on observation (e.g. with strong odor or sheen). An OVA was used to screen for VOCs in the soil headspace; and a field GC was used to confirm the highest OVA reading at each location. Immunoassay techniques were used to screen soil samples for PCBs and PNAs. Soil samples were also screened for metals with an XRF analyzer.

5.5.2.2 Laboratory Analysis Rationale

One soil sample was collected and submitted to the laboratory for analysis from the interval in each of four borings that exhibited the highest detections of metals during XRF screening and from the interval in each of four borings that exhibited non-detectable levels of metals during XRF screening. These eight soil samples were analyzed in the laboratory by USEPA Method 6010 for aluminum, arsenic, barium, chromium, nickel, selenium, and zinc; USEPA Method 7131 for cadmium; USEPA Method 7421 for lead; USEPA Method 7471 for mercury; and USEPA Method 7761 for silver.

In addition, one soil sample that exhibited the highest level of volatile organics detected by TVA-1000 screening and visual observation was collected and submitted to the laboratory for analysis by USEPA Method 8260 for VOCs and one sample that exhibited the highest PNA content based on immunoassay was collected and submitted to the laboratory for analysis by USEPA Method 8270 for SVOCs . A soil sample that exhibited the highest level of PCBs by immuno-assay screening was also collected from each boring and submitted to the laboratory for analysis by USEPA Method 8080 for PCBs. Screening data from soil samples collected during the Phase II ESI are presented on Figure 5-3.

Three groundwater samples were collected with a hydraulic probe: two located near the groundwater/surface-water interface of the former culvert and Tyler Pond, and one in an area that had historically exhibited high concentrations of metals (AHI, 1994). The groundwater samples were collected for metals analysis, and separated into two aliquots; one was filtered in the field through a 0.45-micron filter, and one was left unfiltered, to distinguish between total and dissolved metals. The samples were then submitted to the laboratory for analysis by USEPA Method 200.7 for aluminum, chromium, nickel, and zinc; USEPA Method 213.2 for cadmium; USEPA Method 220.2 for lead; and USEPA Method 245.1 for mercury.

Three groundwater samples were collected and submitted for analysis by USEPA Method 8080 for PCBs. Two groundwater samples were also collected and submitted for analysis by USEPA Method 8270 for SVOCs and USEPA Method 8260 for VOCs.

Soil and groundwater sample locations for the Phase II ESI are illustrated on Figure 5-2.

5.5.2.3 Soil Results

Lead was detected in six of the eight samples at concentrations above OM #14 DCVs (400 mg/kg). No SVOCs or VOCs were detected at levels above OM #14 DCVs. No PCBs were detected in any of the soil borings. SIC were not exceeded in any soil samples. Soil analytical data from the Phase II ESI in PAOC #2 are summarized in Tables 5- 6 (organic compounds) and 5-7 (inorganic constituents). A Phase III EOC Study was required at PAOC #2 to characterize the vertical and horizontal extent of lead impacts to unsaturated soil. Laboratory data from soil samples collected during the Phase II ESI are presented on Figures 5-4 and 5-5.

5.5.2.4 Groundwater Results

SVOCs and VOCs were detected at levels below GSI and GCC in the groundwater sample collected from GW-2-1. No SVOCs or VOCs were detected in the sample collected from in GW-2-13.

Metals detections above OM #14 GSI criteria include:

- Cadmium and lead in all filtered and unfiltered samples;
- Mercury, at 0.2 and 0.3 μg/L in filtered samples from GW-2-12 and GW-2-13, respectively, and at 0.3 μg/L in the unfiltered sample from GW-2-13;
- Zinc, at 2020 and 400 μg/L in unfiltered samples from GW-2-12 and GW-2-13, respectively; and
- Nickel, at 560 μg/L in the unfiltered sample from GW-2-12.

Groundwater analytical data from the Phase II ESI in PAOC #2 are summarized in Table 5-8. Laboratory data from groundwater samples collected during the Phase II ESI are presented on Figures 5-4 and 5-5.

5.5.3 Supplemental Phase II ESI

Because cadmium, mercury, and lead were reported in groundwater samples at levels that exceeded OM #14 GSI criteria in filtered samples during the Phase II ESI, monitoring wells (MW-2-12 and MW-2-13A) were installed during a Supplemental Phase II ESI in April 1996. The locations of MW-2-12A and MW-2-13A are shown on Figure 5-1.

Monitoring wells MW-2-12A and MW-2-13A were sampled on three consecutive days. Filtered (using a 1-micron filter) and unfiltered samples were collected for analysis to determine dissolved and total concentrations, respectively, of metals in groundwater. Concentrations of total lead and total cadmium consistently exceeded the MDEQ GSI criteria of 6.6 μg/L and 0.64 μg/L, respectively, in MW-2-13A only. Concentrations of dissolved cadmium below GSI values were present in MW-2-12A and MW-2-13A. Lead and mercury were not detected in filtered samples from MW-2-13A, nor were they detected in filtered or unfiltered samples from MW-2-12A. MW-2-13A was resampled with a 10-micron filter in September 1996 because MDEQ issued interim guidance for mixing zone calculations which required use of 10-micron filters for groundwater samples to be analyzed for metals content. Groundwater was analyzed for lead and cadmium. Concentrations exceeded MDEQ GSI criteria in all unfiltered samples. Dissolved lead in one sample and dissolved cadmium in two samples exceeded the GSI criterion; lead was BDL in other filtered samples. Because concentrations of dissolved lead and cadmium in samples filtered with a 1-micron filter did not exceed the GSI in MW-2-13A, and were not detected in MW-2-12A,

PAOC #2 is no longer considered a PAOC for groundwater. Groundwater data from the Supplemental Phase II ESI in PAOC 2 is summarized on Table 5-9.

5.5.4 Phase III EOC

In April 1996, twenty six soil borings were installed for the Phase III EOC Study to delineate the extent of lead-impacted soil. Soil boring locations are illustrated on Figure 5-6. Soil samples were collected at two-foot intervals and submitted for laboratory analysis for lead by USEPA Method 7421. Lead contamination in soil in excess of DCVs was defined to the north, west, and south. The southeastern limit of contamination was not determined. Concentrations of lead in soil ranged from BDL to 40,000 mg/kg. Soil analytical data from the Phase III EOC for PAOC #2 are summarized in Table 5-10.

Two additional soil borings (SB-29 and SB-30) were installed in September 1996 in an unsuccessful attempt to define the southeastern extent of lead contamination. In December 1996, four additional borings (SB-31 - SB-34) were installed to define the southeastern extent of the lead-impacted soil. The area of lead-impacted soil merged with an area of lead-impacted soil on the CVO property (PAOC # 19, the Kaiser-Frazer Dump Area) where Weston performed a *Limited Waste Removal Action* in 1994 (Weston, 1994). Borings to define the extent of lead-impacted soil in the Kaiser-Frazer Dump area at the CVO property were installed concurrently (Section 5.12) and definition of the affected soil was completed. Soil boring locations SB-2-1 through SB-2-34 are illustrated on Figure 5-6. A summary of soil analytical data for lead from soil borings SB-29 through SB-34 are found on Table 5-11.

During the December 1996, field investigation, stained soils with obvious petroleum or solvent odors were encountered. A soil sample (SB-2-31) was collected for analysis of VOC compounds using USEPA Method 8240. Cis-1,2-dichloroethene and trichloroethene were present at concentrations below generic industrial DCVs. Concentrations of VOC compounds in soil from soil borings SB-29 through SB-34 are found on Table 5-12.

5.6 PAOC #3 - North Hydraulic Elevator Pit

Five hydraulic elevators are used at the facility. As indicated in the Phase I ESA (Chester, 1995), a loss of hydraulic fluid from the north elevator, located near column C-16, was discovered during a pressure test of the hydraulic system in 1991. The amount of fluid lost could not be determined because the hydraulic system was refilled several times prior to the pressure test.

The initial response included replacement of the unit and removal of approximately 40 cubic yards of impacted soils that were then shipped to Michigan Disposal for landfill disposal as a non-hazardous waste. The single wall hydraulic unit was replaced with a double wall unit. Because confirmation testing was not performed on the soil beneath the remediated area this location was identified as a PAOC (Chester, 1995) and a Phase II ESI was conducted in June 1995 to determine whether SVOC compounds were present in soil or groundwater at this location at levels that could pose an unacceptable risk to human health or the environment.

5.6.1 Contaminants of Concern

Data presented in the Phase I ESA (Chester, 1995) indicated that hydraulic fluid has potentially impacted this location. Therefore, the contaminants of concern for this study were SVOCs. There was no evidence that PCBs were in the hydraulic oil, therefore, samples were not analyzed for PCBs.

5.6.2 Phase II ESI

5.6.2.1 Field Screening Rationale

This PAOC is approximately 40-feet by 40-feet. Using a 10-foot grid pattern, four soil boring locations were chosen. Four soil borings were advanced to depths ranging from 13 to 13.7 feet bls, and six discreet two-foot samples were collected at each boring. A total of 24 soil samples were collected for field screening. Samples were inspected to screen out those potentially contaminated based on observation (e.g. with strong odor or sheen). An OVA was used to measure VOCs in the soil headspace of each screening sample. Screening data from soil samples collected during the Phase II ESI are presented on Figure 5-3.

5.6.2.2 Laboratory Analysis Rationale

One soil sample was collected and submitted to the laboratory for analysis from the boring section that exhibited the highest detections of screening analytes at each boring location. These four samples were analyzed by USEPA Method 8270 for SVOCs.

One groundwater sample (GW-3-1) was collected from the boring location that exhibited the highest OVA readings and was submitted to the laboratory for analysis by USEPA Method 8270 for SVOCs.

5.6.2.3 Soil Results

LNAPL was observed in boring SB-3-1. A monitoring well (MW-3-1) was installed adjacent to this location on June 10, 1995, and a 0.2 foot thick layer of free product was observed in the monitoring well on July 17, 1995. Concentrations of SVOC did not exceed OM #14 DCVs or SIC in the soil samples analyzed. Therefore, the North Elevator Pit has been eliminated as a PAOC for soil. Soil analytical data from the Phase II ESI in PAOC #3 are summarized in Table 5-13. Laboratory data from soil samples collected during the Phase II ESI are presented on Figure 5-5.

5.6.2.4 Groundwater Results

Groundwater analytical data from the Phase II ESI in PAOC #3 are summarized in Table 5-14 and shown in Figure 5-5. Naphthalene was detected at a concentration of 177 μg/L, which is above the GSI value. Accordingly, additional investigation was conducted as discussed in Section 5.6.3.

5.6.3 Phase III EOC Study (LNAPL)

In April 1996, BBL performed a Phase III EOC Study to characterize the extent of the LNAPL discovered on groundwater and concentrations of SVOC in soil and groundwater associated with the LNAPL. Four soil borings were performed, one each ten feet to the northwest, northeast, southeast, and southwest of monitoring well MW-3-1. Soil samples were collected at two-foot intervals down to the water table and screened with an OVA. One soil sample was collected from each boring for laboratory analysis based on OVA data. Soil boring locations are illustrated on Figure 5-7. Concentrations of SVOC did not exceed OM #14 DCVs in the soil samples analyzed. Soil analytical data from the Phase III EOC in PAOC #3 are summarized in Table 5-15.

Oily soil was not observed, therefore monitoring wells were installed in all soil boring locations except for the southwest (up-gradient) direction. LNAPL was not observed in any of the monitoring wells. Groundwater analytical data from the Phase III EOC in PAOC #3 are summarized in Table 5-16. Monitoring wells MW-3-5, MW-3-7, and MW-3-8 were all sampled and analyzed for SVOCs. Groundwater analytical data from the Phase III EOC at PAOC #3 are summarized in Table 5-16. None of the published GCC were exceeded, and only naphthalene was detected in excess of the GSI in wells MW-3-6 and MW-3-8. Regardless, this area is not considered a PAOC for groundwater for the following reasons:

1. Well MW-3-7 is in the most appropriate location to evaluate immediate downgradient GSI concentrations and SVOCs were not detected in this well (refer to Figure 5-14 for groundwater flow direction;

2. GW-7-1 and GW-7-2 are further downgradient from PAOC #3 and Table 5-27 shows that there were not positive detections of SVOCs at these locations; and,

3. SVOCs are generally considered to be relatively immobile in groundwater and the closest opportunity for groundwater to vent to surface water is Tyler Pond, which is nearly 800 feet from PAOC #3.

A bail down test was performed in monitoring well MW-3-1 to determine the true thickness of the LNAPL, which was determined to be 0.08 feet. Because the vertical and horizontal extent of LNAPL are small, this area can be addressed by hand bailing the LNAPL.

5.7 PAOC #4 - Leaking Pipe System of Former Tank Farm

As discussed in Section 4.1.2, underground piping associated with the tank farm formerly located at the R&D Site was determined to be leaking in the early 1970s. The system was abandoned and a new aboveground system was installed.

This area was excavated in 1973 to install a new fire protection system. An oily liquid was discovered that apparently originated from the abandoned pipe system. According to the Willow Run Phase I ESA, the release was reported to MDNR, but documentation of the cleanup could not be located. Facility personnel reported that the piping was flushed with water and that contaminated soils were excavated and treated in a fabricated system. Oils collected were recycled. No documentation of the ultimate disposition of the soil was available. This area was investigated as part of the former R&D Site in 1995 and the results are discussed in Section 4.1.2.

5.8 PAOC #5 - ELPO Tank Building Area

The ELPO Tank building adjoins the north side of the Assembly Building. Tanks located at this PAOC include a 20,000-gallon, aboveground waste holding tank, a sulfuric acid tank, a caustic tank, a 100,000 gallon ELPO aboveground dump tank, and a tank identified as a "phosphor" tank that reportedly contained phosphoric acid. These tanks were used for the storage and handling of the electrode position paint (high in lead) and other chemicals used in the undercoat process in the assembly building.

According to the Phase I ESA (Chester 1995), the concrete floor in this area was replaced in the early 1980s because the floors had eroded due to storage of acids and caustics in this building, and interviews with GM personnel indicated that sub-surface soil conditions were not analyzed prior to replacement of the floor. A Phase

II ESI was conducted in June 1995 to determine whether lead was present in soil or groundwater at this location at levels that could pose an unacceptable risk to human health or the environment.

5.8.1 Contaminants of Concern

Lead was identified as the contaminant of concern in the ELPO Tank Building area.

5.8.2 Phase II ESI

5.8.2.1 Field Screening Rationale

This PAOC is approximately 100-feet by 100-feet. Using a 50-foot grid pattern, three sampling locations were chosen. Soil borings were advanced to total depths ranging from 10 to 13 feet bgs. Five or six (depending on depth of boring) representative samples were collected at two foot intervals at each boring. A total of 16 soil samples were collected for field screening. Samples were inspected to screen out those potentially contaminated based on observation, e.g. with strong odor or sheen, and soil samples were screened for metals with an XRF analyzer. Screening data from soil samples collected during the Phase II ESI are presented on Figure 5-3.

5.8.2.2 Laboratory Analysis Rationale

One soil sample was collected and submitted to the laboratory for analysis from each of two boring sections that exhibited relatively high detections of screening analytes and from one boring section that exhibited non-detectable concentrations of screening analytes. These three soil samples were analyzed by USEPA Method 7421 for lead.

One groundwater sample was collected for metals analysis from a soil boring location that exhibited relatively high XRF readings, and separated into two aliquots; one was filtered in the field through a 0.45 micron filter, and one was left unfiltered, to distinguish between total and dissolved metals. The samples were then submitted to the laboratory for analysis by USEPA Method 220.2 for lead. Field screening data from soil samples collected during the Phase II ESI are presented on Figure 5-3.

5.8.2.3 Soil Results

The concentrations of lead in soil samples, which ranged from 2.39 to 3.34 mg/kg, did not exceed OM #14 DCVs or SIC. Therefore, the ELPO Tank Building area has been eliminated as a PAOC for soil. Soil analytical data from the Phase II ESI in PAOC #5 are summarized in Table 5-17. Laboratory data from soil samples collected during the Phase II ESI are presented on Figure 5-4.

5.8.2.4 Groundwater Results

Concentrations of lead were 660 μg/L in both filtered and unfiltered samples. The GCC was not exceed in this well while the GSI of 6.6 μg/L was exceeded. Metals concentrations in groundwater have been evaluated at a series of monitoring wells placed adjacent to Tyler Pond (MW-1-5, MW-2-12A, MW-2-13A, MW-6-5A, and MW-7-3), which are the compliance points for GSI. Therefore, because the compliance points did not exhibit metals concentration exceeding GSI, this area has been eliminated as a PAOC for groundwater. Groundwater analytical

data from the Phase II ESI in PAOC #5 are summarized in Table 5-18. Laboratory data from groundwater samples collected during the Phase II ESI are presented on Figure 5-4.

5.9 PAOC #6 - Aeration Basin

Operations at the aeration basin began prior to GM ownership and ceased in 1961 when the basin was closed. The basin may have been operated as an evaporation pond. The method of basin closure is unclear. As described in the Phase I ESA (Chester 1995) interviews conducted with GM personnel indicate that the basin may have been filled in with materials comprising the dike that surrounded the basin during its period of operation. GM personnel indicated that paint-containing wastes, solvent wastes, and acidic and caustic liquids were discharged to the basin. A Phase II ESI was conducted in June 1995 to determine whether VOCs, SVOCs, PCBs, cyanide, or metals were present in soil or groundwater at levels that could pose an unacceptable risk to human health or the environment at this location. Soil and groundwater sample locations are illustrated in Figure 5-2.

5.9.1 Contaminants of Concern

The historical waste stream information indicates that the contaminants of concern include VOCs, SVOCs, and potentially PCBs, and cyanide. The particular metals of concern in the soil include aluminum, arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and zinc. The particular metals of concern in the groundwater included aluminum, cadmium, chromium, lead, mercury, nickel, and zinc. These metals are potentially associated with the processes that generated the industrial wastewater streams that went to the Aeration Basin based on knowledge of processes conducted at the site during the period of operation.

5.9.2 Phase II ESI

5.9.2.1 Field Screening Rationale

This PAOC is approximately 300-feet by 900-feet. Using a 300-foot by 100-foot biased grid pattern, 10 soil boring locations were chosen. Soil borings were advanced to depths ranging from 12 to 17 feet bgs, and five to eight representative samples were collected at two foot intervals at each boring location. A total of 75 soil samples were collected for field screening. Samples were inspected to screen out those potentially contaminated based on observation, e.g. with strong odor or sheen. An OVA was used to measure VOCs in the soil headspace; a field GC was used to confirm the highest OVA reading at each location. Immunoassay techniques were used to screen soil samples for PCBs. Soil samples were also screened for metals with an XRF analyzer. Screening data from soil samples collected during the Phase II ESI are presented on Figure 5-3.

5.9.2.2 Laboratory Analysis Rationale

One soil sample was collected and submitted to the laboratory for analysis from an interval in each of three borings that exhibited relatively high detections of screening analytes and from an interval in each of three borings that exhibited non-detectable screening analytes. These six soil samples were analyzed by USEPA Method 6010 for aluminum, arsenic, barium, chromium, nickel, selenium, and zinc; USEPA Method 7131 for cadmium; USEPA Method 7421 for lead; USEPA Method 7471 for mercury; and USEPA Method 7761 for silver. These six samples were also submitted to the laboratory for analysis by USEPA Method 8270 for SVOCs; USEPA Method 8260 for

VOCs; USEPA Method 8080 for PCBs; and USEPA Method 9010 for cyanide. Two additional soil samples were collected and submitted to the laboratory for analysis by USEPA Method 8080 for PCBs.

Two of the groundwater samples were collected near the groundwater/surface-water interface, and one from an area that had historically exhibited high concentrations of contaminants (AHI, 1994). Three groundwater samples were collected and submitted to the laboratory for analysis by USEPA Method 200.7 for aluminum, chromium, nickel, and zinc; USEPA Method 213.2 for cadmium; USEPA Method 220.2 for lead; and USEPA Method 245.1 for mercury. Each groundwater sample was separated into two aliquots, one un-filtered and one filtered through a 0.45 micron filter, to distinguish between total and dissolved fractions of analytes.

5.9.2.3 Soil Results

The OM #14 DCVs and SIC were not exceeded for either metals or organic compounds in any of the soil samples analyzed, although cyanide was detected in sample SB-6-8-12-14. Therefore, the former Aeration Basin has been eliminated as a PAOC for soil. Soil analytical data from the Phase II ESI in PAOC #6 are summarized in Tables 5-19 and 5-20. Laboratory data from soil samples collected during the Phase II ESI are presented on Figures 5-4 and 5-5.

5.9.2.4 Groundwater Results

Results of laboratory analyses of groundwater samples were as follows:

- Concentrations of lead and cadmium exceeded the OM #14 GSI criteria were exceeded for lead and cadmium in all the filtered (using a 0.45-micron filter) and unfiltered groundwater samples analyzed.
- Nickel was detected above GSI values in all the unfiltered groundwater samples submitted to the laboratory for analysis and nickel was detected above GSI in the filtered groundwater sample, GW-6-5.
- Mercury was detected above OM #14 GSI values in unfiltered groundwater samples collected from GW-6-5 and GW-6-9, and in a filtered groundwater sample collected from GW-6-5.
- Zinc was also detected above OM #14 GSI values in an unfiltered sample collected from GW-6-9 but not in filtered sample.
- Metals concentrations in all samples analyzed did not exceed GCC.
- No organic compounds were detected above GSI or GCC values in any groundwater sample.

Groundwater analytical data from the Phase II ESI in PAOC #6 are summarized in Tables 5-21 and 5-22. Because cadmium, nickel, mercury, and lead were reported in groundwater samples at levels that exceeded OM #14 GSI criteria a Supplemental Phase II ESI was performed in April 1996. Laboratory data from groundwater samples collected during the Phase II ESI are presented on Figures 5-4 and 5-5.

5.9.3 Supplemental Phase II ESI

A permanent monitoring well (MW-6-5A) was installed during the Supplemental Phase II ESI. The location of MW-6-5A is shown on Figure 5-1, while Figure 5-15 shows the locations of all sampling locations conducted to evaluate PAOC #6. Monitoring well MW-6-5A was sampled on three consecutive days. Filtered (using a 1-micron filter) and unfiltered samples were collected for analysis to determine dissolved and total concentrations, respectively, of metals in groundwater. Concentrations of total lead and total mercury exceeded the MDEQ GSI criteria of 6.6 μg/L and 0.0013 μg/L, respectively, on at least one day. Dissolved lead was present above the GSI criterion on one day only. Concentrations of cadmium and nickel did not exceed GSI criteria in filtered or unfiltered samples in any of the sampling events. Concentrations of all metals analyzed were below GCC.

MW-6-5A was resampled with a 10-micron filter in September 1996 because MDEQ issued interim guidance for mixing zone calculations which required use of 10-micron filters for groundwater samples to be analyzed for metals content. Groundwater was analyzed for lead and mercury. Concentrations of these metals were BDL in all filtered and unfiltered samples. Therefore, because dissolved lead was detected in only one of three samples above the GSI value, the Aeration Basin is no longer considered a PAOC for groundwater. Groundwater analytical data from the Supplemental Phase II ESI for PAOC #6 are summarized in Table 5-23.

5.10 PAOC #7 - Kaiser-Frazer Cinder Storage Area

Kaiser-Frazer (KF) leased the subject site and adjacent areas from the War Asset Administration in November 1945 and then purchased those properties in 1948. KF produced automobiles, trucks, aircraft engines, and other military equipment until 1953. GM purchased the Willow Run property in December 1954. Several potential PAOCs resulting from KF's use of the property were identified in the Phase I ESA. All of these potential PAOCs, except for the cinder storage area, were located in areas which were already scheduled for investigation under this Phase II ESI. The cinder storage area is designated a PAOC because of the operations normally associated with the disposal of incinerator ash. The cinder storage area is located northeast of the former incinerator. A Phase II ESI was conducted in June 1995 to determine whether SVOC compounds and metals were present in soil or groundwater at this location at levels that could pose an unacceptable risk to human health or the environment. Soil and groundwater sample locations are illustrated on Figure 5-2. Follow up investigations were conducted in April 1996, November 1996, and August 1997. These investigations are discussed in Section 5.10.3, 5.10.4, and 5.10.5, respectively.

5.10.1 Contaminants of Concern

Historical information presented in the Phase I ESA (Chester 1995) indicates that the particular contaminants of concern in the soil are PNAs and the following metals: aluminum, arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and zinc. The particular contaminants of concern in the groundwater are PNAs, and the following metals: aluminum, cadmium, chromium, lead, mercury, nickel, and zinc.

5.10.2 Phase II ESI

5.10.2.1 Field Screening Rationale

The estimated dimensions of the cinder storage area are 100-feet by 200-feet. Using a 100-foot grid pattern, two soil boring locations were chosen. Soil borings were advanced to depths of 17 and 20 feet bgs, and six discreet 2-foot soil samples were collected at each boring. A total of 12 soil samples were collected for field screening. Samples were inspected to screen out those potentially contaminated based on observation, e.g. with strong odor or sheen. Immunoassay techniques were used to screen soil samples for PNAs. Soil samples were also screened for metals with an XRF analyzer. Screening data from soil samples collected during the Phase II ESI are presented on Figure 5-3.

5.10.2.2 Laboratory Analysis Rationale

One soil sample was collected and submitted to the laboratory for analysis from each of two boring sections that exhibited relatively high detections of screening analytes and from each of two boring sections that exhibited non-detectable screening analytes. These four soil samples were analyzed by USEPA Method 6010 for aluminum, arsenic, barium, chromium, nickel, and zinc; USEPA Method 7131 for cadmium; USEPA Method 7421 for lead; and USEPA Method 8270 for SVOCs.

Two groundwater samples were collected from boring sections that exhibited relatively high detections of screening analytes, and submitted to the laboratory for analysis by USEPA Method 8270 (base/neutrals fraction only) for SVOCs. Two groundwater samples were collected for metals analysis, and each separated into two aliquots; one was filtered in the field through a 0.45 micron filter, and one was left unfiltered to distinguish between total and dissolved metals. The samples were then submitted to the laboratory for analysis by USEPA Method 200.7 for aluminum, chromium, nickel, and zinc; USEPA Method 213.2 for cadmium; USEPA Method 220.2 for lead; and USEPA Method 245.1 for mercury.

5.10.2.3 Soil Results

Metals and organic compounds were not detected at levels above OM #14 DCVs or SIC in any soil sample. Therefore, the K-F Cinder Storage Area has been eliminated as a PAOC for soil. Soil analytical data from the Phase II ESI in PAOC #7 are summarized in Tables 5-24 and 5-25. Laboratory data from soil samples collected during the Phase II ESI are presented on Figures 5-4 and 5-5.

5.10.2.4 Groundwater Results

In both filtered and unfiltered groundwater samples, cadmium, lead, and mercury were reported at levels that exceeded OM #14 GSI values; no organic compounds were detected and GCC values for metals were not exceeded. Groundwater analytical data from the Phase II ESI in PAOC #7 are summarized in Tables 5-26 and 5-27. Laboratory data from groundwater samples collected during the Phase II ESI are presented on Figures 5-4 and 5-5.

Because cadmium, mercury, and lead were reported in groundwater samples at levels that exceeded OM #14 GSI criteria, a Supplemental Phase II ESI was performed in April 1996.

5.10.3 Supplemental Phase II ESI

A permanent monitoring well (MW-7-3) was installed during the Supplemental Phase II ESI conducted in April 1996, as shown in Figure 5-1. Monitoring well MW-7-3 was sampled on three consecutive days for filtered (using a 1-micron filter) and unfiltered samples to determine dissolved and total concentrations, respectively, of cadmium, mercury, and lead in groundwater. Only lead was detected in unfiltered samples in excess of the GSI. MW-7-3 was resampled in September 1996 for lead analysis with a 10-micron filter because MDEQ issued interim guidance for mixing zone calculations which required use of 10-micron filters for groundwater samples to be analyzed for metals content. Concentrations of lead were BDL in all filtered and unfiltered samples. Therefore, the K-F Cinder Storage Area is no longer considered a PAOC for groundwater. Groundwater analytical data from the Supplemental Phase II ESI in PAOC #7are summarized in Table 5-28.

5.10.4 Supplemental Phase II ESI - Water Main Installation

During November 1996, BBL provided an environmental specialist to observe the installation of a 24-inch water main at the Willow Run property, as part of the Willow Run Creek Cleanup. The water main was installed near the fence line and transected the entire area where the Cinder Storage area might have been located. During this effort, BBL inspected, excavated, and exposed soils for evidence of environmental impacts. If warranted, soil samples were to be collected for visual field screening and laboratory analysis. Later in August 1997, monitoring wells were installed to assess groundwater conditions.

5.10.4.1 Soil Assessment

During the installation of the 24-inch water main, stained soils were encountered at four locations as shown on Figure 5-17, which is provided in Attachment 6. These four areas were identified as potential areas of concern relative to the PAOC #7 area. Wooden blocks were also encountered at one location. To determine whether soil had been impacted above MDEQ generic industrial/commercial subcategory II criteria, four soil samples and a sample of wooden block were collected for laboratory analyses, including VOC, SVOCs, and metals. VOC analyses were performed using EPA Method 8240. SVOCs were analyzed using EPA Methods 8270 (samples other than Composite 1) or 8100 (Composite 1). Metals were analyzed using EPA Methods 6010 (barium, cadmium, chromium, copper, nickel, silver, and zinc), 7060 (arsenic), 7471 (mercury), 7740 (selenium), and 7421 (lead). The constituents for which each sample was analyzed varied as described in the following text. Laboratory analytical data are summarized in Table 5-41 (Summary of Analytical Data, Organic Compounds) and Table 5-42 (Summary of Analytical Data, Metals), which are included as Attachment 7.

Applicable Regulatory Criteria

The generic industrial and commercial cleanup criteria contained in Operational Memorandum (OM) #14, Revision 2 (MDNR, 1995) were designed to be used as generic cleanup criteria for sites that can be appropriately and completely determined to maintain the designated land use. Current and future land use at Willow Run fits the criteria established for the industrial and commercial (subcategory II) exposure scenarios outlined in OM #14 and associated addenda.

Because groundwater samples were not collected for analysis at that time, soil analytical data were compared to soil partitioning (SWP) values. The surficial water-bearing unit is not an aquifer, therefore, only soil partitioning

values protective of GCC and GSI values were considered. Soil data were also compared to DCVs and SIC. SIC include VSIC and PSIC.

Sample Collection and Analytical Data

Composite A (Area 4). Composite A was collected from an area of gray stained soil on November 6, 1996. Composite A was analyzed for VOC, SVOC and the ten Michigan metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc). Concentrations of VOC compounds were below detection limits (BDL). Concentrations of SVOC compounds, arsenic, barium, cadmium, chromium, copper, lead, and zinc were detected below relevant regulatory comparison values. Mercury was detected above the SWP value for the GSI. The location of Composite A is approximately 50 feet from the GSI. To evaluate GSI compliance, a monitoring well was installed near the GSI and groundwater samples were collected, as discussed in Section 5.10.4.2. In addition, surface-water samples were collected from Tyler Pond and analyzed for metals during the Expanded Site Inspection (ESI) of the Willow Run Creek Site [WRCS, (Ecology & Environment, 1992)]. Mercury was not detected.

Composite 1 and Wooden Block Sample (Area 3). Soil samples were collected in the vicinity of the wooden blocks (Composite 1) and the wooden blocks (Block). Composite 1 was analyzed for VOC, SVOC, and lead. Concentrations of VOC compounds were BDL. The concentrations of the SVOCs and lead were below SIC and DCVs except for benzo(a)pyrene, which was detected at 23,000 μg/kg. This exceeds generic industrial DCV of 21,000 μg/kg, so a site-specific DCV for benzo(a)pyrene was calculated.

The SVOC and metals concentrations were below SIC and DCVs, except for benzo(a)pyrene, which at 80,000 μg/kg exceeded the generic industrial DCV of 21,000 μg/kg. Assumptions in calculating the generic DCV include site workers who are exposed to the chemical 112 days per year. Because the blocks are not located at the surface, a worker would only encounter them during utility repair.

Workers installing the water main were exposed to the impacted blocks for less than five days. Using a more conservative value of 20 days in the DCV algorithm, a value of 114,000 μg/kg was calculated. The ingestion rate and skin surface area parameters appropriate for wood blocks are also likely to be less than the generic values used for soil because material from the wood block is less likely to be accidentally ingested, and a smaller portion of a rigid material would come into contact with skin. Therefore, the site-specific value of 114,000 μg/kg is still a conservative value. Since the benzo(a)pyrene concentration detected was well below the site-specific value, further evaluation with respect to this constituent is not necessary.

Concentrations of acenaphthene, 2-methylnaphthalene, naphthalene, mercury, and cadmium exceeded the GSI SWP values so groundwater should be evaluated because the location of the Wooden Block sample is approximately 50 feet upgradient of the GSI. If the groundwater concentrations of these parameters downgradient of Composite 1 and the Wooden Blocks are below the GSI criteria, then this area can be eliminated as an SAOC for soil. The analytical data for soil are summarized in Tables 5-41 and 5-42.

Composite B (Area 2). The soil sample was analyzed for VOC, SVOC, and metals. VOC analyses were performed using EPA Method 8240. SVOCs were analyzed using EPA Method 8270. Metals were analyzed using EPA Method 6010 (barium, cadmium, chromium, copper, silver, and zinc), 7060 (arsenic), 7471 (mercury), 7740 (selenium), and 7421 (lead). The concentrations of arsenic, barium, chromium, copper, lead, and zinc were detected

below relevant regulatory comparison values. Consequently this area can be eliminated as a PAOC. The analytical data for soil are summarized in Table 5-41 and 5-42.

Composite F (Area 1). A soil sample was collected from gray stained soils (Composite F). The soil sample was analyzed for VOC, SVOC, and metals. VOC analyses were performed using EPA Method 8240. SVOCs were analyzed using EPA Method 8270. Metals were analyzed using EPA Method 6010 (barium, cadmium, chromium, copper, silver, and zinc), 7060 (arsenic), 7471 (mercury), 7740 (selenium), and 7421 (lead).

The VOC, SVOC, and metals concentrations were below SIC and DCVs, except for lead, which was detected at 600 mg/kg. This concentration is equal to the generic industrial DCV of 600 mg/kg. The location of Composite is close to the former South Culvert area, where lead impacts above generic industrial criteria have already been documented and are being addressed.

The concentrations of N-nitrosodiphenylamine/diphenalymine, 2,4,5-trichlorophenol, ethylbenzene, toluene, xylenes, barium, mercury, and zinc exceed the GSI SWP values, so groundwater should be evaluated because the location of Composite F is approximately 150 feet upgradient of the GSI. If the groundwater concentration of these compounds downgradient of Composite F are below the GSI, then this area can be eliminated as a PAOC for soil. The analytical data for soil are summarized in Tables 5-41 and 5-42.

5.10.4.2 Groundwater Investigation

Potential Exposure Pathways for Groundwater

Exposure pathways to be considered for groundwater include direct contact (dermal and ingestion) and discharge to surface water. As discussed in Section 2.2, the surficial unit is not a useable aquifer. Therefore, the ingestion pathway is not complete, and health-based and aesthetic drinking water criteria are not applicable to Property groundwater.

Dermal contact with groundwater by utility workers has been considered in developing the Utility Worker GCC recently published by MDEQ in an addendum to OM #14. Because this is a potential exposure pathway at Willow Run, groundwater concentrations have been compared to these values.

Groundwater venting to surface water is a viable pathway to consider for groundwater. If the groundwater samples collected on-site contain contaminant concentrations above GSI criteria, additional groundwater evaluation will be needed.

Three permanent monitoring wells were installed between August 22, and August 25, 1997, at the locations shown on Figure 5-17. Each monitoring well is constructed of 1-inch diameter Schedule 80 polyvinyl chloride (PVC). The monitoring wells consist of 10 feet of 0.10-inch slot PVC well screen and varying amounts of solid PVC riser depending on the depth to the water table. At least 5 feet of well screen was placed below the water table. A 6/12 silica sand pack was placed around the remaining annular space of the borehole up to two feet above the well screen and sealed with 1 foot of bentonite. The remaining annual space to the surface was filled with bentonite cement slurry. The wells have PVC locking caps and flush-mount bolt-down protective covers embedded in concrete.

Following installation, each monitoring well was developed by over pumping and light surging. The wells were developed with a peristaltic pump until the water ran clear. Monitoring well development water wad discharged to land surface in the vicinity of each wellhead.

Monitoring wells were installed in August 1997, downgradient of Composite A (Area 4), Composite 1 and Wooden Blocks (Area 3), and Composite F (Area 1) and samples were obtained to determine compliance with GSI criteria.

Composite A (Area 4). A groundwater monitoring well (MW-A) was installed downgradient of the soil sampling location. Based on the results from soil sampling, the groundwater sample was sampled on August 21, 1997 and analyzed for mercury by EPA Method 245.1. The concentration of mercury was BDL in the groundwater sample. Consequently, this area can be eliminated as a PAOC for both groundwater and soil. The analytical data for groundwater are summarized in Tables 5-43 and 5-44.

Composite 1 and Wooden Blocks (Area 3). A groundwater sample was collected from a monitoring well (MW-WB-1) installed hydraulically downgradient of the soil sampling location. Based on results from soil analysis, groundwater from monitoring well MW-WB-1 was sampled on August 25, 1997 and analyzed for SVOC, mercury, and cadmium analysis. The concentration of SVOCs and mercury in the groundwater samples were BDL. The concentration of dissolved cadmium was below the GCC and GSI criteria. Consequently, this area can be eliminated as a PAOC for both groundwater and soil. The analytical data for groundwater are summarized in Tables 5-43 and 5-44.

Composite F (Area 1). Groundwater from monitoring well MW-F on August 25, 1997 was sampled for VOC, SVOC, barium, mercury, and zinc. The concentration of SVOCs and mercury in the groundwater samples were BDL. VOCs, barium, and zinc were detected at concentrations below the regulatory comparison values. Consequently, with the exception of the lead concentrations in soil already being addressed at the site, this area can be eliminated as a PAOC for both groundwater and soil. The analytical data for groundwater are summarized in Tables 5-43 and 5-44.

Summary. With the exception of the lead concentration in soil relative to PAOC #2, this area can be eliminated as a PAOC in soil and groundwater. As noted previously, Composite F is close to the former South Culvert area, where lead impacts above generic industrial criteria have been documented. Lead concentrations in this area should be addressed along with lead impacts in the South Culvert area.

5.11 PAOC #16 - South Hydraulic Elevator Pit

During Facility Deactivation procedures, GM personnel discovered that there had been a potential for release of fluids from the hydraulic unit of the South Elevator. The hydraulic unit, which had been fully charged during maintenance work several years earlier, was discovered to be lacking hydraulic oil. Therefore, LNAPL potentially existed on the subsurface in that area, and soil and groundwater may have been impacted. This area was designated a PAOC and was investigated in April 1996.

5.11.1 Contaminants of Concern

Contaminants of concern associated with hydraulic oil are SVOC and the ten Michigan metals. There was no evidence that PCBs were in the hydraulic oil, therefore, samples were not analyzed for PCBs.

5.11.2 Phase II ESI

Four soil borings and one permanent monitoring well were installed at PAOC #16.

5.11.2.1 Field Screening Rationale

This PAOC is approximately 40-feet by 40-feet. Using a 10-foot grid pattern, four soil boring locations were chosen. Four soil borings were advanced to depths ranging from 11 to 18 feet bgs, and up to six discreet two-foot samples were collected at each boring. A total of 23 soil samples were collected for field screening. Samples were inspected to screen out those potentially contaminated based on observation (e.g. with strong odor or sheen). An OVA was used to measure VOCs in the soil headspace of each screening sample.

5.11.2.2 Laboratory Analysis Rationale

One soil sample was collected and submitted to the laboratory for analysis from the boring section that exhibited the highest OVA readings at each boring location. These four samples were analyzed by USEPA Method 8270 for SVOCs and for the ten Michigan metals.

One groundwater sample was collected from the boring location that exhibited the highest OVA readings and was submitted to the laboratory for analysis by USEPA Method 8270 for SVOCs and for the ten Michigan metals.

5.11.2.3 Soil Results

No SVOC compounds were detected in soil. Therefore, the South Hydraulic Elevator Pit has been eliminated as a PAOC for soil. Soil analytical data from the Phase II ESI in PAOC #16 are summarized in Table 5-29.

5.11.2.4 Groundwater Results

A permanent monitoring well (MW-16-1, shown on Figure 5-1) was installed in the location of the most-impacted soil boring, based on OVA data. Filtered (using a 1-micron filter) and unfiltered groundwater samples were collected for analysis to determine dissolved and total concentrations, respectively, of metals in groundwater. Groundwater was also analyzed for SVOC by USEPA Method 8270.

Lead, barium, mercury and zinc were detected at levels exceeding GSI criteria in unfiltered samples. Only mercury was detected in the filtered sample. Because the GSI value for mercury is below the achievable detection limit, any detectable concentrations of mercury exceed the GSI value. MW-16-1 was resampled on three consecutive days with a 10-micron filter in September 1996 because MDEQ issued interim guidance for mixing zone calculations which required use of 10-micron filters for groundwater samples to be analyzed for metals content. Groundwater was analyzed for lead, barium, mercury, and zinc. Barium consistently was detected above the MDEQ GSI criterion. Levels were the same for both filtered and unfiltered samples, indicating that barium is present in the dissolved phase. Mercury was present at the detection limit in one unfiltered sample. There were no other metal concentrations detected above MDEQ GSI values at this PAOC. Groundwater analytical data from the Phase II ESI in PAOC #16 are summarized in Tables 5-30 and 5-31.

The following SVOCs were detected above GCC and GSI criteria in MW-16-1: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and dibenzo(a,h)anthracene.

In December 1996, groundwater from monitoring well MW-16-1 was resampled on 3 consecutive days and analyzed for SVOC using USEPA Method 8270. Results were BDL in all samples. Therefore, the South Hydraulic Elevator Pit is no longer considered a PAOC for groundwater.

5.12 PAOC #17 - Pit 117

A conveyor belt formerly transported cars along Pit #117 in the southern portion of the building during final assembly procedures. It was at this location on the assembly line that vehicles were filled with fluids such as antifreeze, brake fluid, washer fluid, power steering fluid, and transmission fluid. In April 1996, after decontamination of this pit during deactivation activities, fluid was discovered apparently seeping up through seams in the concrete and along lag bolts that formerly secured machinery to the concrete.

5.12.1 Contaminants of Concern

Chemicals of concern that are components of these materials include ethylene and propylene glycols, VOC, and SVOC. This area was designated a PAOC and a Phase II ESI was performed in June 1996.

5.12.2 Phase II ESI

5.12.2.1 Field Screening Rationale

Soil borings were completed at 9 locations in Pit 117 on June 28, 1996. Soil samples were collected from each boring location, visually inspected, and screened with an OVA.

5.12.2.2 Laboratory Analysis Rationale

Two soil samples (the most- and least-impacted) from each boring were chosen for laboratory analysis based on visual observation and hydrocarbon vapor content. Eighteen soil samples were collected and analyzed for VOCs, SVOCs, and glycols using USEPA Methods 8260, 8270, and 8015 Direct Aqueous Injection (DAI), respectively.

Groundwater samples were collected from temporary wells installed in soil borings. Samples were analyzed for VOCs, SVOCs, and glycols by USEPA Methods 8260, 8270, and 8015 (Direct Aqueous Injection).

5.12.3 Soil Results

No constituents were detected above generic industrial DCVs or SIC in any of the soil samples. Therefore, Pit #117 has been eliminated as a PAOC for soil. Soil analytical data from the Phase II ESI in PAOC #17 are summarized in Table 5-32.

5.12.3.1 Groundwater Results

Concentrations of VOCs, SVOCs, and glycols in groundwater samples collected at Pit 117 did not exceed GCC or GSI criteria. Therefore, this area has been eliminated as a PAOC for groundwater. Groundwater analytical data from the Phase II ESI in PAOC #17 are summarized in Table 5-33.

5.13 PAOC #18 - Kaiser-Frazer Dump Area

As reported in the Phase I ESA, Kaiser -Frazer dumped "paint sludge" in the area between the fence line and Tyler Pond at the CVO property during the 1940s and 1950s. In February 1994, Weston removed an estimated 90 cubic yards of visible surface waste material, including approximately 30 drum remnants, from this area (Weston, 1994). Waste and soil were removed until visually clean underlying soils were exposed. Waste characterization data from samples of the excavated material indicated that all analyzed parameters except toxicity characteristic leachate procedure (TCLP) lead were below RCRA hazardous waste criteria. TCLP lead concentrations ranged form 0.4 milligrams per liter (mg/L) to 41.7 mg/L. Post-removal samples of visibly clean soil were collected from the floor of the excavated areas and analyzed for VOC, SVOC, pesticides, PCBs, and the target analyte list (TAL). Lead (in four samples) and benzo(a)pyrene (in one sample) were the only constituents present above OM #14 DCVs.

On May 5, 1994, additional soil samples were collected from the excavated areas in an attempt to further assess the vertical extent of contamination. Samples were analyzed for PAH and total lead. Lead (in nine samples), dibenzo(a,h)anthracene (in six samples), and benzo(a)pyrene (in five samples) were detected at concentrations above OM #14 DCVs. Therefore, a Phase III EOC study was performed in December 1996 and March 1997 to define the lateral and vertical extent of lead and PAH-impacted soil. Soil and groundwater sample locations are illustrated on Figure 5-8.

5.13.1 Contaminants of Concern

Based on the results of sampling and analysis of soil in 1994, lead and PAH were the contaminants of concern in this PAOC.

5.13.2 Phase III EOC Study

5.13.2.1 Field Screening Rationale

Soil samples were field-screened visually and for PAH content using immunoassay. Samples from each two-foot interval and the 6-inch interval were collected for screening in soil borings installed in suspected source areas, and in borings performed south of the fence line, which was anticipated to be the southern limit of PAH impacts. Suspected source areas were locations where drums had been discovered and removed in 1994. Impacts were not anticipated to be present south of the fence line, which is in an up gradient location relative to the source area. In borings performed in suspected perimeter areas, a sample was collected for PAH screening from a shallow interval (because the source was at the surface) if visual observations did not indicate otherwise.

5.13.2.2 Laboratory Analysis Rationale

Because no field screening method was used for lead, soil samples were collected at two-foot intervals down to the water table from each soil boring for analysis for lead. A total of 222 samples were collected in December 1996 and analyzed for lead using USEPA Method 7421. An additional 42 samples were collected and analyzed for lead using USEPA Method 6010 in March 1997.

Based on immunoassay, three soil samples (highest, lowest, and intermediate total PAH content) were collected for laboratory analysis for PAH using USEPA Method 8100 from borings in suspected source areas. In borings suspected to be in perimeter locations, one sample was collected for laboratory analysis from the 0-6-inch interval, unless visual observations indicated that soil from a lower interval appeared to be more impacted. A total of 66 soil samples were collected in December 1996 and analyzed for PAH using USEPA Method 8100. An additional 7 samples were collected in March 1997 and analyzed for PAH using USEPA Method 8270.

Groundwater samples were collected in December 1996 from newly installed monitoring wells MW-18-46 and MW-18-47 for analysis of PAH using USEPA Method 8100 and for lead using USEPA Method 7421 to determine if the soil lead and PAH concentrations had caused groundwater impacts.

Because lead and PAH constituents were detected above GSI values, seven existing monitoring wells were sampled in March 1997. Groundwater from three wells (MW-18-46, MW-2, and MW-3) was analyzed for PAH using USEPA Method 8270/625. Groundwater from these wells and four others (MW-18-45, MW-5, MW-6, and MW-12) was analyzed for lead using USEPA Method 200.8

The Kaiser-Frazer Dump Area is co-incident with the area of VOC- impacted groundwater (PAOC #19) discussed in Section 5.13. In several locations, stained soils with obvious petroleum or solvent odors were encountered. A soil sample was collected for analysis of VOC compounds using USEPA Method 8240.

Two permanent monitoring wells were installed in source areas (based on Weston's map). Monitoring well construction diagrams are provided in Appendix B. Groundwater samples were collected and analyzed for lead and PAH using USEPA Methods 8100 and 7421, respectively. Both an unfiltered and a field-filtered (using a 5-micron filter) sample were collected for lead analysis. A 5-micron filter was chosen based on discussions with MDEQ toxicologists.

5.13.2.3 Soil Results

Lead - Concentrations of lead in soil ranged from 1.1 to 170,000 mg/kg. The area of lead impacts above the generic industrial DCV of has been defined to the south and east (Figure 5-9). Impacts to the west coalesce with lead impacted soil in the former South Culvert Area and impacts to the north extend into Tyler Pond. Lead concentration exceeded PSIC in only one sample, from 2 to 4 feet bls in SB-18-9 (no VSIC exists for lead).

PAH - Concentrations of benzo (a) pyrene exceeded generic industrial DCVs in 4 locations as shown on Figure 5-10.

Concentrations were below SIC.

VOC - Concentrations of trichloroethene, cis-1,2-dichloroethene, toluene, ethylbenzene, and xylenes were detected at concentrations below generic industrial DCVs and SIC.

A summary of positive detections of lead in soil is presented in Table 5-34. A summary of positive detections of organic compounds in soil is presented in Table 5-35.

5.13.2.4 Groundwater Results

Concentrations of benzo (a) anthracene at 4.3 μg/L and benzo (b) fluoranthene at 6.2 μg/L, which exceeded GCC and GSI values, were present in monitoring well MW-18-46 in December 1996. However, concentrations of all PAH constituents were BDL in March 1997. A summary of positive detections of PAH compounds in groundwater is presented in Table 5-36.

Concentrations of total lead at 0.024 mg/l in monitoring well MW-18-45 and 0.80 mg/L in monitoring well MW-18-46 exceeded the GSI criterion of 0.0066 mg/L. Concentrations of lead in groundwater samples filtered with a 5-micron filter were BDL. In March 1997, concentrations of lead exceeded GSI only in the unfiltered sample from MW-18-45. Therefore, the Kaiser-Frazer Dump Area is no longer considered a PAOC for groundwater. A summary of lead concentrations in groundwater is presented in Table 5-37.

5.14 PAOC # 19 - CVO Property (a/k/a CAT Site)

Volatile organic halocarbons (VOH) were detected in soil and groundwater during a Phase I Hydrogeologic Investigation performed under P.A. 478 in September 1994 to assess impacts associated with LUSTs (Section 4.1.) at the CVO property. VOH compounds had never been stored in the tanks. Delineation of the VOH impacts was initially performed as part of Final Assessment activities for the tank site under Part 213 because the VOH concentrations were co-mingled with BTEX concentrations related to the LUSTs. However, it became apparent that VOH impacts encompassed a much larger portion of the site east of the CVO building than did BTEX impacts. Because VOH groundwater impacts not regulated under Part 213 encompass a majority of the site east of the on-site building, this portion of the site was addressed under Part 201 of PA 451 and this area was designated PAOC #19. The portion of the site west of the CVO building, which only contained LUST- related BTEX impacts, was addressed under Part 213 (Section 4.1).

5.14.1 Contaminants of Concern

Because the extent of BTEX-impacted groundwater had previously been defined, Phase III EOC activities focused on defining the VOH plume. A geoprobe survey was conducted in April 1996 to determine the extent of the impacted groundwater. Sample locations are shown on Figure 5-12.

5.14.2 Phase III EOC

5.14.2.1 Field Screening Rationale

Groundwater samples from temporary wells were analyzed with a field GC for VOC.

5.14.2.2 Laboratory Analysis Rationale

Permanent monitoring wells were installed at locations where GC analysis of the groundwater samples indicated that VOC were not present. Groundwater samples were also collected from two temporary wells (TW-2 and TW-3) installed with a hand auger on the south bank of Tyler Pond to evaluate groundwater VOC concentrations at the GSI. Groundwater samples from the newly-installed monitoring wells were analyzed at a laboratory by USEPA Method 8260.

Vinyl chloride and dichloroethene were detected in the groundwater samples submitted for laboratory analysis at concentrations that exceeded Part 201 GSI criteria. The extent of VOH impacts had not been defined to the east or southeast, therefore, a second field mobilization was performed in September 1996 to complete plume definition. During the September field investigation, temporary wells were installed, developed and sampled. Groundwater samples were analyzed at Environmental Compliance Inc. (ECI) analytical laboratory using USEPA Method 8010 and with 24-hour turn-around time. If the data indicated that the groundwater samples had VOH concentrations above GSI values, the temporary wells were abandoned and additional temporary wells were installed at step-out locations. When the data indicated that groundwater VOH concentrations were below GSI, the temporary wells were completed as permanent monitoring wells.

5.14.3 Groundwater Results

VOA constituents were detected in groundwater samples collected in April 1996 from GP-18. Concentrations of ethylbenzene, xylenes, and 1,2,4-trimethylbenzene in GP-18 were less than 10 μg/L. Groundwater samples collected during the September field investigation were therefore only analyzed for VOH using USEPA Method 8100. VOH compounds detected above OM#14 criteria in groundwater samples collected in April and September include:

- Vinyl chloride exceeded the GSI value of 3.1 μg/L in 12 samples, ranging from 7 μg/L in MW-4 to 98,000 μg/L in MW-3 and including both TW-2 and TW-3, installed on the bank of Tyler Pond;
- Vinyl chloride also exceeded the GCC value of 290 μg/L in 9 samples;
- Trans-1,2-dichloroethene (DCE) exceeded the GSI value of 300 μg/L in four samples, ranging from 301 μg/L in TW-10 to 950 μg/L in MW-2;
- 1,1-DCE exceeded the GSI value of 32 μg/L in MW-2 at 18,400 μg/L; and
- Trichloroethene (TCE) exceeded the GSI value of 94 μg/L in TW-9 at 221 μg/L.

Laboratory analytical data are summarized on Table 5-38. Laboratory analytical reports are included in Appendix C.

The extent of VOH impacts to groundwater at the CVO property have been defined to the northwest, west, south, and east (Figure 5-13). Impacts extend north into Tyler Pond. A remedy is currently being designed for this area.

5.15 Background Wells

Groundwater sampling of monitoring wells BG-1, BG-2, BG-3, BG-4 and BG-5 was performed on April 17, 1996. Filtered (using a 1-micron filter) and unfiltered samples were collected for analysis to determine dissolved and total concentrations, respectively, of cadmium, lead, mercury, and nickel. Results of all analyses were BDL for all analytes except total lead in BG-3 and BG-4. Concentrations of total lead were 0.0066 and 0.0055 μg/L in BG-3 and BG-4, respectively. Because total metals concentrations did not exceed GSI criteria, it was not necessary to resample the background wells with a 10-micron filter. Groundwater analytical data from the background wells are summarized in Table 5-39.

5.16 Data Validation

As stipulated in the project-specific QAPP, all data was validated by the QA Officer following USEPA Functional Data Validation Guidelines and the appropriate data quality objectives (DQO) and analytical data levels. Sampling procedures were determined to be complete and acceptable, and results of laboratory QA/QC samples were within acceptable limits. Data validation reports indicated that the laboratory data can be used for quantitative purposes in all cases. Data validation reports are included in Appendix C with the laboratory reports.

5.17 Water Table Elevation

On April 1996, depth to water and depth to LNAPL were measured in all monitoring wells. Water-table elevation and apparent LNAPL thickness were calculated and the results were tabulated in Table 5-40. A contour map of water-table elevation is presented as Figure 5-14. Groundwater flow direction is generally east.

5.18 PAOC #20 - Former CAT Site VOC Plume

As described in Section 5.13, the co-mingled VOH and BTEX plume on the CVO property was separated into PAOC #19, which was addressed under Part 201 of PA 451, and PAOC #20, which was addressed under Part 213 of PA 451. PAOC #20 included only BTEX impacts associated with the former LUST area, and is fully discussed in Section 4.1.3.

6. Facility Deactivation

6.1 Introduction

Facility deactivation activities were initiated by GM in 1993, when the Assembly Plant ceased operations. As part of decommissioning the Willow Run Assembly Plant, GM contracted Chester to perform a facility deactivation assessment of the plant to determine which areas of the plant required decontamination after closure. The facility deactivation survey was performed during September, October, and November 1994. The Chester team identified structures and equipment that would require cleanup to prevent the potential for future spills or releases. All deactivation work was performed in accordance with state and federal regulations.

Concurrently, Toltest, Inc. (Toltest) provided a team of technicians to locate, confirm through bulk sampling, and record the location and condition of asbestos-containing material (ACMs) throughout the plant.

6.2 Deactivation/Decontamination

Chester reviewed available drawings and files of the site, building and process equipment, interviewed site personnel, and visually inspected the structures and equipment. Decontamination residues that could not be characterized by process knowledge, generator knowledge, or through the use of Material Safety Data Sheets (MSDS) were sampled and analyzed to identify the regulatory status or cleaning methods to be used. Structural areas identified for cleaning at Willow Run included booths, sumps, pits, trenches, elevator pits, substations, and the roof. Equipment and machinery was identified for cleaning in the main building (including booths), ELPO area, old and new WWTPs, Pump Station, and Power House and included conveyors, aboveground storage tanks (ASTs), process tanks (aboveground and in ground), filters, pumps, ovens, and hydraulic units. No PCB capacitors were identified. After cleaning, equipment was scrapped if it was determined to be non-hazardous. Hazardous materials were disposed of through Laidlaw Environmental Services (LES) as detailed in Sections 6.3 through 6.21.

Eighteen thousand gallons of rinse water was generated during structure and equipment power washing, and was sampled and analyzed to ensure that YCUA discharge standards were met. If the standards were not met, the wastewater was properly treated on-site with activated carbon filtration prior to discharge. Oily material was skimmed, drummed, and disposed of by LES. Settled material and soils were analyzed for hazardous characteristics and disposed of properly.

The Sections 6.3 through 6.21 summarize structures and equipment that were identified as requiring special handling, decontamination, cleaning, and/or disposal.

Units not identified as needing cleaning had been cleaned by GM production and maintenance personnel prior to Chester's involvement, or were visibly clean, had good integrity, and floors and walls around the units were visibly clean. Units cleaned by GM personnel were those slated for sale or relocation, or units where cleaning was needed to eliminate a hazard (e.g., a pipe filled with paint).

6.3 Industrial Waste Lines and Wastewater Treatment Plant

Industrial waste lines and sewers were addressed by GM prior to Chester's involvement. According to interviews with Ken Harfoot, all process piping above ground was water blasted, removed, and scrapped. The effluent was treated at the WWTP, which was still operating at that time. In-ground piping was drained to the WWTP, but was

not water blasted because of the danger of bursting the pipes due to high pressure. In-ground piping was abandoned by plugging the ends after lines were drained.

Upon completion of addressing the industrial waste lines, GM decommissioned the WWTP. Treatment tanks, process equipment, and process piping were water blasted with a minimum pressure of 20,000 pounds per square inch (psi). Rinsewaters were tested prior to disposal at YCUA. Hazardous sludges were disposed at United States Pollution Control, Incorporated (USPCI) Lone Mountain facility. F-listed wastes had not been generated at the site since the 1980s, and the only characteristic hazardous waste generated at the WWTP was lead in wastes associated with the ELPO process.

6.4 WWTP Storage Tanks (ASTs)

Three ASTs were determined as requiring cleaning: the Lime Slurry Storage Tank and the Lime Slurry Day Tank in the WWTP, the Undercoat Hot Wax Tank with containment and piping in the main building. The 'hot wax' material in the Undercoat Hot Wax Tank was collected and drummed by Inland Waters. Analysis of the hot wax indicated that the material was hazardous due to a concentration of barium in TCLP leachate of 3,200 mg/L and a flashpoint of 90° Fahrenheit (F). The maximum concentration for barium in TCLP leachate is 100 mg/L (40 CFR 261.24) and material with a flashpoint less than 140° F is hazardous due to the characteristic of ignitability (40CFR 261.21). The hot wax was transported to LES/HydroCarbon Recyclers for disposal. The piping associated with the Hot Wax Tank was removed and disposed as hazardous with LES/Lone Mountain Facility. These units were gross dry decontaminated and high pressure power washed by Inland Waters[1]. All washwaters generated were pumped into one of two 21,000 gallon frac tanks staged on-site. Treatment of the washwaters is discussed in Section 6.1.

The Skim Oil Tank, Sulphuric Acid Tank, and Diesel Fuel Tank at the WWTP, five ASTs in the ELPO area, four tanks in the Fire Pump House, a tank at the old WWTP, and four tanks in the Main Building did not require cleaning.

In general, ELPO tanks were drained of any product and the product was sent back to the supplier. Tanks were gross dry decontaminated and the deck and piping externals were pressure washed. Washwater was managed as discussed previously.

Five ASTs were dismantled and transported off site as scrap metal by R. J. Torching. The other ASTs remain on site.

6.5 Aboveground Process Tanks (APTs)

Eighteen of thirty-nine aboveground process tanks (APTs) required cleaning. All tanks were gross dry decontaminated by Inland Waters. Eight APTs in the Main Building, including two in the ELPO area (ELPO Dip Tank and ELPO Paint Mix Tank), and 16 APTs at the new WWTP did not require cleaning because they had already been cleaned by GM personnel.

[1]Gross dry decontamination includes mechanical scraping, brushing, and/or vacuuming.

Four APTs on the first floor of the main building contained dirt and dust. These materials were removed and collected from the APTs and transported as non-regulated material to City Environmental, Inc. for disposal. Fourteen tanks on the second floor required cleaning, including eleven Body Phosphate System process tanks, two Body Anti-Rust Tanks, and the Hydromation tank. The materials (debris) removed from the second floor tanks were collected and sampled for disposal characteristics. Zinc was present in TCLP leachate at a concentration of 521 mg/l. The characteristically hazardous regulatory action level for this constituent is 500 mg/L. This material was drummed by Inland Waters and transported to LES/HydroCarbon Recyclers for disposal.

Piping from the secondary containment in the paint mix room contained paint thinner. Inland Waters removed and drummed the thinner which was transported to LES/HydroCarbon Recyclers for disposal. In addition, the areas in and around the secondary containment in the paint mix room, the body phosphate system process stage tank, and the Hydromation Tank were gross dry decontaminated of dirt and refuse which was transported as non-regulated material, to City Environmental, Inc. for disposal.

Paint lines from the Paint Mix Room to the booths had previously been addressed. Solvent in the lines was drained by GM personnel, drummed, and shipped to Chemical Waste Management. Piping was flushed with alcohol and water, then with water only. Rinseate was also drummed and shipped to Chemical Waste Management.

All tanks except the Condensate Return Tank and tanks in the WWTP have been dismantled and transported off-site as scrap metal by R.J. Torching.

6.6 In-Ground Process Tanks (IPTs)

Two in-ground process tanks (IPTs) were identified as requiring cleaning. The Brine Tank contained residual salt and water and the Recirculation Tank contained water, dirt and debris. The water was drained from both units by Inland Waters and transferred into the on-site frac tank for treatment. The residual salt, dirt and debris were removed from the tanks and transported as non-regulated material to City Environmental, Inc. for disposal. After cleaning, both IPTs were filled with sand and capped with seven inches of concrete.

The Clarifier at the old WWTP and the Urethane Paint Booth Water Recirculation Tank did not require cleaning because they had been cleaned prior to plant closure by GM personnel.

6.7 Sumps and Trenches

Eighteen sumps and trenches were identified as requiring cleaning. All liquid and dry residual materials were removed from the sumps and trenches by Inland Waters. The water was collected and transferred into the on-site frac tank for treatment. The dry material, dirt, dust and refuse, was sampled and analyzed for disposal characteristics. Analytical results for this material were below detection limits for RCRA and Toxic Substances Control Act (TSCA) regulated constituents, and Michigan metals. The dry residual material was disposed as non-regulated material, and transported to City Environmental, Inc. for disposal. Sumps and trenches were power washed if necessary. All sumps and trenches were filled with compacted sand and capped with six to seven inches of concrete, with the exception of three trenches located in the eastern portion of the first floor of the main building.

Nine other sump and trench units identified in the Main Building, including two in the ELPO area, did not require cleaning because they were visibly clean, had good integrity, and the floors and walls surrounding the trenches had good integrity.

6.8 Pits

Sixty seven pits, including two in the new WWTP and one in the ELPO area, were identified as requiring cleaning. All pits were gross dry decontaminated and high pressure water blasted. Materials removed from the pits consisted of dirt and refuse and were disposed of as non-regulated material and transported to City Environmental, Inc. Inland Waters pumped the water from Pits-117, 143 and 157 into the on-site frac tank for treatment, as discussed in Section 6.1. Residue from Pit 118 was sampled 9/24/94 and analyzed for hazardous characteristics and for PCB content. The material was found to be non-hazardous and PCB content was less than 1 mg/kg. After decontamination, all pits were filled with compacted sand and capped with seven inches of concrete except fluorescent light pits.

Five pits in the Main Building did not require cleaning because they were visibly clean, had good integrity, and the floors and walls surrounding the trenches had good integrity.

6.9 Filters

Six filters were identified as Requiring cleaning and were gross dry decontaminated. The Revolving Filter and the Filter Presses in the main building at the WWTP were also power washed by Inland Waters to remove the dust and debris. Washwater generated during cleanup was pumped into the on-site frac tank for treatment, as discussed in Section 6.1.

Two filters at Pump Station contained #6 fuel oil which was collected and drummed by Inland Waters. Portions of the filters that contained the oil were flushed with a slug of hot water. The fuel oil and rinseate were transported to LES/HydroCarbon Recyclers, for disposal. The Cyclone filter contained dust and dirt was gross dry decontaminated. All dry materials collected consisted of dust and dirt and were transported to City Environmental, Inc. as non-regulated material for disposal.

Filters located in the Main Building were dismantled and sent off site as scrap metal by R. J. Torching.

6.10 Pumps

Thirteen pumps were identified as requiring cleaning. Four pumps in the WWTP contained water which was collected by Inland Waters and placed into the on-site frac tank for treatment, as discussed in Section 6.1. Pumps and associated piping with sulphuric acid residue were dismantled and drummed by Inland Waters. The two drums collected were transported to LES/Lone Mountain Facility for disposal.

In the Pump Station, water and oil found in the Air Diaphragm Pump, #6 fuel oil found in the Delaval Pumps, and paint thinner and gasoline in Blackmer pumps were collected and drummed by Inland Waters and transported to LES/HydroCarbon Recyclers for disposal. Pumps containing transmission fluid, power steering fluid, and antifreeze were drained and collected and drummed by Inland Waters and transported to Great Northern Oil for recycling. Paint thinner in piping in the Pump House and in the main Building was collected by Inland Waters and drummed for transport to LES/Lone Mountain Facility for disposal. The piping was removed and scrapped by R.J. Torching. Piping in the Pump House a was flushed with a slug of hot water, which was collected and drummed for disposal.

Water from the Centrifugal pumps in the Main Building was collected and placed into the on-site frac tank. The centrifugal pump units were removed, dismantled, and scrapped for metal by R.J. Torching.

6.11 Hydraulic Units

Hydraulic oil from three trash compactor motors and six hydraulic pumps was drained and drummed by Inland Waters and transported to Great Northern Oil for recycling.

All hydraulic units were removed and scrapped for metal by R.J. Torching.

6.12 Booths

Twenty booths were identified as requiring cleaning. The conveyor units located in these booths were gross dry decontaminated of their machine greases. The grease was collected and drummed by Inland Waters. A grease sample was collected from the one drum generated during cleaning of the 20 booths to determine disposal requirements. Because the lead concentration in TCLP leachate was 10.3 mg/l, the drummed grease was sent to LES/Lone Mountain Facility for disposal.

All fluorescent light tubes and ballasts were removed from the booths. The ballasts were inspected, possible PCB ballasts were segregated and drummed for disposal to LES/Grayback Facility. All fluorescent light tubes were packaged and transported to GreenLites Lamp Recycling, Inc. for recycling.

All booths were disassembled and scrapped for the metal by R.J. Torching.

6.13 Body Fabrication Booths

Four units were cleaned during facility deactivation procedures. All fluorescent light tubes and ballasts were removed. The light tubes were packaged and transported to GreenLites Recycling, Inc. for recycling. The ballasts were inspected and possible PCB ballasts were segregated, drummed and transported to LES/Grayback Facility for disposal.

Mercury switches were removed from the heating units located outside the booths. The mercury was packaged and transported to Waste Management, Inc., for reclamation.

Body fabrication booths were dismantled and scrapped for the metal by R.J.Torching.

6.14 Conveyors Units

Two of five conveyor units were cleaned during facility deactivation procedures. The units were vacuumed to remove dust and dirt and dismantled and scrapped. The debris was collected and transported as non-regulated material to City Environmental, Inc. for disposal. The remaining three units had been removed from the plant and sold by GM personnel prior to initiation of cleanup activities under Chester's supervision.

6.15 Electrical Substation

Three substations where PCB-containing transformers were formerly located were classified as requiring cleaning. Results of PCB wipe tests in these three substations ranged from 13 to 39 micrograms per square centimeter (μg/100 cm^2). Concentrations of PCBs in wipe tests performed in two other substations formerly containing PCB transformers were less than 10 μg/100 cm^2. The PCB transformers had been removed by GM in October 1993. The fluid was removed and properly disposed and the transformers were landfilled at the LES/Grayback facility.

The floors in the substations where wipe samples exceeded 10 μg/100 cm^2 were mopped by Inland Waters to remove dust and dirt. The floors were then sealed with an industrial grade two-part epoxy paint.

Other substations at Willow Run, including one at the WWTP and two at the Powerhouse, did not require cleaning.

6.16 Ovens

Seven ovens were identified as requiring cleaning. All mercury switches were removed and transported to Waste Management, Inc. for mercury reclamation. All grease and debris was removed from the conveyors in the ovens. The grease was drummed with the previously collected grease from the Booths (Section 6.1.9). The debris was collected and transported as non-regulated material to City Environmental, Inc. for disposal.

All ovens remain in place.

6.17 Roofs, Stacks, and Vents

All 273 stacks located throughout the plant were visually inspected and gross dry decontaminated as necessary by Inland Waters. Material from the stacks was sampled and analyzed for hazardous characteristics to determine disposal requirements. Analytical data indicated that this material was non-hazardous. The material was transported as non-hazardous material to City Environmental, Inc. for disposal.

Vents were visually inspected by Chester and it was determined that no cleaning was required.

Material from the portion of the roof over the body shop was sampled and analyzed for lead to determine whether it had been impacted by lead solder grind. Lead was detected in TCLP leachate at concentrations ranging from 0.10 mg/L to 700 mg/L. Additional samples were collected to delineate the area for cleaning. Michigan Pumping Services (MPS) gross dry decontaminated the area by removing loose material via brooms and vac truck. The material was processed through a shaker to separate the roof deposits from the roof ballast. A sample of the processed roof ballast was taken to determine lead content. Concentrations of lead in TCLP leachate were below 5.0 mg/l, the RCRA action level for lead. The roof ballast was placed into roll off boxes for transportation to LES/East Carbon Development Corporation (ECDC) for disposal.

The concentrated roof deposits were sampled and analyzed for lead. Lead was present in TCLP leachate at a concentration of 206.0 mg/l. Therefore, this material was placed into Baker Vac boxes for transportation and disposal as hazardous material at LES/Lone Mountain Facility.

6.18 Elevators and Pits

None of the elevators were decommissioned during the deactivation of the plant. The pits were inspected and cleared of the debris. The debris collected consisted of rags, refuse and dirt. This material was transported as non-regulated material to City Environmental, Inc. for disposal. The North and South Hydraulic Elevator Pits were identified as PAOC #s16 and 3, respectively during Phase I ESA activities. These areas are fully discussed in Sections 5.11 and 5.6.

6.19 Battery Charge Room

Seven units were identified as requiring cleaning. All racks were gross dry decontaminated and high pressured power washed to remove solid residue of sulfuric acid. The washwater was sampled and analyzed. Only pH was not within discharge standards, therefore a neutralizing solution was added to adjust the pH so that the water could be discharged to YCUA. Analytical data from the solid material indicated a pH level of 2.91. This material was transported to LES/Lone Mountain Facility for disposal.

The water removed from battery charge sumps and the steam clean booth was placed into the on-site frac tank for treatment, as discussed in Section 6.1.

6.20 Medical Department Equipment

No PCB capacitors were located in the GE X-Ray Machine. The X-ray film, unused syringes, medications and needs were collected and transported by GM personnel from Willow Run Powertrain.

The small quantities of photo processing chemicals were sampled and analyzed for disposal requirements. Analytical data indicated the chemicals were non-hazardous. These chemicals were directed to the sanitary sewer connected to YCUA.

6.21 Miscellaneous

Thirty one miscellaneous items were identified as requiring cleaning. These items were addressed as follows:

- Because the fire protection system was previously connected to Tyler Pond, which contains PCB contaminated sediments, the fire protection system was sampled at four points and analyzed for PCBs. PCBs were not present.

- The air oilers were drained of oil. The oil was collected, drummed, and transported to Great Northern Oil for recycling. The oilers were removed and scrapped by R.J. Torching.

- Drums of rubber sol, caustic and oxygen scavenger found in the power house were collected and transported to LES/Lone Mountain Facility for disposal. Small quantity chemicals were collected for a Lab Pack disposal with LES to LES/HydroCarbon Recyclers. Mercury containing units were drained and switches collected for off site reclamation to Waste Management, Inc. Small cans of hydraulic oils were transported to Great Northern Oil for recycling. Rainwater standing in a pit was collected and placed into the on-site frac tank. The pit was then power washed and the washwater was placed into the frac tank.

- The Loading Dock was gross dry decontaminated. The leaves, dirt, refuse and grease on the floor were collected and transported off site as non-regulated material to City Environmental, Inc. for disposal.

- The catch basin, full of rainwater, was emptied and gross dry decontaminated of refuse. The refuse was collected and transported off site as non-regulated material to City Environmental, Inc. for disposal. The rainwater was directed into the sanitary sewer connected to YCUA.

- Desiccant from air dryers in the New WWTP and the Power House was collected and transported as non-regulated material to City Environmental, Inc. for disposal. Air dryers in the Power House were scrapped by R.J. Torching.

- The loading ramps were gross dry decontaminated. The small amount grease, dust and dirt was transported as non-regulated material to City Environmental, Inc. for disposal.

- The #6 fuel oil was collected and drummed from the Hilco transfer valves in the Pump House and transported to LES/Lone Mountain Facility for disposal.

- A small quantity of gasoline stored in a can in the Pump House was used on site as fuel. The can was crushed and disposed of as non-regulated material to City Environmental, Inc. for disposal.

- #6 fuel oil in piping in the Pump House was collected by Inland Waters and drummed for transport to LES/Lone Mountain Facility for disposal. The piping was flushed with a slug of hot water, which was collected and drummed for disposal at LES/Lone Mountain Facility, and the piping was scrapped.

- The Trane Absorption chiller units were drained and drummed. A sample of the lithium bromide solution was taken for disposal requirements. Selenium was present in TCLP leachate at a concentration of 15.6 mg/l, which exceeds the RCRA action level for selenium of 1.0 mg/l. This material was transported to Dynecol, Inc. for disposal. The mercury in the U-tubes was collected and containerized for transportation to Waste Management, Inc. for reclamation. These units remain in place.

- The oil storage cage floor was gross dry decontaminated. The material collected was transported as non-regulated material City Environmental, Inc. for disposal.

- A 30 gallon can of acid cleaner was sampled for disposal requirements. Lead was present in TCLP leachate at a concentration of 13.2 mg/l. The acid cleaner was transported to LES/Lone Mountain Facility for disposal.

- Pigeon droppings found on the roof were collected and drummed by MPS as part of the roof cleaning project. MPS was responsible for the disposal of this non-RCRA- or TSCA-regulated material.

- Gasoline in piping in the Main Building was collected by Inland Waters and drummed for transport to LES/Lone Mountain Facility for disposal.

- Mercury switches located in thermostats in Wet Sand Zones 1 through 6 (gas-fired heaters) were collected and transported to Waste Management, Inc. for mercury reclamation.

- All 55 gallon drums and small containers of hazardous materials and off-spec industrial chemicals were characterized by generator knowledge, process knowledge, or sampling and analysis. These containers were transported to appropriate disposal facilities for proper disposal. These activities were conducted prior to and during deactivation activities.

- Small quantity chemicals, drums of off-spec and unused chemicals located throughout the plant were collected for Lab Pack disposal by LES to LES/HydroCarbon Recyclers.

6.22 Non-Intact Wood Block Flooring

Non-intact wood floor block was removed and placed in 40 cubic yard rolloff boxes. Samples were taken to determine proper disposal. Cresol was present in TCLP leachate in one sample at 515.0 and 1830.0 μg/L. The contents of this box and others that were subsequently sampled and found to have hazardous concentrations of cresol were transported to LES/Lone Mountain Facility. Non-hazardous block was transported by GM personnel to the GM Truck and Bus Pontiac East Plant Incinerator in Pontiac, Michigan for disposal.

6.23 Asbestos Containing Materials

Asbestos containing materials assessment was contracted to Toltest. The Traverse Group (TGI) was contracted to review the ACM survey and prepare ACM repair specifications. ACMs were identified in caulk materials, boiler insulation, floor tile and mastic, cooling tower baffle, gasket material, mudded fittings, vibration dampeners, and thermal insulation throughout the building. All damaged, friable ACMs were repaired and/or removed prior to sale of the property.

7. Development of Site-Specific Criteria

7.1 Lead in Soil

The Phase II ESI and the Phase III EOC Study present results that exceed generic DCVs for lead in soil. Because toxicity indices are unavailable for exposure to lead, a human health risk assessment in accordance with *Risk Assessment Guidance for Superfund* (USEPA 1989) guidelines cannot be conducted, and exposure to lead is evaluated via pharmacokinetic modeling and target blood lead levels.

To evaluate industrial worker potential exposure to lead in soil and dust from that soil, USEPA Region V (P. VanLeeuwen, Region V Toxics Branch, pers. comm.) currently recommends using the following equation (1):

$$(1)\quad C_s = \frac{(PbB_{GM}target - PbB_{GM}0)}{BKSF*(IR_s*AF_s + K_{sd}*IR_d*AF_d)}$$

Equation (1) can be used either to predict a blood lead level associated with a known soil lead concentration or to calculate a soil concentration (Cs)that will not cause a blood lead level in the fetus of a pregnant worker to be greater than the USEPA childhood target blood lead level of 10 μg/dL. For this evaluation, the latter method has been used, and as recommended by USEPA Region V (P. VanLeeuwen, Region V Toxics Branch, personal communication), the values used for the equation variables were obtained from Phase I of the Third National Health and Nutrition Examination Survey (NHANES III 1994), which grouped blood lead levels according to age, sex, and race. A C_s value was calculated using data from the NHANES III study and USEPA "typical" values for the remaining parameters:

C_s = arithmetic mean concentration (mg/kg) of lead in soil at the workplace where exposure occurs

PbB_{GM}target = target geometric mean blood lead level [in micrograms per deciliter (μg/dL)] in a population of pregnant women or women of child-bearing age exposed to lead in contaminated soil/dust via occupational activities. The value of PbB_{GM}target in a pregnant woman's blood is calculated as follows:

$PbB_{GM}maternal = PbB_{95th}maternal/ GSD_i^{1.645} = 11.1/(1.8)^{1.645} = 4.23$ μg/dL

$PbB_{95th}maternal = PbB_{95th}fetal/R = 10/0.9 = 11.1$ μg/dL

R = ratio of PbB in fetal blood to maternal blood = 0.9

(values for R, PbB_{95th}fetal, and GSD_i are USEPA recommended "typical" values)

$PbB_{GM}0$ = geometric mean blood lead level in women of child-bearing age not exposed to lead in contaminated soil/dust via occupational activities (1.9μg/dl)

BKSF = biokinetic slope factor (0.4 μg/dL increase in blood lead per μg/day lead absorbed)

IR = mean daily intake rate of soil (IR_s) and dust (IR_d) at the workplace (0.050 g/day); for industrial exposure (250 out of 365 days per year, multiply by 0.68; for utility worker exposure (112 days per year in Michigan), multiply by 0.31

AF = absolute absorption fraction (bioavailability) of lead in soil (AF_s) and in dust (AF_d) (0.10)

K_{sd} = mass fraction of soil in indoor dust, calculated as the increment in dust lead concentration per unit concentration in soil (1.0)

Using these values in equation (1) the calculated arithmetic mean concentration of soil in the workplace that would be protective of women of child-bearing age are:

C_s = 1,691 mg/kg (industrial worker, 250 days per year exposure)
3,747 mg/kg(Michigan utility worker, 112 days per year exposure)

Equation (1) was also used to predict a soil lead concentration associated with an adult blood lead level of 40 μg/dL (for PbB_{GM}target), which is the current OSHA target adult blood lead level. The calculated C_s values obtained are:

C_s = 27,813 mg/kg (industrial)
62,083 mg/kg (Michigan utility worker)

The arithmetic mean of lead concentrations in soil samples from the portion of PAOC#2 with lead concentrations above 400 mg/kg is 2,590 mg/kg, which is less than the calculated lead soil concentration considered protective of female utility workers of child-bearing age.

8. SUMMARY

This section presents a summary of the results of the environmental investigations discussed in Sections 3, 4, and 5, and integrates the discussion presented in Section 7 for developing site specific criteria. The results are presented by regulatory program and area.

8.1 Resource Conservation and Recovery Act Issues (RCRA) Issues

Of eight SWMUs identified during the PA/VSI in 1992, only SWMU # 3 (Outdoor Drum Storage Area) and SWMU #7 (Former Indoor Drum Storage Area) required RCRA closure. Closure as a TSDF container storage unit was previously approved on June 27, 1985 for both areas. Subsequently, the RCRA Permit Part A was amended to designate GM Willow Run as a large-quantity hazardous waste generator storing wastes on site for less than 90 days and hazardous waste generated at the facility was stored for less than 90 days at the Outdoor Drum Storage Area. Generator closure in accordance with 40 CFR 262.34(a)(1)(iv)(B) was certified in a letter to MDEQ from BBL dated May 19, 1997.

Despite submittal of a closure report in 1984 for the Former Wastewater Lagoons, approval of the report was not required because phosphating wastewaters were de-classified and are not considered as hazardous waste. Accordingly, the lagoons are not subject to RCRA regulations.

There are no active RCRA issues at the facility.

8.2 Underground Storage Tank (UST) Sites

Of the five UST issues discussed, two LUST sites are undergoing corrective action (monitoring). No additional UST issues are outstanding.

The R&D Site FAR and CAP were submitted October 1, 1996. This area is also known as AOC #1 in the PA/VSI and PAOC #4/#8 in this report. The CAT Site (PAOC #20) FAR and CAP were also submitted October 1, 1996. Groundwater at both the R&D (PAOC #4/#8) and CAT (PAOC #20) sites is being monitored for VOCs and to determine whether RNA is occurring and is a viable remedy. These sites will be evaluated in October 1997 to determine whether they can be closed under Part 213.

The Closure Report for the North Tank Farm was submitted October 1, 1996.

Potential UST locations were investigated in the Phase II ESI and no tanks were found and no evidence of contaminants was present.

8.3 Potential Areas of Environmental Concern (PAOCs)

Ten PAOCs (#s 1, 2, 3, 5, 6, 7, 16, 17, 18, and 19) were investigated in the Phase II ESI, Supplemental Phase II ESI, and/or Phase III EOC Studies. PAOC #4/#8 was addressed with the R&D Site. PAOC #s 8, 9, 12, 13, 14, and 15 were UST sites (#s8 and 9) discussed in Section 8.2 or potential UST sites where tanks could not be found (#s12, 13, 14, and 15).

PAOCs with remaining issues are as follows:

- A small area within PAOC #18 contains soil with benzo(a)pyrene in soil above generic industrial DCVs.
- Halogenated volatile organics exist in groundwater above GSI values at PAOC #19.
- Lead concentrations were detected in soil above the MDEQ generic industrial DCV at PAOC #2, formerly a culvert in which plating wastes were deposited. Lead impacts here coalesce with lead-impacted soil on the CVO property (PAOC # 18). Although lead levels in soil in the former South Culvert area are high, a preliminary review of the data suggests that risk is low.
- LNAPL was detected in one monitoring well (MW-3-1) at PAOC #3, the North Hydraulic Elevator Pit. LNAPL was not observed in three monitoring wells installed 10 feet from MW-3-1 that define the extent of LNAPL.

No other issues are known to be outstanding.

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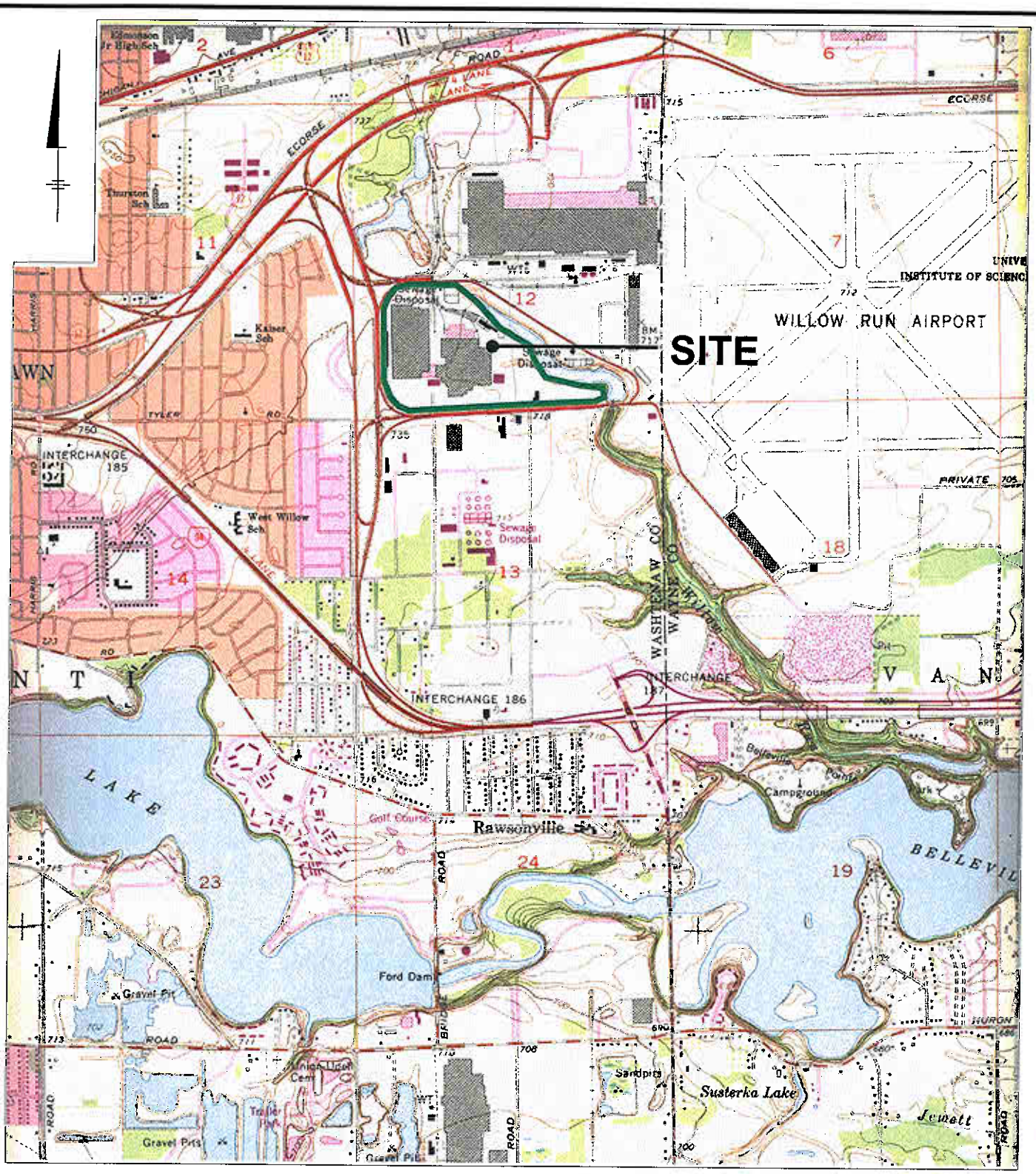
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MAP SOURCE: UNITED STATES GEOLOGIC SURVEY TOPOGRAPHIC QUADRANGLE, 7.5 MIN. SERIES, YPSILANTI EAST, MICHIGAN photo-revised 1983.

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APPROXIMATE SCALE IN FEET

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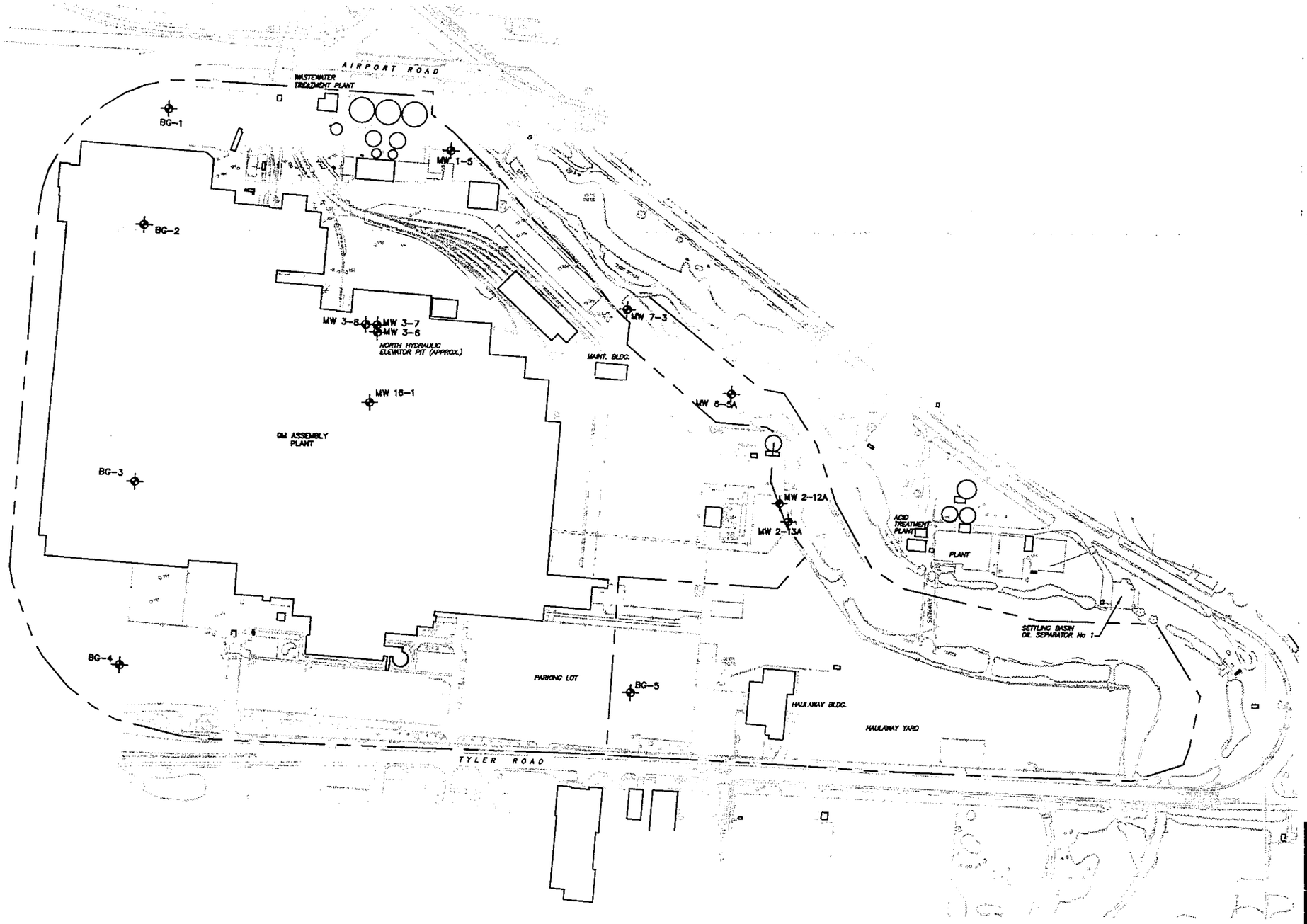
GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN

DESCRIPTION OF EXISTING CONDITIONS

SITE LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
1-1



LEGEND

- PROPERTY LINE
- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MANHOLE
- CATCH BASIN
- MONITORING WELL

350 0 350

SCALE IN FEET

SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

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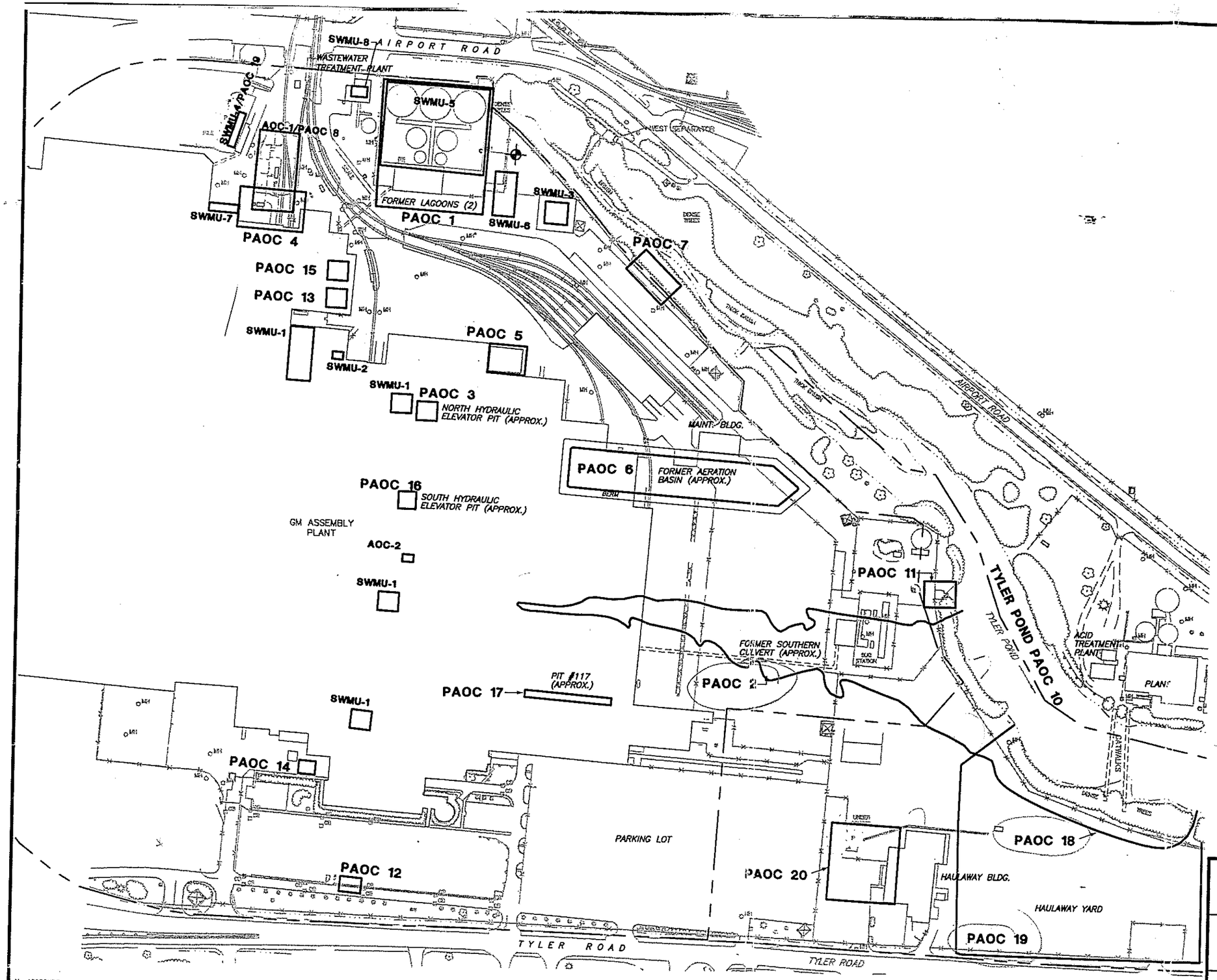
GENERAL MOTORS CORPORATION
WILLOW RUN FACILITY - YPSILANTI, MI

DESCRIPTION OF EXISTING CONDITIONS REPORT

SITE MAP

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE 1-2



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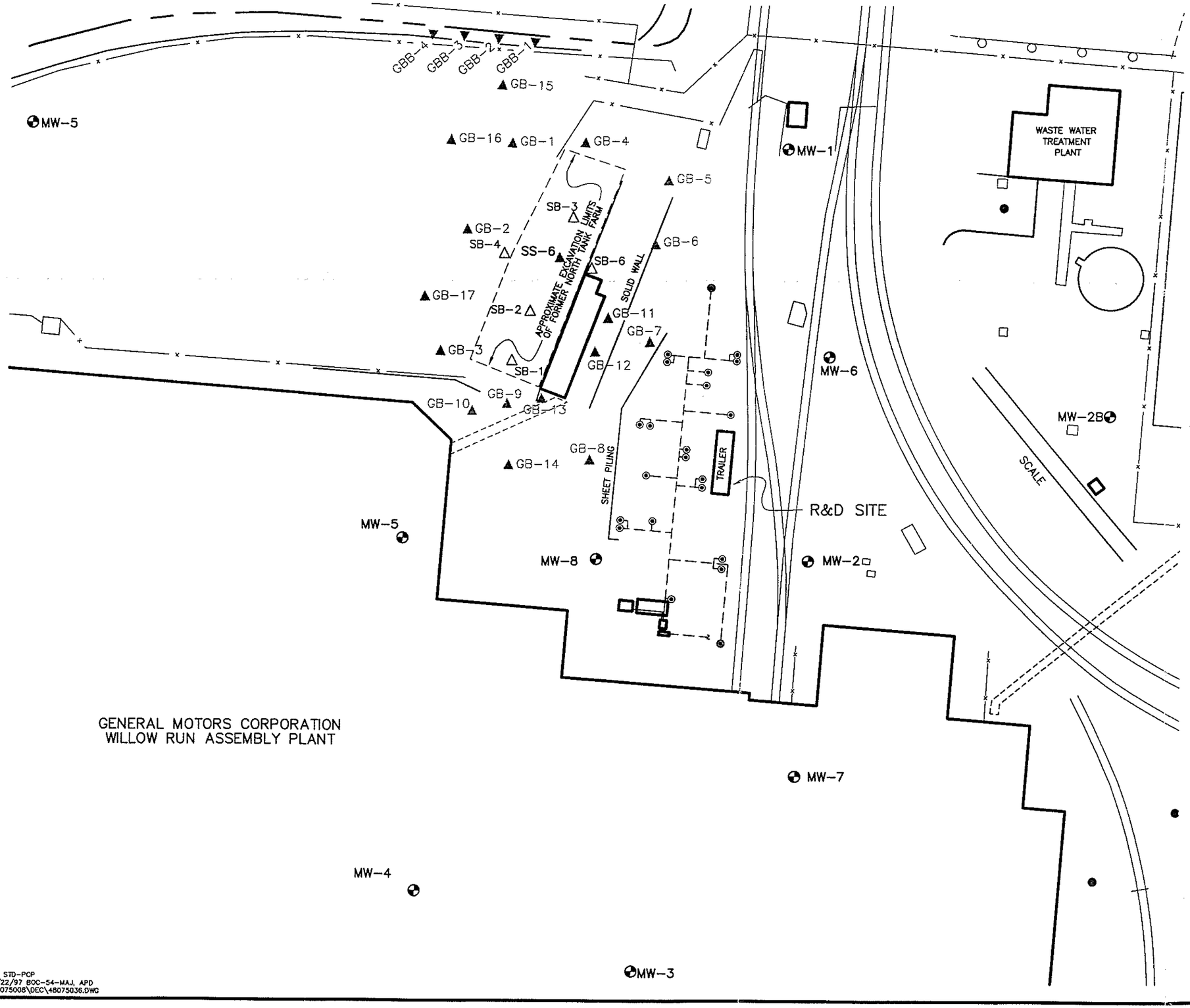
SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

GENERAL MOTORS CORPORATION
WILLOW RUN FACILITY – YPSILANTI, MI
DESCRIPTION OF EXISTING CONDITIONS REPORT

LOCATIONS OF PAOCs AND AOCs

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FIGURE 1-3



LEGEND

GBB-▼ / GB-▲ — 1994 GEOPROBE LOCATION INSTALLED FOR INITIAL ASSESSMENT BY O'BRIEN & GERE (P.A. 478 PROGRAM)

SS-- ▲ — SOIL SAMPLE COLLECTED DURING TANK REMOVAL IN 1994 BY O'BRIEN & GERE

MONITORING WELL

SB- △ — 1996 SOIL VERIFICATION SAMPLE LOCATIONS

0 60' 120'

APPROXIMATE SCALE: 1"=60'

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN

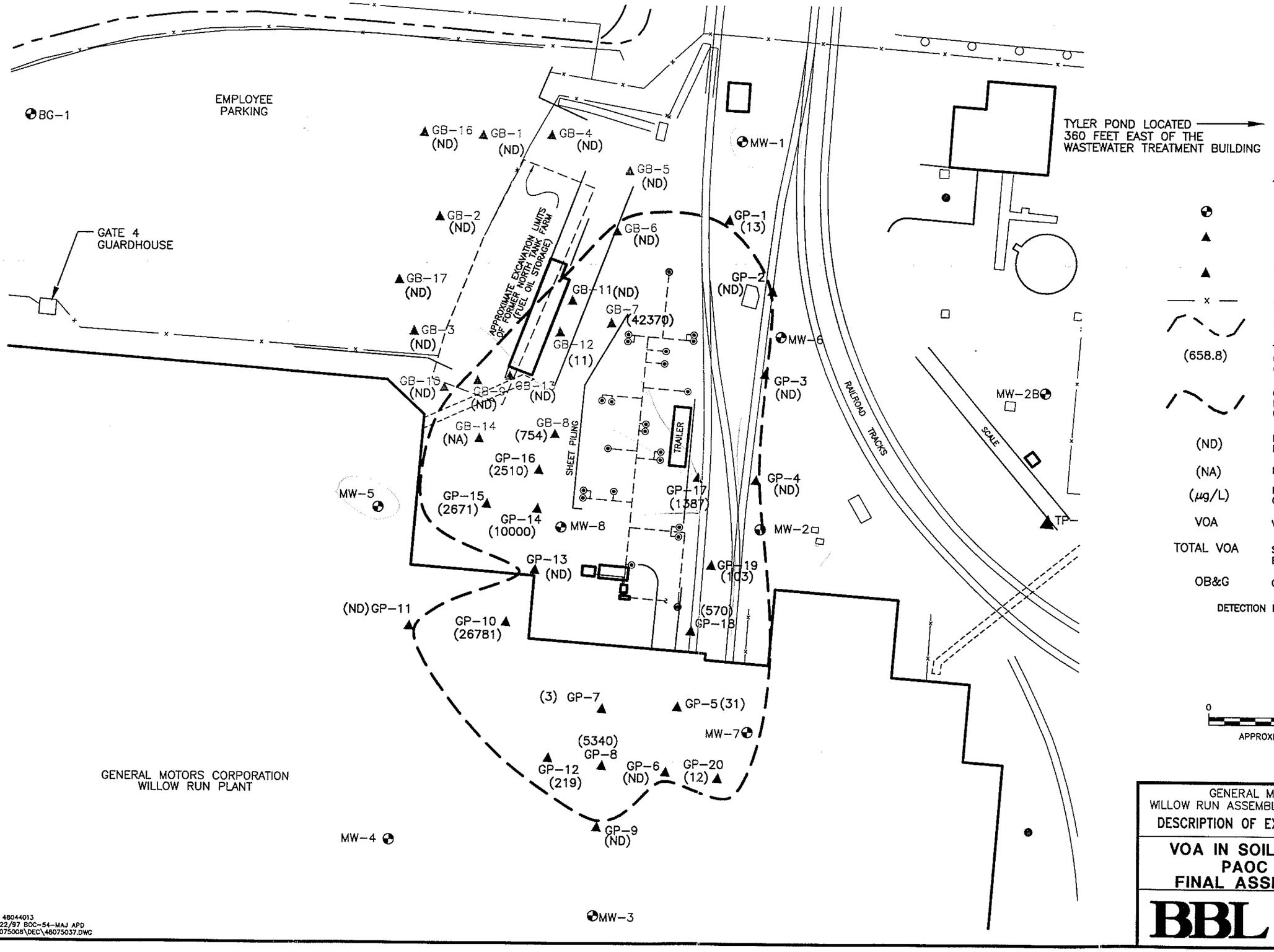
DESCRIPTION OF EXISTING CONDITIONS REPORT

SOIL BORING/GROUNDWATER SAMPLE LOCATIONS PAOC #9 NORTH TANK FARM CLOSURE REPORT

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

ATTACHMENT 4-1

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LEGEND

◔	MONITORING WELL LOCATION
▲	GEOPROBE INSTALLED 1994 FOR NORTH TANK FARM ASSESSMENT (OB&G)
▲	GEOPROBE INSTALLED 1995 FOR R&D SITE ASSESSMENT (BBL)
— x —	FENCE
	PROPERTY LINE
(658.8)	TOTAL VOA CONCENTRATION ($\mu g/kg$)
	CONTOUR DELINEATING THE EXTENT OF SOIL CONTAMINATION
(ND)	BELOW THE ANALYTICAL METHOD DETECTION LIMIT
(NA)	NOT ANALYZED
($\mu g/L$)	MICROGRAMS PER LITER GRADIENT MEASUREMENTS
VOA	VOLATILE ORGANIC AROMATICS
TOTAL VOA	SUM OF BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES.
OB&G	O'BRIEN AND GERE

DETECTION LIMITS 10 $\mu g/kg$

0 60' 120'

APPROXIMATE SCALE: 1"=60'

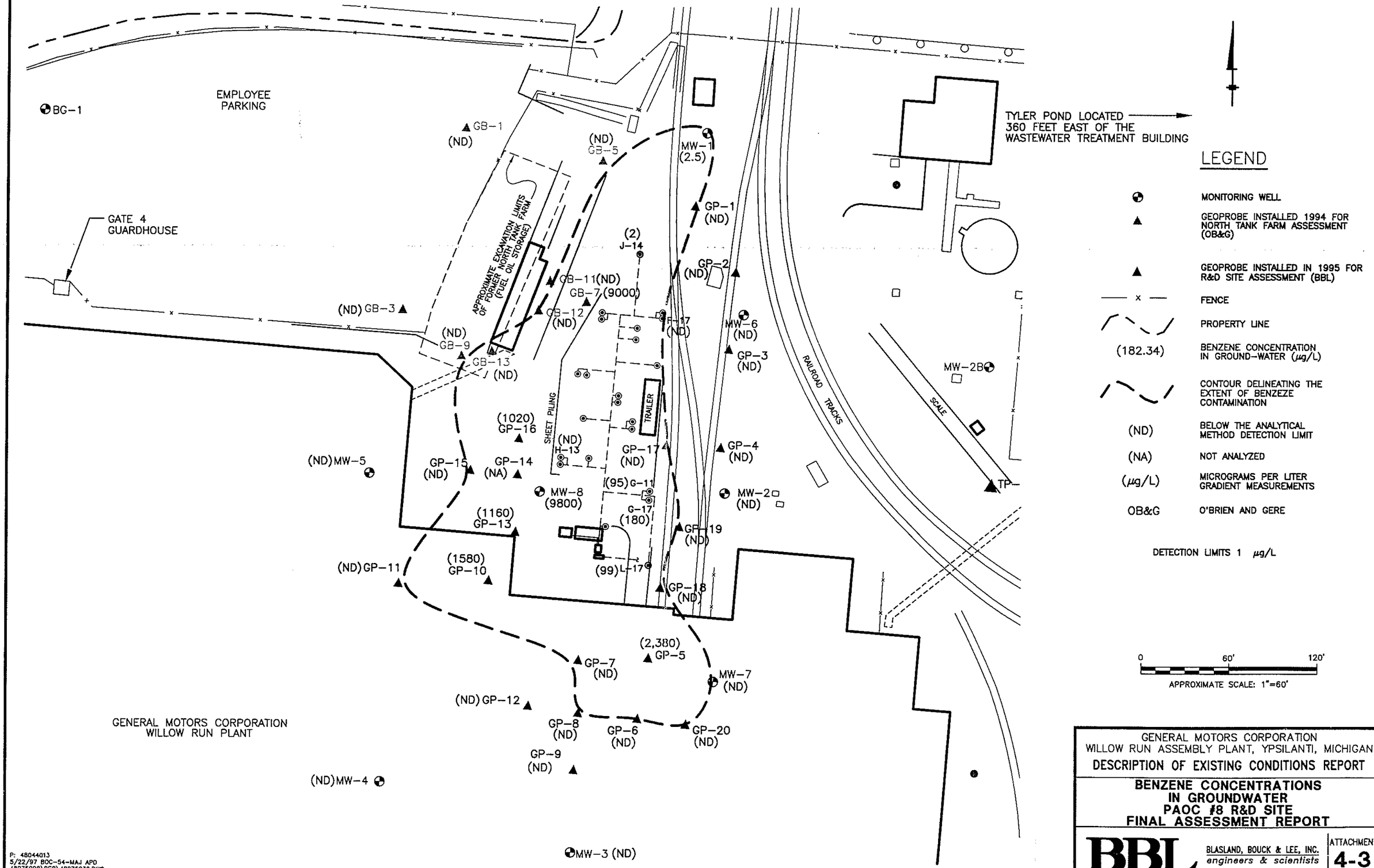
GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

VOA IN SOIL CONCENTRATIONS
PAOC #8 R&D SITE
FINAL ASSESSMENT REPORT

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

ATTACHMENT **4-2**

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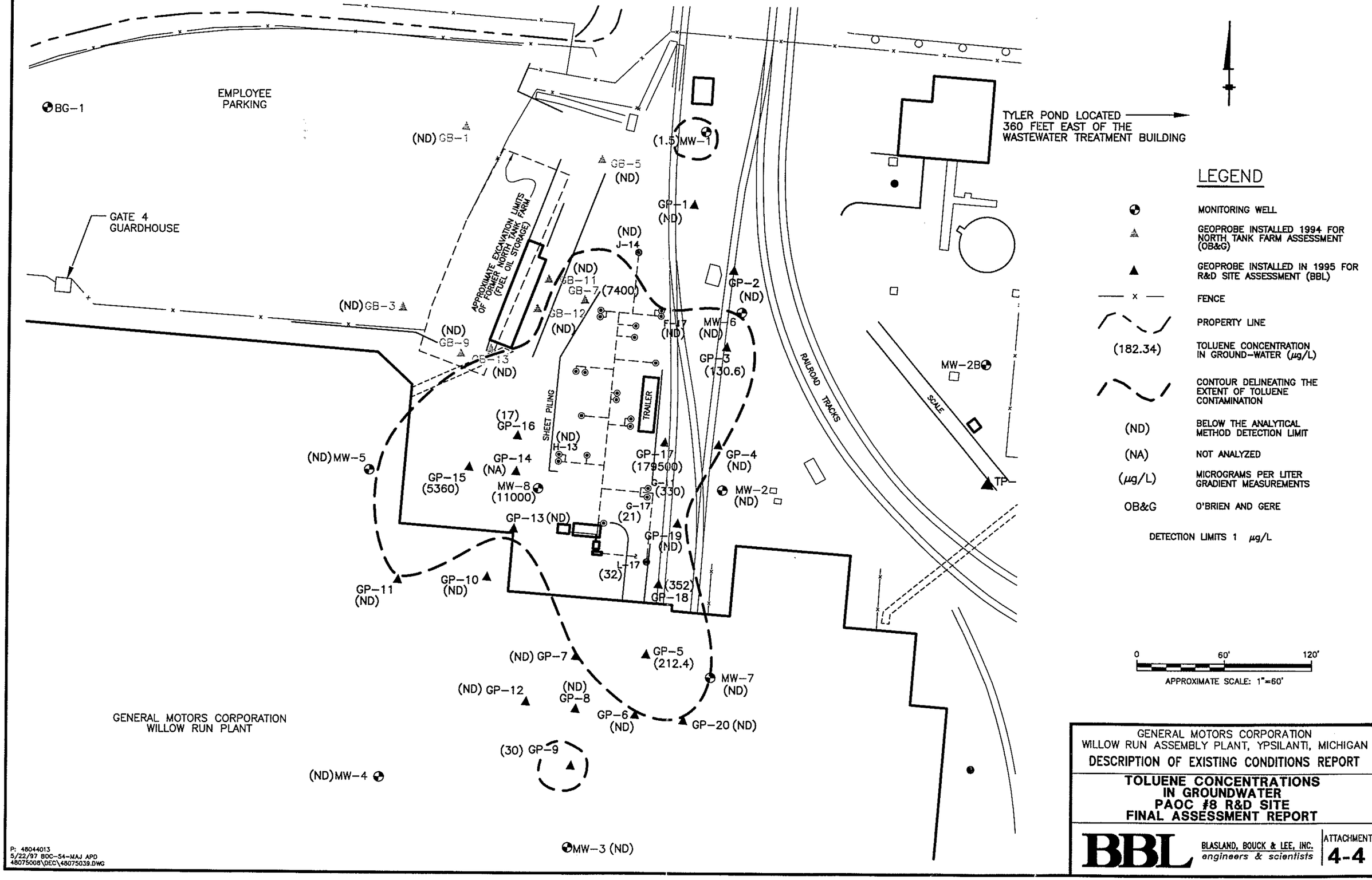
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GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

BENZENE CONCENTRATIONS IN GROUNDWATER PAOC #8 R&D SITE FINAL ASSESSMENT REPORT

BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

ATTACHMENT 4-3



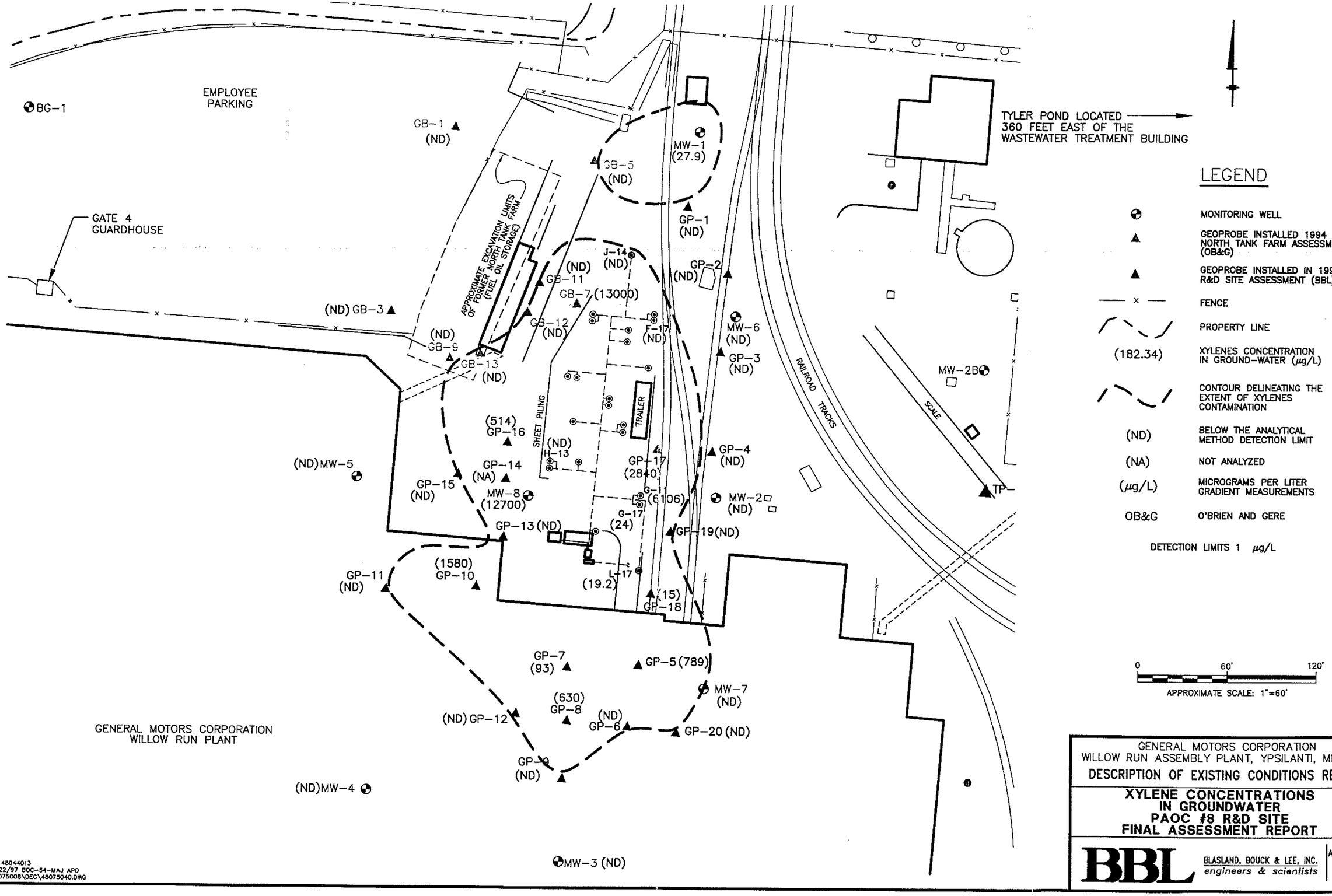
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GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

TOLUENE CONCENTRATIONS IN GROUNDWATER PAOC #8 R&D SITE FINAL ASSESSMENT REPORT

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ATTACHMENT 4-4



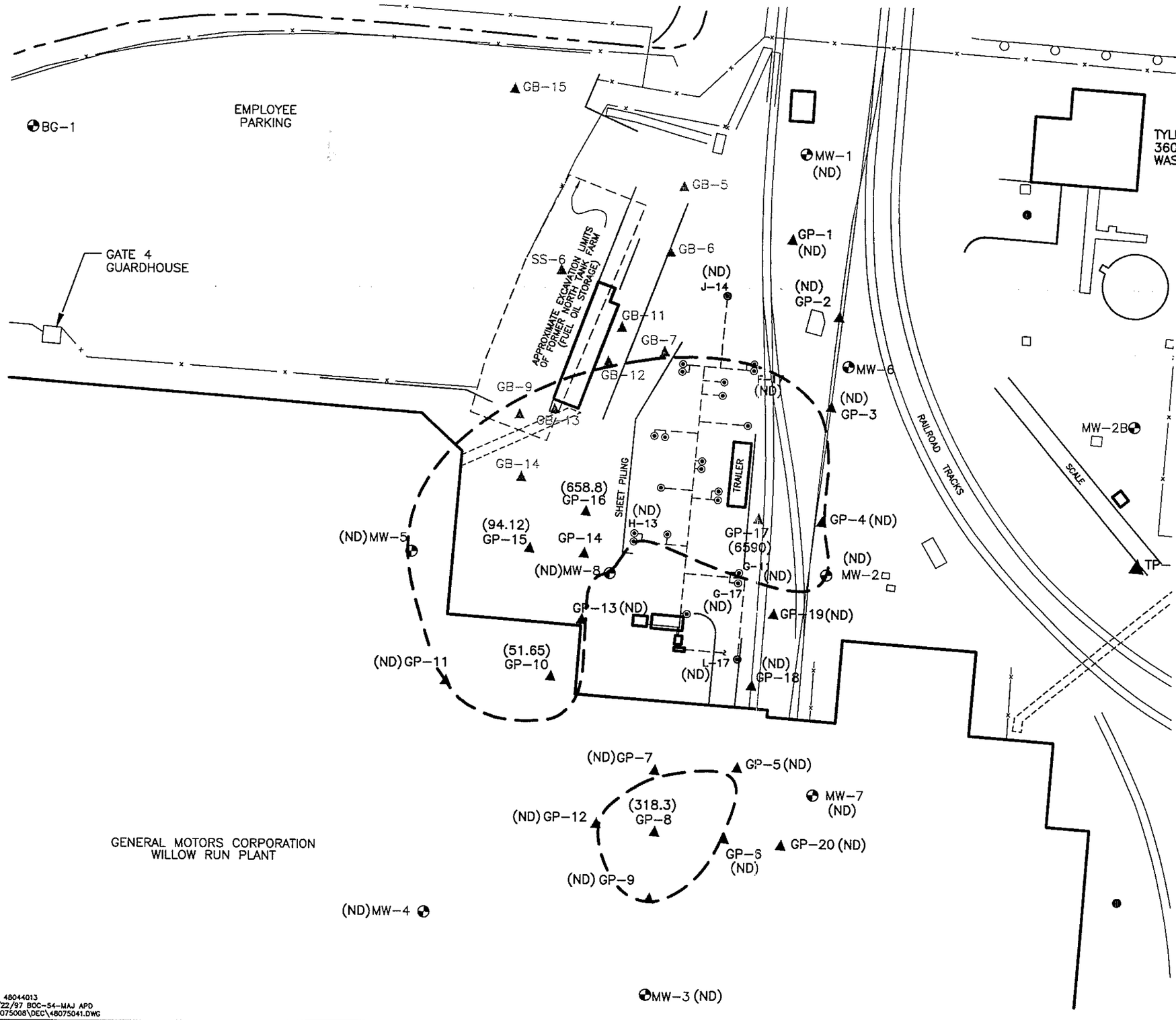
GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

XYLENE CONCENTRATIONS IN GROUNDWATER PAOC #8 R&D SITE FINAL ASSESSMENT REPORT

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

ATTACHMENT **4-5**

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LEGEND

- MONITORING WELL
- GEOPROBE INSTALLED 1994 FOR NORTH TANK FARM ASSESSMENT (OB&G)
- GEOPROBE INSTALLED IN 1995 FOR R&D SITE ASSESSMENT (BBL)
- FENCE
- PROPERTY LINE
- (658.8) TETRACHLOROETHYLENE CONCENTRATION IN GROUND-WATER ($\mu g/L$)
- CONTOUR DELINEATING THE EXTENT OF TOTAL TETRA-CHLOROETHYLENE CONTAMINATION
- (ND) BELOW THE ANALYTICAL METHOD DETECTION LIMIT
- ($\mu g/L$) MICROGRAMS PER LITER GRADIENT MEASUREMENTS
- OB&G O'BRIEN AND GERE

DETECTION LIMITS 5 $\mu g/L$

0 60' 120'

APPROXIMATE SCALE: 1"=60'

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

PCE CONCENTRATIONS IN GROUNDWATER PAOC #8 R&D SITE FINAL ASSESSMENT REPORT

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

ATTACHMENT **4-6**

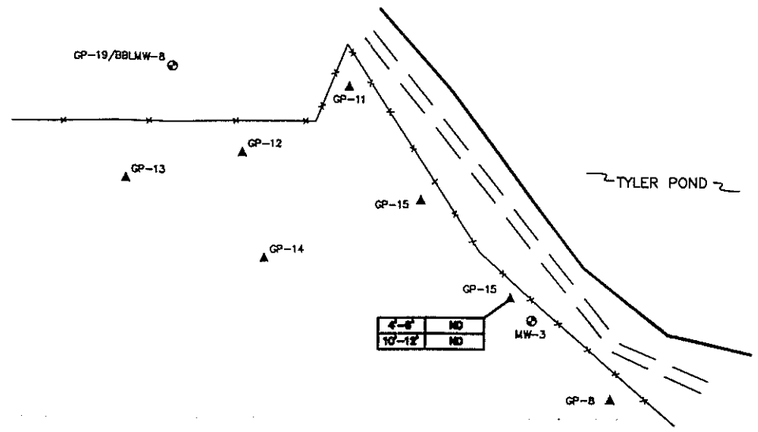
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5/22/97 BOC-54-MAJ APD
48075008\DEC\48075041.DWG

80 0 80

APPROXIMATE SCALE IN FEET

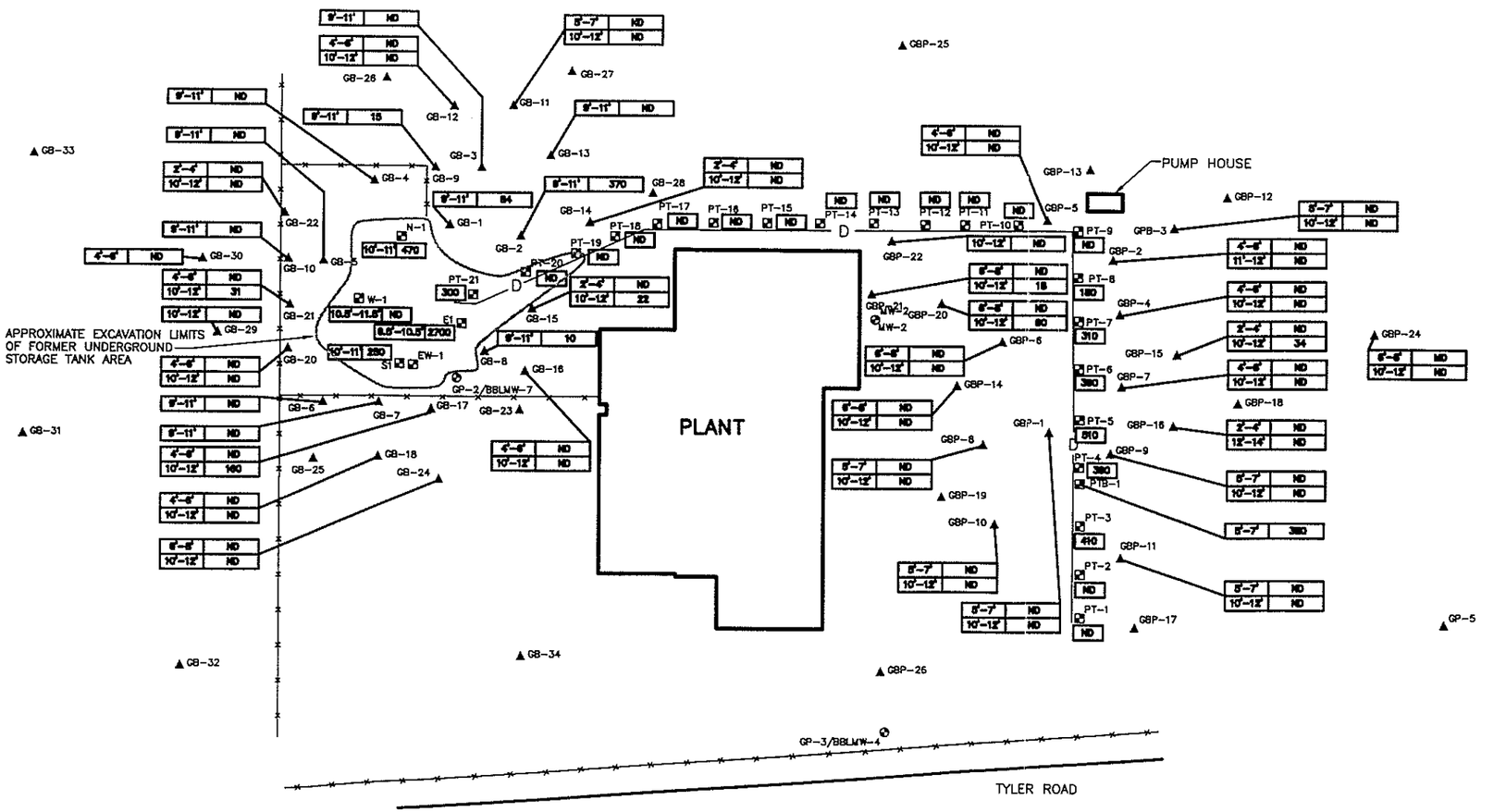
NOTES:

1. BASE MAP DIGITIZED FROM PHOTOCOPY OF SITE PLAN, OBRIEN & GERE ENGINEERS (DATE UNKNOWN), AT AN
2. THE LOCATION OF FEATURES SUCH AS BORINGS, WELLS, SAMPLES, LIMITS, ETC. ARE APPROXIMATE ONLY.
3. SOIL DATA FROM GB AND GBP BORINGS TAKEN FROM PHASE I HYDROGEOLOGIC INVESTIGATION BY O'BRIEN AND GERE, INC. , 1994.
4. PT-1 THROUGH PT-21 EXCEPT PT-3 THROUGH PT-7 SAMPLED AT 3'-4'. PT-3 THROUGH PT-7 SAMPLED AT 4'-5'.



LEGEND

- GEOPROBE LOCATION
- MONITORING WELL
- SOIL OR WATER SAMPLE
- EXTENT OF EXCAVATED SOIL
- FORMER DIESEL FUEL LINE
- FENCE LINE
- SEWER LINE
- 5'-7' | 1480 — BENZENE CONCENTRATION (µg/kg)
- ND — NOT DETECTED
- (µg/kg) — MICROGRAMS PER KILOGRAM



GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN

DESCRIPTION OF EXISTING CONDITIONS REPORT

BENZENE IN SOIL
PAOC #20 CAT SITE
FINAL ASSESSMENT REPORT

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE 4-7

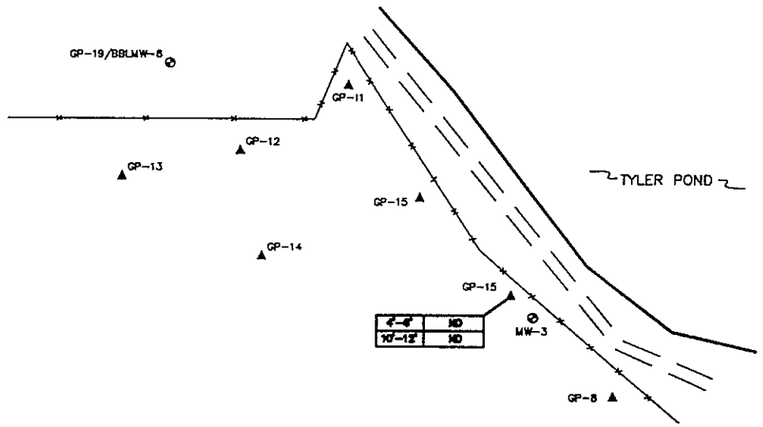
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80 0 80

APPROXIMATE SCALE IN FEET

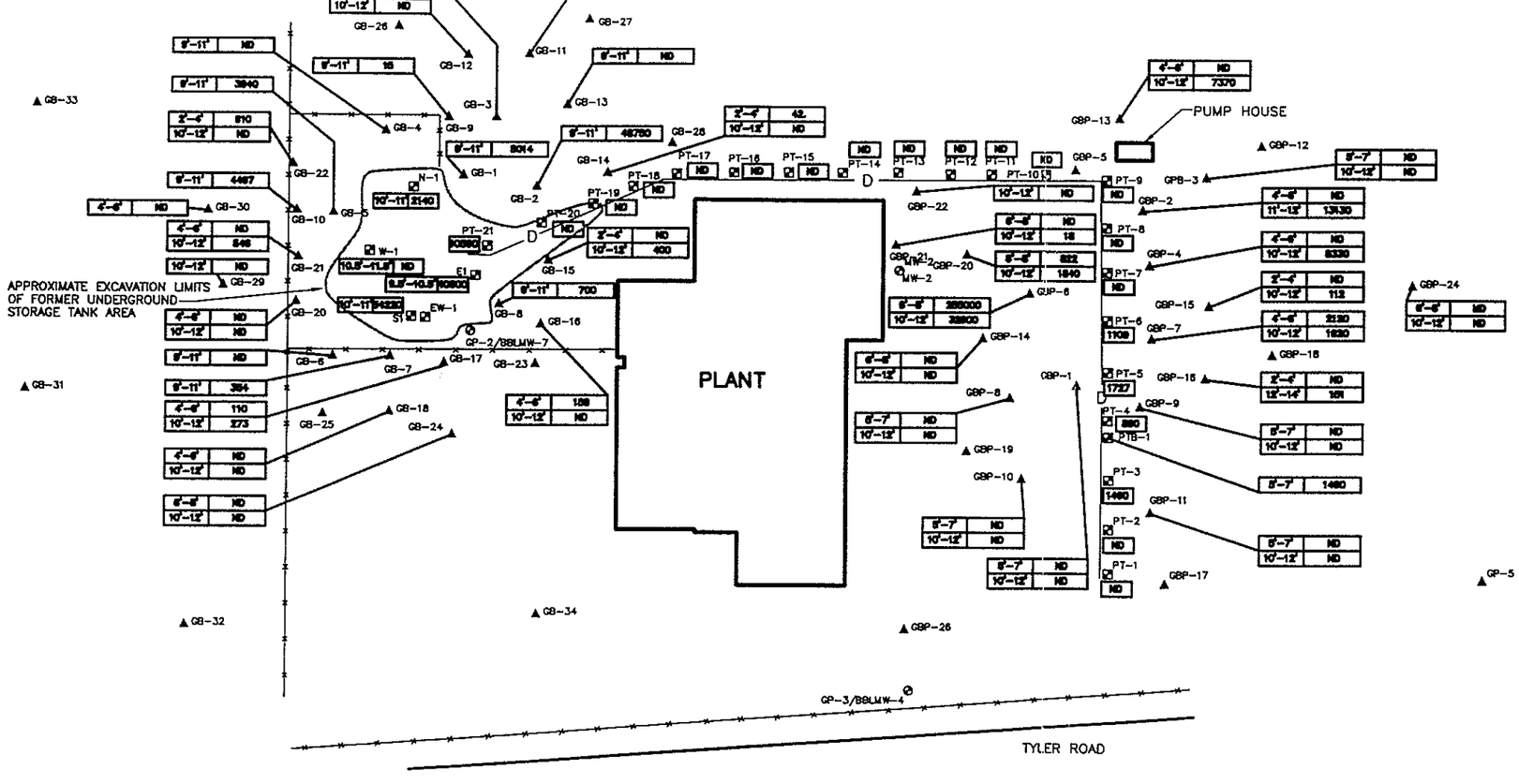
NOTES:

1. BASE MAP DIGITIZED FROM PHOTOCOPY OF SITE PLAN, OBRIEN & GERE ENGINEERS (DATE UNKNOWN), AT AN
2. THE LOCATION OF FEATURES SUCH AS BORINGS, WELLS, SAMPLES, LIMITS, ETC. ARE APPROXIMATE ONLY.
3. SOIL DATA FROM GB AND GBP BORINGS TAKEN FROM PHASE I HYDROGEOLOGIC INVESTIGATION BY O'BRIEN AND GERE, INC. , 1994.
4. PT-1 THROUGH PT-21 EXCEPT PT-3 THROUGH PT-7 SAMPLED AT 3'-4'. PT-3 THROUGH PT-7 SAMPLED AT 4'-5'.



LEGEND

- GEOPROBE LOCATION
- MONITORING WELL
- SOIL OR WATER SAMPLE
- EXTENT OF EXCAVATED SOIL
- FORMER DIESEL FUEL LINE
- FENCE LINE
- SEWER LINE
- 6'-7' 1480 — TOTAL VOA CONCENTRATION (µg/kg)
- ND — NOT DETECTED
- (µg/kg) — MICROGRAMS PER KILOGRAM
- TOTAL VOA — SUM OF BENZENE, TOLUENE ETHYLBENZENE AND XYLENES
- VOA — VOLATILE ORGANIC AROMATICS



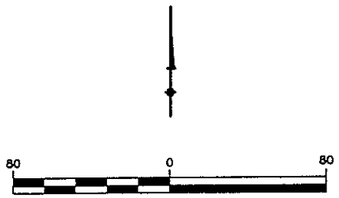
5/22/97 BOC-54-CSB APD
48075008\DEC\48075043.DWG

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

TOTAL VOA IN SOIL
PAOC #20 CAT SITE
FINAL ASSESSMENT REPORT

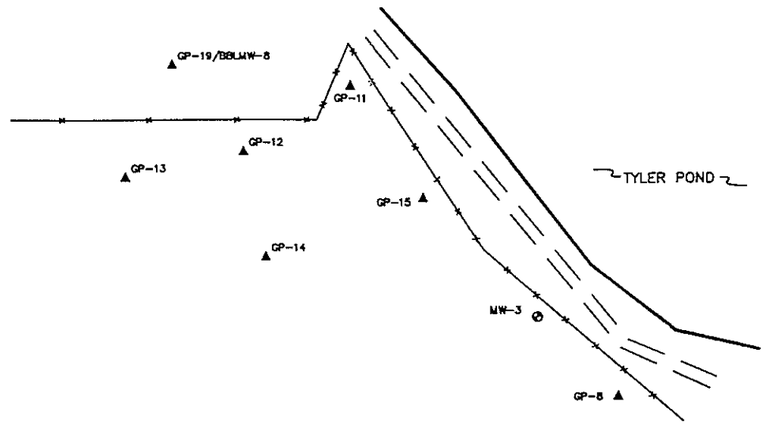
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ATTACHMENT **4-8**



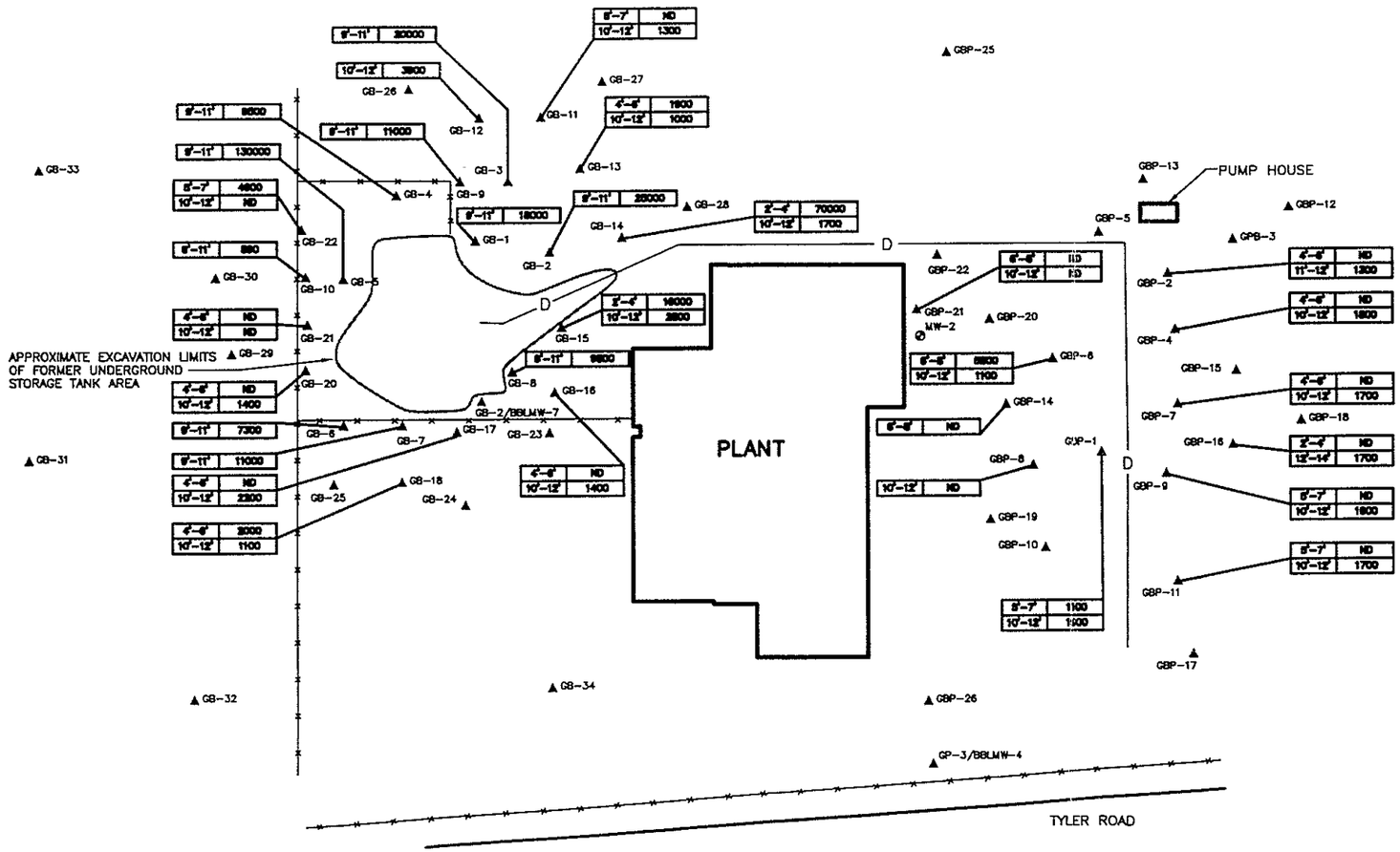
NOTES:

1. BASE MAP DIGITIZED FROM PHOTOCOPY OF SITE PLAN, OBRIEN & GERE ENGINEERS (DATE UNKNOWN), AT AN
2. THE LOCATION OF FEATURES SUCH AS BORINGS, WELLS, SAMPLES, LIMITS, ETC. ARE APPROXIMATE ONLY.
3. SOIL DATA FROM GB AND GBP BORINGS TAKEN FROM PHASE I HYDROGEOLOGIC INVESTIGATION BY O'BRIEN AND GERE, INC. , 1994.



LEGEND

- ▲ GEOPROBE LOCATION
- ⊘ MONITORING WELL
- EXTENT OF EXCAVATED SOIL
- D FORMER DIESEL FUEL LINE
- FENCE LINE
- SEWER LINE
- 10'-12' | 1800 LEAD CONCENTRATION (µg/kg)
- ND NOT DETECTED
- (µg/kg) MICROGRAMS PER KILOGRAM



GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN

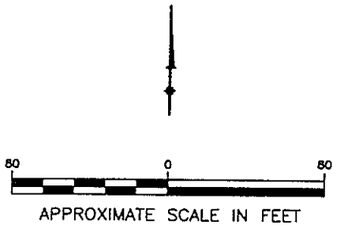
DESCRIPTION OF EXISTING CONDITIONS REPORT

LEAD IN SOIL
PAOC #20 CAT SITE
FINAL ASSESSMENT REPORT

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

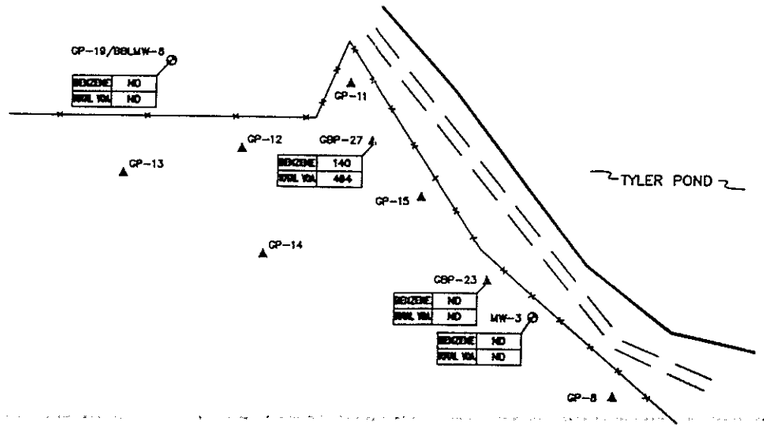
ATTACHMENT **4-9**

5/22/97 BOC-54-APD
48075008\DEC\48075044.DWG



NOTES:

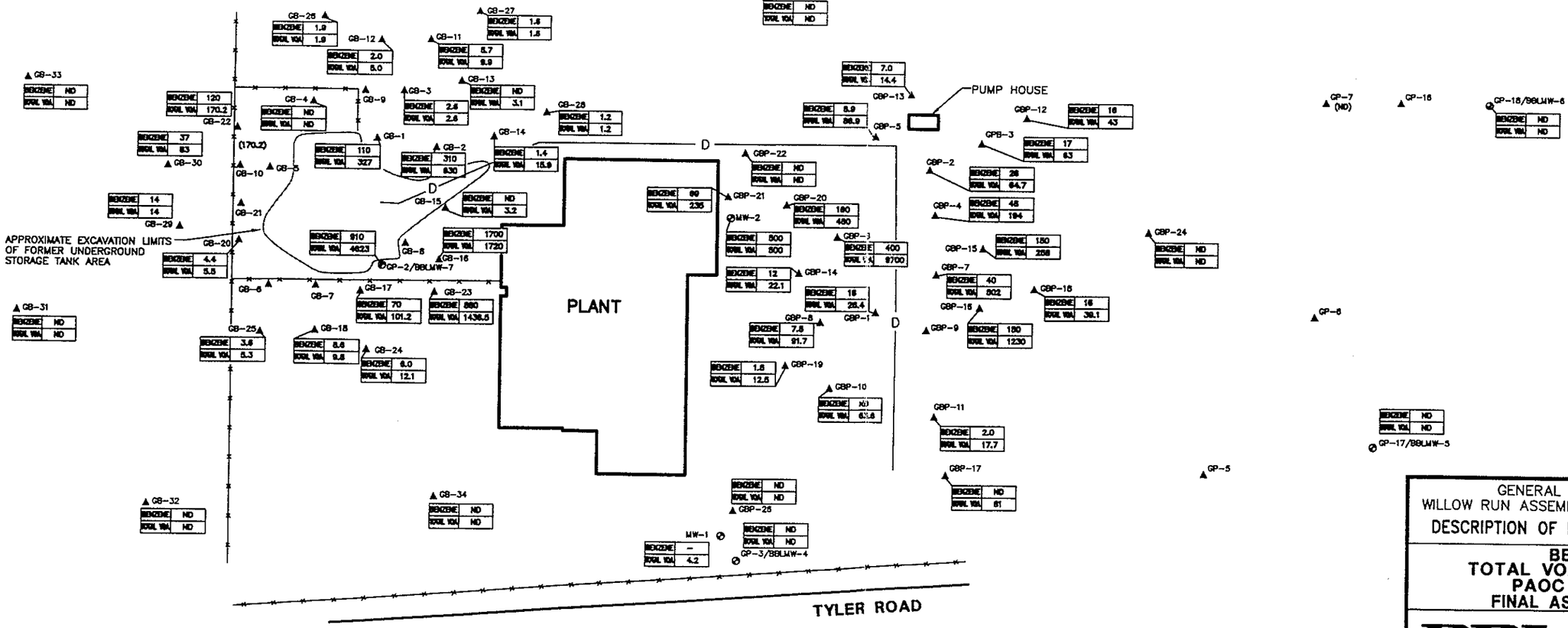
1. BASE MAP DIGITIZED FROM PHOTOCOPY OF SITE PLAN, OBRIEN & GERE ENGINEERS (DATE UNKNOWN), AT AN
2. THE LOCATION OF FEATURES SUCH AS BORINGS, WELLS, SAMPLES, LIMITS, ETC. ARE APPROXIMATE ONLY.
3. DATA FROM GB AND GBP BORINGS TAKEN FROM PHASE I HYDROGEOLOGIC INVESTIGATION BY O'BRIEN AND GERE, INC. , 1994.



LEGEND

▲	GEOPROBE LOCATION
⊘	MONITORING WELL
	EXTENT OF EXCAVATED SOIL
——D——	FORMER DIESEL FUEL LINE
——×——×——	FENCE LINE
— — —	SEWER LINE
ND	NOT DETECTED
(µg/L)	MICROGRAMS PER LITER
TOTAL VOA	SUM OF BENZENE, TOLUENE ETHYLBENZENE AND XYLENES
VOA	VOLATILE ORGANIC AROMATICS

ALL DATA MEASURED IN µg/L



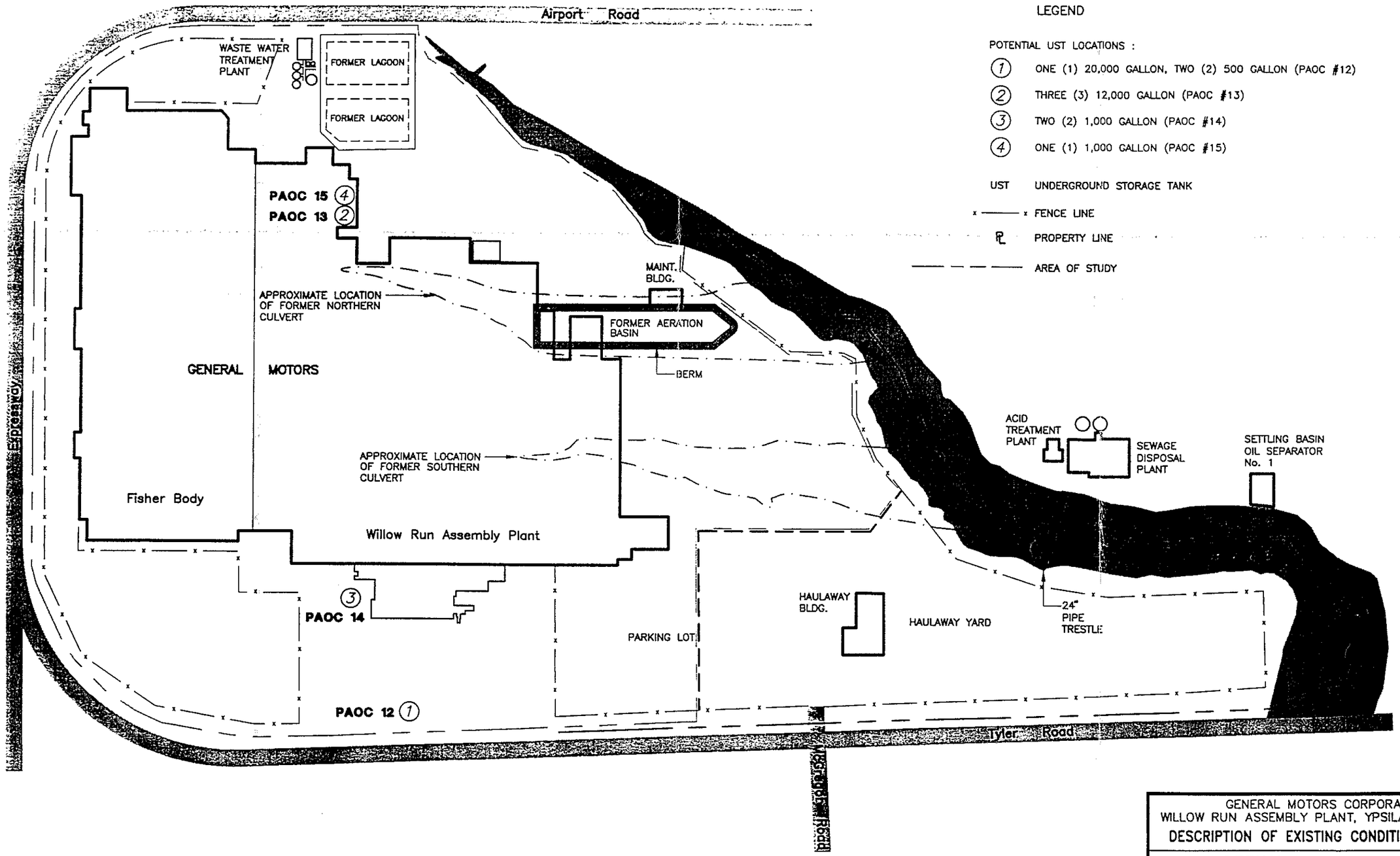
5/22/97 BOC-54-MAJ, APD
48075008\DEC\48075045.DWG

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

BENZENE AND TOTAL VOA IN GROUNDWATER PAOC #20 CAT SITE FINAL ASSESSMENT REPORT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

ATTACHMENT 4-10



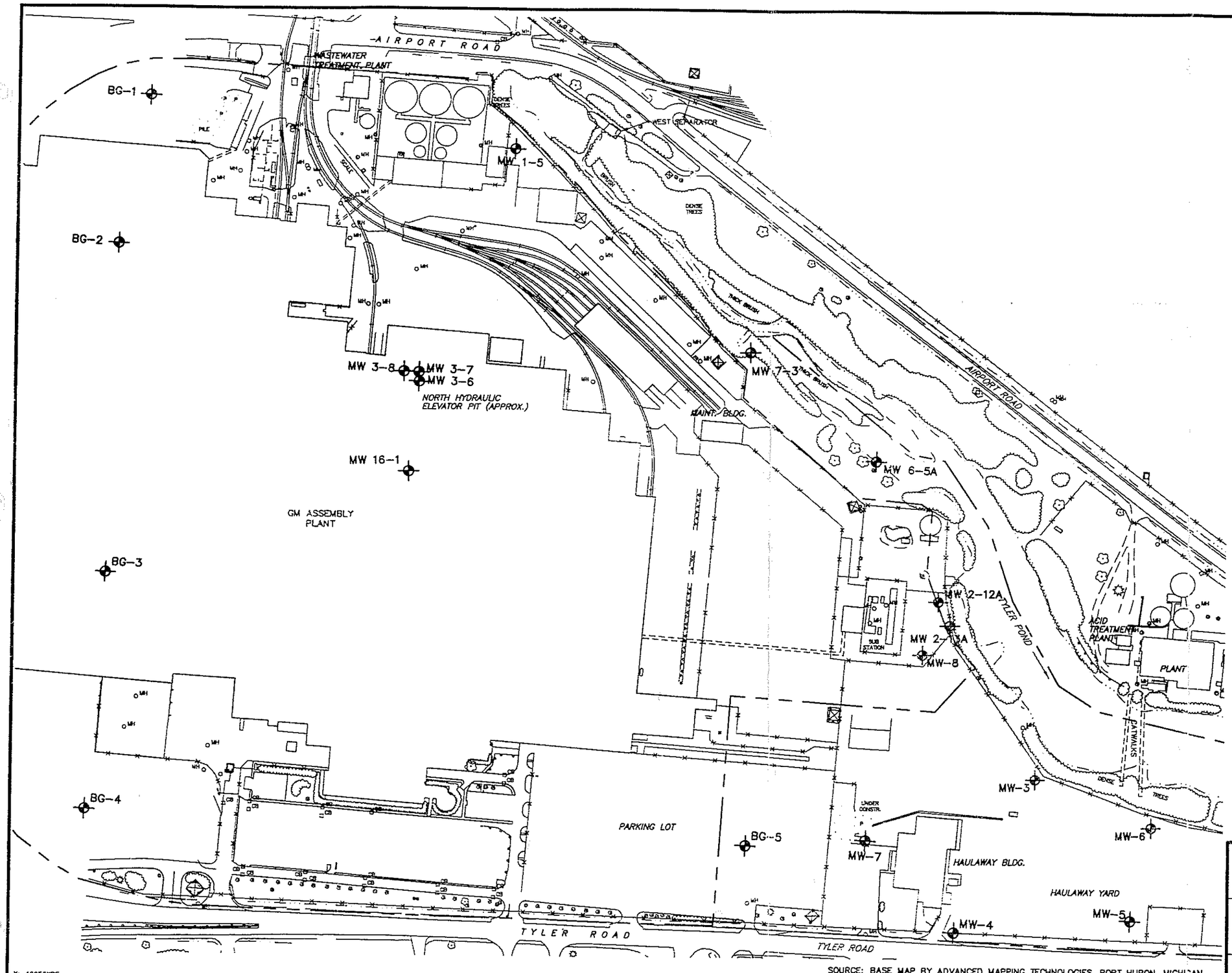
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48075008\DEC\48075046.DWG

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

POTENTIAL LOCATIONS OF UNDERGROUND STORAGE TANKS PHASE II ENVIRONMENTAL SITE ASSESSMENT

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE 4-11



LEGEND

- PROPERTY LINE
- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MANHOLE
- CATCH BASIN
- PERMANENT WELL INSTALLATION

SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

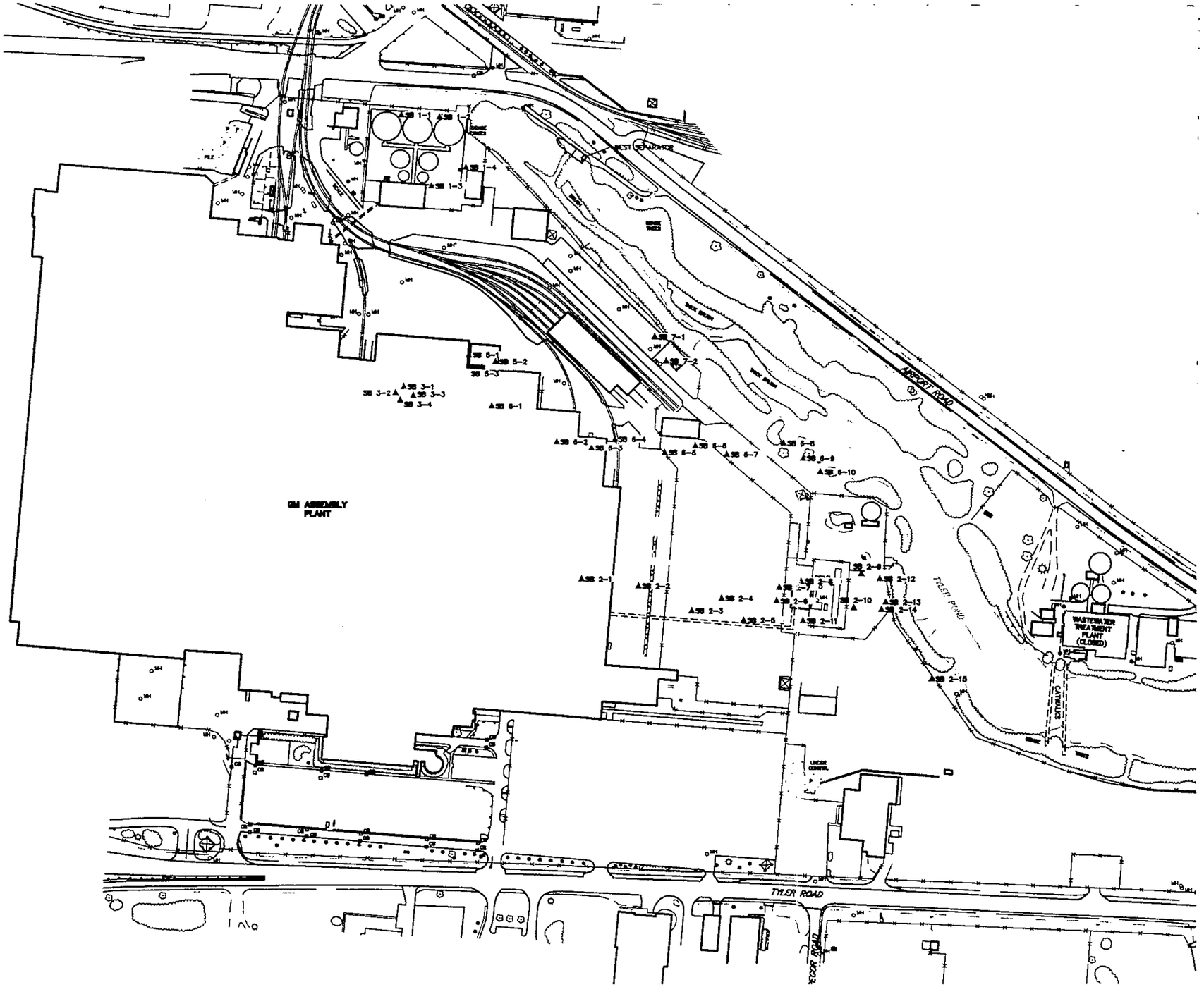
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5/8/97-80C-54 MAJ APD
48075008\48075047.DWG

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

MONITORING WELL LOCATIONS SUPPLEMENTAL PHASE II ESI

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FIGURE 5-1



LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MH MANHOLE
- CB CATCH BASIN
- ▲ SAMPLE LOCATION

300' 0 300'

APPROXIMATE SCALE: 1" = 300'

SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN. AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

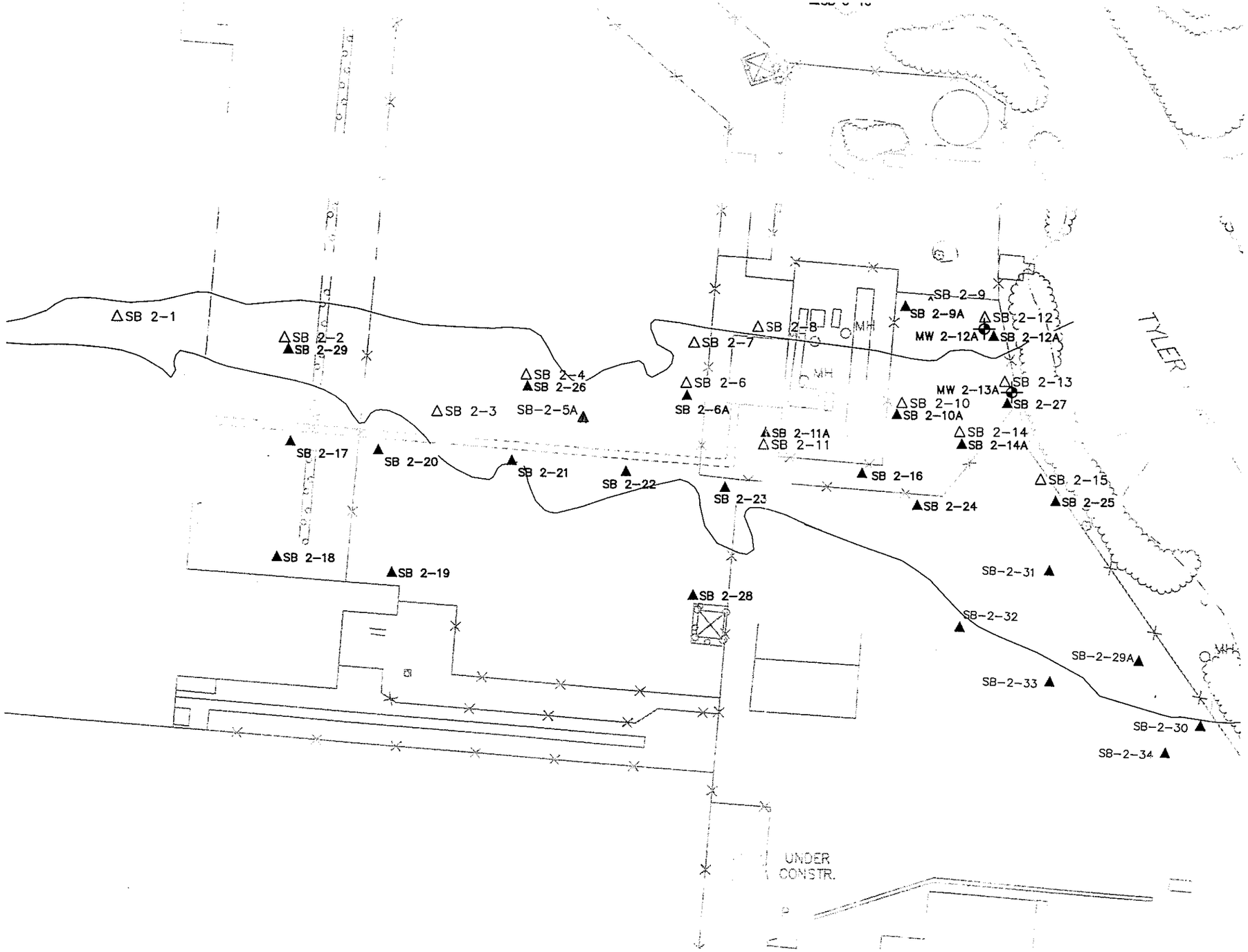
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5/22/97 BOC-54 APD
48075006\DEC\48075048.DWG

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

SOIL BORING/GROUNDWATER SAMPLE LOCATIONS
PHASE II ENVIRONMENTAL SITE ASSESSMENT

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE 5-2



LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MANHOLE
- CATCH BASIN
- MW 2-13A — MONITORING WELL
- ▲SB 2-17 — SOIL BORING LOCATION (PHASE III EOC)
- △SB 2-2 — SOIL BORING LOCATION (PHASE II ESI)

100 0 100 200

APPROXIMATE SCALE: 1 inch = 100 feet

SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

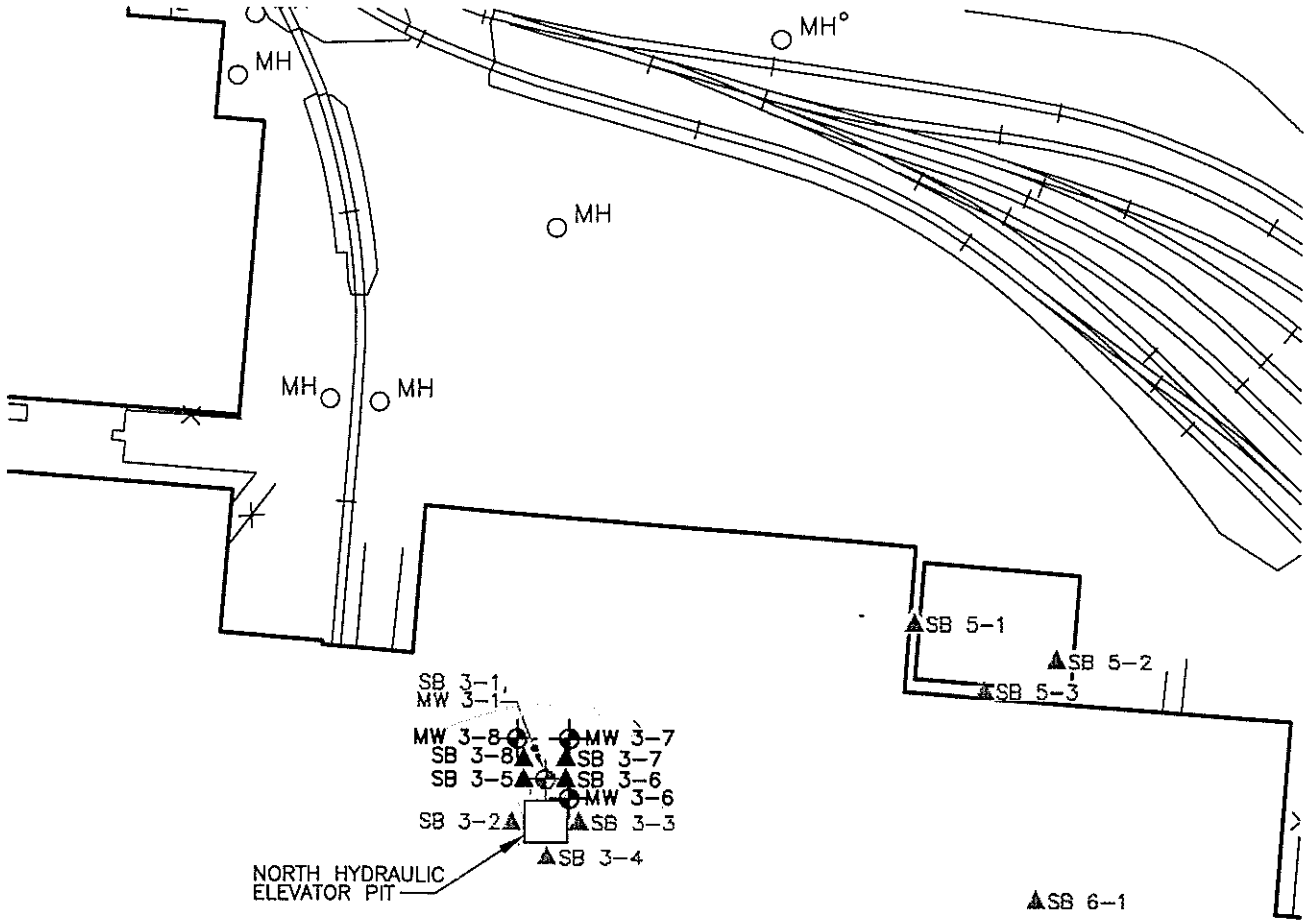
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6/3/97 BOC-54 MAJ, APD
48075008\DEC\48075049.DWG

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

SOIL BORING LOCATION MAP
PAOC #2 FORMER SOUTH CULVERT
PHASE III EOC STUDY

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE 5-6



LEGEND

	RAILROAD LINE
MH	MANHOLE
CB	CATCH BASIN
SB 3-7	SOIL BORING LOCATION
MW 3-7	MONITORING WELL
SB 3-2	SOIL BORING FROM 1995 PHASE II
MW 3-1	MONITORING WELL FROM 1995 PHASE II

100 0 100

APPROXIMATE SCALE IN FEET

NOTE:
BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

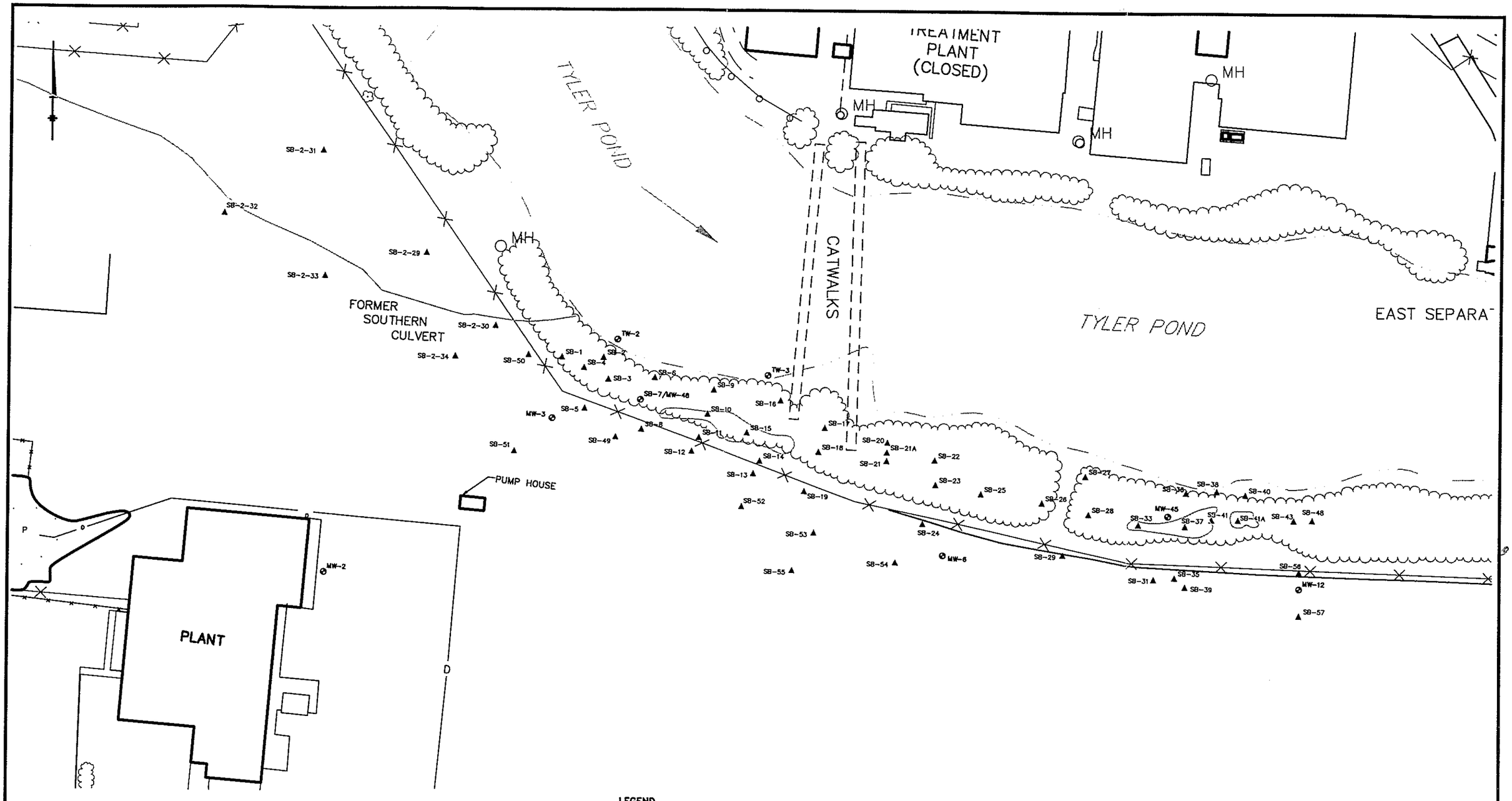
GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

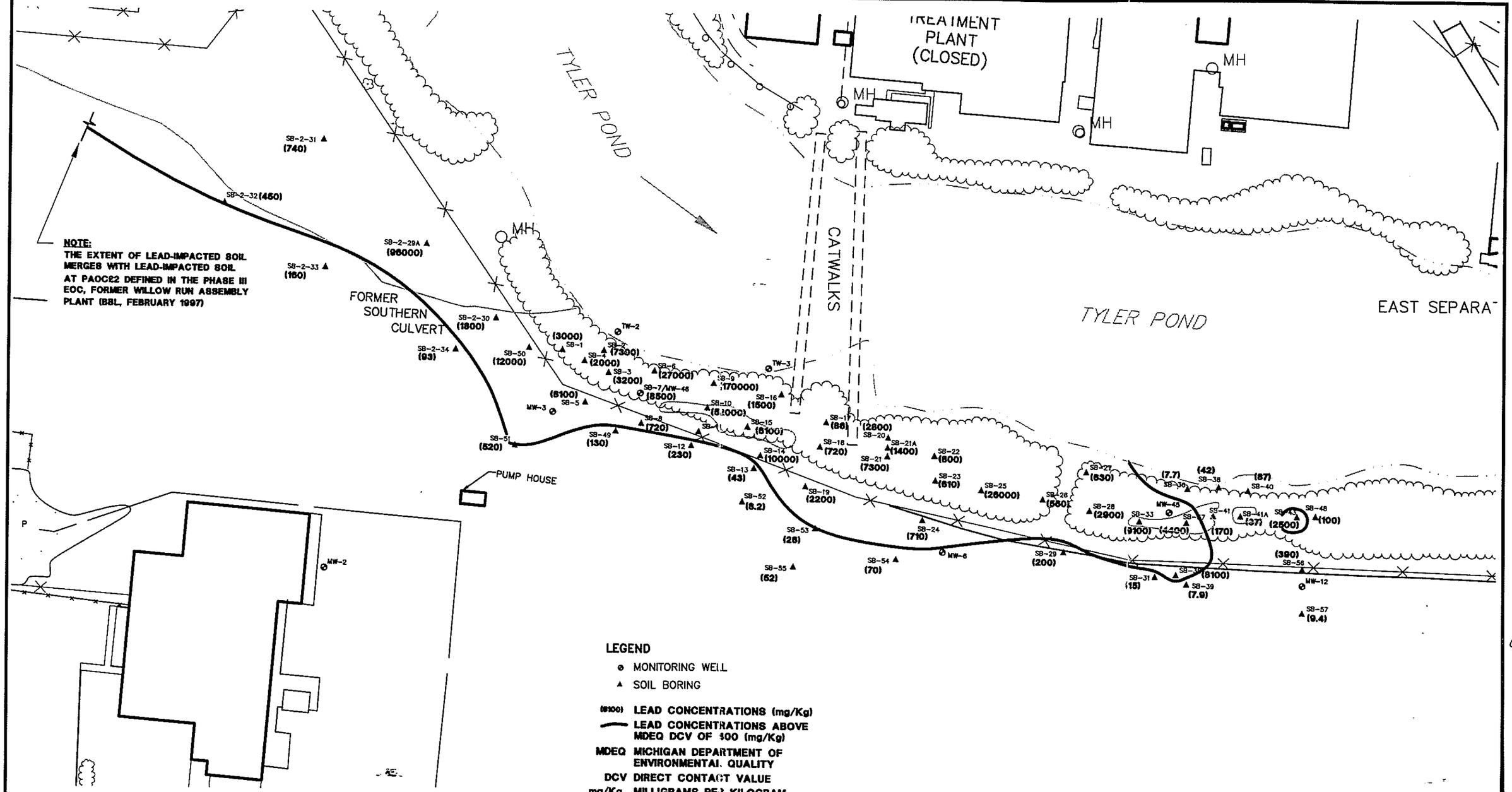
PAOC #3 SAMPLING LOCATIONS PHASE III EOC STUDY

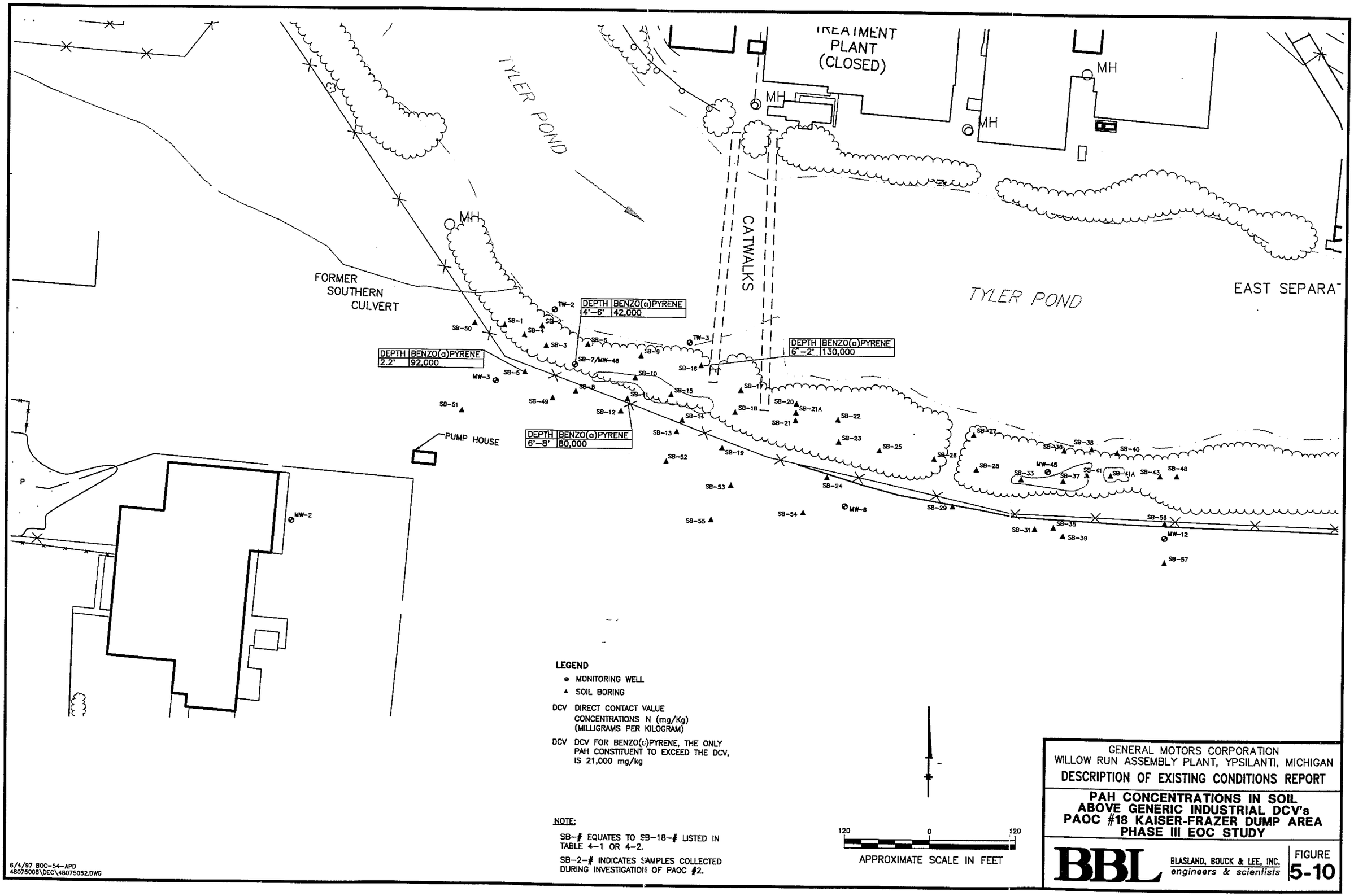
BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5-7

X: 48027003
P: 48075056
9/3/97 BOC-54-MAI.APD
48075\DEC\48075056.DWG


TREATMENT PLANT (CLOSED)
MH
MH
MH
MH
TYLER POND
TYLER POND
CATWALKS
EAST SEPARA
FORMER SOUTHERN CULVERT
PUMP HOUSE
PLANT
SB-2-31
SB-2-32
SB-2-29
SB-2-33
SB-2-30
SB-2-34
SB-50
SB-1
SB-2
SB-3
TW-2
SB-6
SB-9
TW-3
SB-7/MW-4B
SB-16
SB-5
MW-3
SB-10
SB-8
SB-15
SB-17
SB-49
SB-51
SB-11
SB-18
SB-20
SB-21A
SB-12
SB-14
SB-21
SB-22
SB-13
SB-23
SB-25
SB-19
SB-26
SB-52
SB-24
SB-27
SB-38
SB-40
SB-28
MW-45
SB-33
SB-37
SB-41
SB-41A
SB-43
SB-48
SB-53
SB-54
MW-6
SB-29
SB-55
SB-56
SB-31
SB-35
SB-39
MW-12
SB-57
MW-2
P
D
D
D


TREATMENT PLANT (CLOSED)
MH
MH
MH
MH
TYLER POND
TYLER POND
CATWALKS
EAST SEPARA
FORMER SOUTHERN CULVERT
PUMP HOUSE
NOTE:
THE EXTENT OF LEAD-IMPACTED SOIL MERGES WITH LEAD-IMPACTED SOIL AT PAOC22 DEFINED IN THE PHASE III EOC, FORMER WILLOW RUN ASSEMBLY PLANT (BBL, FEBRUARY 1997)
SB-2-31 (740)
SB-2-32 (450)
SB-2-29A (96000)
SB-2-33 (160)
SB-2-30 (1800)
SB-2-34 (93)
SB-50 (12000)
SB-1 (3000)
SB-7 (7300)
SB-2 (2000)
SB-3 (3200)
SB-6 (27000)
SB-9 (170000)
SB-7/MW-46 (8500)
SB-16 (1500)
SB-10 (51000)
SB-15 (6100)
SB-17 (86)
SB-20 (2800)
SB-18 (720)
SB-21A (1400)
SB-22 (800)
SB-21 (7300)
SB-23 (610)
SB-25 (26000)
SB-26 (580)
SB-27 (630)
SB-38 (42)
SB-40 (87)
SB-28 (2900)
SB-33 (9100)
SB-41 (170)
SB-41A (37)
SB-43 (2500)
SB-48 (100)
SB-56 (390)
SB-31 (15)
SB-39 (7.9)
SB-57 (9.4)
MW-12
MW-45
MW-6
MW-3
MW-2
TW-2
TW-3
SB-6 (6100)
SB-5 (520)
SB-49 (130)
SB-8 (720)
SB-12 (230)
SB-14 (10000)
SB-13 (43)
SB-52 (8.2)
SB-19 (2200)
SB-53 (26)
SB-55 (52)
SB-54 (70)
SB-24 (710)
SB-29 (200)
P
LEGEND
MONITORING WELL
SOIL BORING
(8100) LEAD CONCENTRATIONS (mg/Kg)
LEAD CONCENTRATIONS ABOVE MDEQ DCV OF 400 (mg/Kg)
MDEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DCV DIRECT CONTACT VALUE
mg/Kg MILLIGRAMS PER KILOGRAM
NOTE:
SB-# EQUATES TO SB-18-# LISTED IN TABLE 4-1 OR 4-2.
SB-2-# INDICATES SAMPLES COLLECTED DURING INVESTIGATION OF PAOC #2.
CONCENTRATIONS SHOWN ARE THE HIGHEST OF ALL SAMPLES ANALYZED FROM EACH BORING LOCATION. SAMPLES WERE COLLECTED AT 0'-6", THEN AT 2-FOOT INTERVALS DOWN TO THE WATER-TABLE.
120
0
120
APPROXIMATE SCALE IN FEET
6/4/97 BOC-54-APD
48075008\DEC\48075051.DWG
GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS
LEAD CONCENTRATIONS IN SOIL
PAOC #18 KAISER FRAZER DUMP AREA
PHASE III EOC STUDY
BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists
FIGURE
5-9



LEGEND

- ⊙ MONITORING WELL
- ▲ SOIL BORING

DCV DIRECT CONTACT VALUE CONCENTRATIONS IN (mg/Kg) (MILLIGRAMS PER KILOGRAM)

DCV DCV FOR BENZO(a)PYRENE, THE ONLY PAH CONSTITUENT TO EXCEED THE DCV, IS 21,000 mg/kg

NOTE:

SB-# EQUATES TO SB-18-# LISTED IN TABLE 4-1 OR 4-2.

SB-2-# INDICATES SAMPLES COLLECTED DURING INVESTIGATION OF PAOC #2.

120 0 120

APPROXIMATE SCALE IN FEET

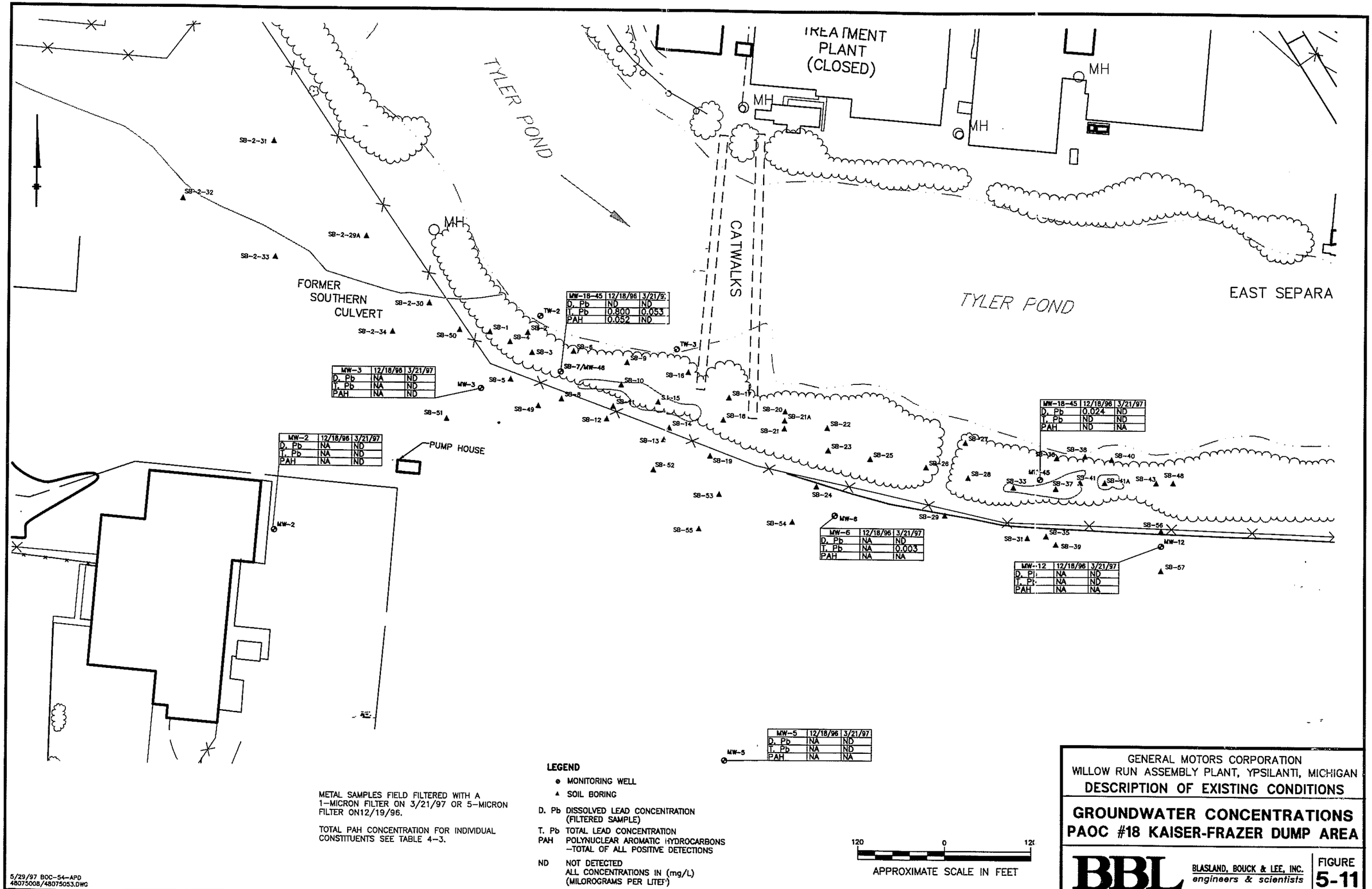
GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

PAH CONCENTRATIONS IN SOIL ABOVE GENERIC INDUSTRIAL DCV's PAOC #18 KAISER-FRAZER DUMP AREA PHASE III EOC STUDY

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5-10

6/4/97 BOC-54-APD
48075008\DEC\48075052.DWG



METAL SAMPLES FIELD FILTERED WITH A 1-MICRON FILTER ON 3/21/97 OR 5-MICRON FILTER ON12/19/96.

TOTAL PAH CONCENTRATION FOR INDIVIDUAL CONSTITUENTS SEE TABLE 4-3.

LEGEND

- ● MONITORING WELL
- ▲ SOIL BORING

D. Pb DISSOLVED LEAD CONCENTRATION (FILTERED SAMPLE)

T. Pb TOTAL LEAD CONCENTRATION

PAH POLYNUCLEAR AROMATIC HYDROCARBONS -TOTAL OF ALL POSITIVE DETECTIONS

ND NOT DETECTED
ALL CONCENTRATIONS IN (mg/L) (MILOROGRAMS PER LITER)

5/29/97 BOC-54-APD
48075008/48075053.DWG

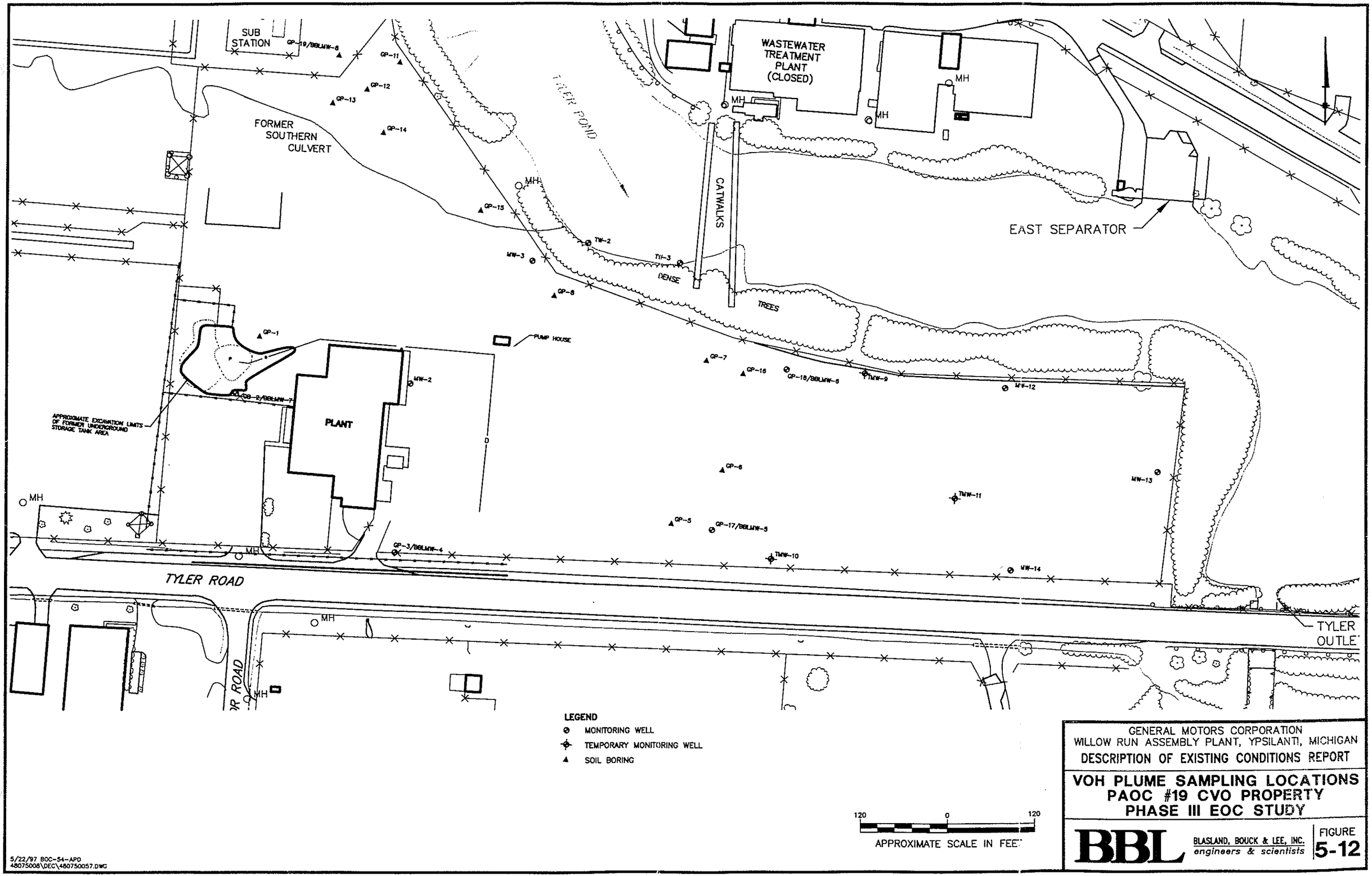
GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN

DESCRIPTION OF EXISTING CONDITIONS

GROUNDWATER CONCENTRATIONS PAOC #18 KAISER-FRAZER DUMP AREA

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE **5-11**



GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

VOH PLUME SAMPLING LOCATIONS
PAOC #19 CVO PROPERTY
PHASE III EOC STUDY

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE **5-12**

5/22/97 BOC-54-APD
48075008\DEC\480750057.DWG

SUB STATION

GP-19/BGLMW-5: ND / ND / 16

GP-11

GP-12

GP-13

GP-14

FORMER SOUTHERN CULVERT

TYLER POND

WASTEWATER TREATMENT PLANT (CLOSED)

MH

MH

MH

MH

MH

MH

MH

MH

CATWALKS

EAST SEPARATOR

GP-15

3111 / 1450 / 1 — TW-2

2003 / 1290 / 21 — TW-3

MW-3: 98700 / 98000 / ND

DENSE TREES

GP-8

GP-1

PUMP HOUSE

GP-7: 18400 / 16000 / ND

GP-16

GP-18/BGLMW-6: 21.4 / 150 / ND

TMW-9: 2818 / 9640 / 221

MW-12: 1 / ND / ND / ND

APPROXIMATE EXCAVATION LIMITS OF FORMER UNDERGROUND STORAGE TANK AREA

GP-2/BGLMW-7: ND / ND / ND

PLANT

MW-2: 140950 / 83000 / ND

GP-6

GP-5

1 / 3,185 / ND — TMW-11

MW-13: ND / ND / ND / ND

GP-17/BGLMW-5: 1400 / 2300 / ND

14 / 1 — GP-3/BGLMW-4

TMW-10: 7433 / 4890 / ND

ND / ND / ND / ND — MW-14

TYLER ROAD

TYLER OUTLE

R ROAD

LEGEND

- MONITORING WELL
- TEMPORARY MONITORING WELL
- SOIL BORING
- 1400 / 2300 / ND — DICHLOROETHYLENE CONCENTRATIONS, ppb / VINYL CHLORIDE CONCENTRATION, ppb / TRICHLOROETHYLENE CONCENTRATION, ppb

120 0 120

APPROXIMATE SCALE IN FEET

5/22/97 BOC-54-APD
48075008/DEC\48075054.DWG

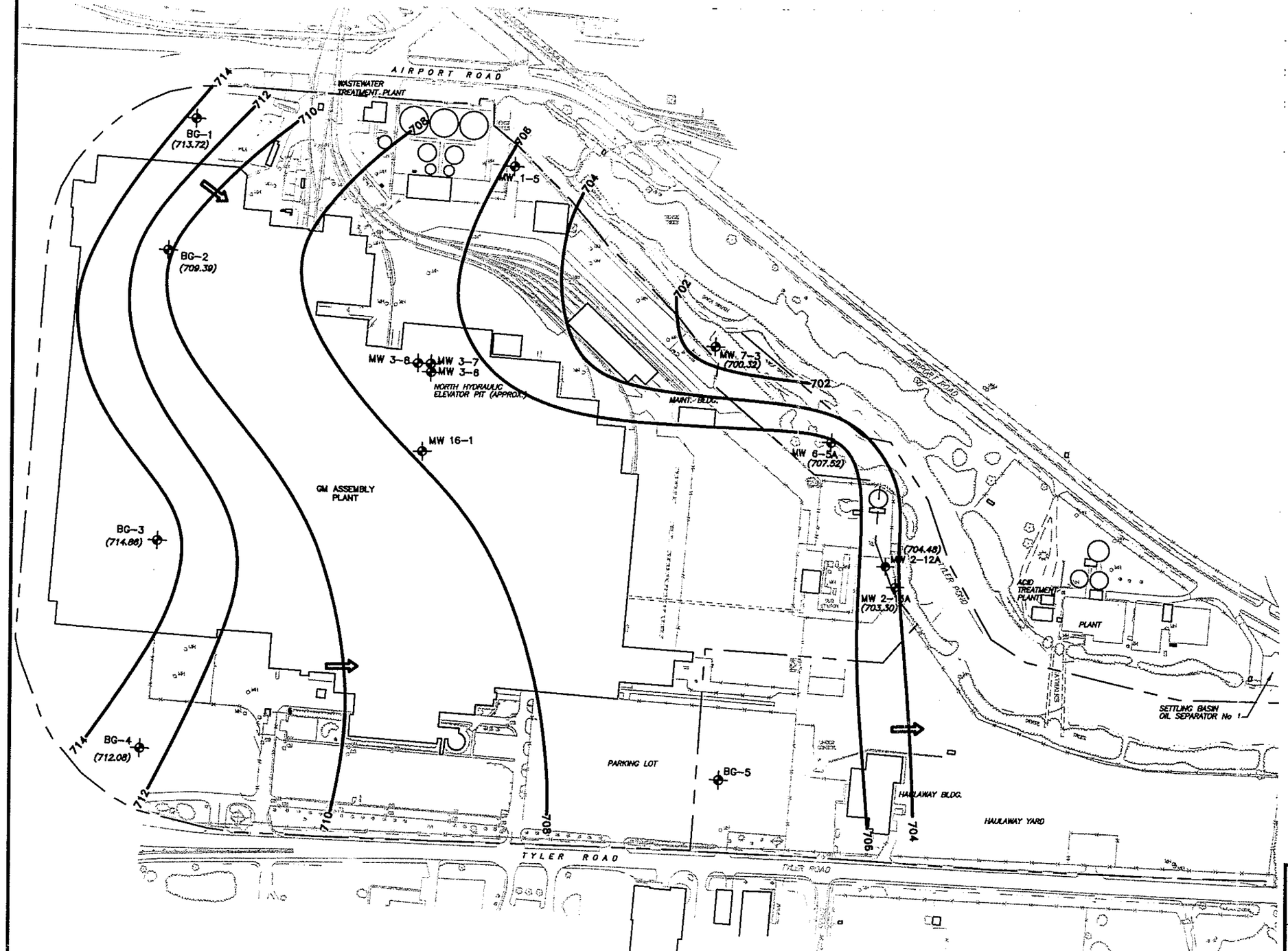
GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN

DESCRIPTION OF EXISTING CONDITIONS REPORT

VOLATILE ORGANIC HALOCARBON CONCENTRATIONS IN GROUNDWATER PAOC #19 CVO PROPERTY

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE 5-13



LEGEND

- PROPERTY LINE
- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MANHOLE
- CATCH BASIN
- MONITORING WELL
- —704— GROUNDWATER ELEVATION CONTOUR IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
- GROUNDWATER FLOW DIRECTION

300 0 300

SCALE IN FEET

X: 48027003
P:48050012
12/19/96-BOC-54 MAJ APD
48075008\DEC\48075061.DWG

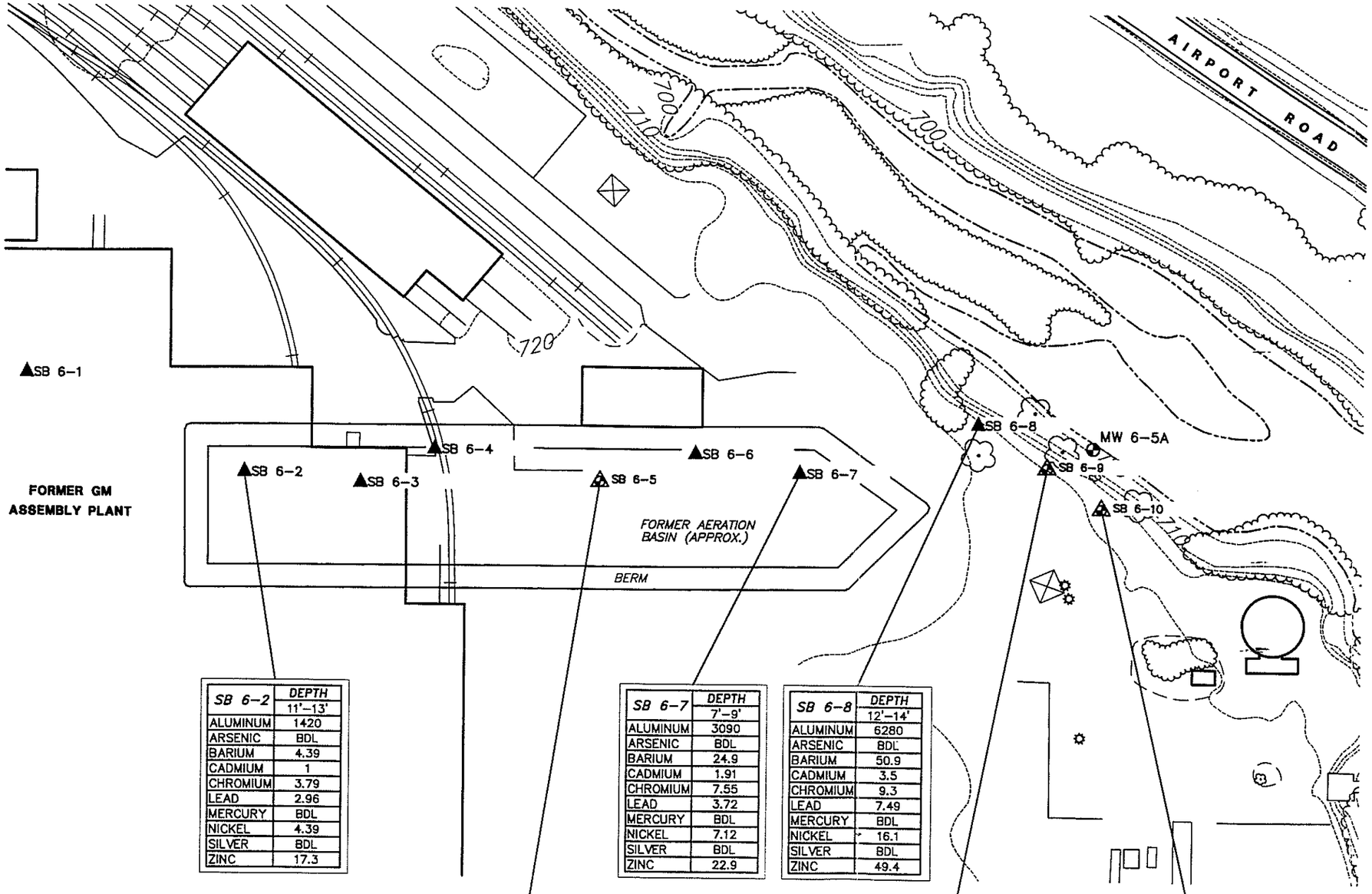
SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

GENERAL MOTORS CORPORATION
WILLOW RUN FACILITY – YPSILANTI, MI
DESCRIPTION OF EXISTING CONDITIONS REPORT

GROUNDWATER ELEVATION CONTOUR MAP APRIL 12, 1996

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5-14



SB 6-2	DEPTH 11'-13'
ALUMINUM	1420
ARSENIC	BDL
BARIUM	4.39
CADMIUM	1
CHROMIUM	3.79
LEAD	2.96
MERCURY	BDL
NICKEL	4.39
SILVER	BDL
ZINC	17.3

SB 6-7	DEPTH 7'-9'
ALUMINUM	3090
ARSENIC	BDL
BARIUM	24.9
CADMIUM	1.91
CHROMIUM	7.55
LEAD	3.72
MERCURY	BDL
NICKEL	7.12
SILVER	BDL
ZINC	22.9

SB 6-8	DEPTH 12'-14'
ALUMINUM	6280
ARSENIC	BDL
BARIUM	50.9
CADMIUM	3.5
CHROMIUM	9.3
LEAD	7.49
MERCURY	BDL
NICKEL	16.1
SILVER	BDL
ZINC	49.4

SB 6-5	DEPTH 4'-5'	GROUND WATER
ALUMINUM	6370	BDL/2520
ARSENIC	2.34	NA/NA
BARIUM	51.8	NA/NA
CADMIUM	3.2	19/17
CHROMIUM	35	BDL/BDL
LEAD	34	2580/1120
MERCURY	BDL	0.3/0.2
NICKEL	62.7	380/390
SILVER	BDL	NA/NA
ZINC	73.5	BDL/BDL

SB 6-9	DEPTH 8'-10'	GROUND WATER
ALUMINUM	6120	BDL/6610
ARSENIC	2.88	NA/NA
BARIUM	86.2	NA/NA
CADMIUM	8.4	4.4/212
CHROMIUM	26.2	BDL/BDL
LEAD	54.2	120/1590
MERCURY	BDL	BDL/0.4
NICKEL	126	BDL/640
SILVER	BDL	NA/NA
ZINC	200	BDL/350

SB 6-10	DEPTH 8'-10'	GROUND WATER
ALUMINUM	4950	BDL/1120
ARSENIC	BDL	NA/NA
BARIUM	20.4	NA/NA
CADMIUM	1.47	5/21
CHROMIUM	7.55	BDL/BDL
LEAD	2.95	61/110
MERCURY	BDL	BDL/BDL
NICKEL	7.78	BDL/340
SILVER	BDL	NA/NA
ZINC	22.5	BDL/BDL

LEGEND

- TREE LINE
- RAILROAD LINE
- DITCH, STREAM OR RIVER
- TOPOGRAPHIC CONTOUR
- EXISTING GRAVEL ROAD
- EXISTING PAVED ROAD
- EXISTING CONCRETE DRIVE, PAD, WALL
- MW 6-5A — MONITORING WELL INSTALLED DURING THE SUPPLEMENTAL PHASE II ESI
- SB 6-10 — SOIL BORING WITH TEMPORARY WELL, WATER SAMPLE FROM PHASE II ESI
- SB 6-8 — SOIL BORING FROM PHASE II ESI

100 0 100

APPROXIMATE SCALE IN FEET

NOTE:

BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON MICHIGAN. AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

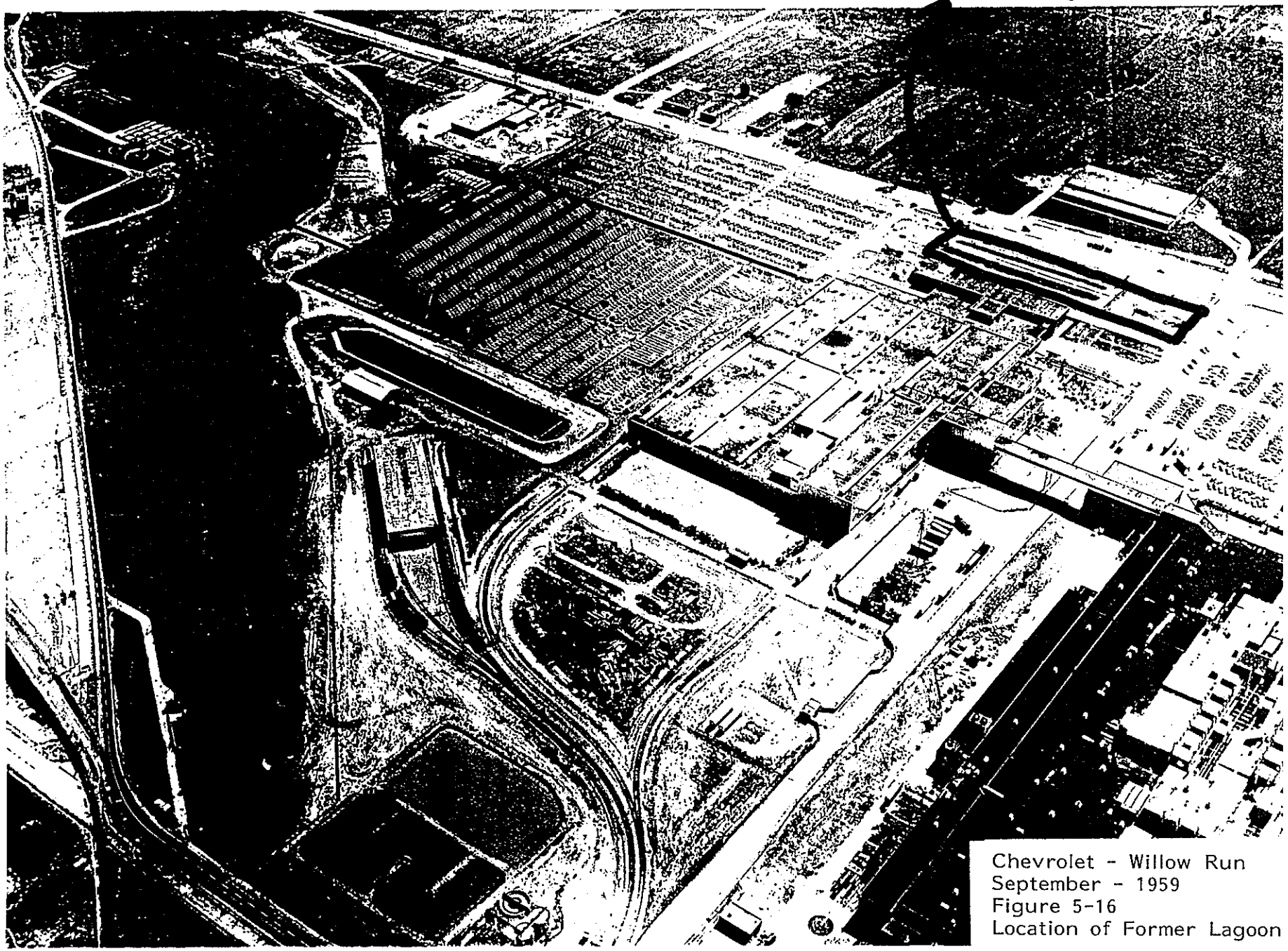
SAMPLING CONDUCTED TO EVALUATE PAOC #6

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

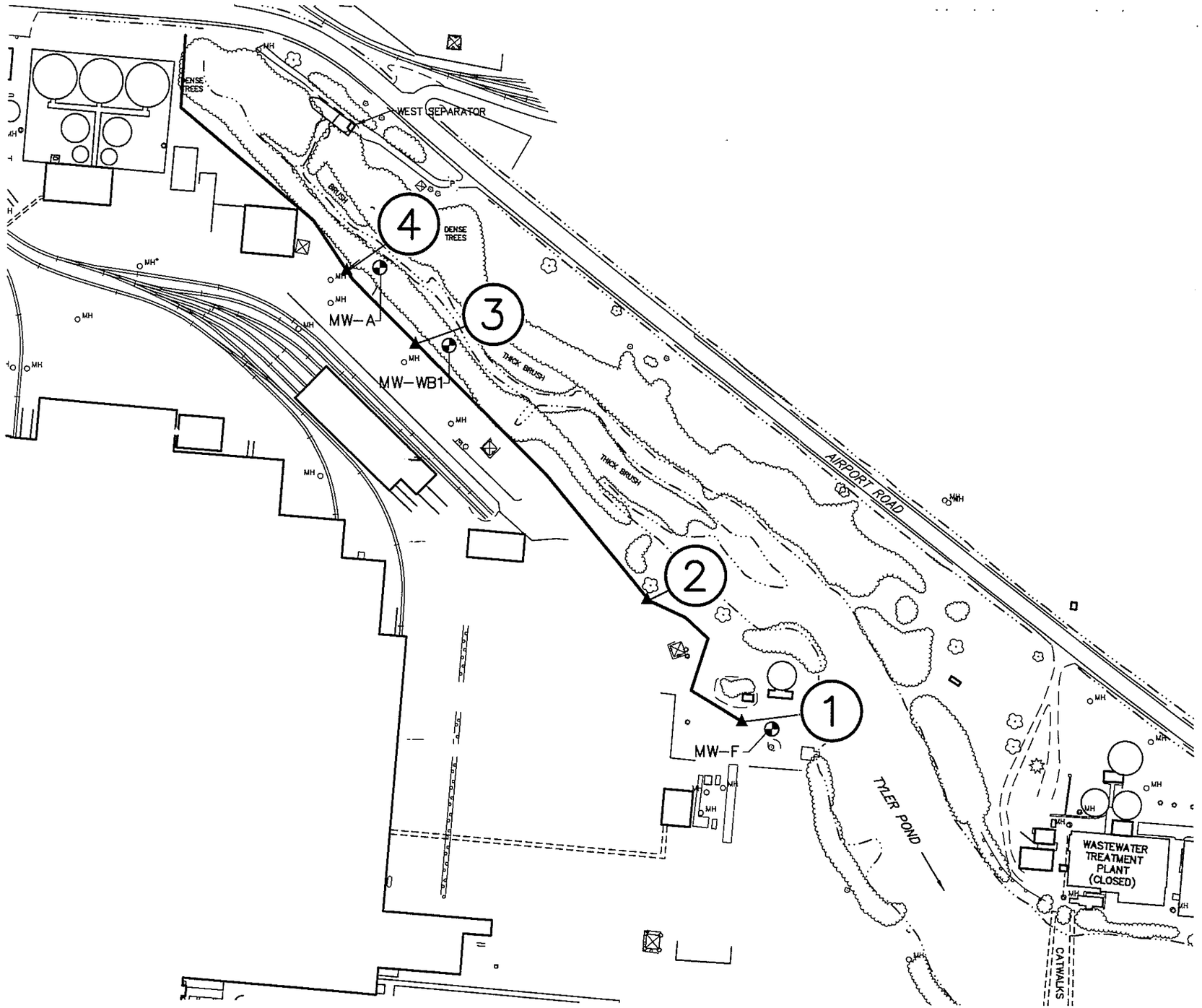
FIGURE 5-15

P: 48075138
8/26/97 BOC-54 MAJ
48075008\48075139.DWG

Location of Former Lagoons



Chevrolet - Willow Run
September - 1959
Figure 5-16
Location of Former Lagoon



LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MH — MANHOLE
- CB — CATCH BASIN
- MONITORING WELL
- (1) STAINED GRAY SOILS COMPOSITE F COLLECTED
- (2) STAINED GRAY SOILS COMPOSITE B COLLECTED
- (3) COMPOSITE 1 AND WOOD BLOCK SAMPLE COLLECTED
- (4) STAINED GRAY SOILS COMPOSITE A COLLECTED
- NEW WATER MAIN INSTALLATION

200 0 200

APPROXIMATE SCALE IN FEET

SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

X: 48027 003
10/7/97 BOC-54
48075008\48075055.DWG

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN
DESCRIPTION OF EXISTING CONDITIONS REPORT

WATER MAIN INSTALLATION SOIL SAMPLE AND MONITORING WELL LOCATIONS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5-17

SB 1-1	DEPTH 4'-6'
ALUMINUM	4240
ARSENIC	BDL
BARIUM	27.5
CADMIUM	1.87
CHROMIUM	24.9
LEAD	7.17
MERCURY	BDL
NICKEL	208
SILVER	BDL
ZINC	77

SB 1-2	DEPTH 0'-2'	DEPTH 14'-16'
ALUMINUM	4370	5640
ARSENIC	2.94	2.91
BARIUM	3.67	25.8
CADMIUM	1.99	2.13
CHROMIUM	7.34	6.95
LEAD	26.2	6.39
MERCURY	BDL	BDL
NICKEL	7.86	6.52
SILVER	BDL	0.56
ZINC	41.6	23.4

SB 1-3	DEPTH 2'-4'	DEPTH 8'-10'
ALUMINUM	4280	3680
ARSENIC	BDL	3.25
BARIUM	68.8	49.3
CADMIUM	2.41	2.24
CHROMIUM	26.2	10.8
LEAD	62.5	41
MERCURY	BDL	BDL
NICKEL	7.95	44.8
SILVER	BDL	BDL
ZINC	57	46.3

SB 1-4	DEPTH 7'-9'	GROUND WATER
ALUMINUM	9580	BDL/310
ARSENIC	BDL	NA/NA
BARIUM	60.8	NA/NA
CADMIUM	4.71	17/7.7
CHROMIUM	13.7	NA/NA
LEAD	8.65	300/280
MERCURY	BDL	NA/NA
NICKEL	22.6	280/7280
SILVER	BDL	NA/NA
ZINC	60.8	NA/NA

SB 7-1	DEPTH 4'-6'	DEPTH 16'-18'	GROUND WATER
ALUMINUM	15980	3330	BDL/24200
ARSENIC	7.92	2.44	NA/NA
BARIUM	58.8	26.3	NA/NA
CADMIUM	6.51	1.35	6.8/26
CHROMIUM	20.2	9.8	BDL/BDL
LEAD	10.09	14.23	6.8/900
MERCURY	BDL	BDL	0.3/0.5
NICKEL	58	18.8	BDL/BDL
SILVER	BDL	BDL	NA/NA
ZINC	81.4	23.3	BDL/BDL

SB 7-2	DEPTH 4'-6'	DEPTH 14'-16'	GROUND WATER
ALUMINUM	5460	5140	BDL/1470
ARSENIC	3.26	3.64	NA/NA
BARIUM	11.6	27.6	NA/NA
CADMIUM	2.17	3.42	39/29
CHROMIUM	9.78	6.95	BDL/BDL
LEAD	10.98	4.97	440/390
MERCURY	NA	NA	0.3/0.3
NICKEL	7.93	5.85	BDL/BDL
SILVER	NA	NA	NA/NA
ZINC	33.5	22.5	BDL/BDL

SB 6-9	DEPTH 8'-10'	GROUND WATER
ALUMINUM	6120	BDL/6610
ARSENIC	2.88	NA/NA
BARIUM	86.2	NA/NA
CADMIUM	8.4	4.4/212
CHROMIUM	26.2	BDL/BDL
LEAD	54.2	120/1590
MERCURY	BDL	BDL/0.4
NICKEL	126	BDL/640
SILVER	BDL	NA/NA
ZINC	200	BDL/350

SB 6-10	DEPTH 8'-10'	GROUND WATER
ALUMINUM	4950	BDL/7120
ARSENIC	BDL	NA/NA
BARIUM	20.4	NA/NA
CADMIUM	1.47	5/21
CHROMIUM	7.55	BDL/BDL
LEAD	2.95	61/110
MERCURY	BDL	BDL/BDL
NICKEL	7.78	BDL/340
SILVER	BDL	NA/NA
ZINC	22.5	BDL/BDL

SB 2-9	DEPTH 5'-6'
ALUMINUM	5380
ARSENIC	2.46
BARIUM	74.6
CADMIUM	5.85
CHROMIUM	18.8
LEAD	545
MERCURY	BDL
NICKEL	9.6
SILVER	BDL
ZINC	580

SB 2-12	DEPTH 5'-7'	GROUND WATER
ALUMINUM	38200	BDL/76300
ARSENIC	BDL	NA/NA
BARIUM	348	NA/NA
CADMIUM	45.6	19/390
CHROMIUM	118	BDL/BDL
LEAD	839	70/1550
MERCURY	BDL	0.2/BDL
NICKEL	64	BDL/560
SILVER	BDL	NA/NA
ZINC	2300	BDL/2020

SB 5-1	DEPTH 8.5'-10.5'
ALUMINUM	NA
ARSENIC	NA
BARIUM	NA
CADMIUM	NA
CHROMIUM	NA
LEAD	3.0
MERCURY	NA
NICKEL	NA
SILVER	NA
ZINC	NA

SB 5-2	DEPTH 1'-3'	GROUND WATER
ALUMINUM	NA	NA/NA
ARSENIC	NA	NA/NA
BARIUM	NA	NA/NA
CADMIUM	NA	NA/NA
CHROMIUM	NA	NA/NA
LEAD	3.34	160/660
MERCURY	NA	NA/NA
NICKEL	NA	NA/NA
SILVER	NA	NA/NA
ZINC	NA	NA/NA

SB 5-3	DEPTH 8'-10'
ALUMINUM	NA
ARSENIC	NA
BARIUM	NA
CADMIUM	NA
CHROMIUM	NA
LEAD	2.39
MERCURY	NA
NICKEL	NA
SILVER	NA
ZINC	NA

SB 6-2	DEPTH 11'-13'
ALUMINUM	1420
ARSENIC	BDL
BARIUM	4.39
CADMIUM	1
CHROMIUM	3.79
LEAD	2.96
MERCURY	BDL
NICKEL	4.39
SILVER	BDL
ZINC	17.3

SB 6-5	DEPTH 4'-5'	GROUND WATER
ALUMINUM	6370	BDL/2520
ARSENIC	2.34	NA/NA
BARIUM	51.8	NA/NA
CADMIUM	3.2	19/17
CHROMIUM	35	BDL/BDL
LEAD	34	2580/1120
MERCURY	BDL	0.3/0.2
NICKEL	62.7	380/390
SILVER	BDL	NA/NA
ZINC	73.5	BDL/BDL

SB 6-7	DEPTH 7'-9'
ALUMINUM	3090
ARSENIC	BDL
BARIUM	24.9
CADMIUM	1.91
CHROMIUM	7.55
LEAD	3.72
MERCURY	BDL
NICKEL	7.12
SILVER	BDL
ZINC	22.9

SB 6-8	DEPTH 12'-14'
ALUMINUM	6280
ARSENIC	BDL
BARIUM	50.9
CADMIUM	3.5
CHROMIUM	9.3
LEAD	7.49
MERCURY	BDL
NICKEL	16.1
SILVER	BDL
ZINC	49.4

SB 2-1	GROUND WATER
ALUMINUM	BDL/5780
ARSENIC	NA/NA
BARIUM	NA/NA
CADMIUM	22/24
CHROMIUM	BDL/BDL
LEAD	880/610
MERCURY	BDL/BDL
NICKEL	BDL/BDL
SILVER	NA/NA
ZINC	BDL/BDL

SB 2-2	DEPTH 9'-11'
ALUMINUM	3110
ARSENIC	BDL
BARIUM	14.5
CADMIUM	1.57
CHROMIUM	8.32
LEAD	5.51
MERCURY	BDL
NICKEL	44.2
SILVER	BDL
ZINC	19.1

SB 2-5	DEPTH 3'-5'
ALUMINUM	1040
ARSENIC	BDL
BARIUM	393
CADMIUM	40.8
CHROMIUM	2.37
LEAD	1500
MERCURY	BDL
NICKEL	21.3
SILVER	BDL
ZINC	1700

SB 2-6	DEPTH 7'-9'
ALUMINUM	5430
ARSENIC	BDL
BARIUM	82.2
CADMIUM	5.73
CHROMIUM	17.3
LEAD	214
MERCURY	BDL
NICKEL	8.15
SILVER	BDL
ZINC	480

SB 2-11	DEPTH 5'-6'
ALUMINUM	4830
ARSENIC	12.4
BARIUM	360
CADMIUM	6.35
CHROMIUM	12
LEAD	10900
MERCURY	BDL
NICKEL	11.3
SILVER	BDL
ZINC	2200

SB 2-10	DEPTH 5'-7'
ALUMINUM	5600
ARSENIC	BDL
BARIUM	391
CADMIUM	32.5
CHROMIUM	111
LEAD	2580
MERCURY	BDL
NICKEL	133
SILVER	BDL
ZINC	580

SB 2-14	DEPTH 5'-7'
ALUMINUM	23200
ARSENIC	6.8
BARIUM	522
CADMIUM	50
CHROMIUM	80.5
LEAD	8440
MERCURY	BDL
NICKEL	77.7
SILVER	BDL
ZINC	2000

SB 2-13	GROUND WATER
ALUMINUM	BDL/7960
ARSENIC	NA/NA
BARIUM	NA/NA
CADMIUM	12/220
CHROMIUM	BDL/BDL
LEAD	140/1880
MERCURY	0.3/0.3
NICKEL	BDL/BDL
SILVER	NA/NA
ZINC	BDL/400

LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MH MANHOLE
- CB CATCH BASIN
- SOIL BORING LOCATION
- TEMPORARY MONITORING WELL/ SOIL BORING LOCATION

RESULTS TABLES

BLUE — INDICATES RESULTS OF GROUND-WATER TESTING (ug/L)

RED — INDICATES RESULTS OF SOIL TESTING (mg/kg)

SB 5-2	DEPTH 1'-3'	GROUND WATER
ALUMINUM	BDL	BDL/BDL
ARSENIC	BDL	NA/NA
BARIUM	BDL	NA/NA
CADMIUM	BDL	BDL/BDL
CHROMIUM	BDL	BDL/BDL
LEAD	3.34	160/660
MERCURY	BDL	BDL/BDL
NICKEL	BDL	BDL/BDL
SILVER	BDL	NA/NA
ZINC	BDL	BDL/BDL

SOIL BORING NUMBER IS INDICATED IN UPPER LEFT CORNER OF DATA TABLE

RESULTS (IN RED) OF SOIL TESTING, AT SPECIFIED DEPTH (eg. 1'-3') FOR INORGANIC COMPOUNDS (INDICATED AT LEFT)

RESULTS (IN BLUE) OF GROUND-WATER TESTING, FOR INORGANIC COMPOUNDS (INDICATED AT LEFT)

ALL BDL — ALL COMPOUNDS TESTED FOR WERE BELOW DETECTION LEVEL

BDL — BELOW METHOD DETECTION LEVEL

140/1880 — RESULT FOR FILTERED/UNFILTERED SAMPLES (RESPECTIVELY)

ug/L — MICROGRAMS PER LITER

mg/kg — MILLIGRAMS PER KILOGRAM

NA — NOT ANALYZED

SOIL BORINGS SHOWN ON MAP WITHOUT DATA WERE NOT ANALYZED

SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP-21.DWG" PROVIDED BY CONESTOGA-ROVERS & ASSOCIATES.

120' 0 120' 240'

APPROXIMATE SCALE: 1" = 120'

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN

DESCRIPTION OF EXISTING CONDITIONS REPORT

LABORATORY RESULTS INORGANIC COMPOUNDS DETECTED PHASE II ESI

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5-4

X: 48027005, 48027003
P: 48027004
4/24/97 BOC-54 APD
48075008/DEC/48075059.DWG



9–11	ND
15–16.5	ND
	POS

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

5–7	20
9–11	ND
	POS

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

9–11	ND
13–14	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

8–10	782
8–10	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

8–10	ND
12–14	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

8–10	ND
10'–12	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

13–15	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

13–17	ND
	POS

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

11–13	ND
	POS

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

11–13	1508.9
	POS

GAS CHROMATOGRAPH
PC3 IMMUNOASSAY

8–12	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

7–12	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

15–17	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

9–11	ND
	POS

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

11–13	ND
	POS

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

A	
B	POS

PCB IMMUNOASSAY

3–5	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

11–13	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

11–13	ND
	ND

GAS CHROMATOGRAPH
PC3 IMMUNOASSAY

8–12	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

7–12	ND
	ND

GAS CHROMATOGRAPH
PCB IMMUNOASSAY

LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MH — MANHOLE
- CB — CATCH BASIN
- SOIL BORING LOCATION
- TEMPORARY MONITORING WELL/ SOIL BORING LOCATION

RESULTS TABLES

LIGHT PURPLE — INDICATES ORGANIC VAPOR RESULTS BY PHOTO–IONIZATION DETECTOR (ppm)

DARK PURPLE — INDICATES ORGANIC VAPOR RESULTS BY FLAME–IONIZATION DETECTOR (ppm)

SCALE FOR PHOTO–IONIZATION DETECTOR RESULTS

BAR CHART SHOWS PID AND FID RESULTS AT DEPTHS SAMPLED. SAMPLE DEPTHS ARE INDICATED AT LEFT

1460.8
20.9
769.0

RESULTS LARGER THAN SCALE

SCALE FOR FLAME–IONIZATION DETECTOR RESULTS

9–11	ND

GAS CHROMATOGRAPH

RESULTS (in ppb)OF GAS–CHROMATOGRAPH FIELD TESTING DEPTHS IN FEET ARE INDICATED AT LEFT

ND	PCB IMMUNOASSAY

RESULTS OF IMMUNOASSAY FIELD TESTING GIVEN AS POSITIVE (POS) OR NEGATIVE (ND)

BDL — BELOW METHOD DETECTION LEVEL

FILT. — RESULT FOR CHARCOAL FILTERED SAMPLES

ppm — PARTS PER MILLION

ND — NOT DETECTED

POS — POSITIVE DETECTION

SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP–21.DWG" PROVIDED BY CONESTOGA–ROVERS & ASSOCIATES.

120' 0 120' 240'

APPROXIMATE SCALE: 1" = 120'

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANNT, YPSILANTI, MICHIGAN

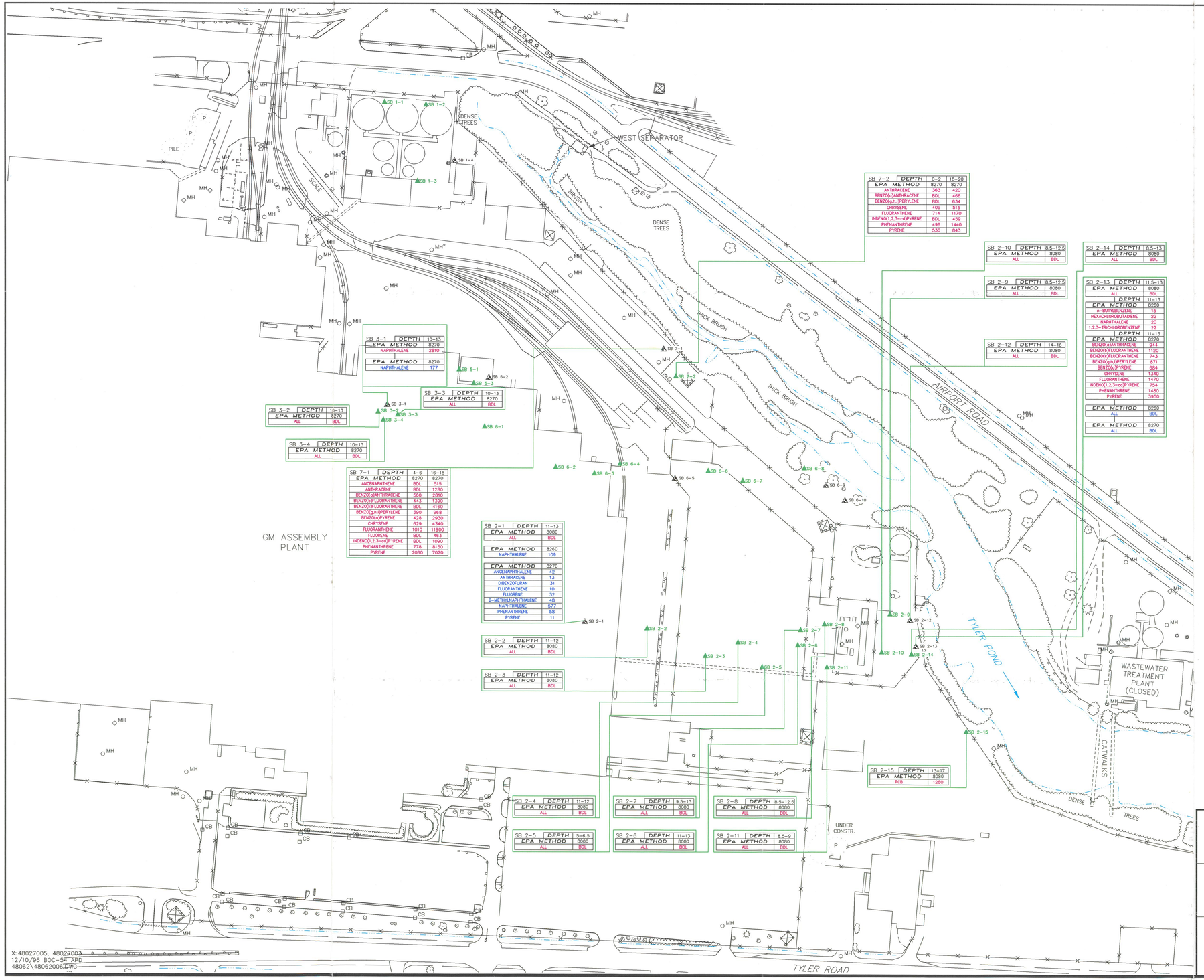
DESCRIPTION OF EXISTING CONDITIONS REPORT

SOIL FIELD SCREENING RESULTS PHASE II ESI

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5-3

X: 48027 005 P: 48027 008
4/24/97 BOC–54 APD
48075008/DEC/48075058.DWG



SB 7-2	DEPTH	0–2	18–20
EPA METHOD		8270	8270
ANTHRACENE		363	420
BENZO(a)ANTHRACENE		BDL	466
BENZO(g,h,i)PERYLENE		BDL	634
CHRYSENE		459	515
FLUORANTHENE		714	1170
INDENO(1,2,3-cd)PYRENE		BDL	459
PHENANTHRENE		496	1440
PYRENE		530	843

SB 2-10	DEPTH	8.5–12.5
EPA METHOD		8080
ALL		BDL

SB 2-9	DEPTH	8.5–12.5
EPA METHOD		8080
ALL		BDL

SB 2-12	DEPTH	14–16
EPA METHOD		8080
ALL		BDL

SB 2-14	DEPTH	8.5–13
EPA METHOD		8080
ALL		BDL

SB 2-13	DEPTH	11.5–13
EPA METHOD		8080
ALL		BDL
DEPTH		11–13
EPA METHOD		8260
n-BUTYLBENZENE		15
HEXACHLOROBUTADIENE		22
NAPHTHALENE		20
1,2,3-TRICHLOROBENZENE		22
DEPTH		11–13
EPA METHOD		8270
BENZO(a)ANTHRACENE		944
BENZO(b)FLUORANTHENE		1120
BENZO(k)FLUORANTHENE		743
BENZO(g,h,i)PERYLENE		871
BENZO(a)PYRENE		684
CHRYSENE		1340
FLUORANTHENE		1470
INDENO(1,2,3-cd)PYRENE		754
PHENANTHRENE		1480
PYRENE		3950
EPA METHOD		8260
ALL		BDL
EPA METHOD		8270
ALL		BDL

SB 3-1	DEPTH	10–13
EPA METHOD		8270
NAPHTHALENE		2810
EPA METHOD		8270
NAPHTHALENE		177

SB 3-3	DEPTH	10–13
EPA METHOD		8270
ALL		BDL

SB 3-2	DEPTH	10–13
EPA METHOD		8270
ALL		BDL

SB 3-4	DEPTH	10–13
EPA METHOD		8270
ALL		BDL

SB 7-1	DEPTH	4–6	16–18
EPA METHOD		8270	8270
ANCENAPHTHENE		BDL	515
ANTHRACENE		BDL	1280
BENZO(a)ANTHRACENE		560	2810
BENZO(b)FLUORANTHENE		443	1390
BENZO(k)FLUORANTHENE		BDL	4160
BENZO(g,h,i)PERYLENE		390	968
BENZO(a)PYRENE		428	2930
CHRYSENE		629	4340
FLUORANTHENE		1010	11900
FLUORENE		BDL	463
INDENO(1,2,3-cd)PYRENE		BDL	1090
PHENANTHRENE		778	8150
PYRENE		2080	7020

SB 2-1	DEPTH	11–13
EPA METHOD		8080
ALL		BDL
EPA METHOD		8260
NAPHTHALENE		109
EPA METHOD		8270
ANCENAPHTHALENE		42
ANTHRACENE		13
DIBENZOFURAN		31
FLUORANTHENE		10
FLUORENE		32
2-METHYLNAPHTHALENE		48
NAPHTHALENE		577
PHENANTHRENE		58
PYRENE		11

SB 2-2	DEPTH	11–12
EPA METHOD		8080
ALL		BDL

SB 2-3	DEPTH	11–12
EPA METHOD		8080
ALL		BDL

SB 2-4	DEPTH	11–12
EPA METHOD		8080
ALL		BDL

SB 2-7	DEPTH	9.5–13
EPA METHOD		8080
ALL		BDL

SB 2-8	DEPTH	8.5–12.5
EPA METHOD		8080
ALL		BDL

SB 2-5	DEPTH	5–6.5
EPA METHOD		8080
ALL		BDL

SB 2-6	DEPTH	11–13
EPA METHOD		8080
ALL		BDL

SB 2-11	DEPTH	8.5–9
EPA METHOD		8080
ALL		BDL

SB 2-15	DEPTH	13–17
EPA METHOD		8080
PCB		1260

LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- GUARDRAIL
- RAILROAD LINE
- MH — MANHOLE
- CB — CATCH BASIN
- SOIL BORING LOCATION
- TEMPORARY MONITORING WELL/ SOIL BORING LOCATION

RESULTS TABLES

BLUE — INDICATES RESULTS OF GROUND–WATER TESTING (ug/L)

RED — INDICATES RESULTS OF SOIL TESTING (ug/kg)

SB 2-13	DEPTH	11.5–13
EPA METHOD		8080
ALL		BDL
DEPTH		11–13
EPA METHOD		8260
n-BUTYLBENZENE		15
EPA METHOD		8270
ALL		BDL

SOIL BORING NUMBER IS INDICATED IN UPPER LEFT CORNER OF DATA TABLE

RESULTS (IN RED) OF SOIL TESTING, AT SPECIFIED DEPTH USING SPECIFIED EPA METHOD (eg. 11–13 & 8260)

RESULTS (IN BLUE) OF GROUND–WATER TESTING, AT SPECIFIED DE USING SPECIFIED EPA METHOD (eg. 11–13 & 8270)

CHEMICAL COMPOUNDS ONLY NOTED WHEN DETECTED AT ANY DEP (OTHER COMPOUNDS TESTED FOR, BUT RESULTS WERE BDL)

ALL BDL — ALL COMPOUNDS TESTED FOR WERE BELOW DETECTION LEVEL

BDL — BELOW METHOD DETECTION LEVEL

ug/L — MICROGRAMS PER LITER

ug/kg — MICROGRAMS PER KILOGRAM

SOURCE: BASE MAP BY ADVANCED MAPPING TECHNOLOGIES, PORT HURON, MICHIGAN AERIAL PHOTOGRAPHY DATED NOVEMBER 10, 1994. "MAP–21.DWG" PROVIDED BY CONESTOGA–ROVERS & ASSOCIATES.

120' 0 120' 240'

APPROXIMATE SCALE: 1" = 120'

X: 48027005, 48027003
12/10/96 BOC-SA APD
48062\48062006.DWG

GENERAL MOTORS CORPORATION
WILLOW RUN ASSEMBLY PLANT, YPSILANTI, MICHIGAN

DESCRIPTION OF EXISTING CONDITIONS

LABORATORY RESULTS ORGANIC COMPOUNDS DETECTED PHASE II ESI

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE 5-5

TABLE 5-1

SAMPLING AND ANALYSIS PLAN
from
PHASE II ENVIRONMENTAL SITE INVESTIGATION

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

PAOC	LOCATION	CHEMICALS OF CONCERN (1)	FIELD SCREENING METHODS	SAMPLING RATIONALE AND LOCATIONS (2)	LABORATORY ANALYSES SOILS	LABORATORY ANALYSES GROUNDWATER (GW)
1. Former Waste Water Treatment Plant Lagoon	East of Water Treatment Building	Metals (1)	XRF Visual Observations	160x270' area, 100' grid = 5 locations Six 2-foot comp/loc = 30 soil samples for screening.	3 hot/3 low for lab analysis or 10% if screening is BDL to be analyzed by EPA Methods, 6010, 7131, 7421, 7471 and 7841. = 6 soil samples	One GW sample will be collected if XRF hot and one XRF BDL sample will be analyzed by EPA Methods 6010, 200.7, 213.2, 220.2, 245.1. = 1 GW samples (metals = 2 for filt/unfilt).
2. Former South Culvert Area	East and Southeast of Assembly Plant	VOCs Metals (1) PCBs	OVA - All Samples Field GC - One hot OVA per boring XRF - All Soil Samples Immunoassay - One per boring Visual observations	300x1200' area, 100x300' grid = 15 locations, three in hot AHI Report Six 2-foot comp/loc = 90 soil samples for screening.	4 hot/4 low for lab analysis or 10% if screening is BDL 6010, 7131,7421,7471,7841 = 8 metals analyses One 8260, 8270 if Field GC hot = 1 analysis One 8080 per location, selected based on visual observations = 15 soil samples	3 GW samples to be collected from geoprobes, two located near GSI and one in Hot AHI report. If Field GC hot - one 8260, 8270 analyses Metals(1), field filtered and unfiltered = 6 samples Analyzed by EPA Methods 6010, 200.7, 213.2, 220.2 and 245.1. 8080 = 3 samples
3. North Hydraulic Elevator Pit	Near Column C-16	SVOCs	OVA Visual observations	40x40' area, 10' grid = 4 locations Six 2-foot comp/loc = 24 soil samples for screening	4 soil samples, one per boring - analyzed for EPA Method 8270. = 4 soil samples	One GW sample to be collected and analyzed by EPA Method 8270 to be located based on hot OVA and visual observations of stained soil or free product. = one GW sample.
4. Leaking UST Pipe System of Former Tank Farm	Assembly building, R&D site and North Tank Farm	VOCs SVOCs	OVA - all soil samples Immunoassay - one per boring based on hot OVA Visual observations	30x90' area, 40' grid = 4 locations Six 2-foot comp/loc = 24 soil samples for screening.	2 hot/2 low for lab analysis or 10% if screening is BDL to be analyzed by EPA Methods 8260 and 8270. = 4 soil samples	One GW sample to be analyzed by EPA Methods 8260 and 8270 to be located based on hot OVA and visual observations.
5. ELPO Tank Building Area	North side of Assembly Building	Lead (Pb)	XRF - All soil samples Visual observations	100x100' area, 50' grid = 4 locations Six 2-foot comp/loc = 24 soil samples for screening.	2 hot/2 low for lab analysis or 10% if screening is BDL to be analyzed by EPA Method 7421. = 4 soil samples	One GW samples to collected from hot XRF or visual to be analyzed by EPA Method 220.2 (metals = 2 for filt/unfilt)
6. Former Aeration Basin	East and Northeast of Assembly Plant	VOCs SVOCs, PCBs Metals (1) Total cyanides	OVA- all soil samples Field GC - two per loc. Immunoassay - one location XRF - all soil samples Visual observations	300x900' area, 300x100' grid = 9 locations Six 2-foot comp/loc = 54 soil samples for screening.	3 hot/3 low for lab analysis or 10% if screening is BDL 8260, 8270, 6010, 7131, 7421, 7471, 7841, 8080, and 9010 = 6 soil samples	3 GW samples, two to be collected from GSI areas and one to be collected from hot AHI report area. GW samples to be analyzed by EPA Methods 8260, 8270, 200.7, 213.2, 220.2 and 245.1, 8080 and 9010. (metals = 6 for filt/unfilt)
7. Kaiser/Frazer Cinder Storage Area	Northeast of the Former Incinerator	Metals (1) PNAs	XRF- all soil samples Imunnoassay - two samples per location Visual observations	100x200' area, 100' grid = 2 locations Six 2-foot comp/loc = 12 soil samples for screening.	2 hot/2 low for lab analysis or 10% if screening is BDL to be analyzed by EPA Methods, 8270 B/N, 6010, 7131, 7421, 7471 and 7841. = 4 soil samples	GW samples to be collected only if field screening results are posilive. Samples to be analyzed by EPA Methods 8270 B/N, 200.7, 213.2, 220.2 and 245.1, (metals filt/unfilt)

1) metals, soils = As, Ba, Cd, Cr, Hg, Pb, Se, Ag, Ni and Zn.
   metals, groundwater = Al, Cd, Cr, Pb, Hg, Ni, and Zn.
2) In the event that potential free product near the water table is observed, a permanent monitoring well will be installed to determine the presence of free product.

BDL - below detection limit
VOC = volatile organic compounds
PNA = polynuclear aromatic hydrocarbons
PCB = polychlorinated biphenyls

SVOC = Semi-volatile organic compounds
AHI = Atwell-Hicks, Inc.

XRF = x-ray fluorescence analyzer
GC = gas chromatograph
OVA = organic vapor analyzer

3LE 5-2

Sampling and Analysis Summary

from

Supplemental Phase II ESI and Phase III EOC Study Work Plan, Willow Run Assembly Plant, Ypsilanti, Michigan

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

PAOC	Location	Contaminants of Concern	Field Screening Methods	Sample Locations	Soil Analyses	Groundwater Analyses
#1 Waste Water Treatment Plant Lagoon	East of Water Treatment Building	Lead, cadmium, nickel	None	Install permanent monitoring well in location of temporary well SB 1-4. Sample on three consecutive days.	None	6 samples (3 filtered,3 unfiltered): 6010 (Cd, Ni), 7421 (Pb) QA/QC[1]
#2 Former South Culvert	East of southern portion of the building	Lead (groundwater and soil), cadmium, mercury (groundwater)	None	15 soil borings interior to former culvert area, based on 100-foot grid; six soil borings exterior to culvert. Collect samples at 2-foot intervals to the water table for laboratory analysis. Install two permanent monitoring wells near Tyler Pond. Sample on three consecutive days.	147 samples: 7241(Pb) 30 QA/QC (8 equipment blanks, 22 duplicates)	12 samples (3 filtered, 3 unfiltered): 7131 (Cd), 7421 (Pb), 7470 (Hg) QA/QC[1]
#3 North Elevator Pit	Northeastern portion of the building	LNAPL, PAH, 10 Michigan metals	TVA-1000 Visual Observation	4 soil borings 10 feet NW, SE, NE, and SW of existing plume well; install monitoring well in NE, SE, and SW locations if plume limit reached. Screen soil with TVA-1000 and select hottest sample from each boring for laboratory analysis.	4 samples for 8270 (PAH); QA/QC[1]	3 samples: 8270 (PAH); QA/QC[1]
#6 Former Aeration Basin	East-northeast of assembly plant	Lead, nickel, cadmium, mercury	None	Install permanent monitoring well in location of temporary well SB 6-5. Sample on three consecutive days.	None	6 samples (3 filtered,3 unfiltered): 6010 (Ni), 7421 (Pb), 7470 (Hg), 7131 (Cd) QA/QC[1]
#7 Kaiser-Frazer Cinder Storage Area	Northeast of former incinerator	Lead, cadmium, mercury	None	Install permanent monitoring well in location of temporary well SB 7-2. Sample on three consecutive days.	None	6 samples (3 filtered,3 unfiltered): 7131 (Cd), 7421 (Pb), 7470 (Hg) QA/QC[1]
#16 South Elevator Pit	Southwest portion of building	LNAPL, PAH, 10 Michigan metals	TVA-1000, visual observation	4 soil borings 10 feet NW, SE, NE, and SW of existing plume well; install monitoring well in hottest location. Screen soil with TVA-1000 and select hottest sample from each boring for laboratory analysis.	4 samples for 8270 (PAH) 2 QA/QC samples (1 equipment blank, 1duplicate)	1 sample: 8270 (PAH), 6010 (Ba, Cr, Cu, and Zn), 7421 (Pb), 7470 (Hg), 7060 (As), 7131 (Cd), 7741 (Se), 7761 (Ag), 3 QA/QC samples (1 equipment blank, 1filtered and 1 unfiltered duplicate)
Background Wells	Various	Cadmium, lead, mercury, nickel	TVA-1000	5 monitoring wells installed at locations up-gradient from PAOCs or SWMUs	None	10 samples (5 filtered, 5 unfiltered): 6010 (Cd, Ni), 7421 (Pb), 7470 (Hg) QA/QC[1]

[1] - QA/QC samples determined on a site-wide basis at a rate of 15% duplicates and 5% equipment blanks

TABLE 5-3

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 1 - FORMER WASTE WATER TREATMENT LAGOON
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification						USGS Background Concentration Mean	Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-1-1 4-6'	SB-1-2 0-2'	SB-1-2 14-16'	SB-1-3 2-4'	SB-1-3 8-10'	SB-1-4 7-9'				
6010	Aluminum	2000	ug/kg	4.2E+06	4.4E+06	5.6E+06	4.3E+06	3.7E+06	9.6E+06	5.7E+07	ID	ID	ID
6010	Arsenic	2000	ug/kg	BDL	2,940	2,910	BDL	3,250	BDL	7,400	1.0E+05	ID	5.4E+05
6010	Barium	2000	ug/kg	27,500	3,670	25,800	68,800	49,300	60,800	4.2E+05	3.2E+08	ID	1.7E+08
6010	Chromium	2000	ug/kg	24,900	7,340	6,950	26,200	10,800	13,700		1.0E+09	ID	1.9E+05
6010	Nickel	2000	ug/kg	2.1E+05	7,860	8,520	7,950	44,800	22,600	18,000	3.4E+08	ID	9.6E+06
6010	Zinc	2000	ug/kg	27,000	41,600	23,400	57,000	46,300	60,800	52,000	1.0E+09	ID	ID
7131	Cadmium	50	ug/kg	1,870	1,990	2,130	2,410	2,240	4,710		2.3E+06	ID	1.3E+06
7421	Lead	1000	ug/kg	7,170	26,200	6,390	62,500	41,000	8,650	17,000	4.0E+05	ID	5.2E+07
7841	Silver	500	ug/kg	BDL	BDL	560	BDL	BDL	BDL		2.1E+07	ID	3.5E+06

Notes:
ug/kg - micrograms per kilogram
ID - inadequate data to develop criterion
BDL - below detection level
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97+"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-4

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 1 - FORMER WASTE WATER TREATMENT LAGOON
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected		Detection Level	Units	Sample Identification GW-1-4	Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
200.7	Aluminum-filtered	**	200	ug/L	BDL	NS	NA
200.7	Aluminum-unfiltered		200	ug/L	310	NS	7.0E+07
200.7	Nickel-filtered	**	200	ug/L	280	57	NA
200.7	Nickel-unfiltered		200	ug/L	2280	57	1.6E+08
213.2	Cadmium-filtered	**	0.5	ug/L	17	0.64	NA
213.2	Cadmium-unfiltered		0.5	ug/L	7.7 *	0.64	1.1E+05
220.2	Lead-filtered	**	5	ug/L	300	6.6	NA
220.2	Lead-unfiltered		5	ug/L	280 *	6.6	ID

Notes:
ug/L - micrograms per liter
BDL - below detection level
NS - no standards developed
NA - Not applicable
ID - insufficient data to develop criterion
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality
* Data Validation of the metals analyses indicated that the results are within the method specified limits.
** - Samples were field-filtered using a 0.45 micron filter

TABLE 5-5

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 1 - FORMER WASTE WATER TREATMENT LAGOON
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Date	Filter Size (microns)	Cadmium		Lead		Nickel	
			Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)
MW-1-5-1	04/14	1.0	0.00011	<0.000050	**0.012**	<0.0050	<0.040	<0.040
MW-1-5-2	04/15	1.0	0.000054	<0.000050	0.0063	<0.0050	<0.040	<0.040
MW-1-5-3	04/16	1.0	<0.000050	<0.000050	**0.0099**	<0.0050	<0.040	<0.040
MW-1-5-1	09/18	10	NA	NA	<0.0050	<0.0050	NA	NA
MW-1-5-2	09/19	10	NA	NA	<0.0050	<0.0050	NA	NA
MW-1-5-3	09/20	10	NA	NA	<0.0050	<0.0050	NA	NA
MDEQ GCC Values			110,000		ID		1.6E+08	
MDEQ GSI Values			0.00064		0.0066		0.057	

Notes:
mg/L - milligrams per liter NA - Not analyzed
ID - insufficient data to develop criterion
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memo
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality
Bold values indicate concentrations above their respective GSI value.

TABLE 5-6

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification						Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-2-1-11-13	SB-2-2-11-12	SB-2-3A-4-5	SB-2-4-11-12	SB-2-5-5-6.5	SB-2-6-11-13			
8080	PCB 1260	330	ug/kg	BDL	BDL	BDL	BDL	BDL	BDL	21000	ID	ID
8270	Benzo(a)anthracene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+05	ID	ID
8270	Benzo(b)fluoranthene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+05	ID	ID
8270	Benzo(k)fluoranthene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+06	ID	ID
8270	Benzo(g,h,I)perylene	330	ug/kg	NA	NA	NA	NA	NA	NA	1.6E+07	ID	4.1E+08
8270	Benzo(a)pyrene	330	ug/kg	NA	NA	NA	NA	NA	NA	21000	1.2E+06	1.1E+06
8260	n-Butylbenzene	10	ug/kg	NA	NA	NA	NA	NA	NA	NS	NS	NS
8270	Chrysene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+07	ID	ID
8270	Fluoranthene	330	ug/kg	NA	NA	NA	NA	NA	NA	5.4E+08	1.3E+09	4.8E+09
8260	Hexachlorobutadiene	10	ug/kg	NA	NA	NA	NA	NA	NA	1.9E+06	3.2E+05	1E+08
8270	Indeno(1,2,3-cd)pyrene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+05	ID	ID
8260	Naphthalene	10	ug/kg	NA	NA	NA	NA	NA	NA	1.6E+08	2.3E+07	4.8E+09
8270	Phenanthrene	330	ug/kg	NA	NA	NA	NA	NA	NA	1.6E+07	ID	6.9E+07
8270	Pyrene	330	ug/kg	NA	NA	NA	NA	NA	NA	3.4E+08	1.1E+09	3.5E+09
8260	1,2,3-Trichlorobenzene	10	ug/kg	NA	NA	NA	NA	NA	NA	NS	NS	NS

Notes:
ug/kg - micrograms per kilogram
BDL - below detection limit
ID - Inadequate data to develop criterion
NA - not analyzed
NS - no standards developed
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-6

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification						Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-2-7-9.5-13	SB-2-8-8.5-12.5	SB-2-9-8.5-12.5	SB-2-10-8.5-12.5	SB-2-11-8.5-9	SB-2-12-14-16.5			
8080	PCB 1260	330	ug/kg	BDL	BDL	BDL	BDL	BDL	BDL	21000	ID	ID
8270	Benzo(a)anthracene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+05	ID	ID
8270	Benzo(b)fluoranthene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+05	ID	ID
8270	Benzo(k)fluoranthene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+06	ID	ID
8270	Benzo(g,h,I)perylene	330	ug/kg	NA	NA	NA	NA	NA	NA	1.6E+07	ID	4.1E+08
8270	Benzo(a)pyrene	330	ug/kg	NA	NA	NA	NA	NA	NA	21000	1.2E+06	1.1E+06
8260	n-Butylbenzene	10	ug/kg	NA	NA	NA	NA	NA	NA	NS	NS	NS
8270	Chrysene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+07	ID	ID
8270	Fluoranthene	330	ug/kg	NA	NA	NA	NA	NA	NA	5.4E+08	1.3E+09	4.8E+09
8260	Hexachlorobutadiene	10	ug/kg	NA	NA	NA	NA	NA	NA	1.9E+06	3.2E+05	1.0E+08
8270	Indeno(1,2,3-cd)pyrene	330	ug/kg	NA	NA	NA	NA	NA	NA	2.1E+05	ID	ID
8260	Naphthalene	10	ug/kg	NA	NA	NA	NA	NA	NA	1.6E+08	2.3E+07	4.8E+09
8270	Phenanthrene	330	ug/kg	NA	NA	NA	NA	NA	NA	1.6E+07	ID	6.9E+07
8270	Pyrene	330	ug/kg	NA	NA	NA	NA	NA	NA	3.4E+08	1.1E+09	3.5E+09
8260	1,2,3-Trichlorobenzene	10	ug/kg	NA	NA	NA	NA	NA	NA	NS	NS	NS

Notes:
ug/kg - micrograms per kilogram
BDL - below detection limit
ID - Inadequate data to develop criterion
NA - not analyzed
NS - no standards developed
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-6

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification				Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-2-13-11-13	SB-2-13-11.5-12.5	SB-2-14-8.5-12.5	SB-2-15-13-17			
8080	PCB 1260	330	ug/kg	NA	BDL	BDL	1840	21000	ID	ID
8270	Benzo(a)anthracene	330	ug/kg	944	NA	NA	NA	2.1E+05	ID	ID
8270	Benzo(b)fluoranthene	330	ug/kg	1120	NA	NA	NA	2.1E+05	ID	ID
8270	Benzo(k)fluoranthene	330	ug/kg	743	NA	NA	NA	2.1E+06	ID	ID
8270	Benzo(g,h,I)perylene	330	ug/kg	871	NA	NA	NA	1.6E+07	ID	4.1E+08
8270	Benzo(a)pyrene	330	ug/kg	684	NA	NA	NA	21000	1.2E+06	1.1E+06
8260	n-Butylbenzene	10	ug/kg	15	NA	NA	NA	NS	NS	NS
8270	Chrysene	330	ug/kg	1340	NA	NA	NA	2.1E+07	ID	ID
8270	Fluoranthene	330	ug/kg	1470	NA	NA	NA	5.4E+08	1.3E+09	4.8E+09
8260	Hexachlorobutadiene	10	ug/kg	22	NA	NA	NA	1.9E+06	3.2E+05	1.0E+08
8270	Indeno(1,2,3-cd)pyrene	330	ug/kg	754	NA	NA	NA	2.1E+05	ID	ID
8260	Naphthalene	10	ug/kg	20	NA	NA	NA	1.6E+08	2.3E+07	4.8E+09
8270	Phenanthrene	330	ug/kg	1480	NA	NA	NA	1.6E+07	ID	6.9E+07
8270	Pyrene	330	ug/kg	3950	NA	NA	NA	3.4E+08	1.1E+09	3.5E+09
8260	1,2,3-Trichlorobenzene	10	ug/kg	22	NA	NA	NA	NS	NS	NS

Notes:
ug/kg - micrograms per kilogram
BDL - below detection limit
ID - Inadequate data to develop criterion
NA - not analyzed
NS - no standards developed
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-7

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification								Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-2-2 9-11'	SB-2-5 3-5'	SB-2-6 7-9'	SB-2-9 3-5'	SB-2-10 5-7'	SB-2-11 3-5'	SB-2-12 5-7'	SB-2-14 5-7'			
6010	Aluminum	2000	ug/kg	3.11E+06	1.04E+06	5.43E+06	5.38E+06	5.60E+06	4.83E+06	3.82E+07	2.32E+07	ID	ID	ID
6010	Arsenic	2000	ug/kg	BDL	BDL	BDL	2,460	BDL	12,400	BDL	6,800	1.0E+05	ID	5.4E+05
6010	Barium	2000	ug/kg	14,500	3.93E+05	82,200	74,800	3.91E+05	3.60E+05	3.48E+05	5.22E+05	3.2E+08	ID	1.7E+08
6010	Chromium	2000	ug/kg	8,320	2,370	17,300	18,800	1.11E+05	12,000	1.18E+05	80,300	1.0E+09	ID	1.9E+05
6010	Nickel	2000	ug/kg	44,200	21,300	8,150	9,600	1.33E+05	11,300	64,000	77,700	3.4E+08	ID	9.6E+06
6010	Zinc	2000	ug/kg	19,100	1.70E+06	4.80E+05	5.80E+05	5.80E+05	2.20E+06	2.30E+06	2.00E+06	1.0E+09	ID	ID
7131	Cadmium	50	ug/kg	1,570	40,800	5,730	5,850	32,500	6,350	45,600	50,000	2.3E+06	ID	1.3E+06
7421	Lead	1000	ug/kg	5,510	**1.50E+06**	2.14E+05	**5.45E+05**	**2.58E+06**	**1.09E+07**	**8.39E+05**	**6.44E+06**	4.0E+05	ID	5.2E+07

Notes:
ug/kg - micrograms per kilogram
BDL - below detection limit
ID - inadequate data to develop criterion
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-8

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification			Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
				GW-2-1	GW-2-12	GW-2-13		
200.7	Aluminum-filtered	200	ug/L	BDL	BDL	BDL	NS	NA
200.7	Aluminum-unfiltered	200	ug/L	5780	16300	1960	NS	7.0E+07
200.7	Nickel-filtered	200	ug/L	BDL	BDL	BDL	57	NA
200.7	Nickel-unfiltered	200	ug/L	BDL	560	BDL	57	1.6E+08
200.7	Zinc-filtered	200	ug/L	BDL	BDL	BDL	81	NA
200.7	Zinc-unfiltered	200	ug/L	BDL	2020	400	81	1.2 E+08
213.2	Cadmium-filtered	0.5	ug/L	22	19	12	0.64	NA
213.2	Cadmium-unfiltered	0.5	ug/L	24	390	220	0.64	1.1E+05
220.2	Lead-filtered	5	ug/L	880	70	140	6.6	NA
220.2	Lead-unfiltered	5	ug/L	610 *	1550	1880	6.6	ID
245.1	Mercury-filtered	0.2	ug/L	BDL	0.2	0.3	0.0013	NA
245.1	Mercury-unfiltered	0.2	ug/L	BDL	BDL	0.3	0.0013	56

Notes:
ug/L - micrograms per liter
BDL - below detection limit
ID - Inadequate data to develop criterion
NA - Not applicable
NS - no standards developed
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)"
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality
* Data Validation of the metals analyses indicated that the results are within the method specified limits.

TABLE 5-9

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 2 - FORMER SOUTH CULVERT
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Date	Filter Size (microns	Cadmium		Lead		Mercury	
			Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)
MW-2-12-A	04/14	1.0	0.00016	0.00036	<0.0050	<0.0050	<0.00020	<0.00020
MW-2-12-A	04/15	1.0	0.00014	0.00023	<0.0050	<0.0050	<0.00020	<0.00020
MW-2-12-A	04/16	1.0	<0.000050	0.00016	<0.0050	<0.0050	<0.00020	<0.00020
MW-2-13-A	04/14	1.0	**0.15**	0.00014	**0.49**	<0.0050	<0.00020	<0.00020
MW-2-13-A	04/15	1.0	**0.064**	0.00015	**0.37**	<0.0050	<0.00020	<0.00020
MW-2-13-A	04/16	1.0	**0.15**	0.000084	**0.61**	<0.0050	<0.00020	<0.00020
MW-2-13-A	09/18	10	**0.0059**	**0.00079****	**0.028**	**0.018**	NA	NA
MW-2-13-A	09/19	10	**0.0021**	0.00057	**0.007**	<0.0050	NA	NA
MW-2-13-A	09/20	10	**0.0021**	**0.00066****	**0.007**	<0.0050	NA	NA
MDEQ GCC Values			~~110,000~~ 190		ID		56*	
MDEQ GSI Values			0.00064		0.0066		0.057	

Notes:
mg/L - milligrams per liter
ID - Insufficient data
NA - Not Analyzed
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorand
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
* - Solubility (GCC criterion is greater than solubility in water)
** - Value was reported below method detection limit (MDL) of 0.0010, which did not meet OM #6 target MDLs.
Laboratory analysts were able to quantify concentrations to this accuracy after reviewing chromatograms.
Bold values indicate concentrations above their respective GSI value.

TABLE 5-10

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE III EOCI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification (depth')	Units	Lead Concentration	Generic Industrial Cleanup DCV*	PSIC
SB-2-5A (1-3')	mg/kg	***5,000***	400	52,000
SB-2-5A (3-5')	mg/kg	***8,800***	400	52,000
SB-2-5A (5-7')	mg/kg	***40,000***	400	52,000
SB-2-5A (7-9')	mg/kg	***510***	400	52,000
SB-2-5A (9-11')	mg/kg	***1,200***	400	52,000
SB-2-6A (1-3')	mg/kg	28	400	52,000
SB-2-6A (3-5')	mg/kg	34	400	52,000
SB-2-6A (5-7')	mg/kg	***2,300***	400	52,000
SB-2-9A (1-3')	mg/kg	260	400	52,000
SB-2-9A (3-5')	mg/kg	320	400	52,000
SB-2-9A (5-7')	mg/kg	74	400	52,000
SB-2-9A (7-9')	mg/kg	6	400	52,000

Notes:
PSIC - Particulate soil inhalation criteria mg/kg - milligrams per kilogram
Bold values exceed DCV; Bold Italic values also exceed PSIC.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC) for lead.
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", MDEQ Environmental Response Division, 12/12/96
Generic industrial cleanup criteria are from MDEQ Operational Memorandum #14,Revision
* - Criterion developed using the USEPA Integrated Uptake Biokinetic Model for Children. No risk assessment method is currently available for adults.
MDEQ = Michigan Department of Environmental Quality

TABLE 5-10

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE III EOCI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification (depth')	Units	Lead Concentration	Generic Industrial Cleanup DCV*	PSIC
SB-2-10A (1-3')	mg/kg	***710***	400	52,000
SB-2-10A (3-5')	mg/kg	***910***	400	52,000
SB-2-10A (5-7')	mg/kg	***890***	400	52,000
SB-2-10A (7-9')	mg/kg	400	400	52,000
SB-2-11 (1-3')	mg/kg	***1,300***	400	52,000
SB-2-11 (3-5')	mg/kg	***21,000***	400	52,000
SB-2-11 (5-7')	mg/kg	180	400	52,000
SB-2-12A (1-3')	mg/kg	***640***	400	52,000
SB-2-12A (3-5')	mg/kg	***1,400***	400	52,000
SB-2-12A (5-7')	mg/kg	7	400	52,000
SB-2-12A (7-9')	mg/kg	7	400	52,000

Notes:
PSIC - Particulate soil inhalation criteria mg/kg - milligrams per kilogram
Bold values exceed DCV; Bold Italic values also exceed PSIC.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC) for lead.
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", MDEQ Environmental Response Division, 12/12/96
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TABLE 5-10

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE III EOCI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification (depth')	Units	Lead Concentration	Generic Industrial Cleanup DCV*	PSIC
SB-2-14 (1-3')	mg/kg	55	400	52,000
SB-2-14 (3-5')	mg/kg	***9,200***	400	52,000
SB-2-14 (5-7')	mg/kg	***12,000***	400	52,000
SB-2-14 (7-9')	mg/kg	***18,000***	400	52,000
SB-2-16 (1-3')	mg/kg	***1,200***	400	52,000
SB-2-16 (3-5')	mg/kg	***6,800***	400	52,000
SB-2-16 (5-7')	mg/kg	***2,700***	400	52,000
SB-2-16 (7-9')	mg/kg	***4,200***	400	52,000
SB-2-17 (1-3')	mg/kg	18	400	52,000
SB-2-17 (3-5')	mg/kg	5	400	52,000
SB-2-17 (5-7')	mg/kg	4	400	52,000
SB-2-17 (7-9')	mg/kg	5	400	52,000

Notes:
PSIC - Particulate soil inhalation criteria mg/kg - milligrams per kilogram
Bold values exceed DCV; Bold Italic values also exceed PSIC.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC) for lead.
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", MDEQ Environmental Response Division, 12/12/96
Generic industrial cleanup criteria are from MDEQ Operational Memorandum #14,Revision
* - Criterion developed using the USEPA Integrated Uptake Biokinetic Model for Children. No risk assessment method is currently available for adults.
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TABLE 5-10

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE III EOCI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification (depth')	Units	Lead Concentration	Generic Industrial Cleanup DCV*	PSIC
SB-2-18 (1-3')	mg/kg	3	400	52,000
SB-2-18 (3-5')	mg/kg	5	400	52,000
SB-2-18 (5-7')	mg/kg	2	400	52,000
SB-2-18 (7-9')	mg/kg	2	400	52,000
SB-2-19 (1-3')	mg/kg	9	400	52,000
SB-2-19 (3-5')	mg/kg	9	400	52,000
SB-2-19 (5-7')	mg/kg	7	400	52,000
SB-2-20 (1-3')	mg/kg	22	400	52,000
SB-2-20 (3-5')	mg/kg	13	400	52,000
SB-2-20 (5-7')	mg/kg	6	400	52,000
SB-2-20 (7-9')	mg/kg	4	400	52,000

Notes:
PSIC - Particulate soil inhalation criteria mg/kg - milligrams per kilogram
Bold values exceed DCV; Bold Italic values also exceed PSIC.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC) for lead.
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", MDEQ Environmental Response Division, 12/12/96
Generic industrial cleanup criteria are from MDEQ Operational Memorandum #14,Revision
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TABLE 5-10

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE III EOCI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification (depth')	Units	Lead Concentration	Generic Industrial Cleanup DCV*	PSIC
SB-2-21 (1-3')	mg/kg	120	400	52,000
SB-2-21 (3-5')	mg/kg	330	400	52,000
SB-2-21 (5-7')	mg/kg	25	400	52,000
SB-2-21 (7-9')	mg/kg	32	400	52,000
SB-2-21 (9-11')	mg/kg	24	400	52,000
SB-2-22 (1-3')	mg/kg	***410***	400	52,000
SB-2-22 (3-5')	mg/kg	***1,900***	400	52,000
SB-2-22 (5-7')	mg/kg	***1,000***	400	52,000
SB-2-22 (7-9')	mg/kg	***1,600***	400	52,000
SB-2-22 (9-11')	mg/kg	***690***	400	52,000
SB-2-23 (1-3')	mg/kg	***1,400***	400	52,000
SB-2-23 (3-5')	mg/kg	***11,000***	400	52,000

Notes:
PSIC - Particulate soil inhalation criteria mg/kg - milligrams per kilogram
Bold values exceed DCV; Bold Italic values also exceed PSIC.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC) for lead.
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", MDEQ Environmental Response Division, 12/12/96
Generic industrial cleanup criteria are from MDEQ Operational Memorandum #14,Revision
* - Criterion developed using the USEPA Integrated Uptake Biokinetic Model for Children. No risk assessment method is currently available for adults.
MDEQ = Michigan Department of Environmental Quality

Notes:
mg/kg - milligrams per kilogram
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-10

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE III EOCI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification (depth')	Units	Lead Concentration	Generic Industrial Cleanup DCV*	PSIC
SB-2-24 (1-3')	mg/kg	***920***	400	52,000
SB-2-24 (3-5')	mg/kg	***720***	400	52,000
SB-2-24 (5-7')	mg/kg	24	400	52,000
SB-2-24 (7-9')	mg/kg	21	400	52,000
SB-2-24 (9-11')	mg/kg	4	400	52,000
SB-2-25 (1-3')	mg/kg	***580***	400	52,000
SB-2-25 (3-5')	mg/kg	***7,600***	400	52,000
SB-2-25 (5-7')	mg/kg	***890***	400	52,000
SB-2-25 (7-9')	mg/kg	***1,100***	400	52,000
SB-2-25 (9-11')	mg/kg	***410***	400	52,000
SB-2-26 (1-3')	mg/kg	***1,200***	400	52,000
SB-2-26 (3-5')	mg/kg	***730***	400	52,000
SB-2-26 (5-7')	mg/kg	140	400	52,000
SB-2-26 (7-9')	mg/kg	120	400	52,000

Notes:
PSIC - Particulate soil inhalation criteria mg/kg - milligrams per kilogram
Bold values exceed DCV; Bold Italic values also exceed PSIC.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC) for lead.
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", MDEQ Environmental Response Division, 12/12/96
Generic industrial cleanup criteria are from MDEQ Operational Memorandum #14,Revision
* - Criterion developed using the USEPA Integrated Uptake Biokinetic Model for Children. No risk assessment method is currently available for adults.
MDEQ = Michigan Department of Environmental Quality

TABLE 5-10

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - FORMER SOUTH CULVERT AREA
(PHASE III EOCI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification (depth')	Units	Lead Concentration	Generic Industrial Cleanup DCV*	PSIC
SB-2-27 (1-3')	mg/kg	58	400	52,000
SB-2-27 (3-5')	mg/kg	33	400	52,000
SB-2-27 (5-7')	mg/kg	240	400	52,000
SB-2-27 (7-9')	mg/kg	75	400	52,000
SB-2-27 (9-11')	mg/kg	370	400	52,000
SB-2-27 (11-13)	mg/kg	***1,200***	400	52,000
SB-2-28 (1-3')	mg/kg	54	400	52,000
SB-2-28 (3-5')	mg/kg	7	400	52,000
SB-2-28 (5-7')	mg/kg	5	400	52,000
SB-2-28 (7-9')	mg/kg	6	400	52,000
SB-2-29 (1-3')	mg/kg	7	400	52,000
SB-2-29 (3-5')	mg/kg	14	400	52,000
SB-2-29 (5-7')	mg/kg	4	400	52,000
SB-2-29 (7-9')	mg/kg	5	400	52,000

Notes:
PSIC - Particulate soil inhalation criteria mg/kg - milligrams per kilogram
Bold values exceed DCV; Bold Italic values also exceed PSIC.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC) for lead.
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", MDEQ Environmental Response Division, 12/12/96
Generic industrial cleanup criteria are from MDEQ Operational Memorandum #14,Revision
* - Criterion developed using the USEPA Integrated Uptake Biokinetic Model for Children. No risk assessment method is currently available for adults.
MDEQ = Michigan Department of Environmental Quality

TABLE 5-11

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - SOUTH CULVERT AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-2-29	0-2'	09/16	7421	1,400
	2'-4'		7421	2,300
	4'-6'		7421	96,000
	6'-8'		7421	11,000
	8'-10'		7421	31,000
SB-2-30	0-2'	09/16	7421	13
	2'-4'		7421	220
	4'-6'		7421	**940**
	6'-8'		7421	**1,800**
	8'-10'		7421	120
SB-2-31	2"-8"	12/16	7421	5
	8"-2.2'		7421	**740**
	2.2'-4.2'		7421	77
	4.2'-6.2'		7421	8
	6.2'-8.2'		7421	5
	8.2'-10.2'		7421	5
SB-2-32	2"-8"	12/16	7421	**450**
	8"-2.2'		7421	110
	2.2'-4.2'		7421	4
	4.2'-6.2'		7421	3
	6.2'-8.2'		7421	4
	8.2'-10'		7421	6

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.
Bold values exceed DCV.

TABLE 5-11

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 2 - SOUTH CULVERT AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-2-33	2"-8"	12/16	7421	140
	8"-2.2'		7421	160
	2.2'-4.2'		7421	58
	4.2'-6.2'		7421	29
	6.2'-8.2'		7421	70
	8.2'-10'		7421	30
SB-2-34	2"-8"	12/16	7421	6
	8"-2.2'		7421	93
	2.2'-4.2'		7421	5
	4.2'-6.2'		7421	7
	6.2'-8.2'		7421	4
	8.2'-10'		7421	5

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-12

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
PAOC 2 - SOUTH CULVERT AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification		Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-35 (8.2'-10.2')	SB-2-31 (2.2'-4.2')			
cis-1,2-Dichloroethylene	ug/kg	1,200	24,000	8.20E+06	1.0 E+06*	2.7E+11
Trichloroethylene	ug/kg	53,000	17,000	1.60E+06	1.9E+05	1.4E+09
Toluene	ug/kg	1,100	<500	1.60E+08	6.2 E+05*	1.4E+10
Chlorobenzene	ug/kg	<500	3,300	1.40E+07	1.3E+06	2.4E+09
Ethylbenzene	ug/kg	3,800	<500	7.20E+07	3.8 E+05*	3.5E+10
Xylenes	ug/kg	15,000	<500	1.00E+09	4.0 E+05*	1.5E+11

Notes:
ug/kg - micrograms per kilogram
Samples analyzed by EPA Method 8240. Samples collected in December 1996.
* - VSIC exceeds Csat; Csat is used.
Csat - Soil saturation screening concentrations, from "Generic Soil Saturation Screening Concentrations", 1/17/97
DCV - Direct Contact Values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-13

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 3 - NORTH HYDRAULIC ELEVATOR PIT
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification				Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-3-1-10-13	SB-3-2-10-13	SB-3-3-10-13	SB-3-4-10-13			
8270	Naphthalene	330	ug/kg	2810	BDL	BDL	BDL	1.6E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
BDL - Below detection limit
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-14

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 3 - NORTH HYDRAULIC ELEVATOR PIT
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification GW-3-1	Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
8270	Naphthalene	10	ug/L	177	34	31,000

Notes:
ug/L - micrograms per liter
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operation
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-15

SUMMARY OF LABORATORY ANALYTICAL DATA
SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 3 - NORTH HYDRAULIC ELEVATOR PIT
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification				Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-3-5 (8-10')	SB-3-6 (8-10')	SB-3-7 (10-12')	SB-3-8 (10-12')			
Anthracene	ug/kg	640	<330	<330	<330	1.0E+09	2.3E+09	3.5E+10
Benzo(a)anthracene	ug/kg	830	<330	<330	<330	2.1E+05	ID	ID
Benzo(a)pyrene	ug/kg	660	<330	<330	<330	2.1E+04	1.2E+06	1.1E+06
Benzo(b)fluoranthene	ug/kg	1000	<330	<330	<330	2.1E+05	ID	ID
Benzo(g,h,I)perylene	ug/kg	540	<330	<330	<330	1.6E+07	ID	4.1E+08
Benzo(k)fluoranthene	ug/kg	350	<330	<330	<330	2.1E+06	ID	ID
Chrysene	ug/kg	790	<330	<330	<330	2.1E+07	ID	ID
Fluoranthene	ug/kg	2.2E+03	<330	<330	<330	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	340	<330	<330	<330	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd)pyrene	ug/kg	450	<330	<330	<330	2.1E+05	ID	ID
1-Methylnaphthalene	ug/kg	<330	<330	2600	2200	ID	NA	NA
2-Methylnaphthalene	ug/kg	<330	<330	2500	2200	ID	ID	ID
Naphthalene	ug/kg	<330	<330	2200	7300	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	2000	<330	<330	<330	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	2700	<330	<330	<330	3.4E+08	1.1E+09	3.5E+09

Notes
ug/kg - micrograms per kilogram
ID - insufficient data to determine criterion
NA - not applicable
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
Samples collected April 1996

TABLE 5-16

SUMMARY OF LABORATORY ANALYTICAL DATA
SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 3 - NORTH HYDRAULIC ELEVATOR PIT
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification			Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
		MW-3-6	MW-3-7	MW-3-8		
2-Methylnaphthalene	ug/l	<10	<10	12	34{B}	24,600*
Naphthalene	ug/l	**100**	<5.0	**260**	34	31,000*

Notes:
ug/l - micrograms per liter
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality
{B} - Chemical has either not been evaluated or an inadequate database precludes the developmen
* - Calculated GCC exceeds solubility, therefore solubility is used as the criterion.
Samples collected April 1996

TABLE 5-17

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 5 - ELPO TANK BUILDING AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification			Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-5-1-8.5-10.5	SB-5-2-1-3	SB-5-3-8-10			
7421	Lead	1	mg/kg	3	3.34	2.39	400	ID	52,000

Notes:

mg/kg - milligrams per kilogram
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-18

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 5 - ELPO TANK BUILDING AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification GW-5-2	Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
220.2	Lead-unfiltered	5	ug/L	660	6.6	ID
220.2	Lead-filtered*	5	ug/L	660	6.6	NA

Notes:
* - 0.45-micron filter
ug/L - micrograms per liter
ID - Inadequate data to develop criteria
NA - Not applicable
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-19

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 6 - FORMER AERATION BASIN
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification								Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-6-2 11-13'	SB-6-4 15-16.5'	SB-6-5 4-5'	SB-6-7 7-9'	SB-6-8 12-14'	SB-6-9 8-10'	SB-6-9 15-16.5'	SB-6-10 8-10'			
6010	Aluminum	2000	ug/kg	1.42E+06	NA	6.37E+06	3.09E+06	6.28E+06	6.12E+06	NA	4.95E+06	ID	ID	ID
6010	Arsenic	2000	ug/kg	BDL	NA	2,340	BDL	BDL	2,880	NA	BDL	1.0E+05	ID	5.4E+05
6010	Barium	2000	ug/kg	4,390	NA	51,800	24,900	50,900	86,200	NA	20,400	3.2E+08	ID	1.7E+08
6010	Chromium *	2000	ug/kg	3,790	NA	35,000	7,550	9,300	26,200	NA	7,550	2.2E+07	ID	1.9E+05
6010	Nickel	2000	ug/kg	4,390	NA	62,700	7,120	16,100	1.26E+05	NA	7,780	3.4E+08	ID	9.6E+06
6010	Zinc	2000	ug/kg	17,300	NA	73,500	22,900	49,400	2.00E+05	NA	22,500	1.0E+09	ID	ID
7131	Cadmium	50	ug/kg	1,000	NA	3,200	1,910	3,500	8,400	NA	1,470	2.3E+06	ID	1.3E+06
7421	Lead	1000	ug/kg	2,960	NA	34,000	3,720	7,490	54,200	NA	2,950	4.0E+05	ID	5.2E+07

Notes:
ug/kg - milligrams per kilogram
BDL - below detection limit
ID - inadequate data to develop criterion
NA - not analyzed
* Value reported is for Chromium (VI).
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-20

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 6 - FORMER AERATION BASIN
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification						Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-6-2-11-13	SB-6-5-4-5	SB-6-7-7-9	SB-6-8-12-14	SB-6-9-8-10	SB-6-10-8-10			
9010	Cyanide	200	ug/kg	BDL	BDL	BDL	314	BDL	BDL	9.9E+07	ID	1.7E+09
8260	None	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	NA	NA	NA
8270	None	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	NA	NA	NA
8080	None	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	NA	NA	NA

Notes:
BDL - below detection limit
ug/kg - micrograms per kilogram
NA - not available
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-21

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 6 - FORMER AERATION BASIN
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification			Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
				GW-6-5	GW-6-9	GW-6-10		
200.7	Aluminum-filtered	200	ug/L	BDL	BDL	BDL	NS	NA
200.7	Aluminum-unfiltered	200	ug/L	2520	6610	1120	NS	7.0E+07
200.7	Nickel-filtered	200	ug/L	380	BDL	BDL	57	NA
200.7	Nickel-unfiltered	200	ug/L	390	640	340	57	1.6E+08
200.7	Zinc-filtered	200	ug/L	BDL	BDL	BDL	81	NA
200.7	Zinc-unfiltered	200	ug/L	BDL	350	BDL	81	1.2 E +08
213.2	Cadmium-filtered	0.5	ug/L	19 *	4.4	5	0.64	NA
213.2	Cadmium-unfiltered	0.5	ug/L	17	212	21	0.64	110000
220.2	Lead-filtered	5	ug/L	2580 *	120	61	6.6	NA
220.2	Lead-unfiltered	5	ug/L	1120	1590	110	6.6	ID
245.1	Mercury-filtered	0.2	ug/L	0.3	BDL	BDL	0.0013	NA
245.1	Mercury-unfiltered	0.2	ug/L	0.2	0.4	BDL	0.0013	56

Notes:
ug/L - micrograms per liter
BDL - below detection limit
ID - Inadequate data to develop criteria
NA - Not applicable
NS - no standards developed
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality
* Data Validation of the metals analyses indicated that the results are within the method specified limits.

TABLE 5-22

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 6 - FORMER AERATION BASIN
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification		Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
				GW-6-9	GW-6-10		
9010	Cyanide	50	ug/L	BDL	BDL	5.2	650000
8260	1,2,3-Trichlorobenzene	1	ug/L	3	BDL	NS	NS
8260	1,2,4-Trichlorobenzene	1	ug/L	3	BDL	22	16000
8270	None	NA	NA	BDL	BDL	NA	NA
8080	None	NA	NA	BDL	BDL	NA	NA

Notes:
ug/L - micrograms per liter
BDL - below detection limit
NA - not available
NS - no standards developed
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revisio
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-23

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 6 - FORMER AERATION BASIN
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Date	Filter Size (microns)	Cadmium		Lead		Mercury		Nickel	
			Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)
MW-6-5A-1	04/14	1.0	<0.000050	<0.000050	**0.013**	<0.0050	**0.00024**	<0.00020	0.040	<0.040
MW-6-5A-2	04/15	1.0	0.00017	0.00018	**0.0079**	**0.0076**	<0.00020	<0.00020	<0.040	<0.040
MW-6-5A-3	04/16	1.0	<0.000050	<0.000050	<0.0050	<0.0050	<0.00020	<0.00020	<0.040	<0.040
MW-6-5A-1	09/18	10	NA	NA	<0.0050	<0.0050	NA	NA	NA	NA
MW-6-5A-2	09/19	10	NA	NA	<0.0050	<0.0050	NA	NA	NA	NA
MW-6-5A-3	09/20	10	NA	NA	<0.0050	<0.0050	NA	NA	NA	NA
Generic Industrial/Commercial GCC			110,000		ID		56 *		1.6E+08	
Generic Industrial/Commercial GSI			0.00064		0.0066		1.3E-06		0.057	

Notes:
mg/L - milligrams per liter NA - Not analyzed
ID - Insufficient data
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)"
GCC - Groundwater Contact Criteria and solubility values from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality
* - Solubility (GCC criterion is greater than solubility in water)
Bold values indicate concentrations above their respective GSI value.

TABLE 5-24

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 7 - KAISER-FRAZER CINDER STORAGE AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification						Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-7-1-4-6	SB-7-1-16-18	SB-7-2-0-2	SB-7-2-4-6	SB-7-2-14-16	SB-7-2-18-20			
6010	Aluminum	2000	ug/kg	1.60E+07	3.33E+06	NA	5.46E+06	5.14E+06	NA	ID	ID	ID
6010	Arsenic	2000	ug/kg	7,920	2,440	NA	3,260	ID	NA	100,000	ID	5.4E+05
6010	Barium	2000	ug/kg	58,800	26,300	NA	11,600	27,600	NA	3.2E+08	ID	1.7E+08
6010	Chromium *	2500	ug/kg	20,200	9,800	NA	9,780	6,950	NA	2.2E+07	ID	1.9E+05
6010	Nickel	2000	ug/kg	38,000	18,800	NA	7,930	5,850	NA	3.4E+08	ID	9.6E+06
6010	Zinc	2000	ug/kg	81,400	23,300	NA	33,500	22,500	NA	1.0E+09	ID	ID
7131	Cadmium	50	ug/kg	6,510	1,380	NA	2,170	3,420	NA	2.3E+06	ID	1.3E+06
7421	Lead	1000	ug/kg	10,090	14,230	NA	10,980	4,970	NA	4.0E+05	ID	5.2E+07

Notes:
ug/kg - micrograms per kilogram
ID - inadequate data to develop criterion
NA - Not analyzed
* Value reported is for Chromium (VI).
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-25

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 7 - KAISER-FRAZER CINDER STORAGE AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification						Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
				SB-7-1-4-6	SB-7-1-16-18	SB-7-2-0-2	SB-7-2-4-6	SB-7-2-14-16	SB-7-2-18-20			
8270	Acenaphthene	330	ug/kg	BDL	515	BDL	NA	NA	BDL	8.1E+08	1.4E+08	7.3E+09
8270	Anthracene	330	ug/kg	BDL	1280	BDL	NA	NA	420,	1E+08	2.3E+09	3.5E+10
8270	Benzo(a)anthracene	330	ug/kg	560	2810	363	NA	NA	466	2.1E+05	ID	ID
8270	Benzo(b)fluoranthene	330	ug/kg	443	1390	BDL	NA	NA	BDL	2.1E+05	ID	ID
8270	Benzo(k)fluoranthene	330	ug/kg	BDL	4160	BDL	NA	NA	BDL	2.1E+06	ID	ID
8270	Benzo(g,h,i)perylene	330	ug/kg	390	968	BDL	NA	NA	634	1.6E+07	ID	4.1E+08
8270	Benzo(a)pyrene	330	ug/kg	428	2930	BDL	NA	NA	BDL	21000	1.2E+06	1.1E+06
8270	Chrysene	330	ug/kg	629	4340	409	NA	NA	515	2.1E+07	ID	ID
8270	Fluoranthene	330	ug/kg	1010	11900	714	NA	NA	1170	5.4E+08	1.3E+09	4.8E+09
8270	Fluorene	330	ug/kg	BDL	463	BDL	NA	NA	BDL	5.4E+08	2.1E+08	4.8E+09
8270	Indeno(1,2,3-cd)pyrene	330	ug/kg	BDL	1090	BDL	NA	NA	459	2.1E+05	ID	ID
8270	Phenanthrene	330	ug/kg	778	8150	496	NA	NA	1440	1.6E+07	ID	6.9E+07
8270	Pyrene	330	ug/kg	2060	7020	530	NA	NA	843	3.4E+08	1.1E+09	3.5E+09

Notes:

ug/kg - micrograms per kilogram
BDL - below detection limit
NA - not applicable
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-26

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 7 - KAISER-FRAZER CINDER STORAGE AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification		Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
				GW-7-1	GW-7-2		
200.7	Aluminum-filtered	200	ug/L	BDL	BDL	NS	NA
200.7	Aluminum-unfiltered	200	ug/L	24200	1470	NS	7.0E+07
213.2	Cadmuim-filtered	0.5	ug/L	6.8	39 *	0.64	NA
213.2	Cadmium-unfiltered	0.5	ug/L	26	29	0.64	1.1E+05
220.2	Lead-filtered	5	ug/L	6.8	440 *	6.6	NA
220.2	Lead-unfiltered	5	ug/L	900	390	6.6	ID
245.1	Mercury-filtered	0.2	ug/L	0.3	0.3	0.0013	NA
245.1	Mercury-unfiltered	0.2	ug/L	0.5	0.3	0.0013	56

Notes:
ug/L - micrograms per liter
BDL - below detection limit
NS - no standards developed
* Data Validation of the metals analyses indicated that the results are within the method specified limits.
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revisio
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-27

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 7 - KAISER-FRAZER CINDER STORAGE AREA
(PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification		Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
				GW-7-1	GW-7-2		
8270	None	NA	ug/L	BDL	BDL	NA	NA

Notes:
ug/L - micrograms per liter
BDL - below detection limit
NA - not applicable
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revisio
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-28

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 7 - KAISER-FRAZER CINDER STORAGE AREA
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Date	Filter Size (microns)	Cadmium		Lead		Mercury	
			Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)
MW-7-3-1	04/14	1.0	0.00016	<0.000050	**0.027**	<0.0050	<0.00020	<0.00020
MW-7-3-2	04/15	1.0	0.00018	<0.000050	**0.0073**	<0.0050	<0.00020	<0.00020
MW-7-3-3	04/16	1.0	0.00021	<0.000050	**0.084**	<0.0050	<0.00020	<0.00020
MW-7-3-1	09/18	10	NA	NA	<0.0050	<0.0050	NA	NA
MW-7-3-2	09/19	10	NA	NA	<0.0050	<0.0050	NA	NA
MW-7-3-3	09/20	10	NA	NA	<0.0050	<0.0050	NA	NA
Generic Industrial/Commercial GCC			110000		ID		56 *	
Generic Industrial/Commercial GSI			0.00064		0.0066		0.057	

Notes:
mg/L - milligrams per liter
ID - Insufficient data
NA - Not analyzed
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandu
GCC - Groundwater Contact Criteria and solubility values from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality
* - Solubility (GCC criterion is greater than solubility in water)
Bold values indicate concentrations above their respective GSI value.

TABLE 5-29

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 16 - SOUTH HYDRAULIC ELEVATOR PIT
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification				Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-16-1 (8-10')	SB-16-2 (8-10')	SB-16-3 (8-10')	SB-16-4 (8-10')			
Anthracene	ug/kg	<330	<330	<330	<330	1.0E+09	2.30E+09	3.5E+10
Benzo(a)anthracene	ug/kg	<330	<330	<330	<330	2.1E+05	ID	ID
Benzo(a)pyrene	ug/kg	<330	<330	<330	<330	21,000	1.20E+06	1.10E+06
Benzo(b)fluoranthene	ug/kg	<330	<330	<330	<330	2.1E+05	ID	ID
Benzo(g,h,I)perylene	ug/kg	<330	<330	<330	<330	1.6E+07	ID	4.10E+08
Benzo(k)fluoranthene	ug/kg	<330	<330	<330	<330	2.1E+06	ID	ID
Chrysene	ug/kg	<330	<330	<330	<330	2.1E+07	ID	ID
Fluoranthene	ug/kg	<330	<330	<330	<330	5.4E+08	1.30E+09	4.80E+09
Fluorene	ug/kg	<330	<330	<330	<330	5.4E+08	2.10E+08	4.80E+09
Indeno (1,2,3-cd)pyrene	ug/kg	<330	<330	<330	<330	2.1E+05	ID	ID
1-Methylnaphthalene	ug/kg	<330	<330	<330	<330	NA	NA	NA
2-Methylnaphthalene	ug/kg	<330	<330	<330	<330	1.6E+08	2.30E+07	4.80E+09
Naphthalene	ug/kg	<330	<330	<330	<330	1.6E+08	2.30E+07	4.80E+09
Phenanthrene	ug/kg	<330	<330	<330	340	1.6E+07	ID	6.90E+07
Pyrene	ug/kg	<330	<330	<330	<330	3.4E+08	1.10E+09	3.50E+09

Notes:
ug/kg - micrograms per kilogram
ID - Insufficient data
NA - Not available
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-30

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 16 - SOUTH HYDRAULIC ELEVATOR PIT
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected		Unit	EPA Method	Sample Identification				Generic Industrial/ Commercial GSI	Generic Industrial/ Commercial GCC
				MW-16-1 04/14	MW-16-1 09/18	MW-16-1 09/19	MW-16-1 09/20		
				1-micron filter	10-micron filter				
Arsenic	Total	mg/L	7060	<0.010	NA	NA	NA	0.050	4.70E+03
	Dissolved	mg/L		<0.010	NA	NA	NA		
Barium	Total	mg/L	6010	0.680	0.630	0.650	0.660	0.630	1.50E+07
	Dissolved	mg/L		0.590	0.680	0.670	0.630		
Cadmium	Total	mg/L	7131	0.00007	NA	NA	NA	0.00064	1.10E+05
	Dissolved	mg/L		<0.000050	NA	NA	NA		
Chromium	Total	mg/L	6010	0.028	NA	NA	NA	0.077	3.20E+08
	Dissolved	mg/L		<0.010	NA	NA	NA		
Copper	Total	mg/L	6010	<0.025	NA	NA	NA	0.018	8.10E+06
	Dissolved	mg/L		<0.025	NA	NA	NA		
Lead	Total	mg/L	7421	0.2300	<0.0050	<0.0050	<0.0050	0.0066	ID
	Dissolved	mg/L		<0.00050	<0.0050	<0.0050	<0.0050		
Mercury	Total	mg/L	7470	0.00024	<0.00020	<0.00020	0.0002	1.3E-06	56*
	Dissolved	mg/L		0.00021	<0.00020	<0.00020	<0.00020		
Selenium	Total	mg/L	7741	<0.0080	NA	NA	NA	0.0005	1.10E+06
	Dissolved	mg/L		<0.0080	NA	NA	NA		
Silver	Total	mg/L	7761	<0.000050	NA	NA	NA	0.0001	1.70E+06
	Dissolved	mg/L		<0.000050	NA	NA	NA		
Zinc	Total	mg/L	6010	0.098	<0.020	<0.020	<0.020	0.081	1.20E+08
	Dissolved	mg/L		0.027	<0.020	<0.020	<0.020		

Notes:
mg/L - milligrams per liter
Samples collected in April 1996
NA - not analyzed
ID - insufficient data
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memor
GCC - Groundwater Contact Criteria and solubility values from MDEQ "Generic Groundwater Contact Criteria, 01/17//97
MDEQ - Michigan Department of Environmental Quality
* - Solubility (GCC criterion is greater than solubility in water)

TABLE 5-31

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 16 - SOUTH HYDRAULIC ELEVATOR PIT
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification MW-16-1	Generic Industrial/ Commercial GCC	Generic Industrial/ Commercial GSI	Solubility
Anthracene	ug/L	29	>Sol	1.10E+05	4.3E+01
Benzo(a)anthracene	ug/L	**40**	4	0.31	9
Benzo(a)pyrene	ug/L	**29**	0.24	0.31	2
Benzo(b)fluoranthene	ug/L	**51**	>Sol	0.31	2
Benzo(g,h,i)perylene	ug/L	18	ID	ID	NA
Benzo(k)fluoranthene	ug/L	**18**	>Sol	0.31	1
Bis (2-Ethylhexyl) phthalate	ug/L	24	46	59	340
Chrysene	ug/L	**36**	>Sol	0.31	2
Dibenzo (a,h) anthracene	ug/L	**6.4**	0.11	0.31	2
Dibenzofuran	ug/L	10	ID	ID	NA
Fluoranthene	ug/L	84	>Sol	370	206
Fluorene	ug/L	10	>Sol	1.40E+04	2.0E+03
Indeno (1,2,3-cd)pyrene	ug/L	**16**	1.1	0.31	NA
Phenanthrene	ug/L	100	>Sol	ID	1,000
Pyrene	ug/L	110	>Sol	1.10E+04	135

Notes:
ug/L - micrograms per liter
ID - Insufficient data
NA - Not available
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)"
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
Bold values exceed above GCC and GSI Criteria.

TABLE 5-32

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN SOIL

PAOC 17 - PIT 117
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-1 (1 - 3')	SB-2 (1 - 3')	SB-3 (1 - 3')	SB-6 (3 - 5')	SB-8 (1 - 3')	SB-8 (3 - 5')			
Acenaphthene	ug/kg	<330	560	400	<330	<330	<330	8.1E+08	1.4E+08	7.3E+09
Anthracene	ug/kg	<330	1100	<330	<330	<330	<330	1.0E+09	2.3E+09	3.5E+10
Benzo(a)anthracene	ug/kg	<330	940	<330	<330	<330	<330	2.1E+05	ID	ID
Benzo(a)pyrene	ug/kg	<330	780	<330	<330	<330	<330	2.1E+04	1.2E+06	1.1E+06
Benzo(b)fluoranthene	ug/kg	460	990	<330	<330	<330	<330	2.1E+05	ID	ID
Benzo(g,h,i)perylene	ug/kg	<330	620	<330	<330	<330	<330	1.6E+07	ID	4.1E+08
Benzo(k)fluoranthene	ug/kg	360	<330	<330	<330	<330	<330	2.1E+06	ID	ID
Chrysene	ug/kg	380	1100	<330	<330	<330	<330	2.1E+07	ID	ID
Dibenzofuran	ug/kg	<330	540	350	<330	<330	<330	ID	ID	ID
Fluoranthene	ug/kg	1300	2600	610	<330	<330	<330	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	980	530	<330	<330	<330	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd)pyrene	ug/kg	<330	500	<330	<330	<330	<330	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	350	1300	<330	<330	<330	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	670	2800	860	<330	<330	<330	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	640	2600	650	<330	<330	<330	3.4E+08	1.1E+09	3.5E+09
Methylene Chloride	ug/kg	<5.0	<5.0	30	<5.0	<5.0	<5.0	3.3E+06	5.1E+05	4.9E+09
Trichloroethylene	ug/kg	<5.0	<5.0	<5.0	19	<5.0	<5.0	1.6E+05	1.9E+05	1.4E+09
1,1,1-Trichlorethane	ug/kg	<5.0	<5.0	<5.0	<5.0	9.7	35	3.1E+06	1.3E+08	6.6E+11
Tetrachloroethene	ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	6.7	5.0E+04	4.4E+05	4.0E+09

Notes:
ug/kg - micrograms per kilogram
ID - insufficient data
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-33

SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER

PAOC 17 - PIT 117
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification					Generic Industrial/ Commercial GCC	Generic Industrial/ Commercial GSI
		TW-3	TW-6	TW-7	TW-8	TW-9		
1,1-Dichloroethane	ug/L	<1.0	<1.0	1.6	5.1	3.2	2.10E+06	ID
Naphthalene	ug/L	1.6	<1.0	<1.0	<1.0	<1.0	31,000 *	34
Trichloroethene	ug/L	<1.0	4.9	<1.0	<1.0	<1.0	11,000	94
1,1,1-Trichloroethane	ug/L	<1.0	<1.0	3.8	2.7	<1.0	3.80E+05	120

Notes:
ug/L - micrograms per liter
ID - Insufficient data to establish criterion
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memoran
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
* - Solubility value (GCC criterion is greater than solubility in water)

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-1	0-6"	12/09/96	7421	**870**
	6"-2'		7421	**2,900**
	2'-4'		7421	**820**
	4'-6'		7421	**1,800**
	6'-8'		7421	4
	8'-10'		7421	**3,000**
	10'-12'		7421	300
	12'-13'		7421	**810**
SB-18-2	0-6"	12/10/96	7421	**5,300**
	6"-2'		7421	**7,300**
	2'-4'		7421	**670**
	4'-6'		7421	**1,400**
SB-18-3	0-6"	12/12/96	7421	190
	6"-2'		7421	**680**
	2'-4'		7421	**2,200**
	4'-6'		7421	240
	6'-8'		7421	**450**
	8'-10'		7421	**1,600**
	10'-11'		7421	**3,200**
SB-18-4	0-6"	12/11/96	7421	65
	6"-2'		7421	**2,000**
	2'-4'		7421	**1,800**
	4'-6'		7421	**2,000**
	6'-8'		7421	**1,700**
	8'-10'		7421	**710**
	10'-11'		7421	79

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-5	2"-8"	12/12/96	7421	97
	8"-2.2'		7421	**710**
	2.2'-4.2'		7421	**8,100**
	4.2'-6.2'		7421	**2,300**
	6.2'-8.2'		7421	140
	8.2'-10.2'		7421	16
SB-18-6	0-6"	12/10/96	7421	**560**
	6"-2'		7421	**980**
	2'-4'		7421	**27,000**
	4'-6'		7421	**1,300**
SB-18-7	0-6"	12/12/96	7421	**1,800**
	6"-2'		7421	**1,100**
	2'-4'		7421	**680**
	4'-6'		7421	**3,000**
	6'-8'		7421	**8,500**
	8'-10'		7421	**500**
SB-18-8	2"-8"	12/09/96	7421	11
	8"-2.2'		7421	**720**
	2.2'-4.2'		7421	120
	4.2'-6.2		7421	3
	6.2'-8.2'		7421	6
	8.2'-10.2'		7421	3
	10.2'-12.2'		7421	3
SB-18-9	0-6"	12/10/96	7421	**9,200**
	6"-2'		7421	**2,900**
	2'-4'		7421	***170,000***
	4'-6'		7421	**460**

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-19-10	0-6"	12/10/96	7421	**2,000**
	6"-2'		7421	**800**
	2'-4'		7421	**1,400**
	4'-6'		7421	**52,000**
	6'-8'		7421	170
	8'-10'		7421	**2,200**
SB-18-11	0-6"	12/12/96	7421	**4,500**
	6"-2'		7421	**4,900**
	2'-4'		7421	**1,500**
	4'-6'		7421	**1,700**
	6'-8'		7421	**3,100**
	8'-10'		7421	8
	10'-11'		7421	2
SB-18-12	2"-8"	12/09/96	7421	23
	8"-2.2'		7421	56
	2.2'-4.2'		7421	230
	4.2'-6.2		7421	9
	6.2'-8.2'		7421	4
	8.2'-10.2'		7421	5
	10.2'-11.5'		7421	2
SB-18-13	2"-8"	12/09/96	7421	43
	8"-2.2'		7421	12
	2.2'-4.2'		7421	4
	4.2'-6.2		7421	4
	6.2'-8.2'		7421	4
	8.2'-10.2'		7421	3
	10.2'-11.5'		7421	3

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-14	0-6"	12/12/96	7421	**3,300**
	6"-2'		7421	**10,000**
	2'-4'		7421	**1,200**
	4'-6'		7421	**1,200**
	6'-8'		7421	**480**
	8'-10'		7421	**670**
SB-18-15	0-6"	12/10/96	7421	**6,100**
	6"-2'		7421	**2,100**
	2'-4'		7421	**3,500**
	4'-6'		7421	**5,200**
	6'-8'		7421	**2,300**
	8'-10'		7421	**1,200**
SB-18-16	0-6"	12/11/96	7421	**1,100**
	6"-2'		7421	**1,500**
	2'-4'		7421	140
	4'-5.5'		7421	**1,400**
SB-18-17	0-6"	12/11/96	7421	86
	6"-2'		7421	12
	2'-3'		7421	4
SB-18-18	0-6"	12/12/96	7421	280
	6"-2'		7421	**720**
	2'-4'		7421	29
	4'-6'		7421	220
	6'-8'		7421	110
	8'-9'		7421	4

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-19	2"-8"	12/09/96	7421	54
	8"-2.2'		7421	**2,200**
	2.2'-4.2'		7421	9
	4.2'-6.2		7421	38
	6.2'-8.2'		7421	5
	8.2'-10.2'		7421	7
	10.2'-11.5'		7421	5
SB-18-20	0-6"	12/14/96	7421	220
	6"-2'		7421	**2,800**
	2'-4'		7421	13
SB-18-21	0-6"	12/11/96	7421	**450**
	6"-2'		7421	**7,300**
	2'-4'		7421	**2,100**
	4'-6'		7421	160
	6'-8'		7421	8
	8'-10'		7421	5
SB-18-21A	0-6"	12/13/96	7421	360
	6"-2'		7421	**730**
	2'-4'		7421	**1,400**
	4'-6'		7421	**570**
	6'-8'		7421	11
	8'-10'		7421	12
SB-18-22	0-6"	12/17/96	7421	340
	6"-2'		7421	**800**
	2'-4'		7421	**500**
	4'-6'		7421	70

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-23	0-6"	12/11/96	7421	**530**
	6"-2'		7421	**610**
	2'-4'		7421	320
	4'-6'		7421	360
	6'-8'		7421	**490**
	10'-12'		7421	120
SB-18-24	2"-8"	12/18/96	7421	33
	8"-2.2'		7421	190
	2.2'-4.2'		7421	**710**
	4.2'-6.2		7421	6
	6.2'-8.2'		7421	6
	8.2'-10.2'		7421	10
	10.2'-11.5'		7421	7
SB-18-25	0-6"	12/18/96	7421	**26,000**
	6"-2'		7421	**1,600**
	2'-4'		7421	27
	4'-6'		7421	17
	6'-8'		7421	5
	8'-10.5'		7421	5
SB-18-26	0-6"	12/11/96	7421	**560**
	6"-2'		7421	12
	2'-4'		7421	6
	4'-6'		7421	6
	6'-8'		7421	8
	8'-10'		7421	9
	10'-12'		7421	8

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-27	0-6"	12/17/96	7421	190
	6"-2'		7421	190
	2'-4'		7421	**630**
	4'-6'		7421	29
SB-18-28	0-6"	12/11/96	7421	**2,900**
	6"-2'		7421	**800**
	2'-4'		7421	4
	4'-6'		7421	45
	6'-8'		7421	6
	8'-10'		7421	5
	10'-12'		7421	4
	12'-13'		7421	37
SB-18-29	2"-8"	12/18/96	7421	8
	8"-2.2'		7421	200
	2.2'-4.2'		7421	13
	4.2'-6.2		7421	8
	6.2'-8.2'		7421	24
	8.2'-11'		7421	62
SB-18-31	2"-8"	12/14/96	7421	4
	8"-2.2'		7421	15
	2.2'-4.2'		7421	4
	4.2'-6.2		7421	2
	6.2'-8.2'		7421	5
	8.2'-10.2'		7421	4
	10.2'-12'		7421	5

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-33	0-6"	12/10/96	7421	330
	6"-2'		7421	**9,100**
	2'-4'		7421	5
	4'-6'		7421	3
	6'-8'		7421	7
	8'-10'		7421	5
	10'-11.5'		7421	3
SB-18-35	2"-8"	12/13/96	7421	15
	8"-2.2'		7421	70
	2.2'-4.2'		7421	**8,100**
	4.2'-6.2		7421	**3,100**
	6.2'-8.2'		7421	18
	8.2'-10.2'		7421	360
	10.2'-12'		7421	6
SB-18-36	0-6"	12/13/96	7421	8
	6"-2'		7421	5
	2'-4'		7421	5
	4'-5'		7421	4
SB-18-37	0-6"	12/09/96	7421	**4400**
	6"-2'		7421	200
	2'-4'		7421	47
	4'-6'		7421	13
	6'-8'		7421	3
	8'-10'		7421	7
	10'-12'		7421	6

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-38	0-6"	12/13/96	7421	42
	6"-2'		7421	8
	2'-4'		7421	4
	4'-5'		7421	2
SB-18-39	2"-8"	12/14/96	7421	1
	8"-2.2'		7421	4
	2.2'-4.2'		7421	4
	4.2'-6.2		7421	3
	6.2'-8.2'		7421	7
	8.2'-10.2'		7421	2
	10.2'-12'		7421	8
SB-18-40	0-6"	12/13/96	7421	97
	6"-2'		7421	13
	2'-4'		7421	5
	4'-6'		7421	3
SB-18-41	0-6"	12/09/96	7421	170
	6"-2'		7421	6
	2'-4'		7421	11
	4'-6'		7421	10
	6'-8'		7421	5
	8'-10'		7421	6
	10'-12'		7421	3
	12'-13.5'		7421	6

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-41A	0-6"	12/13/96	7421	37
	6"-2'		7421	23
	2'-4'		7421	3
	4'-6'		7421	7
	6'-8'		7421	4
	8'-10'		7421	5
	10'-11'		7421	3
SB-18-43	0-6"	12/09/96	7421	**2,500**
	6"-2'		7421	**700**
	2'-4'		7421	11
	4'-6'		7421	35
	6'-8'		7421	6
	8'-10'		7421	52
	10'-12'		7421	3
	12'-13'		7421	14
SB-18-45	0-6"	12/16/96	7421	**1,700**
	6"-2'		7421	340
	2'-4'		7421	4
	4'-6'		7421	8
	6'-8'		7421	10
	8'-10'		7421	4
	10'-11'		7421	8

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-48	0-6"	12/13/96	7421	100
	6"-2'		7421	7
	2'-4'		7421	3
	4'-6'		7421	4
	6'-8'		7421	3
	8'-10'		7421	4
	10'-11'		7421	3
SB-18-49	2"-8"	12/18/96	7421	27
	8"-2.2'		7421	94
	2.2'-4.2'		7421	130
	4.2'-6.2		7421	4
	6.2'-8.2'		7421	8
	8.2'-10.2'		7421	3
	10.2'-11.5'		7421	3
SB-18-50	2"-8"	12/18/96	7421	65
	8"-2.2'		7421	52
	2.2'-4.2'		7421	**11,000**
	4.2'-6.2		7421	**12,000**
	6.2'-8.2'		7421	**6,600**
	8.2'-10.2'		7421	**10,000**
	10.2'-11.5'		7421	120

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-51	0-6"	03/22/97	6010	**520**
	6"-2'		6010	260
	2'-4'		6010	8
	4'-6'		6010	5
	6'-8'		6010	5
	8'-10'		6010	32
	10'-12'		6010	8
SB-18-52	0-6"	03/22/97	6010	82
	6"-2'		6010	5
	2'-4'		6010	6
	4'-6'		6010	8
	6'-8'		6010	23
	8'-10'		6010	2
	10'-12'		6010	2
SB-18-53	0-6"	03/22/97	6010	26
	6"-2'		6010	15
	2'-4'		6010	5
	4'-6'		6010	8
	6'-8'		6010	2
	8'-10'		6010	3
	10'-12'		6010	2
SB-18-54	0-6"	03/22/97	6010	70
	6"-2'		6010	12
	2'-4'		6010	37
	4'-6'		6010	7
	6'-8'		6010	7
	8'-10'		6010	7
	10'-12'		6010	6

Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-34
SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Depth	Date Sampled	Analytical Method	Lead Concentration (mg/kg)
SB-18-55	0-6"	03/22/97	6010	52
	6"-2'		6010	47
	2'-4'		6010	14
	4'-6'		6010	7
	6'-8'		6010	6
	8'-10'		6010	7
	10'-12'		6010	3
SB-18-56	0-6"	03/22/97	6010	390
	6"-2'		6010	49
	2'-4'		6010	4
	4'-6'		6010	4
	6'-8'		6010	7.4
	8'-10'		6010	5.6
	10'-12'		6010	3.1
SB-18-57	0-6"	03/22/97	6010	5
	6"-2'		6010	3
	2'-4'		6010	4
	4'-6'		6010	9
	6'-8'		6010	9
	8'-10'		6010	9
	10'-12'		6010	4

Notes:
mg/kg - milligrams per kilogram
Generic Industrial Cleanup Criteria DCV for lead is 400 mg/kg.
DCV - direct contact value; Criteria developed using the USEPA Integrated Uptake Biokinetic Model for Children.
PSIC - particulate soil inhalation criteria; from Draft Interim Generic Soil Inhalation Criteria for Ambient Air,
Notes:
mg/kg - milligrams per kilogram
Generic Industrial/Commercial Subcategory II Direct Contact Value (DCV) for lead is 400 mg/kg.
DCV for lead developed using the USEPA Integrated Uptake Biokinetic Model for Children.
Particulate soil inhalation criterion (PSIC) for lead is 52,000 mg/kg.
Insufficient data exist to calculate a volatile soil inhalation criterion (VSIC).
PSIC and VSIC from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 12/12/96
Bold values exceed DCV; Bold Italic values also exceed PSIC.

TABLE 5-35

SUMMARY OF LABORATORY ANALYTICAL DATA
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-1 (0-6")	SB-18-2 (4'-6')	SB-18-3 (0-6")	SB-18-3 (4'-6')	SB-18-3 (10'-11')	SB-18-4 (0-6")			
Acenaphthene	ug/kg	420	840	<330	<330	<3300	<330	8.10E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<330	<330	<330	<330	3700	<330	1.60E+07	ID	1.2E+09
Anthracene	ug/kg	700	550	<330	900	<3300	<330	1.00E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	1600	1100	600	1700	<3300	720	2.10E+05	ID	ID
Benzo (a) pyrene	ug/kg	1600	1100	460	2800	<3300	520	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	2400	1800	870	2200	<3300	640	2.10E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	1200	1400	470	2200	<3300	510	1.60E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<330	<330	<330	1800	<3300	820	2.10E+06	ID	ID
Chrysene	ug/kg	1600	1200	740	2100	<3300	840	2.10E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<330	<330	<330	<330	<3300	<330	21,000	ID	ID
Fluoranthene	ug/kg	3600	2200	1400	4000	4700	1700	5.40E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	340	1000	<330	<330	<3300	<330	5.40E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	1600	1600	640	3100	<3300	520	2.10E+05	ID	ID
Naphthalene	ug/kg	<330	1100	<330	<330	4800	<330	1.60E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	2800	2100	630	2300	6700	770	1.60E+07	ID	6.9E+07
Pyrene	ug/kg	3400	2100	1100	3900	6300	1300	3.40E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<330	4700	<330	<330	17000	<330	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	4400	<330	<330	17000	<330	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
Samples collected in March 1997 (SB-51) were analyzed by EPA Method 8270.
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
Bold values exceed DCV. All concentrations were below VSIC and PSIC.

TABLE 5-35

SUMMARY OF LABORATORY ANALYTICAL DATA
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-5 (2.2'-4.2')	SB-18-6 (4'-6')	SB-18-7 (0-6")	SB-18-7 (4'-6')	SB-18-7 (8'-10")	SB-18-8 (2"-8")			
Acenaphthene	ug/kg	40000	1200	<800	21000	7300	<3500	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<8800	<330	<800	<15000	<2800	<3500	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	48000	2200	<800	31000	11000	<3500	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	*220000	5300	*7000	*120000	*33000	*11000	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	**92000**	4600	<4000	**42000**	14000	<3500	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	150000	7600	5900	76000	25000	7000	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	45000	3000	1800	24000	7800	7700	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	150000	<3000	5900	76000	25000	7000	2.1E+06	ID	ID
Chrysene	ug/kg	*220000	5600	*7000	*120000	*33000	*11000	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	14000	<3000	<800	<7700	<7700	<3500	21,000	ID	ID
Fluoranthene	ug/kg	280000	13000	7100	110000	36000	<3500	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	34000	940	<800	19000	6900	<3500	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	63000	5100	2800	31000	11000	<3500	2.1E+05	ID	ID
Naphthalene	ug/kg	27000	<330	<800	18000	5800	<3500	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	280000	8300	3800	98000	35000	10000	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	210000	120000	5700	88000	28000	8500	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<8800	<330	<800	<15000	<3800	<3500	ID	ID	ID
1-Methylnaphthalene	ug/kg	9000	<330	<800	<15000	<3800	<3500	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
Samples collected in March 1997 (SB-51) were analyzed by EPA Method 8270.
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
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TABLE 5-35

SUMMARY OF LABORATORY ANALYTICAL DATA
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-9 (4'-6')	SB-18-10 (0-6")	SB-18-10 (6"-2')	SB-18-10 (8'-10')	SB-18-11 (6'-8')	SB-18-12 (2"-8")			
Acenaphthene	ug/kg	<330	3500	<6700	1300	32000	<330	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<330	<330	<330	680	<8800	<330	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	<330	6200	12000	1700	44000	450	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<330	12000	21000	3100	*200000	<330	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<330	5900	9000	<3300	**80000**	<2700	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	<330	10000	16000	<3300	140000	<2700	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<330	3400	<6700	<3300	36000	<2700	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<330	<3300	<6700	<3300	140000	<2700	2.1E+06	ID	ID
Chrysene	ug/kg	<330	10000	21000	3800	*200000	780	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<330	<3300	<6700	<3300	14000	<2700	21,000	ID	ID
Fluoranthene	ug/kg	<330	27000	45000	5700	230000	2400	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	3000	<6700	<3300	31000	<330	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<330	5600	<6700	<3300	61000	<2700	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	1800	4700	1800	37000	<330	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	<330	16000	36000	5000	220000	2400	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	<330	19000	37000	5600	180000	2000	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<330	550	1400	3900	9100	<330	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	540	1400	4300	<1800	<330	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
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TABLE 5-35

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POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-13 (0-6")	SB-18-14 (2'-4')	SB-18-15 (6'-2')	SB-18-15 (4'-6')	SB-18-15 (6'-8')	SB-18-16 (6"-2')			
Acenaphthene	ug/kg	<330	2500	480	5300	<330	67000	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<330	<1800	<330	420	<330	<8100	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	640	3500	810	9100	<330	130000	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<330	*12000	2500	20000	410	*450000	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<2700	4300	<6700	9500	<330	**130000**	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	<2700	7500	<6700	20000	<330	290000	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<2700	2800	<6700	7700	<330	75000	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<2700	7500	<6700	<6700	<330	290000	2.1E+06	ID	ID
Chrysene	ug/kg	1000	*12000	3700	21000	420	*450000	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<2700	<7300	<6700	<6700	<330	29000	21,000	ID	ID
Fluoranthene	ug/kg	2400	13000	5300	44000	500	520000	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	2200	440	<6700	<330	57000	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<2700	<7300	<6700	10000	<330	24000	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	2200	<330	2300	<330	50000	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	2900	11000	3300	31000	490	440000	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	2000	9100	5200	37000	<330	450000	3.40E+08	1.1E+09	3.50E+09
2-Methylnaphthalene	ug/kg	<330	<1800	<330	1000	<330	13000	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	<1800	<330	1100	<330	9000	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
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TABLE 5-35

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POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-17 (2'-4')	SB-18-18 (2'-4')	SB-18-19 (2"-8")	SB-18-20 (6"-2')	SB-18-21A (0-6")	SB-18-21A (4'-6')			
Acenaphthene	ug/kg	<330	<360	<330	5600	<330	710	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<330	<360	<330	6300	<330	<330	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	<330	<360	690	<3500	<330	<1700	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<330	800	<330	3500	970	<1700	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<330	470	<2800	<3500	890	<1700	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	<330	450	<2800	<3500	1600	<1700	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<330	<360	<330	<3500	780	<1700	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<330	450	<2800	<3500	<330	<1700	2.1E+06	ID	ID
Chrysene	ug/kg	<330	800	990	<3500	1200	<1700	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<330	<360	<2800	<3500	<330	<1700	21,000	ID	ID
Fluoranthene	ug/kg	<330	<360	2400	<3500	2300	<1700	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	<360	<330	6000	<330	1600	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<330	<360	<2800	<3500	990	<1700	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	<360	360	62000	<330	960	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	<330	640	2900	6700	1100	<1700	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	<330	610	1900	4200	1800	1800	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<330	<360	<330	54000	<330	5300	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	<360	<330	39000	<330	3700	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
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PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-21A (6'-8')	SB-18-22 (2'-4')	SB-18-23 (6"-2')	SB-18-23 (4'-6')	SB-18-23 (6'-8')	SB-18-24 (8"-2.2')			
Acenaphthene	ug/kg	<330	<380	<330	4700	<330	930	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<330	<380	<330	<330	<330	<330	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	<330	<380	<330	6800	<330	3000	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<330	*630	540	8000	<330	7800	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<330	<380	<330	<3300	<330	6600	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	<330	590	<330	8300	420	6400	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<330	<380	<330	<3300	350	3800	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<330	590	<330	<3300	<330	7400	2.1E+06	ID	ID
Chrysene	ug/kg	<330	*630	480	6300	<330	9100	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<330	<380	<330	<3300	<330	750	21,000	ID	ID
Fluoranthene	ug/kg	<330	670	<330	22000	900	15000	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	<380	<330	4400	<330	1100	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<330	430	<330	<3300	400	4900	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	<380	<330	4900	<330	<330	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	<330	440	<330	24000	410	9100	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	<330	540	<330	18000	580	14000	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<330	430	<330	1400	<330	<330	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	460	<330	870	<330	<330	1.60E+08	2.3E+07	4.8E+09

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PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-25 (2'-4')	SB-18-26 (2'-4')	SB-18-27 (2'-4')	SB-18-28 (0-6")	SB-18-28 (6'-8')	SB-18-28 (10'-12')			
Acenaphthene	ug/kg	<330	<330	<7800	<330	<330	<6700	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<330	<330	9800	<330	<330	<6700	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	<330	<330	<7800	<330	<330	<6700	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<330	<330	*<7800	690	<330	<6700	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<330	<330	<7800	950	<330	<6700	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	<330	<330	<7800	1800	<330	<6700	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<330	<330	<7800	1100	<330	<6700	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<330	<330	<7800	<330	<330	<6700	2.1E+06	ID	ID
Chrysene	ug/kg	<330	<330	*<7800	940	<330	<6700	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<330	<330	<7800	<330	<330	<6700	21,000	ID	ID
Fluoranthene	ug/kg	<330	<330	<7800	1900	<330	<6700	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	<330	14000	<330	<330	<6700	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<330	<330	<7800	1100	<330	<6700	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	<330	10000	<330	<330	<6700	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	<330	<330	13000	970	<330	<6700	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	<330	<330	<7800	1600	<330	<6700	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<330	<330	29000	<330	<330	2400	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	<330	37000	<330	<330	<6700	1.60E+08	2.3E+07	4.8E+09

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PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-29 (8.2'-11')	SB-18-31 (2.2'-4.2')	SB-18-33 (6"-2')	SB-18-33 (4'-6')	SB-18-33 (8'-10')	SB-18-35 (2.2'-4.2')			
Acenaphthene	ug/kg	<330	<330	<330	<330	<330	41000	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<3300	<330	<330	<330	<330	<40000	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	<330	<330	<330	<330	<330	<40000	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<3300	<330	800	<330	<330	<40000	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<3300	<330	<330	<330	<330	<40000	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	<3300	<330	<330	<330	<330	<40000	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<3300	<330	<330	<330	<330	<40000	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<3300	<330	<330	<330	<330	<40000	2.1E+06	ID	ID
Chrysene	ug/kg	3900	<330	1300	<330	<330	<40000	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<3300	<330	<330	<330	<330	<40000	21,000	ID	ID
Fluoranthene	ug/kg	<3300	<330	1800	<330	<330	<40000	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	<330	<330	<330	<330	55000	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<3300	<330	<330	<330	<330	<40000	2.1E+05	ID	ID
Naphthalene	ug/kg	<3300	<330	<330	<330	<330	110000	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	<330	<330	660	<330	<330	61000	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	<3300	<330	1600	<330	<330	<40000	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	1900	<330	<330	<330	<330	290000	ID	ID	ID
1-Methylnaphthalene	ug/kg	<3300	<330	<330	<330	<330	230000	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
Samples collected in March 1997 (SB-51) were analyzed by EPA Method 8270.
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
Bold values exceed DCV. All concentrations were below VSIC and PSIC.

TABLE 5-35

SUMMARY OF LABORATORY ANALYTICAL DATA
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-35 (8.2'-10.2')	SB-18-36 (2'-4')	SB-18-37 (0-6")	SB-18-37 (2'-4')	SB-18-37 (10'-12')	SB-18-38 (2'-4')			
Acenaphthene	ug/kg	<2800	<330	<330	760	<330	<330	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<2800	<330	<330	2600	<330	<330	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	<2800	<330	<330	5600	<330	<330	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<2800	<330	1200	7200	<330	<330	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<2800	<330	1800	4200	<330	<330	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	<2800	<330	1700	7200	<330	<330	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<2800	<330	2000	<3300	<330	<330	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<2800	<330	1800	<3300	<330	<330	2.1E+06	ID	ID
Chrysene	ug/kg	<2800	<330	1500	5800	<330	<330	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<2800	<330	<330	<3300	<330	<330	21,000	ID	ID
Fluoranthene	ug/kg	9100	<330	1700	14000	<330	<330	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<2800	<330	<330	3300	<330	<330	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<2800	<330	2400	3600	<330	<330	2.1E+05	ID	ID
Naphthalene	ug/kg	<2800	<330	<330	6000	<330	<330	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	<2800	<330	520	11000	<330	<330	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	3600	<330	1700	10000	<330	<330	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	6000	<330	<330	1700	<330	<330	ID	ID	ID
1-Methylnaphthalene	ug/kg	<2800	<330	<330	950	<330	<330	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
Samples collected in March 1997 (SB-51) were analyzed by EPA Method 8270.
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
Bold values exceed DCV. All concentrations were below VSIC and PSIC.

TABLE 5-35

SUMMARY OF LABORATORY ANALYTICAL DATA
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-39 (2.2'-4.2')	SB-18-40 (2'-4')	SB-18-41 (0-6'")	SB-18-41 (6"-2')	SB-18-41 (10'-12')	SB-18-41A (2'-4')			
Acenaphthene	ug/kg	<330	<330	<330	<330	<330	<330	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<330	<330	<330	<330	<330	<330	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	<330	<330	<330	<330	<330	<330	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<330	<330	<330	<330	<330	<330	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<330	<330	<330	<330	<330	<330	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	<330	<330	360	<330	<330	<330	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<330	<330	<330	<330	<330	<330	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<330	<330	<330	<330	<330	<330	2.1E+06	ID	ID
Chrysene	ug/kg	<330	<330	<330	<330	<330	<330	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<330	<330	<330	<330	<330	<330	21,000	ID	ID
Fluoranthene	ug/kg	<330	<330	440	<330	<330	<330	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	<330	<330	<330	<330	<330	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<330	<330	<330	<330	<330	<330	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	<330	<330	<330	<330	<330	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	<330	<330	<330	<330	<330	<330	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	<330	<330	430	<330	<330	<330	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<330	<330	<330	<330	<330	<330	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	<330	<330	<330	<330	<330	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
Samples collected in March 1997 (SB-51) were analyzed by EPA Method 8270.
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
Bold values exceed DCV. All concentrations were below VSIC and PSIC.

TABLE 5-35

SUMMARY OF LABORATORY ANALYTICAL DATA
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification						Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-43 (0-6')	SB-18-45 (4'-6')	SB-18-46 (2'-2.5')	SB-18-48 (6'-2')	SB-18-49 (2.2'-4.2')	SB-18-50 (2.2'-4.2')			
Acenaphthene	ug/kg	<330	<350	9000	<330	<330	<330	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	830	<350	<8700	<330	<330	<330	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	1600	<350	<8700	<330	<330	<330	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	<3000	<350	*17000	<330	480	610	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	<3000	<350	<8700	<330	610	<330	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	4100	<350	9200	<330	950	1600	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	<3000	<350	<8700	<330	<330	<330	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	<3000	<350	9200	<330	<330	<330	2.1E+06	ID	ID
Chrysene	ug/kg	<3000	<350	*17000	<330	550	550	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<3000	<350	<8700	<330	<330	<330	21,000	ID	ID
Fluoranthene	ug/kg	4400	<350	18000	<330	780	1000	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	<350	9300	<330	<330	<330	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	<3000	<350	<8700	<330	<330	1900	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	<350	<8700	<330	<330	<330	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	2500	<350	29000	<330	<330	480	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	4400	<350	12000	<330	800	910	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<330	<350	14000	<330	<330	<330	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	<350	17000	<330	<330	<330	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
Samples collected in March 1997 (SB-51) were analyzed by EPA Method 8270.
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
Bold values exceed DCV. All concentrations were below VSIC and PSIC.

TABLE 5-35

SUMMARY OF LABORATORY ANALYTICAL DATA
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN SOIL

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification							Generic Industrial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC
		SB-18-51 (0-6")	SB-18-51 (6"-2')	SB-18-51 (2'-4')	SB-18-51 (4'-6')	SB-18-51 (6'-8')	SB-18-51 (8'-10')	SB-18-51 (8'-10')			
Acenaphthene	ug/kg	<330	<330	<330	<330	<330	<330	<330	8.1E+08	1.4E+08	7.3E+09
Acenaphthylene	ug/kg	<330	<330	<330	<330	<330	<330	<330	1.6E+07	ID	1.2E+09
Anthracene	ug/kg	<330	<330	<330	<330	<330	<330	<330	1.0E+09	2.3E+09	3.5E+10
Benzo (a) anthracene	ug/kg	1400	<330	<330	<330	<330	<330	<330	2.1E+05	ID	ID
Benzo (a) pyrene	ug/kg	750	<330	<330	<330	<330	<330	<330	21,000	1.2E+06	1.1E+06
Benzo (b) fluoranthene	ug/kg	890	<330	<330	<330	<330	<330	<330	2.1E+05	ID	ID
Benzo (g,h,I perylene	ug/kg	820	<330	<330	<330	<330	<330	<330	1.6E+07	ID	4.1E+08
Benzo (k) fluoranthene	ug/kg	780	<330	<330	<330	<330	<330	<330	2.1E+06	ID	ID
Chrysene	ug/kg	1500	<330	<330	<330	<330	<330	<330	2.1E+07	ID	ID
Dibenzo (a,h) anthracene	ug/kg	<330	<330	<330	<330	<330	<330	<330	21,000	ID	ID
Fluoranthene	ug/kg	2800	<330	<330	<330	<330	<330	<330	5.4E+08	1.3E+09	4.8E+09
Fluorene	ug/kg	<330	<330	<330	<330	<330	<330	<330	5.4E+08	2.1E+08	4.8E+09
Indeno (1,2,3-cd) pyrene	ug/kg	770	<330	<330	<330	<330	<330	<330	2.1E+05	ID	ID
Naphthalene	ug/kg	<330	<330	<330	<330	<330	<330	<330	1.6E+08	2.3E+07	4.8E+09
Phenanthrene	ug/kg	980	<330	<330	<330	<330	<330	<330	1.6E+07	ID	6.9E+07
Pyrene	ug/kg	1900	<330	<330	<330	<330	<330	<330	3.4E+08	1.1E+09	3.5E+09
2-Methylnaphthalene	ug/kg	<330	<330	<330	<330	<330	<330	<330	ID	ID	ID
1-Methylnaphthalene	ug/kg	<330	<330	<330	<330	<330	<330	<330	1.60E+08	2.3E+07	4.8E+09

Notes:
ug/kg - micrograms per kilogram
ID -Insufficient data to calculate a value
Samples collected in December 1996 (SB-1 through 50) were analyzed by EPA Method 8100.
Samples collected in March 1997 (SB-51) were analyzed by EPA Method 8270.
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Soil Inhalation Criteria for Ambient Air, 01/17/97"
MDEQ - Michigan Department of Environmental Quality
Bold values exceed DCV. All concentrations were below VSIC and PSIC.

TABLE 5-36

SUMMARY OF LABORATORY ANALYTICAL DATA
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) DETECTED IN GROUNDWATER

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Parameter Detected	Units	Well MW-18-46		MDEQ GCC Value	MDEQ GSI Value
		December 1996	March 1997		
Benzo (a) anthracene	ug/l	**4.3**	BDL	4	0.31
Benzo (b) fluoranthene	ug/l	**6.2**	BDL	2*	0.31
Fluoranthene	ug/l	14	BDL	206*	370
Phenanthrene	ug/l	15	BDL	1000*	NE/ID
Pyrene	ug/l	12	BDL	135*	11,000

Notes:
This table includes positive detections only. Concentrations of PAH in other monitoring wells sampled were below method detection limits (BDL).
Sample collected 12/19/96.
Sample analyzed by EPA Method 8100.
ug/l - micrograms per liter
Bold values exceed GCC and GSI value.
NE/ID - Not evaluated/inadequate data; chemical has either not been evaluated or an inadequate database that precludes the development of a GSI value.
MDEQ - Michigan Department of Environmental Quality
GCC - Groundwater Contact Criteria; from Technical Support Document dated 1/17/97
GSI - Groundwater Surface Water Interface; MDEQ Operational Memorandum #14, Revision 2.
* - Calculated GCC exceeds solubility, therefore solubility is used as the criterion.

TABLE 5-37

SUMMARY OF LABORATORY ANALYTICAL DATA
LEAD DETECTED IN GROUNDWATER

PAOC 18 - KAISER-FRAZER DUMP AREA
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Date	Filter Size (microns)	Lead		Generic Industrial/Commercial GCC	Generic Industrial/Commercial GSI
			Total (mg/L)	Dissolved (mg/L)		
MW-18-45	12/19/96	5	**0.0240**	<0.0050	ID	0.0066
MW-18-45	03/21/97	1	0.0040	<0.0050	ID	0.0066
MW-18-46	12/19/96	5	**0.8000**	<0.0050	ID	0.0066
MW-18-46	03/21/97	1	**0.0530**	<0.0050	ID	0.0066
MW-2	03/21/97	1	<0.0050	<0.0050	ID	0.0066
MW-3	03/21/97	1	0.0030	<0.0050	ID	0.0066
MW-5	03/21/97	1	<0.0050	<0.0050	ID	0.0066
MW-6	03/21/97	1	<0.0050	<0.0050	ID	0.0066
MW-12	03/21/97	1	<0.0050	<0.0050	ID	0.0066

Notes:
Samples analyzed by EPA Method 7421 or 200.8
mg/l - milligrams per liter
Bold values exceed GSI value.
ID - Insufficient data
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality

TABLE 5-38

SUMMARY OF LABORATORY ANALYTICAL DATA
VOLATILE ORGANIC HALOCARBONS DETECTED IN GROUNDWATER

PAOC 19 - COMPANY VEHICLE OPERATIONS
(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Location	Date	EPA Method	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	Vinyl Chloride	TCE
GP-7	04/19	8260	<250	<250	**18,400**	**16000***	<250
GP-18	04/22	8260	7	<1	<1	**33**	<1
MW-2	04/24	8260	140,000	**950**	<500	**83000***	<500
MW-3	04/24	8260	~~98,000~~ 9,800	**700**	<500	~~**98000***~~ 20,000	<500
MW-4	04/24	8260	14	<1	<1	**7**	<1
MW-5	04/24	8260	1,400	<100	<100	**2300***	<100
MW-6	04/24	8260	20	1.4	<1	**150**	<1
MW-7	04/24	8260	<500	<500	<50	<50	<50
MW-8	04/24	8260	~~39~~	~~3.9~~	<1	<1	15
TW-2	09/12	8010	1,069	33	9	**1450***	1
TW-3	09/12	8010	1,680	**307**	16	**1290***	21
TW-9	09/12	8010	2,880	35	3	**9640***	**221**
TW-10	09/12	8010	7,130	**301**	2	**4890***	<1
TW-11	09/12	8010	1	<1	<1	**3185***	<1
MW-12	09/17	8010	15	<1	<1	<1	88
MW-13	09/17	8010	<1	<1	<1	<1	<1
MW-14	09/17	8010	<1	<1	<1	<1	<1
Generic Industrial/Commercial GCC			170,000	200,000	9,900	290	11,000
Generic Industrial/Commercial GSI			{B}	300	32	3.1	94

Note:
All values are in micrograms per liter
TCE - Trichloroethylene
DCE - Dichloroethylene
GSI - Ground-water/Surface-water Interface values from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)"
GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria, 01/17//97"
MDEQ - Michigan Department of Environmental Quality
{B} - Chemical has not been evaluated or an insufficient data base precludes the development of a GSI value
Bold concentrations exceed GSI values.
* Concentration exceeds GCC.

TABLE 5-39

SUMMARY OF LABORATORY ANALYTICAL DATA
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER

BACKGROUND WELLS
(SUPPLEMENTAL PHASE II ESI)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

Sample Identification	Date	Filter Size (microns)	Cadmium		Lead		Mercury		Nickel	
			Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Dissolved (mg/L)
BG-1	4/17/96	1.0	<0.000050	<0.000050	<0.0050	<0.0050	<0.00020	<0.00020	<0.040	<0.040
BG-2	4/17/96	1.0	<0.000050	<0.000050	<0.0050	<0.0050	<0.00020	<0.00020	<0.040	<0.040
BG-3	4/17/96	1.0	<0.000050	<0.000050	0.0066	<0.0050	<0.00020	<0.00020	<0.040	<0.040
BG-4	4/17/96	1.0	<0.000050	<0.000050	0.0055	<0.0050	<0.00020	<0.00020	<0.040	<0.040
BG-5	4/17/96	1.0	<0.000050	<0.000050	<0.0050	<0.0050	<0.00020	<0.00020	<0.040	<0.040
MDEQ GCC Values			110,000		ID		56*		1.6E+08	
MDEQ GSI Values			0.00064		0.0066		1.3E-06		0.057	

Notes:
mg/L - milligrams per liter
GCC - Generic groundwater contact criteria
MDEQ - Michigan Department of Environmental Quality
ID - Insufficient data
NA - Not Analyzed
GSI - Groundwater/surface water interface criteria established by the MDEQ in the Environmental Response Division Operational Memorandum #14, Revision 2
GCC and solubility values from "Generic Groundwater Contact Criteria: Technical Support Document", October 1996
* - Solubility (GCC criterion is greater than solubility in water)
Bold values indicate concentrations above their respective GSI value.

TABLE 5-40

WATER-TABLE ELEVATION
APRIL 24, 1996

(PHASE III EOC)
DESCRIPTION OF EXISTING CONDITIONS REPORT

WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

WELL ID	TOC (feet above sea level)	DEPTH TO WATER 4/24/96 (feet)	WATER-TABLE ELEVATION 4/24/96 (feet above sea level)
MW-2-12A	716.03	11.3	704.73
MW-2-13A	715.45	11.8	703.65
MW-6-5	713.97	5.61	708.36
MW-7-3	716.84	16.27	700.57
MW-BG-1	725.05	11.11	713.94
MW-BG-2	717.98	8.51	709.47
MW-BG-3	723.33	8.31	715.02
MW-BG-4	721.21	9.03	712.18
MW-BG-5	720.01	8.61	711.40
GW-16-1	721.63	10.67	710.96
MW-1-5	NA	17.67	NA

TOC - Top of Casing

TABLE 5-41
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN SOIL
SUPPLEMENTAL PHASE II ESI

WATER MAIN INSTALLATION
WILLOW RUN FACILITY
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification					Unlimited Land Use PSIC	Infinite Source VSIC	Generic Industrial Cleanup DCV	Generic Csat	GSI SWP
		Composite A 11/06/96	Composite 1 11/06/96	Block 11/06/96	Composite B 11/08/96	Composite F 12/14/96					
EPA Method 8240											
Cis-1,2-Dichloroethylene	ug/kg	<5.0	<5.0	SNA	<5.0	2,000	1.0E+06	6.9E+07	8.2E+06	1.0E+06	ID
Toluene	ug/kg	<5.0	<5.0	SNA	<5.0	*67000**	1.4E+10	4.7E+06	1.6E+08	6.2E+05	ID
Ethylbenzene	ug/kg	<5.0	<5.0	SNA	<5.0	*6,300*	3.5E+10	1.6E+07	7.2E+07	3.8E+05	4.2E+02
Xylenes	ug/kg	<5.0	<5.0	SNA	<5.0	*19,000*	1.5E+11	7.7E+07	1.0E+09	4.0E+05	7.7E+02

Notes:
ug/kg - micrograms per kilogram
SNA - Sample not analyzed for this compound.
Samples collected November and December, 1996.
PSIC - Particulate soil inhalation criteria; from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document, 12/12/96".
VSIC - Volatile soil inhalation criteria; from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document, 12/12/96".
DCV - Direct contact value; from Michigan Department of Environmental Quality Operational Memorandum #14, Revision 2.
Csat - Soil saturation screening concentration, from "Generic Soil Saturation Screening Concentrations: Technical Support Document, 1/17/97".
GSI SWP - Groundwater/Surface Water Interface-Soil/Water Partition Values; from Soil/Water Partitioning Criteria: Technical Support Document, 01/17/97".
* - Considered to exceed GSI SWP because value exceeds Csat.
Italic Values exceed GSI SWP.

TABLE 5-41 (continued)
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN SOIL
PHASE II ESI

WATER MAIN INSTALLATION
WILLOW RUN FACILITY
YPSILANTI, MICHIGAN

Parameter Detected	Units	Sample Identification: Composite A 11/06/96	Composite 1 11/06/96	1*	Block 11/06/96	Composite B 11/08/96	Composite F 12/14/96	Unlimited Land Use PSIC	Infinite Source VSIC	Generic Industrial Cleanup DCV	Generic Csat	GSI SWP	
EPA Method 8270													
Acenaphthene	ug/kg	<330	*3,700*		*8,700*	<330	<14,000	7.3E+09	1.4E+08	8.1E+08	NA	8.7E+02	
Acenaphthylene	ug/kg	<330	440		<2,600	<330	<14,000	ID	1.2E+09	1.6E+07	NA	ID	
Anthracene	ug/kg	<330	42,000	2*	12,000	<330	<14,000	3.5E+10	2.3E+09	1.0E+09	NA	1.0E+08	
Benzo(a)anthracene	ug/kg	830	48,000	3*	48,000	<330	<14,000	ID	ID	2.1E+05	NA	NL	
Benzo(a)pyrene	ug/kg	960	23,000		**80,000**	<330	<14,000	1.1E+06	1.2E+06	2.1E+04	NA	NL	
Benzo(b)fluoranthene	ug/kg	1,200	36,000	4*	130,000	<330	<14,000	ID	ID	2.1E+05	NA	NL	
Benzo(k)fluoranthene	ug/kg	350	36,000	4*	31,000	<330	<14,000	ID	ID	2.1E+06	NA	NL	
Benzo(g,h,i)perylene	ug/kg	800	14,000		92,000	<330	<14,000	4.1E+08	ID	1.6E+07	NA	NL	
Butylbenzylphthalate	ug/kg	410	SNA		<2,600	<330	920,000	2.4E+10	1.7E+10	7.2E+08	9.3E+05	ID	
Bis(2-Ethylhexyl)phthalate	ug/kg	<330	SNA		<2,600	<330	16,000	5.2E+08	4.8E+09	1.1E+07	3.1E+07	NL	
Chrysene	ug/kg	880	48,000	3*	64,000	<330	<14,000	ID	ID	2.1E+07	NA	NL	
Dibenz(a,h)anthracene	ug/kg	<330	19,000	5*	<26,000	<330	<14,000	ID	ID	2.1E+04	NA	NL	
Dibenzofuran	ug/kg	<330	SNA		5,900	<330	<14,000	ID	ID	ID	NA	ID	
Fluoranthene	ug/kg	1,300	54,000		96,000	<330	<14,000	4.8E+09	1.3E+09	5.4E+08	NA	1.3E+06	
Fluorene	ug/kg	<330	4,000		11,000	<330	<14,000	4.8E+09	2.1E+08	5.4E+08	NA	6.2E+06	
Indeno (1,2,3)pyrene	ug/kg	680	19,000	5*	76,000	<330	<14,000	ID	ID	2.1E+05	NA	NL	
1-Methylnaphthalene	ug/kg	<330	420		<2,600	SNA	SNA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	ug/kg	<330	540		*3,200*	<330	61,000	ID	ID	ID	NA	2200	*6
N-Nitrosodiphenylamine	ug/kg	<330	SNA		<2,600	<330	*14,000*	ID	ID	5.1E+06	NA	2.2E+03	
Naphthalene	ug/kg	<330	920		*7,400*	<330	*160,000*	4.8E+09	2.3E+07	1.6E+08	NA	2.2E+03	
Phenanthrene	ug/kg	910	42,000	2*	71,000	<330	46,000	6.9E+07	ID	1.6E+07	NA	ID	
Pyrene	ug/kg	2,800	51,000		100,000	<330	<14,000	3.5E+09	1.1E+09	3.4E+08	NA	3.7E+07	
2,4,5-Trichlorophenol	ug/kg	<330	SNA		<2,600	<330	*17,000*	1.2E+10	7.2E+08	4.5E+08	NA	1.3E+03	

Notes:
ug/kg - micrograms per kilogram
ID - Insufficient data to determine a value
Samples collected November and December, 1996.
NA - Not available
SNA - Sample not analyzed for this compound
NL - "Non-leaching" chemical under most soil conditions.
PSIC - Particulate soil inhalation criteria; from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document, 12/12/96".
VSIC - Volatile soil inhalation criteria; from "Draft Interim Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document, 12/12/96".
DCV - Direct contact value; from Michigan Department of Environmental Quality Operational Memorandum #14, Revision 2.
Csat - Soil saturation screening concentration, from "Generic Soil Saturation Screening Concentrations: Technical Support Document, 1/17/97".
GSI SWP - Groundwater/Surface Water Interface-Soil/Water Partition Values; from Soil/Water Partitioning Criteria: Technical Support Document, 01/17/97".
*1-Composite 1 was analyzed by EPA Method 8100 instead of EPA Method 8270.
*2-Value is total of Phenanthrene + Anthracene
*3-Value is total of Chrysene + Benzo(a)anthracene
*4-Value is total of Benzo(b)fluoranthene + Benzo(k)fluoranthene
*5-Value is total of Ideno(1,2,3-cd)pyrene + Dibenzo (a,h) anthracene
*6-Value is based on criteria for naphthalene.
BOLD values exceed DCV.
Italic values exceed GSI SWP.

TABLE 5-42
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN SOIL
SUPPLEMENTAL PHASE II ESI

WATER MAIN INSTALLATION
WILLOW RUN FACILITY
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification					Generic Industrial/ Commercial DCV	Generic Industrial Infinite Source VSIC	Generic Industrial PSIC	Csat
				Composite A 11/06/96	Composite 1 11/06/96	Block 11/06/96	Composite B 11/08/96	Composite F 12/14/96				
7060	Arsenic	0.70	mg/kg	4.2	SNA	5.1	3.0	3.4	83	ID	540	NA
6010	Barium	1.0	mg/kg	54	SNA	20	56	1800	320,000	ID	170,000	NA
6010	Cadmium	0.50	mg/kg	0.77	SNA	4.7	<1.0	<0.5	2,300	ID	1,300	NA
6010	Chromium	1.0	mg/kg	13	SNA	2.5	13	1300	1,000,000	ID	69,000	NA
6010	Copper	2.5	mg/kg	10	SNA	31	8.5	68	170,000	ID	69,000	NA
7421	Lead	0.50	mg/kg	25	25	42	76	**600**	400	ID	52,000	NA
7471	Mercury	0.030	mg/kg	*0.036*	SNA	0.27	<.030	0.13	1,400	ID	10,000	NA
6010	Nickel	4.0	mg/kg	SNA	SNA	<4.0	SNA	SNA	340,000	ID	9,600	NA
7740	Selenium	1.0	mg/kg	<1.0	SNA	<1.0	<1.0	<1.0	23,000	ID	69,000	NA
6010	Silver	1.0	mg/kg	<1.0	SNA	<1.0	<1.0	<5.0	21,000	ID	3500	NA
6010	Zinc	2.0	mg/kg	37	SNA	20	53	16,000	1,000,000	ID	ID	NA

Notes:
mg/kg - milligrams per kilogram
ID - Inadequate data to develop criterion.
SNA - Sample not analyzed for this parameter.
NA - Not applicable.
MDEQ - Michigan Department of Environmental Quality
DCV - Direct Contact Values for Industrial Sites from MDEQ "Environmental Response Division Operational Memorandum #14 (Revision 2)".
VSIC - Volatile Soil Inhalation Criteria from MDEQ "Draft Interim Generic Soil Inhalation Criteria for Ambient Air, 12/12/96".
PSIC - Particulate Soil Inhalation Criteria from MDEQ "Draft Interim Generic Soil Inhalation Criteria for Ambient Air, 12/12/96".
Csat - Generic Soil Saturation; from "Generic Soil Saturation Screening Concentrations, Technical Support Document, 01/17/97".
BOLD values exceed DCV
Italic values exceed GSI SWP
GSI SWP - Groundwater/Surface Water Interface-Soil/Water Partition Values; from Soil/Water Partitioning Criteria: Technical Support Document, 01/17/97".
* - Interim value, currently under review by MDEQ

TABLE 5-43
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN GROUNDWATER
SUPPLEMENTAL PHASE II ESI

WATER MAIN INSTALLATION
WILLOW RUN FACILITY
YPSILANTI, MICHIGAN

Parameter Detected EPA Method 8260 (VOC)	Units	Sample Identification				GSI Values	GCC	Water Solubility
		MW-F 08/25/97	MW-WB-1 08/25/97	MW-A 08/25/97	Detection Limit			
1,1-Dichloroethane	ug/L	3	SNA	SNA	1	NLS	2,100,000	5,100,000
1,1,1-Trichloroethane	ug/L	3	SNA	SNA	1	200	380,000	1,300,000

Notes:
ug/L - micrograms per liter
SNA - Sample not analyzed for this compound.
NLS - A literature search has not been completed; see GSI Criteria dated 07/28/97.
Samples collected August 25, 1997.
GCC - Groundwater Contact Criteria; from "Generic Groundwater Contact Criteria: Technical Support Document, 1/17/97".
GSI - Groundwater Surface Water Interface; from Michigan Department of Environmental Quality Operational Memorandum #14, Revision 2, addendum dated 07/28/97.
Bold values exceed GCC.
Italic values exceed GSI.

TABLE 5-44
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN GROUNDWATER
SUPPLEMENTAL PHASE II ESI

WATER MAIN INSTALLATION
WILLOW RUN FACILITY
YPSILANTI, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units		Sample Identification MW-F 08/25/97	MW-WB-1 08/25/97	MW-A 08/25/97	GSI Values	GCC	Water Solubility
200.8	Barium	200	ug/L	Total Dissolved*	200 220	SNA SNA	SNA SNA	NLS	15,000,000	--
245.1	Mercury	0.2	ug/L	Total Dissolved*	ND ND	ND ND	ND ND	0.0013{A}	>Solubility	56
200.8	Cadmium	0.2	ug/L	Total Dissolved*	SNA SNA	ND 0.6	SNA SNA	3.4{A,D}	110,000	--
200.8	Zinc	20	ug/L	Total Dissolved*	60 50	SNA SNA	SNA SNA	190{A,D}	**********	--

Notes:
ug/L - micrograms per liter
SNA - Sample not analyzed for this compound.
ND - Not detected.
Samples collected August 25, 1997.
* - Sample field-filtered using a 0.45-micron filter.
GCC - Groundwater Contact Criteria; from "Generic Groundwater Contact Criteria: Technical Support Document, 1/17/97".
GSI - Groundwater Surface Water Interface; from Michigan Department of Environmental Quality Operational Memorandum #14, Revision 2, addendum dated 07/28/97.
Bold values exceed GCC.
Italic values exceed GSI.
NLS - A literature search has not been completed.
{A} - Background, as defined in Rule 701 (c), may be substituted if higher than the cleanup criteria.
{D} - GSI value is pH, temperature, or water hardness dependent.

TECHNICAL REPORT

Quality Assurance Project Plan
Willow Run Assembly Plant
Ypsilanti, Michigan

General Motors Corporation
Worldwide Facilities Group
Remediation Team/Facilities Management
Flint, Michigan

February 1996

BBL
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1. Introduction

This project-specific Quality Assurance Project Plan (QAPP) has been developed to ensure that appropriate data collection and analysis procedures are implemented, and that accurate and precise data of known data quality are collected for this project. The QAPP has been prepared in accordance with United States Environmental Protection Agency (EPA) Quality Assurance/ Quality Control (QA/QC) guidelines, and the EPA Region IV Standard Operating Procedures (SOP) Manual. Data Quality Objectives (DQO) for this project include DQO levels I, II and III. Analytical data reporting levels for this project coincide with EPA analytical levels III and IV. All data will be validated in accordance with EPA Functional Data Validation Guidelines at the appropriate DQO and Analytical Data levels.

2. Project Description

The work to be performed comprises a Supplemental Phase II Environmental Site Investigation (ESI) and a Phase III Extent of Contamination (EOC) Study at General Motors Corporation's Willow Run Assembly Plant (Site) in Ypsilanti, Michigan. The scope of this project was based on BBL's initial Phase II ESI (BBL 1995) of the Site.

Six potential areas of environmental concern (PAOCs) investigated in the initial Phase II ESI require additional investigation. A PAOC is defined as follows: an area with a documented or known release(s) into the environment of a hazardous substance or oil, at levels that could adversely impact public health or the environment. The following PAOCs require further investigation:

PAOC	INVESTIGATION TYPE
PAOC 1 - Former Waste Water Treatment Plant (WWTP) Lagoon	Supplemental Phase II ESI
PAOC 2 - Former South Culvert Area	Supplemental Phase II ESI and Phase III EOC
PAOC 3 - North Hydraulic Elevator Pit	Phase III EOC
PAOC 6 - Former Aeration Basin	Supplemental Phase II ESI
PAOC 7 - Kaiser-Frazer Cinder Storage Area	Supplemental Phase II ESI
PAOC 16 - South Hydraulic Elevator Pit	Phase II ESI

A site plan showing the locations of the PAOCs is included as Figure 2. A Phase II ESI is an intrusive investigation performed to confirm or deny the presence of contaminants in soil or groundwater at levels of concern to the public health or the environment. A Supplemental Phase II ESI is an intrusive investigation preformed to collect additional data to complete an inconclusive Phase II ESI. A Phase III EOC Study is an intrusive investigation conducted to determine the horizontal and vertical extent of previously identified contamination.

3. Project Organization and Responsibilities

Primary responsibility for the quality control activities at the site will be undertaken by the Quality Assurance Officer (Ms. Nan E. Martin) who reports to the Project Manager (Ms. Barbara Sullivan, P.G.). The Field Manager (Mr. Alan J. Fass) is responsible for the implementation of all field activities, and he also reports to the Project Manager. The Quality Assurance Officer (QAO) will be responsible for ensuring the implementation of valid measurement systems. The analytical laboratory, Savannah Laboratories & Environmental Services, Inc., will be responsible for implementing and following the procedures documented in the Laboratory Quality Assurance Plan (LQAP), which is provided in Appendix A. Any revisions to the QAPP or LQAP will be reviewed and signed by the QAO.

Quality Assurance meetings and audits will be conducted on a periodic basis. These may involve BBL, project laboratories, and data validators. A required meeting or teleconference call between BBL and the project laboratory will be held prior to the start of the field studies.

4. Quality Assurance Objectives

4.1 Data Quality Objectives (DQO)

DQOs are qualitative and quantitative statements that ensure that data generated during these Supplemental Phase II ESI and Phase III EOC Study are adequate to support the objectives of the project. DQOs are based on the intended use and are specified for each data collection activity. Different levels of data quality are defined as the degree of uncertainty in the data with respect to precision, accuracy, representativeness, completeness, and comparability. The levels are assigned based on the data use, analytical requirements, and data quality.

Parameters of precision, accuracy, representativeness, completeness, and comparability (PARCC) are defined as follows:

Accuracy - is a measure of bias that exists in a measurement system. It refers to the degree of agreement of a measured value relative to a accepted reference or true value and is expressed as a percent or bias recovery.

Precision - a measure of mutual agreement between duplicate analyses of the same parameter, made under a given set of similar conditions. Precision is expressed in terms of the standard deviation of a set of results from the arithmetic mean, or a Relative Percent Difference (RPD) between the duplicate results.

Representativeness - expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter, variations at a sampling point, a process condition, or an environmental condition.

Completeness - a measure of the amount of valid data obtained from the sampling activities compared to the amount that was originally expected under ideal conditions. This is expressed as a percentage.

Comparability - expresses the confidence with which one data set can be compared to another.

All field and analytical data will be reviewed relative to these parameters and specific project requirements to assess the quality of the data achieved. The specific laboratory goals for PARCC parameters are defined in the LQAP. The DQOs for screening data and laboratory analytical data for this project are as follows:

DQO1 - Field screening data

DQO1 is a screening objective to afford a quick, preliminary assessment of site contamination. This objective for data quality is available for data collection activities that involve rapid, non-rigorous methods of analysis and quality assurance. The primary reason for this objective is to allow for the collection of the greatest amount of data with the least expenditure of time and money. The user should be aware that data collected for this objective have neither definitive identification of pollutants nor definitive quantitation of their concentration level.

DQO2 - Compound/element specific field screening data

DQO2 is a verification objective used to verify analytical (field or lab) results. A minimum of 10% verification of results is required. This objective for data quality is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings (10% or more) that were acquired using non-rigorous methods of analysis and quality assurance. This objective allows a quick focus on specific pollutants and specific levels of concentration, by using field screening methods and verifying at least 10% by more rigorous analytical methods and quality assurance.

DQO3 - Laboratory analytical data

DQO3 is a definitive objective used to assess the accuracy of the concentration level as well as the identity of the analyte(s) of interest. This objective for data quality is available for data collection activities that require a high degree of qualitative and quantitative accuracy of all findings using rigorous methods of analysis and quality assurance for critical samples (i.e. those samples for which the data are considered essential in making a decision). This quality objective is intended to give a level of confidence for a select group of critical samples so a decision can be made based on an action level with regard to: treatment; disposal; site remediation and/or removal of pollutants; health risk or environmental impact; cleanup verification; pollutant source identification; delineation of contaminants; and other significant decisions where an action level is of concern. Only those methods that are analyte specific can be used for this quality objective. Error determinations are made for all analytes that are of interest.

The EPA analytical support levels, as noted above, define the type of analysis and the associated level of QC effort. These levels are defined as follows:

Level I - Field screening or analysis using portable instruments.
Level II - Field analysis using sophisticated instruments.
Level III - Standard EPA approved laboratory methods.
Level IV - EPA CLP routine analytical services laboratory methods.
Level V - EPA CLP non-standard services laboratory methods.

4.2 Quality Assurance Objectives

Two quality assurance objectives for this project have been identified:

- Soil sampling for vapor screening QA/QC objectives (Level I).
- Soil and groundwater sampling for laboratory analyses QA/QC objectives (Level III).

4.2.1 QA/QC Objectives for Soil Sampling for Vapor Screening

Manufacturer's instrument calibration procedures will be followed and documented. Soil samples will be collected with inert equipment and placed into sampling jars for headspace screening. Duplicate analyses will be performed at a frequency of ten percent of the total samples analyzed for that sampling/analysis

episode. Field blanks and background checks will be conducted at a frequency of five percent of the total samples analyzed. EPA Level I DQO will be designated for all field screening.

4.2.2 QA/QC Objectives for Soil and Groundwater Sampling for Laboratory Analysis

Sampling procedures will be conducted in accordance with EPA QA/QC guidelines and policies. Sample integrity will be defined and the data will be of known quality. Duplicates, field blanks and equipment blanks at a frequency of ten percent of total samples will be collected and analyzed as indicators of sampling methodologies. EPA Level III and Level IV DQO and Analytical Reporting Levels will be designated for all laboratory analytical analyses.

5. Sampling Procedures

5.1 Data Collection Approach and Sampling Methodologies

Based on the data reviewed for each PAOC, soil borings and groundwater monitoring wells will be placed in the areas most likely to have been the source or discharge point. Soil samples will be collected by advancing a stainless steel geoprobe split-spoon sampler, at 2-foot intervals, down to the water table. Groundwater samples will be collected with a Teflon bailer. Samples collected for metals analyses will be divided into two aliquots. One aliquot will be filtered in the field with a 1.0 micron filter to eliminate larger suspended particles.

The soil and groundwater samples will be analyzed by appropriate analytical methods, as described in Table 1 of the Work Plan, taking into consideration the method quantitation limits and RBSC. Where appropriate, historical data will be used to reduce the number of geoprobe borings as well as the number of samples to be collected and analyzed.

5.2 Sampling and Analysis Plan

The sampling and analysis plan (SAP) in the form of a table is provided in Table 1 of the Work Plan. This SAP was prepared in accordance with GM's Generic Environmental Assessment RFP/Specifications, Phase I and II, dated April 13, 1994. The strategy applied to determine the location and quantity of sampling locations was as follows:

1. Determine the area of the PAOC;
2. Determine a reasonable grid size based on the appropriate DQOs;
3. Propagate the grid system onto the PAOC area;
4. Extrapolate the number of sampling points and compare to the area represented by the sampling point;
5. Determine if grid size is appropriate for the required data use and confidence level; and
6. Bias sampling locations based on historical data to reduce the quantity of sampling locations required to meet DQOs.

The sampling location rationale and sample analyses are presented for each PAOC identified in BBL's initial Phase II ESI. Based on historical information and discussions with the GM Remediation Team Staff, sampling locations and sample analysis methods were determined and are summarized in Table 1 of the Work Plan. Sample screening strategies will be employed, where appropriate, to reduce the number of samples analyzed by the laboratory and provide insight into selecting the appropriate samples for laboratory analyses. A TVA-1000 Organic Vapor Analyzer (OVA) will be used to detect organic vapors in the range of 1 ppm and greater. The TVA-1000 will be used as a gross screening instrument for soil samples, where appropriate. Analyses to be performed at each PAOC are based on the contaminants of concern identified in the Phase I ESA.

5.3 Health and Safety Air Monitoring

The contaminants of concern will be monitored in the breathing zone area according to the project Health and Safety Plan (HASP). A TVA-1000 Organic Vapor Analyzer and MIE MiniRam aerosol monitor will be used to monitor the breathing zone. Calibration procedures are discussed in Section 7 of this document.

6. Sample Management

6.1 Sample Bottles and Preservation

Sample bottles will be prepared by the laboratory and made available to the sampling team. The bottles will be prepared according to EPA recommended protocols for the analytes and matrices of concern. Preservative will be added in accordance with the requirements listed in the QAPP Appendix. If additional preservative is needed, the field crew will record the required adjustment on the field data sheet and on the chain-of-custody (COC) form.

6.2 Sample Document and Custody Procedures

BBL will use COC protocols consistent with EPA sample custody protocols as described in "NEIC Policies and Procedures" EPA-330/9-78-001-R, revised May 1986. The custody procedure is in three parts: 1. sample collection, 2. laboratory, and 3. final evidence files. Field custody (sample collection) procedures are described herein. These procedures provide documentation of the handling and tracking of a sample from time of collection through the time of analysis.

COC forms will accompany sample bottles to the field. The field crew will record whether the cooler was intact upon arrival in the field. The crew will contact the laboratory immediately if the seal is broken, bottles are damaged, or the proper number of bottles was not received. A record is maintained of sample collection, transfer, shipment, and receipt at the laboratory. COC documentation will include: Client and project, project number, sampling date and time, sample site location, cross-referenced site and sample numbers, analyses required, sample description, container and preservative, number of bottles, method of shipment (if applicable) including courier name and special instructions for the laboratory. A separate COC will be filled out for the contents of each shipment container.

Each time a sample is transferred to another custodian, signatures of the persons relinquishing and receiving the sample, time and date of the transfer must be obtained and documented on the COC. The original COC is shipped along with the samples. A copy of the COC will be retained by the Field Manager and relinquished to the QAO for sample tracking purposes.

Sample containers will be labeled with client, project number, sample location, sample date, time, description, preservative and analyses required.

6.3 Sample Handling and Shipping

The protection of personnel involved in the shipment of samples from the field to the laboratories is as important as the maintenance of the integrity of the samples themselves. The samples will either be picked up at the site by laboratory personnel, or dropped off at the laboratory by BBL personnel.

Samples obtained for the Supplemental Phase II ESI and the Phase III EOC Study will be classified as environmental or low level samples. Environmental samples are those which are collected off-site, around the perimeter of a waste site, or in areas where hazards are thought to be significantly reduced by normal processes.

In preparation for shipment to the analytical laboratories, all samples will be packaged in accordance with the following procedures:

- Check to make sure that sample is properly preserved; tighten cap securely; mark liquid levels if bottles are partially full;
- Make sure sample labels are securely attached to the sample container; place each container in a zip-loc or plastic bag, ensuring that labels are visible;
- Place containers in a cooler with sufficient ice or ice packs so that the samples remain at a temperature of 4°C during shipping;
- Put COC form in waterproof plastic bag, and tape to the underside of the cooler lid;
- Close and seal cooler with tape and custody seals in such a manner that the seals will be broken if the cooler is opened;
- Add clearly visible return address labels and "This End Up" labels on the outside of the cooler;
- Samples will be delivered to the laboratory 24 to 48 hours from the day of collection;
- The shipping service will be notified of the restricted articles prior to pick-up; and
- Notify the laboratory immediately following all sample shipments with the following information: No. of samples, types of samples, and times samples collected.

Field and trip blanks must be received in the field within one day of preparation in the laboratory. Blank water samples may be held up to two days of receipt at the site but must be returned to lab at the end of the second day. Specific COC procedures for each sample from its arrival in the laboratory through analysis are contained in the LQAP.

7. Calibration Procedures and Frequency

Each piece of equipment used in activities affecting quality is calibrated and maintained periodically to assure accuracy within specified limits. Standard procedures for field equipment maintenance, repair and calibration for all instruments and equipment will be followed.

7.1 Field procedures

It is the responsibility of the Field Team Leader to ensure that the field equipment is calibrated and maintained prior to use in the field, during field operations and after use.

Preventative maintenance of all field equipment will be addressed by an inventory control system implemented by BBL's Field Team Leader on an outgoing basis. The inventory control system maintains equipment control records, general equipment maintenance, and repair calibration records. This system ensures that routine maintenance and servicing of the equipment is performed in accordance with the appropriate DQOs and Analytical Levels.

7.2 Laboratory Procedures

Laboratory calibration procedures and frequency of calibration will follow the specifications contained in the LQAP. It will be the responsibility of the laboratories to perform and maintain instrument calibration for all laboratory equipment in accordance with appropriate EPA analytical methods and Section 8 of this plan.

8. Laboratory Analytical Procedures

The following analytical procedures will be utilized by the laboratory for the analysis of environmental samples:

- U.S. Environmental Protection Agency Contract Laboratory Protocol, Statement of Work, March 1990, protocols for analysis of organic and inorganic constituents.

- "Test Methods for Evaluating Solid Waste," SW-846 EPA, Office of Solid Waste, 1986 with updates.

- "Methods for Chemical Analysis of Water and Wastes," EPA Office of Research and Development, Cincinnati, OH. March 1983 EPA 600/4-79-020.

Table 2 of the Work Plan presents a summary of the OM #14, Revision 2, GSI values for groundwater and the industrial direct contact values for soils, the EPA methods, method detection limits, and target method detection limits. Analytical methods were selected so that the method detection limits complies with those listed in MDEQ OM#14, Revision 2.

The main objective of the QA/QC requirements is to assure the production of known data quality which will support the site investigation. There are two categories of QA/QC outlined in the analytical methods:

1. Instrument or system performance QA/QC; and
2. Sample or method performance QA/QC.

System performance assures that the equipment is operating correctly and that possible sources of error are under control. A number of items are required and documented: Instrument calibration, calibration verifications and blanks, check samples, range analysis and detection limit determination.

Method performance assures the analysis is within specified control limits and is evaluated through specific parameters used to assess the validity of the sample analysis which include:

Method Blank - Provides a means of assessing the existence and magnitude of contamination introduced during analysis and to assure that contaminants are not reflected in data results;

Trip Blank - Assesses contamination during bottle preparation and lab contamination introduced during the analysis;

Matrix Spike - The analyte of interest is added to a sample prior to preparation at every level of concentration and with every sample matrix within a case of samples. Matrix spikes (MS) are used to assess the effect of the sample matrix on the analytical method. The compounds used as spikes must provide a percent recovery that is within the established limits (accuracy). Additionally, the result

obtained for each of the Matrix Spike Duplicates (MSD) must agree within the required relative percent difference (RPD) limits (precision). MS/MSD will be analyzed at a frequency of 5%, or one per 20 samples per matrix;

Duplicates - Duplicate sample analysis is performed for each matrix and concentration level in a batch of samples. The results of the duplicate analyses serve as an indicator of the precision of the method. Duplicate samples will be analyzed at a frequency of 15%, or one per 7 samples per matrix; and

Surrogate Standards - An organic compound similar in chemical composition to analytes of interest is spiked into samples to provide accuracy and precision information to monitor sample preparation and analysis. The QC control limits, of data quality acceptance criteria for each type of QC performance samples, will be specified in the LQAP. The specific types and frequencies of QC checks that will be performed in support of each test method, the calibration procedures for each instrument, and the QC control limits and/or data quality acceptance criteria for each of the types of QC performance samples will be specified in detail in the LQAP. It is the responsibility of the laboratory to document, in each data package, that both initial and ongoing instrument and analytical QC requirements have been met.

Laboratory Reportables - Reports provided by the analytical laboratory will contain the following information pertaining to samples submitted for analysis:

- Analytical method - the method(s) established by the USEPA and used for analysis of a given sample.
- Parameter - the specific chemical contaminant which is a constituent of the sample provided for analysis.
- Result - the concentration of a chemical contaminant, expressed as a ratio of the quantity of that contaminant to the quantity of sampled media, such as parts of contaminant per billion parts of media.
- Method detection limit - the limit of detection for the submitted sample, or the lowest concentration of a chemical contaminant necessary for detection by the analytical equipment.
- Date sampled - date the analytical sample is collected in the field.
- Date analyzed - date the sample is analyzed by the laboratory.
- Date extracted - date the chemical is extracted, or separated from the contaminated media during preparation of the sample for laboratory analysis.
- Method blank
- Laboratory control standard
- Matrix spike, % recovery
- Matrix spike duplicate, % recovery
- Precision, as RPD limit (relative percent difference)
- Surrogate Recoveries, % accuracy

9. Data Tracking, Validation and Reporting

9.1 Data Tracking

Samples will be tracked during the sampling phase, laboratory analysis, and data validation program. Sample tracking will begin at the laboratory prior to sampling, when bottles are prepared and shipped. During sampling, this task will involve ensuring that the proper documentation, COC, and sample transport to the laboratory are performed. The laboratory will document extraction and analysis dates for tracking purposes. Furthermore, the QAO will maintain a record of receipt of analytical results, submittal of results for data validation, and completion of results to ensure that only validated and final analytical data are used in the Supplemental Phase II ESI and Phase III EOC Study.

9.2 Data Validation

Data validation is the assessment of data quality with respect to method requirements and technical performance. Analytical and field data packages are examined to ensure that all QC requirements are performed and that the data collected are of known data quality. Data reduction, validation, and reporting for samples analyzed by the laboratory will be performed in accordance with the Project Operations Plan and the specifications in the "Laboratory Data Validation Functional Guidelines," "CLP Organics Data Review and Preliminary Review" (EPA 1992a), and the SOP HW-2 "Evaluation of Metals Data for the CLP" (EPA 1992a), for format and content reference. The most current version of these documents will be used for validation purposes.

The validated data will be reduced and tabulated electronically. The tabulated format will be suitable for inclusion in the Supplemental Phase II ESI and the Phase III EOC Study. The data tabulations will be sorted by classes of constituents (e.g. VOCs, SVOCs, inorganics). Each individual table will contain the following information: sample identification, analytical parameters, detection limits, concentrations detected and qualifiers, as appropriate. A complete copy of the data package and data validation report will be contained in the Supplemental Phase II ESI and Phase III EOC Study as a separate appendix.

9.3 Data Reporting

Additional review and reduction of analytical and field data for the Supplemental Phase II ESI and the Phase III EOC Study will be conducted by the project team. Data qualifications will be determined utilizing QA/QC protocols in combination with the technical and professional judgment of the project team. Non-conformities will be used to determine the technical utility of the data relative to the proposed use.

Field measurement data will be similarly reduced into a tabulated format suitable for inclusion in the Supplemental Phase II ESI and the Phase III EOC Study. These tabulations will include but not be limited to the following information: Field screening results, field analyses, well construction details, and water-level measurements and surveyed measuring point elevations.

Certain field logs will be transferred into typed formats or organized in their original form for inclusion in the report as appendices. The following field logs will be included in the report: Sample/Core logs, well construction logs, water-level logs, and water sampling logs.

10. Internal Quality Control Checks

General programmatic requirements for internal quality control checks are established in BBL's Comprehensive Quality Assurance Plan (ComQAP). Laboratory quality control checks will be performed as discussed in the LQAP. These specifications include the types of control samples required, the frequency of each control, the compounds to be used for sample spikes and surrogate spikes and the quality control acceptance criteria.

Internal quality control checks will be documented in the data validation packages.

11. System and Performance Audits

Audits may be performed by BBL and GM. The performance and system audits for the laboratory are described in the LQAP.

11.1 System Audits

System audits will be carried out to verify that:

- The QA/QC procedures are established and followed;
- The reviews and sign-offs required in BBL's procedures are being implemented; and
- Internal audits are conducted by the laboratories on a regular basis.

11.2 Performance Audits

Performance audits are more extensive than system audits and are used to monitor project specific field and lab activities. Performance audits involve review of on-site field investigation procedures, equipment calibration techniques and records, laboratory QA/QC and sample documentation.

12. Preventive Maintenance

12.1 Field Procedures

The field equipment preventive maintenance program helps to ensure the effective completion of the sampling effort and is designed to minimize equipment down time. Program implementation is concentrated in three areas:

- Maintenance responsibilities;
- Maintenance schedules; and
- Inventory of critical spare parts and equipment.

The maintenance responsibilities for field equipment will be assigned to the Field Manager. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for determining that critical spare parts are included with the field equipment. An adequate inventory of spare parts will be maintained to minimize down time. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes and/or cannot be obtained in a timely manner.

12.2 Laboratory Procedures

All analytical equipment at the analytical laboratory will be covered by some type of maintenance contract. The degree and extent of outside (contracted) routine and/or preventive maintenance assistance will be a function of the complexity of the equipment, and the contract laboratory expertise relative to repair and/or maintenance of the instrumentation.

Annual preventive maintenance service visits will involve cleaning, adjusting, inspecting and testing procedures designed to deduce product failure and/or extent useful product life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by contract laboratory personnel.

13. Specific Routine Procedures to Assess Data Precision, Accuracy and Completeness

13.1 Field Procedures

In order to maintain data quality, field procedures have been developed and are contained in the "Supplemental Phase II Environmental Site Investigation and Phase III Extent of Contamination Study Work Willow Run Assembly Plant" (Work Plan).

Field generated information such as soil and rock conditions, logs and field analysis forms will be reviewed for validity. The review will include bound logbooks/forms, data entry and calculation checks.

13.2 Laboratory Procedures

Quality Assurance (QA) procedures are based on the specific method used for sample analysis. Each analytical procedure includes determination maintenance of standard response and linearity, instrument tuning, internal standard responses, surrogate recoveries in blanks and samples, spike recoveries and duplicate precision. Many of the QA criteria are method based. Decisions as to corrective action in the form of re-analysis will be determined by the laboratory QA director together with the project QAO. Surrogate, internal standard and spike recoveries will be plotted on control charts so that trends in data quality can also be monitored so that appropriate and timely corrective actions can be implemented.

The contract laboratory's QA/QC program will include the following elements:

- Precision, in terms of relative percent difference (RPD), will be determined by relative sample analysis at a frequency of one per sample set or one sample in ten (10%) whichever is greater or at the appropriate frequency as prescribed by the analytical method. RPD is defined as the absolute difference of duplicate measurements divided by the mean of the analyses normalized to percentage.

- Accuracy, in terms of percent recovery (recovery of known constituent additions or surrogate recoveries), will be determined by the analysis of spiked and unspiked samples. The objective is to spike with such a quantity as to raise the sample concentration to 75% of the working analytical range. For large on-going projects, it will often be best to perform the spiking of a random sample after the initial analysis has been completed. Alternatively and specific to certain methods, matrix spike and matrix spike duplicates are used for expression of accuracy. Recovery data can be gathered in two forms; relative recovery and absolute recovery. Relative recovery is based on a spike being added to project samples while absolute recovery is based upon the standard reference materials (SRMs) or spiking of laboratory water (matrix spike blank). The frequency of spiking for both absolute and/or relative recoveries will be one per set of twenty project samples.

- With each set of project samples a method blank will be prepared and analyzed. If field blanks are received, this blank will be processed and reported as a project sample. Trip blanks will be prepared and analyzed for volatile organic compounds (VOCs) with the project specific samples.

Additionally, holding blanks for volatile analysis and solvent blanks will be prepared as required. Solvent blanks are analyzed based upon method blank results and/or changes in solvent suppliers/lots. Unprocessed solvent blanks will be continually analyzed on the GC and or GC/MS as a routine control measure for these instruments.

- SRMs will be used for each analysis. Sources of SRMs include the EPA, commercially available material from certified vendors and/or laboratory produced solutions. SRMs when available and appropriate, will be processed and analyzed on a frequency of one per set of samples.

- Stock and working standard solutions and separate spiking solutions will be prepared from materials supplied by the EPA or purchased from commercially available sources. Standard curves will be generated consistent with methodology. Standard curves will be produced once per day and/or verified by re-analysis of mid-range standards at least every tenth sample. Standard curves for conventional parameters will not be generated daily but will be verified on a daily basis. Standard curves will also be reviewed for consistency to help identify problems that could be associated with the applicable instruments and/or the standard solutions.

- Completeness is the evaluation of the amount of valid data generated versus the total set of data produced from a particular sampling and analysis event. Valid data is determined by independent confirmation of compliance with method-specific and project-specific data quality objectives. The calculation of data set completeness will be performed by the following equation.

$$\frac{\textit{Number of Validated Sample Results}}{\textit{Total Number of Sample Results Reported}} \; X \; 100 \; \% = \% \; \textit{Complete}$$

14. Investigative Corrective Action

All non-conformances within the established quality control procedures will be identified and controlled. The field team leader will be responsible for making corrective actions on a day to day basis during the field activities. All changes will be documented in the logbook, and the QAO will be notified.

The QAO will identify non-conformances which are of program significance or which require special expertise and will notify the Project Manager. Corrective action may include:

- Re-analyses of sample parameters;
- Re-sampling of site location; and
- Accepting the data and determining its level of uncertainty.

The Project Manager will be responsible to ensure that corrective actions for non-conformance are implemented by:

- Evaluating all reported non-conformances;
- Controlling additional work on non-conforming items;
- Determining and evaluating disposition or action to be taken;
- Maintaining a log of non-conformance;
- Reviewing non-conformance reports; and
- Ensuring that non-conformance reports are included in the final site documentation.

Any staff member who discovers or suspects a non-conformance, that is an identified or suspected deficiency in an approved document, is responsible for initiating a non-conformance report.

The Project Manager will ensure that additional work dependent on the non-conforming activity will not be performed until the non-conformance is corrected.

15. Quality Assurance Reports

The Project Manager and the QAO, will review the implementation of this QAPP on a regular basis and submit periodic summary reports to the Project Manager as described below. These reviews will include an assessment of data quality, deliverables, QC activities, and the results of systems and/or performance audits as appropriate. Regular QA reporting throughout the duration of the project, as well as reporting on an as-needed basis, may include the following: Progress reports, conference calls, and/or meetings.

Progress reports will be prepared as appropriate. At a minimum these reports will include the following: a description of the activities that have taken place during the quarter, all validated results of analytical data, a description of all data anticipated and activities scheduled for the next quarter and a description of any problems encountered or anticipated;

Conference calls and/or meetings will be scheduled if requested by the project coordinator to discuss any concerns that may arise during the course of the field program that might require significant corrective actions, changes to the scope of work, or departures form the approved project SOPs; and

Serious deficiencies in sampling and/or monitoring data will be reported to the Project Manager as soon as practicable after such deficiencies have been noted.

The laboratory's internal QA reporting is described in the LQAP.

APPENDIX A
SAMPLE PRESERVATION AND HOLDING TIMES

SAMPLE PRESERVATION AND HOLDING TIMES CONTAINERS, VOLUME REQUIREMENTS AND METHOD

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WATER AND WASTEWATER

TEST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
ACIDITY		100	P,G	COOL, 4°C	24 HOURS	2310
ALKALINITY		100	P,G	COOL, 4°C	24 HOURS	2320
ASBESTOS (PLM)		100	P,G	NONE REQUIRED	30 DAYS	600/M4-82
ASBESTOS (TEM)		100	P,G	NONE REQUIRED	30 DAYS	----
BICARBONATE		100	P,G	COOL, 4°C	24 HOURS	2320
BOD	COMP.	1000	P,G	COOL, 4°C	48 HOURS	405.1
BROMIDE		100	P,G	NONE REQUIRED	28 DAYS	D1246
CARBONATE		100	P,G	COOL, 4°C	24 HOURS	2320
COD	COMP.	50	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	410.4
CHLORIDE		50	P,G	NONE REQUIRED	28 DAYS	4500-CL-E
CHLORINE - (FIELD)		200	P,G	NONE REQUIRED	ANALYZE IMMED.	PAPER TES
CHLORINE, TOTAL RESIDUAL		200	P,G	NONE REQUIRED	ANALYZE IMMED.	4500-Cl-
CHLORINE DEMAND		200	P,G	NONE REQUIRED	ANALYZE IMMED.	409A
COLIFORM FECAL		100	P,G	COOL, 4°C 0.008% SODIUM THIOSULFATE	6 HOURS	9132
COLIFORM TOTAL		100	P,G	COOL, 4°C 0.008% SODIUM THIOSULFATE	6 HOURS	9132
COLOR		50	P,G	COOL, 4°C	48 HOURS	110.3
CONDUCTIVITY		100	P,G	COOL, 4°C	28 DAYS	120.1

METHOD SOURCES: MCAWW, ASTM, CFR, STANDARD METHODS

WATER AND WASTEWATER

ST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
ANIDES, TOTAL	GRAB	500	P,G	COOL, 4°C SODIUM HYDROXIDE TO pH>12, *0.6g ASCORBIC ACID	14 DAYS	335.2/ 335.3
AMENABLE	GRAB	500	P,G	COOL, 4°C SODIUM HYDROXIDE TO pH>12, *0.6g ASCORBIC ACID	14 DAYS	335.1
FREE		500	P,G	COOL, 4°C SODIUM HYDROXIDE TO pH>12, *0.6g ASCORBIC ACID	14 DAYS	4500-CN-I
ISSOLVED OXYGEN		300	BOD BOTTLE	NONE REQUIRED	ANALYZE ON SITE	360.1
RIDE	COMP.	300	P,G	NONE REQUIRED	28 DAYS	340.2
JNGI, TOTAL		50	P,G	NONE REQUIRED	48 HOURS	STAIN
ARDNESS		100	P,G	NITRIC ACID TO pH<2	6 MONTHS	200.7 & 2340B
ODIDE		100	P,G	COOL, 4°C	24 HOURS	D1246
EGIONELLA		100	P,G	NONE REQUIRED	48 HOURS	DYE
ETALS, TOTAL	COMP.	100	P,G	COOL, 4°C NITRIC ACID TO pH<2	6 MONTHS	200.7
MERCURY	COMP.	100	G ONLY	COOL, 4°C NITRIC ACID TO pH<2	28 DAYS	245.2
CHROMIUM VI	COMP.	200	P,G	COOL, 4°C NO PRESERV.	24 HOURS	7196
DRINKING WATER	----	1000	P,G	COOL, 4°C NITRIC ACID TO pH<2	6 MONTHS	200.7
ISSOLVED	----	200	P,G	COOL, 4°C NITRIC ACID TO pH<2 FILTER ON SITE	6 MONTHS	200.7

METHOD SOURCES: MCAWW, ASTM, STANDARD METHODS

ACID OR BASE IN THE PRESENCE OF RESIDUAL CHLORINE

WATER AND WASTEWATER

TEST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
NITROGEN AS: AMMONIA	COMP.	400	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	350.3
KJELDAHL	COMP.	500	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	351.3
NITRATE	COMP.	100	P,G	COOL, 4°C	48 HOURS	D81-0025
NITRITE	COMP.	50	P,G	COOL, 4°C	48 HOURS	354.
ODOR		200	G ONLY	COOL, 4°C	24 HOURS	140.1
OIL & GREASE	GRAB	1000	G ONLY	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	413.2
PH	GRAB	25	P,G	NONE REQUIRED	ANALYZE IMMED.	150.1
PHENOLICS (4AAP), TOTAL	GRAB	500	G ONLY	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	420. 4?
PHOSPHATE		50	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	200.7
PHOSPHORUS, TOTAL		50	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	200.7
DISSOLVED		50	P,G	COOL, 4°C SULFURIC ACID TO pH<2 FILTER ON SITE	24 HOURS	200.7
RADIATION SCREEN		100	P,G	NONE REQUIRED	—	D3648
SOLIDS, TOTAL	COMP.	100	P,G	COOL, 4°C	7 DAYS	160.3
DISSOLVED (TDS)	COMP.	100	P,G	COOL, 4°C	7 DAYS	160.1
SUSPENDED (TSS)	COMP.	500	P,G	COOL, 4°C	7 DAYS	160.2
SULFATE		50	P,G	COOL, 4°C	28 DAYS	200.7

WATER AND WASTEWATER

EST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
ULFIDE, TOTAL	GRAB	500	P,G	COOL, 4°C ADD 2ml OF 2N ZINC ACETATE PLUS SODIUM HYDROXIDE TO pH>9	7 DAYS	376.1
ULFITE		50	P,G	NONE REQUIRED	ANALYZE IMMED.	377.1
ULFUR		100	P,G	COOL, 4°C NITRIC ACID TO pH<2	6 MONTHS	200.7
URFACTANTS/MBAS		250	P,G	COOL, 4°C	48 HOURS	5540C
EMPERATURE		1000	P,G	NONE REQUIRED	ANALYZE ON SITE	170.1
OTAL BACTERIA/ OTAL PLATE COUNT		1000	P,G	COOL, 4°C	48 HOURS	9215D
OTAL ORGANIC ARBON (TOC)		25	P,G	COOL, 4°C SULFURIC ACID OR HYDROCHLORIC ACID TO pH<2	28 DAYS	415.1
TOTAL ORGANIC ALOGENS (TOX)		100	G, AMBER TEFLON LINED CAP	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	9020
OTAL PETROLEUM HYDROCARBONS (TPH)		1000	G ONLY	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	418.1
TRIHALOMETHANES		40	VOA	COOL, 4°C	14 DAYS	502.2
URBIDITY		100	P,G	COOL, 4°C	48 HOURS	180.1

METHOD SOURCES: MCAWW, EPA SW-846, STANDARD METHODS

METHOD NUMBER	TEST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME
601	VOLATILES: HALOGENATED	GRAB	40	VOA	COOL, 4°C *0.008% SODIUM THIOSULFATE	14 DAY
602	VOLATILES: AROMATIC & NON-HALOGENATED (BTEX & MTBE)	GRAB	40	VOA	COOL, 4°C SULFURIC ACID TO pH<2 *0.008% SODIUM THIOSULFATE	14 DAY
604	PHENOLS-GC		1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/40
608	PESTICIDES & PCBS		1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/40
610	PNA/PAH		1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/40
5	HERBICIDES		1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/4
624	TTO (VOLATILES)	GRAB	40 & 40	VOA	COOL, 4°C *0.008% SODIUM THIOSULFATE; COOL, 4°C SULFURIC ACID TO pH<2 *0.008% SODIUM THIOSULFATE	14 DAY
625	TTO (SEMI-VOLATILES, PNA/PAH, PCBS, PESTICIDES)	COMP.	1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/40
CALIFORNIA-DHS (8015M)	TPH-GC		2 x 1000	G, AMBER TEFLON LINED CAP	COOL, 4°C HYDROCHLORIC ACID TO pH<2	7/4
GRO *PUBL-SW-140	GASOLINE RANGE ORGANICS		2 x 40	VOA	COOL, 4°C HYDROCHLORIC ACID TO pH<2	14 DAY
RO PUBL-SW-141	DIESEL RANGE ORGANICS		2 x 1000	G, AMBER TEFLON LINED CAP	COOL, 4°C HYDROCHLORIC ACID TO pH<2	7/47
---	FSCAN		2 x 40	VOA	COOL, 4°C	14 DA

METHOD SOURCES: EPA-600/4-79-020, CALIFORNIA METHOD, *WISCONSIN DNR
^ = DAYS UNTIL EXTRACTION/DAYS AFTER EXTRACTION

SOIL, SEDIMENT, SLUDGE & SOLID WASTE

F"HOD BER	TEST	MINIMUM VOLUME REQUIRED (oz)	CONTAINER	PRESERVATIVE	HOLDING TIME
0	VOLATILES: HALOGENATED	4	G, WITH SEPTUM	COOL, 4°C	14 DAYS
:0	VOLATILES: AROMATIC & NON-HALOGENATED (BTEX & MTBE)	4	G, WITH SEPTUM	COOL, 4°C	14 DAYS
,040	PHENOLS-GC	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
3080	PESTICIDES & PCBS	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
0,8310	PNA/PAH	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
50	HERBICIDES	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
60	TTO (VOLATILES)	4	G, WITH SEPTUM	COOL, 4°C	14 DAYS
70	TTO (SEMI-VOLATILES, PNA/PAH, PCBS, PESTICIDES)	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
:ALIFORNIA-D"S (8015M)	TPH-GC	8	G, TEFLON LINED CAP	COOL, 4°C	3 DAYS
,RO •PUBL-SW-140	GASOLINE RANGE ORGANICS	25g in 40ml	VOA	*COOL, 4°C	14 DAYS
;RO •PUBL-SW-141	DIESEL RANGE ORGANICS	4	VOA	COOL, 4°C	3 DAYS
--	FSCAN	4	G, WITH SEPTUM	COOL, 4°C	14 DAYS

.ETHOD SOURCES: EPA SW-846, CALIFORNIA METHOD, •WISCONSIN DNR

^ = DAYS UNTIL EXTRACTION/DAYS AFTER EXTRACTION

METHOD NUMBER	TEST	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME
8010	VOLATILES: HALOGENATED	**2 x 40	G, WITH SEPTUM	COOL, 4°C SULFURIC ACID TO pH<2 *4 DROPS	14 DAYS
8020	VOLATILES: AROMATIC & NON-HALOGENATED (BTEX & MTBE)	**2 x 40	G, WITH SEPTUM	COOL, 4°C SULFURIC ACID TO pH<2 *4 DROPS	14 DAYS
8040	PHENOLS-GC	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
8080	PESTICIDES & PCBS	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
8100,8310	PNA/PAH	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
8150	HERBICIDES	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
8260	TTO (VOLATILES)	**2 x 40	G, WITH SEPTUM	COOL, 4°C *4 DROPS	14 DAYS
8270	TTO (SEMI-VOLATILES, PNA/PAH, PCBS, PESTICIDES)	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
CALIFORNIA-DHS	TPH-GC	100	G ONLY	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS
---	FSCAN	2 x 40	G, WITH SEPTUM	COOL, 4°C	14 DAYS

METHOD SOURCES: EPA SW-846, CALIFORNIA METHOD

^ = DAYS UNTIL EXTRACTION/DAYS AFTER EXTRACTION
(FOR CONCENTRATED LIQUID WASTE, THE HOLDING TIME = 14/40)

*10 % SODIUM THIOSULFATE: SHOULD ONLY BE USED IN THE PRESENCE OF RESIDUAL CHLORINE

*ALL CONCENTRATED LIQUID WASTE: USE AN 8oz WIDEMOUTH JAR WITHOUT PRESERVATIVES.

LIQUID WASTE & SOIL, SEDIMENT, SLUDGE & SOLID WASTE

EST	MINIMUM VOLUME REQUIRED (g/ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
CIDITY	20/100	P,G	COOL, 4°C	14 DAYS	2310
LKALINITY	20/100	P,G	COOL, 4°C	14 DAYS	2320
BESTOS (PLM)	10/100	P,G	NONE REQUIRED	30 DAYS	600/M4-82020
BESTOS (TEM)	10/100	P,G	NONE REQUIRED	30 DAYS	----
H CONTENT	50/100	P,G	COOL, 4°C	7 DAYS	160.4
OTTOM SEDIMENT WATER (BS&W)	100mls	P,G	NONE REQUIRED	28 DAYS	D96
RITISH THERMAL NITS (BTU/lb)	50/50	P,G	NONE REQUIRED	28 DAYS	D240
LORINE	20/100	P,G	COOL, 4°C	14 DAYS	D4208, 207M-PARR
ONDUCTIVITY	100	P,G	COOL, 4°C	28 DAYS	9050
ORROSIVITY/pH	25/25	P,G	NONE REQUIRED	ANALYZE IMMED.	9045/9040
YANIDE, TOTAL	50/500	P,G	COOL, 4°C * SODIUM HYDROXIDE TO pH>12	14 DAYS	9010
AMENABLE	100/500	P,G	COOL, 4°C * SODIUM HYDROXIDE TO pH>12	14 DAYS	9010
REACTIVE	50/500	P,G	COOL, 4°C	ANALYZE IMMED.	7.3.3.2
ENSITY	50/250	P,G	NONE REQUIRED	28 DAYS	D5057/D287
XTRACTABLE RGANIC HALOGENS EOX)	20/20	G ONLY	COOL, 4°C	28 DAYS	9020M (TR-019)
ORMALDEHYDE	50/50	G ONLY	COOL, 4°C	28 DAYS	8315
ITIBILITY/ FLASH POINT	200/100	G ONLY	COOL, 4°C	ANALYZE IMMED.	1010

METHOD SOURCES: EPA SW-846, ASTM, CFR, STANDARD METHODS, MCAWW, DOHRMANN, PARR

LIQUID WASTE & SOIL, SEDIMENT, SLUDGE & SOLID WASTE

TEST	MINIMUM VOLUME REQUIRED (g/ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
METALS, TOTAL	100/100	P,G	COOL, 4°C *NITRIC ACID TO pH<2	6 MONTHS	6010
MERCURY	100/100	G ONLY	COOL, 4°C *NITRIC ACID TO pH<2	28 DAYS	7471/7470
CHROMIUM VI	100/200	P,G	COOL, 4°C NO PRESERV.	24 HOURS	7196
OXIDATION SCREEN	20/100	P,G	NONE REQUIRED	28 DAYS	D4981
PAINT FILTER TEST	50/100	P,G	NONE REQUIRED	28 DAYS	9095
PHENOLS, TOTAL	500	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	9065,9066
ERCENT WATER	50/50	P,G	NONE REQUIRED	28 DAYS	D3792
RADIATION SCREEN	10/100	P,G	NONE REQUIRED	---	D3648
SOLIDS, TOTAL (%)	50/100	P,G	NONE REQUIRED	7 DAYS	2540-G
SULFIDE, TOTAL	50/500	P,G	COOL, 4°C *ADD 2ml OF 2N ZINC ACETATE	7 DAYS	9030
REACTIVE	50/100	P,G	COOL, 4°C	A.S.A.P.	7.3.4.1
TOTAL HALOGENS AS CHLORINE (TX)	20/100	P,G	COOL, 4°C	14 DAYS	9020M - (TR-019
TOTAL ORGANIC CARBON (TOC)	25/25	P,G	COOL, 4°C *SULFURIC ACID OR HYDROCHLORIC ACID TO pH<2	28 DAYS	9060
TOTAL PETROLEUM HYDROCARBONS (TPH)	100/100	G ONLY	COOL, 4°C *SULFURIC ACID TO pH<2	28 DAYS	418.1
VISCOSITY	1000mls	P,G	COOL, 4°C	28 DAYS	D2196
WATER MIX SCREEN	50/100	P,G	COOL, 4°C	28 DAYS	D5058

METHOD SOURCES: EPA SW-846, MCAWW, ASTM, DOHRMANN, STANDARD METHODS

*AQUEOUS SAMPLES ONLY

TCLP (TOXICITY CHARACTERISTIC LEACHING PROCEDURE) WASTE

TEST	MINIMUM VOLUME REQUIRED (oz)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
METALS,	8	P,G	COOL, 4°C *NITRIC ACID TO pH<2	180/180^	1311 & 6010
MERCURY	8	G ONLY	COOL, 4°C *NITRIC ACID TO pH<2	28/28^	1311 & 7471/7470
ORGANICS:					
VOLATILES	8	G, WITH SEPTUM	COOL, 4°C	14/14^	1311 & 8010, 8020 OR 8260
SEMI-VOLATILES	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^	1311 & 8270
PESTICIDES & HERBICIDES	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^	1311 & 8080, 8150

METHOD SOURCES: EPA SW-846, CFR

\QUEOUS SAMPLES ONLY

= DAYS UNTIL EXTRACTION/DAYS AFTER EXTRACTION

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*NOTE: This information is current through January, 1993 and is subject to change.

QUALITY ASSURANCE PROJECT PLAN

PHASE II ENVIRONMENTAL SITE INVESTIGATION

PREPARED FOR

GENERAL MOTORS
WILLOW RUN ASSEMBLY PLANT
YPSILANTI, MICHIGAN

JUNE 1995

PROJECT NUMBER: 480.27.002

PREPARED BY:

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SECTION 1.0 - INTRODUCTION

This project-specific QAPP has been developed to ensure that appropriate data collection and analysis procedures are implemented, and that accurate and precise data of known data quality are collected for this project. The QAPP has been prepared in accordance with USEPA Quality Assurance/Quality Control (QA/QC) guidelines, and the USEPA Region IV Standard Operating Procedures (SOP) Manual. Data Quality Objectives (DQO) for this project include DQO level's I, II and III. Analytical data reporting levels for this project coincide with USEPA analytical levels III and IV. All data will be validated in accordance with EPA Functional Data Validation Guidelines at the appropriate Data Quality Objectives and Analytical Data levels.

SECTION 2.0 - PROJECT DESCRIPTION

The work to be performed comprises a Phase II Environmental Site Investigation (ESI) at General Motors Corporation's (GM) Willow Run Creek (WRC) Assembly Plant (Facility). The scope of this project was based on BB&L's review of Chester Environmental's Phase I ESA of the facility.

The purpose of the Phase II ESI is to determine whether hazardous substances or oil have in fact been released to the environment at concentrations of concern, as defined in GM's Generic Environmental Assessment RFP/Specifications, Phase I and II, dated April 13, 1994. The ESI will concentrate on:

1) The hazardous substances and oil known or likely to have been managed at the Potential Areas of Concern (PAOC) identified in Chester's Phase I ESA for the facility;
2) The areas most likely to have been impacted by the suspected release;
3) Developing efficient sampling strategies;
4) Developing regional or background concentrations;
5) Reviewing and incorporating local and federal regulation requirements to assure proper and acceptable protocols are used.

The following are the PAOC's as defined by GM and described in Chester's Phase I ESA for the facility:

1) Former WWTP Lagoons Subsurface Soil
2) Former South Culvert Area
3) North Hydraulic Elevator Pit
4) Leaking Pipe System of Former Tank Area
5) ELPO Tank Building Area

6) Former Aeration Basin

7) Kaiser-Frasier Cinder Storage Area

SECTION 3.0 - PROJECT ORGANIZATION AND RESPONSIBILITIES

Primary responsibility for the quality control activities at the site will be undertaken by the Quality Assurance Officer (Ms. Nan E. Martin) who reports to the Project Manager (Mr. Sven Pavlovics, R.E.M.). The Field Manager (Mr. Michael Mueller) is responsible for the implementation of all field activities, and he also reports to the Project Manager. The Quality Assurance Officer (QAO) will be responsible for ensuring the implementation of valid measurement systems. The analytical laboratory, Environmental Compliance, Inc., will be responsible for implementing and following the procedures documented in the Laboratory Quality Assurance Plan, which is provided in Appendix 1. Any revisions to the QAPP or Laboratory Quality Assurance Plan will be reviewed and signed by the QAO.

Quality Assurance meetings and audits will be conducted on a periodic basis. These may involve BB&L, MDNR, project laboratories, and data validators. A required meeting between BB&L and the project laboratories will be held prior to the start of the field studies.

SECTION 4.0 - QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

4.1 Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements that ensure that data generated during the Phase II ESI are adequate to support the objectives of the project. DQOs are based on the intended use and are specified for each data collection activity. Different levels of data quality are defined as the degree of uncertainty in the data with respect to precision, accuracy, representativeness, completeness, and comparability. The levels are assigned based on the data use, analytical requirements, and data quality. Parameters of precision, accuracy, representativeness, completeness, and comparability (PARCC) are defined as follows:

Accuracy - is a measure of bias that exists in a measurement system. It refers to the degree of agreement of a measured value relative to a accepted reference or true value and is expressed as a percent or bias recovery.

Precision - a measure of mutual agreement between duplicate analyses of the same parameter, made under a given set of similar conditions. Precision is expressed in terms of the standard deviation of a set of results from the arithmetic mean, or a Relative Percent Difference (RPD) between the duplicate results.

Representativeness - expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter, variations at a sampling point, a process condition, or an environmental condition.

Completeness - a measure of the amount of valid data obtained from the sampling activities compared to the amount that was originally expected under ideal conditions. This is expressed as a percentage.

Comparability - expresses the confidence with which one data set can be compared to another.

All field and analytical data will be reviewed relative to these parameters and specific project requirements to assess the quality of the data achieved. The specific laboratory goals for PARCC parameters are defined in the Laboratory Quality Assurance Plan. The DQOs for screening data and laboratory analytical data for this project are as follows:

DQO1 - Field screening data

DQO1 is a screening objective to afford a quick, preliminary assessment of site contamination. This objective for data quality is available for data collection activities that involve rapid, non-rigorous methods of analysis and quality assurance. These methods are used to make quick, preliminary assessments of types and levels of pollutants. The primary reason for this objective is to allow for the collection of the greatest amount of data with the least expenditure of time and money. The user should be aware that data collected for this objective have neither definitive identification of pollutants nor definitive quantitation of their concentration level.

DQO2 - Compound/element specific field screening data

DQO2 is a verification objective used to verify analytical (field or lab) results. A minimum of 10% verification of results is required. This objective for data quality is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings (10% or more) that were acquired using non-rigorous methods of analysis and quality assurance. This objective allows a quick focus on specific pollutants and

specific levels of concentration, by using field screening methods and verifying at least 10% by more rigorous analytical methods and quality assurance.

DQO3 - Laboratory analytical data

DQO3 is a definitive objective used to assess the accuracy of the concentration level as well as the identity of the analyte(s) of interest. This objective for data quality is available for data collection activities that require a high degree of qualitative and quantitative accuracy of all findings using rigorous methods of analysis and quality assurance for critical samples (i.e. those samples for which the data are considered essential in making a decision). This quality objective is intended to give a level of confidence for a select group of critical samples so a decision can be made based on an action level with regard to: treatment; disposal; site remediation and/or removal of pollutants; health risk or environmental impact; cleanup verification; pollutant source identification; delineation of contaminants; and other significant decisions where an action level is of concern. Only those methods that are analyte specific can be used for this quality objective. Error determinations are made for all analytes that are of interest.

The USEPA analytical support levels as noted above define the type of analysis and the associated level of QC effort. These levels are defined as follows:

Level I - Field screening or analysis using portable instruments.

Level II - Field analysis using sophisticated instruments.

Level III - Standard USEPA approved laboratory methods.

Level IV - USEPA CLP routine analytical services laboratory methods.

Level V - USEPA CLP non-standard services laboratory methods.

4.2 Quality Assurance Objectives

Two quality assurance objectives for this project have been identified:

- Soil and ground-water sampling and vapor screening QA/QC objectives.
- Soil and ground-water sampling and laboratory analysis QA/QC objectives.

4.2.1 QA/QC Objectives for Soil and Ground-water Sampling and Vapor Screening

Manufacturer's instrument calibration procedures will be followed and documented. Soil samples will be collected with inert equipment and placed into sampling jars for headspace screening. Duplicate analyses will be performed at a frequency of 10 percent of the total samples analyzed for that sampling/analysis episode. Field blanks and background checks will be conducted at a frequency of 5 percent of the total samples analyzed.

4.2.2 QA/QC Objectives for Soil and Ground-water Sampling and Laboratory Analysis

Sampling procedures will be conducted in accordance with USEPA QA/QC guidelines and policies. Sample integrity will be defined and the data will be of known quality. Duplicates, field blanks and equipment blanks at a frequency of 10 percent of total samples will be collected and analyzed as indicators of sampling methodologies. USEPA Level III Data Quality Objectives and Level ~~III~~ IV Analytical Reporting Levels will be designated for all laboratory analytical analyses.

SECTION 5.0 - SAMPLING PROCEDURES

5.1 Data Collection Approach and Sampling Methodologies

Based on the data reviewed for each PAOC, soil borings and ground-water monitoring wells will be placed in the areas most likely to have been the source or discharge point. Soil samples will be collected by advancing a stainless steel geoprobe split-spoon sampler at 2-foot intervals into the water table. The ground-water samples will be analyzed by appropriate analytical methods described in Table 1, taking into consideration the method quantitation limits and Michigan Type-C Criteria. Where appropriate, historical data will be used to reduce the number of geoprobe borings as well as the number of samples to be collected and analyzed.

5.2 Sampling and Analysis Plan

The sampling and analysis plan (SAP) in the form of a table is provided in Table 1. This SAP was prepared in accordance with GM's Generic Environmental Assessment RFP/Specifications, Phase I and II, dated April 13, 1994. The strategy applied to determine the location and quantity of sampling locations was as follows:

1. Determine the area of the PAOC,
2. Determine a reasonable grid size,
3. Propagate the grid system onto the PAOC area,
4. Extrapolate the number of sampling points and compare to the area represented by the sampling point,
5. Determine if grid size is appropriate for the required confidence level.

6. Bias sampling locations based on historical data to reduce the quantity of sampling locations required for appropriate confidence levels.

The sampling location rationale and sample analysis strategies are presented for each PAOC identified in Chester's Phase I ESA. Based on historical information and discussions with Mr. Mark Napolitan of the GM Remediation Team, sampling locations and sample analysis methods are described below and summarized in Table 1. Sample screening strategies will be employed where appropriate to reduce the number of samples analyzed by the laboratory and provide insight into selecting the appropriate samples for laboratory analyses. Proposed sample screening methods and rationale include:

- **Field Gas Chromatography** - BTEX and solvents can be detected in the 1-10 ppb w/v range.
- **X-ray Fluorescence** - Metals can be detected in the 600 - 1,000 parts per billion (ppb) range. Four metals will be analyzed as indicator metals for the purpose of this investigation. The indicator metals will be prescribed based on historical data and instrument accuracy and precision data.
- **Immuno-assay techniques** - Polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons can be detected in the 1,000 ppb range. Immuno-assay techniques will be used based on the results of TVA-1000 screening analyses and visual observations that do not indicate the presence of analytes and field observations that indicate potential SVOC contamination.

- **TVA-1000 Organic Vapor Analyzer** - Organic vapors are detected in the range of 1 ppm and greater. The TVA-1000 will be used as a gross screening instrument for soil samples, where appropriate.

Where visual observations of soil samples collected with a geoprobe indicate potential free phase hydrocarbons, a permanent ground-water monitoring well will be installed, developed, purged and sampled. Metals analytes were chosen based on MDNR Operational Memorandum #14.

5.3 Health and Safety Air Monitoring

The contaminants of concern will be monitored in the breathing zone area according to the project Health and Safety Plan (HASP). The following instruments will be used.

- TVA-1000 Organic Vapor Analyzer
- Field Gas Chromatograph
- Hydrogen Cyanide Monitor

Calibration procedures are discussed in Section 7 of this document.

SECTION 6.0 - SAMPLE MANAGEMENT

6.1 Sample Bottles and Preservation

Sample bottles will be prepared by the laboratory and made available to the sampling team. The bottles will be prepared according to USEPA recommended protocols for the analytes and matrices of concern. Preservative will be added in accordance with the requirements listed on Table 2. If additional preservative is needed, the field crew will record the required adjustment on the field data sheet and on the chain-of-custody form.

6.2 Sample Document and Custody Procedures

BB&L will use chain-of-custody protocols consistent with USEPA sample custody protocols as described in "NEIC Policies and Procedures" EPA-330/9-78-001-R, revised May 1986. The custody procedure is in three parts: 1. sample collection, 2. laboratory, and 3. final evidence files. Field custody (sample collection) procedures are described herein.

These procedures provide documentation of the handling and tracking of a sample from time of collection through the time of analysis.

COC forms will accompany sample bottles to the field. The field crew will record whether the cooler was intact upon arrival in the field. The crew will contact the laboratory immediately if the seal is broken, bottles are damaged, or the proper number of bottles was not received. A record is maintained of sample collection, transfer, shipment, and receipt at the laboratory. COC documentation will include: Client and project, project number, sampling date and time, sample site location, cross-referenced site

and sample numbers, analyses required, sample description, container and preservative, number of bottles, method of shipment (if applicable) including courier name and special instructions for the laboratory. A separate COC will be filled out for the contents of each shipment container.

Each time a sample is transferred to another custodian, signatures of the persons relinquishing and receiving the sample, time and date of the transfer must be obtained and documented on the COC. The original COC is shipped along with the samples. A copy of the COC will be retained by the Field Manager and relinquished to the QAO for sample tracking purposes.

Sample containers will be labeled with client, project number, sample location, sample date, time, description, preservative and analyses required.

6.3 Sample Handling and Shipping

The protection of personnel involved in the shipment of samples from the field to the laboratories is as important as the maintenance of the integrity of the samples themselves. The samples will either be picked up at the site by laboratory personnel, or dropped off at the laboratory by BB&L personnel.

Samples obtained from the Phase II ESI will be classified as environmental or low level samples. Environmental samples are those which are collected off-site, around the perimeter of a waste site, or in areas where hazards are thought to be significantly reduced by normal processes.

In preparation for shipment to the analytical laboratories, all samples will be packaged in accordance with the following procedures:

- Check to make sure that sample is properly preserved; tighten cap securely; mark liquid levels if bottles are partially full;
- Make sure sample labels are securely attached to the sample container; place each container in a zip-loc or plastic bag, ensuring that labels are visible;
- Place containers in a cooler lined with two inches of vermiculite or equivalent absorbent material; add sufficient ice or ice packs to the cooler so that the samples remain at a temperature of 4°C during shipping;
- Put chain-of-custody form in waterproof plastic bag, and tape to the underside of the cooler lid;
- Close and seal cooler with tape and custody seals in such a manner that the seals will be broken if the cooler is opened;
- Add clearly visible return address labels and "This End Up" labels on the outside of the cooler;
- Samples will be delivered to the laboratory 24 to 48 hours from the day of collection. Alert the shipping service of the restricted articles prior to pick-up; and
- Notify the laboratory immediately following all sample shipments with the following information: No. of samples, types of samples, and times samples collected.

Field and trip blanks must be received in the field within one day of preparation in the laboratory. Blank water samples may be held up to two days of receipt at the site but must be returned to lab at the end of the second day. Specific chain-of-custody procedures for each sample from its

arrival in the laboratory through analysis are contained in the Laboratory Quality Assurance Plan.

SECTION 7.0 - CALIBRATION PROCEDURES AND FREQUENCY

Each piece of equipment used in activities affecting quality is calibrated and maintained periodically to assure accuracy within specified limits. Standard procedures for field equipment maintenance, repair and calibration for all instruments and equipment will be followed.

7.1 Field procedures

It is the responsibility of the Field Team Leader to ensure that the field equipment is calibrated and maintained prior to use in the field, during field operations and after use.

Preventative maintenance of all field equipment will be addressed by an inventory control system implemented by BBL's Field Team Leader on an outgoing basis. The inventory control system maintains equipment control records, general equipment maintenance, and repair calibration records. This system ensures that routine maintenance and servicing of the equipment is performed in accordance with DQO Analytical Levels.

7.2 Laboratory Procedures

Laboratory calibration procedures and frequency of calibration will follow the specifications contained in the Laboratory Quality Assurance Plan. It will be the responsibility of the laboratories to perform and maintain instrument calibration for all laboratory equipment in accordance with appropriate EPA analytical methods and Section 8 of this plan.

SECTION 8.0 - LABORATORY ANALYTICAL PROCEDURES

The analytical procedures to be utilized for laboratory analysis of environmental samples will be from:

- U.S. Environmental Protection Agency Contract Laboratory Protocol, Statement of Work, March 1990, protocols for analysis of organic and inoranic constituents.
- "Test Methods for Evaluating Solid Waste," SW-846 EPA, Office of Solid Waste, 1986 with updates.
- "Methods for Chemical Analysis of Water and Wastes," EPA Office of Research and Development, Cincinnati, OH. March 1983 EPA 600/4-79-020.

Table 3 summarizes the analytical methods used, and their detection limits.

The main objective of the QA/QC requirements is to assure the production of known data quality which will support the site investigation. There are two categories of QA/QC outlined in the analytical methods: 1. instrument or system performance QA/QC; and 2. sample or method performance QA/QC.

System performance assures that the equipment is operating correctly and that possible sources of error are under control. A number of items are required and documented: Instrument calibration, calibration verifications and blanks, check samples, range analysis and detection limit determination.

Method performance assures the analysis is within specified control limits and is evaluated through specific parameters used to assess the validity of the sample analysis which include:

Method Blank - Provides a means of assessing the existence and magnitude of contamination introduced during analysis and to assure that contaminants are not reflected in data results;

Trip Blank - Assesses contamination during bottle preparation and lab contamination introduced during the analysis;

Matrix Spike - The analyte of interest is added to a sample prior to preparation at every level of concentration and with every sample matrix within a case of samples. Matrix spikes (MS) are used to assess the effect of the sample matrix on the analytical method. The compounds used as spikes must provide a percent recovery that is within the established limits (accuracy). Additionally, the result obtained for each of the Matrix Spike Duplicates (MSD) must agree within the required relative percent difference (RPD) limits (precision). MS/MSD will be analyzed at a frequency of 5%, of one per 20 samples per matrix, or one pair per two week period;

Duplicates - Duplicate sample analysis is performed for each matrix and concentration level in a batch of samples. The results of the duplicate analyses serve as an indicator of the precision of the method; and

Surrogate Standards - An organic compound similar in chemical composition to analytes of interest is spiked into samples to provide accuracy and precision information to monitor sample preparation and analysis. The QC control limits, of data quality acceptance criteria for each type of QC performance samples, will be specified in the Laboratory Quality

Assurance Plan. The specific types and frequencies of QC checks that will be performed in support of each test method, the calibration procedures for each instrument, and the QC control limits and/or data quality acceptance criteria for each of the types of QC performance samples will be specified in detail in the QALP. It is the responsibility of the laboratory to document, in each data package, that both initial and ongoing instrument and analytical QC requirements have been met.

SECTION 9.0 - DATA TRACKING, VALIDATION AND REPORTING

9.1 Data Tracking

Samples will be tracked during the sampling phase, laboratory analysis, and data validation program. Sample tracking will begin at the laboratory prior to sampling, when bottles are prepared and shipped. During sampling, this task will involve ensuring that the proper documentation, chain-of-custody, and sample transport to the laboratory are performed. The laboratory will document extraction and analysis dates for tracking purposes. Furthermore, the QAO will maintain a record of receipt of analytical results, submittal of results for data validation, and completion of results to ensure that only validated and final analytical data are used in the Remedial Action Program report.

9.2 Data Validation

Data validation is the assessment of data quality with respect to method requirements and technical performance. Analytical and field data packages are examined to ensure that all QC requirements are performed and that the data collected are of known data quality. Data reduction, validation, and reporting for samples analyzed by the laboratory will be performed in accordance with the Project Operations Plan and the specifications in the "Laboratory Data Validation Functional Guidelines," "CLP Organics Data Review and Preliminary Review" (USEPA 1992a), and the SOP HW-2 "Evaluation of Metals Data for the CLP" (USEPA 1992a), for format and content reference. The most current version of these documents will be used for validation purposes.

The validated data will be reduced and tabulated electronically. The tabulated format will be suitable for inclusion in the Phase II ESI report. The data tabulations will be sorted by classes of constituents (e.g. VOCs, inorganics). Each individual table will contain the following information sample identification, analytical parameters, detection limits, concentrations detected and qualifiers, as appropriate. A complete copy of the data package, data validation report, and data usability report will be contained in the Phase II ESI report as a separate Appendix.

9.3 Data Reporting

Additional review and reduction of analytical and field data for the Phase II ESI will be conducted by the project team. Data qualifications will be determined utilizing QA/QC protocols in combination with the technical and professional judgment of the project team. Non-conformities will be used to determine the technical utility of the data relative to the proposed use.

Field measurement data will be similarly reduced into a tabulated format suitable for inclusion in the Phase II ESI report. These tabulations will include but not be limited to the following information: Field screening results, field analyses, well construction details, and water-level measurements and surveyed measuring point elevations.

Certain field logs will be transferred into typed formats or organized in their original form for inclusion in the report as appendices. The following field logs will be included in the report: Sample/Core logs, well construction logs, water-level logs, and water sampling logs.

SECTION 10.0 - INTERNAL QUALITY CONTROL CHECKS

General programmatic requirements for internal quality control checks are established in BB&L's Quality Assurance Program Plan. BB&L's Standard Operation Procedures lists the types of technical reviews required for quality control deliverables and establishes the requirements for controlling non-conformance's and the related internal quality control checks.

Laboratory quality control checks will be performed as discussed in the Laboratory Quality Assurance Plan. These specifications include the types of control samples required, the frequency of each control, the compounds to be used for sample spikes and surrogate spikes and the quality control acceptance criteria.

Internal quality control checks will be documented in the data validation packages.

SECTION 11.0 - SYSTEM AND PERFORMANCE AUDITS

Audits may be performed by BBL, USEPA, NYSDEC and the Town of North Hempstead. Audits may be performed on a periodic basis. Copies of the performed audits will be distributed to the Project Manager, USEPA, NYSDEC and the Town of North Hempstead. The performance and system audits for the laboratory are described in the QALP.

11.1 System Audits

System audits will be carried out to verify that:

- The QA/QC procedures are established and followed;
- The reviews and sign-offs required in BB&L's procedures are being implemented; and
- Internal audits are being conducted by the laboratories on a regular basis.

11.2 Performance Audits

Performance audits are more extensive than system audits and are used to monitor project specific field and lab activities. Performance audits involve review of on-site field investigation procedures, equipment calibration techniques and records, laboratory QA/QC and sample documentation.

SECTION 12.0 - PREVENTIVE MAINTENANCE

12.1 Field Procedures

The field equipment preventive maintenance program helps to ensure the effective completion of the sampling effort and is designed to minimize equipment down time. Program implementation is concentrated in three areas:

- Maintenance responsibilities.
- Maintenance schedules.
- Inventory of critical spare parts and equipment.

The maintenance responsibilities for field equipment will be assigned to the Field Manager. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for determining that critical spare parts are included with the field equipment. An adequate inventory of spare parts will be maintained to minimize down time. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes and/or cannot be obtained in a timely manner.

12.2 Laboratory Procedures

All analytical equipment at the analytical laboratory will be covered by some type of maintenance contract. The degree and extent of outside (contracted) routine and/or preventive maintenance assistance will be a

function of the complexity of the equipment, and the contract laboratory expertise relative to repair and/or maintenance of the instrumentation.

Annual preventive maintenance service visits will involve cleaning, adjusting, inspecting and testing procedures designed to deduce product failure and/or extent useful product life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by contract laboratory personnel.

SECTION 13.0 - SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

13.1 Field Procedures

In order to maintain data quality, standard operating procedures for field procedures have been developed and are contained in the Work Plan.

Field generated information such as soil and rock conditions, logs and field analysis forms will be reviewed for validity. The reviewing will include bound logbooks/forms, data entry and calculation checks.

13.2 Laboratory Procedures

Quality Assurance (QA) procedures are based on the specific methodology utilized for sample analysis. Each analytical procedure includes determination maintenance of standard response and linearity, instrument tuning, internal standard responses, surrogate recoveries in blanks and samples, spike recoveries and duplicate precision. Many of the QA criteria are method based. Decisions as to corrective action in the form of re-analysis will be determined by the laboratory QA director together with the project QAO. Surrogate, internal standard and spike recoveries will be plotted on control charts so that trends in data quality can also be monitored so that appropriate and timely corrective actions can be implemented.

The contract laboratory's quality assurance quality control program will include the following elements:

- Precision, in terms of relative percent difference (RPD), will be determined by relative sample analysis at a frequency of one per sample set or one sample in ten (10%) whichever is greater or at the appropriate frequency as prescribed by the analytical method. RPD is defined as the absolute difference of duplicate measurements divided by the mean of the analyses normalized to percentage.
- Accuracy, in terms of percent recovery (recovery of known constituent additions or surrogate recoveries), will be determined by the analysis of spiked and unspiked samples. The objective is to spike with such a quantity as to raise the sample concentration to 75% of the working analytical range. For large on-going projects, it will often be best to perform the spiking of a random sample after the initial analysis has been completed. Alternatively and specific to certain methods, matrix spike and matrix spike duplicates are used for expression of accuracy. Recovery data can be gathered in two forms; relative recovery and absolute recovery. Relative recovery is based on a spike being added to project samples while absolute recovery is based upon the SRM's or spiking of laboratory water (matrix spike blank). The frequency of spiking for both absolute and/or relative recoveries will be one per set of twenty project samples.
- With each set of project samples a method blank will be prepared and analyzed. If field blanks are received, this blank will be processed and reported as a project sample. Trip blanks will be prepared and analyzed with all sample collections for volatile organic analysis. Additionally, holding blanks for volatile analysis and solvent blanks will be prepared as required. Solvent blanks are analyzed

based upon method blank results and/or changes in solvent suppliers/lots. Unprocessed solvent blanks will be continually analyzed on the GC and or GC/MS as a routine control measure for these instruments.

- Standard Reference Materials (SRM's) will be used for each analysis. Sources of SRM's include the U.S. Environmental Protection Agency, commercially available material from CRADA certified vendors and/or laboratory produced solutions. SRM's when available and appropriate, will be processed and analyzed on a frequency of one per set of samples.
- Stock and working standard solutions and separate spiking solutions will be prepared from materials supplied by the U.S. Environmental Protection Agency or purchased from commercially available sources. Standard curves will be generated consistent with methodology. Standard curves will be produced once per day and/or verified by re-analysis of mid-range standards at least every tenth sample. Standard curves for conventional parameters will not be generated daily but will be verified on a daily basis. Standard curves will also be reviewed for consistency to help identify problems that could be associated with the applicable instruments and/or the standard solutions.
- Completeness is the evaluation of the amount of valid data generated versus the total set of data produced from a particular sampling and analysis event. Valid data is determined by independent confirmation of compliance with method-specific and project-specific data quality

objectives. The calculation of data set completeness will be performed by the following equation.

$$\frac{\text{Number of Validated Sample Results}}{\text{Total Number of Sample Results Reported}} \times 100 = \% \text{ Complete}$$

SECTION 14.0 - INVESTIGATIVE CORRECTIVE ACTION

All non-conformances within the established quality control procedures will be identified and controlled. The field team leader will be responsible for making corrective actions on a day to day basis during the field activities. All changes will be documented in the logbook, and the QAO will be notified.

The QAO will identify non-conformances which are of program significance or which require special expertise and will notify the Project Manager. Corrective action may include:

Re-analyses of sample parameters;

Re-sampling of site location; and

Accepting the data and determining its level of uncertainty.

The Project Manager will be responsible to ensure that corrective actions for non-conformance are implemented by:

Evaluating all reported non-conformances;

Controlling additional work on non-conforming items;

Determining and evaluating disposition or action to be taken;

Maintaining a log of non-conformance;

Reviewing non-conformance reports; and

Ensuring that non-conformance reports are included in the final site documentation.

Any staff member who discovers or suspects a non-conformance, which is an identified or suspected deficiency in an approved document, is responsible for initiating a non-conformance report.

The Project Manager will ensure that additional work dependent on the non-conforming activity will not be performed until the non-conformance is corrected.

SECTION 15.0 - QUALITY ASSURANCE REPORTS

The Project Manager and the QAO, will review the implementation of this Quality Assurance Project Plan on a regular basis and submit periodic summary reports to the Project Manager. These reviews will include an assessment of data quality, deliverables, QC activities, and the results of systems and/or performance audits as appropriate. Regular QA reporting throughout the duration of the project, as well as reporting on an as-needed basis will include the following:

Progress reports will be prepared as appropriate. At a minimum these reports will include the following: a description of the activities that have taken place during the quarter, all validated results of analytical data, a description of all data anticipated and activities scheduled for the next quarter and a description of any problems encountered or anticipated;

Conference calls and/or meetings will be scheduled if requested by the project coordinator to discuss any concerns that may arise during the course of the field program that might require significant corrective actions, changes to the scope of work, or departures form the approved project SOPs; and

Serious deficiencies in sampling and/or monitoring data will be reported to the Project Manager as soon as practicable after such deficiencies have been noted.

The laboratory's internal QA reporting will be described in the Laboratory Quality Assurance Plan, which is provided in Appendix 1.

TABLES

TABLE 1

GENERAL MOTORS SAMPLING AND ANALYSIS PLAN

PHASE II ESI, WILLOW RUN CREEK ASSEMBLY PLANT, YPSILANTI, MICHIGAN

PAOC	LOCATION	CHEMICALS OF CONCERN (1)	FIELD SCREENING METHODS	SAMPLING RATIONALE AND LOCATIONS (2)
1. Former Waste Water Treatment Plant Lagoon	East of Water Treatment Building	Metals (1)	XRF Visual Observations	160x270' area, 100' grid **= 5 locations** Six 2-foot comp/loc **= 30 soil samples for screening.**
2. Former South Culvert Area	East and Southeast of Assembly Plant	VOCs Metals (2) PCBs	OVA - All Samples Field GC - One hot OVA per boring XRF - All Soil Samples Immuno-Assay - One per boring Visual observations	300x1200' area, 100x300' grid = 15 locations, three in hot AHI Report Six 2-foot comp/loc **= 90 soil samples for screening.**
3. North Hydraulic Elevator Pit	Near Column C-16	SVOCs	OVA Visual observations	40x40' area, 10' grid **= 4 locations** Six 2-foot comp/loc **= 24 soil samples for screening**
4. Leaking UST Pipe System of Former Tank Farm	Assembly building, R&D site and North Tank Farm	VOCs SVOCs	OVA - all soil samples Immuno-assay - one per boring based on hot OVA Visual observations	30x90' area, 40' grid **= 4 locations** Six 2-foot comp/loc **= 24 soil samples for screening.**
5. ELPO Tank Building Area	North side of Assembly Building	Lead (Pb)	XRF - All soil samples Visual observations	100'x100' area, 50' grid **= 4 locations** Six 2-foot comp/loc **= 24 soil samples for screening.**
6. Former Aeration Basin	East and Northeast of Assembly Plant	VOCs SVOCs, PCBs 8 RCRA Metals Total cyanides	OVA- all soil samples Field GC - two per loc. Immuno-assay - one location XRF - all soil samples Visual observations	300x900' area, 300x100' grid **= 9 locations** Six 2-foot comp/loc **= 54 soil samples for screening.**
7. Kaiser/Fraiser Cinder Storage Area	Northeast of the Former Incinerator	8 RCRA Metals PNAs	XRF- all soil samples Imunno-assay - two samples per location Visual observations	100x200' area, 100' grid **= 2 locations** Six 2-foot comp/loc **= 12 soil samples for screening.**

'1) Metals = As, Ba, Cd, Cr, Hg, Pb, Se, Ag, Ni and Zn.
2) Metals = Al, As, Ba, Cd, Cr, Pb, Hg, Ni, Se, Ag and Zn.
3) In the event that potential free product near the water table is observed, a permanent monitoring well will be installed and a sample collected to assess free product.

BDL = Below detection limit
VOC = Volatile Organic Compounds
PNAs = Polynuclear aromatic hydrocarb

TABLE 1 (Continued)

GENERAL MOTORS SAMPLING AND ANALYSIS PLAN

PHASE II ESI, WILLOW RUN CREEK ASSEMBLY PLANT, YPSILANTI, MICHIGAN

PAOC	LABORATORY ANALYSES SOILS	LABORATORY ANALYSES GROUND WATER (GW)
1. Former Waste Water Treatment Plant Lagoon	3 hot/3 low for lab analysis or 10% if screening is BDL to be analyzed by EPA Methods, 6010, 7131, 7421, 7471 and 7841. **= 6 soil samples**	One GW sample will be collected if XRF hot and one XRF BDL sample will be analyzed by EPA Methods 6010, 200.7, 213.2, 220.2, 245.1. **= 1 GW samples (metals = 2 for filt/unfilt).**
2. Former South Culvert Area	4 hot/4 low for lab analysis or 10% if screening is BDL **6010, 7131,7421,7471,7841, 9010 = 8 metals analyses** **One 8260, 8270 if Field GC hot = 1 analysis** One 8080 per location, selected based on visual **observations = 15 soil samples**	**3 GW samples to be collected from geoprobes, two** located near GSI and one in Hot AH report. **If Field GC hot - one 8260, 8270 analyses** **Metals(1), field filtered and unfiltered = 6 samples** Analyzed by EPA Methods 6010, 200.7, 213.2, 220.2 and 245.1. **8080 = 3 samples**
3. North Hydraulic Elevator Pit	4 soil samples, one per boring - analyzed for EPA Method 8270. **= 4 soil samples**	One GW sample to be collected and analyzed by EPA Method 8270 to be located based on hot OVA and visu observations of stained soil or free product. **= one GW sample.**
4. Leaking UST Pipe System of Former Tank Farm	2 hot/2 low for lab analysis or 10% if screening is BDL to be analyzed by EPA Methods 8260 and 8270. **= 4 soil samples**	**One GW sample to be analyzed by EPA Methods** 8260 and 8270 to be located based on hot OVA and visual observations.
5. ELPO Tank Building Area	2 hot/2 low for lab analysis or 10% if screening is BDL to be analyzed by EPA Method 7421. **= 4 soil samples**	**One GW samples to collected from hot XRF or visual** to be analyzed by EPA Method 220.2 (metals = 2 for filt/unfilt)
6. Former Aeration Basin	3 hot/3 low for lab analysis or 10% if screening is BDL 8260, 8270, 6010, 7131, 7421, 7471, 7841, 8080, and 9010 **= 6 soil samples**	**3 GW samples, two to be collected from GSI areas** and one to be collected from hot AHI report area. GW samples to be analyzed by EPA Methods 8260, 8270, 200.7, 213.2, 220.2 and 245.1, 8080 and 9010. (metals = 6 for filt/unfilt)
7. Kaiser/Fraiser Cinder Storage Area	2 hot/2 low for lab analysis or 10% if screening is BDL to be analyzed by EPA Methods, 8270 B/N, 6010, 7131, 7421, 7471 and 7841. **= 4 soil samples**	GW samples to be collected only if field screening results are positive. Samples to be analyzed by EPA Methods 8270 B/N, 200.7, 213.2, 220.2 and 245.1, (metals filt/unfilt)

'1) Metals = As, Ba, Cd PCB = Polychlorinated biphenyls
2) Metals = Al, As, Ba, SVOC = Semi-volatile organic compounds
ns 3) In the event that pot AHI = Atwell-Hicks Inc.
monitoring well will be i

XRF = X-ray Fluorescence Analyzer
GC = Gas Chromatograph
OVA = Organic Vapor Analyzer

Table 2
Preservation Techniques, and Holding Times

Parameter	WATER			SOIL		
	Method	Preservative	Holding Time	Method	Preservative	Holding Time
				(Days)		
Metals						
Aluminum (Al)	200.7	B	180	6010	B	180
Antimony (Sb)	204.2	B	180	6010	B	180
Arsenic (As)	6020	B	180	6020	B	180
Barium (Ba)	6010	B	180	6010	B	180
Beryllium (Be)	6010	B	180	6010	B	180
Cadmium (Cd)	213.2	B	180	7131	B	180
Chromium (Cr)	200.7	B	180	6010	B	180
Copper (Cu)	6010	B	180	6010	B	180
Iron (Fe)	200.7	B	180	6010	B	180
Lead (Pb)	220.2	B	180	7421	B	180
Manganese (Mn)	200.7	B	180	6010	B	180
Mercury (Hg)	245.1	B	38*	7471	B	38*
Nickel (Ni)	200.7	B	180	6010	B	180
Selenium (Se)	6010	B	180	6010	B	180
Silver (Ag)	279.2	B	180	7841	B	180
Sodium (Na)	200.7	B	180	6010	B	180
Thallium (Tl)	279.2	B	180	7841	B	180
Vanadium (V)	200.7	B	180	6010	B	180
Zinc (Zn)	200.7	B	180	6010	B	180
Organic Compounds						
Volatiles	8260	F, G	14	8260	F, G	14
Semi-Volatiles	8270	A	7*	8270	A	7*
Pesticides/PCBs	8080	A	7*	8080	A	7*
Other Parameters						
Cyanide, Free	9010	D	14	9010	D	14
Kjeldahl Nitrogen	351.3	C	28			
NO3 + NO2 + NH4				300	C	28

Notes:

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* - Holding time is 13 days if stored in a plastic container

DL - Detection Level

A - Cool @ 4 degrees C

B - HNO3, pH<2

C - H2SO4, pH<2

D - NaOH, pH>12

F - Na2S2O3 (If Cl present)

G - HCl, pH<2

Table 3
Laboratory Analytical Methods and Detection Levels

Parameter	Matrix			
	Water		Soil	
	Method	DL (ug/L)	Method	DL (ug/kg)
Metals				
Aluminum (Al)	200.7	20	6010	500
Antimony (Sb)	204.2	5	6010	500
Arsenic (As)	6020	1	6020	100
Barium (Ba)	6010	200	6010	1000
Beryllium (Be)	6010	0.3	6010	200
Cadmium (Cd)	213.2	0.2	7131	50
Chromium (Cr)	200.7	50	6010	2500
Copper (Cu)	6010	25	6010	1000
Iron (Fe)	200.7	100	6010	2000
Lead (Pb)	220.2	3	7421	1000
Manganese (Mn)	200.7	20	6010	2000
Mercury (Hg)	245.1	0.2	7471	100
Nickel (Ni)	200.7	50	6010	1000
Selenium (Se)	6010	5	6010	500
Silver (Ag)	279.2	0.5	7841	500
Sodium (Na)	200.7	n/a	6010	n/a
Thallium (Tl)	279.2	2	7841	500
Vanadium (V)	200.7	20	6010	1000
Zinc (Zn)	200.7	20	6010	1000
Organic Compounds				
Volatiles	8260	1	8260	10
Semi-Volatiles	8270	5	8270	330
Pesticides/PCBs	8080		8080	
Aldrin		0.01		1.7
A. Chlordane		0.01		1.7
PCB 1010		0.01		330
PCB 1221		0.2		330
PCB 1232		0.4		330
PCB 1242		0.2		330
PCB 1248		0.2		330
PCB 1254		0.2		330
PCB 1260		0.2		330
Other Parameters				
Cyanide, Free	9010	5	9010	200
Kjeidahl Nitrogen	351.3	10	n/a	n/a

Notes:
DL - Detection Level
n/a - Not Applicable
ug/L - micrograms per liter
ug/kg - micrograms per kilogram

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Table 4
Field Analytical Methods and Detection Levels

Parameter	Technique	Matrix	Detection Level
Metals			
Arsenic (As)	XRF	Soil	600 - 1000 ppb
Chromium (Cr)	XRF	Soil	600 - 1000 ppb
Copper (Cu)	XRF	Soil	600 - 1000 ppb
Lead (Pb)	XRF	Soil	600 - 1000 ppb
Zinc (Zn)	XRF	Soil	600 - 1000 ppb
Organic Compounds			
BTEX	GC	Soil Headspace	1 - 10 ppb
Solvents	GC	Soil Headspace	1 - 10 ppb
Organic Vapors	TVA-1000	Soil Headspace	> 1000 ppb
PCBs	IA	Soil Headspace	1000 ppb
PNAs	IA	Soil	1000 ppb

Notes: 480\05950883.wk4
DL - Detection Level
ppb - parts per billion
XRF - X ray fluorescence
GC - Field Gas Chromatography
TVA-1000 - Organic Vapor Analyzer
PCBs - Polychlorinated Biphenyl compounds
PNAs - Polynuclear Aromatic compounds
IA - Immuno-assay techniques

APPENDIX 1

LABORATORY QUALITY ASSURANCE PLAN

ECI QA/QC MANUAL

ECI ENVIRONMENTAL COMPLIANCE INC

ENVIRONMENTAL CHEMICAL ANALYTICAL LABORATORY

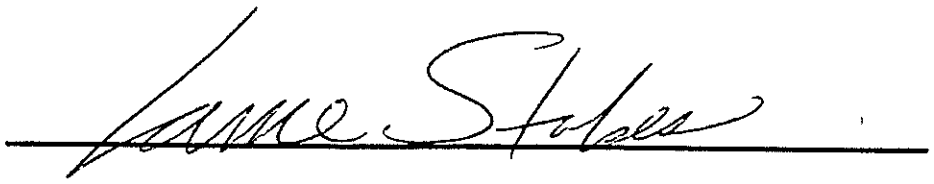
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QUALITY ASSURANCE/QUALITY CONTROL MANUAL FOR ENVIRONMENTAL CHEMICAL ANALYSIS

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MANUAL NUMBER 141



LANCE STOKES, Ph.D.

PRESIDENT

ECI ENVIRONMENTAL COMPLIANCE, INC.

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INTRODUCTION

ECI Environmental Compliance, Inc.'s testing laboratory is committed to an extensive program of Quality Assurance/Quality Control (QA/QC) to ensure the production of valid data. QA/QC includes personnel, equipment, and procedures involved in the acceptance, preparation, analysis, report formulation, and signature release of projects. The effectiveness of the QA/QC plan is based upon a multi-level commitment for the adherence to, and implementation of, the defined goals and objectives as stated in this manual and as defined in the prescribed methodologies utilized for the various analytical procedures.

This QA/QC manual is specifically dedicated to the application of environmental analysis and follows the guidelines and specifications for preparing QA/QC plans as recommended by the United States Environmental Protection Agency (EPA).

ECI offers an environmental analytical service that responds to the needs and desires of our clients by stressing accuracy, reliability, rapid serviceability (fast turn-around time), courtesy and respect. These components, coupled with the continuously expanding updated capital equipment inventory, are responsible for our acceptance within the marketplace and the establishment of our excellent reputation.

PURPOSE

The purpose of this QA/QC manual is to formally present actual methodologies and protocols used which ensure that all data generated is of known accuracy and precision, with a record trail that is legally defensible and scientifically correct. The program is designed for redundancy and continuous monitoring to assure compliance through audits and inspections of the laboratory, along with the application of corrective actions as determined in order to upgrade quality as well as meet client requirements.

SCOPE

The QA/QC program is designed to control, monitor and continuously improve the data acquisition, data processing and the results generated and used at ECI. Standardization, statistical, investigative, preventative, and corrective techniques are incorporated to insure customer and regulatory agency satisfaction.

OBJECTIVES

The objectives of the QA/QC plan are broad based and include the following:

1. All analytical methods used shall insure that the client's requirements for accuracy, precision, sensitivity, and specificity are met.
2. The generated data provided shall be defensible in court.
3. The documentation necessary to support the generated data in court shall be readily available.
4. The data shall meet or exceed all performance standards required by clients or regulatory agencies.
5. All staff members shall receive sufficient training to enable them to carry out the provisions of this manual.
6. All standards used throughout the laboratory will be tracked with traceability to a known source to insure reliability and authority.
7. All routine analysis of samples will be monitored to insure optimum analytical performance and to improve methodology.

POLICIES

The following policies have been implemented and are enforced within the laboratory to achieve the above stated objectives:

1. All quality assurance activities shall emphasize the satisfaction of clients and regulatory agencies with respect to accuracy, precision, sensitivity and specification(s).

2. The laboratory will utilize published analytical methods whenever possible. All unpublished methods will be validated in-house, in order to guarantee that they meet or exceed ECI standards.

3. All employees will be trained commensurate with their duties, position, and responsibilities with appropriate documentation.

4. The laboratory shall have a comprehensive preventative maintenance program to minimize instrument down time.

5. Control charts, where deemed appropriate, on selected analytical laboratory instrumentation shall be maintained.

6. The laboratory shall participate in inter-laboratory testing programs, as appropriate, in conformance with requirements of clients and/or regulatory agencies. In addition, a program for on-going certification regimens and conformance protocol will be enforced.

SECTION 1

SAMPLING PROCEDURES

All samples sent to ECI shall be collected by the client, their representative, ECI, or an ECI contractor. Correct sample preservation techniques shall be used to ensure sample stability prior to being analyzed. The following is a partial list of the items that must be considered to ensure the quality of the analytical data, beginning with the sample collection:

1. All samples shall be collected in appropriate containers.
2. Sample containers shall be clean and free from contamination before sample collection.
3. A representative sample shall be taken, free of headspace.
4. The samples shall be stabilized with a preservative when appropriate, at the time of collection. This is done to minimize any loss of analyte(s) due to absorption, degradation, volatilization, and/or chemical reaction.
5. An appropriate amount of sample shall be drawn, by taking into consideration the number of analyte(s), and the requirements of the individual analytical methods.
6. Each container shall be properly labeled.
7. Containers shall be properly packaged and shipped to the laboratory, in order to meet prescribed analytical holding times.
8. All samples must be accompanied by a **Chain-of-Custody** form. Upon the request of the client, ECI will provide Chain-of-Custody forms (Figure 1), appropriate EPA cleaned sample bottles, sample coolers, blue ice, sample container labels, sample preservatives, and instructions for the sampling and preserving of different analytes.

The maximum sample holding times, appropriate sample containers, correct preservatives (reagent grade), minimal acceptable sample volume (per analyte), and analytical method numbers, for waters, soils, and wastes are outlined in Section 5.

CHAIN-OF-CUSTODY PROTOCOL

The following protocol is to be instituted for all incoming samples:

1. The chain-of-custody form shall be completely filled out and signed by the person(s) generating the incoming sample(s).
2. Upon sample receipt at the laboratory, the person who delivers the sample(s) is responsible for signing and releasing them to the laboratory chain-of-custody custodian, who in turn signs them in as being received by the laboratory.
3. Once the samples are in ECI's custody, they shall be kept in an area restricted to authorized personnel only.
4. A copy of the chain of custody form will be transmitted to the customer with the final report.

RECEIVING AND SHIPPING PROCEDURES

RECEIVING

All incoming samples will be initially checked for damage and the presence of broken custody seals (if applicable) upon receipt. A purchase order, shipper, letter of instruction memo shall accompanying sample(s), to be tested or evaluated. The samples shall be examined for the following items by the receiving clerk:

1. Sufficient test material.
2. Clarification of purchase order, shipper, letter or instruction memo.
3. Signature of authorized company official.
4. Specification and procedure call out, including the revision number or letter (if applicable).

Each purchase order, shipper, or letter of instruction memo shall be stamped with the date and time received and shall be assigned a distinct/unique laboratory identification number (LIN) by the receiving clerk and entered into the customer log sheet (receiving register).

The LIN and other pertinent information shall be recorded on the customer purchase order and/or other accompanying documentation. A transient work sheet along with the LIN, purchase order number, or other authorizing information, date received and customer number shall be prepared with the following additional information:

1. Test procedure(s) and specification(s) (if known).
2. Testing limitations or special instructions.
3. Preservation protocol.
4. Name of person (client) responsible in case conditions warrant communication.

SHIPPING

Upon completion of all tests on an individual order and data entry into the appropriate hard cover log books with signature and date by the analyst, the results shall be reviewed and initialed by the departmental supervisor and by the director. A typed report shall then be prepared from the data presented from the transient work sheets.

All sample material will be stored for not more than thirty (30) days unless requested by the customer, after which time it will either be returned to the customer, or properly disposed of per state and federal regulations.

SAMPLE CUSTODY AND MANAGEMENT

All samples received by ECI shall be processed through an orderly sequence specifically designed to ensure continued identification and integrity of both the sample and its documentation.

All samples received by ECI shall be checked for label clarity and identification, specific analyses requested, proper sample containers and preservation, and chain-of-custody documentation. If any of these items are incomplete, an ECI sample deviation waiver must be signed to indicate that the customer is aware of the sample deficiencies. (See SECTION 5).

Upon receipt, each sample shall be checked against the accompanying chain-of-custody documentation. Each sample shall be logged in by assigning a sequential job number, recording the date received, as well as, all relevant information for sample processing, appropriate holding times, sample storage requirements and due date of the analytical results. Laboratory analytical transient work sheets shall be filled out and copies provided to each department involved.

When each analysis is completed, all quality control data shall be reviewed and if acceptable, the results will be initialed by a supervisor and recorded on the work order forms. Upon completion, the worksheets are returned to the sample handling area where the reports are compiled and the data is readied for reporting.

All samples are retained for no more than thirty (30) days after the completion of the report, unless otherwise requested by the client.

INTAKE OF CUSTOMER SAMPLES

LIQUID SAMPLES

1. Samples shall be in EPA cleaned bottles, or equivalent.
2. Samples shall be preserved as specified, SECTION 5.
3. Samples shall be labelled appropriately (composite sample, grab sample, customer name, customer date, analytes being analyzed, sample location, time sampled, etc...).
4. Samples shall be accompanied by a chain-of-custody form (with preservatives stated on it).
5. A copy of each customer's wastewater permit should be placed in file, if applicable, for reference.

SOIL SAMPLES

1. Samples shall be in EPA cleaned bottles, or equivalent.
2. Samples shall be preserved as specified (SECTION 5).
3. Samples shall be labelled appropriately (customer name, customer date, analytes being analyzed, sample location, time sampled, etc...).
4. Samples shall be accompanied by a chain-of-custody form (with preservatives stated on it).

WASTE SAMPLES

1. Samples shall be in EPA cleaned bottles, or equivalent.
2. Samples shall be labelled appropriately (customer name, customer date, analytes being analyzed, sample location, time sampled, etc...).
3. Samples shall be accompanied by a chain-of-custody form (with preservatives stated on it).

INTAKE OF CUSTOMER SAMPLES [continued]

DRINKING WATER SAMPLES

1. Samples shall be in EPA cleaned bottles, or equivalent.
2. Samples shall be preserved as specified in SECTION 5.
3. Samples shall be appropriately labelled to reflect sampling procedure, customer name, location, time sampled, etc.
4. Sample containers shall be identified as drinking water and a special label shall be affixed to the work sheet and bottle/container specifying "ANALYTICAL PROTOCOLS FOR DRINKING WATER ONLY CAN BE USED".
5. Samples shall be accompanied by a chain-of-custody form.

If any of the above policies are not conformed to, the deviation waiver form (Figure 2) which indicates that the customer was informed of the policy, must be signed before any samples can be accepted.

REPORT GENERATION

Once the data has been compiled , the report is reviewed for quality and completeness by the QA/QC manager. Once approved and initialed, the report is submitted for typing. After typing, the entire report, including billing, customer information, sample description(s), and the analytical data are reviewed and proofed by at least two (2) people. The report is then, if necessary, resubmitted for corrections,corrected and mailed to the customer. ECI shall retain a copy of the report in the filing system for permanent record. All data and records are **CONFIDENTIAL** and copies to other parties will be generated only upon request and permission of the client.

The report shall consist of the client's name, along with a company name and address (if applicable), a report date, report number, a customer purchase order number, and an assigned ECI invoice number. The body of the report consists of a "work requested" section followed by a "description of sample" section, including sample preservation information, which is proceeded by the area reporting the analytical results. Data is reported by sample description and test method, as well as the date of analysis for each analyte, and the detection limits for each parameter.

SECTION 2

LABORATORY DOCUMENTATION

Accurate and complete documentation of all analyses, standards, procedures, and other ensuing information are an important and integral part of the QA/QC program including:

1. Laboratory standards and reagents.

2. Laboratory equipment operations, calibrations, and maintenance.

3. Laboratory analytical methods.

4. Laboratory standard operating procedures.

Only QA/QC approved laboratory sheets and notebooks are used in the laboratory. Copies of data sheets are kept in each client's file, and the original lab sheets and notebooks are kept in a location designated by the QA/QC Manager.

CALIBRATION PROCEDURES AND FREQUENCY

The calibration of each piece of analytical equipment is required to ensure that the equipment is functioning properly during operation and to provide confidence in the data. The analytical equipment must be able to meet or exceed the specified detection limits at the specified accuracy and precision for a designated period of time. The time between calibrations is dependent upon the method or specific client requirements. Each piece of equipment is calibrated with standard solutions appropriate to the specific analytical method and equipment.

DATA VALIDATION

The data generated at ECI is checked for accuracy, precision, and quality a minimum of three (3) times before it is released to the client:

1. The analyst reviews the data to determine completion and correctness of results, and confirms that the QA/QC data falls within acceptable limits.

2. The laboratory supervisor (or designatee) then checks for calculation errors, and makes sure that the QA/QC results fall within acceptable limits, the client's instructions have been followed, the documentation is complete, and the data matches historical data, if it is available.

3. The QA/QC manager (or designatee) repeats the review for the same criteria as described in Item #2 above.

4. Client reports clearly indicate when specified data does not meet appropriate control criteria. Qualifications to data, when appropriate, appear within the body of the report.

5. If the maximum contaminant limits (MCL) are exceeded after confirming failure, the analyst (usually the chief chemist) will notify the office manager/supervisor who will then notify the client.

The data validation process consists of generating, reducing, and reviewing the data. Once all reviews have been completed and initialed, the President of ECI (or his designatee) reviews and signs each completed customer report.

ANALYTICAL TEST METHODS AND PROCEDURES

The need to provide accurate and precise data is driven by corporate policy and client regulatory requirements. ECI provides the required accuracy and precision by using approved methods from regulatory agencies. ECI's written STANDARD OPERATING PROCEDURES (SOPs) reflect the corporations's commitment to provide defendatble data. Written SOPs provide assurance that proper protocol is followed and that data is accurately produced. Blind control samples are analyzed as part of normal operations. A Qualtiy Assurance Trend Analysis program of charted control data is in place. For a partial listing of viable methods used , please refer to SECTION 5.

METHODOLOGY

Laboratory analyses follow (but are not limited to) accepted methods from one or more of the following references:

1. Methods for Chemical Analysis of Water, EPA 600/4-79-020, U.S. EPA and EMSL, revised March 1983.

2. Test Methods for Evaluating Solid Waste, SW-846, Third Edition: U.S. EPA Office of Solid Waste and Emergency Response, December 1987.

3. Federal Register, Rules and Regulations, U.S. Government Printing Office, Various Dates.

4. Code of Federal Regulations, U.S. Government Print Office, Revised Annually.

5. Standard Methods for the Examination of Water and Wastewater, Sixteenth Edition; APHA, AWWA, WPC, 1989.

6. Standard Methods for the Examination of Water and Wastewater, Seventeenth Edition; APHA, AWWA, WPCF, 1989.

7. Annual Book of ASTM Standards, American Society for Testing and Materials, Revised Annually.

8. MERA

SECTION 3

INTERNAL LABORATORY QUALITY CONTROL CHECKS AND FREQUENCY

Blanks, duplicates and intra-laboratory standards will be analyzed at a frequency of at least ten percent (10%). Intra-laboratory standards may consist of spiked laboratory water, commercially prepared matrix standards, matrix spikes, QA/QC checks, etc. Where the method dictates, surrogate standards will be used. Exceptions to the ten percent (10%) frequency requirement will be defined by the method or when sample volumes are restricted.

QUALITY ASSURANCE OF ANALYTICAL PERFORMANCE

Matrix-Specific QA/QC is used to assess the effects of a sample matrix or field conditions on the analytical data. Matrix-Specific QA/QC is composed of:

1. The analysis of matrix spikes, matrix duplicates (upon client request), and matrix spike duplicates.
2. The determination of method detection limits in a specific matrix.
3. Monitoring the accuracy (percent recovery) of surrogate compounds which are spiked into the sample.
4. Monitoring the results of standard additions in environmental samples.
5. The analysis of field blanks.

MATRIX SPIKE

A matrix spike is the addition of a known amount of analytes to the matrix of an environmental sample. Similar to the method blank, the matrix spike is taken through the entire process (extraction, clean up, analysis, etc.) to determine what effect the matrix has on the analytical date generated. Results are expressed as percent recovery (accuracy).

MATRIX DUPLICATE

The matrix duplicate is an environmental sample which is divided into two (2) aliquot. Each aliquot is taken through the process separately. The results are used to calculate the relative percent difference (RPD).

MATRIX SPIKE DUPLICATE

The matrix spike duplicate is an environmental sample which has been divided into two (2) separate aliquot. To each aliquot, a known amount of analytes are added. Each sample is processed through the system separately. The results from the two (2) aliquot are used to determine accuracy (percent recovery) and precision (relative percent difference).

SURROGATE RECOVERIES AND STANDARD ADDITIONS

Surrogates are compounds of known concentration which are added to samples to monitor the effect the matrix has on the accuracy of the analysis. These compounds exhibit similar chemical characteristics of the analytes of interest, but are not normally found in environmental samples. The results are expressed in percent recovery (accuracy).

In the analysis of volatiles, semi-volatiles, etc., using gas chromatography/mass spectrometry, surrogates are routinely added to environmental samples. The surrogate recoveries are primarily used to determine the effect the matrix and analytical procedure has on the environmental sample.

STANDARD ADDITIONS

The standard additions is the process by which a series of known concentrations of an analyte are added to an environmental sample. This method is used to calculate percent recoveries and is primarily used in analyzing metals and other inorganic tests.

FIELD BLANKS

Field blanks are laboratory generated blanks which help monitor contamination originating from the collection, transportation or storage of environmental samples. Two (2) types of field blanks are equipment and trip. The equipment blank is deionized water that is poured through the sample collection device to check the adequacy of the cleaning procedures of the sampling collection device. A trip blank is a laboratory generated sample, usually deionized water, which is sent to the field, remains unopened, and is sent back to the laboratory for analysis. The purpose of the trip blank is to monitor contamination in the field and during transportation.

CORRECTIVE ACTION PROCEDURES

The ECI QA/QC plan is designed to minimize errors, deficiencies, or "out of control" situations. In an event that errors occur, laboratory personnel must initiate corrective actions immediately. Laboratory personnel are alerted that corrective actions may be necessary if:

1. QA/QC data are outside the acceptable windows for precision and accuracy.

2. Blanks contain contaminants above acceptable levels.

3. Undesirable trends are detected in spike recoveries.

4. There are unusual changes in detection limits.

5. Deficiencies are detected by internal or external audits or from the results of performance evaluation samples.

6. Inquiries concerning data quality are received from clients.

"Out of control" data will result in a series of actions that the laboratory personnel will initiate. All actions must be well documented and presented to the QA/QC Manager for final approval.

ECI's corrective action procedures meet with SW-846 specification and consists of:

1. Identification and definition of the problem
2. Assignment of responsibility for investigation of the problem.
3. Determination of the appropriate corrective action to eliminate the problem.
4. Assigning and accepting responsibility for implementing the corrective action.
5. Implementing the corrective action and evaluating its effectiveness.
6. Verifying that the corrective action has eliminated the problem.

PREVENTATIVE MAINTENANCE

ECI conducts a program of preventative maintenance, (equipment cleaning, lubrication, adjustments, filter changes, etc.) on analytical equipment. The program is designed to prevent equipment failure from ordinary routine use. The preventative maintenance recommendations of the equipment manufacturers are used as guidelines for the program.

A record of the preventative maintenance will be kept in the Instrument Log Book for each piece of analytical equipment. The task performed, date and person(s) performing the task will appear in the Log Book. The Laboratory Manager and the QA/QC Manager will be notified if any problems are identified at the time of the preventative maintenance.

QA/QC REPORTS TO MANAGEMENT

The QA/QC Manager is responsible for reporting the following to the President and/or Laboratory Director:

1. The results of audits by regulatory agencies and clients.

2. The results of internal audits.

3. Comments and recommendations on the improvement of operations.

4. Identification of corrective action.

5. The trends discovered by doing statistical analysis of the QA/QC data generated in the laboratory.

SECTION 4

APPENDIX A

ANALYTICAL INSTRUMENTATION AND EQUIPMENT

This section provides a partial list of current equipment for analysis.

LABORATORY EQUIPMENT

The laboratory has state-of-the-art equipment to perform the broad range of environmental investigations, evaluations and remediation services that ECI provides. The following is a representative list of the diverse instrumentation owned by the laboratory and is designed to provide the most precise information in the analysis of environmental samples.

Hewlett-Packard 589011 GAs Chromatograph, 7673A Automatic Injector, 5970 Mass Selective, Detector with HP-UX Chem Station using OI Analytical Sample Concentrator

Hewlett-Packard 589011 Gas Chromatograph, 7673A Automatic Injector, Electron Capture Detector (ECD) and Flame Ionization Detector (FID) with H-P3396A Integrator

Varian 3400 Gas Chromatograph equipped with a Hall (ELCD) and Photo Ionization Detector in series using Tekmar LSC2000 Interfaced with an ALS 2016 Auto Sampler and Flame Ionization Detector (FID)

Milton Roy Company Spectronic 21 Spectrophotometer

HACH DR/2000 Spectrophotometer, Model 399A

Orion pH/Ionalyzer, Model 901

Orion Research Microprocessor Ionalyzer, Model 901

MCL Model TOX-10/TSX-10 Microcoulometer Organic Halogen Analyzer and Preparator

YSI Model 51B Oxygen Meter

HACH Model 2300 Conductivity Meter

5 Lars Lande Zero Headspace Extractors (ZHE)

Lars Lande 5 Place Rotary Extractor

Beckman FT1100 Fourier Transform Infrared Spectrophotometer

SMI III Model SS-3B Direct Current Plasma (DCP)

Varian Spectra AA-400 Zeeman Graphite Furnace, Atomic Absorption Spectrophotometer with Autoanalyzer

Bacharach Coleman Model 50B Cold Vapor Mercury Analyzer

2 Sartorius 2003 MPI Analytical Balances

Mettler AE 240 Analytical Balance

SECTION 5

FIGURE 1

CHAIN OF CUSTODY RECORD

CHAIN OF CUSTODY RECORD

ECI
ENVIRONMENTAL COMPLIANCE, INC.
35526 Grand River Ave., Suite 151 • Farmington Hills, MI 48335 • Phone (810) 557-2707 • Fax (810) 528-5174

Date: _____ Page _____ of _____

Purchase Order No.:	Reference No.:		
SEND INVOICE TO: Name		REPORT RESULTS TO: Name	Title
Company	Dept.	Company	
Address		Mailing Address	
City, State, Zip		City, State, Zip	
		Telephone No.	Fax No.
Special Instructions:		Number of Containers / ANALYSIS REQUESTED	
Sampler:			

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE/ GRAB	PRESERVATIVES	Remarks (matrix)

Relinquished by:	Date/Time	Received by:	Date/Time
Relinquished by:	Date/Time	Received by:	Date/Time
Relinquished by:	Date/Time	Received by:	Date/Time
Method of Shipment:		Rush / 5 Working Days / 10 Working Days	Sampling Location:

Authorized by: _____ Date _____
(Client Signature Must Accompany Request)

FIGURE 2

SAMPLE DEVIATION WAIVER FORM

ECI SAMPLE DEVIATION WAIVER FORM

I, (NAME & TITLE)_____OF_____

HEREBY STATE THAT I DID NOT COMPLY WITH ONE (1) OR MORE OF THE FOLLOWING ECI SAMPLE ACCEPTANCE POLICIES:

_____ THE SAMPLE(S) WAS/WERE NOT CONTAINED IN AN EPA CLEANED, OR EQUIVALENT BOTTLE

_____ THE SAMPLE(S) WAS/WERE NOT PRESERVED

_____ THE SAMPLE(S) WAS/WERE NOT PROPERLY LABELLED

_____ THE SAMPLE(S) WAS/WERE NOT ACCOMPANIED BY A CHAIN OF CUSTODY FORM

_____ A COPY OF A WASTEWATER DISCHARGE PERMIT HAS NOT BEEN SUPPLIED TO ECI

(INDICATE NOT APPLICABLE WHEN APPROPRIATE)

COMENTS:

SIGNATURE_____

_____

DATE

APPENDIX B

SAMPLE PRESERVATION AND HOLDING TIMES
CONTAINERS, VOLUME REQUIREMENTS AND METHOD

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WATER AND WASTEWATER

TEST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
ACIDITY		100	P,G	COOL, 4°C	24 HOURS	2310
ALKALINITY		100	P,G	COOL, 4°C	24 HOURS	2320
ASBESTOS (PLM)		100	P,G	NONE REQUIRED	30 DAYS	600/M4-82
ASBESTOS (TEM)		100	P,G	NONE REQUIRED	30 DAYS	----
BICARBONATE		100	P,G	COOL, 4°C	24 HOURS	2320
BOD	COMP.	1000	P,G	COOL, 4°C	48 HOURS	405.1
BROMIDE		100	P,G	NONE REQUIRED	28 DAYS	D1246
CARBONATE		100	P,G	COOL, 4°C	24 HOURS	2320
COD	COMP.	50	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	410.4
CHLORIDE		50	P,G	NONE REQUIRED	28 DAYS	4500-CL-D
CHLORINE - (FIELD)		200	P,G	NONE REQUIRED	ANALYZE IMMED.	PAPER TES
CHLORINE, TOTAL RESIDUAL		200	P,G	NONE REQUIRED	ANALYZE IMMED.	4500-C
CHLORINE DEMAND		200	P,G	NONE REQUIRED	ANALYZE IMMED.	409A
COLIFORM FECAL		100	P,G	COOL, 4°C 0.008% SODIUM THIOSULFATE	6 HOURS	9132
COLIFORM TOTAL		100	P,G	COOL, 4°C 0.008% SODIUM THIOSULFATE	6 HOURS	9132
COLOR		50	P,G	COOL, 4°C	48 HOURS	110.3
CONDUCTIVITY		100	P,G	COOL, 4°C	28 DAYS	120.1

METHOD SOURCES: MCAWW, ASTM, CFR, STANDARD METHODS

WATER AND WASTEWATER

TEST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
CYANIDES, TOTAL	GRAB	500	P,G	COOL, 4°C SODIUM HYDROXIDE TO pH>12, *0.6g ASCORBIC ACID	14 DAYS	335.2/ 335.3
AMENABLE	GRAB	500	P,G	COOL, 4°C SODIUM HYDROXIDE TO pH>12, *0.6g ASCORBIC ACID	14 DAYS	335.1
FREE		500	P,G	COOL, 4°C SODIUM HYDROXIDE TO pH>12, *0.6g ASCORBIC ACID	14 DAYS	4500-CN-I
DISSOLVED OXYGEN		300	BOD BOTTLE	NONE REQUIRED	ANALYZE ON SITE	360.1
FLUORIDE	COMP.	300	P,G	NONE REQUIRED	28 DAYS	340.2
FUNGI, TOTAL		50	P,G	NONE REQUIRED	48 HOURS	STAIN
HARDNESS		100	P,G	NITRIC ACID TO pH<2	6 MONTHS	200.7 & 2340B
IODIDE		100	P,G	COOL, 4°C	24 HOURS	D1246
LEGIONELLA		100	P,G	NONE REQUIRED	48 HOURS	DYE
METALS, TOTAL	COMP.	100	P,G	COOL, 4°C NITRIC ACID TO pH<2	6 MONTHS	200.7
MERCURY	COMP.	100	G ONLY	COOL, 4°C NITRIC ACID TO pH<2	28 DAYS	245.2
CHROMIUM VI	COMP.	200	P,G	COOL, 4°C NO PRESERV.	24 HOURS	7196
DRINKING WATER	----	1000	P,G	COOL, 4°C NITRIC ACID TO pH<2	6 MONTHS	200.7
DISSOLVED	----	200	P,G	COOL, 4°C NITRIC ACID TO pH<2 FILTER ON SITE	6 MONTHS	200.7

METHOD SOURCES: MCAWW, ASTM, STANDARD METHODS

*SHOULD ONLY BE USED IN THE PRESENCE OF RESIDUAL CHLORINE

WATER AND WASTEWATER

TEST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
NITROGEN AS: AMMONIA	COMP.	400	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	350.3
KJELDAHL	COMP.	500	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	351.3
NITRATE	COMP.	100	P,G	COOL, 4°C	48 HOURS	D81-002
NITRITE	COMP.	50	P,G	COOL, 4°C	48 HOURS	354.
ODOR		200	G ONLY	COOL, 4°C	24 HOURS	140.
OIL & GREASE	GRAB	1000	G ONLY	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	413.2
pH	GRAB	25	P,G	NONE REQUIRED	ANALYZE IMMED.	150.1
PHENOLICS (4AAP), TOTAL	GRAB	500	G ONLY	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	420. 42
PHOSPHATE		50	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	200.7
PHOSPHORUS, TOTAL		50	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	200.7
DISSOLVED		50	P,G	COOL, 4°C SULFURIC ACID TO pH<2 FILTER ON SITE	24 HOURS	200.7
RADIATION SCREEN		100	P,G	NONE REQUIRED	---	D3648
SOLIDS, TOTAL	COMP.	100	P,G	COOL, 4°C	7 DAYS	160.3
DISSOLVED (TDS)	COMP.	100	P,G	COOL, 4°C	7 DAYS	160.1
SUSPENDED (TSS)	COMP.	500	P,G	COOL, 4°C	7 DAYS	160.2
SULFATE		50	P,G	COOL, 4°C	28 DAYS	200.7

METHOD SOURCES: MCAWW, ASTM

WATER AND WASTEWATER

TEST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
SULFIDE, TOTAL	GRAB	500	P,G	COOL, 4°C ADD 2ml OF 2N ZINC ACETATE PLUS SODIUM HYDROXIDE TO pH>9	7 DAYS	376.1
SULFITE		50	P,G	NONE REQUIRED	ANALYZE IMMED.	377.1
SULFUR		100	P,G	COOL, 4°C NITRIC ACID TO pH<2	6 MONTHS	200.7
SURFACTANTS/MBAS		250	P,G	COOL, 4°C	48 HOURS	5540C
TEMPERATURE		1000	P,G	NONE REQUIRED	ANALYZE ON SITE	170.1
TOTAL BACTERIA/ TOTAL PLATE COUNT		1000	P,G	COOL, 4°C	48 HOURS	9215D
TOTAL ORGANIC CARBON (TOC)		25	P,G	COOL, 4°C SULFURIC ACID OR HYDROCHLORIC ACID TO pH<2	28 DAYS	415.1
TOTAL ORGANIC HALOGENS (TOX)		100	G, AMBER TEFLON LINED CAP	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	9020
TOTAL PETROLEUM HYDROCARBONS (TPH)		1000	G ONLY	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	418.1
TRIHALOMETHANES		40	VOA	COOL, 4°C	14 DAYS	502.2
TURBIDITY		100	P,G	COOL, 4°C	48 HOURS	180.1

METHOD SOURCES: MCAWW, EPA SW-846, STANDARD METHODS

METHOD NUMBER	TEST	SAMPLE TYPE	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDIN TIME
601	VOLATILES: HALOGENATED	GRAB	40	VOA	COOL, 4°C *0.008% SODIUM THIOSULFATE	14 DA
602	VOLATILES: AROMATIC & NON-HALOGENATED (BTEX & MTBE)	GRAB	40	VOA	COOL, 4°C SULFURIC ACID TO pH<2 *0.008% SODIUM THIOSULFATE	14 DA
604	PHENOLS-GC		1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/40
608	PESTICIDES & PCBS		1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/40
610	PNA/PAH		1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/40
615	HERBICIDES		1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/4
624	TTO (VOLATILES)	GRAB	40 & 40	VOA	COOL, 4°C *0.008% SODIUM THIOSULFATE COOL, 4°C SULFURIC ACID TO pH<2 *0.008% SODIUM THIOSULFATE	14 DA 14 DA
625	TTO (SEMI-VOLATILES, PNA/PAH, PCBS, PESTICIDES)	COMP.	1000	G, AMBER TEFLON LINED CAP	COOL, 4°C	7/40
CALIFORNIA-DHS (8015M)	TPH-GC		2 x 1000	G, AMBER TEFLON LINED CAP	COOL, 4°C HYDROCHLORIC ACID TO pH<2	7/4
GRO ▪PUBL-SW-140	GASOLINE RANGE ORGANICS		2 x 40	VOA	COOL, 4°C HYDROCHLORIC ACID TO pH<2	14 DA
DRO ▪PUBL-SW-141	DIESEL RANGE ORGANICS		2 x 1000	G, AMBER TEFLON LINED CAP	COOL, 4°C HYDROCHLORIC ACID TO pH<2	7/47
---	FSCAN		2 x 40	VOA	COOL, 4°C	14 DA

METHOD SOURCES: EPA-600/4-79-020, CALIFORNIA METHOD, ▪WISCONSIN DNR
^ = DAYS UNTIL EXTRACTION/DAYS AFTER EXTRACTION
*SHOULD ONLY BE USED IN THE PRESENCE OF RESIDUAL CHLORINE

SOIL, SEDIMENT, SLUDGE & SOLID WASTE

METHOD NUMBER	TEST	MINIMUM VOLUME REQUIRED (oz)	CONTAINER	PRESERVATIVE	HOLDING TIME
8010	VOLATILES: HALOGENATED	4	G, WITH SEPTUM	COOL, 4°C	14 DAYS
8020	VOLATILES: AROMATIC & NON-HALOGENATED (BTEX & MTBE)	4	G, WITH SEPTUM	COOL, 4°C	14 DAYS
8040	PHENOLS-GC	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
8080	PESTICIDES & PCBS	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
8100,8310	PNA/PAH	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
8150	HERBICIDES	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
8260	TTO (VOLATILES)	4	G, WITH SEPTUM	COOL, 4°C	14 DAYS
8270	TTO (SEMI-VOLATILES, PNA/PAH, PCBS, PESTICIDES)	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^
CALIFORNIA-DHS (8015M)	TPH-GC	8	G, TEFLON LINED CAP	COOL, 4°C	3 DAYS
GRO ▪PUBL-SW-140	GASOLINE RANGE ORGANICS	25g in 40ml	VOA	*COOL, 4°C	14 DAYS
DRO ▪PUBL-SW-141	DIESEL RANGE ORGANICS	4	VOA	COOL, 4°C	3 DAYS
---	FSCAN	4	G, WITH SEPTUM	COOL, 4°C	14 DAYS

METHOD SOURCES: EPA SW-846, CALIFORNIA METHOD, ▪WISCONSIN DNR

^ = DAYS UNTIL EXTRACTION/DAYS AFTER EXTRACTION

* ADD 25 g OF METHANOL TO SAMPLE VIAL IMMEDIATELY AFTER SAMPLE COLLECTION

METHOD NUMBER	TEST	MINIMUM VOLUME REQUIRED (ml)	CONTAINER	PRESERVATIVE	HOLDING TIME
8010	VOLATILES: HALOGENATED	**2 x 40	G, WITH SEPTUM	COOL, 4°C SULFURIC ACID TO pH<2 *4 DROPS	14 DAYS
8020	VOLATILES: AROMATIC & NON-HALOGENATED (BTEX & MTBE)	**2 x 40	G, WITH SEPTUM	COOL, 4°C SULFURIC ACID TO pH<2 *4 DROPS	14 DAYS
8040	PHENOLS-GC	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
8080	PESTICIDES & PCBS	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
8100,8310	PNA/PAH	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
8150	HERBICIDES	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
8260	TTO (VOLATILES)	**2 x 40	G, WITH SEPTUM	COOL, 4°C *4 DROPS	14 DAYS
8270	TTO (SEMI-VOLATILES, PNA/PAH, PCBS, PESTICIDES)	**1 gal.	G, AMBER TEFLON LINED CAP	COOL, 4°C *3 mls	7/40^
CALIFORNIA-DHS	TPH-GC	100	G ONLY	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS
---	FSCAN	2 x 40	G, WITH SEPTUM	COOL, 4°C	14 DAYS

METHOD SOURCES: EPA SW-846, CALIFORNIA METHOD

^ = DAYS UNTIL EXTRACTION/DAYS AFTER EXTRACTION
(FOR CONCENTRATED LIQUID WASTE, THE HOLDING TIME = 14/40)

*10 % SODIUM THIOSULFATE: SHOULD ONLY BE USED IN THE PRESENCE OF RESIDUAL CHLORINE

**ALL CONCENTRATED LIQUID WASTE: USE AN 8oz WIDEMOUTH JAR WITHOUT PRESERVATIVES.

LIQUID WASTE & SOIL, SEDIMENT, SLUDGE & SOLID WASTE

TEST	MINIMUM VOLUME REQUIRED (g/ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
ACIDITY	20/100	P,G	COOL, 4°C	14 DAYS	2310
ALKALINITY	20/100	P,G	COOL, 4°C	14 DAYS	2320
ASBESTOS (PLM)	10/100	P,G	NONE REQUIRED	30 DAYS	600/M4-82020
ASBESTOS (TEM)	10/100	P,G	NONE REQUIRED	30 DAYS	----
ASH CONTENT	50/100	P,G	COOL, 4°C	7 DAYS	160.4
BOTTOM SEDIMENT & WATER (BS&W)	100mls	P,G	NONE REQUIRED	28 DAYS	D96
BRITISH THERMAL UNITS (BTU/lb)	50/50	P,G	NONE REQUIRED	28 DAYS	D240
CHLORINE	20/100	P,G	COOL, 4°C	14 DAYS	D4208, 207M-PARR
CONDUCTIVITY	100	P,G	COOL, 4°C	28 DAYS	9050
CORROSIVITY/pH	25/25	P,G	NONE REQUIRED	ANALYZE IMMED.	9045/9040
CYANIDE, TOTAL	50/500	P,G	COOL, 4°C * SODIUM HYDROXIDE TO pH>12	14 DAYS	9010
AMENABLE	100/500	P,G	COOL, 4°C * SODIUM HYDROXIDE TO pH>12	14 DAYS	9010
REACTIVE	50/500	P,G	COOL, 4°C	ANALYZE IMMED.	7.3.3.2
DENSITY	50/250	P,G	NONE REQUIRED	28 DAYS	D5057/D287
EXTRACTABLE ORGANIC HALOGENS (EOX)	20/20	G ONLY	COOL, 4°C	28 DAYS	9020M (TR-019)
FORMALDEHYDE	50/50	G ONLY	COOL, 4°C	28 DAYS	8315
IGNITIBILITY/ FLASH POINT	200/100	G ONLY	COOL, 4°C	ANALYZE IMMED.	1010

METHOD SOURCES: EPA SW-846, ASTM, CFR, STANDARD METHODS, MCAWW, DOHRMANN, PARR

*AQUEOUS SAMPLES ONLY

LIQUID WASTE & SOIL, SEDIMENT, SLUDGE & SOLID WASTE

TEST	MINIMUM VOLUME REQUIRED (g/ml)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
METALS, TOTAL	100/100	P,G	COOL, 4°C *NITRIC ACID TO pH<2	6 MONTHS	6010
MERCURY	100/100	G ONLY	COOL, 4°C *NITRIC ACID TO pH<2	28 DAYS	7471/7470
CHROMIUM VI	100/200	P,G	COOL, 4°C NO PRESERV.	24 HOURS	7196
OXIDATION SCREEN	20/100	P,G	NONE REQUIRED	28 DAYS	D4981
PAINT FILTER TEST	50/100	P,G	NONE REQUIRED	28 DAYS	9095
PHENOLS, TOTAL	500	P,G	COOL, 4°C SULFURIC ACID TO pH<2	28 DAYS	9065,9066
PERCENT WATER	50/50	P,G	NONE REQUIRED	28 DAYS	D3792
RADIATION SCREEN	10/100	P,G	NONE REQUIRED	---	D3648
SOLIDS, TOTAL (%)	50/100	P,G	NONE REQUIRED	7 DAYS	2540-G
SULFIDE, TOTAL	50/500	P,G	COOL, 4°C *ADD 2ml OF 2N ZINC ACETATE	7 DAYS	9030
REACTIVE	50/100	P,G	COOL, 4°C	A.S.A.P.	7.3.4.1
TOTAL HALOGENS AS CHLORINE (TX)	20/100	P,G	COOL, 4°C	14 DAYS	9020M - (TR-01
TOTAL ORGANIC CARBON (TOC)	25/25	P,G	COOL, 4°C *SULFURIC ACID OR HYDROCHLORIC ACID TO pH<2	28 DAYS	9060
TOTAL PETROLEUM HYDROCARBONS (TPH)	100/100	G ONLY	COOL, 4°C *SULFURIC ACID TO pH<2	28 DAYS	418.1
VISCOSITY	1000mls	P,G	COOL, 4°C	28 DAYS	D2196
WATER MIX SCREEN	50/100	P,G	COOL, 4°C	28 DAYS	D5058

METHOD SOURCES: EPA SW-846, MCAWW, ASTM, DOHRMANN, STANDARD METHODS

*AQUEOUS SAMPLES ONLY

TCLP (TOXICITY CHARACTERISTIC LEACHING PROCEDURE) WASTE

TEST	MINIMUM VOLUME REQUIRED (oz)	CONTAINER	PRESERVATIVE	HOLDING TIME	METHOD NUMBER
METALS,	8	P,G	COOL, 4°C *NITRIC ACID TO pH<2	180/180^	1311 & 6010
MERCURY	8	G ONLY	COOL, 4°C *NITRIC ACID TO pH<2	28/28^	1311 & 7471/7470
ORGANICS:					
VOLATILES	8	G, WITH SEPTUM	COOL, 4°C	14/14^	1311 & 8010, 8020 OR 8260
SEMI-VOLATILES	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^	1311 & 8270
PESTICIDES & HERBICIDES	8	G, TEFLON LINED CAP	COOL, 4°C	14/40^	1311 & 8080, 8150

METHOD SOURCES: EPA SW-846, CFR

*AQUEOUS SAMPLES ONLY

^ = DAYS UNTIL EXTRACTION/DAYS AFTER EXTRACTION

REFERENCES

1. Methods for the Determination of Organic Compounds in Drinking Water, Supplement 1. USEPA, 600/4-90/020, July 1990.

2. Code of Federal Regulations; Title 40, Protection of Environment; Chapter 1, Environmental Protection Agency; Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants. The Federal Register, July 1990.

3. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. USEPA, SW-846, Third Edition, November 1990.

4. Methods for Chemical Analysis of Water and Wastes. USEPA, 600/4-79-020, March 1983.

5. Annual Book of ASTM Standards. American Society for Testing Materials, vols. 1-15, 1992.

6. Standard Methods for the Examination of Water and Wastewater. American Public Health Association, 17th Edition, 1989.

7. DHS-California method by GC-FID.

8. Total, Extractable and Leachable Organic Halides in soil and sediments. John T. Martin and Yoshihiro Takahashi, Dorhmann division technical reprint TR-019.

9. Analytical Methods for Oxygen Bombs. Parr Instrument Company, August 24, 1987.

10. Leaking Underground Storage Tank (LUST) Guidance, Wisconsin DNR, PUBL-SW-130 92 rev., April, 1992.

*NOTE: This information is current through January, 1993 and is subject to change.

ANCG / BRTCG

LEVEL IV DATA VALIDATION

INORGANIC ANALYSES

Data Quality Objective: DQO 3
Data Reporting Level: Level IV

	Reported/ Completed		Within Limits/ Acceptable		
	Yes	No	Yes	No	Not Required
1. Method blanks					
2. MS or RWS % recovery (%R)					
3. MSD or RWSD or LD %R					
4. MS/MSD or RW/RWS Mean %R					
5. RPD					
6. Matrix specific MS					
7. LCS %R					
8. ICVS %R					
9. Calibration Curve Standards					
10. CCVS %R					
11. ICS %R (ICP only)					
12. DCS %R					
13. Post digestion analytical spike (furnace AA only)					

Comments: Surrogates

ORGANIC ANALYSES

Data Quality Objective: DQO 3
Data Reporting Level: Level IV

Gas Chromatography or Wet Chemistry

	Reported/ Completed		Within Limits/ Acceptable		
	Yes	No	Yes	No	Not Required
1. Water blanks					
2. Extraction Blanks					
3. RWS					
4. RWSD					
5. RWS/RWSD Mean %R					
6. RPD					
7. MS (batch or sample)					
8. MSD (batch or sample)					
9. LD (optional)					
10. Surrogate spikes					

Comments: _____

LEVEL IV DATA VALIDATION

MASS SPECTROMETER

	Reported/ Completed		Within Limits/ Acceptable		
	Yes	No	Yes	No	Not Required
1. Water Blanks					
2. Extraction Blanks					
3. RWS					
4. RWSD					
5. RWS/RWSD Mean %R					
6. RPD					
7. MS (batch or sample)					
8. MSD (batch or sample)					
9. LD (optional)					
10. Surrogate spikes					
11. BFS or DTFP Tuning					
12. Initial Calibration 12a. SPCC compounds (RRF/>0.3/0.5)					
12b. CCC Compounds (RSD/30%)					
12c. Other Compounds (RRF>0.05)					

Comments: _____

DATA EVALUATION SUMMARY

	Reported/ Completed		Within Limits/ Acceptable		
	Yes	No	Yes	No	Not Required
1. Field measurements of pH, specific conductance and temperature are consistent with historical data.					
2. Field records					
3. Methods (general information)					
4. Sample Preservation					
5. Detection/practical quantitation limits					
6. Holding Times					
6A. Sample collection dates 6B. Laboratory receiving dates 6C. Sample prep./extraction dates 6D. Sample/extract analysis dates					
7. QA/QC samples 7A. Equipment Blank 7B. Field Blank 7C. Trip Blank 7D. Duplicate 7E. Splits 7F. Background					
8. Inorganics QA Data					
9. Organics QA Data (GC/Wet chemistry)					

Comments: _____

Data Validation and Quality Assurance Review
Data Approved for Release By:

_____ Date: _____

_____ Date: _____

Sven R. Pavlovics, R.E.M.
Quality Assurance Officer

Phase II Environmental Site Investigation

Date Start/Finish: 06/07/95 - 06/07/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :** N/A
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12 ft.

Geologist: D.S. Meuse

Boring No. SB-1-1

Client:
General Motors Corporation

Location:
Willows Run Assembly Plant
Former WWTP Lagoon

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Moderate yellowish brown (10YR 5/4), medium to fine sand, some gravel and silt	Cement grout backfill to 12'
				Black (N1), coal boiler slag, moderate yellowish brown (10 YR 5/4), medium to coarse sand	
				Moderate yellowish brown (10YR 5/4), medium to fine sand	
5				Light grey (N7), medium to fine sand, some clay	
				Moderate yellowish brown (10YR 5/2), medium sand	
				Dusky yellowish brown (10YR 3/2), clay	
				Greyish olive (5Y 4/2), fine to medium sand	
10				Medium grey (N5), clay	▼
				Greyish olive (5Y 4/1), medium sand	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/07/95		10 ▼

Project: 480.27
Script: nbocabor
Date: 09/11/95

Date Start/Finish: 06/07/95 – 06/07/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :** N/A
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 16 ft.

Geologist: M. Mueller

Boring No. SB-1-2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former WWTP Lagoon

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
5				Dark yellowish brown (10YR 4/2), medium to coarse sand, with 1/4" gravel	Cement grout backfill to 16'
				Light grey (N7), hard rock	
				Dark greenish gray (5GY 4/1), medium to fine sand, some clay	
10				Medium brownish grey (5YR 5/1), fine clay	
				Dark yellowish brown (10YR 4/2), gravel	
				Medium brownish grey (5YR 5/1), silt and clay	
15				Medium olive grey (5Y 5/1), medium fine sand, with 10% silt/clay	
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/07/95		11.0 ▼

Date Start/Finish: 06/06/95 – 06/06/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :** N/A
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 16 ft.

Geologist: D.S. Meuse

Boring No. SB-1-3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former WWTP Lagoon

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Dark yellowish brown (10YR 4/2), silt, with some fine sand	Cement grout backfill to 16'
				Dark yellowish brown (10YR 4/2), silt, some medium to coarse sand, some clay	
5				Dark yellowish brown (10YR 4/2), medium to coarse sand	
				Moderate brown (5YR 4/4), clay, trace silt	
10				Grayish brown (5YR 3/2), clay	
				Grayish brown (5YR 3/2), clay	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/06/95		14.0 ▼

Date Start/Finish: 06/07/95 - 06/07/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :** N/A
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12 ft.

Geologist: D.S. Meuse

Boring No. SB-1-4

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former WWTP Lagoon

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 12'
				Moderate brown (5YR 4/4), gravel, trace sand	
				Moderate brown (5YR 4/4), gravel, little sand	
5				Moderate brown (5YR 4/4) and grayish blue green (5BG 5/2), clay, trace gravel	
				Moderate brown (5YR 4/4) and grayish blue green (5BG 5/2), clay	
				Moderate yellowish brown (10YR 5/4), medium sand	
10				Light brown (5YR 5/6), clay	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/07/95		11.0 ▼

Date Start/Finish: 06/08/95 – 06/08/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :** N/A
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 13 ft.

Geologist: G. Corbett

Boring No. SB-2-1

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 13'
	0.4	27.5		Dark yellowish brown (10YR 4/2), medium sand, concrete chips, 2" of ash	
	0.5	5.4		Dark yellowish orange (10YR 6/6), medium to fine sand, some rocks	
5	1.1	27.1		Dark yellowish brown (5YR 4/2), medium to fine sand, some gravel (concrete chips)	
	0.7	14.8		Dark yellowish brown (10YR 4/2), medium to fine sand	
				Moderate yellowish brown (10YR 5/4), medium to fine sand	
10	0.8	1,460.8		6" Dusky yellowish brown (10YR 2/4) and 6" Black (N1), medium to fine sand (odors)	Groundwater table not determined due to low permeability
	20.9	769		Varied color, concrete chips and gravel (odors)	
				Dark yellowish brown (10YR 4/2), medium to fine sand, gravel, wood chips, not homogonized (odors)	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Project: 480.27
Script: nbocabor
Date: 09/11/95

Date Start/Finish: 06/07/95 - 06/07/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12 ft.

Geologist: G. Corbett

Boring No. SB-2-2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 12'
	0.1	4.7		Dark yellowish brown (10YR 4/2), silt with some gravel and sand	
	0.1	4.7		Light brown (5YR 5/6), sand with some silt	
5	0.1	4.5		Light brown (5YR 5/6), medium sand with some silt	
	0.0	4.1		Light brown (5YR 5/6), medium sand	
	0.1	5.2		Moderate brown (5YR 4/4), coarse to medium sand	
10	0.1	7.9		Dark yellowish brown (10YR 4/2), medium sand	Groundwater table not determined due to low permeability
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Project: 480.27
Script: nbocabor
Date: 09/11/95

Date Start/Finish: 06/07/95 - 06/07/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 5 ft.

Geologist: G. Corbett

Boring No. SB-2-3A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 5'
	0.2	5.1		Grayish brown (5YR 3/2), gravel with some silt	
	1.0	38.5		Moderate brown (5YR 4/4), sand with some clay and silt	
5				Brownish black (5YR 2/1), fine sand with some gravel	Groundwater table not encountered due to boring refusal
10					
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/07/95 - 06/07/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 5 ft.

Geologist: G. Corbett

Boring No. SB-2-3B

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 5'
	0.2			Grayish brown (5YR 3/2), gravel with some silt	
				Moderate brown (5YR 4/4), sand with some clay and silt	
5				Brownish black (5YR 2/1), fine sand with some gravel	Groundwater table not encountered due to boring refusal
10					
15					
20					

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ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/07/95 - 06/07/95 **Drilling Company:** Young Environmental Inc. **Driller's Name:** Ken Shole **Drilling Method:** Geoprobe **Bit Size:** N/A **Auger Size :** **Rig Type:** Mobile **Spoon Size:** 2-in. **Hammer Weight:** 140-lb **Height of Fall:** 30-in.	**Borehole Depth:** 12 ft. **Geologist:** G. Corbett	**Boring No. SB-2-4** **Client:** General Motots Corporation **Location:** Willow Run Assembly Plant Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 12'
	0.3	19.8		Moderate brown (5YR 4/4), sandy silt	
	0.1	5.5		Dark yellowish brown (10YR 2/2), silt, some gravel and sand, glass debris	
5	0.0	4.9		Light brown (5YR 5/6), medium to fine sand	
	0.0	4.5			
10	0.1	8.1		Moderate reddish brown (10R 4/6), medium to fine sand	
	0.4	41.5		Light brown (5YR 5/6), medium to fine sand	
				Moderate yellowish brown (10YR 5/4), medium sand	
15				Moderate reddish orange (10R 6/6), medium sand with some silt	
20					

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Remarks:

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Saturated Zones

Date / Time	Elevation	Depth
06/07/95		9.0 ▼

Project: 480.27 Script: nbocabor Date: 09/11/95

Date Start/Finish: 06/07/95 - 06/07/95 **Drilling Company:** Young Environmental Inc. **Driller's Name:** Ken Shole **Drilling Method:** Geoprobe **Bit Size:** N/A **Auger Size :** **Rig Type:** Mobile **Spoon Size:** 2-in. **Hammer Weight:** 140-lb **Height of Fall:** 30-in.	**Borehole Depth:** 6.5 ft. **Geologist:** G. Corbett	**Boring No. SB-2-5** **Client:** General Motors Corporation **Location:** Willow Run Assembly Plant Former South Culvert Area

DEPTH ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 6.5
	0.3	6.2		Pale yellowish brown (10YR 6/2), gravel with some coarse sand	
	1.2	10.8		Color varies, debris (wood, brick, glass, ash)	
5	0.5	4.4		Color varies, concrete chips, ash, and coarse sand	Groundwater table not encountered due to boring refusal
10					
15					
20					

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Remarks:

PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/07/95 - 06/07/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 13 ft.

Geologist: G. Corbett

Boring No. SB-2-6

Client:
Former Southern Culvert

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 13'
	0.3	10.1		Non-homogenous color (browns to black), gravel, sand, debris (glass, wood, concrete, metal)	
	0.4	11.1			
5	0.0	6.5		Moderate yellowish brown (10YR) (for gravel), gravel, sand, debris	
	0.0	5.4		Moderate brown (5YR 4/4), medium to coarse sand, some silt	
10	0.3	85.8		Light brown (5YR 5/6), silt	
				Grayish black (N2), medium to fine sand, some silt with cobbles	
	0.5	73.5		Grayish black (N2), homogenized silt with moderate silt trace gravel	
15					
20					

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Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/07/95		9 ▼

Project: 480.27
Script: nbocabor
Date: 09/11/95

Date Start/Finish: 06/09/95 - 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 13 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-2-7

Client:
Former Southern Culvert

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 13'
	0.2	4.3		Pale yellowish brown (10YR 6/2), gravel	
	0.2	4.3		Dark yellowish orange (10YR 6/6), medium to fine sand, some silt	
5	0.1	5.4		Grayish black (N2), ash, some burnt paper	
	0.3	4.5		Dark yellowish brown (10YR 4/2), fine sand, some silt	
10	0.2	6.4		Moderate yellowish brown (10YR 5/4), clay	Groundwater table not determined due to low permeability
	0.0	4.1		Moderate yellowish brown (10YR 5/4), medium to fine grain sand	
15				Pale yellowish brown (10YR 6/2), fine sand, some silt	
20				Moderate yellowish brown (10yr 5/4), fine sand	

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/08/95 - 06/08/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12.5 ft.

Geologist: G. Corbett

Boring No. SB-2-8

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 12.5'
	0.3	6.1		Moderate yellowish brown (10YR 5/4), medium to fine sand with gravel and concrete chips	
	0.2	5.2		Dark yellowish brown (10YR 2/2), coarse to medium sand, some gravel	
5	0.2	4.6		Dark yellowish orange (10YR 6/6), medium to fine sand	
	0.4	4.4		Dark yellowish orange (10YR 6/6), medium to fine sand, some asphalt type gravel (2" layer)	
	0.3	5.6		Pale yellowish brown (10YR 6/2), medium to fine sand	
10	0.4	5.8		Dark yellowish brown (10YR 4/2), medium to fine sand, some gravel	
				Dark yellowish orange (10YR 6/6), medium to fine sand (2" layer)	
				Dark yellowish brown (10YR 4/2), medium to fine sand, some gravel	
15					
20					

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Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/08/95		7 ▼

Date Start/Finish: 06/08/95 - 06/08/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12.5 ft.

Geologist: D.S. Meuse/G. Corbett

Boring No. SB-2-9

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 12.5'
	0.5	7.1		Pale yellowish brown (10YR 6/2), gravel Silt, some fine sand, cobbles, ash, wood ash	
	0.6	6.0			
5				Dark yellowish orange (10YR 6/6), medium to fine sand	
	0.6	9.2		Moderate yellowish brown (10YR 5/4), clay	
	0.4	4.8		Dark yellowish orange (10YR 6/6), medium to fine sand	
10	0.8	12.0		Dark yellowish orange (10YR 6/6), medium to fine sand, some gravel	
	0.4	5.8			
15					
20					

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/08/95		10 ▼

Project: 480.27
Script: nbocabor
Date: 09/11/95

Date Start/Finish: 06/08/95 - 06/08/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :** N/A
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12.5 ft.

Geologist: D.S. Meuse/G. Corbett

Boring No. SB-2-10

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 12.5'
	0.6	7.2		Light olive gray (5Y 6/1), gravel, some coarse sand	
				Dark yellowish brown (10YR 4/2), silt, some cobbles	
	0.8	8.9		Dark yellowish orange (10YR 6/6), medium to fine sand	
5				Black (N1), ash	
	2.4	26.9		Pale yellowish brown (10YR 6/2), gravel, coarse sand, and birch chips	
				Dark yellowish brown (10YR 4/2), silt, birch chips, decomposing peat, - note - only 1' of material recovered in probe	
10	1.0	760.5		First foot moderate brown (5YR 3/4) and last 6" Dusky yellowish brown (10YR 2/2), silt, some gravel and decomposed wood - note - only one foot of recovered material for 4' spoon	Groundwater table not determined due to low permeability
15					
20					

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Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/08/95 – 06/08/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :** N/A
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 9.0 ft.

Geologist: G. Corbett

Boring No. SB-2-11

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 8.0'
	1.3	15.8		Medium gray (N5), gravel, some medium sand	
				Dark reddish brown (10R 3/4), gravel, some sand, silt and glass	
	0.8	7.4		Black (N1), gravel, some sand, silt, and glass	
5				Light brown (5YR 6/4), gravel, some medium sand	
	2.4	7.5		Light brown (5YR 5/6), gravel, some medium sand	
				Moderate yellowish brown (10YR 5/4). coarse to medium sand	
	1.0	5.7		Light brownish gray (5YR 6/1), cobbles and concrete	
10				Probe hit concrete	Groundwater table not determined due to boring refusal
15					
20					

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ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGD AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/08/95 - 06/08/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :** N/A
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 16.5 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-2-12

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 16.5'
	0.4	5.1		Meidum light gray (N6), gravel, some coarse sand	
	0.2	4.4		Dark yellowish brown (10YR 5/2), silt, some sand and chrushed stone	
5	0.7	12.3		Moderate yellowish brwon (10YR 5/4), silt, some sand	
	0.2	4.2		Color varies, glass, brick, cobbles, decaying organic material	
	0.3	4.4		Dark yellowish orange (10YR 6/6), medium to fine grain sand	
10	0.2	3.8		Dark yellowish orange (10YR 6/6), medium to fine grain sand, some silt	
	0.3	4.0		Dark yellowish orange (10YR 6/6), medium to fine grain sand	
15				Dark yellowish orange (10YR 6/6), clay	
20					

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/08/95		11.0 ▼

Date Start/Finish: 06/08/95 – 06/08/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12.5 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-2-13

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 12.5'
	0.1	3.9		Moderate brown (5YR 3/4), sand, some gravel and silt	
				Light brown (5YR 5/6), fine sand, some cobbles	
	0.1	3.8			
5				Medium to fine sand, some silt	
	0.1	3.9			
	0.1	3.7			
				Dark yellowish brown (10YR 4/2), mixed gravel, some metal scraps, brick scaps, and coarse sand	
10	0.2	4.1		Dark yellowish brown (10YR 4/2) band 1" thick, mixed gravel, some metal scraps, brick scaps, and coarse sand	
	0.9	20.6		Dark yellowish brown (10YR 4/2), mixed gravel, some metal scraps, brick scraps, and coarse sand	
15				Brownish black (5YR 2/1), mixed ash, some coal and coarse sand	
20					

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Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/08/95		12.0 ▼

Date Start/Finish: 06/08/95 - 06/08/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12.5 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-2-14

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 12.5'
	1.1	7.6		Pale yellowish brown (10YR 6/2), gravel, some coarse sand Light brown (5YR 5/6), 50/50 silt and sand	
	1.8	15.2		Dusky brown (5YR 2/2), ash, metal shavings, wood chips, glass	
5	1.6	16.0		Color varies, moderate yellowish brown (10YR 5/4) soil, material varies, brick, ash, dirt, glass - note: sludge ran out of 4' probe only 1 1/2' of soil recovered	
10	2.0	28.0		Dusky yellowish brown (10YR 2/2), glass, silt, decomposing material with a 2" layer of pale yellowish orange (10YR 8/6), sand, some metal shavings - note: sludge ran out of 4' probe only 1 1/2' of soil recovered	Groundwater table not determined due to low permeability
15					
20					

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Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Project: 480.27
Script: nbocabor
Date: 09/11/95

Date Start/Finish: 06/09/95 - 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 18.5 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-2-15

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former South Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 18.5'
	0.1			Pale yellowish brown (10YR 6/2), gravel	
				Silt, some sand and cobbles	
	0.2			Light brown (5YR 6/4), sandstone	
5				Dusky yellowish brown (10YR 2/2), silt, some sand and cobbles	
	0.1			Dusky yellowish brown (10YR 2/2), silt, some sand and cobbles - note: less than 1' of recovery from 4' probe	
10	0.5				Groundwater table not determined due to low permeability
15	0.6				
20					

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Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Project: 480.27
Script: nbocabor
Date: 09/11/95

Date Start/Finish: 06/05/95 - 06/05/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 13.7 ft.

Geologist: S. Pavlovics

Boring No. SB-3-1

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
North Hydraulic Elevator Pit

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	1.7	8.0		Concrete	Cement grout backfill to 13.7'
	1.7	6.7		Modrerate yellowish brown (10YR 5/4), medium to fine sand, 15% 1/4" stone	
5	1.7	5.8		Pale yellowish brown (5YR 4/4), fine sand, little silt	
	1.6	5.8		Pale yellowish brown (5YR 4/4), medium to fine sand	
	1.5	5.4		Grayish yellowish orange (10YR 7/4), clay, trace fine sand	
10	3.3	10,797.8		Pale yellowish brown (10YR 6/2), silty sand	
				Pale yellowish brown (10YR 6/2), silty sand, little clay	
				Free product encountered, strong petroleum odor	
15				Dusky yellowish brown (10YR 2/2), silt, some sand and cobbles - note: less than 1' of recovery from 4' probe	
20					

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Remarks:
PRIVILEGED AND CONFIDENTAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/05/95	N/A	13.7 ▼

Project: 480.27
Script: nbocabor
Date: 09/12/95

Date Start/Finish: 06/05/95 - 06/05/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 13 ft.

Geologist: D.S. Meuse

Boring No. SB-3-2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
North Hydraulic Elevator Pit

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	1.6	8.5		Concrete	Cement grout backfill to 13'
				Dark yellowish brown (10YR 4/2), medium to fine sand	
	3.4	11.2			
5	2.1	7.4		Dusky yellowish brown (10YR 2/2), medium to coarse sand, some gravel, little clay	
	3.6	7.3		Moderate yellowish brown (10YR 5/4) to moderate brown (10YR 4/4), medium to coarse sand	
	2.2	8.1		Moderate yellowish brown (10YR 5/4), medium to fine sand	
10	3.3	8.2		Light brown (5YR 5/6) to moderate yellowish brown (10YR 5/4), medium sand	
				Dark yellowish brown (10YR 4/2), medium to coarse sand	
15					
20					

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Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/05/95	N/A	13.0 ▼

Date Start/Finish: 06/05/95 - 06/05/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 13 ft.

Geologist: D.S. Meuse

Boring No. SB-3-3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
North Hydraulic Elevator Pit

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	2.0	7.6		Concrete Dark yellowish brown (10YR 4/2), medium to fine sand	Cement grout backfill to 13'
	1.4	7.0			
5	1.5	5.8		Dusky yellowish brown (10YR 2/2), medium to coarse sand, some gravel, little clay	
	1.2	5.7		Moderate yellowish brown (10YR 5/4) to moderate brown (10YR 4/4), medium to coarse sand	
	1.4	6.9		Moderate yellowish brown (10YR 5/4), medium to fine sand	
10	14.1	109.3		Light brown (5YR 5/6) to moderate yellowish brown (10YR 5/4), medium sand	
				Dark yellowish brown (10YR 4/2), medium to coarse sand	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/05/95	N/A	13.0 ▼

Date Start/Finish: 06/05/95 – 06/05/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 13 ft.

Geologist: S. Pavolovich

Boring No. SB-3-4

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
North Hydraulic Elevator Pit

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	2.0	6.2		Concrete	Cement grout backfill to 13'
	1.7	7.6		Dark yellowish brown (10YR 4/2), fine sand	
5	1.7	9.4		Dark yellowish brown (10YR 4/2), coarse to medium sand, some clay and silt	
	1.2	9.2		Dark yellowish brown (10YR 4/2), medium sand	
	1.4	8.6		Dark yellowish brown (10YR 4/2), coarse sand	
10	14.1	4.8		Dark yellowish brown (10YR 4/2), medium sand	
				Grayish green (10GY 5/2), fine sand, some silt	Groundwater table not encountered
15					
20					

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ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/06/95 – 06/06/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: KVA/Hammer Drill
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 10.5 ft.

Geologist: M. Mueller

Boring No. SB-5-1

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
ELPO Tank Building Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 10.5'
				Moderate brown (5YR 3/4), medium to coarse sand, some 1/4" gravel	
				Moderate yellowish brown (10YR 5/4), medium to fine sand, 10% clay, with some 3/4" gravel	
5				Moderate yellowish brown (10YR 5/2), clay, with medium to fine sand	
				Moderate yellowish brown (10YR 5/4), medium to fine sang	
				Dark yellowish brown (10YR 4/2), medium to coarse sand	Groundwater table not determined due to low permeability
10				Moderate yellowish brown (10YR 5/4), medium to fine sand	
				Medium gray (N5), medium to fine sand, 10% clay	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/06/95 - 06/06/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: KVA/Hammer Drill
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 13 ft.

Geologist: D. Meuse

Boring No. SB-5-2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
ELPO Tank Building Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 13'
				Moderate brown (5YR 4/4), fine sand, some silt and gravel	
				Dark yellowish brown (10YR 4/2), silt, some fine sand, little gravel	
				Grayish brown (5YR 3/2), clay, little gravel	
5				Dark yellowish brown (10YR 4/2), clay	
				Moderate brown (5YR 3/4), clay, little silt	
10				Moderate brown (5YR 4/4), sand, clay, some silt	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
08/06/95	N/A	10 ▼

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/06/95 – 06/06/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: KVA/Hammer Drill
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 10 ft.

Geologist: S. Pavlovics

Boring No. SB-5-3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
ELPO Tank Building Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 10'
				Moderate yellowish brown (10YR 5/4), medium to fine sand	
				Moderate yellowish brown (10YR 5/4), medium to coarse sand, 25% silty clay, 25% 1/4" stone	
5				Moderate yellowish brown (10YR 5/4), clay, 25% fine silty sand	
				Dark yellowish orange (10YR 6/6), clay, fine silty sand (25%)	
10					
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/06/95	N/A	10.0 ▼

Date Start/Finish: 06/09/95 - 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 17 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-6-1

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former Aeration Basin

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 17'
	0.3	4.3		Moderate yellowish brown (10YR 5/4), gravel, some sand, little silt	
	0.2	4.3		Moderate yellowish brown (10YR 5/4), silt with some sand, trace clay and gravel	
5	0.3	3.5		Moderate yellowish brown (10YR 5/4), medium to fine sand, little silt	
				Pale yellowish brown (10YR 6/2), gravel with 1" cobble	
	0.2	3.7		Pale yellowish brown (10YR 6/2), clay	
10	0.3	4.3		Darkish yellow orange (10YR 6/6), medium to fine sand	
	0.1	3.5			
	0.3	7.1		Moderate brown (5YR 4/4), sand	
15	0.2	3.6		Medium light gray (N6), sand	
20					

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ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/06/95	N/A	13.0 ▼

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/09/95 – 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 14.5 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-6-2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former Aeration Basin

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	0.5	7.3		Pale yellowish brown (10YR 6/2), gravel	Cement grout backfill to 14.5'
				Medium light gray (N6), gravel with 3/4" cobble	
	0.2	3.6		Light brown (5YR 5/6), sand, some gravel	
5				Moderate yellowish brown (10YR 5/4), clay	
	0.4	5.1		Light brown (5YR 6/4), medium to fine sand	
	0.1	3.3			
				Light brown (5YR 6/4), medium to fine sand	▼
10	0.3	4.4			
	0.3	3.4		Greenish gray (5GY 6/1), sand	
	0.2	3.9			
15				Medium light gray (N6), sand	
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTAIL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/09/95	N/A	9.0 ▼

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/09/95 – 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 16 ft.

Geologist: G. Corbett

Boring No. SB-6-3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former Aeration Basin

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Concrete	Cement grout backfill to 16'
	0.2	3.3		Moderate yellowish brown (10YR 5/4), medium to fine sand, some cobble	
	0.3	3.1		Moderate yellowish brown (10YR 5/4), clay	
5				Moderate yellowish brown (10YR 5/4), medium to fine sand	
	0.8	6.4		Dark yellowish brown (10YR 4/2), clay	
				Dark yellowish brown (10YR 4/2), clay	
	0.1	9.5		Grayish black (N2), clay	
				Olive gray (5Y 3/2), clay	
10	0.3	4.9		Dark yellowish orange (10YR 6/6), medium to fine sand	
	0.4	3.8		Dark yellowish orange (10YR 6/6), medium to fine sand	
				Dark yellowish brown (10YR 4/2), medium to fine sand	
	0.2	3.4		Dark yellowish brown (10YR 4/2), medium to fine sand, some gravel	
15	0.1	3.5		Dusky brown (10YR 2/2), medium to fine sand	
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/09/95	N/A	12.0 ▼

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/09/95 - 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 16.5 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-6-4

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Northern Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Light brown (5YR 5/6), clay	Cement grout backfill to 16.5'
	0.5	4.2		Dusky yellowish brown (10YR 2/2), gravel, some sand, little silt	
	0.2	3.8		Light brown (5YR 5/6), silt, some fine sand	
5	0.4	3.9		Moderate yellowish brown (10YR 5/4), clay	
	0.4	4.0		Light brown (10YR 5/6), fine sand	
10	0.1	5.2			
	0.1	4.1			
	0.1	7.7			
15	0.2	9.4			
				Medium gray (N5), clay	
20					

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ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/09/95	N/A	10.0 ▼

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/09/95 - 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 15 ft.

Geologist: D.S. Meuse

Boring No. SB-6-5

Client:
General Motors Corportion

Location:
Willow Run Assembly Plant
Former Aeration Basin

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 15'
	1.3	183.1		Dusky brown (5YR 2/2), gravel, some silt	
	0.8	1,051.7		Dusky yellowish brown (10YR 2/2), silt, some sand, little gravel, cobbles, wood	
5	2.0	118.9		Dark yellowish orange (10YR 6/6), medium to fine sand	
	0.1	5.1			
	0.5	41.7			
10	0.3	8.1		Medium light gray (N6), sand	
	0.1	5.2		Medium light gray (N6), clay	
15				Medium light gray (N6), fine sand	
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/09/95	N/A	10.5 ▼

Date Start/Finish: 06/09/95 - 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 14.5 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-6-6

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Northern Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 14.5'
				Pale yellowish brown (10YR 6/2), gravel	
	0.4	5.9		Light brown (5YR 5/6), silt, some coarse sand	
	0.2	3.8		Moderate yellowish brown (10YR 5/4), clay	
5	0.2	4.2		Light brown (10YR 5/6), medium to fine sand	
	0.2	4.1			
10	0.4	6.1			
	0.2	4.7			
	0.3	6.6		Medium light gray (N6), medium to fine sand	
15				Medium light gray (N6), clay	
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/09/95	N/A	9.0 ▼

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/09/95 - 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 14.5 ft.

Geologist: G. Corbett/D.S. Meuse

Boring No. SB-6-7

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Northern Culvert Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
				Asphalt	Cement grout backfill to 14.5'
	0.4	5.2		Dusky brown (5YR 2/2), gravel, some sand	
				Light brown (5YR 5/6), coarse sand, some silt	
	0.1	3.7		Light brown (5YR 5/6), clay	
5	0.3	4.5		Moderate yellowish brown (10YR 5/4), medium sand	
	0.1	3.7			
10	0.2	5.9			
	0.2	3.9			
	0.2	4.3		Medium light gray (N6), medium to fine sand	
15				Moderate yellowish brown (10YR 5/4), medium to fine sand	
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVELEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/06/95	N/A	9.5 ↧

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/09/95 – 06/09/95 **Drilling Company:** Young Environmental Inc. **Driller's Name:** Ken Shole **Drilling Method:** Geoprobe **Bit Size:** N/A **Auger Size :** **Rig Type:** Mobile **Spoon Size:** 2-in. **Hammer Weight:** 140-lb **Height of Fall:** 30-in.	**Borehole Depth:** 14 ft. **Geologist:** G. Corbett/D.S. Meuse	**Boring No. SB-6-8** **Client:** General Motors Corporation **Location:** Willow Run Assembly Plant Former Aeration Basin

DEPTH ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	0.3	3.3		Moderate brown (5YR 3/4), silt	Cement grout backfill to 14'
	0.2	3.0		Moderate yellowish brown (10YR 5/4), silt, some sand , 1/2" cobbles, ground glass	
5	0.3	3.4		Dark yellowish brown (10YR 4/2), clay	
	0.3	3.2		Pale yellowish brown (10YR 6/2) and dark yellowish orange (10YR 6/6), clay, some silt	
	1.3	15.8		Light blue (5B 7/6), silt with 1/2" layer of dead vegetation	
10	0.3	3.5		Moderate yellowish brown (10YR 5/4), sand	Groundwater table not determined due to low permeability
	0.4	22.4		Medium light gray (N6), clay	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/09/95 – 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 14 ft.

Geologist: D.S. Meuse

Boring No. SB-8-9

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former Aeration Basin

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	0.1	3.1		Dusky brown (5YR 2/2), silt, some sand	Cement grout backfill to 14'
	0.1	3.1		Dark yellowish brown (10YR 4/2), medium sand, little silt	
5	0.1	3.3		Light brown (5YR 5/6), medium sand	
	0.2	18.1		Color varies, gravel, silt, debris (brick, cement/concrete chips), ash, wood	
	0.3	9.0		Light brown (5YR 5/6), sand, some silt	
10				Light brown (5YR 5/6) and medium gray (N5), medium sand	
	0.2	4.6		Light brown (5YR 5/6), medium sand	
	0.1	6.0		Medium gray (N5), clay	
15					
20					

BLASLAND, BOUCK & LEE
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Remarks:
PRIVILEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/09/95	N/A	9.0 ▼

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/09/95 – 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12 ft.

Geologist: D.S. Meuse

Boring No. SB-8-10

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former Aeration Basin

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	0.5	3.6		Dusky brown (5YR 2/2), silt, vegetation	Cement grout backfill to 12'
	0.3	3.3		Moderate yellowish brown (10YR 5/4), sand, silt, some cobbles Moderate yellowish brown (10YR 5/4), sand, silt	
5	0.4	4.6		Moderate brown (5YR 4/4), gravel, sand, ash, and debris (ceramic bits) – note only 1.5' recovered in probe	
	0.6	159.2		Light brown (5YR 6/4), sand, some silt	
10	0.3	5.4		Light brown (5YR 5/6), snad, some silt Darkish yellowish orange (5YR 6/6), sand	▼
15					
20					

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Remarks:
PRIVELEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/09/95	N/A	10.0 ▼

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/09/95 - 06/09/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 12 ft.

Geologist: D.S. Meuse

Boring No. SB-6-10

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Former Aeration Basin

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
	0.5	3.6		Dusky brown (5YR 2/2), silt, vegetation	Cement grout backfill to 12'
	0.3	3.3		Moderate yellowish brown (10YR 5/4), sand, silt, some cobbles Moderate yellowish brown (10YR 5/4), sand, silt	
5	0.4	4.6		Moderate brown (5YR 4/4), gravel, sand, ash, and debris (ceramic bits) - note only 1.5' recovered in probe	
	0.6	159.2		Light brown (5YR 6/4), sand, some silt	
10	0.3	5.4		Light brown (5YR 5/6), sand, some silt Darkish yellowish orange (5YR 6/6), sand	
15					
20					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
PRIVELEGED AND CONFIDENTIAL, PREPARED AT GENERAL MOTORS COUNSEL'S REQUEST

Saturated Zones

Date / Time	Elevation	Depth
06/09/95	N/A	10.0

Project: 480.27
Script: nbocabor
Date: 09/13/95

Date Start/Finish: 06/06/95 - 06/06/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 18 ft.

Geologist: M. Mueller

Boring No. SB-7-1

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Kaiser/Fraiser Cinder Storage Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
5				Moderate yellowish brown (10YR 5/2), medium to fine sand	Cement grout backfill to 18'
				Pale yellowish brown (10YR 6/2), medium to coarse sand, with 1/4" gravel	
				Dark yellowish brown (10YR 4/2), medium to fine sand	
				Medium dark gray (N4), coarse sand with rocks	
				Light brown (10YR 5/4), medium to fine sand, 10% clay -	
10				Medium dark gray (N4), medium to coarse sand, 10% clay	
				Light brown (10YR 5/4), medium sand, 1/4" gravel, 10% clay	
15					
20					

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/06/95	N/A	17.0 ↧

Date Start/Finish: 06/06/95 - 06/06/95
Drilling Company: Young Environmental Inc.
Driller's Name: Ken Shole
Drilling Method: Geoprobe
Bit Size: N/A **Auger Size :**
Rig Type: Mobile
Spoon Size: 2-in.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 17 ft.

Geologist: M. Mueller

Boring No. SB-7-2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Kaiser/Fraiser Cinder Storage Area

DEPTH / ELEVATION	PID (ppm)	FID (ppm)	Geologic Column	Stratigraphic Description	Boring Construction
				GROUND SURFACE	
0				Dark yellowish brown (10YR 4/2), medium to fine sand, with 1/4" to 3/4" rocks	Cement grout backfill to 17'
5				Dark yellowish brown (10YR 4/2), medium to fine sand, clay Dark yellowish brown (10YR 4/2), medium to fine sand, 10% clay	
10					
15				Dark yellowish brown (10YR 4/2), medium to fine sand, 30% clay, with 1/4" rocks Moderate yellowish brown (10YR 4/4), medium sand, 10% clay, coarse gravel	
20					

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Saturated Zones

Date / Time	Elevation	Depth
06/06/95	N/A	17.0 ▼

Supplemental Phase II Environmental Site Investigation

Date Start/Finish: 04/10/96 / 04/10/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 27 ft.

Geologist: M. Mueller

Well No. GW-1-5

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Clayey sand, olive brown (2.5Y 4/4), fine to medium grained, poorly sorted, 10% subrounded to subangular gravel, slight HCL reaction	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 14 feet BGS); 2-inch Schedule 40 PVC riser (0.1 to 17 feet BGS)
5										
10									Sandy clay, olive brown (2.5Y 4/3), soft, semi-cohesive, 5% rounded pebbles, slight HCL reaction	
15									Sandy clay, dark grey (5Y 4/2), soft, semi-cohesive, 5% sand, slight HCL reaction	Bentonite seal (14 to 15 feet BGS)
20										No. 3 silica sand (15 to 27 feet BGS)
25										0.010" slot Schedule 40 PVC well screen (17 to 27 feet BGS)
30										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
4/14/96		18.16
4/15/96		18.07
4/16/96		18.12

Date Start/Finish: 04/11/96 / 04/11/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 17 ft.

Geologist: M. Mueller

Well No. GW-2-12A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
			12 12 8 10	20					Sand, black (10YR 2/1), medium grained, poorly sorted, 10% rounded to subrounded gravel and pebbles, moderate HCL reaction	Well cap Cement pad (0 to 0.5 feet BGS) Grout (0.2 to 4 feet BGS)
			25 27 26 33	53						2-inch Schedule 40 PVC riser (0.1 to 7 feet BGS)
5			12 19 27 21	46						Bentonite seal (4 to 5 feet BGS)
			13 22 18 12	40					Sand, dark yellowish brown (10YR 4/6), fine grained, well sorted, no HCL reaction	
10			13 9 9 10	18						No. 3 silica sand (5 to 17 feet BGS)
			9 12 15 16	27						
17										0.010" slot Schedule 40 PVC well screen (7 to 17 feet BGS)

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
4/14/96		11.59
4/15/96		11.54
4/16/96		11.58

Date Start/Finish: 04/11/96 / 04/11/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 20 ft.

Geologist: M. Mueller

Well No. GW-2-13A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
										GROUND SURFACE	
					17					Asphalt Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, 10% rounded gravel, moderate HCL reaction	Well cap Cement pad (0 to 0.5 feet BGS) Grout (0.2 to 7 feet BGS)
					13						
5					12						2-inch Schedule 40 PVC riser (0.1 to 10 feet BGS)
					22					Gravelly sand, dark yellowish brown (10YR 3/4), fine to medium grained, poorly sorted, 5% rounded gravel, moderate HCL reaction	Bentonite seal (7 to 8 feet BGS)
10					22					Gravelly sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 10% rounded gravel, some rounded pebbles and clay, moderate HCL reaction	No. 3 silica sand (8 to 20 feet BGS)
					29						
					5					Sand, black (2.5Y 2.5/1), fine to medium grained, poorly sorted, 5% rounded gravel, moderate HCL reaction	0.010" slot Schedule 40 PVC well screen (10 to 20 feet BGS)
15											
22											

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Saturated Zones

Date / Time	Elevation	Depth
4/14/96		12.19 ▼
4/15/96		12.13 ▼
4/16/96		12.14 ▽

Date Start/Finish: 04/10/96 / 04/10/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Corehole Depth: N/A ft.
Borehole Depth: 20 ft.

Geologist: M. Mueller

Well No. GW-8-5A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Clayey sand, very dark brown (7.5YR 2.5/2), soft, semi-cohesive, fine grained, 5% claym slight HCL reaction	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 1 feet BGS); 2-inch Schedule 40 PVC riser (0.1 to 10 feet BGS); Bentonite seal (1 to 8 feet BGS); No. 3 silica sand (8 to 20 feet BGS); 0.010" slot Schedule 40 PVC well screen (10 to 20 feet BGS)
5						91			Sandy clay, black (2.5Y 2.5/1), soft, semi-cohesive, 10% sand, slight HCL reaction	
10									Silty clay, dark olive grey (5Y 3/2), soft, semi-cohesive, 10% silt, slight HCL reaction	
15										
22										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
4/14/96		6.32
4/15/96		6.20
4/16/96		6.58

Date Start/Finish: 04/10/96 / 04/10/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 23 ft.

Geologist: M. Mueller

Well No. GW-7-3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Sand, black (2.5Y 2.5/1), fine to medium grained, poorly sorted, organic, slight HCL reaction	Flush cap Cement pad (0 to 0.5 feet BGS) Grout (0.2 to 1 feet BGS) 2-inch Schedule 40 PVC riser (0.1 to 13 feet BGS) Bentonite seal (1 to 11 feet BGS) No. 3 silica sand (11 to 23 feet BGS) 0.010" slot Schedule 40 PVC well screen (13 to 23 feet BGS)
5										
10									Clayey sand, very dark grey (5Y 3/1), fine to medium grained, poorly sorted, <5% clay, slight HCL reaction	
15										
20										
25										

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Saturated Zones

Date / Time	Elevation	Depth
4/14/96		16.54
4/15/96		16.38
4/16/96		16.50

Date Start/Finish: 04/11/96 / 04/11/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 11.0 ft.

Geologist: T. Twist

Well No. SB-16-1

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
						0.0			Concrete	Bentonite and cement backfill to 11 feet
						0.0			Sand, olive brown (2.5Y 4/3), fine to medium grained, poorly sorted, 5% rounded gravel, very slight HCL reaction	
5						0.0				
						0.0				
						0.0			Sand, olive grey (5Y 4/2), fine to medium grained, poorly sorted, slight HCL reaction	
10						0.0				
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/11/96 / 04/11/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 11.0 ft.

Geologist: M. Mueller

Well No. SB-16-2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
						0.0			Concrete	Bentonite and cement backfill to 11 feet
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	
5						0.0				
						0.0			Sandy clay, dark yellowish brown (10YR 4/4), soft, semi-cohesive, 15% sand	
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	
10									Sand, light olive brown (2.5Y 5/3), fine to medium grained, poorly sorted, slight HCL reaction	
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/11/96 / 04/11/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 11.0 ft.

Geologist: M. Mueller

Well No. SB-16-3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
						0.0			Concrete	Bentonite and cement backfill to 11 feet
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	
5						0.0				
						0.0			Sandy clay, dark yellowish brown (10YR 4/4), soft, semi-cohesive, 15% sand	
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	
10									Sand, light olive brown (2.5Y 5/3), fine to medium grained, poorly sorted, slight HCL reaction	
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 18.0 ft.

Geologist: T. Twist

Well No. MW-18-1/SB18-3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
						0.0			Concrete	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 5 feet BGS)
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	
5						0.0				2-inch Schedule 40 PVC riser (0.1 to 8 feet); Bentonite seal (5 to 6 feet BGS)
						0.0			Sandy clay, dark yellowish brown (10YR 4/4), soft, semi-cohesive, 15% sand	
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	
10									Sand, light olive brown (2.5Y 5/3), fine to medium grained, poorly sorted, slight HCL reaction	No. 3 silica sand (6 to 18 feet BGS)
									Sand, olive grey (5Y 4/2), fine to medium grained, poorly sorted, moderate HCL reaction	
15										0.010" slot Schedule 40 PVC well screen (8 to 18 feet BGS)
									Clay, dark grey (5Y 4/1), soft, cohesive	
22										

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Saturated Zones

Date / Time	Elevation	Depth
4/15/96		10.75 ▼
4/24/96		10.67 ▼

Project: 869.50
Script: nbblwell
Date: 10/30/96

Date Start/Finish: 04/11/96 / 04/11/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 11.0 ft.

Geologist: T. Twist

Well No. SB-16-4

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
						0.0			Concrete	Bentonite and cement backfill to 11 feet
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	
5						0.0				
						0.0			Sandy clay, dark yellowish brown (10YR 4/4), soft, semi-cohesive, 15% sand	
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	
10									Sand, light olive brown (2.5Y 5/3), fine to medium grained, poorly sorted, slight HCL reaction	
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 06/26/96 / 06/26/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size** : 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 7 ft.

Geologist: A. Fass

Well No. P117-TW1

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
									Sand, dark yellowish orange (10YR 6/6), fine to coarse grained, poorly sorted, little gravel, dry	No. 3 silica sand (0 to 7 feet BGS)
5										0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10										
15										

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Saturated Zones

Date / Time	Elevation	Depth
06/29/96		4.44 ▼

Date Start/Finish: 06/28/96 / 06/28/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 6.5 ft.

Geologist: A. Fass

Well No. P117-TW2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
						14.3			Sand, moderate yellowish brown (10YR 5/4), fine to medium grained, subangular to subrounded grains, well sorted, moist, little silt	
						3.0			Sand, moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2), medium to coarse grained, poorly sorted, subangular to subrounded grains, dry	No. 3 silica sand (0 to 7 feet BGS)
5									Gravelly sand, some clay, some silt, dark yellowish orange (10YR 6/6), fine to coarse grained, subangular to subrounded grains, poorly sorted, wet	0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10									Sand, some silt, pale yellowish brown (10YR 2/2), fine grained, well sorted, wet	
15										

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Saturated Zones

Date / Time	Elevation	Depth
06/29/96		4.15 ▼

Date Start/Finish: 06/28/96 / 06/28/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 5.8 ft.

Geologist: A. Fass

Well No. P117-TW3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
						111			Sand, minor gravel, moderate yellowish brown (10YR 5/4), fine to coarse grained, poorly sorted, wet	
						56			Sand, brownish grey (5YR 4/1), fine to medium grained, subangular to subrounded grains, well sorted, wet	No. 3 silica sand (0 to 7 feet BGS)
5										0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/29/96		3.90 ▼

Project: 480.58
Script: nbblwell
Date: 10/30/98

Date Start/Finish: 06/28/96 / 06/28/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 5.8 ft.

Geologist: A. Fass

Well No. P117-TW4

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
						38			Sand, minor gravel, moderate yellowish brown (10YR 5/4), fine to coarse grained, poorly sorted, wet	
						8			Sand, brownish grey (5YR 4/1), fine to medium grained, subangular to subrounded grains, well sorted, wet	No. 3 silica sand (0 to 7 feet BGS)
5										0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/29/98		3.75 ▼

Project: 480.58
Script: nbblwell
Date: 10/30/98

Date Start/Finish: 06/28/96 / 06/28/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 5.4 ft.

Geologist: A. Fass

Well No. P117-TW5

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
						5			Sand, dark yellowish orange (10YR 6/6), fine to medium grained, subangular to subrounded grains, moderately sorted, moist	
						2.55			Sand, light brownish grey (5YR 6/1), fine to medium grained, moderately sorted, wet	No. 3 silica sand (0 to 7 feet BGS)
5										0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/29/96		4.37 ▼

Date Start/Finish: 06/28/96 / 06/28/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 5.4 ft.

Geologist: A. Fass

Well No. P117-TW6

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
						6			Sand, dark yellowish orange (10YR 6/6), fine to medium grained, poorly sorted, dry, some gravel	
						2			Sand, dark yellowish orange (10YR 6/6), fine to medium grained, poorly sorted, moist, some gravel	No. 3 silica sand (0 to 7 feet BGS)
5									Sand, dark yellowish brown (10YR 4/2), fine to medium grained, moderately sorted, wet, some coarse sand	0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/29/96		4.24 ▼

Date Start/Finish: 06/28/96 / 06/28/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 6.5 ft.

Geologist: A. Fass

Well No. P117-TW7

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
						10			Sand, some clay, moderate yellowish brown (10YR 5/4), fine to medium grained, poorly sorted, wet	
						2			Sand 30%, clay 70%, medium dark grey (N5), sand is fine to medium grained, poorly sorted, wet, quartzose, clay is friable, wet	No. 3 silica sand (0 to 7 feet BGS)
5										0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/29/96		3.28 ▼

Date Start/Finish: 06/28/96 / 06/28/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 6.6 ft.

Geologist: A. Fass

Well No. P117-TW8

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
						1			Sand, moderate yellowish brown (10YR 5/4), fine to medium grained, subangular to subrounded grains, moderately sorted, moist	
						1			Sand, medium dark grey (N5), fine to medium grained, fair to moderately sorted, moist, quartzose	No. 3 silica sand (0 to 7 feet BGS)
5										0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10										
15										

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Saturated Zones

Date / Time	Elevation	Depth
06/29/96		3.27

Date Start/Finish: 06/28/96 / 06/28/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 4-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 6.0 ft.

Geologist: A. Fass

Well No. P117-TW9

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	Well cap
									Concrete	2-inch Schedule 40 PVC riser (1.5 feet ABS to 2 feet BGS)
						1			Sand, pale yellowish brown (10YR 6/2), fine to medium grained, well sorted, subangular to subrounded grains, moist	
						0			Sand, medium dark grey (N5), fine to medium grained, well sorted, subangular to subrounded grains, wet	No. 3 silica sand (0 to 7 feet BGS)
5										0.010" slot Schedule 40 PVC well screen (2 to 7 feet BGS)
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
06/29/96		3.03 ▼

Project: 480.58
Script: nbblwell
Date: 10/30/96

Date Start/Finish: 04/10/96 / 04/10/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 21 ft.

Geologist: T. Twist

Well No. BG-1

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Asphalt	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 7 feet BGS)
									Sand, dark brown (7.5YR 3/2), fine to medium grained, poorly sorted, some pebble sized fragments of quartzite, no HCL reaction	
									Sandy clay, yellowish brown (10YR 5/4), soft, semi-cohesive, 15% sand	2-inch Schedule 40 PVC riser (0.1 to 11 feet BGS)
5									Sandy clay, very dark greyish brown (10YR 3/2), soft, semi-cohesive, 15% sand	Bentonite seal (7 to 8 feet BGS)
									Sandy clay, dark greyish brown (10YR 4/2), soft, semi-cohesive, 15% sand	
10									Sandy clay, dark grey (5Y 4/1), soft, semi-cohesive, 15% sand	No. 3 silica sand (8 to 21 feet BGS)
									Sand, dark grey (5Y 4/1), fine to medium grained, poorly sorted, slight HCL reaction	
15										0.010" slot Schedule 40 PVC well screen (11 to 21 feet BGS)
										20
22										

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Saturated Zones

Date / Time	Elevation	Depth
4/17/96		11.55
4/24/96		11.11

Date Start/Finish: 04/11/96 / 04/11/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 19 ft.

Geologist: T. Twist

Well No. BG-2

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Concrete	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 6 feet BGS)
									Sand, dark brown (10YR 3/3), Coarse to fine grained, poorly sorted, 15% rounded gravel, moderate HCL reaction	
5									Sandy clay, grey (2.5Y 5/1), firm, semi-cohesive, 5% sand	2-inch Schedule 40 PVC riser (0.1 to 9 feet BGS); Bentonite seal (6 to 7 feet BGS)
									Sand, greyish brown (2.5Y 5/2), fine to medium grained, poorly sorted, 5% silt, moderate HCL reaction	
10									Sandy, dark grey (5Y 4/1), fine to medium grained, poorly sorted, 5% silt, moderate HCL reaction	No. 3 silica sand (7 to 19 feet BGS)
									Sandy clay, dark grey (5Y 4/1), soft, semi-cohesive, 10% sand	
15										0.010" slot Schedule 40 PVC well screen (9 to 19 feet BGS)
22										

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Saturated Zones

Date / Time	Elevation	Depth
4/17/98		8.58 ▼
4/24/98		8.51 ▽

Project: 869.50
Script: nbblwell
Date: 10/30/98

Date Start/Finish: 04/11/96 / 04/11/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 19 ft.

Geologist: T. Twist

Well No. BG-3

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Concrete	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 6 feet BGS)
									Sand, yellowish brown (10YR 5/4), fine to medium grained, poorly sorted, moderate HCl reaction	2-inch Schedule 40 PVC riser (0.1 to 9 feet BGS)
5									Gravelly sand, greyish brown (2.5Y 5/2), fine to medium grained, poorly sorted, 10% rounded gravel, moderate HCL reaction	Bentonite seal (6 to 7 feet BGS)
10									Gravelly sand, dark greyish brown (2.5Y 4/2), fine to coarse grained, poorly sorted, 15% rounded gravel, moderate HCL reaction	No. 3 silica sand (7 to 19 feet BGS)
15									Sandy clay, dark grey (5Y 4/1), soft, semi-cohesive, 15% sand, moderate HCL reaction	0.010" slot Schedule 40 PVC well screen (9 to 19 feet BGS)
									Gravelly sand, dark grey (5Y 4/1), fine to medium grained, poorly sorted, 5% rounded to subrounded gravel, slight HCL reaction	
22										

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Saturated Zones

Date / Time	Elevation	Depth
4/17/96		8.43
4/24/96		8.36

Project: 869.50
Script: nbblwell
Date: 05/10/96

Date Start/Finish: 04/10/96 / 04/10/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 20 ft.

Geologist: T. Twist

Well No. BG-4

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 6 feet BGS)
									Sand, dark brown (7.5YR 3/2), fine to medium grained, poorly sorted, some gravel sized fragments of quartzite, slight HCL reaction	
5									Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	2-inch Schedule 40 PVC riser (0.1 to 10 feet BGS); Bentonite seal (6 to 7 feet BGS)
									Sand, brown (10YR 4/3), fine to medium grained, poorly sorted, slight HCL reaction	
10									Gravelly sand, olive brown (2.5Y 4/4), fine to coarse grained, poorly sorted, 15% gravel, rounded to subrounded, moderate HCL reaction	No. 3 silica sand (7 to 20 feet BGS)
15									Silty sand, dark grey (5Y 4/1), fine to medium grained, poorly sorted, 5% silt	0.010" slot Schedule 40 PVC well screen (10 to 20 feet BGS)
									Sandy clay, dark grey (5Y 4/1), soft, semi-cohesive, 10% sand	
22										

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Saturated Zones

Date / Time	Elevation	Depth
4/17/96		9.13
4/24/96	-1	9.03

Date Start/Finish: 04/10/96 / 04/10/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 19 ft.

Geologist: T. Twist

Well No. BG-5

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Asphalt	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 6 feet BGS)
									Sand, dark brown (7.5YR 3/2), fine to medium grained, poorly sorted, some gravel sized fragments of quartzite, slight HCL reaction	
5									Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, no HCL reaction	2-inch Schedule 40 PVC riser (0.1 to 9 feet BGS); Bentonite seal (6 to 7 feet BGS)
10									Silty sand, olive brown (2.5Y 4/4), fine to coarse grained, poorly sorted, <5% silt, slight HCL reaction	No. 3 silica sand (7 to 19 feet BGS)
									Gravelly sand, olive brown (2.5Y 4/4), fine to coarse grained, poorly sorted, <5% gravel, rounded to subrounded, moderate HCL reaction	
15										0.010" slot Schedule 40 PVC well screen (9 to 19 feet BGS)
									Silty sand, dark grey (5Y 4/1), fine to medium grained, poorly sorted, 5% silt	
22										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
4/17/96		8.82 ▼
4/24/96	-1	8.61 ▼

Phase III Extent of Contamination Study

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 18.0 ft.

Geologist: T. Twist

Well No. MW-3-8

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
						0.0			Concrete	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 5 feet BGS)
						0.0			Sand, dark brown (10YR 3/3), fine to medium grained, poorly sorted, <1% rounded gravel, moderate HCL reaction	
5						0.0				2-inch Schedule 40 PVC riser (0.1 to 8 feet BGS); Bentonite seal (5 to 8 feet BGS)
						0.0				
						0.0			Sandy clay, olive brown (2.5Y 4/3), firm, semi-cohesive, 15% sand	
10						21.0			Clayey sand, dark grey (5Y 4/1), fine grained, poorly sorted, 25% clay moderate HCL reaction	No. 3 silica sand (8 to 18 feet BGS)
									Sandy clay, olive (5Y 4/4), soft, semi-cohesive, 15% sand	
15										0.010" slot Schedule 40 PVC well screen (8 to 18 feet BGS)
									Clay, dark grey (5Y 4/1), firm, cohesive	
22										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth
4/15/96		11.82

Project: 869.50
Script: nbblwell
Date: 10/30/96

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 19.0 ft.

Geologist: T. Twist

Well No. MW-3-7

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0						0.0			Concrete	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 6 feet BGS)
						0.0			Gravelly sand, dark brown (10YR 3/3), fine to coarse grained, poorly sorted, 15% rounded to subrounded gravel, slight HCL reaction	
5						0.0				2-inch Schedule 40 PVC riser (0.1 to 9 feet BGS)
						0.0			Sand, yellowish brown (10YR 5/4), fine to medium grained, poorly sorted, moderate HCL reaction	Bentonite seal (6 to 7 feet BGS)
						0.0			Clay, dark greyish brown (2.5Y 4/2), soft, cohesive	
10						21.0			Sand, dark grey (5Y 4/1), fine to medium grained, poorly sorted, moderate HCL reaction	No. 3 silica sand (7 to 19 feet BGS)
									Silty sand, olive grey (5Y 4/2), fine grained, poorly sorted, 20% silt, slight HCL reaction	
15										0.010" slot Schedule 40 PVC well screen (9 to 19 feet BGS)
									Clayey sand, dark grey (5Y 4/1), fine to medium grained, poorly sorted, 20% clay, moderate HCL reaction	
22										

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Saturated Zones

Date / Time	Elevation	Depth
4/15/96		11.87

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 19.0 ft.

Geologist: T. Twist

Well No. MW-3-8

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
						0.0			Concrete	Well cap; Cement pad (0 to 0.5 feet BGS); Grout (0.2 to 6 feet BGS)
						0.0			Gravelly sand, dark greyish brown (2.5Y 4/2), fine to medium grained, poorly sorted, 30% rounded to subrounded gravel, slight HCL reaction	
5						0.0				2-inch Schedule 40 PVC riser (0.1 to 9 feet BGS)
						0.0			Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, moderate HCL reaction	Bentonite seal (6 to 7 feet BGS)
						5.0				
10						83.0			Sandy clay, olive brown (2.5Y 4/4), soft, semi-cohesive, 20% sand	No. 3 silica sand (7 to 19 feet BGS)
									Sand, black (N 2.5/0), fine to medium grained, poorly sorted, very slight HCL reaction	
15									Silty sand, olive grey (5Y 4/2), fine grained, poorly sorted, 20% silt, slight HCL reaction	0.010" slot Schedule 40 PVC well screen (9 to 19 feet BGS)
22										

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Saturated Zones

Date / Time	Elevation	Depth
4/15/96		12.02 ▼

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hand Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 12.0 ft.

Geologist: T. Twist

Well No. SB-3-5

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
						2.0			Concrete	Bentonite and cement backfill to 12 feet
						5.0			Sand, dark brown (10YR 3/3), fine to medium grained, poorly sorted, <1% rounded gravel, slight HCL reaction	
5						0.0				
						0.0			Sand, yellowish brown (10YR 5/4), fine to medium grained, poorly sorted, moderate HCL reaction	
						0.0			Clay, olive grey (5Y 4/2), firm, cohesive	
10						0.0			Sand, olive brown (2.5Y 4/3), fine to medium grained, poorly sorted, moderate HCL reaction	
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10.0 ft.

Geologist: M. Mueller

Well No. SB-2-5A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Asphalt	Bentonite and cement backfill to 10 feet
									Sand, black (10YR 2/1), fine to coarse grained, poorly sorted, 5% rounded gravel, slight HCL reaction	
									Gravelly sand, black (N 2.5/0), fine to coarse grained, poorly sorted, 15% rounded to subangular gravel, moderate HCL reaction	
5									Gravelly sand, dark brown (10Yr 3/3), fine to coarse grained, poorly sorted, 15% rounded to subangular gravel	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Project: 869.50
Script: nbblwell
Date: 05/09/96

Date Start/Finish: 04/15/96 / 04/15/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 6 ft.

Geologist: M. Mueller

Well No. SB-2-8A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 6 feet
									Sand, dark yellowish brown (10YR 3/6), fine to medium grained, poorly sorted, moderate HCL reaction	
5									Clayey sand, very dark brown (10YR 2/2) to light yellowish brown (10YR 6/4), fine to medium grained, poorly sorted, slight HCL reaction	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/13/96 / 04/13/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8 ft.

Geologist: M. Mueller

Well No. SB-2-9A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 8 feet
									Sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 5% rounded gravel, moderate HCL reaction	
5									Sand, yellowish brown (10YR 5/8), fine to medium grained, poorly sorted, quartzose, no HCL reaction	
10										
15										

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ENGINEERS & SCIENTISTS

Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/15/96 / 04/15/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8 ft.

Geologist: M. Mueller

Well No. SB-2-10A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 8 feet
									Gravelly sand, black (10YR 2/1), fine to medium grained, poorly sorted, 15% rounded gravel, moderate HCL reaction	
5										
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/15/96 / 04/15/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 6 ft.

Geologist: M. Mueller

Well No. SB-2-11

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
										GROUND SURFACE	
										Asphalt	Bentonite and cement backfill to 6 feet
										Sand, very dark greyish brown (10YR 3/2), fine to medium grained, poorly sorted, 10% rounded gravel, 1% rounded pebbles, slight HCL reaction	
										Sand, black (10YR 2/1), coarse to fine grained, poorly sorted, 10% rounded gravel, 1% rounded pebbles, slight HCL reaction	
5										Sand, olive brown (2.5Y 4/4), fine to medium grained, poorly sorted, 5% rounded gravel, slight HCL reaction	
10											
15											

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/13/96 / 04/13/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10 ft.

Geologist: M. Mueller

Well No. SB-2-14A

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Asphalt	Bentonite and cement backfill to 10 feet
									Sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 5% rounded gravel, moderate HCL reaction	
5									Sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 5% rounded gravel, 1% rounded cobbles, some metal fragments, moderate HCL reaction	
									Sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 5% rounded gravel, some metal fragments, moderate HCL reaction	
10										
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/15/96 / 04/15/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8 ft.

Geologist: M. Mueller

Well No. SB-2-16

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 8 feet
									Sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 5% rounded gravel, moderate HCL reaction	
5									Sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 5% rounded gravel, 5% crushed red brick, moderate HCL reaction	
									Sand, light olive brown (2.5Y 5/8), fine to medium grained, poorly sorted, no HCL reaction	
10										
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8.0 ft.

Geologist: M. Mueller

Well No. SB-2-17

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 8 feet
									Gravelly sand, dark yellowish brown (10YR 3/6), fine to coarse grained, poorly sorted, 5% rounded to subrounded gravel, slight HCL reaction	
									Sand, yellowish brown (10YR 5/6), fine to medium grained, poorly sorted, no HCL reaction	
5									Sand, brownish yellow (10YR 6/8), fine to medium grained, poorly sorted, no HCL reaction	
									Clayey sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, 20% clay, no HCL reaction	
10										
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8.0 ft.

Geologist: M. Mueller

Well No. SB-2-18

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 8 feet
									Gravelly sand, light grey (2.5Y 7/1), fine grained, poorly sorted, 5% rounded gravel, very slight HCL reaction	
									Sand, yellowish brown (10YR 5/8), fine to medium grained, poorly sorted, <1% rounded gravel, no HCL reaction	
5									Sand, brownish yellow (10YR 6/6) fine to medium grained, poorly sorted, no HCL reaction	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 6.0 ft.

Geologist: M. Mueller

Well No. SB-2-19

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 6 feet
									Gravelly sand, dark yellowish brown (10YR 4/4), fine to medium grained, poorly sorted, 10% rounded to subrounded gravel, slight HCL reaction	
5									Sand, dark yellowish brown (10YR 4/4), fine to medium grained, poorly sorted, no HCL reaction	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8.0 ft.

Geologist: M. Mueller

Well No. SB-2-20

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 8 feet
									Gravelly sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 1% rounded gravel, slight HCL reaction	
									Sand, dark yellowish brown (10YR 4/4), fine to medium grained, poorly sorted, no HCL reaction	
5									Sand, dark yellowish brown (10YR 4/6), fine to medium grained, poorly sorted, <1% rounded gravel, no HCL reaction	
									Sand, dark yellowish brown (10YR 4/4), fine to medium grained, poorly sorted, <1% rounded gravel, no HCL reaction	
10										
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10.0 ft.

Geologist: M. Mueller

Well No. SB-2-21

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 10 feet
									Gravelly sand, dark brown (10YR 3/3), fine to medium grained, poorly sorted, 15% rounded gravel, slight HCL reaction	
									Gravelly sand, very dark brown (10YR 2/2), fine to coarse grained, poorly sorted, 5% rounded gravel, slight HCL reaction	
5									Sand, dark yellowish brown (10YR 4/4) fine to medium grained, poorly sorted, no HCL reaction	
									Sand, olive brown (2.5Y 4/4), fine to medium grained, poorly sorted, slight HCL reaction	
10									Sand, dark greyish brown (2.5Y 4/2), fine to coarse grained, poorly sorted, <1% rounded gravel, slight HCL reaction	
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/13/96 / 04/13/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10 ft.

Geologist: M. Mueller

Well No. SB-2-22

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 10 feet
									Sand, very dark brown (10YR 2/2), fine to medium grained, poorly sorted, 5% rounded gravel, moderate HCL reaction	
									Gravelly sand, black (10YR 2/1), fine to medium grained, poorly sorted, moderate HCL reaction	
5										
10										
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/13/96 / 04/13/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10 ft.

Geologist: M. Mueller

Well No. SB-2-23

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 10 feet
									Gravelly sand, black (10YR 2/1), coarse to fine grained, poorly sorted, 5% rounded gravel, moderate HCL reaction	
5										
									Sand, yellowish brown (10YR 5/8), fine to medium grained, poorly sorted, quartzose, no HCL reaction	
10										
15										

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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/15/96 / 04/15/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10 ft.

Geologist: M. Mueller

Well No. SB-2-24

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 10 feet
									Gravelly sand, black (10YR 2/1), coarse to fine grained, poorly sorted, 10% gravel, rounded, moderate HCl reaction	
									Sand, dark yellowish brown (10YR 4/4), coarse to fine grained, poorly sorted, 10% subrounded pebbles, strong HCL reaction	
5									Sand, yellowish brown (10YR 5/8), fine to medium grained, poorly sorted, quartzose, no HCL reaction	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/15/96 / 04/15/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10 ft.

Geologist: M. Mueller

Well No. SB-2-25

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Asphalt	Bentonite and cement backfill to 10 feet
									Sand, very dark brown (10YR 2/2), fine to coarse grained, poorly sorted, 1% rounded gravel, no HCL reaction	
5									Clayey sand, dark greyish brown (2.5Y 4/2), fine to medium grained, poorly sorted, 5% clay, 10% cobble sized, angular red brick fragments, slight HCL reaction	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8 ft.

Geologist: M. Mueller

Well No. SB-2-26

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 8 feet
									Sand, black (10YR 2/1), fine to coarse grained, poorly sorted, 5% subrounded gravel, slight HCL reaction	
5									Sand, black (10YR 2/1), fine to medium grained, poorly sorted, 20% glass fragments, slight HCL reaction	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/15/96 / 04/15/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8 ft.

Geologist: M. Mueller

Well No. SB-2-28

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Sand, dark yellowish brown (10YR 4/4), fine to medium grained, poorly sorted, 10% rounded gravel, 1% rounded pebbles, slight HCL reaction	Bentonite and cement backfill to 8 feet
									Sand, yellowish brown (10YR 5/8), coarse to fine grained, poorly sorted, quartzose, no HCL reaction	
5									Sand, yellowish brown (10YR 5/8), fine to medium grained, poorly sorted, quartzose, no HCL reaction	
									Sandy clay, olive grey (5Y 4/2), soft, semi-cohesive, 10% sand	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 04/12/96 / 04/12/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 8 ft.

Geologist: M. Mueller

Well No. SB-2-29

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 8 feet
									Gravelly sand, dark yellowish brown (10YR 3/6), fine to coarse grained, poorly sorted, 5% rounded to subrounded gravel, no HCL reaction	
5									Sand, brownish yellow (10YR 6/8), fine to medium grained, poorly sorted, no HCL reaction	
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

South Culvert Extension on CVO Property

Date Start/Finish: 09/16/96 / 09/16/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10 ft.

Geologist: M. Mueller

Well No. SB-2-29

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Asphalt	Bentonite and cement backfill to 10 feet below land-surface
									Gravelly sand, dark yellowish brown (10YR 3/6), fine to coarse grained, poorly sorted, 5% rounded to subrounded gravel, no HCL reaction	
							4		Sand, brownish yellow (10YR 6/8), fine to medium grained, poorly sorted, no HCL reaction	
5										
10										
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 09/16/96 / 09/16/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 8.25-in.
Rig Type: Mobile B-47
Spoon Size: 2-in.

Borehole Depth: 10 ft.

Geologist: M. Mueller

Well No. SB-2-30

Client:
General Motors Corporation

Location:
Willow Run Assembly Plant
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Concrete	Bentonite and cement backfill to 10 feet below land surface
									Sand, brownish yellow (10YR 6/8), fine to medium grained, poorly sorted, no HCL reaction	
5									Sand, very dark grey (10YR 3/1), fine to medium grained, poorly sorted, no HCL reaction	
									Sand, light yellowish brown (10YR 6/4), fine to medium grained, poorly sorted, no HCL reaction	
10									Gravelly sand, grey (10YR 5/1), fine to coarse grained, poorly sorted, 15% rounded to subrounded gravel, no HCL reaction	
15										

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Remarks:
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Saturated Zones

Date / Time	Elevation	Depth

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Former South Culvert Area Approx. 100' north of SB–2–33 Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 16, 1996	
BORING NO.: SB–2–31	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 10' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 2M2 collected from SB–2–31 (2.2–4.2) for Pb analysis, and 826P (pending P.M. approval) analysis. (Duplicate soil sample)
WEATHER: Snow, 32°, Wind – SW 5–10 mph	

SAMPLE NO.	TEST TYPE	DEPTH FROM	DEPTH TO	NO. OF BLOWS	SOIL DESCRIPTION AND BORING LOG
					0–2" Asphaltic conrete
1	Pb	2"	8"		2"–1' Sand and rock fragments (sub–base), pale yellowish brown.
					1'–1.5' Clayey sand, some rock fragments, grayish brown.
2	Pb	8"	2.2'		1.5'–2' Silty–clayey sand, dark yellowish orange.
	Pb				2'–3' Silty sand, dark yellowish orange.
3	8260*	2.2'	4.2'		3'–4' Paint waste (green, yellow, black).
					4'–4.5' Decomposing layer of apparent black tar paper
4	Pb	4.2'	6.2'		(roofing material?)
					4.5'–7' Clayey sand, dark yellowish orange.
					7'–7.5' Sandy clay, dark yellowish orange.
5	Pb	6.2'	8.2'		7.5'–8.5' Clayey sand, dark yellowish orange.
					8.5'–12' Silty sand, pale yellowish brown.
6	Pb	8.2'	10.2'		(Petroleum sheen noted on soils below 10'BGS – below the water table)

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

* – Hold for P.M. approval

J-5'1

SOIL BORING RECORD

MW-3

EXPLORATION FOR: Subsurface Lithology	LOCATION: Former South Culvert Area Approx. 130' west and 75' north of SB–2–33 Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 16, 1996	
BORING NO.: SB–2–32	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 10' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Snow, 32°, Wind – SW 5–10 mph	

SAMPLE NO.	TEST TYPE	DEPTH FROM	DEPTH TO	NO. OF BLOWS	SOIL DESCRIPTION AND BORING LOG
					0–2" Asphaltic conrete
1	Pb	2"	8"		2"–1' Sand and rock fragments (sub–base), pale yellowish brown.
					1'–1.5' Coal and iron slag, some sand, dusky brown–black.
2	Pb	8"	2.2'		1.5'–2' Gravely sand, moderate–dark yellowish brown.
					2'–3.5' Gravelly sand, moderate yellowish brown.
3	Pb	2.2'	4.2'		3.5'–5.5' Sand, moderate yellowish brown.
					5.5'–7' Silty sand, moderate yellowish brown.
4	Pb	4.2'	6.2'		
					7'–7.5' Silty clay, moderate yellowish brown.
5	Pb	6.2'	8.2'		7.5'–8' Sand, fine to medium grained, moderate yellowish brown.
					8'–8.5' Sandy gravel, dusky brown.
6	Pb	8.2'	10'		'8.5'–10' Silty sand, grayish orange–dark yellowish orange.
					'10'–12' Sandy silt, dark yellowish orange
					End of boring = 12'BGS.

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Former South Culvert Area Approx. 136' west and 75' north of SB–2–34 Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 16, 1996	
BORING NO.: SB–2–33	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Snow, 32°, Wind – SW 5–10 mph	

SAMPLE NO.	TEST TYPE	DEPTH FROM	DEPTH TO	NO. OF BLOWS	SOIL DESCRIPTION AND BORING LOG
					0–2' Asphaltic conrete
1	Pb	2"	8"		2'–2.5' Silty clay and clayey sand, some red paint waste fragments
					2.5'–4.5' Silty sand, dark yellowish orange – moderate yellowish
2	Pb	8"	2.2'		brown.
					4.5'–5' Silty–clayey sand, dark yellowish orange – moderate
3	Pb	2.2'	4.2'		yellowish brown.
					5'–7' Gravelly sand, moderate–dark yellowish brown.
4	Pb	4.2'	6.2'		
					7'–8' Sand, dark yellowish brown, coarse to fine grading, some
5	Pb	6.2'	8.2'		metal fragments.
					8'–11' Same as SB–2–34 with the addition of some rock
6	Pb	8.2'	11'		fragments.
					11'–12' Silty clay, light olive gray.
7	Pb	11'	12'		End of boring = 12'BGS.

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Former South Culvert Area Approx. 15' west and 105' south of SB–18–1 Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 16, 1996	
BORING NO.: SB–2–34	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 10' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 3M2 collected from SB–2–34 (8" –2.2') for Pb analysis only. (Duplicate soil sample.)
WEATHER: Snow, 32°, Wind – SW 5–10 mph	

SAMPLE NO.	TEST TYPE	DEPTH FROM	DEPTH TO	NO. OF BLOWS	SOIL DESCRIPTION AND BORING LOG
					0–2' Asphaltic conrete
1	Pb	2"	8"		2"–2' Same as SB–2–31.
					2'–4.5' Sand (very fine) – silty sand, dark yellowish orange.
2	Pb	8"	2.2'		
					4.5'–5' Silty–clay, dark yellowish orange
3	Pb	2.2'	4.2'		
					5'–6' Silty sand, dark yellowish orange.
4	Pb	4.2'	6.2'		
					6'–7' Sandy silt, dark yellowish orange.
5	Pb	6.2'	8.2'		7'–8.25' Silty sand, dark yellowish orange.
					8.25'–8.75' Silty clay, light yellowish orange–pale yellowish brown
6	Pb	8.2'	10'		8.75'–10' Silty sand – clayey sand, pale yellowish brown –
					light olive gray.
					10'–12' Silty clay, light olive gray.
					End of boring = 12'BGS.

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Kaiser-Frazer Dump Area Phase III EOC Study

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser Frazer Dump Area PAOC 18 15' north of fence and 10' west of gridline A+00 (see Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 9, 1996	
BORING NO.: SB–18–1	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 13' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 5 (2'–4') (Pb Only)
WEATHER: Cloudy, 28°, Wind – West 5–10 mph	

SAMPLE NO.	TEST TYPE	DEPTH FROM	DEPTH TO		SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb, PAH, lPAH	0–1.5' Silty sand, dark yellowish brown (10YR 4/2)
2		6"	2'	Pb, PAH, lPAH	1.5'–2.5' Silty sand, iron slag, moderate brown.
3		2'	4'	Pb, PAH, lPAH, Dup Pb	2.5'–8.5' Silty sand, moderate yellowish brown (10YR 5/4) to grayish orange (10YR 7/4)
4		4'	6'	Pb, PAH, lPAH	
5		6'	8'	Pb, PAH, lPAH	
6		8'	10'	Pb, PAH, lPAH	8.5'–10.5' Clayey sand – gravelly sand, dark yellowish brown (10YR4/2).
7		10'	12'	Pb, PAH, lPAH	10.5'–12.5' Silty sand/sandy silt, dark yellowish orange. 12.5'–14.0' Silty clay – sandy clay, discolored grayish black (N2) to olive gray (5Y 4/1)*
8		12'	13'	Pb, PAH, lPAH	End of boring = 14'BGS.

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

*Note: Discolored soils at 12.5' – 14' soil interval.

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser Frazer Dump Area PAOC 18 Approx. 33' north of fence and 20' east of gridline A+00 (see Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 10, 1996	
BORING NO.: SB–18–2	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 6.25' BGS
DRILL TYPE: Hand Auger	COMMENTS: Duplicate 1T (4'–6') (Pb Only)
WEATHER: Cloudy, 32°, Wind – West <5 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	LAB/FIELD TEST TYPE	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb, PAH, IPAH	0–2' Silty sand/clayey sand, some gravel, concrete debris, iron slag, debris, dark yellowish brown (10YR 4/2)
2		6"	2'	Pb, PAH, IPAH	2'–5' Gravelly sand, some silt, dark yellowish brown concrete debris, paint sludge (hardened) – green and yellow fragments, glass debris, plastic, debris.
3		2'	4'	Pb, PAH, IPAH,	
4		4'	6'	Pb, PAH, IPAH, Dup Pb–Lab	5'–6.25' – Organic silty clay, brownish black (5YR 2/1), hydrocarbon odors.
5					6.25'–7' Sandy clay–silty clay, grayish black (N2) – dark gray (N3), stained/discolored, petroleum sheen, hydrocarbon odors.
6					
7					End of boring = 7' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

Note: 9:05–9:20 One soil boring was attempted. Refusal @ 2' BLS – concrete encountered. Boring moved approx. 1' east.
8:20–9:15 Spent time securing safety lines and shoveling soil and debris to make a level surface to hand auger and sample.

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser Frazer Dump Area PAOC 18 Approx. 5' north of fence and 30' east of gridline A+00 (see Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 12, 1996	
BORING NO.: SB–18–3	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Overcast, 39°, Wind – NE 5–10 mph	

SAMPLE NO.	TEST TYPE	DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb, PAH, IPAH	0–1' Silty sand/clayey sand, some gravel, dark red solidified paint waste?
2		6"	2'	Pb, PAH, IPAH	2'–4' Gravelly sand, some silt, dark yellowish brown concrete debris, paint sludge (hardened) – green and yellow fragments, glass debris, plastic debris.
3		2'	4'	Pb, PAH, IPAH,	
4		4'	6'	Pb, PAH, IPAH	4'–5' concrete fragments 5'–5.5' concrete fragments
5		6'	8'	Pb, PAH, IPAH	5.5'–9.75' Concrete debris
6		8'	10'	Pb, PAH, IPAH	9.75'–10' Glass and plastic debris 10'–11' Organic silty clay, hydrocarbon odors, dusky brown, shell fragments.
7		10'	11'	Pb, PAH, IPAH	11'–12' Silty clay – sandy silt, olive gray, petroleum sheen, hydrocarbon odors. End of boring = 12'BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

Note: Sample 10'–11' has strong hydrocarbon odors, note on COC.

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 11, 1996

BORING NO.: SB-18-4

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Overcast, 36o, Wind - NE 10-15 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 16' north of fence and 10' east of gridline A+00 (see Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 11' BGS

COMMENTS: Duplicate W (0-6")
(Pb Only)

SAMPLE NO.	DEPTH FROM	DEPTH TO	Test Type	Lab/Field SOIL DESCRIPTION AND BORING LOG
1	0	6"	Pb, Dup-Pb	0-1' Silty sand/clayey sand, some gravel, dark red solidified paint waste? Material at 0' - 1' interval.
2	6"	2'	Pb	2'-4' Gravelly sand, some silt, dark yellowish brown concrete debris, paint sludge (hardened) - green and yellow fragments, glass debris, plastic, debris.
3	2'	4'	Pb	
4	4'	6'	Pb	4'-7' Plastic debris
5	6'	8'	Pb	7'-8' Concrete debris
6	8'	10'	Pb	
7	10'	11'	Pb	11'-12' Silty sand, dark yellowish orange
				End of boring = 14' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

Note: At approx. 1' BLS, a yellow fragment of hardened paint-waste material encountered.

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 12, 1996

BORING NO.: SB-18-5

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Overcast, Drizzle, 38°, Wind - NE 5-10 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 8' south of fence and 20' east of gridline A+00 (see Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 10.25' BGS

COMMENTS: Duplicate 1 TH (2.2'-4.2') (Pb Only)

SAMPLE NO.	DEPTH FROM	DEPTH TO	Test Type	Lab/Field SOIL DESCRIPTION AND BORING LOG
1	2"	8"	Pb	0-2" Asphaltic Concrete
2	8"	2.2'	Pb	2" - 1' Sand and rock fragments pale yellowish brown (fill material) 1'-5' Sand, coal, iron slag, and apparent roof shingle debris (fill material), rock fragments and other debris.
3	2.2'	4.2'	Pb, PAH Dup Pb, PAH	
4	4.2'	6.2'	Pb	5'-7' Iron slag, some clayey sand (fill material).
5	6.2'	8.2'	Pb	7'-8.5' Sandy clay to clayey sand, dark yellowish orange.
6	8.2'	10.2'	Pb	8.5'-11' Silty sand, dark yellowish orange - pale yellowish brown.
				11'-12' Sandy silt, pale yellowish brown.
				End of boring = 12.5' BGS

REMARKS Borehole grouted and asphalt patched.

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

8:15 - Attemped boring at approx. 1' east of this boring. Driller advanced probe 0-8' BGS with approx. 30-35% recovery, so another boring was attempted to obtain better recovery. Second attempt resulted in approx. 50% recovery. Apparent fill material.

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 10, 1996

BORING NO.: SB-18-6

RECORDED BY: Alan Fass

DRILL TYPE: Hand Auger

WEATHER: Cloudy, 35°, Wind - West <5 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 26' north of fence and 64' east of gridline A+00 (see Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 6.5' BGS

COMMENTS: Duplicate 4 T (4'-6') - PAH
Duplicate 2T (4'-6') - Pb

SAMPLE NO.	DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1	0"	6"	Pb, PAH IPAH	0-2' Silty sand/clayey sand, some gravel, concrete debris, iron slag, debris, dark yellowish brown (10YR 4/2)
2	6"	2'	Pb, PAH IPAH	2'-5' Gravelly sand, some silt, dark yellowish brown concrete debris, paint sludge (hardened) - green and yellow fragments, glass debris, plastic, debris.
3	2'	4'	Pb, PAH IPAH	
4	4'	6'	Pb (dup), IPAH,PAH PAH - Lab	5'-5.5' Sand, dark yellowish orange (10 YR 6/6), coarse grained, some gravel. 5.5'-6.5' Organic silty clay, brownish black (5YR 2/1), hydrocarbon odors.
5				6.5'-7' Sandy clay - silty clay, grayish black (N2) - dark gray (N3), stained/discolored, petroleum sheen. Hydrocarbon odors.
6				End of boring = 7' BGS
	7			

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 11' north of fence and 60' east of gridline A+00 (see Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 12, 1996	
BORING NO.: SB–18–7	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 10' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 2 TH (2'–4') (Pb)
WEATHER: Overcast, 39°, Wind – NE 5–10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb, PAH IPAH	0–1.5' Clayey sand, dark yellowish brown, some rock fragments and grass.
2		6"	2'	Pb, PAH IPAH	1.5'–2.5' Clayey sand as above, and solidified paint waste? material (blue and dark red)
3		2'	4'	Pb, PAH IPAH Dup Pb	2.5'–4' Silty clay, moderate–dark yellowish brown, some rock and metal fragments.
4		4'	6'	Pb, PAH IPAH	4'–5.5' Clayey sand, dark yellowish brown. 5.5'–5.75' Paint waste? (solidified)
5		6'	8'	Pb, PAH IPAH	5.75'–6' Silty clay, moderate yellowish brown. 6'–7' Sand and paint waste?
6		8'	10'	Pb, PAH IPAH	7'–7.25' Black hardened material (looks like coal but noteable hydrocarbon odors)
					7.25'–9' Silty sand, pale–dark yellowish orange and glass debris. 9'–10' Sand clay, dark yellowish orange–olive gray.
					10'–11.5' Sandy silt, olive gray. 11.5'–12' Silty sand, black, apparent discoloration.
					End of boring = 12' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 10' south of fence and 75' east of gridline A+00 (see Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 9, 1996	
BORING NO.: SB–18–8	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 12.25' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Sunny, 28°, Wind – West 10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lead–7420 PAH–8100 Immunoassay PAH	SOIL DESCRIPTION AND BORING LOG
1		2"	8"	Pb, PAH IPAH	0–2" Asphalt 2"–1' Silty sand, some gravel, dark yellowish brown (10YR 4/2)
2		8"	2.2'	Pb, PAH IPAH	well sorted. 1'–3' Silty clay, little sand, dusky brown (5YR 2/2).
3		2.2'	4.2'	Pb, PAH IPAH	3'–5' Same as 1'–3' except dark yellowish orange (10YR 6/6).
4		4.2'	6.2'	Pb IPAH	5'–7' Sandy silt, same color.
5		6.2'	8.2'	Pb IPAH	7'–8' Silty clay, same color, wet, plastic.
6		8.2'	10.2'	Pb IPAH	8'–11' Silty sand, same color.
7		10.2'	12.2'	Pb IPAH	11'–12.2' Sand, fine–medium grained, same color, moist–wet.
					End of boring = 14' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Note: Driller said 0'–1' is very soft (below asphalt), 25% recovery from 0–4' below asphalt.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 10, 1996

BORING NO.: SB-18-9

RECORDED BY: Alan Fass

DRILL TYPE: Hand Auger

WEATHER: Cloudy, 37°, Wind - West <5 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 33' north of fence and 106' east of gridline A+00 (see Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 6' BGS

COMMENTS:

SAMPLE NO.	DEPTH FROM	DEPTH TO	Test Type	Lab/Field SOIL DESCRIPTION AND BORING LOG
1	0"	6"	Pb, PAH IPAH	0-2' Silty sand/clayey sand, some gravel, concrete debris, iron slag, debris, dark yellowish brown (10YR 4/2)
2	6"	2'	Pb, PAH IPAH	
3	2'	4'	Pb, PAH IPAH	2'-5' Gravelly sand, some silt, dark yellowish brown concrete debris, paint sludge (hardened) - green and yellow fragments, glass debris, plastic, debris.
4	4'	6'	Pb, PAH IPAH PAH - Lab	Hydrocarbon odors noted in soils from 5'-7' BGS.
				End of boring = 7' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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Spent 45 minutes securing safety lines and leveling the soils in the work area along the slope.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 10, 1996

BORING NO.: SB-18-10

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Mostly cloudy, 40₀, Wind - West 5-10 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 17' north of fence and 106' east of gridline A+00 (see Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 10' BGS

COMMENTS: 14:50 Prepared field equipment blank 2T off inside of plastic sampling tube (12'-14' interval) - (Pb and PAH) Duplicate 3T (6'-8') - (Pb)

SAMPLE NO.	DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1	0"	6"	Pb, PAH IPAH	0-5' Silty sand to clayey sand, some gravel, dark yellowish brown (10YR 4/2); brick, metal, glass and paint fragments (solidified).
2	6"	2'	Pb, PAH IPAH	
3	2'	4'	Pb, PAH IPAH	
4	4'	6'	Pb, PAH IPAH	5'-7' Silty sand, dark yellowish orange (10YR 6/6).
5	6'	8'	Pb, PAH IPAH Dup Pb-Lab	7'-7.5' Silty sand, dark yellowish orange (10YR 6/6); glass, paint (solidified) and unidentifiable debris.
6	8'	10'		7.5'-8.5' Silty clay, brownish black (5YR 2/1), hydrocarbon odors. 8.5'-10' Silty-sandy clay, grayish brown (5YR 3/2).
7				10'-12' Clayey sand to silty sand, light olive gray (6/1). End of boring = 12' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser-Frazer Dump Area PAOC 18 Approx. 25' north of fence and 96' east of gridline A+00 (see Weston Map - Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 12, 1996	
BORING NO.: SB-18-11	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 3 TH (2'-4') (Pb)
WEATHER: Overcast, 38o, Wind - NE 5-10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0-5' Silty sand to clayey sand, some gravel, dark yellowish brown (10YR 4/2); brick, metal, glass and paint fragments (solidified).
2		6"	2'	Pb	
3		2'	4'	Dup Pb	
4		4'	6'	Pb	5'-6' Silty sand, dark yellowish orange (10YR 6/6).
5		6'	8'	Pb, PAH	6'-8' solidified paint? waste, rock fragments.
6		8'	10'	Pb	8'-10' Silty-sandy clay, grayish brown (5YR 3/2).
7		10'	11'	Pb	10'-12' Clayey sand to silty sand, light olive gray (6/1).
					End of boring = 12' BGS

REMARKS

Pb - lead

PAH - polynuclear aromatic hydrocarbons

IPAH - PAH sample collected for immunoassay

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 32' West of SB–18–19
DATE: December 9, 1996	Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
BORING NO.: SB–18–12	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11.5' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Field equipment blank 1M prepared at 10:25 off inside of plastic sampling tube (0–4' interval) Duplicate 2 (2.2'–4.2') (Pb)
WEATHER: Sunny, 28°, Wind – West 10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		2"	8"	Pb, PAH IPAH	0–2" Asphalt 2"–2' Silty sand, some gravel, dark yellowish brown (10YR 4/2).
2		8"	2.2'	Pb, PAH IPAH	2'–5' Silty sand, dark yellowish orange (10YR 6/6).
3		2.2'	4.2'	Dup Pb	
4		4.2'	6.2'	Pb, PAH IPAH	5'–6' Silty clay, same color, moist, slightly friable.
5		6.2'	8.2'	Pb, PAH IPAH	6'–7.5' Clayey silt, same color.
6		8.2'	10.2'	Pb, PAH IPAH	7.5'–8.5' Silty clay, same color. 8.5'–11' Sand, pale yellowish brown (10YR 6/2), very fine to fine.
7		10.2'	11.5'	Pb, PAH IPAH	11'–12' Sand, moderate yellowish brown, (10YR 5/4), medium–coarse, moist–wet.
					End of boring = 12' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Driller had to readvance probe 0'–4' BGS to allow us to obtain enough soil for sampling.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser-Frazer Dump Area PAOC 18 38' West of SB-18-19
DATE: December 9, 1996	Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
BORING NO.: SB-18-13	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11.5' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Sunny, 30o, Wind - West 10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		2"	8"	Pb, PAH IPAH	0-2" Asphalt 2"-2' Silty sand, some gravel, dark yellowish brown (10YR 4/2).
2		8"	2.2'	Pb, PAH IPAH	2'-5' Silty sand, dark yellowish orange (10YR 6/6).
3		2.2'	4.2'	Pb, PAH IPAH	
4		4.2'	6.2'	Pb, PAH IPAH	5'-6' Silty clay, same color, moist, slightly friable.
5		6.2'	8.2'	Pb, PAH IPAH	6'-7.5' Clayey silt, same color.
6		8.2'	10.2'	Pb, PAH IPAH	7.5'-8.5' Silty clay, same color. 8.5'-11' Sand, pale yellowish brown (10YR 6/2), very fine to fine.
7		10.2'	11.5'	Pb, PAH IPAH	11'-12' Sand, moderate yellowish brown, (10YR 5/4), medium-coarse, moist-wet.
					End of boring = 12' BGS

REMARKS

Pb - lead

PAH - polynuclear aromatic hydrocarbons

IPAH - PAH sample collected for immunoassay

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 1' north of fence and 156' east of gridline A+00 (see Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 12, 1996	
BORING NO.: SB–18–14	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 10.5' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Overcast, 37°, Wind – NE 5–10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0'–2' Silty sand, dusky brown, and debris (metal, glass, bricks).
2		6"	2'	Pb	2'–7' Silty sand, moderate yellowish brown – grayish orange, and metal debris.
3		2'	4'	Pb, PAH	
4		4'	6'	Pb	
5		6'	8'	Pb	7'–8' Sandy silt, grayish orange.
6		8'	10.5'	Pb	8'–11' Silty sand, dark yellowish orange – grayish orange. 11'–12' Sand, grayish orange – dark yellowish orange, very fine – fine. End of boring = 12' BGS.

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Attempted boring at approximately 1' north of this boring. Driller advanced probe 0–4' BGS with approx. 50% recovery and 4'–8' BGS with approx. 20% recovery. Second boring attempted, resulted in approx. _____% recovery. Apparent fill material.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser-Frazer Dump Area PAOC 18 Approx. 16' north of fence and 139' east of gridline A+00 (see Weston Map - Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 10, 1996	
BORING NO.: SB-18-15	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 10' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: 15:10 Prepared field equipment blank #1T off inside of plastic sampling tube (4'-8' interval) (Pb and PAH analysis)
WEATHER: Mostly cloudy, 40o, Wind - West <5 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0-5' Silty sand to clayey sand, some gravel, dark yellowish brown (10YR 4/2); brick, metal, glass and paint fragments (solidified).
2		6"	2'	Pb	
3		2'	4'	Pb	
4		4'	6'	Pb	5'-7' Silty sand, dark yellowish orange (10YR 6/6).
5		6'	8'	Pb	7'-8' Metal, glass, paint chips, paint (solidified) fragments; some sand, moderate brown (5YR 4/4).
6		8'	10'	Pb	8'-10' Same lithology as SB-18-15 (8.5'-10'). 10'-12' Silty sand, pale yellowish brown (10YR 5/4) - dark yellowish orange (10YR 6/6) End of boring = 12' BGS.

REMARKS

Pb - lead

PAH - polynuclear aromatic hydrocarbons

IPAH - PAH sample collected for immunoassay

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 50' north of fence and 160' east of gridline A+00 (see Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 11, 1996	
BORING NO.: SB–18–16	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 5.5' BGS
DRILL TYPE: Hand Auger	COMMENTS: 12:30 Prepared field equipment blank #2W off inside of hand auger prior to boring (0–4') Pb and PAH analysis.
WEATHER: Overcast, 36°, Wind – NE 10–15 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0'–5.5' Clayey sand/sandy clay, moderate–dark yellowish brown, some roots, rock fragments, and black solidified material as noted below.
2		6"	2'	Pb, PAH Dup Pb	
3		2'	4'	Pb	
4		4'	5.5'	Pb	5.5'–6' Organic clay, black, hydrocarbon odors.
5					End of boring = 6.0' BGS
6					
7					

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Black solidified layer at 16"–18", 23"–24", 26"–27" BGS, creosote–like odors.
Duplicate 4W (6"–2') (Pb)

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 34' north of fence and 190' east of gridline A+00 (see Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 11, 1996	
BORING NO.: SB–18–17	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 3' BGS
DRILL TYPE: Hand Auger	COMMENTS:
WEATHER: Overcast, 35°, Wind – NE 10–15 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0'–2' Clayey sand/sandy clay, some roots and rock fragments, dusky yellowish brown.
2		6"	2'	Pb	2'–3' Clayey sand, moderate–dark yellowish orange, some rock and shell fragments.
3		2'	3'	Pb	3'–4' Organic clay, olive gray.
4					End of boring = 4' BGS.
5					
6					
7					

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 12, 1996

BORING NO.: SB–18–18

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Overcast, 36°, Wind – NE 5–10 mph

LOCATION: Kaiser–Frazer Dump Area PAOC 18
Approx. 20' north of fence and 6.5' west of SB–17 (see Weston Map – Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 9' BGS

COMMENTS: 9:00 Field equipment blank 1TH prepared off the inside of the sampling tube (8'–12' interval).

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0–1' Gravelly sand, dark yellowish brown.
2		6"	2'	Pb	1'–5' Clayey sand, pale yellowish brown.
3		2'	4'	Pb, PAH Dup Pb	
4		4'	6'	Pb	5'–6' Sandy clay, pale yellowish brown.
5		6'	8'	Pb	6'–7' Sand, little silt and rock fragments, moderate brown. 7'–8' Asphalt and rock fragments.
6		8'	9'	Pb	8'–9' Silty sand, pale yellowish orange. 9'–11' Sandy silt, pale yellowish brown.
					11'–12' Silty sand, pale yellowish orange. End of boring = 12' BGS

REMARKS Duplicate 4TH (2'–4') – Pb

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Offset east of proposed location due to utilities conflict (underground) pipes) 18' west of SB–18–13 Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 9, 1996	
BORING NO.: SB–18–19	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11.5' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate (2.2'–4.2')–(Pb)
WEATHER: Sunny, 30°, Wind – West 5–10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		2"	8"	Pb, PAH, IPAH	Same lithology as SB–18–12 except 2'–4' clayey sand, dark yellowish orange to silty sand, dark yellowish orange.
2		8"	2.2'	Pb, PAH, IPAH	
3		2.2'	4.2'	Dup Pb	4'–8.5' Silty sand, dark yellowish orange.
4		4.2'	6.2'	Pb, PAH, IPAH	
5		6.2'	8.2'	Pb, PAH, IPAH	
6		8.2'	10.2'	Pb, PAH, IPAH	8.5'–10' Sandy silt, dark yellowish orange.
7		10.2'	11.5'	Pb, PAH, IPAH	10'–12' Silty sand – silty sand moderate yellowish brown, moist–wet.
					End of boring = 12' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Boring location was offset approx. 36' east due to proposed location lying in an area of underground pipelines.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 49' south of fence and 10' east of center of westmost catwalk.
DATE: December 14, 1996	Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
BORING NO.: SB–18–20	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 4' BGS
DRILL TYPE: Hand Auger/Shovel	COMMENTS: 12:35 Duplicate 1S from 6"–2' interval (Pb and 8260 analysis)
WEATHER: Sunny, 40°, Wind – Southwest 5–10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb	0–1.5' Clayey sand, dusky brown, some roots, some rock fragments, little paint (hardened) fragments, metal debris.**
2		6"	2'	Pb, PAH, 8260*	1.5'–2.5' Paint waste material (some hardened and some pliable wastes blended together) colors include shades of blue, red, and purple. Chemical vapors noted.
3		2'	4'	Pb	2.5'–3' Clayey sand, dusky brown, some glass debris.
					3'–4' Organic sandy clay, black.
					4'–5' Organic sandy clay, black.
					End of boring = 5' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

* – Hold 8260 sample for P.M. approval.

** – Metal debris included a crushed rusting 5–gallon metal container. Container was empty.

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Duplicate soil sample collected from 6"–2' interval for Pb and PAH analysis. Did not submit PAH duplicate to lab. Did submit Pb and 8260 duplicate to lab, labeled Duplicate 1S.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 11, 1996

BORING NO.: SB-18-21

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Overcast, rain (light), 38o, Wind - NE 10-15 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 24' north of fence and 11' east of center of westmost pipe trestle/catwalk
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 10.5' BGS

COMMENTS:

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb, PAH/ IPAH	0-1.5' Clayey sand, dusky brown, some roots, rock fragments, metal and glass debris.
2		6"	2'	Pb, PAH/ IPAH	1.5'-4' Clayey sand, dusky brown and some yellow paint-like fragments (hardened).
3		2'	4'	Pb, PAH/ IPAH	4'-5.5' Sandy silt, light yellowish orange. 5.5'-9.5' Clayey silt, dark yellowish orange - light yellowish orange - dark yellowish orange.
4		4'	6'	Pb, PAH/ IPAH	9.5'-10.5' Sandy clay, brownish-olive gray.
5		6'	8'	Pb, PAH/ IPAH	10.5'-11' Organic sandy clay. 11'-12' Organic silty clay, brownish-olive gray.
6		8'	10'	Pb, PAH/ IPAH	
					End of boring = 12' BGS.

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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Attempted a soil boring initially at approx. 3' south of this boring. Refusal at 6' BGS.
Hold PAH & IPAH soil samples until receive authorization from Barb Sullivan to run.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 2' north of SB–18–21 (See Weston Map–Figure 1)
DATE: December 13, 1996	Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
BORING NO.: SB–18–21A	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 10.5' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 1F (4'–6') – (Pb) Duplicate 6F (4'–6') – (PAH)
WEATHER: Cloudy, 38°, Wind – NW 5–10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb, IPAH	0–1' Silty sand, moderate yellowish brown with rock fragments, roots, and paint fragments.
2		6"	2'	Pb, IPAH	1'–5' Paint fragments (blue, dark red, and yellow) dispersed with concrete fragments, and brown sand.
3		2'	4'	Pb, IPAH	
4		4'	6'	Pb, PAH IPAH, Dup Pb, PAH	5'–5.75' Layer of paint waste sludge (dark red). 5.75'–6.5' Coarse sand with rock fragments, rustic discoloration.
5		6'	8'	Pb, IPAH	6.5'–7' Silty sand, some rock fragments, dusky brown. 7'–8' Silty sand, moderate yellowish orange.
6		8'	10.5'	Pb, IPAH	8'–8.5' Silty clay/clayey silt, moderate yellowish brown – light yellowish orange.
					8.5'–10' Clayey sand, some rock fragments, olive brown. 10'–12' Clayey sand, little shell fragments, olive brown.
					End of boring = 12 BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Duplicate soil sample collected from 4'–6' interval for Pb and PAH analysis, based on paint sludge.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 13' north and 7' east of SB–18–23 (See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 17, 1996	
BORING NO.: SB–18–22	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 6' BGS
DRILL TYPE: Hand Auger	COMMENTS:
WEATHER: Light Snow, 32°, Wind – SW 0–5 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb	0'–3.5' Clayey/gravelly sand, dusky yellowish brown (fill) paint waste fragments at 2'–3' BGS.
2		6"	2'	Pb	
3		2'	4'	Pb, PAH Dup Pb, PAH	3.5'–5' Gravelly sand, coarse grained (fill for pipeline trench/ catwalk pipes situated approx. 2' west of boring).
4		4'	6'	Pb	5'–5.5' Organic silty clay, dusky brown. 5.5'–7' Silty sand, some shell fragments, olive gray.
					End of boring = 7'BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Duplicate soil sample collected from 2'–4' BGS for Pb and PAH analysis labeled Duplicate 1T2 (soil from 2'–4' BGS for Pb and PAH analyses).

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 11, 1996

BORING NO.: SB-18-23

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Overcast, Drizzle, 39°, Wind - NE 5-10 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 40' east and 20' south of SB-18-21 (See Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 12' BGS

COMMENTS:

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb, PAH IPAH	0-0.5' Clayey sand, dusky brown. 0.5'-2' Silty clay, pale brown.
2		6"	2'	Pb, PAH IPAH	2'-2.5' Paint waste (hardened), brown, gray and dark blue.
3		2'	4'	Pb, PAH IPAH	2.5'-3' Clayey sand, some rock fragments, dusky brown. 3'-3.5' Clayey sand, some rock fragments, dark yellowish orange.
4		4'	6'	Pb, PAH IPAH	3.5'-4' Sand, some silt and rock fragments, dark yellowish orange. 4'-5.5' Sandy silt, light yellowish orange.
5		6'	8'	Pb, PAH IPAH	5.5'-9.5' Clayey silt, dark yellowish orange - light yellowish orange - dark yellowish orange.
6		8'	10'	No Sample Recovery	9.5'-10.5' Sandy clay, brownish-olive gray. 10.5'-11' Organic sandy clay.
7		10'	12'	Pb, PAH IPAH	11'-12' Organic silty clay, brownish-olive gray.
					End of boring = 14' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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Void at 8'-9' BGS, concrete and rock debris was found in the 8'-10' sample tube.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 13' east and 19' south of SB–18–23 (See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 18, 1996	
BORING NO.: SB–18–24	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Sunny, 27°, Wind – West 10–15 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
					0–2" Asphaltic concrete.
1		2	8"	Pb	2"–1' Sandy gravel, dusky brown – very pale orange.
					1'–1.5' Clayey sand, moderate yellowish brown.
2		8"	2.2'	Pb, PAH	1.5'–2' Sandy clay, olive gray.
					2'–3' Clayey/silty sand, light yellowish orange.
3		2.2'	4.2'	Pb	3'–8' Clayey/silty sand, some rock fragments, dark – light
					yellowish orange.
4		4.2'	6.2'	Pb	
					8'–9' Silty sand–sandy clay, apparent petroleum discolored soils,
5		6.2'	8.2'	Pb	light olive gray; metal and glass debris, apparent paint waste
					fragments, petroleum (PAH and solvent–like odors).
6		8.2'	10.2'	Pb	9'–10' Sandy clay–clayey sand, dark yellowish orange–
					olive gray, some paint waste fragments, fabric cloth.
7		10.2'	11.5'	Pb	10'–11' Silty clay, olive gray.
					11'–12' Silty/clayey sand, olive gray.
					End of boring = 12' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 40' west of SB–18–23 (See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 18, 1996	
BORING NO.: SB–18–25	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 10.5' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Sunny, 26°, Wind – West 15–20 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
					0–0.5' Clayey sand, dusky brown.
1		0	6"	Pb	0.5'–2' Silty clay, pale brown.
					2'–2.5' Paint waste (hardened), brown, gray and dark blue.
2		6"	2'	Pb	
					2.5'–3' Clayey sand, some rock fragments, dusky brown.
3		2'	4'	Pb, PAH	3'–3.5' Clayey sand, some rock fragments, dark yellowish orange.
					3.5'–4' Sand, some silt and rock fragments, dark yellowish orange.
4		4'	6'	Pb	4'–5.5' Sandy silt, light yellowish orange.
					5.5'–9.5' Clayey silt, dark yellowish orange – light yellowish
5		6'	8'	Pb	orange – dark yellowish orange.
					9.5'–10.5' Sandy clay, brownish–olive gray.
6		8'	10.5'	Pb	10.5'–11' Organic sandy clay.
					11'–12' Organic silty clay, brownish–olive gray.
					End of boring = 12' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 11, 1996

BORING NO.: SB–18–26

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Overcast, light rain, 38°, Wind – NE 5–10 mph

LOCATION: Kaiser–Frazer Dump Area PAOC 18
Approx. 20' north of fence and 92' east of eastmost catwalk/pipe trestle
See Weston Map – Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 12.5' BGS

COMMENTS: 9:00 Field equipment blank #1W prepared off inside of plastic sampling tube for 4'–8' interval Pb and PAH analysis.

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb Dup–Pb	0–1' Sandy clay, dark yellowish brown, some rock fragments, roots
2		6"	2'	Pb	1'–4.5' Silty sand, dark yellowish orange.
3		2'	4'	Pb	4.5'–6' Sandy silt, dark yellowish orange.
4		4'	6'	Pb	6'–7' Sandy silt, grayish orange.
5		6'	8'	Pb	7'–8.5' Clayey silt, pale yellowish brown.
6		8'	10'	Pb	8.5'–9' Silty clay, pale yellowish orange. 9'–10' Silty sand, pale yellowish orange.
7		10'	12'	Pb	10'–11' Silty clay, moderate–dark yellowish brown. 11'–14' Sand, olive gray, very fine.
					End of boring = 14' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Duplicate soil sample collected from 0'–6" interval for Pb analysis.
Duplicate 3W (0–6") – Pb.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 30' north and 30' east of SB–18–27 See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 17, 1996	
BORING NO.: SB–18–27	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 6' BGS
DRILL TYPE: Hand Auger	COMMENTS: 12:09 Equipment blank 1T2 prepared off inside of hand auger prior to boring for Pb and PAH analysis.
WEATHER: Snow flurries, 32°, Wind – SW 10–15 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb	0–1.5' Clayey sand; little rock, paint waste fragments, and roots, plastic debris, dusky yellowish brown.
2		6"	2'	Pb	1.5'–3.5' Same as 0–1.5' except moderate yellowish brown.
3		2'	4'	Pb, PAH	3.5'–4.5' Paint waste layer, black and red.
4		4'	6'	Pb	4.5'–6' Clayey/sandy silt – silty sand, dark yellowish orange. 6'–7' Silty sand, light olive gray–black, petroleum sheen.

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Duplicate soil sample collected from 0–6" for Pb analysis. (Not sent to lab.)
Duplicate soil sample collected from 0–6" for PAH analysis. (Not sent to lab.)

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 45' west of SB–18–33 and 15' north of fence See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 11, 1996	
BORING NO.: SB–18–28	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 13' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 2W (6"–2') – (Pb)
WEATHER: Overcast, 36°, Wind – NE 10–15 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb, PAH/ IPAH	0–1' Silty sand, some rock and coal slag fragments, dusky yellowish brown (10YR 2/2).
2		6"	2'	Dup Pb	1'–3.5' Clayey silt – sandy silt, moderate yellowish brown (10YR 5/4).
3		2'	4'	Pb, PAH/ IPAH	3.5'–3.75' Silty clay, black (N1), discolored, hydrocarbon–like odo 3.75'–4.5' Silty sand, dark yellowish brown.
4		4'	6'	Pb, PAH/ IPAH	4.5'–8.5' Silty sand, dark yellowish orange.
5		6'	8'	Pb, PAH/ IPAH	4.5'–8.5' Silty sand, dark yellowish orange.
6		8'	10'	Pb, PAH/ IPAH	8.5'–10' Sandy silt, dark yellowish orange.
7		10'	12'	Pb, PAH/ IPAH	10'–10.5' Silty clay, moderate yellowish brown, moist, friable. 10.5'–13' Clayey silt, pale yellowish brown, moist.
8		12'	13'	Pb, PAH/ IPAH	13'–13.25' Sand, dark yellowish orange, very fine –fine grained. 13.25'–13.75' Clayey silt, black discoloration, petroleum sheen.
					13.75'–14' Silty clay, olive gray. End of boring = 14' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Boring lies approx. 3' west of a large (3–prong growth) tree.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser-Frazer Dump Area PAOC 18 Approx. 8' south of fence and 26' east of outfall 12 See Weston Map - Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 18, 1996	
BORING NO.: SB-18-29	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: 10:52 Equipment blank 2W2 prepared off inside of a 4' sampling tube for Pb analysis only.
WEATHER: Sunny, 27o, Wind - West approx. 15-20 mph	

SAMPLE NO.	DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
				0-2" Asphaltic concrete.
1	2	8"	Pb	
				2"-1' Sandy gravel, dusky brown - very pale orange.
2	8"	2.2'	Pb	1'-1.5' Clayey sand, moderate yellowish brown.
				1.5'-2' Sandy clay, olive gray.
3	2.2'	4.2'	Pb	2'-3' Clayey/silty sand, light yellowish orange.
			Pb	3'-8' Clayey/silty sand, some rock fragments, dark - light
4	4.2'	6.2'	Dup Pb	yellowish orange.
			Pb, 8260	8'-9' Silty sand-sandy clay, apparent petroleum discolored soils,
5	6.2'	8.2'	Dup 8260	light olive gray; metal and glass debris, apparent paint waste
			Pb, PAH	fragments, petroleum (PAH and solvent-like odors).
6	8.2'	11'	Dup PAH	9'-10' Sandy clay-clayey sand, dark yellowish orange-
				olive gray, some paint waste fragments, fabric cloth.
				10'-11' Silty clay, olive gray.
				11'-12' Silty/clayey sand, olive gray.
				End of boring = 12' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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Hydrocarbon (solvent-like) odors noted in soils recovered from 1'-12' BGS. Petroleum odors (PAHs) noted in soils recovered from 8'-12' BGS.
Duplicate soil sample collected from 4'-6' BGS for Pb analysis, from 8.2'-11' BGS for PAH analysis, and from 6.2'-8.2' BGS for 8260 analysis.

Duplicate I.D.'s for Soil Samples:

Duplicate I.D.	Corresponds to SB#	Lab Analysis
Duplicate 1W2	SB-18-29 (4.2'-6.2')	7421-Pb
Duplicate 2W2	SB-18-29 (8.2'-11')	8100-PAH
Duplicate 3W2	SB-18-29 (6'-8')	8260 (Hold)

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 14, 1996

BORING NO.: SB-18-31

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Sunny, 26o, Wind - West 0-5 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 20' southwest of SB-18-35
See Weston Map - Figure 1)

Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 12' BGS

COMMENTS: 8:35 Equipment blank 1S prepared off inside of plastic sampling tube for 4'-8' interval for PAH and Pb analysis.

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
					0-2" Asphaltic concrete.
1		2"	8"	Pb	2"-1' Sand and rock fragments (sub base).
				Pb	1'-3' Silty sand, dark yellowish orange. 1416
2		8"	2.2'	Dup Pb	
					3'-3.5' Clayey sand, dark yellowish orange.
3		2.2'	4.2'	Pb, PAH	3.5'-4.5' Silty sand, moderate yellowish orange.
					4.5'-6.5' Gravelly, clayey sand - gravelly sandy clay.
4		4.2'	6.2'	Pb	
					6.5'-7.5' Silty clay, light olive gray.
5		6.2'	8.2'	Pb	7.5'-10.5' Silty sand, pale yellowish brown - moderate yellowish brown - dark yellowish orange.
6		8.2'	10.2'	Pb	
					10.5'-11.75' Silty/sandy clay, dark yellowish orange.
7		10.2'	12'	Pb	11.75'-12' Silty sand, pale yellowish brown.
					End of boring = 12'BGS

REMARKS

SS - Split Spoon
BLS - Below Land Surface
NR - Not Recorded

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Duplicate soil sample collected from 2.2'-4.2' for PAH analysis. (Not submitted to lab.)
Duplicate soil sample collected from 8"-2.2' for Pb analysis (Duplicate 2S) - submitted to lab.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 10, 1996

BORING NO.: SB-18-33

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Mostly cloudy, 33o, Wind - West <5 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 18' north of fence and 92' west of outfall 13
See Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 11.5' BGS

COMMENTS:

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"		6"	0-1' Silty sand, some rock and coal slag fragments, dusky yellowish brown (10YR 2/2).
2		6"		2'	1'-3.5' Clayey silt - sandy silt, moderate yellowish brown (10YR 5/4).
3		2'		4'	3.5'-3.75' Silty clay, black (N1), discolored, hydrocarbon-like odor. 3.75'-4.5' Silty sand, dark yellowish brown.
4		4'		6'	4.5'-8.5' Silty sand, dark yellowish orange.
5		6'		8'	
6		8'		10'	8.5'-10' Sandy silt, dark yellowish orange.
7		10'	11.5'	12'	10'-10.5' Silty clay, moderate yellowish brown, moist, friable. 10.5'-12.5' Clayey silt, pale yellowish brown, moist.
					End of boring = 12' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 9.5' south of fence and 69' west of outfall 13 See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 13, 1996	
BORING NO.: SB–18–35	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 12' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 4F (2.2'–4.2') – (Pb) Duplicate 7F (8"–2.2') – (8260)
WEATHER: Sunny, 41°, Wind – West 5–10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		2"	8"	Pb, 8260*	0–2" Asphaltic concrete. 2"–1' Sandy gravel, pale yellowish brown (sub–base).
2		8"	2.2'	Pb, 8260* Dup 8260	1'–2' Silty sand, olive brown apparent staining and hydrocarbon odors.
3		2.2'	4.2'	Pb, PAH, 8260* Dup Pb	2'–4.5' Paint sludge (red, dark blue), gooey, hydrocarbon odors.
4		4.2'	6.2'	Pb, 8260*	4.5'–6' Sand, moderate yellowish brown, hydrocarbon odors. 6'–7' Silty sand, moderate yellowish brown, (oil–like residue in soil), hydrocarbon odors.
5		6.2'	8.2'	Pb, 8260*	7'–7.5' Clayey sand, dark yellowish orange (oil–like residue in soil), no hydrocarbon odors.
6		8.2'	10.2'	Pb, PAH, 8260*	7.5'–8.5' Silty sand, dark yellowish orange, hydrocarbon odors.
7		10.2'	12'	Pb, 8260*	8.5'–11.5' Silty sand, moderate brown, hydrocarbon odors. 11.5'–12.5' Silty sand, light olive gray, hydrocarbon odors.
					12.5'–13' Sandy silt, light olive gray, hydrocarbon odors. 13'–14' Silty sand, pale yellowish brown – light olive gray, hydrocarbon odors.

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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* – Hold 8260 sample for P.M. approval.

Note: All soils between 2' and 14' BGS had hydrocarbon odors.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 13, 1996

BORING NO.: SB-18-36

RECORDED BY: Alan Fass

DRILL TYPE: Hand Auger

WEATHER: Cloudy, 38₀, Wind - West 5-10 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 40' north of fence and 62' west of outfall 13
See Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 5' BGS

COMMENTS: Duplicate 4F (2.2'-4.2') - (Pb)
Duplicate 7F (8"-2.2') - (8260)

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0-1.5' Silty sand, dark yellowish brown, some roots and rock fragments.
2		6"	2'	Pb	1.5'-4' Silty sand, moderate yellowish brown, some roots.
3		2'	4'	Pb, PAH Dup Pb	4'-5' Silty sand, dark yellowish orange.
4		4'	5'	Pb	5'-6' Silty sand/sandy silt, dark yellowish orange - moderate olive brown.
					End of boring = 6' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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Duplicate soil sample taken @ 2'-4' interval for Pb analysis.
(Duplicate 2F) - (Pb)

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 14' north of fence and 70' west of outfall 13 See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 9, 1996	
BORING NO.: SB–18–37	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 12' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: Duplicate 4 (2'–4') – (Pb)
WEATHER: Cloudy, 28°, Wind – West < 5 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb, PAH IPAH	0–1' Silty sand, some rock and coal slag fragments, dusky yellowish brown (10YR 2/2).
2		6"	2'	Pb, PAH IPAH	1'–3.5' Clayey silt – sandy silt, moderate yellowish brown (10YR 5/4).
3		2'	4'	Dup. Pb	3.5'–3.75' Silty clay, black (N1), discolored, hydrocarbon–like odo 3.75'–4.5' Silty sand, dark yellowish brown.
4		4'	6'	Pb, PAH IPAH	4.5'–8.5' Silty sand, dark yellowish orange.
5		6'	8'	Pb, PAH IPAH	8.5'–10' Sandy silt, dark yellowish orange.
6		8'	10'	Pb, PAH IPAH	10'–10.5' Silty clay, moderate yellowish brown, moist, friable. 10.5'–12.5' Clayey silt, pale yellowish brown, moist.
7		10'	12'	Pb, PAH IPAH	12.5'–14' Silty sand, pale yellowish brown, wet.
					End of boring = 14' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 13, 1996

BORING NO.: SB-18-38

RECORDED BY: Alan Fass

DRILL TYPE: Hand Auger

WEATHER: Cloudy, 38°, Wind - NW 5-10 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 41' north of fence and 36' west of outfall 13
See Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 5.5' BGS

COMMENTS: 9:50 Field equipment blank 1F prepared off inside of hand auger. Pb & PAH analysis (lab).

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0-1.5' Silty sand, dark yellowish brown, some roots and rock fragments.
2		6"	2'	Pb	1.5'-4' Silty sand, moderate yellowish brown, some roots.
3		2'	4'	Pb, PAH Dup PAH	4'-5' Silty sand, dark yellowish orange.
4		4'	5.5'	Pb	5'-6' Silty sand/sandy silt, dark yellowish orange - moderate olive brown.

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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Duplicate soil sample taken at 2'-4' interval for PAH analysis. (Duplicate 5F)

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 20' southeast of SB–18–35 See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 14, 1996	
BORING NO.: SB–18–39	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 12' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: 9:05 Equipment blank 2S from 0–4' sampling tube.
WEATHER: Sunny, 27°, Wind – West 5 mph	9:10 Equipment blank 3S from 4'–8' sampling tube. Both equipment blanks for PAH analysis only.

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		2"	8"	Pb	0–2" Asphaltic concrete. 2"–1' Sand and rock fragments (sub base).
2		8"	2.2'	Pb	1'–3' Silty sand, dark yellowish orange.
3		2.2'	4.2'	Pb, PAH	3'–3.5' Clayey sand, dark yellowish orange. 3.5'–6.5' Silty sand, moderate yellowish orange.
4		4.2'	6.2'	Pb	
5		6.2'	8.2'	Pb	6.5'–7.5' Sandy silt, dark yellowish orange – moderate yellowish brown.
6		8.2'	10.2'	Pb	7.5'–8' Silty clay, dark yellowish orange – moderate yellowish brown.
7		10.2'	12'	Pb	8'–9' Silty sand, dark yellowish orange – moderate yellowish brown.
					9'–10' Sandy–clayey silt, pale yellowish brown – dark yellowish orange.
					10'–12' Silty sand, pale yellowish brown.
					End of boring = 12' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 38' north of fence and 16' west of outfall 13 (See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 13, 1996	
BORING NO.: SB–18–40	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 6.25' BGS
DRILL TYPE: Hand Auger	COMMENTS:
WEATHER: Cloudy, 36°, Wind – NW 5–10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0–1.5' Silty sand, dark yellowish brown, some roots and rock fragments.
2		6"	2'	Pb	1.5'–4' Silty sand, moderate yellowish brown, some roots.
3		2'	4'	Pb, PAH	4'–5' Silty sand, dark yellowish orange.
4		4'	6'	Pb	5'–7' Silty sand/sandy silt, dark yellowish orange – moderate olive brown.
					End of boring = 7' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Duplicate soil sample taken @ 2'–4' interval for Pb analysis. (Not submitted to lab.)

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 9, 1996

BORING NO.: SB–18–41

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Cloudy, 28°, Wind – West 5–10 mph

LOCATION: Kaiser–Frazer Dump Area PAOC 18
Approx. 17' north of fence and 38' west of outfall 13
(See Weston Map – Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 13.5' BGS

COMMENTS: 14:10 (Pb and PH analysis)
Equipment rinse #2M blank taken on plastic sampling tube, prior to boring. Taken off inside of plastic sampling tube. (0'–4' interval) (Duplicate 3–Pb)

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb, PAH, IPAH	0–1.5' Silty sand, dark yellowish brown (10YR 4/2).
2		6"	2'	Dup Pb	1.5'–5' Silty sand, dark yellowish orange (10YR 6/6).
3		2'	4'	Pb, PAH, IPAH	
4		4'	6'	Pb, PAH, IPAH	5'–6' Clayey silt – silty clay, dark yellowish orange.
5		6'	8'	Pb, PAH, IPAH	6'–10' Silt, grayish orange (10YR 7/4) – dark yellowish orange.
6		8'	10'	Pb, PAH, IPAH	10'–13' Silty sand, pale yellowish brown (10YR 6/2).
7		10'	12'	Pb, PAH, IPAH	
8		12'	13.5'	Pb, PAH, IPAH	13'–13.5' Silty clay, pale yellowish brown, moist, friable. 13.5'–14' Silty sand, pale yellowish brown, wet.
					End of boring = 14' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Duplicate soil sample (Duplicate 3) taken from 6"–2' interval for Pb analysis.
Duplicate soil sample collected from 2'–4' interval for PAH analysis, but not submitted to lab.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 23' south of fence and 24' west of outfall 13 (See Weston Map – Figure 1) Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
DATE: December 13, 1996	
BORING NO.: SB–18–41A	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS: 12:18 Equipment blank 2F prepared off inside of plastic sampling tube for 0–4' interval – (Pb and PAH analysis)
WEATHER: Cloudy, 39°, Wind – NW 10–15 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb, lPAH	0'–3' Silty sand, brown.
2		6"	2'	Dup Pb	
3		2'	4'	Pb, PAH, lPAH	3'–6' Silty sand, light yellowish orange.
4		4'	6'	Pb, lPAH	6'–6.5' Clayey sand – sandy clay – clayey silt, light yellowish orange.
5		6'	8'	Pb, lPAH	6.5'–7.5' Silty gravelly sand, light–pale yellowish orange. 7.5'–9' Sandy silt, pale yellowish orange to silt, dark yellowish orange.
6		8'	10'	Pb, lPAH	9'–10' Silty clay, dark yellowish orange and medium gray blended.
7		10'	11'	Pb, lPAH	10'–11' Silty sand, pale yellowish orange – dark yellowish orange. 11'–12' Silty sand, pale yellowish brown.
					End of boring = 12' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Duplicate soil sample collected from 6"–2' for Pb analysis. (Duplicate 3F)

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 9, 1996

BORING NO.: SB-18-43

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Cloudy, 30o, Wind - West 5-10 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 16' north of fence and 10' east of outfall 13 (centerline)
(See Weston Map - Figure 1)
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 13' BGS

COMMENTS:

SAMPLE NO.	DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1	0"	6"	Pb, PAH IPAH	0-1.5' Silty sand, dark yellowish brown (10YR 4/2).
2	6"	2'	Pb, PAH IPAH	1.5'-5' Silty sand, dark yellowish orange (10YR 6/6).
3	2'	4'	Dup. Pb	
4	4'	6'	Pb, PAH IPAH	5'-6' Clayey silt - silty clay, dark yellowish orange.
5	6'	8'	Pb, PAH IPAH	6'-10' Silt, grayish orange (10YR 7/4) - dark yellowish orange.
6	8'	10'	Pb, PAH IPAH	
7	10'	12'	Pb, PAH IPAH	10'-13' Silty sand, pale yellowish brown (10YR 6/2).
8	12'	13'	Pb, PAH IPAH	13'-13.5' Silty clay, pale yellowish brown, moist, friable.
				13.5'-14' Silty sand, pale yellowish brown, wet.
				End of boring = 14' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 16, 1996

BORING NO.: SB–18–45/MW–18–45

RECORDED BY: Alan Fass

DRILL TYPE: Hand Auger

WEATHER: Sunny, 29°, Wind – West 5 mph

LOCATION: Kaiser–Frazer Dump Area PAOC 18
Approx. 5' east and 3' north of SB–18–37 (See Weston Map – Figure 1)
71' west of outfall 13 and 17' north of fence.
Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 11' BGS

COMMENTS: Duplicate 1M2 collected from SB–18–45 (6"–2') for Pb analysis. Duplicate 4M2 collected from SB–18–45 (4'–6') for PAH analysis. Equipment blank 4S from 0–4' sampling tube for PAH analysis. Equipment blank 5S from 4'–8'sampling tube for PAH and Pb analysis.

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0"	6"	Pb	0–1' Silty sand, some rock and coal slag fragments, dusky yellowish brown (10YR 2/2).
2		6"	2'	Pb Dup Pb	1'–1.3' Paint sludge/waste.
3		2'	4'	Pb	1'–3.5' Clayey silt – sandy silt, moderate yellowish brown (10YR 5/4).
4		4'	6'	Pb, PAH Dup PAH	3.5'–3.75' Silty clay, black (N1), discolored, hydrocarbon–like odo 3.75'–4.5' Silty sand, dark yellowish brown.
5		6'	8'	Pb	4.5'–8.5' Silty sand, dark yellowish orange.
6		8'	10'	Pb	8.5'–10' Sandy silt, dark yellowish orange.
7		10'	12'	Pb	10'–10.5' Silty clay, moderate yellowish brown, moist, friable. 10.5'–12.5' Clayey silt, pale yellowish brown, moist.
8		12'	14'		12.5'–14' Silty sand, pale yellowish brown, wet.
9		14'	17'		14'–15.5' Silty sand – sandy silt – pale yellowish brown. 15.5'–17' Organic silty clay, olive gray.
					End of boring = 17' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 2' northwest of SB–18–7 (See Weston Map – Figure 1)
DATE: December 17, 1996	Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
BORING NO.: SB–18–46	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 11' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Cloudy, 34°, Wind – West 10–15 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		2'	2.5'	PAH, 8260*	0–12' See SB–18–7 (0–12') lithology except 1.5'–2' paint waste, dark red, brown and black.
					12'–16' Silty sand, dark olive gray, some shell fragments.
					16'–17' Silty clay, light olive gray.
					End of boring = 17' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

*–Hold 8260 sample for P.M. approval.

m:\480\06070266.wk3

An initial boring was attempted at SB–18–7 but encountered concrete debris at 2.5' BGS to 7' BGS. Refusal at 7' BGS.

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 13, 1996

BORING NO.: SB-18-48

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Partly sunny, 40o, Wind - West 10-15 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 25' east of SB-18-43
(See Weston Map - Figure 1)

Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 12' BGS

COMMENTS:

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		0	6"	Pb	0-1.5' Silty sand, dark yellowish brown (10YR 4/2).
2		6"	2'	Pb, PAH	1.5'-5' Silty sand, dark yellowish orange (10YR 6/6).
3		2'	4'	Pb	
4		4'	6'	Pb	5'-6' Clayey silt - silty clay, dark yellowish orange.
5		6'	8'	Pb	6'-10' Silt, grayish orange (10YR 7/4) - dark yellowish orange.
6		8'	10'	Pb	
7		10'	12'	Pb	10'-13' Silty sand, pale yellowish brown (10YR 6/2).
					13'-13.5' Silty clay, pale yellowish brown, moist, friable.
					13.5'-14' Silty sand, pale yellowish brown, wet.
					End of boring = 14' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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Duplicate soil samples were collected from 6"-2' for Pb and PAH analysis. (Not submitted to Lab.)

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology

DATE: December 18, 1996

BORING NO.: SB-18-49

RECORDED BY: Alan Fass

DRILL TYPE: Simco Earthprobe 200

WEATHER: Cloudy, 25°, Wind - West 5-10 mph

LOCATION: Kaiser-Frazer Dump Area PAOC 18
Approx. 20' southwest of SB-18-8
(See Weston Map - Figure 1)

Willow Run
GM Willow Run Facility
Ypsilanti Township, Michigan

WATER TABLE: Approx. 11.5' BGS

COMMENTS: 9:14 Equipment blank 1W2 prepared off 4'-8' sampling tube for PAH and Pb analysis.

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
					0-2" Asphaltic concrete.
1		2"	8"	Pb	2"-1' Sandy gravel, dusky brown - very pale orange.
				Pb	1'-1.5' Clayey sand, moderate brown, wood debris (black stained).
2		8"	2.2'	Dup Pb	1.5'-3' Silty clay, little sand, dusky brown (5YR 2/2).
					3'-5' Same as 1'-3' except dark yellowish orange (10YR 6/6).
3		2.2'	4.2'	Pb, PAH	
					5'-7' Sandy silt, same color.
4		4.2'	6.2'	Pb	
					7'-8' Silty clay, same color, wet, plastic.
5		6.2'	8.2'	Pb	
					8'-11' Silty sand, same color.
6		8.2'	10.2'	Pb	
					11'-12.2' Sand, fine-medium grained, same color, moist-wet.
7		10.2'	11.5'	Pb	
					End of boring = 12' BGS

REMARKS

SS - Split Spoon

BLS - Below Land Surface

NR - Not Recorded

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Duplicate soil sample collected from 8"-2.2' for Pb analysis (Duplicate 4W2).

SOIL BORING RECORD

EXPLORATION FOR: Subsurface Lithology	LOCATION: Kaiser–Frazer Dump Area PAOC 18 Approx. 25' west of SB–18–1 (See Weston Map – Figure 1)
DATE: December 18, 1996	Willow Run GM Willow Run Facility Ypsilanti Township, Michigan
BORING NO.: SB–18–50	
RECORDED BY: Alan Fass	WATER TABLE: Approx. 12' BGS
DRILL TYPE: Simco Earthprobe 200	COMMENTS:
WEATHER: Light snow, 24°, Wind – West 5–10 mph	

SAMPLE NO.		DEPTH FROM	DEPTH TO	Lab/Field Test Type	SOIL DESCRIPTION AND BORING LOG
1		2"	8"	Pb	0–2" Asphaltic concrete. 2"–1' Sandy gravel, dusky brown – very pale orange.
2		8"	2.2'	Pb	1'–3' Clayey sand, some rock fragments, moderate brown.
3		2.2'	4.2'	Pb, PAH	3'–10' Fill material consisting of sandy gravel, (discolored black–dusky brown), iron slag.
4		4.2'	6.2'	Pb Dup Pb	
5		6'	8.2'	Pb	
6		8.2'	10.2'	Pb	10'–10.5' Organic silty clay, dusky brown, glass debris.
7		10.2'	12'	Pb	10.5'–12' Clayey–silty sand, dark yellowish orange.
					End of boring = 12.5' BGS

REMARKS

SS – Split Spoon

BLS – Below Land Surface

NR – Not Recorded

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Duplicate soil sample collected from 4.2'–6.2' for Pb analysis. (Duplicate 5W2)
Driller had to resample 0–12' BGS due to poor recovery (voids or non compact fill).

SOIL BORING LOG

Exploration for: Lead, PAH

Location: Willow Run CVO Facility, Ypsilanti, Michigan

Date: 3/22/97

Boring No.: SB-51

Record By: John Menhennett

Drill Type: Geoprobe

Weather: Overcast, cool 30°F

Water Table: 10' BLS

Sample No.	Type	Depth From	Depth To	No. of Blows	Soil Description and Boring Log
		LS	3"	N/A	asphalt
		3"	12"	N/A	fill rock material
		12"	3.5'	N/A	7.5YR 3/2 (dark brown) very fine to fine grained sand sub rounded to rounded - moderately sorted
		3.5'	7.0'	N/A	10YR 5/6 (yellowish brown) - Very fine to fine grained sand - sub rounded to rounded moderately sorted
		7	7.5'	N/A	10YR 6/6 (brownish yellow) same description as above
		7.5	8.0	N/A	10YR 6/1 (gray) silty clay
		8.0'	10.5'	N/A	10YR 6/6 (brownish yellow) Very fine to fine grained sand - sub rounded to rounded - moderately sorted
		10.5'	12.0'	N/A	10YR 6/1 (gray) silty clay.

*Remarks: PH – Post Hole Digger; SPT – Standard Penetration Test; N/A - Not applicable; BLS - Below Land Surface.

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SOIL BORING LOG

Exploration for: LEAD

Location: WILLOW RUN CVO FACILITY, YPSILANTI, MICHIGAN

Date: 3/22/97

Boring No.: SB-52

Record By: John Menhennet

Drill Type: Geoprobe

Weather: Overcast - Cool 30°F

Water Table: 10' BLS

Sample No.	Type	Depth From	Depth To	No. of Blows	Soil Description and Boring Log
		LS	3"	N/A	asphalt
		3"	12"	N/A	rock fill material
		12"	3'	N/A	5Y 3/1 (very dark gray) clayey sand - low plasticity
		3'	4.5'	N/A	2.5Y 4/4 (olive brown) very fine to fine grained sand with rounded to rounded - moderately sorted.
		4.5	7.0'	N/A	10YR 5/6 (yellowish brown) clayey sand - very fine to fine grained - sub rounded to rounded - moderately sorted
		7.0'	8.0'	N/A	2.5Y 6/6 brownish yellow clayey sand - very fine grained to fine grained - sub rounded to rounded moderately sorted.
		8.0'	12.0'	N/A	10YR 6/4 (light yellowish brown) sand - very fine to fine grained, sub rounded to rounded - moderately sorted.

*Remarks: PH -- Post Hole Digger; SPT -- Standard Penetration Test; N/A - Not Applicable; BLS - Below Land Surface.

SOIL BORING LOG

Exploration for: LEAD

Location: WILLOW RUN CVO FACILITY, YPSILANTI, MICHIGAN

Date: 3/22/97

Boring No.: SB-53

Record By: JOHN MENHENNETT

Drill Type: GEOPROBE

Weather: OVERCAST, COOL 30°F

Water Table: 10' BLS

Sample No.	Type	Depth From	Depth To	No. of Blows	Soil Description and Boring Log
		LS	3"	N/A	asphalt
		3"	12"	N/A	fill rock material
		12"	18"	N/A	7.5YR 3/2 (very dark brown) very fine to fine grained sand w/ trace to rounded - moderately sorted
		18"	3'	N/A	5Y 3/1 (very dark gray) sandy clay - low plasticity
		3'	10'	N/A	10YR 6/6 (brownish yellow) very fine to fine grained sand - subrounded to rounded - moderately sorted
		10'	12'	N/A	2.5Y 4/2 (dark grayish brown) sandy clay - low to moderate plasticity

*Remarks: PH – Post Hole Digger; SPT – Standard Penetration Test; N/A – not applicable; BLS – Below Land Surface.

SOIL BORING LOG

Exploration for: LEAD

Location: WILLOW RUN CVO FACILITY, YPSILANTI, MICHIGAN

Date: 3/22/97

Boring No.: SB-5.4

Record By: JOHN MENHENNETT

Drill Type: GEOPROBE

Weather: OVERCAST, COOL 30°F

Water Table: 10' BLS

Sample No.	Type	Depth From	Depth To	No. of Blows	Soil Description and Boring Log
		LS	3"	N/A	asphalt
		3"	12"	N/A	fill rock material
		12"	18"	N/A	7.5 YR 3/2 (very dark brown) very fine to fine grained sand, subrounded to rounded, moderately sorted
		18"	3'	N/A	5Y 3/1 (very dark gray) sandy clay - low plasticity
		3'	10'	N/A	10 YR 6/6 (brownish yellow) very fine to fine grained sand, subrounded to rounded, moderately sorted
		10'	12'	N/A	2.5 Y 4/2 (dark grayish brown) sandy clay - low to moderate plasticity.

*Remarks: PH – Post Hole Digger; SPT – Standard Penetration Test; N/A – not applicable; BLS – Below Land Surface.

SOIL BORING LOG

Exploration for: LEAD

Location: WILLOW RUN CVO FACILITY, YPSILANTI, MICHIGAN

Date: 3/22/97

Boring No.: SB-55

Record By: JOHN MENHENNETT

Drill Type: GEOPROBE

Weather: OVERCAST, COOL 30°F

Water Table: 10' BLS

Sample No.	Type	Depth From	Depth To	No. of Blows	Soil Description and Boring Log
		LS	3"	N/A	asphalt
		3"	12"	N/A	fill rock material
		12"	18"	N/A	7.5 YR 3/2 (very dark brown) very fine to fine grained sand - subrounded to rounded - moderately sorted
		18"	3'	N/A	5Y 3/1 (very dark gray) sandy clay - low plasticity
		3'	10'	N/A	10 YR 6/6 (brownish yellow) very fine to fine grained sand - subrounded to rounded - moderately sorted
		10'	12'	N/A	2.5 Y 4/2 (dark grayish brown) sandy clay - low to moderate plasticity.

*Remarks: PH – Post Hole Digger; SPT – Standard Penetration Test; N/A – not applicable; BLS – Below Land Surface.

SOIL BORING LOG

Exploration for: LEAD

Location: WILLOW RUN CVO FACILITY, YPSILANTI, MICHIGAN

Date: 3/22/97

Boring No.: SB-56

Record By: JOHN MENHENNETT

Drill Type: GEOPROBE

Weather: OVERCAST, COOL 30°F

Water Table: 10' BLS

Sample No.	Type	Depth From	Depth To	No. of Blows	Soil Description and Boring Log
		LS	3"	N/A	asphalt
		3"	12"	N/A	fill rock material
		12"	18"	N/A	7.5 YR 3/2 (very dark brown) very fine to fine Gravel sand, subrounded to rounded - moderately sorted
		18"	3'	N/A	5Y 3/1 (very dark gray) sandy clay - low plasticity
		3'	10'	N/A	10 YR 6/6 (brownish yellow) very fine to fine sand - subrounded to rounded - moderately sorted
		10'	12'	N/A	2.5 Y 4/2 (dark grayish brown) sandy clay - low to moderate plasticity.

*Remarks: PH – Post Hole Digger; SPT – Standard Penetration Test; N/A – not applicable; BLS – Below Land Surface.

SOIL BORING LOG

Exploration for: LEAD

Location: WILLOW RUN CVO FACILITY, YPSILANTI, MICHIGAN

Date: 3/22/97

Boring No.: SB-57

Record By: JOHN MENHENNETT

Drill Type: GEOPROBE

Weather: OVERCAST, COOL 30°F

Water Table: 10' BLS

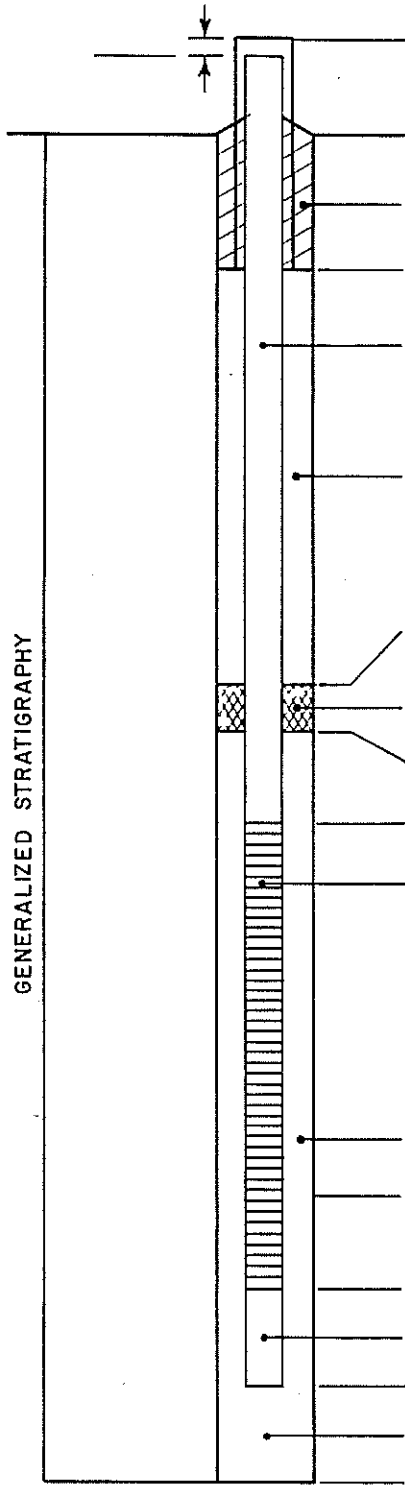
Sample No.	Type	Depth From	Depth To	No. of Blows	Soil Description and Boring Log
		LS	3"	N/A	asphalt
		3"	12"	N/A	fill rock material
		12"	18"	N/A	7.5 YR 3/2 (very dark brown) very fine to fine grained sand - well bedded to rounded - moderately sorted
		18"	3'	N/A	5Y 3/1 (very dark gray) sandy clay - low plasticity
		3'	10'	N/A	10 YR 6/6 (brownish yellow) very fine to fine grained sand - well rounded to rounded - moderately sorted
		10'	12'	N/A	2.5 Y 4/2 (dark grayish brown) sandy clay - low to moderate plasticity.

*Remarks: PH – Post Hole Digger; SPT – Standard Penetration Test; N/A – not applicable; BLS – Below Land Surface.

SUBSURFACE FIELD LOG
MONITORING WELL CONSTRUCTION DETAILS

SHEET 1 OF 1

MW-18-45
MONITORING WELL: Willow Run (Kaiser-Frazer Dump Area)
PROJECT NO.: 480.75
BY: Alan Fass
DATE: 12/16/96



PROTECTIVE CASING-MATERIAL Sch. 40 PVC
-HEIGHT ~3 feet
-DIAMETER 2 inches
SURFACE SEAL-MATERIAL Cement Grout
SURFACE SEAL-DEPTH 0-3.5 feet BGS
RISER-MATERIAL Sch. 40 PVC
-DIAMETER 2 inches
ANNULUS-MATERIAL Cement Grout
ANNULUS-DEPTH 3.5 feet BGS
SEAL-MATERIAL Bentonite
SEAL-DEPTH 4.5 feet BGS
SCREEN-TOP 6.5 feet BGS
-MATERIAL Sch. 40 PVC
-SLOT SIZE .010
-LENGTH 10 feet
-DIAMETER 2 inches
PACK-MATERIAL #3 Sand
BORING-DIAMETER 7.25 inches
SCREEN-DEPTH 16.5 feet BGS
SUMP-LENGTH 6 inches
SUMP-DEPTH 16.5 feet BGS
BACKFILL-MATERIAL #3 Sand
BORING-DEPTH 17 feet BGS

14.65
-3
11.65

WATER LEVEL UPON COMPLETION 14.65 ft. below Top-of-Casing (T.O.C.)
DRILLER Brad Massevant - Superior Environmental
METHOD Hollow Stem Auger
RIG TYPE Simco Earthprobe 200
SAMPLING METHOD Bailer
DEVELOPMENT DATE 12/17/96
DEVELOPMENT METHOD Peristaltic Pump (Slow Develop)

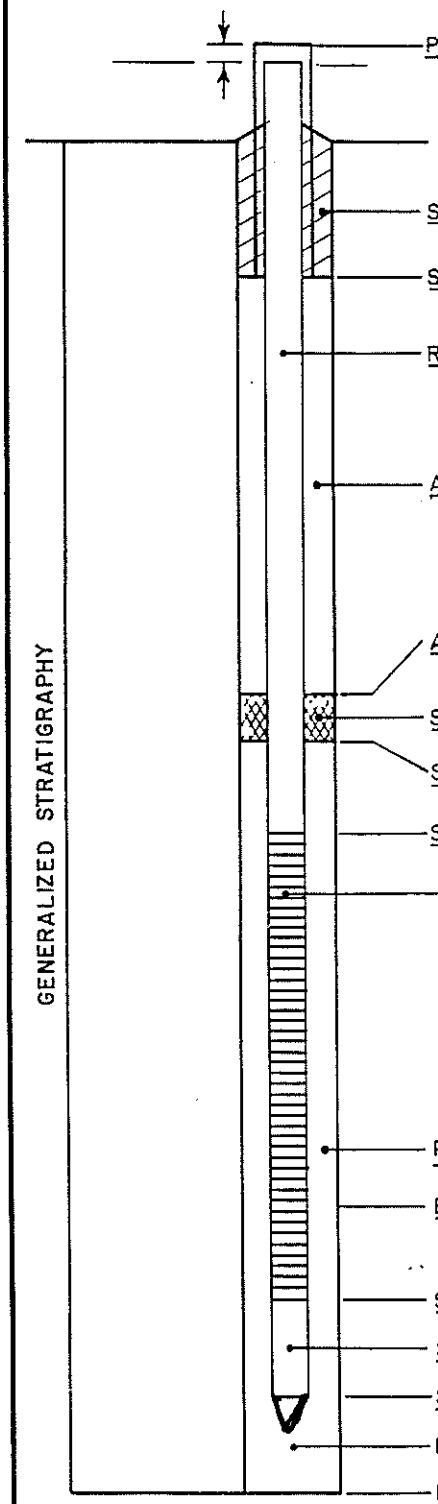
BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

50663

SHEET 1 OF 1

SUBSURFACE FIELD LOG
MONITORING WELL CONSTRUCTION DETAILS

MW-18-46
MONITORING WELL
PROJECT: Willow Run (Kaiser-Frazer Dump Area)
PROJECT NO.: 480.75
BY: Alan Fass
DATE: 12/17/96



PROTECTIVE CASING-MATERIAL Sch. 40 PVC
-HEIGHT ~3 ft.
-DIAMETER 2 inches
SURFACE SEAL-MATERIAL Cement Grout
SURFACE SEAL-DEPTH 0-3.5 feet BGS
RISER-MATERIAL Sch. 40 PVC
-DIAMETER 2 inches
ANNULUS-MATERIAL Cement Grout
ANNULUS-DEPTH 3.5 feet BGS
SEAL-MATERIAL Bentonite
SEAL-DEPTH 4.5 feet BGS
SCREEN-TOP 6.5 feet BGS
-MATERIAL Sch. 40 PVC
-SLOT SIZE .010
-LENGTH 10 feet
-DIAMETER 2 Inches
PACK-MATERIAL #3 Sand
BORING-DIAMETER 7.25 inches
SCREEN-DEPTH 16 feet BGS
SUMP-LENGTH 6 inches
SUMP-DEPTH 16.5 feet BGS
BACKFILL-MATERIAL #3 Sand
BORING-DEPTH 17 feet BGS

WATER LEVEL UPON COMPLETION 14.34 ft. below Top-of-Casing (T.O.C.)
DRILLER Brad Masserant - Superior Environmental
METHOD Hollow Stem Auger
RIG TYPE Simco Earthprobe 200
SAMPLING METHOD Bailer
DEVELOPMENT DATE 12/17/96
DEVELOPMENT METHOD Peristaltic Pump (Slow Develop)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

50663

Date Start/Finish: 04/19/96 / 04/19/96
Drilling Company: Superior Environmental
Driller's Name: T. Germayne
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 7 5/8-in.
Rig Type: Mobile B-57
Spoon Size: 2-in.

Corehole Depth: N/A ft.
Borehole Depth: 20 ft.

Geologist: M.Mueller

Well No. MW-4

Client:
General Motors Corporation

Location:
Complete Auto Transit Site
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Fill material	Well cap; Cement pad
									Light brown sand	
5										Neat cement
									Brown sand	Bentonite seal
										2-inch Schedule 40 PVC riser
10										6/20 silica sand
15										0.010" slot stainless steel well screen
									Clay	
20										

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ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth
04/24/96		12.29 ▼

Date Start/Finish: 04/23/96 / 04/23/96
Drilling Company: Superior Environmental
Driller's Name: N. Massey
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 7 5/8-in.
Rig Type: Mobile B-57
Spoon Size: 2-in.

Corehole Depth: N/A ft.
Borehole Depth: 20 ft.

Geologist: R.S.A. Sunderland

Well No. MW-7

Client:
General Motors Corporation

Location:
Complete Auto Transit Site
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Fill material, light brown, fine to medium sand, 20% brownish grey cobbles, poorly sorted	Well cap; Cement pad
									Sand, yellowish brown, fine to medium grained, poorly sorted, quartoze	
5										Neat cement; Bentonite seal
										2-inch Schedule 40 PVC riser
10									Sand, grey, fine to medium grained, poorly sorted, quartzose	
									Sand, olive grey, fine to medium grained, poorly sorted	6/20 silica sand
15										0.010" slot stainless steel well screen
									Sand, grey, fine to medium grained, poorly sorted	
20									Sandy clay, soft, semi-cohesive	

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ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth
04/24/96		10.37 ▼

Project: 480.43
Script: nbblwell
Date: 11/14/96

Date Start/Finish: 04/23/96 / 04/23/96
Drilling Company: Superior Environmental
Driller's Name: N. Massey
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 7 5/8-in.
Rig Type: Mobile B-57
Spoon Size: 2-in.

Corehole Depth: N/A ft.
Borehole Depth: 20 ft.

Geologist: R.S.A. Sunderland

Well No. MW-8

Client:
General Motors Corporation

Location:
Complete Auto Transit Site
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Gravelly sand, dark brown, fine to medium grained, poorly sorted, 15% rounded gravel	Well cap; Cement pad
									Gravelly sand, black, fine to medium grained, poorly sorted, 15% rounded gravel	
5									Sandy clay, dark grey, soft, semi-cohesive	Neat cement
									Sandy clay, light brown, soft, semi-cohesive	Bentonite seal; 2-inch Schedule 40 PVC riser
10									Sandy clay, dark grey, soft, semi-cohesive	6/20 silica sand
15										0.010" slot stainless steel well screen
									Sandy clay, greyish brown. soft, semi-cohesive	
20										

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ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth
04/24/96		9.8t ▼

Project: 480.43
Script: nbblwell
Date: 11/14/96

Date Start/Finish: 04/22/96 / 04/22/96
Drilling Company: Superior Environmental
Driller's Name: N. Massey
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 7 5/8-in.
Rig Type: Mobile B-57
Spoon Size: 2-in.

Corehole Depth: N/A ft.
Borehole Depth: 20 ft.

Geologist: M.Mueller

Well No. MW-5

Client:
General Motors Corporation

Location:
Complete Auto Transit Site
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
									Fill material	Well cap; Cement pad
									Orange/light brown sand	
5										Neat cement; Bentonite seal
									Light brown/tan sand	2-inch Schedule 40 PVC riser; 6/20 silica sand
10										
15										0.010" slot stainless steel well screen
17									Grey clay	
20										

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ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth
04/24/96		11.84

Project: 480.43
Script: nbblwell
Date: 11/14/96

Date Start/Finish: 04/22/96 / 04/22/96
Drilling Company: Superior Environmental
Driller's Name: N. Massey
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 7 5/8-in.
Rig Type: Mobile B-57
Spoon Size: 2-in.

Corehole Depth: N/A ft.
Borehole Depth: 20 ft.

Geologist: R.S.A. Sunderland

Well No. MW-6

Client:
General Motors Corporation

Location:
Complete Auto Transit Site
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
0									Fill material, light brown, fine to medium sand, 20% brownish grey cobbles, poorly sorted	Well cap; Cement pad
									Sand, very dark brown, fine to medium grained, poorly sorted, 10% rounded gravel	
5									Sand, yellowish brown, fine to medium grained, poorly sorted, quartoze	Neat cement; Bentonite seal; 2-inch Schedule 40 PVC riser
10									Sandy clay, grey, soft, semi-cohesive	
									Sand, grey, fine to medium grained, poorly sorted, quartzose	6/20 silica sand
15									Clay, grey, firm, cohesive	0.010" slot stainless steel well screen
20										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth
04/24/96		11.18

Project: 480.43
Script: nbblwell
Date: 11/14/96

Date Start/Finish: 09/16/96 / 09/16/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 7 5/8-in.
Rig Type: Mobile B-57
Spoon Size: 2-in.

Corehole Depth: N/A ft.
Borehole Depth: 18 ft.

Geologist: M. Mueller

Well No. MW-12

Client:
General Motors Corporation

Location:
Complete Auto Transit Site
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
	1					17.8			Sand, brownish yellow (10YR 6/6), fine grained, poorly sorted, 10% silt	Well cap; Cement pad
	2					8				
5	3					17.8				Neat cement; Bentonite seal
	4					23.8			Sand yellowish brown (10YR 5/8), fine grained, well sorted, 5% silt	2-inch Schedule 40 PVC riser
	5					34				
10									Sand, dark yellowish brown (10YR 4/6), fine grained, well sorted, 5% silt	6/20 silica sand
									Silt, dark grey (5Y 4/1), some clay (5%)	
15										0.010" slot stainless steel well screen
									Silty clay, light olive grey (5Y 6/2), firm, semi-cohesive	
20										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth
09/17/96		13.14 ▼

Project: 480.43
Script: nbblwell
Date: 11/20/96

Date Start/Finish: 09/16/96 / 09/16/96
Drilling Company: Superior Environmental
Driller's Name: G. Hill
Drilling Method: Hollow Stem Auger
Bit Size: N/A-in. **Auger Size :** 7 5/8-in.
Rig Type: Mobile B-57
Spoon Size: 2-in.

Corehole Depth: N/A ft.
Borehole Depth: 18 ft.

Geologist: M. Mueller

Well No. MW-13

Client:
General Motors Corporation

Location:
Complete Auto Transit Site
Ypsilanti, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	FID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
									GROUND SURFACE	
	1					0.4			Sand, brownish yellow (10YR 6/6), fine grained, poorly sorted, 10% silt	Well cap; Cement pad
	2					0.4				
5	3					0.4				Neat cement; Bentonite seal
	4					1			Sand, dark yellowish brown (10YR 4/6), fine grained, well sorted, 5% silt	2-inch Schedule 40 PVC riser
	5					0.6				
10										6/20 silica sand
									Clay, dark grey (N 2/0), soft, cohesive	
15										0.010" slot stainless steel well screen
20										

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Remarks:

Saturated Zones

Date / Time	Elevation	Depth
09/17/96		11.09