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**Worldwide Facilities Group
Environmental Services
Remediation Team**

October 21, 2005

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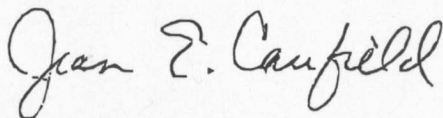
Dear Mr. Patulski:

Re: RCRA Facility Investigation Report
Centerpoint Business Campus, Pontiac, MI
MID 005 356 902

Enclosed are two copies of the final text of the RCRA Facility Investigation (RFI) Report for the General Motors Corporation (GM) Centerpoint Business Campus in Pontiac, Michigan. The enclosed document reflects approval of red-line changes presented in the November 30, 2000 version of the RFI Report, approved by the U.S. EPA on June 27, 2005. The RFI Report is pursuant to the U.S. EPA RCRA 3008(h) Administrative Order on Consent signed with GM on September 24, 1998.

Please contact me at 248-753-5774 if you want to discuss the RFI Report or have questions regarding any of the information provided.

Sincerely,



Jean E. Caufield
Project Manager

Enclosure

Cc: Jeanne Piercey, Conestoga Rovers & Associates





RCRA FACILITY INVESTIGATION (RFI) REPORT

MID 005 356 902

GM TRUCK GROUP
PONTIAC, MICHIGAN

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OCTOBER 21, 2005
(SAME AS RED-LINE STRIKE-OUT VERSION
DATED NOVEMBER 30, 2000)
REF. NO. 7097 (12)

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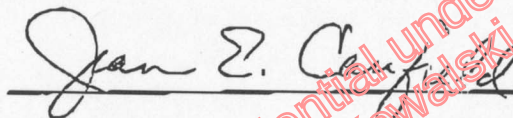
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CERTIFICATION

"I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to evaluate the information submitted. I certify that the information contained in or accompanying this submittal is true, accurate, and complete. As to those identified portion(s) of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and all attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations."

Signature:



Name:

Jean Caufield

Title:

Project Manager

Date:

October 21, 2005

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LIST OF ACRONYMS

AMSL	Above Mean Sea Level
AOC(s)	Area(s) of Concern
AOIs	Areas of Interest
ASTs	Above-ground Storage Tanks
BGS	Below Ground Surface
BHHRA	Baseline Human Health Risk Assessment
BKSF	Biokinetic Slope Factor
CDM	Camp Dresser and McKee
CAS	Columbia Analytical Services
CDC	Center for Disease Control
CDI	Chronic Daily Intake
CET	Carlo Environmental Technologies
CMS	Corrective Measures Study
COPC	Contaminant of Potential Concern
Consent Order	Administrative Order on Consent
CRA	Conestoga-Rovers & Associates
CRP	Community Relations Plan
CSF	Cancer Slope Factor
DCC	Direct Contact Criteria
DMP	Data Management Plan
DWP	Drinking Water Protection
ERD	Environmental Response Division
FSP	Field Sampling Plan
GCPC	Groundwater Contact Protection Criteria
GM	General Motors Corporation
GSD	Geological Survey Division
GSI	Groundwater/Surface Water Interface
HASP	Health and Safety Plan
HQ	Hazard Quotient
HSA	Hollow-stem Auger
ID	Insufficient Data
IM	Interim Measures

LIST OF ACRONYMS (CONT'D)

LUST	Leaking Underground Storage Tank
MDEQ	Michigan Department of Environmental Quality [formerly the Michigan Department of Natural Resources(MDNR)]
MDPH	Michigan Department of Public Health
NCP	National Contingency Plan
ND	Non-detect
NPDES	National Pollution Discharge Elimination System
OSWER	Office of Solid Waste and Emergency Response
PCBs	Polychlorinated Biphenyls
PID	Photoionization Detector
PMP	Project Management Plan
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
ppm	parts per million
PRE	Preliminary Risk Evaluation
PR/VSİ	Preliminary Review/ Visual Site Inspection
PSIC	Particulate Soil Inhalation Criteria
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RBRG	Risk-based Remediation Goal
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RFI	RCRA Facility Investigation
RME	Reasonable Max Exposure
SOW	Scope of Work
SVOCs	Semi-Volatile Organic Compounds
SWMU	Solid Waste Management Unit
TCL/TAL	Target Compound List/Target Analyte List
TCLP	Toxicity Characteristic Leachate Procedure

LIST OF ACRONYMS (CONT'D)

TICs	Tentatively Identified Compounds
TPC	Truck Product Center
UCL	Upper Confidence Limit
U.S. EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
WWTP	Wastewater Treatment Plant

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1.0 INTRODUCTION

1.1 GENERAL

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report was prepared by Conestoga-Rovers & Associates, Inc. (CRA) for the General Motors Corporation (GM) Truck Group Facility (Facility) in Pontiac, Michigan. The Facility location is presented on Figure 1.1. A Facility Plan is presented on Figure 1.2. This document summarizes the methodologies and results of the investigative field activities completed by CRA at the Facility during two primary phases of investigation.

The first phase of RFI investigative activities was conducted between November 1998 and January 1999 and focused on characterizing soil environmental quality within and adjacent to five Solid Waste Management Units (SWMUs) identified by the United States Environmental Protection Agency (U.S. EPA) in a RCRA 3008(h) Administrative Order on Consent (Consent Order) with GM. The Consent Order, which was executed by U.S. EPA on September 24, 1998, required GM to initiate investigative/corrective actions at the Facility pursuant to Section 3008h of RCRA. The RFI was completed in general accordance with the specifications outlined in the September 4, 1998 RFI Work Plan (CRA, 1998) and associated Quality Assurance Project Plan (QAPP) for the Facility which were approved by the U.S. EPA on September 11, 1998 and September 23, 1998, respectively. The seven SWMUs which were addressed pursuant to the Consent Order are summarized below.

	<i>SWMU</i>	<i>Description</i>	<i>Scope</i>
1)	#30	Former J-Lot Fill Area	Interim Measure (IM)
2)	#32	Former Coal Pile Storage Area	IM
3)	#3	Container Storage Area	RFI
4)	#29	Wastewater Treatment Plant	RFI
5)	#31	Former Surface Impoundment	RFI
6)	#33	Former South Retention Pond	RFI
7)	#34	North Retention Pond	RF

The results of the first phase of RFI field activities were compiled and transmitted to U.S. EPA for review in the RFI Report dated July 19, 1999. GM received comments on the July 19, 1999 RFI Report in correspondence from U.S. EPA dated July 12, 2000. The July 12, 2000 U.S. EPA correspondence included comments on the RFI Report and a request for limited supplemental RFI investigations.

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The limited supplemental RFI investigative activities were conducted in accordance with the RFI Work Plan Addendum dated July 27, 2000 which was approved by the U.S. EPA on August 2, 2000. The results of the limited supplemental RFI investigative activities were transmitted to U.S. EPA in a document entitled "Addendum No. 1 to RCRA Facility Investigation (RFI) Report" dated November 21, 2000. (Addendum No. 1 to RFI Report, CRA November 2000).

In addition to the request for limited supplemental investigations on July 12, 2000, U.S. EPA also provided GM with several comments on the original July 19, 1999 RFI Report. GM's responses to the July 12, 2000 U.S. EPA comments were transmitted to U.S. EPA on August 17, 2000 and approved by U.S. EPA in correspondence dated September 29, 2000.

This document presents a compilation of the information generated from the above referenced activities which are summarized as follows:

1. the results of the Phase I RFI activities completed between November 1998 and January 1999 which were reported to U.S. EPA in the original RFI Report (CRA, July 19, 1999).
2. the results of the Phase II RFI activities completed in August 2000 which were reported to U.S. EPA in the Addendum No. 1 to RFI Report (CRA, November 21, 2000).
3. GM's responses dated August 17, 2000 to U.S. EPA's comments dated July 12, 2000 on the RFI Report (CRA, July 19, 1999) which were approved by U.S. EPA on September 29, 2000.

1.2 INTERIM MEASURES

Investigations and corrective actions for two additional SWMUs at the Facility were addressed by GM through RCRA Interim Measure (IM) programs. As summarized below, the IM's were completed at SWMU #30, the Former J-Lot Fill Area, and SWMU #32, the Former Coal Pile Storage Area. Both IM's were completed concurrently with the RFI Work Plan (CRA, 1998) development and implementation. The scope and results of the IM activities were submitted to the U.S. EPA in CRA reports entitled RCRA Interim Measures Construction Certification Report, Former J-Lot Fill Area (CRA, 1998a) and RCRA Interim Measure Investigation and Design Report, SWMU #32, Former Coal Pile Storage Area (CRA, 1999), respectively. The IMs at the Former J-Lot

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Fill Area (SWMU #30) and the Former Coal Pile Storage Area (SWMU #32) were both approved by U.S. EPA in correspondence dated June 11, 1998 and June 15, 2000, respectively.

The remainder of Section 1.0 presents a summary of pertinent background information on the Facility.

1.3 FACILITY HISTORY

In 1927, the Facility began producing medium and heavy duty trucks and buses at the former Pontiac Central Manufacturing and Assembly Plant, which was formerly located in the northwest corner of the Facility. Major manufacturing activities associated with the production of these vehicles included machining, stamping, plating, smelting, fiberglass laminating, heat treating, painting, and sealing. Subsequent operations were expanded to include more than 60 manufacturing and office buildings, the biggest of which was the GM Pontiac East Assembly Plant (which is currently located in the southeast corner of the Facility). An aerial photograph of the Facility in 1985 is presented on Figure 1.3. The Facility Plan from 1987 is presented on Figure 1.4. These figures present the Facility conditions prior to closing and the initiation of significant brownfield redevelopment activities at the Centerpoint Business Campus.

In August 1990, manufacturing operations at the former Pontiac Central Manufacturing and Assembly Plant were discontinued. Between 1991 and 1995, the plant was environmentally decommissioned and the area was redeveloped as the GM Truck Product Center (TPC) Central, the "hub" of the Centerpoint Business Campus, which is a large scale industrial and commercial business development. An aerial photograph of the GM TPC Central from 1995 is presented on Figure 1.5. The building depicted on Figure 1.5, which is currently used as an engineering center, was previously a portion of the former Pontiac Central Manufacturing and Assembly Plant. Figure 1.6 provides a current overview of the expansion and redevelopment activities proposed for the Facility. An overview of the planned development activities, as proposed by Etkin Equities (August 1999), is presented on Figures 1.7 and 1.8.

As part of this redevelopment, the Facility was divided into three major parcels of land, including Parcels "A", "B", and "C". Parcel "A" includes the GM TPC Central and part of the Centerpoint Business Campus, which is predominately used as office, design, and engineering areas. Parcel "B", which was subdivided into parcels B1, B2, and B3, contains GM TPC East, the former South Retention Pond (SWMU #33), and the North

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Retention Pond (SWMU #34). Parcel "C", which was subdivided into parcels C1, C2, C3, and C4, contains the truck Engineering Center, the Pontiac East Assembly Plant, the Container Storage Area (SWMU #3), the Waste Water Treatment Plant area (SWMU #29), and the former Surface Impoundment (SWMU #31). Access roads were constructed throughout the Facility to connect the parcels and the campus development (i.e., Centerpoint Parkway and Campus Drive). Figure 1.9 provides a map showing the Facility layout, the location of the five SWMUs, and the two SWMUs that were addressed under the IM program (SWMU #30 and SWMU #32).

1.4 RFI OVERVIEW

In March 1987, a Preliminary Review/Visual Site Inspection (PR/VSI) Report was prepared by A.T. Kearney, Inc. and K.W. Brown and Associates, Inc. on behalf of U.S. EPA (U.S. EPA, 1987). The PR/VSI identified 31 SWMUs and six Areas of Concern (AOC) at the GM Facility.

On September 1, 1987, as a follow-up to the PR/VSI, the U.S. EPA performed a RCRA inspection of the Facility. During the inspection, the U.S. EPA collected 11 soil samples. Of these 11 samples, six were located within defined boundaries of four of the SWMUs being addressed in this RFI Report. The U.S. EPA did not collect any samples from SWMU #3 - Container Storage Area. A breakdown of the soil samples collected by the U.S. EPA in each of the relevant SWMUs is summarized below. Results of the U.S. EPA sampling activities were presented in the RFI Work Plan (CRA, 1998b).

<i>SWMU</i>	<i>Description</i>	<i>Number of Samples</i>
#3	Container Storage Area	0
#29	Wastewater Treatment Plant	1
#31	Former Surface Impoundment	1
#33	Former South Retention Pond	2
#34	North Retention Pond	2

Following the August 17, 1995 meeting between GM and the U.S. EPA, GM identified an additional 43 Areas of Interest (AOIs) in its independent review of existing environmental conditions at the Facility. The historical operations and wastes managed at each of the SWMUs/AOIs were described in detail in two documents entitled Review of Existing Conditions Report (CRA, 1995a), and Supplemental Review of Existing Conditions Report (CRA, 1995b). These two reports also included information from

interviews with Facility managers, existing analytical data from the SWMUs/AOIs, and information on the Facility-specific geologic/hydrogeologic conditions at the Facility.

Based on U.S. EPA's review of reports and the Facility conditions, the Consent Order required further action at seven SWMUs. Investigative activities to address five of the seven areas were summarized in the September 4, 1998 U.S. EPA-approved RFI Work Plan (CRA, 1998b). The remaining two areas were addressed as Interim Measures as discussed in Section 1.2. The RFI Work Plan (CRA, 1998b) also included the following support information and project plans:

- SWMU Photographic Log (photographs from 1995 and 1997);
- Project Management Plan (PMP);
- Quality Assurance Project Plan (QAPP);
- Data Management Plan (DMP);
- Health and Safety Plan (HASP);
- Community Relations Plan (CRP);
- Field Sampling Plan (FSP); and
- Historical Analytical Results (Appendix H).

As indicated above, Appendix H of the RFI Work Plan (CRA, 1998b) presented supplemental analytical results from previous U.S. EPA data collection activities at four (#29, #31, #33, and #34) of the five SWMUs (no sampling results were available for SWMU #3 - Container Storage Area). The analytical data from the GM and U.S. EPA sampling activities were used in conjunction with historical operations information to design the sampling strategy for each SWMU investigation. These sampling strategies were summarized in Table 1.4 of the RFI Work Plan (CRA, 1998b) and are discussed in more detail in Section 3.0 of this RFI Report.

1.5 RFI OBJECTIVES

As specified in the RFI Work Plan (CRA, 1998b), surface and subsurface soil samples were collected from investigative boreholes installed at each of the five SWMUs (#3, #29, #31, #33, and #34) and sediment samples were also collected from SWMU #34 during the Phase I RFI investigation. In addition, perched groundwater samples were collected from SWMU #3 and SWMU #31 during the Phase II RFI investigation. Combining the

historical information available for each SWMU, with the analytical data from the two phases of RFI sampling activities, the objectives of the RFI were to:

- characterize potential source(s) of hazardous constituents;
- define the nature and extent of hazardous constituents in environmental media, if any;
- characterize the potential migration pathways, if any, of hazardous constituents;
- identify actual or potential environmental receptors;
- provide the data necessary to complete the RFI Report including a Preliminary Risk Evaluation, if required; and
- determine whether a Corrective Measures Study (CMS) is required based on the Preliminary Risk Evaluation.

1.6 RFI REPORT ORGANIZATION

The RFI Report is organized as follows:

- Section 2.0 Environmental Setting;
- Section 3.0 RFI Scope of Work Methodologies;
- Section 4.0 RFI Summary;
- Section 5.0 Results of RFI;
- Section 6.0 Preliminary Risk Evaluation;
- Section 7.0 Summary, Conclusions, and Recommendations; and
- Section 8.0 References.

The RFI Report includes the following appendices:

- Appendix A Stratigraphic and Instrumentation Logs;
- Appendix B Laboratory Analytical Data Reports;
- Appendix C Soil Cuttings Waste Characterization Analytical Results;
- Appendix D Laboratory Assessment and Validation Reports;
- Appendix E MDEQ Generic Cleanup Criteria and Screening Levels; and
- Appendix F Preliminary Risk Evaluation Calculations.

2.0 ENVIRONMENTAL SETTING

2.1 FACILITY LOCATION

As shown on Figure 1.1, the Facility is located in Sections 3 and 4 of Township T2N, Range R10E, City of Pontiac, Oakland County, Michigan. The Facility encompasses approximately 350 acres of land and currently contains the Centerpoint Business Campus which includes the GM Pontiac East Assembly Plant (U.S. EPA ID No. MID 005 356 902). The Facility formerly contained the Pontiac Central Manufacturing and Assembly Plant. The Facility is generally bordered by South Boulevard to the north, the Grand Trunk Western Railroad to the south, Opdyke Road to the east, and East Boulevard/Martin Luther King Jr. Boulevard to the west. A Facility plan is presented on Figure 1.2.

2.2 SURROUNDING LAND USE

The surrounding land uses to the north and west of the Facility are presented on Figure 2.1. Land uses to the south, west, and east of the Facility are presented on Figure 2.2. The surrounding land uses on the east and south sides of the Facility are residential. The land use to the north, and west of the Facility is a mixture of industrial/commercial. Land uses at and surrounding the Facility are summarized as follows:

<i>Location</i>	<i>Jurisdiction</i>	<i>Land Use</i>
Facility	City of Pontiac	Industrial/Commercial
North	City of Pontiac	Industrial/Commercial
East	Bloomfield Township	Residential
South	Bloomfield Township	Residential
West	City of Pontiac/Bloomfield Township	Industrial/Commercial

2.3 DEMOGRAPHICS

The populations within a three-mile, five-mile, and ten-mile radius of the Facility, in 1990 and 1994, are estimated below:

<i>Location</i>	<i>Population</i>		<i>% Change (1990-1994)</i>
	<i>1990</i>	<i>1994</i>	
Three-mile	53,130	54,519	+2.6
Five-mile	171,040	174,349	+1.9
Ten-mile	708,384	729,197	+2.9

2.4 REGIONAL AND SITE SETTING

A detailed description of the regional geology, hydrogeology, hydrology, and climatological data were presented in the RFI Work Plan (CRA, 1998b). The information was obtained from published regional information, as well as other subsurface investigations performed on or in the vicinity of the Facility. The detailed information that was presented in the RFI Work Plan (CRA, 1998b) is summarized below.

2.4.1 GEOLOGY

The regional geologic profile typically consists of three distinct units, including: (1) a surficial fill and/or a native granular horizon; (2) a glacial till deposit; and (3) a Mississippian-aged bedrock (Coldwater Shale) (see Figures 2.3 and 2.4). In areas of the Facility, the surficial fill materials are typically comprised of a variable mix of sand, gravel, clay, asphalt, concrete, and other engineered fill. The fill unit ranges in depth from approximately 5 to 15 feet below grade. Below the fill material, up to 350 feet of glacial material is encountered. This glacial material generally consists of a medium-textured, poorly stratified clay till with thin, laterally discontinuous lenses of silts, sands, and/or gravels. However, in the vicinity of the Facility, the glacial till does contain several interbedded laterally continuous sand layers of variable thickness between 120 and 350 feet below grade. This includes a glacial outwash deposit of well-sorted sand and gravel at approximately 220 feet below grade.

Well logs from production wells at the Facility and supply wells off of the Facility were obtained and reviewed in the Review of Existing Conditions Report (CRA, 1995a) and supplemented through a request to the MDEQ Geologic Survey Division in September/October 2000. The locations of these well logs are presented on Figure 2.5.

A generalized east-west geologic cross-section in the vicinity of the Facility is presented on Figure 2.6. Well logs obtained in a radius of approximately 1 mile of the Facility are presented in Appendix A."

Depth to bedrock in the vicinity of the Facility ranges from approximately 250 to 350 feet below grade. The surface elevation of the bedrock unit is approximately 625 to 650 feet above mean sea level (AMSL). The Coldwater Shale may be as much as 1,300 feet thick in the vicinity of the Facility and is generally described as dark brown to black, bituminous, fissile, and finely laminated.

2.4.2 HYDROGEOLOGY

Groundwater is encountered within the surficial fill/granular material, the glacial till deposits, and the underlying bedrock unit. Depth to groundwater, groundwater quality, and groundwater quantity vary between and within the geological units.

Within the shallow surficial fill/granular horizon, groundwater is encountered in unconfined "perched" conditions (accumulating on top of the clay till). Its presence and saturated thickness are influenced by seasonal precipitation, local drainage patterns, and surficial geology. In the area of the Facility, the perched groundwater is occasionally encountered at depths of approximately 10 to 20 feet below grade and is laterally discontinuous. The shallow perched water table zone is generally not utilized for water supply purposes in the Pontiac area. In addition, the use of this zone as a potable supply would be generally prohibited by Michigan Department of Public Health regulations (i.e., it is at a depth of less than 25 feet) [Part 127 of Act 368 (Groundwater Quality Control), 1978].

Within the glacial till, groundwater has been encountered in confined conditions within the interbedded sand units and the outwash deposits encountered approximately 120 to 250 feet below grade. According to a 1981 hydraulic assessment of the Facility completed by Camp, Dresser, and McKee (CDM, 1981), three sand and sand/gravel aquifers were identified beneath the GM property at depths of approximately 120, 150, and 210 feet bgs, respectively. Within the study area, the units are approximately 7, 25, and 50 feet thick, respectively. These interbedded sand units are considered regional aquifer(s) and formerly supplied the Facility with an industrial water supply (until the late 1980's when the GM production wells were decommissioned). These interbedded sand aquifers are separated from the perched groundwater by approximately 100 feet of -glacial clay till. This glacial clay has an estimated hydraulic conductivity on the order

of 10^{-6} cm/s to 10^{-9} cm/s based upon published values (Fetter, 1994 and Kasenow, 1997) for glacial clay till and acts as an aquitard, restricting vertical movement from the shallow perched zone (when present) to the top of the interbedded sand aquifer encountered approximately 120 feet below grade. As a result, there is no vertical migration pathway for potentially impacted perched groundwater.

Below the overburden aquifers, the Coldwater Shale is commonly considered a nonproductive aquifer, typically yielding only small amounts of water. A more abundant water supply is found at greater depths and with significant increases in mineral content (i.e., brines). The bedrock water resources, like the more usable lower sand and gravel aquifer above them, are considered to be protected from surficial contamination (see Figures 2.7 and 2.8). Therefore, the drinking water exposure pathway for groundwater for these five SWMU can be eliminated.

2.4.3 HYDROLOGY

The Facility is located within both the Clinton River and Rouge River drainage basins (see Figure 2.9). The Clinton River, which is located approximately 0.85 miles northeast of the Facility, flows easterly and discharges into Lake St. Clair. The Rouge River, which is located approximately 3.0 miles southeast of the Facility, flows to the southwest prior to turning east and discharging into the Detroit River (below Lake St. Clair). Several surface water bodies and intermittent drains are also located within a mile of the Facility. The closest of these include Hadsells Pond, which is located approximately 2,000 feet west of the Facility and Hamlin Drain, which is located off the southeast corner of the Facility. There are no natural surface water bodies on the Facility and therefore the groundwater/surface water interface (GSI) exposure pathway was eliminated from further review.

2.4.4 CLIMATE

The prevailing winds are from the northwest in the winter, and the southwest in the summer months. The prevailing wind direction and speed for the region are presented on Figure 2.10. Precipitation data for the period 1931 through 1960, inclusive, indicate the mean annual precipitation to be 30.68 inches with 56 percent of the total precipitation falling during the period from May through October. Pontiac is located in an area of temperate climate having average daily temperatures of 25°F and 72°F for January and July, respectively.

2.5 POTENTIAL RECEPTOR IDENTIFICATION

The potential receptor identification review was performed to identify potential human, fauna, and flora receptors of possible Facility-related constituents that may migrate through environmental media of concern.

2.5.1 LAND USE

The land on site is used for industrial and commercial purposes. Access within the industrial portions of the Facility is restricted through the use of security fences and security guards. Land use in the vicinity of the Facility is used for residential and commercial purposes (see Figure 2.1/2.2). Land use at the Facility is expected to remain industrial or commercial into the reasonably foreseeable future. As a result, current and future potential receptors include trespassers, construction workers, or Facility employees.

2.5.2 POTABLE WATER USE

Water for potable and industrial uses is supplied to the Facility by the City of Pontiac. As a result, the groundwater pathway is reasonably expected to remain incomplete in the future.

2.5.3 GROUNDWATER USE

Shallow perched groundwater, to the extent it is present, is not used at the Facility for any use. In many locations the perched water is absent altogether. In addition, as identified in Section 2.5.2, shallow (i.e., <25 feet) perched groundwater use would be generally prohibited by Michigan Department of Public Health regulations. As a result, the shallow groundwater pathway is reasonably expected to remain incomplete in the future.

2.5.4 GROUNDWATER/SURFACE WATER INTERFACE

As discussed in Section 2.4.3, there are no natural surface water bodies at the Facility. Therefore, the groundwater/surface water (GSI) interface exposure pathway was eliminated from further review.

2.5.5 ECOLOGICAL CHARACTERISTICS

The majority of the Facility is used for industrial or commercial activities and contains very little natural flora or habitat for fauna. SWMU #34 is an active stormwater retention basin and therefore, has the potential for limited habitat for some flora and fauna. It should also be noted that many portions of the Facility have been landscaped within recent years as part of the Centerpoint Business Campus development. As a result, there are no significant environmental receptors within the identified SWMUs.

2.6 SCREENING LEVELS

Generic risk based industrial cleanup criteria are specified in Part 201 of Michigan's Natural Resources and Environmental Protection Act, Public Act 451, and outlined in the Michigan Department of Environmental Quality (MDEQ) Environmental Response Division (ERD) Operational Memorandum No. 18, revised June 6, 2000 (MDEQ, 2000). This risk-based industrial criteria provides land-use specific screening levels for evaluation of SWMU-specific analytical data (i.e., the risk-based industrial criteria provides a "starting point" for evaluation of SWMU-specific data).

Validated soil sample analytical data were compared to the risk-based standards presented below.

- Generic Industrial Direct Contact Criteria (DCC);
- Volatile Soil Inhalation Criteria (VSIC) for Ambient Air;
- Groundwater Contact Protection Criteria (GCPC);
- Particulate Soil Inhalation Criteria (PSIC); and
- Soil Volatilization to Indoor Air (for potential future land uses).

Several other generic industrial soil cleanup criteria were listed in the MDEQ Operational Memorandum No. 18. However, after assessing the criteria, they were

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determined not to be applicable to Facility conditions and were eliminated from consideration. These criteria include the Groundwater/Surface Water Interface (GSI) Criteria, and the Drinking Water Protection (DWP) Criteria. The GSI criteria was eliminated based on the absence of natural surface water bodies on or adjacent to the Facility. The DWP criteria was eliminated based on Michigan Department of Public Health (MDPH) regulations and previous geologic characterization at the Facility. The MDPH regulations (Part 127 of Act 368) prohibit drinking water wells at a depth of less than 25 feet, which would exclude the limited non-potable water that may be present within the surficial fill material or within the thin, shallow, discontinuous sand lenses as a source of drinking water. Additionally, municipal water is available at the Facility, and the potentially potable groundwater encountered approximately 120 feet below grade is protected by approximately 100 feet of glacial clay till. This glacial till has an estimated hydraulic conductivity of less than 10^{-7} cm/sec and acts as an aquitard, restricting vertical movement and/or migration of contaminants.

Based on an evaluation of the applicable MDEQ generic industrial cleanup criteria, the generic industrial Direct Contact Criteria (DCC) is generally the most applicable and stringent for the conditions identified at the Facility. Therefore, although all the criteria listed above were compared to the analytical results from the RFI, only the DCC criteria are listed in the data tables to compare, assess, and identify potential risks associated with the chemical constituents detected during the investigation. As indicated above, the DCC and other applicable criteria are summarized in MDEQ Operational Memorandum No. 18, which is presented in Appendix E.

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3.0 RFI SCOPE OF WORK AND METHODOLOGIES

3.1 GENERAL

The RFI was implemented to characterize the nature and extent of Facility-derived constituents which may be present at each SWMU as a result of previous operations and/or releases. The potential chemical constituents and associated soil and groundwater quality at each SWMU were investigated by installing at least three boreholes in each study area. The borehole locations, borehole depths, number of samples collected, the parameters analyzed, and the procedures/methodologies utilized to investigate each SWMU were based on information presented in the Review of Existing Conditions Report (CRA, 1995a) and the Supplemental Review of Existing Conditions Report (CRA, 1995b).

The sampling activities for the RFI were completed in two phases between December 1998 and January 1999, and in August 2000. All subsurface drilling activities were conducted by Carlo Environmental Technologies (CET) of Clinton Township, Michigan or Altech Services L.L.C. of Southfield, Michigan. Analytical laboratory services were provided by Columbia Analytical Services, Inc. (CAS) of Kelso, Washington. Surveying activities were completed by CRA.

The remainder of this section summarizes the field activities and the methodologies utilized during the RFI (as specified in the U.S. EPA-approved RFI Work Plans). Any deviations from these methodologies are discussed in the subsequent section (Section 4.0), which describes each SWMU, and summarizes the SWMU-specific investigations.

3.2 SOIL BORING AND SOIL SAMPLING

Between December 2 and 18, 1998, CET completed the Phase I RFI investigation drilling program under the direct supervision of CRA. The boreholes were advanced using a drill rig equipped with 4.25-inch inside diameter (ID) hollow stem augers (HSA) and two foot-long stainless steel split spoons. Boreholes were completed to depths ranging between 2 and 42 feet below grade (the deepest boring installed during the RFI). All sampling equipment was decontaminated prior to field use and after each sample was collected to prevent cross contamination between samples. Decontamination procedures were consistent with those outlined in the QAPP. Soil boring stratigraphic logs are presented in Appendix A.

3.2.1 SOIL SAMPLE SCREENING AND LABELING

Soil samples collected during the RFI were screened in the field with a photoionization detector (PID) equipped with the 10.2 EV lamp to assess the relative presence and concentrations of volatile organic compounds within each sample. The field screening activities were conducted in accordance with the specifications outlined in the RFI Work Plan. Upon completion of the sampling activities, boreholes were abandoned with bentonite chips to grade level.

Soil borings completed during the RFI were designated with a suffix that included the SWMU number and the boring number. For example, the first borehole completed at SWMU #3 was designated as BH-3-1, while the second borehole was designated as BH-3-2. Individual soil samples collected from each borehole were designated to include the sample type (surficial "SS", subsurface "S", or sediment "SD"), the CRA project number (7097), the collection date (m/d/y), the samplers initials (TJ or DS), and the sample number (in numerical sequence utilizing a 3-digit code). Due to previous sample numbers assigned during the interim measures investigations, the sample numbers associated with the five SWMUs started with number 019 and ended with number 067. These 49 samples included duplicate, matrix spike, and equipment blank samples, which were designated using the same numbering system to prevent laboratory bias of field QC samples.

3.2.2 SOIL SAMPLE ANALYSIS

After completing the sampling activities, select soil samples from each borehole were submitted for chemical analysis. The samples selected typically included a shallow surficial soil sample and/or a subsurface soil sample, depending on the RFI Work Plan (CRA, 1998b) specifications. If no staining or PID readings were present, the surficial soil sample was collected in the 0 to 2 foot below ground surface (bgs) interval. Samples being submitted for a volatile organic compound (VOC) analysis were collected below the 6-inch depth interval. The subsurface soil samples selected for chemical analysis were generally collected from the interval exhibiting the most staining or highest PID response.

Soil samples selected for chemical analysis were submitted to Columbia Analytical Services, Inc. for one or more of the following analyses:

- Target Compound List (TCL) VOCs by U.S. EPA Method 8260B;
- TCL semi-volatile organic compounds (SVOCs) by U.S. EPA Method 8270C;
- TCL polychlorinated biphenyls (PCBs) by U.S. EPA Method 8082;
- Target Analyte List (TAL) inorganic constituents (metals) by U.S. EPA 6010B, 6020, and 7470A;
- Total cyanide and sulfide by U.S. EPA Methods 9010B and 9030B, respectively; and
- U.S. EPA Appendix IX VOCs, SVOCs, PCBs (excluding pesticides, herbicides, dioxin, and furans) and/or metals using the same analytical methods referenced above.

Duplicate soil samples collected during the investigation were submitted for analysis at a frequency of 1 per 10 investigative samples. The Appendix IX samples were submitted for analysis at a frequency of 1 per 10 investigative samples or a minimum of one Appendix IX sample per SWMU. The TCL, TAL and Appendix IX parameter/analyte lists are presented in Tables C.1.1 and Table C.1.2 of the QAPP (CRA, 1998b), respectively. The summary of analytical methods is presented in Table C.7.1 of the QAPP (CRA, 1998b).

Matrix spike or matrix spike duplicate samples collected during the investigation were submitted for analysis at a frequency of 1 per 20 investigative samples. Equipment blank samples (rinsate samples) collected during the investigation were submitted for analysis at a frequency of 1 per 10 investigative samples. Soil sample analytical reports are presented in Appendix B.

3.3 MONITORING WELLS AND GROUNDWATER SAMPLING

As specified in the RFI Work Plan (CRA, 1998b), groundwater samples were to be collected at each SWMU if a significant groundwater aquifer was encountered during the soil boring program (in which case three of the soil borings installed at each study area were to be completed as monitoring wells). The monitoring wells were to be installed if the native porous media encountered throughout the study area was greater than 5 feet thick and the zone of saturation was greater than 2 feet thick. The monitoring wells were to be developed, purged, and sampled for the TCL/TAL constituents identified above. However, as identified in Section 2.4 of this RFI Report (and in previous investigations), the subsurface soils at the Facility are predominately glacial clay tills. As a result, a groundwater aquifer was not encountered immediately below

any of the SWMUs during the Phase I RFI investigation. Therefore, groundwater samples were not collected during the first phase of the RFI investigation.

Based upon comments received from U.S. EPA on July 12, 2000, it was agreed that perched water table zone monitoring wells would be installed and sampled at SWMU #3 and SWMU #31. These monitoring wells were installed and sampled during the Phase II RFI investigation in August 2000. Additional details on the Phase II RFI investigation are presented in Section 4.2.

3.4 SAMPLE VALIDATION

After receiving the soil and groundwater sample analytical results from the laboratory, CRA's quality assurance officer completed a data quality assessment and validated the data using evaluation methodologies specified in the QAPP. The quality assurance/quality control (QA/QC) evaluation included a review of the laboratory blank data, as well as recovery data from matrix and surrogate spikes and check samples. The analytical data were also assessed for accuracy and precision based on the review of the spike recovery data. Analytical data quality assessment and validation reports for the Phase I and Phase II investigations are presented in Appendix D.

3.5 SURVEYING

After completing the boring program, the horizontal coordinates and vertical elevation (ground surface) of each borehole was surveyed to the nearest 0.01 feet by CRA. The data were used to prepare the figures for this RFI report.

3.6 WASTE DISPOSITION

Soil cuttings, development liquids, decon water, and used personal protective equipment (PPE) from the investigative activities were containerized in 55-gallon drums. The drums were appropriately labeled, and staged at the container storage pad at the wastewater treatment plant. The soil materials were subsequently sampled by GM and transported as non-hazardous material to the ECDC Environmental, Inc. disposal facility in East Carbon, Utah on April 7, 1999. The minor amount of decontamination fluids were subsequently discharged to the WWTP. Analytical results for the soil wastes are presented in Appendix C.

4.0 RFI INVESTIGATION SUMMARY

The RFI field activities were completed at the Facility during two phases of the RFI investigation:

- Phase I RFI Field Investigation: Soil; and
- Phase II RFI Field Investigation: Perched Water Table Zone.

The investigative activities are discussed in the following sections.

4.1 PHASE I RFI FIELD INVESTIGATION: SOIL

This section of the RFI Report presents a description of each of the five SWMUs, a summary of the SWMU-specific investigation activities (Table 4.1), and a summary of the samples collected at each location (Table 4.2) during the Phase I RFI investigation. The results of the investigative activities are presented in Section 5.0.

4.1.1 SWMU #3 - CONTAINER STORAGE AREA

A. SWMU #3 DESCRIPTION

The Container Storage Area was constructed in 1986 outside the southwest corner of Pontiac East Assembly Plant (see Figure 4.1). It consists of a concrete containment pad measuring approximately 50 feet wide by 100 feet long. The concrete pad was constructed with a self-contained spill collection trench and sump and is surrounded with a 6 to 8 inch concrete berm for secondary containment. The container storage area is used for the temporary accumulation (less than 90 days) of 55-gallon drums containing waste solvents and sludges, as well as non-hazardous materials, from ongoing operations at the Pontiac East Assembly Plant. As a result, the Container Storage Area does not require a RCRA permit.

After 1995, a concrete slab was constructed on the east and south sides of the Container Storage Area for potential parking of fork lift trucks and emergency response vehicles, and storage of scrap metal containers. No historical soil sampling or analytical results are available for this area.

The PR/VSI identified evidence of soil contamination (discolored soils) adjacent to the concrete pad at the Container Storage Area. The PR/VSI further stated that the potential for release of contaminants to adjacent soil from this unit was moderate to high.

B. SWMU #3 INVESTIGATION SUMMARY

On December 2 and 7, 1998, CRA supervised the installation of six investigative boreholes in the vicinity of SWMU #3 (Figure 4.1). Four of the six boreholes (BH-3-1 through BH-3-4) were completed on the south, west, north, and east sides of the Container Storage Area, respectively. The two remaining boreholes (BH-3-5 and BH-3-5A) were completed in the center of the Container Storage Area. All boreholes were advanced to approximately 20 feet below grade, except BH-3-5 (16.6 feet). Borehole BH-3-5 was terminated at 16.6 feet due to auger refusal. It was replaced by borehole BH-3-5A, which was completed approximately seven feet south of BH-3-5. After completing the sampling activities, all borings were abandoned with bentonite chips and capped with at least six inches of concrete. The concrete cap for the two borings completed within the storage pad were sealed with a chemically resistant coating (an epoxy resin).

Ten soil samples collected from SWMU #3 were submitted for laboratory analysis. These included two samples from each borehole except BH-3-5A, which did not have any samples submitted for chemical analysis. Two samples were submitted from the adjacent borehole BH-3-5, where the PID field screening results were higher than those recorded for borehole BH-3-5A. The soil samples selected for chemical analysis were generally collected from near surface intervals (between 0.5 and 3.0 feet below grade) and shallow subsurface intervals (between 3.0 and 9.0 feet below grade) using the criteria specified in the RFI Work Plan. Nine of the ten soil samples submitted to the laboratory were analyzed for TCL VOCs, TCL SVOCs, TCL PCBs, TAL metals, and total cyanide. The tenth sample (BH-3-4, 3 to 5 feet bgs), was analyzed for the Appendix IX constituents (VOCs, SVOCs, PCBs, metals, cyanide, and sulfide).

4.1.2 SWMU #29 - WASTEWATER TREATMENT TANK AREA

A. SWMU #29 DESCRIPTION

The Wastewater Treatment Tank Area is located east of Building 56 and west of Centerpoint Parkway in the southcentral portion of the Facility (Figure 4.2). Currently,

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the area consists of 20 open top, vertical, above-ground storage tanks (ASTs). These tanks have been periodically painted over the years and tested for structural integrity. The wastewater treatment tank area has a total capacity of approximately 7.85 million gallons of water. Of this, 5.85 million gallons are used for treatment. The remaining 2.0 million gallons are used for clarification. The wastewater treatment tanks are designated as follows:

<i># of Tanks</i>	<i>Description</i>	<i>Working Volume (gallons)</i>
3	Treatment of Acid Wastes	343,000
6	Treatment of General Wastes	716,000
2	Clarifiers	827,000
1	Equalization Tank	349,000
3	Sludge Thickening Tanks	36,000
1	Cleaner Waste Tank	177,000
3	Oil Skimmer Tanks	5,000

The PR/VSI report indicated that the wastewater treatment tank area had a history of releasing acidic/oily wastes to adjacent soils. Visible signs of release were noted during the 1987 Facility inspection.

B. SWMU #29 INVESTIGATION SUMMARY

On December 1 and 2, 1998, CRA supervised the installation of eight investigative boreholes in the vicinity of SWMU #29 (see Figure 4.2). Four of the boreholes (BH-29-1 through BH-29-4) were completed on the southwest, south, east, and north perimeter of the tank area, respectively. The other four boreholes (SS-29-1 through SS-29-4) were completed north of General Waste Treatment Tank #6, northeast of Waste Holding Tank #3, northwest of Clarifier #2, and southeast of General Waste Treatment Tank #2, respectively. Boreholes for BH-29-1 through BH-29-4 were advanced to 20 feet below grade and boreholes SS-29-1 through SS-29-4 were advanced to 2.0 feet below grade.

Nine soil samples collected from SWMU #29 were submitted for laboratory analysis. This included one soil sample from each of the eight sampling locations plus a duplicate sample from borehole SS-29-4. The surficial soil samples collected from the shallow boreholes (designated with an "SS") were collected between 0.8 and 2.0 feet below grade. The soil samples collected from the deeper boreholes (designated with a "BH") were collected between 4 and 6 feet below grade or 10 and 12 feet below grade. Eight of the nine soil samples submitted to the laboratory were analyzed for TCL VOCs, TCL

SVOCs, TCL PCBs, TAL metals, and cyanide. The ninth sample (SS-29-1, 0.8 to 2.0 feet), was analyzed for the Appendix IX constituents (VOCs, SVOCs, PCBs, metals, cyanide, and sulfide). During the soil sampling activities, a split-spoon rinsate sample was also collected. The rinsate sample was analyzed for TCL VOCs, SVOCs, PCBs, and TAL metals.

4.1.3 SWMU #31 - FORMER SURFACE IMPOUNDMENT

A. SWMU #31 DESCRIPTION

The Former Surface Impoundment was located on the south side of the wastewater treatment tank area in the south central portion of the Facility. It was used to temporarily store wastewater during a period of repair to the WWTP. Since 1995, redevelopment activities in the vicinity of the Former Surface Impoundment have included the construction of the South Access Road, and grading and landscaping during development of the Centerpoint Business Campus. Although the exact boundaries of the impoundment are unknown, its approximate location is presented on Figure 4.3. The location was identified and staked in the field through the use of historical topographic maps, benchmarks, aerial photographs, and existing surveys available for this portion of the Facility.

The PR/VSI report indicated that the former surface impoundment was used to store approximately 70,000 gallons of F006/F019 wastes, which may have contained heavy metals. GM indicated that the storage occurred on a temporary basis once in 1978 during an upset in their wastewater treatment plant process operations. The PR/VSI also indicated that the spill history in the area was unknown and noted that there were no release controls in place.

It should be noted that the approximate location of the Former Surface Impoundment is in the vicinity of the "Burn Pile". The Burn Pile area is discussed in further detail in the Review of Existing Conditions Report (CRA, 1995a) and Supplemental Review of Existing Conditions Report (CRA, 1995b).

B. SWMU #31 INVESTIGATION SUMMARY

On December 10 and 11, 1998, CRA supervised the installation of six investigative boreholes within and adjacent to SWMU #31 (see Figure 4.3). Two of the boreholes

(BH-31-1 and BH-31-3) were completed on the south and northeast sides of the former surface impoundment. The other four boreholes (BH-31-2 and SS-31-1 through SS-31-3) were completed in the central, southcentral, northwest, and northeast portions of the surface impoundment, respectively. Boreholes BH-31-1 through BH-31-3 were advanced to 20 feet below grade and boreholes SS-31-1 through SS-31-3 were advanced to 2.0 feet below grade.

Seven soil samples collected from SWMU #31 were submitted for laboratory analysis. This included one soil sample from each of the six sampling locations plus a duplicate sample from BH-31-1. The surficial samples were collected from 0.0 to 2.0 feet below grade. The soil samples selected for analysis from the deeper boreholes were collected from 4 to 6 feet below grade or 8 to 10 feet below grade. Six of the seven soil samples submitted to the laboratory were analyzed for TAL metals. The seventh sample (BH-31-2, 1.0 to 1.5 feet bgs) was analyzed for the Appendix IX constituents (VOCs, SVOCs, PCBs, metals, cyanide, and sulfide). Additionally, one of the six samples submitted for metals analysis (SS-31-2, 0 to 2 feet) was also submitted for a TCL VOC analysis due to elevated PID readings. A split-spoon rinsate sample was also collected after the soil sampling activities were completed. The rinsate sample was analyzed for TCL VOCs and TAL metals.

4.1.4 SWMU #33 - FORMER SOUTH RETENTION POND

A. SWMU #33 DESCRIPTION

The Former South Retention Pond was located in the southeastern portion of the Facility, east of the Grand Trunk Western Railway, north of Square Lake Road, and west of Opdyke Road (see Figure 4.4). The Former South Retention Pond, which was approximately 100 yards long, 5 to 7 yards deep, and 30 yards wide, collected storm water runoff from the south end of the Pontiac East Assembly Plant and the wastewater treatment plant area. As part of the Site redevelopment program, the south retention pond was backfilled, redeveloped for commercial uses, and leased to the existing developer of the Centerpoint Business Campus. The Centerpoint Parkway roadway has also been constructed immediately north and west of the Former South Retention Pond and provides primary access within the Centerpoint Business Campus.

The PR/VSI report indicated that potential contaminant-laden runoff from the retention pond collection areas may have contributed to a release of hazardous constituents to

soils in area. The pond was regulated under NPDES storm water discharge permit No. MI0001007.

B. SWMU #33 INVESTIGATION SUMMARY

On December 9, 11, and 16 through 18, 1998, CRA supervised the installation of seven investigative boreholes in the vicinity of SWMU #33 (see Figure 4.4). The seven boreholes (BH-33-1 through BH-33-7, and BH-33-3A) were completed adjacent to and within the estimated boundary of former retention pond. The approximate boundaries were identified and staked in the field through the use of historical topographic maps, benchmarks, aerial photographs and existing topographic plans, and surveys available for this portion of the Facility. The boreholes were advanced to depths of 34 feet, 36 feet, 28 feet, 31.5 feet, 42 feet, 40 feet, and 40 feet, respectively. Boreholes BH-33-3 and BH-33-4 were terminated at 28 feet and 31.5 feet below grade after encountering obstructions. Borehole BH-33-3A, which was installed as a replacement boring for BH-33-3, was installed approximately 8 feet northwest of borehole BH-33-3. It was extended to 40 feet below grade with continuous soil sampling employed between 28 and 40 feet below grade. Although the RFI Work Plan stated that boreholes at SWMU #33 were to be advanced approximately 20 feet below grade, the boreholes were extended to approximately 40 feet below grade due to the fill material imported to the area.

Twelve soil samples collected from SWMU #33 were submitted for laboratory analysis. This included at least one soil sample from each of the six sampling locations. Additionally, a second soil sample was submitted from boreholes BH-33-1, BH-33-2, BH-33-3, and BH-33-4 and duplicate samples were submitted from BH-33-1 and BH-33-4. The soil samples selected for analysis were collected between 14 and 36 feet below grade. Nine of the twelve soil samples submitted to the laboratory were analyzed for TCL VOCs, TCL SVOCs, TCL PCBs, TAL metals, and cyanide. The remaining three soil samples from BH-33-1 and BH-33-4 and a duplicate sample from BH-33-1, were analyzed for the Appendix IX constituents (VOCs, SVOCs, PCBs, metals, cyanide, and sulfide). During the soil sampling activities, a split-spoon rinsate sample was also collected. The rinsate sample was analyzed for TCL VOCs, SVOCs, PCBs, and TAL metals.

4.1.5 SWMU #34 - NORTH RETENTION POND**A. SWMU #34 DESCRIPTION**

The North Retention Pond is located in the north central portion of the Facility, south of South Boulevard and north of Campus Drive (see Figure 4.5). The North Retention Pond, which was originally approximately 30 yards long, 3 yards deep, and 15 yards wide, historically collected storm water runoff from the northern parking lots of the Pontiac East Assembly Plant. As part of the Site redevelopment program, the North Retention Pond was regraded, deepened and landscaped to accommodate additional stormwater runoff from the newly constructed GM TPC East parking lots and Campus Drive. The North Retention Pond and surrounding property has been leased to the existing developer of the Centerpoint Business Campus.

The PR/VSI report indicated that potential contaminant-laden runoff from the North Retention Pond collection area may have contributed to a release of hazardous constituents to soils in the area.

B. SWMU #34 INVESTIGATION SUMMARY

On December 3, 4, and 8, 1998, CBA supervised the installation of four investigative boreholes and the collection of two sediment samples within and adjacent to the North Retention Pond (Figure 4.5). The four boreholes (BH-34-1 through BH-34-4) were completed within the southeast, southwest, northwest, and northeast portions of the pond, respectively. All boreholes were advanced to 20 feet below grade. The two sediment samples (SD-34-1 and SD-34-2) were collected within the center portion of the existing retention pond. The sediment sampling locations were terminated approximately one foot below grade.

Five soil samples and two sediment samples collected from SWMU #34 were submitted for laboratory analysis. This included one soil sample from each location plus a duplicate sample from BH-34-1. The soil samples from the boreholes were collected from 2.0 to 4.0 feet below grade. The sediment samples were collected between 0.0 and 1.0 foot below grade. Six of the seven soil samples submitted to the laboratory were analyzed for TCL VOCs, TCL SVOCs, TCL PCBs, TAL metals, and cyanide. The seventh sample (SD-34-2), was analyzed for the Appendix IX constituents (VOCs, SVOCs, PCBs, metals, cyanide, and sulfide).

4.2 PHASE II RFI FIELD INVESTIGATION: PERCHED WATER TABLE ZONE

The second phase of RFI field activities was conducted between August 9 and 17, 2000. One monitoring well (MW-3-1) was installed at SWMU #3 in the vicinity of BH-3-1, where a native sand seam had been encountered from 11 to 14 feet bgs during the Phase I RFI field investigation (Figure 4.1). The second monitoring well (MW-31-1) was installed at SWMU #31 in the vicinity of BH-31-2, where a native sand seam had been encountered during the Phase I RFI field investigation from 9 to 12 feet bgs (Figure 4.3). All monitoring well installation protocols were consistent with the Field Sampling Plan (Appendix G of the approved RFI Work Plan (CRA, 1998b)). Stratigraphic and Instrumentation logs for the two perched water table zone monitoring wells are presented in Appendix A.

Groundwater samples were collected and analyzed in accordance with the approved Quality Assurance Project Plan (QAPP) (CRA, 1998b)) (Appendix C of the RFI Work Plan (CRA, 1998b)) and the RFI Work Plan Addendum dated July 27, 2000. Development and purging of the monitoring wells was completed with a variable speed peristaltic pump (to minimize agitation) and samples were collected with disposable polyethylene bailers. Field parameters of pH, temperature, and conductivity were measured, and the samples were collected in order of the parameters' volatilization sensitivity (i.e., most volatile first). Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, TCL PCBs, and TAL metals.

5.0 RESULTS OF RFI

The RFI results are presented in a manner consistent with the two phases of the RFI investigation:

- Phase I RFI Results: Soil; and
- Phase II RFI Results: Perched Water Table Zone.

The results are discussed in the following sections.

5.1 PHASE I RFI RESULTS: SOIL

This section of the RFI Report presents a geological and soil sample analytical summary for each of the five SWMUs investigated during the RFI. Stratigraphic and instrumentation logs are presented in Appendix A. Laboratory analytical data reports are presented in Appendix B. Data validation reports are presented in Appendix D.

5.1.1 SWMU #3 - CONTAINER STORAGE AREA

The general geologic conditions encountered at the Container Storage Area consisted of approximately 0.5 to 1.0 feet of concrete followed by 0.3 to 6.3 feet of a medium-grained sand fill material. Underlying the fill material was an olive to dark gray silty clay (till). As presented in geologic cross sections A-A' and B-B' (Figures 5.1 and 5.2), several moist to wet discontinuous sand lenses of variable thickness (1 to 5 feet) were encountered within the silty clay at depths ranging from approximately 6 to 11 feet below grade (915.6 to 922.0 feet AMSL). The uppermost sand lens was encountered approximately 6 to 8 feet below grade and the second sand lens was encountered approximately 10 to 12 feet below grade. The thickness of the uppermost sand lens ranged between 0.8 and 5.2 feet and appeared to pinch out completely on the south side of SWMU #3 at borehole BH-3-1 (see Figure 5.2). The thickness of the second sand lens ranged between approximately 0.8 and 3.1 feet and appeared limited to the southeast corner of the containment pad as it was only identified at boreholes BH-3-1 and BH-3-4. No visual staining was observed during the sampling activities.

Since the geologic conditions encountered did not meet the monitoring well screening requirements specified in the RFI Work Plan (i.e., greater than five feet of native sand

with greater than 2 feet of saturated thickness), no monitoring wells were set below SWMU #3.

Analytical results for the soil samples collected from the Container Storage Area identified no VOCs, 20 SVOCs, one PCB, 23 metals and total cyanide at concentrations at or above the laboratory method detection limit. A summary of the analytes detected at SWMU #3 is presented below and in Tables 5.1, 5.2, and 5.3. Table 5.1 presents the TCL/TAL analyses. Table 5.2 presents the Appendix IX analyses. Table 5.3 presents a summary of the Tentatively Identified Compounds (TICs) analyses. The highest concentration or highest estimated concentration (denoted with a "J" qualifier), of each analyte detected in the area, in milligrams per kilogram (mg/kg), is listed in parenthesis below (except for the metals). The majority of these concentrations were detected in the fill material encountered at borehole BH-3-4 (1 to 3 feet below grade).

- The 20 SVOCs detected include 2-methylnaphthalene (0.3 mg/kg), acenaphthene (1.5 mg/kg), anthracene (2.6 mg/kg), benzo(a)anthracene (3.2 mg/kg), benzo(a)pyrene (2.6 mg/kg), benzo(b)fluoranthene (3.3 mg/kg), benzo(g,h,i)perylene (1.2 mg/kg), benzo(k)fluoranthene (1.4 mg/kg), bis (2-ethylhexyl)phthalate (0.11 mg/kg), carbazole (1.6 mg/kg), chrysene (2.9 mg/kg), dibenzo(a,h)anthracene (0.4 mg/kg), dibenzofuran (1.2 mg/kg), fluoranthene (9.7 mg/kg), fluorene (1.8 mg/kg), indeno(1,2,3-cd)pyrene (1.4 mg/kg), naphthalene (0.8 mg/kg), phenanthrene (12.0 mg/kg), phenol (0.4 mg/kg), and pyrene (8.3 mg/kg);
- The only PCB compound detected was Aroclor 1254 (0.13J mg/kg); and
- All 23 TAL metals were detected (see Tables 5.1 and 5.2 for individual metal concentrations detected in the samples).

As presented in Tables 5.1, 5.2, and 5.3, none of the analyte concentrations detected at the Container Storage Area were above the applicable June 2000 MDEQ generic industrial cleanup criteria which were utilized as the screening levels.

5.1.2 SWMU #29 - WASTEWATER TREATMENT TANK AREA

The general geologic conditions encountered in the Wastewater Treatment Tank Area consisted of approximately zero to 4.3 feet of sand or gravel fill material overlying a brown to dark brown to olive green silty clay (till). A moist to wet sand lens of variable thickness (0.6 to 2.7 feet) was encountered within the clay till in three of the four

boreholes at depths ranging from approximately 11 to 12.6 feet below grade (940.5 to 945.3 feet AMSL). As presented on geologic cross sections C-C' and D-D' (Figures 5.3 and 5.4), the thickness of the sand lens appeared to range between 0.6 and 2.7 feet. It also appeared to be pinch out completely on the northern side of the Wastewater Treatment Area at borehole BH-29-4 (Figure 5.4). No visual staining was observed during the sampling activities.

Additionally, since the geologic conditions encountered did not meet the monitoring well screening requirements specified in the RFI Work Plan (i.e., greater than five feet of native sand and greater than 2 feet of saturated thickness), no monitoring wells were set below the SWMU #29 area.

Analytical results for the soil samples identified five VOCs, 17 SVOCs, two PCBs, 23 metals and sulfide at concentrations at or above the laboratory method detection limit. A summary of the analytes detected at SWMU #29 is presented below and in Tables 5.4, 5.5, and 5.6. The highest concentration, or highest estimated concentration (denoted with a "J" qualifier), for each analyte detected in the area is listed in parenthesis below (except for the metals). The majority of the organic constituents were detected in the fill material encountered at borehole SS-29-2 (0.8 to 2.0 feet below grade) or BH-29-2 (4 to 6 feet below grade).

- The five VOCs detected include ethylbenzene (0.12 mg/kg), m,p-xylene (0.63 mg/kg), o-xylene (0.22 mg/kg), tetrachloroethene (0.04J mg/kg), and toluene (0.043J mg/kg);
- The 17 SVOCs detected include acenaphthene (0.6 mg/kg), anthracene (0.5 mg/kg), benzo(a)anthracene (1.1 mg/kg), benzo(a)pyrene (1.0 mg/kg), benzo(b)fluoranthene (1.0 mg/kg), benzo(g,h,i)perylene (0.5 mg/kg), benzo(k)fluoranthene (0.8 mg/kg), carbazole (0.2J mg/kg), chrysene (1.2 mg/kg), dibenzo(a,h)anthracene (0.2J mg/kg), dibenzofuran (0.8 mg/kg), fluoranthene (1.8 mg/kg), fluorene (0.5 mg/kg), indeno(1,2,3-cd)pyrene (0.6 mg/kg), naphthalene (0.1J mg/kg), phenanthrene (1.7 mg/kg), and pyrene (2.0 mg/kg);
- The two PCB compounds detected were Aroclor 1254 (0.56J mg/kg) and Aroclor 1260 (0.10J mg/kg); and
- All 23 TAL metals were detected (see Table 5.4 and 5.5 for individual metal concentrations detected in the samples).

As presented in Tables 5.4, 5.5, and 5.6, none of the analyte concentrations detected at the Waste Water Treatment Tank Area were above the applicable June 2000 MDEQ generic industrial cleanup criteria which were utilized as the screening levels.

5.1.3 SWMU #31 - FORMER SURFACE IMPOUNDMENT

The general geologic conditions encountered in the Former Surface Impoundment area consisted of approximately 3.5 to 9.0 feet of clay fill material overlying a medium to dark gray silty clay (till). An odorless, black staining was observed within the fill material between 1.0 and 1.9 feet below grade in borehole BH-31-2 and between approximately 4.5 and 6.0 feet below grade in the clay fill in borehole BH-31-3. As presented in geologic cross section E-E' (Figure 5.5), a thin discontinuous sand lens was encountered within the native silty clay approximately 8 to 10 feet below grade (933 to 931 feet AMSL). The thickness of the sand lens appeared to range between 2.0 and 3.5 feet and appeared to pinch out completely on the eastern side of the study area at borehole BH-31-1 (Figure 5.5).

Since the geologic conditions encountered did not meet the monitoring well screening requirements specified in the RFI Work Plan (i.e., greater than five feet of native sand and greater than 2 feet of saturated thickness), no monitoring wells were set within the SWMU #31 area at the time of the Phase I Investigation.

Analytical results for the soil samples identified one VOC, 11 SVOCs, one PCB, 23 metals and total cyanide at concentrations at or above the laboratory method detection limit. A summary of the analytes detected in the area is presented below and in Tables 5.7, 5.8, and 5.9. The highest concentration, or highest estimated concentration (denoted with a "J" qualifier), for each analyte detected in the area is listed in parenthesis below (except for the metals). The majority of the organic constituents were detected in the fill material encountered at borehole BH-31-2 (1.0 to 1.5 feet below grade).

- The only VOC detected was acetone (11 mg/kg);
- The 11 SVOCs detected include 4-chloroaniline (0.3 mg/kg), acenaphthene (0.7J mg/kg), anthracene (0.6J mg/kg), bis(2-ethylhexyl)phthalate (4.3 mg/kg), butyl benzyl phthalate (0.2J mg/kg), di-n-butyl phthalate (0.5J mg/kg), dibenzofuran (0.1J mg/kg), fluoranthene (0.2J mg/kg), naphthalene (0.5 mg/kg), phenanthrene (0.3 mg/kg), and pyrene (0.3J mg/kg);
- The only PCB compound detected was Aroclor 1254 (0.1J mg/kg); and

- All 23 TAL metals were detected (see Tables 5.7 and 5.8 for individual metal concentrations detected in the samples).

Of the analytes detected, only two of the metal concentrations (arsenic and lead) exceeded any of the applicable June 2000 MDEQ generic industrial cleanup criteria screening levels. The arsenic concentrations detected in BH-31-3, 4 to 6 feet (140 mg/kg) and BH-31-2, 1.0 to 1.5 feet (117 mg/kg) were both above the MDEQ DCC of 61 mg/kg. The lead concentrations detected in BH-31-3, 4 to 6 feet (2,780 mg/kg) and BH-31-2, 1.0 to 1.5 feet (1,790 mg/kg), were both above the MDEQ generic industrial cleanup criteria screening level of 900 mg/kg.

5.1.4 SWMU #33 - FORMER SOUTH RETENTION POND

The general geologic conditions encountered in the Former South Retention Pond consisted of approximately 15 to 20 feet of clay fill material overlying a medium to dark gray silty clay (till). A gray to brown silt horizon was typically detected between 22 and 28 feet below grade. The single exception was borehole BH-33-5, which encountered a fine to coarse sand at 40 feet below grade. Otherwise, as presented on geologic cross section F-F' (Figure 5.6), the subsurface geology at the Former South Retention Pond (SWMU #33) did not appear to contain any sand lenses. No odors or staining was observed during the sampling activities.

Since the geologic conditions encountered did not meet the monitoring well screening requirements specified in the RFI Work Plan (i.e., greater than five feet of native sand and greater than 2 feet of saturated thickness), no monitoring wells were set within the SWMU #33 area.

Analytical results for the soil samples identified no VOCs, two SVOCs (2-methylnaphthalene and phenanthrene), no PCBs, and 23 metals at concentrations at or above the laboratory method detection limit. Analytical results are presented in Tables 5.10, 5.11 and 5.12.

As presented in Tables 5.10 and 5.11, none of the analyte concentrations at the Former South Retention Pond were above the applicable June 2000 MDEQ generic industrial cleanup criteria screening levels.

5.1.5 SWMU #34 - NORTH RETENTION POND

The general geologic conditions encountered in the North Retention Pond area consisted of approximately 1.5 to 3.8 feet of sand and/or clay fill material overlying a brown to dark brown, gray or dark gray silty clay (till) which was encountered between 3.6 and 8.4 feet below grade and continued throughout the total depth of each boring. Thin laterally discontinuous sand seams (less than 0.4 feet thick) were occasionally identified within the gray clay. As presented on geologic cross section G-G' (Figure 5.7), the subsurface geology at the North Retention Pond (SWMU #34) did not appear to contain any significant sand lenses. No visual staining was observed during the sampling activities.

Since the geologic conditions encountered did not meet the monitoring well screening requirements specified in the RFI Work Plan (i.e., greater than five feet of native sand and greater than 2 feet of saturated thickness), no monitoring wells were set within the SWMU #34 area.

Analytical results for the soil samples identified no VOCs, 20 SVOCs, no PCBs, and 23 metals at concentrations at or above the laboratory method detection limit. A summary of the analytes detected in the area is presented below and in Tables 5.13, 5.14, and 5.15. The highest concentration or highest estimated concentration (denoted with a "J" qualifier), of each analyte detected in the SWMU #34 area is listed in parenthesis below (except for the metals). The majority of the organic constituents were detected in the fill material encountered in sediment sample SD-34-1 (0 to 1 foot below grade).

- The 20 SVOCs detected include 2-methylnaphthalene (0.2 mg/kg), acenaphthene (1.9 mg/kg), anthracene (4.5 mg/kg), benzo(a)anthracene (12 mg/kg), benzo(a)pyrene (12 mg/kg), benzo(b)fluoranthene (13 mg/kg), benzo(g,h,i)perylene (4.2 mg/kg), benzo(k)fluoranthene (11 mg/kg), bis (2-ethylhexyl)phthalate (4.1J mg/kg), carbazole (2.9 mg/kg), chrysene (14 mg/kg), di-n-octyl phthalate (0.1J mg/kg), dibenzo(a,h)anthracene (1.4 mg/kg), dibenzofuran (1.3 mg/kg), fluoranthene (33 mg/kg), fluorene (2.8 mg/kg), indeno(1,2,3-cd)pyrene (7 mg/kg), naphthalene (0.3 mg/kg), phenanthrene (26 mg/kg), and phenol (28 mg/kg); and
- All 23 TCL metals were detected (see Table 5.13 and 5.14 for individual metal concentrations detected in the samples).

As presented in Tables 5.13, 5.14, and 5.15, none of the analyte concentrations at the North Retention Pond were above the applicable June 2000 MDEQ generic industrial cleanup criteria screening levels.

5.2 PHASE II RFI RESULTS: PERCHED WATER TABLE ZONE

The Phase II investigative work identified 3 VOCs, no SVOCs, no PCBs, 16 total metals, and 14 dissolved metals at concentrations at or above the laboratory method detection limit. All three of the organic constituents (benzene, cis-1,2-Dichloroethene, and vinyl chloride) were detected in the groundwater sample collected from MW31-1. No organic constituents were detected in the two groundwater samples collected from MW3-1. A summary of the detected analyte results is presented in Table 5.16.

Exceedances of the Michigan Public Act 451, Part 201 Industrial/Commercial Drinking Water Criteria and Federal Maximum Contaminant Levels (MCLs) are underlined in Table 5.16. All TCL VOCs and TAI total and dissolved metals were below the Michigan Public Act 451, Part 201 Industrial Groundwater Contact Criteria (GCC) for all groundwater samples. All of the perched groundwater samples were non-detect for TCL SVOC and TCL PCB analytes.

Analytical data report summaries are presented in Appendix B. The laboratory assessment and validation reports are presented in Appendix D.

5.3 SUMMARY OF RFI RESULTS

5.3.1 SOIL

Validated soil analytical data were compared to the applicable MDEQ risk-based standards which were utilized as screening levels for the RFI as detailed in Section 2.6.

Several criteria were eliminated from consideration including GSI and DWP criteria. The GSI criteria was eliminated based on the absence of surface water bodies on or adjacent to the Facility. The DWP criteria were eliminated based on MDPH regulations and previous geologic characterization at the Site. The MDPH regulations (Part 127 of Act 368) prohibit drinking water wells at a depth of less than 25 feet, which would exclude the limited water that may be present within the surficial fill material or within the thin, shallow, discontinuous sand lenses as a source of drinking water.

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Additionally, the potable drinking water encountered approximately 120 feet below grade is protected by approximately 100 feet of clay-rich glacial till. This glacial till has an estimated hydraulic conductivity of 10^{-7} cm/sec and acts as an aquitard, restricting vertical movement and/or migration.

Based on an evaluation of the applicable MDEQ generic industrial cleanup criteria, the generic industrial DCC is generally the most stringent for the conditions identified at the Facility. Therefore, although all the criteria listed above were compared to the analytical results from the RFI, only the DCC criteria are listed as screening levels in the data tables to compare, assess, and identify potential risks associated with the chemical constituents detected during the investigation. As indicated above, the DCC and other applicable criteria are summarized in MDEQ Operational Memorandum No. 18, which is presented in Appendix D.

A comprehensive summary of the organic and inorganic analytes detected at each SWMU, their reported concentrations, and the MDEQ industrial DCC screening levels for soil is presented in Tables 5.1 through 5.15. In addition, the detection frequencies, the range of detections, the calculated mean and the 95 percent upper confidence level (95% UCL) of the mean concentrations are summarized in Tables 5.17 through 5.21 for all reported analytes, for each SWMU. To calculate the 95% UCL concentration for reported analytes, soil analytical data were tested for normality using the Shapiro-Wilks test. For a normally distributed data set, the 95% UCL was calculated following the equation outlined below:

$$95\% \text{ UCL} = \frac{x + t \cdot S}{\sqrt{n}}$$

where:

95% UCL = upper confidence limit of the mean;
x = mean of the untransformed data;
t = student t-statistic;
S = standard deviation of the untransformed data; and
n = number of samples.

For a lognormally distributed data set, the 95% UCL was calculated following the equation outlined below:

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$$95\% \text{ UCL} = e^{(x + 0.5s^2 + sH/\sqrt{n-1})}$$

where:

- 95% UCL = upper confidence limit of the mean;
 e = constant (base of the natural log, equal to 2.718);
 x = mean of the transformed data;
 s = standard deviation of the transformed data;
 H = H-statistic (e.g., from table published in Gilbert, 1987); and
 n = number of samples.

The result of the screening level assessment indicates that all analytes detected from SWMUs #3, #29, #33, and #34 were below the applicable MDEQ generic industrial criteria screening levels. The only exceedance of the screening levels include two detections of arsenic and two detections of lead at SWMU #31. The arsenic concentrations detected in BH-31-3, 4 to 6 feet (140 mg/kg), and BH-31-2, 1.0 to 1.5 feet (117 mg/kg), were both slightly above the MDEQ DCC screening level of 61 mg/kg. It should be noted that the mean concentration of arsenic at SWMU #31 was 52.5 mg/kg, which is significantly lower than the screening level of 61 mg/kg. In addition, the 95% UCL only slightly exceeded the screening level of 100 mg/kg at 101.8 mg/kg.

The lead concentrations detected in BH-31-3, 4 to 6 feet (2,780 mg/kg), and BH-31-2, 1.0 to 1.5 feet (1,790 mg/kg), were both above the MDEQ DCC screening level of 900 mg/kg. The mean and 95% UCL level for lead at SWMU #31 were 945.3 mg/kg and 1864.0 mg/kg, respectively.

Based upon a review of the results against the appropriate screening levels, no additional evaluation is required to assess potential risks at SWMU #3, #29, #33, and #34. The analytical results at SWMU #31 indicate exceedances of the industrial based screening levels for arsenic and lead. Consequently, additional evaluation, in the form of a preliminary risk evaluation (PRE), is warranted at SWMU #31. The PRE related to arsenic and lead in soil for SWMU #31 is presented in Section 6.0.

5.3.2 PERCHED WATER TABLE ZONE

All perched groundwater results were either non-detect (TCL SVOC and TCL PCB) or below Michigan Public Act 451, Part 201 GCC. Perched groundwater results are presented in Table 5.16.

6.0 PRELIMINARY RISK EVALUATION AT SWMU #31

A PRE was undertaken to further assess the potential risk to human health posed by arsenic and lead in soils at SWMU #31. Perched water table issues were not identified at SWMU #31.

As discussed in Section 2.6, validated soil analytical data from SWMU #31 were compared to the generic risk-based industrial cleanup criteria screening levels specified in the MDEQ ERD Operational Memorandum No. 18, revised June 6, 2000 (MDEQ, 1999). Comparison of the SWMU-specific data to the MDEQ risk-based industrial criteria screening levels identified arsenic and lead as chemicals of potential concern (COPC) (see Table 5.19).

6.1 EXPOSURE ASSESSMENT

The area on which SWMU#31 is located is currently zoned and used for industrial purposes (see Figure 2.1). In addition, it is expected that the current land use of SWMU #31 will remain unchanged in the reasonably foreseeable future. It should be noted, however, that no further development or construction activities are currently planned for this area. The physical setting of SWMU #31 is discussed in Section 4.3.1 of this Report and summarized below.

A secured access road exists through the area of SWMU#31 (see Figure 6.1). This access road is a paved road for limited use by employees only to travel to and from the wastewater treatment plant (from the Pontiac East Assembly Plant). There are no sidewalks or decorative landscaping, or known subsurface utilities in the immediate vicinity of SWMU#31. No industrial work activities occur in the vicinity of SWMU #31. Moreover, access to the road is secured by a guardhouse near the Facility truck docks at the rear of the Pontiac East Assembly thereby further limiting access to trespassers, construction workers, or industrial employees. Photographs of the SWMU#31 area, in its present conditions, are presented on Figure 6.1.

Based on SWMU-specific information, the potential receptors subject to the highest frequency of exposure to the arsenic and lead concentrations above the generic MDEQ DCC screening levels are construction workers involved in some form of future soil excavation activities. Exposures to trespassers (considered to be of extremely low frequency due to existing security measures) and industrial workers (or landscapers) are expected to be mitigated by the presence of asphalt and topsoil/grass over the area of

SWMU #31 (see Figure 6.1). Potential exposure to soils could occur if Facility activities require excavation of surface and subsurface soils, as could be the case during future construction activities at the Facility. During the construction, the soils could be disturbed and construction workers could be exposed to impacted surficial and subsurface soils.

6.1.1 EXPOSURE POINT CONCENTRATIONS

For this SWMU #31 PRE, a most likely exposure scenario (Mean) and a reasonable maximum exposure (RME) scenario were evaluated to estimate a range of potential risks. U.S. EPA has defined the RME concentration as the 95 percent upper confidence limit (95% UCL) of the mean of concentrations, and the mean or average concentration as appropriate for the most likely exposure scenario (Mean) ("Supplemental Guidance to RAGS: Calculating the Concentration Term", OSWER Publication 9285.7-081, May 1992). For this evaluation, the average concentration was calculated by averaging results for all samples using the detected concentrations and counting all non-detects (NDs) as half the detection limit for constituents which were reported as both positive and non-detect in different samples from a single study area. In the event that duplicate samples were analyzed, the average concentration of the duplicate samples was used.

It is possible that soil excavation activities could occur at SWMU #31 in the future. In this case, subsurface soil could be disturbed and exposed. To evaluate SWMU #31 soil exposure scenarios under the future condition, all available soil data, regardless of depth, were used in calculating the mean and the 95% UCL concentrations for arsenic and lead. The arithmetic mean, the calculated 95% UCL, and maximum concentrations for arsenic and lead in SWMU #31 soils are summarized in Table 5.19.

6.1.2 QUANTIFICATION OF EXPOSURE

To evaluate the future construction worker exposure scenario, two levels of assumptions are presented. The Mean scenario presents the 50th percentile or average value for exposure factor assumptions approximating the average expected exposure conditions. The RME scenario presents the 95th percentile confidence level for exposure factor assumptions such as exposure duration, ingestion rates, and total exposed skin surface areas.

To quantify exposures, potential exposure scenarios were developed using exposure assumptions presented in the U.S. EPA documents entitled, "Risk Assessment Guidance for Superfund (RAGS)", Part I: Human Health Evaluation Manual, EPA/540/1-89/002, December 1989; "RAGS Supplemental Guidance Standard Default Exposure Factors", Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6-03, March 25, 1991; "RAGS Supplemental Guidance, Dermal Risk Assessment, Interim Guidance", March 14, 1999; and appropriate Michigan guidance and references. In some instances, where the U.S. EPA and Michigan guidance documents did not present necessary assumptions, and where specific appropriate exposure information were not available, professional judgment was applied to develop conservative assumptions which are protective of human health.

6.2 TOXICITY ASSESSMENT

Table 6.1 presents the toxicity factors [i.e., Cancer Slope Factor (CSF) and Reference Dose (RfD) values] used to estimate the potential non-carcinogenic hazard and incremental carcinogenic risk for arsenic.

A CSF is applied to estimate the potential risk of cancer from an exposure. A RfD is applied to estimate the potential for non-carcinogenic effects to occur from the exposure.

The CSF is expressed as $(\text{mg}/\text{kg}/\text{day})^{-1}$ and when multiplied by the lifetime average daily dose expressed as $\text{mg}/\text{kg}/\text{day}$ will provide an estimate of the probability that the dose will cause cancer during the lifetime of the exposed individual. This increased cancer risk is expressed by terms such as $1\text{E}-06$ or 1×10^{-6} . This is a hypothetical estimate of the upper limit of risk based on very conservative or health-protective assumptions and statistical evaluations of data from animal experiments or from epidemiological studies. To state that a chemical exposure causes a $1\text{E}-06$ added upper limit risk of cancer means that if 1,000,000 people are exposed, one additional incident of cancer is expected to occur. The calculations and assumptions yield an upper limit estimate which indicates that no more than one case is expected and, in fact, there may be no additional cases of cancer. Since U.S. EPA values for CSFs are 95% upper confidence levels, risks are 95% upper bound estimates. Thus, actual risks associated with exposure to a potential carcinogen are not likely to exceed the risks estimated using CSFs, but may be lower.

For substances suspected to cause noncarcinogenic chronic effects, the health criteria are usually expressed as chronic intake levels or RfDs (in units of $\text{mg}/\text{kg}/\text{day}$) below which

no adverse effects are expected. In contrast with the underlying toxicological model used by U.S. EPA to assess carcinogenic risk, which assumes no threshold, the noncarcinogenic dose-response model postulates a "threshold." In other words, there is a level of exposure to a chemical below which virtually no effects are expected. In this PRE, chronic RfDs are used as the toxicity values for noncarcinogenic health effects.

6.3 RISK CHARACTERIZATION FOR ARSENIC

The results of the quantitative risk assessment for arsenic are presented in Appendix F, Tables F-1 to F-4, inclusive.

The estimated additional lifetime carcinogenic risks (R) were calculated according to the following general equation:

$$R = CDI \times CSF$$

where:

- R = Upper Bound Additional Lifetime Cancer Risks;
CDI = Lifetime Average Daily Dose (mg/kg-day); and
CSF = Cancer Slope Factor [(mg/kg-day)⁻¹].

The CSF represents the carcinogenic potency of a chemical. The dose, or intake, represents the amount of contaminant to which a receptor is exposed. When evaluating carcinogenic risks, the dose in all exposure scenarios is the estimated daily intake of each chemical, received during the specified period of exposure, and averaged over a 70-year lifetime.

U.S. EPA has not identified a single value that represents a significant incremental cancer risk. However, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) acceptable risk range for Superfund sites has been set at 10⁻⁶ to 10⁻⁴ per environmental medium (NCP, 1990). In other words, the goal of the NCP is to reduce the cancer risk associated with site contaminants in a given medium to within or below a range of 1 in 10,000 to 1 in 1,000,000.

Potential non-carcinogenic effects were evaluated based on a comparison of chemical-specific chronic exposure doses (depending on the scenario-specific exposure duration) with corresponding reference doses derived from health criteria (see Table 6.1). The result of this comparison is expressed as the Hazard Quotient (HQ):

$$HQ = \frac{\text{Exposure Dose}}{\text{Protective Dose}} = \frac{CDI}{RfD}$$

where:

HQ = Hazard Quotient;
CDI = Chronic Daily Intake (mg/kg-day); and
RfD = Reference Dose (mg/kg-day).

A HQ that exceeds unity (1.0) suggests a greater likelihood of developing an adverse chronic effect. However, the uncertainty factors built into the reference doses result in conservative protective dose values. Therefore, the reference dose is likely well below that for which adverse effects will be seen.

6.3.1 GENERAL SOILS (SURFACE AND SUBSURFACE SOILS) - FUTURE CONSTRUCTION WORKER EXPOSURE

A construction worker exposure scenario was developed assuming that soil excavation and/or construction will occur under the future Site condition. The scenario assumes that the construction worker will be involved in one excavation/construction project at the Facility for a period of 2 weeks (Mean) and 1 month (RME). It should be noted, however, that no further development or construction activities are currently planned for this area. The following conservative and health-protective assumptions were used to calculate exposures:

- Subsurface soils and surficial soils on the Site are disturbed/excavated.
- The exposure point concentrations for arsenic are the mean and the 95% UCL concentration or the maximum detected concentration, whichever is lower, for the Mean and RME condition, respectively.
- The inadvertent soil ingestion rate for adult workers is assumed to be 480 mg of soil per day for the Mean and RME (U.S. EPA, 1991).
- The exposed skin surface area includes the head, hands, and forearms yielding a total of 3,300 cm² for the Mean and RME (U.S. EPA, 1999).
- The soil-to-skin adherence factor is 0.02 mg/cm² for the Mean and 0.2 mg/cm² for the RME (U.S. EPA, 1999).
- The absorption efficiency applicable to ingestion is assumed to be 50 percent for arsenic (MDEQ, 1995).

- The absorption efficiency applicable to dermal contact is assumed to be 3 percent for arsenic (U.S. EPA, 1992).
- It is assumed that future soil excavation and/or construction will occur for no longer than a period of 2 weeks or 10 days for the Mean and, 1 month or 20 days for the RME.
- The adult worker is assumed to weigh 70 kg.
- Averaging time is 25,550 days or 70 years for carcinogens and ED*365 days for non-carcinogens.

The estimated cancer risks and hazards are summarized in Appendix F, Table F-1 to F-4, inclusive. The additional lifetime upper limit of cancer risks were estimated to be $-1.07\text{E}-07$ and $-4.46\text{E}-07$ for the Mean and RME, respectively. The hazard indices were below 1.0, the level of concern for both the Mean and RME. The estimated additional risks of cancer are well below the target U.S. EPA cancer risk range of 10^{-6} to 10^{-4} , while the non-carcinogenic hazards were below 1.0.

6.4 HUMAN HEALTH RISK EVALUATION FOR LEAD

6.4.1 QUANTITATIVE EVALUATION OF NON-RESIDENTIAL ADULT EXPOSURES TO LEAD

The best available quantitative tool for determining risks associated with non-residential adult exposures to lead-impacted soil is primarily based on the U.S. EPA report titled: "Recommendations of the Technical Review Workgroup (TRW) for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (dated December, 1996) and subsequent guidance present in the document titled "Frequently Asked Questions (FAQs) on the Adult Lead Model" (dated April 1999).

The derivation of risk-based remediation goals (RBRG) for lead in soil at any site is largely dependent on the present and expected future land use of the site. As in the arsenic evaluation, the potential exposures to lead-impacted soils by future construction workers were evaluated. Therefore, the soil RBRG for lead for the future construction worker is developed using the TRW Adult Exposure Equation Model.

6.4.1.1 ADULT EXPOSURE EQUATION

The TRW has indicated that the Adult Exposure Equation is a suitable and appropriate model for assessing adult exposures to lead in soils under an industrial setting. The Adult Exposure Equation recommended for use by the TRW is as follows:

$$RBRG = \frac{(PbB_{adult, central, goal} - PbB_{adult, 0}) \bullet AT}{(BKSF \bullet IR_s \bullet AF_s \bullet EF_s)}$$

where:

RBRG	= Risk-Based Remediation Goal for lead (ug/g);
$PbB_{adult, central, goal}$	= goal for central estimate of blood lead concentration (ug/dL) in adults (i.e., women of childbearing age) that have site exposures. The goal is intended to ensure that $PbB_{95fetal}$ does not exceed 10 ug/dL;
$PbB_{adult, 0}$	= typical lead concentration (ug/g) (appropriate average concentration for individual);
AT	= Averaging Time; the total period during which soil contact may occur; 365 days/year for continuing long term exposures;
BKSF	= Biokinetic Slope Factor (ug/dL blood lead increase per ug/day lead uptake);
IR_s	= Ingestion Rate of soil (g/day);
EF_s	= Exposure Frequency for contact with assessed soils (days/yr); and
AF_s	= absolute Absorption Fraction of lead in soil.

The basis for the RBRG calculation is the relationship between the soil lead concentration and the blood lead concentration in the developing fetus of adult women that have site exposures. The relationship between the blood lead concentration in adult women and the corresponding 95th percentile fetal blood lead concentration ($PbB_{95fetal}$), assuming that $PbB_{adult, central}$ reflects the geometric mean of a lognormal distribution of blood lead concentrations in women of child-bearing age, can be described by the following equation:

$$PbB_{adult,central,goal} = \frac{PbB_{95\ fetal}}{GSD_{i,adult}^{1.645} \bullet R_{fetal / maternal}}$$

where:

- $PbB_{95fetal}$ = 95th percentile target blood lead (PbB) concentration in the fetus ($\mu\text{g}/\text{dL}$);
- $R_{fetal/maternal}$ = mean ratio of fetal to maternal PbB;
- $GSD_{i,adult}$ = individual Geometric Standard Deviation, an exponent of 1.645 represents the standard normal deviate used to calculate the 95th percentile from a lognormal distribution of blood lead concentration.

6.4.1.2 ADULT EXPOSURE EQUATION INPUT PARAMETERS

The basis for selection of input parameters for the above model is discussed below.

- 95th Percentile Blood Lead (PbB) Concentration in the Fetus ($PbB_{95fetal}$ in $\mu\text{g}/\text{dL}$):
U.S. EPA has also applied a value of 10 $\mu\text{g}/\text{dL}$ as a target level that is protective for fetuses of pregnant women. Therefore, the value of 10 $\mu\text{g}/\text{dL}$ was used in the modeling.
- Mean Ratio of Fetal to Maternal PbB ($R_{fetal/maternal}$):
Various studies have estimated an average fetal-to-maternal PbB ratio of 0.9 based on a weight of evidence approach. This value has also been used by U.S. EPA in applying the Adult Exposure Model. Therefore, the value of 0.9 for was used in the modeling.
- Individual Geometric Standard Deviation ($GSD_{i,adult}$):
This parameter is used to assess variability in blood lead concentrations among different individuals. Few data are available regarding GSD values reflecting individual variability. Instead, GSD values reflecting community variability (which would be expected to be greater than individual variability) are frequently applied to estimate individual variability. Various studies have indicated that community

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GSDs may range from approximately 1.8 to 2.1. There are no Site-specific data of GSD values and therefore, it is assumed that the potentially exposed population is likely to be heterogeneous. A value for GSD of 2.0 was selected for use in this modeling to be consistent with U.S. EPA's most recent guidance. It should be noted that a GSD value of 2.0 is considered to be very conservative and a lower value (i.e., 1.8) is justified in minor circumstances.

- Baseline PbB Value ($PbB_{adult,0}$):

This parameter is specific to the population in the area of interest. At this time, no source of data describing blood lead levels for the population in the vicinity of the Site has been identified. Therefore, published reference data were used to determine a representative value. A value of 2.0 $\mu\text{g}/\text{dL}$ was chosen for this input parameter based on the assumption of a mixed racial worker population.

- Biokinetic Slope Factor (BKSF in $\mu\text{g}/\text{dL}$ per $\mu\text{g}/\text{day}$):

The TRW adopted a BKSF of 0.4, derived for the baseline human health risk assessment for the California Quich Superfund Site. Therefore, the default value of 0.4 for the parameter BKSF was used in the modeling.

- Soil Absolute Absorption Fraction of Lead (AF_s):

The TRW uses 12 percent (12%) as the absorbed fraction of lead from soil and dust for adults, based on an absorption factor for soluble lead of 0.20 and a relative bioavailability of 0.6 (soil/soluble).

- Soil Ingestion Rate (IRs in g/day):

An ingestion rate of 0.10 g/day was applied for a construction worker at the Site.

6.4.2 SUMMARY

Using the input parameters for the future construction worker, the derived soil RBRG for lead is 5,904 mg/kg . The result of the lead modeling is presented in Table 6.2. The concentrations of lead detected at SWMU#31 are well below the calculated RBRG (which is considered to be a protective level by U.S. EPA).

7.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

CRA conducted an RFI at the GM Truck Group Facility in Pontiac, Michigan in two phases between November 1998 and January 1999 (Phase I), and August 2000 (Phase II) (Figure 1.1). The investigative activities focused on five SWMUs identified by the U.S. EPA in a Consent Order that required GM to initiate investigative/corrective actions at the Facility. The RFI investigation was completed in accordance with the general specifications outlined in a U.S. EPA-approved RFI Work Plan (CRA, 1998b) with exceptions as noted in this report. Investigations of two additional SWMUs (which are summarized below) were addressed by GM through RCRA IM programs. The IMs at SWMU #30 (Former J-Lot Fill Area) and SWMU #32 (Former Coal Pile Storage Area) were successfully implemented and were subsequently approved by U.S. EPA. The two IM's were completed concurrently with the RFI Work Plan development and implementation and are summarized in separate reports. The seven SWMUs addressed through either an IM or this RFI are summarized below.

<i>SWMU</i>	<i>Description</i>	<i>Program</i>
1) #30	Former J-Lot Fill Area	IM
2) #32	Former Coal Pile Storage Area	IM
3) #3	Container Storage Area	RFI
4) #29	Wastewater Treatment Plant	RFI
5) #31	Former Surface Impoundment	RFI
6) #33	Former South Retention Pond	RFI
7) #34	North Retention Pond	RFI

The RFI was implemented in two phases to characterize the nature and extent of hazardous waste or hazardous waste constituents which may be present at each SWMU as a result of previous operations and/or releases. The potential chemical constituents and associated soil quality at each SWMU were investigated by collection of surface soils and installation of at least three boreholes at each SWMU. The borehole locations, borehole depths, number of samples collected, the parameters analyzed, and procedures/methodologies utilized to investigate each SWMU were based on historical operations for each SWMU. In addition, monitoring wells were installed and sampled at SWMU #3 and SWMU #31 during the Phase II RFI activities.

All boreholes were advanced with continuous split spoon sampling to depths ranging between 2 and 42 feet below grade (the deepest boring installed during the RFI). All sample collection, sample screening, sample analytical and equipment decontamination procedures were consistent with those outlined in the QAPP. Soil samples and QA/QC

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samples (duplicates, rinse blanks, etc.) selected for chemical analysis were submitted to Columbia Analytical Services, Inc. for one or more of the analyses identified below

- TCL VOCs, SVOCs and/or PCBs by U.S. EPA Methods 8260B, 8270C, and 8082, respectively;
- TAL metals by U.S. EPA 6010B, 6020, and/or 7470A;
- Total cyanide and sulfide by U.S. EPA Methods 9010B and 9030B, respectively; or
- U.S. EPA Appendix IX VOCs, SVOCs, PCBs (excluding pesticides, herbicides, dioxin, and furans) and/or Metals using the same analytical methods referenced above.

Groundwater samples were analyzed for TCL-VOC, TCL-SVOCs, TCL-PCBs, and TAL inorganics (both filtered and non-filtered).

The general geologic profile of the uppermost 42 feet of overburden soils consisted of a surficial engineered fill and a glacial clay till (which was consistent with geologic profiles identified during previous investigations). The surficial engineered fill materials encountered during the RFI were typically comprised of a sand or clay engineered fill material with occasional occurrences of slag and gravel backfill. The depth of fill material ranged from approximately 0.3 to 20 feet below grade (at SWMW #3 and #33, respectively). Below the fill material, the glacial deposit generally consists of a medium-textured, poorly stratified clay till with thin shallow, laterally discontinuous lenses of sands and silts.

During the Phase I investigation, groundwater monitoring wells were to be installed and sampled if the native porous media encountered throughout the study area was greater than 5 feet thick and the zone of saturation was continuous and greater than 2 feet thick. However, as summarized below, the saturated sand seams encountered within the glacial till deposits were laterally discontinuous, of limited vertical thickness, or absent altogether.

<i>SWMU</i>	<i>Sand Lenses</i>	<i>Depth Encountered (ft. bgs)</i>	<i>Thickness (ft)</i>
#3	1 (upper)	6 to 8	0.8 to 5.2
#3	2 (lower)	10 to 12	0.8 to 3.1
#29	1	11 to 12.6	0.6 to 2.7
#31	1	8 to 10	2.0 to 3.5
#33	0	(through 20 feet)	Not Applicable
#34	0	(through 40 feet)	Not Applicable

These native sand deposits/sand lenses encountered during the RFI did not meet the monitoring well screening requirements specified in the RFI Work Plan (i.e., greater than five feet of native sand and greater than 2 feet of saturated thickness throughout the study area). Therefore, no monitoring wells were installed and no groundwater samples were collected during the Phase I investigation. The RFI investigations were consistent with previous investigations which had indicated that there is no defined water table aquifer near the ground surface at the Facility. This occurrence is primarily related to the occurrence of a massive regional clay till which exists near surface in the area.

A second phase of investigation of the perched water table zone was completed at the request of U.S. EPA at SWMU #3 and SWMU #31. The second phase of investigation included the installation of a shallow monitoring well at SWMU #3 and SWMU #31.

A comprehensive summary of the organic and inorganic analytes detected at each SWMU, their reported concentrations, and the MDEQ industrial direct contact criteria, (used as the screening levels) for soil is presented in Tables 5.1 through 5.15. The perched water table zone results are presented in Table 5.16.

As presented in Tables 5.1 through 5.15, the organic constituents (VOCs, SVOCs, and PCBs) detected in soil during the RFI were predominately at near surface elevations within the surficial engineered fill materials. The relatively low-level concentrations of these constituents were separated from the laterally discontinuous sand seams (and lower till horizons) by low permeability, clay-rich, glacial till deposits (see geologic cross sections A-A' through G-G'; Figures 5.1 through 5.7). The physical properties of the organic constituents detected within the five SWMUs have relatively limited mobilities, which may also inhibit vertical migration. The limited number of VOC constituents detected during the RFI had concentrations that generally decreased significantly with depth. As a result, no Facility-derived constituents were identified to have migrated to lower elevations in the overburden clay till soils.

Of the inorganic constituents detected in soil during the RFI, only two of the metal constituents (arsenic and lead), at two of the sampling locations (both at SWMU #31), were above the MDEQ generic industrial DCC (used as the screening levels). All other analytes detected from the five SWMUs were below applicable MDEQ screening level criteria and do not require any further corrective action. The arsenic concentrations detected at SWMU#31 in BH-31-3, 4 to 6 feet (140 mg/kg), and BH-31-2, 1.0 to 1.5 feet (117 mg/kg), were both above the MDEQ industrial DCC screening level of 61 mg/kg. It should be noted that the mean concentration of arsenic at SWMU #31 was 52.5 mg/kg

which is lower than the screening level of 61 mg/kg. In addition, the 95% UCL for arsenic exceeded the screening level of 61 mg/kg at 101.8 mg/kg.

The lead concentrations detected in BH-31-3, 4 to 6 feet (2,780 mg/kg), and BH-31-2, 1.0 to 1.5 feet (1,790 mg/kg), were both above the MDEQ industrial DCC screening level of 900 mg/kg. The mean and 95% UCL level for lead at SWMU #31 were 945.3 mg/kg and 1,864.0 mg/kg, respectively. A summary of the detected constituents, including their range, average, and 95% UCL, is summarized in Tables 5.17 through 5.21.

Based upon the exceedance of the arsenic and lead screening levels at SWMU #31, a Preliminary Risk Evaluation was completed to further evaluate the potential risks associated with SWMU #31 (Appendix F).

An access road currently exists through the area of SWMU#31 (see Figure 4.3 and 6.1). This access road is a paved single lane road for use by GM employees only to travel to and from the wastewater treatment plant (from the Pontiac East Assembly Plant). There are no sidewalks or decorative landscaping in the vicinity of SWMU#31. No industrial work activities occur in the vicinity of SWMU#31. Moreover, access to the road is secured by a guardhouse near the Pontiac East Assembly truck docks at the rear of the plant thereby further limiting access to trespassers, construction workers, or industrial workers. Under future Facility conditions, the only significant population identified as being potentially exposed to arsenic and lead, the COPCs as identified in the PRE, was construction workers. Exposures to trespassers (considered to be of extremely low frequency) and industrial workers (or landscapers) are expected to be mitigated by the presence of asphalt and topsoil/grass over the area of SWMU #31. It should be noted, however, that no further development or construction activities are currently planned for this area (i.e., this area was redeveloped as part of the Centerpoint Business Campus).

The PRE identified cancer risks at SWMU#31 associated with arsenic on the order of $-1.07\text{E}-07$ to $-4.46\text{E}-07$ for the Mean and RME, respectively. The hazard indices were below 1.0, the level of concern. The estimated additional risks of cancer are well below the U.S. EPA target cancer risk range of 10^{-6} to 10^{-4} .

The risk evaluation for lead identified a risk based remediation goal for lead of 5,904 mg/kg. All lead levels at SWMU#31 were below this RBRG and are currently covered by asphalt or topsoil/grass.

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The Phase II investigation identified that no potable groundwater exist in the surficial water table zone immediately beneath the Facility. In addition, potable water use for the Facility and surrounding area is supplied by the City of Pontiac municipal water supply system. As a result, drinking water consumption is not a completed exposure pathway associated with the perched water table zone at the Facility. In addition, all results were below the Act 451, Part 201 industrial GCC. The industrial GCC are considered to be the most applicable screening levels for the perched water table zone identified at SWMU #3 and SWMU #31. This indicates that the perched groundwater analytical detections are below the level of human health concern for a potential perched water table zone direct contact exposure (e.g., utility trench construction activities).

Based upon the fact that all concentrations were either below applicable industrial land-use based DCC screening levels (SWMU #3, #29, #33, and #34), or did not pose unacceptable risks (SWMU #31), for an industrial land use exposure scenario, the Corrective Measures Study (CMS) Report will evaluate the necessity for and application of institutional controls (e.g., security, deed restrictions, Notice of Approved Environmental Remediation (NAER) filed with the Register of Deeds, etc.) at each of the SWMUs which were investigated/remediated during the IM and RFI activities implemented at the Facility.

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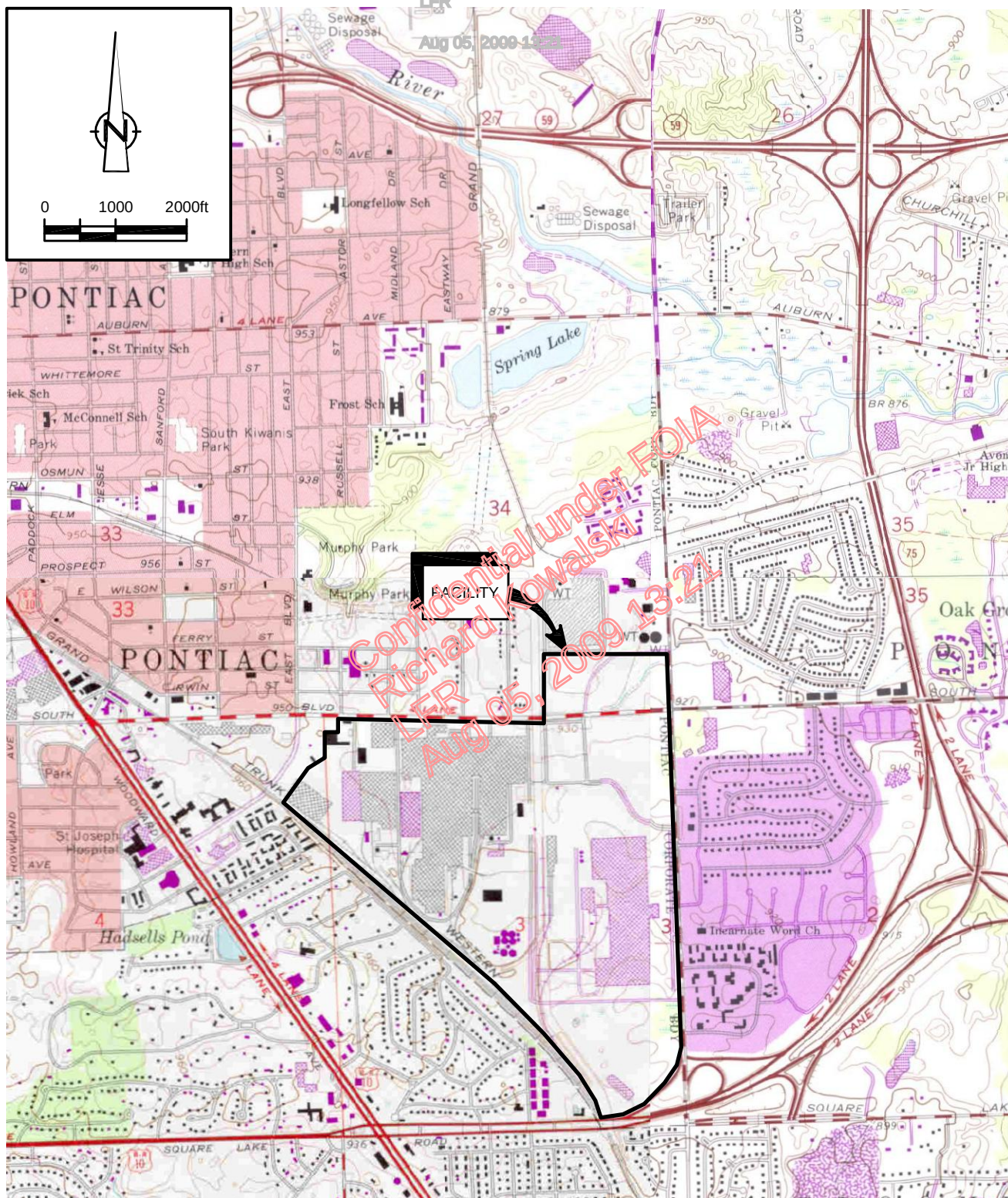
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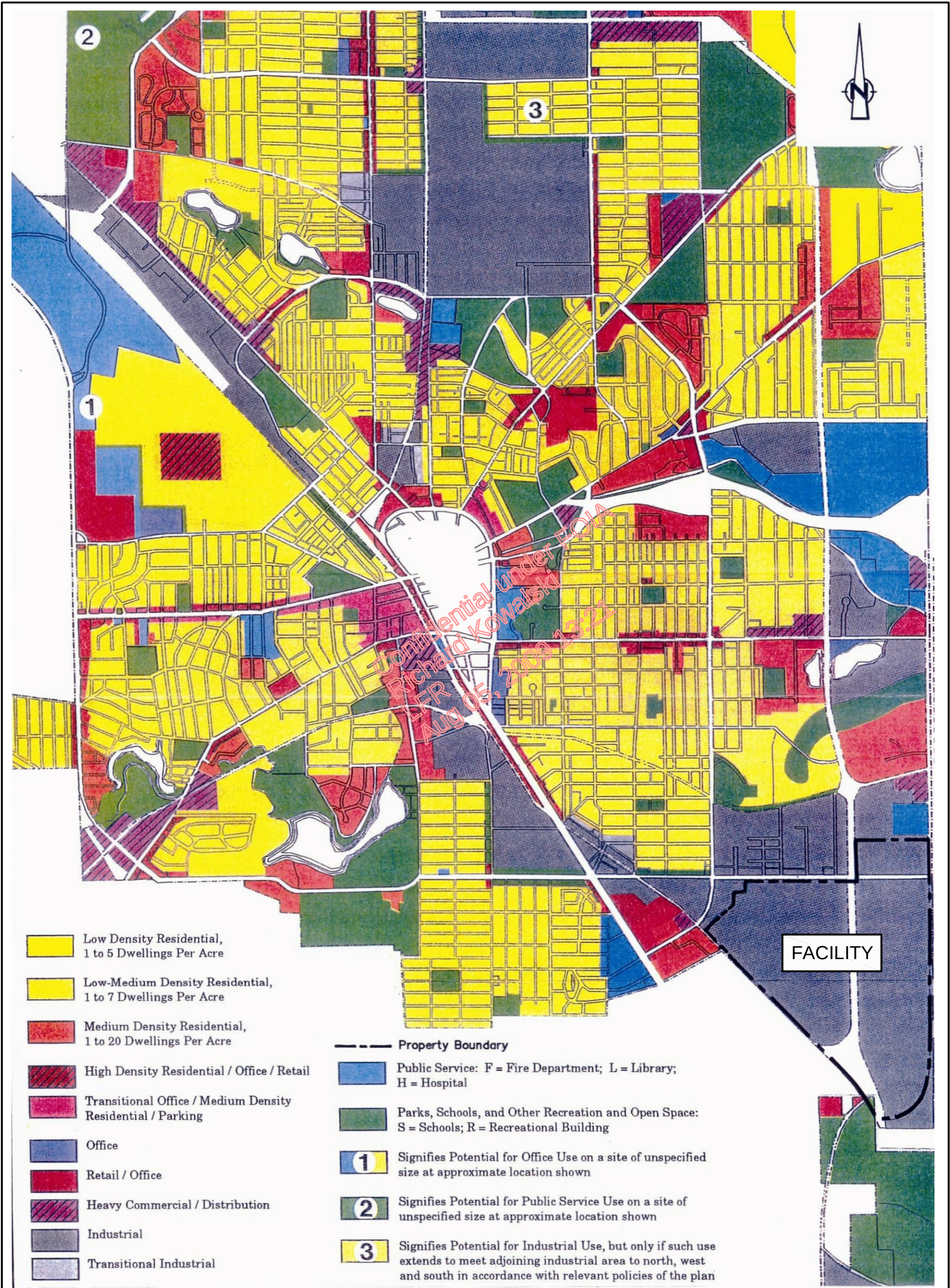


SOURCE: USGS QUADRANGLE MAPS;
BIRMINGHAM, ROCHESTER, PONTIAC NORTH,
AND PONTIAC SOUTH, MICHIGAN



figure 1.1

FACILITY LOCATION
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan



SOURCE: CITY OF PONTIAC PLANNING COMMISSION

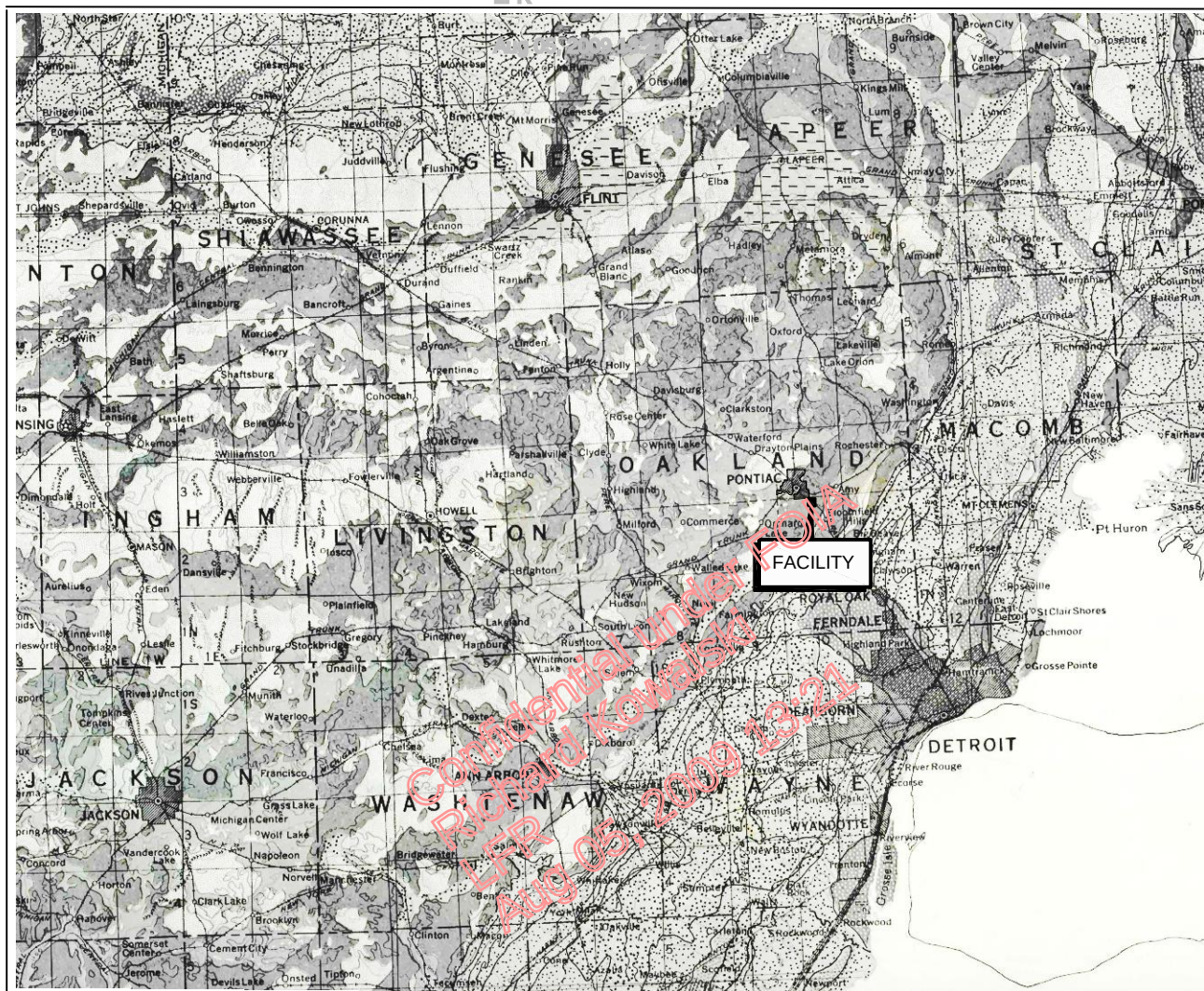
figure 2.1
CITY OF PONTIAC LAND USE MAP
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan



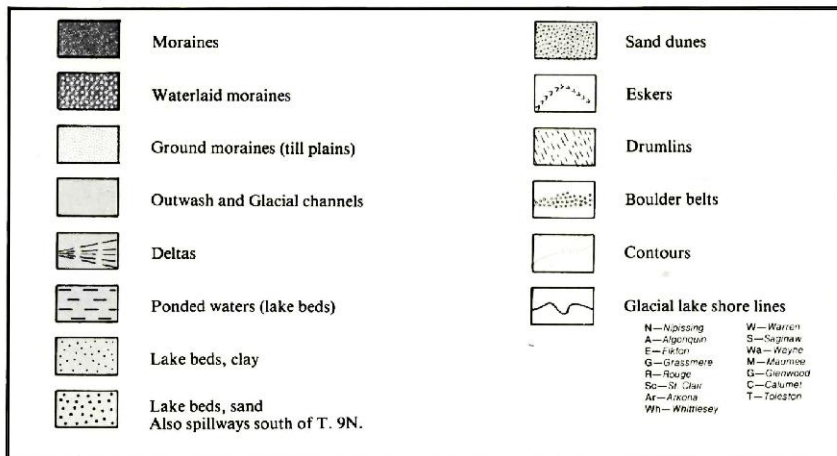


figure 2.2

BLOOMFIELD TOWNSHIP LAND USE PLAN
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan



EXPLANATION



Scale 1:500,000

1 inch represents approximately 8 miles

figure 2.3

REGIONAL SURFICIAL GEOLOGY RFI REPORT GENERAL MOTORS CORPORATION *Pontiac, Michigan*



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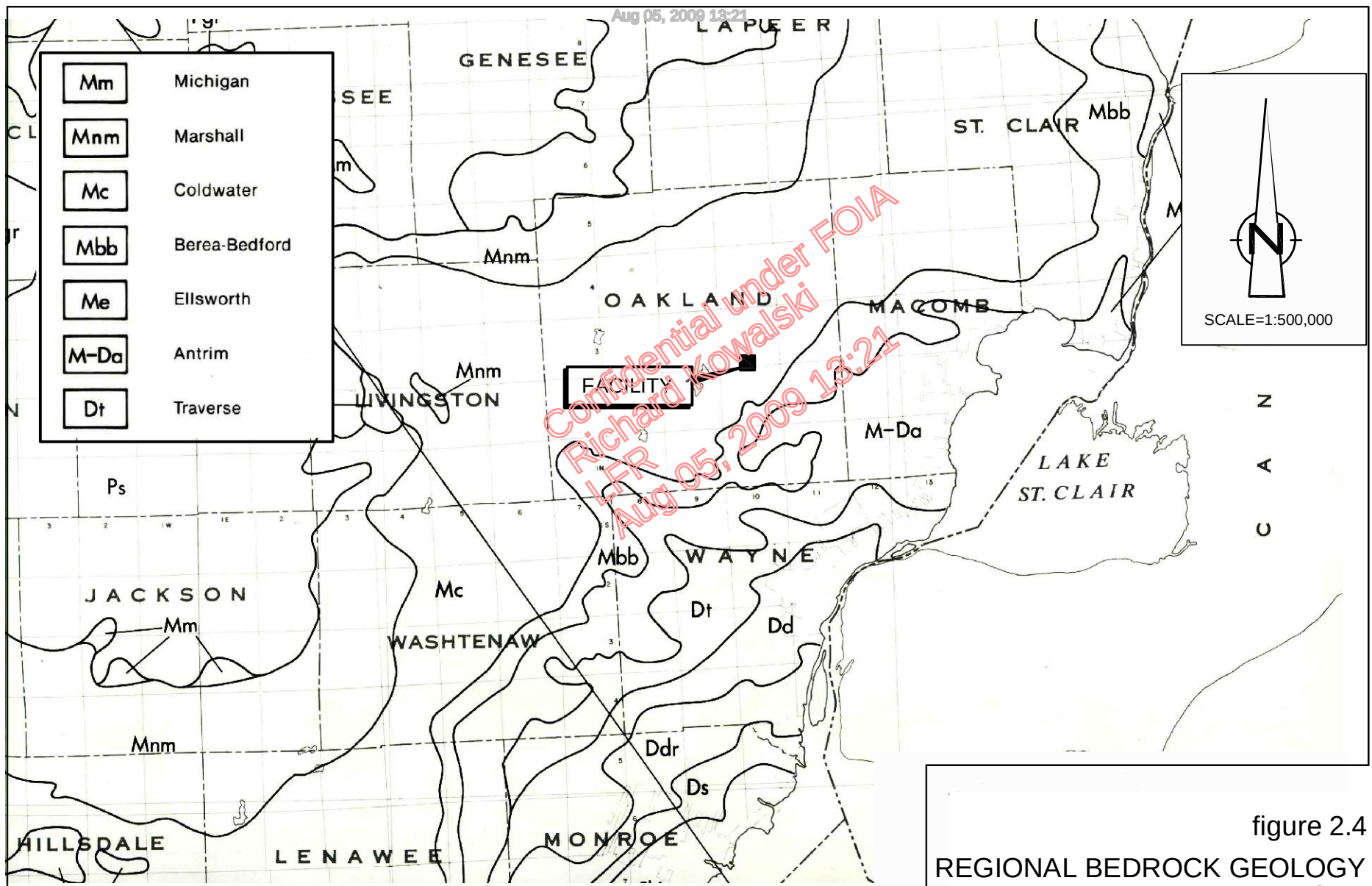


figure 2.4
REGIONAL BEDROCK GEOLOGY
RFI REPORT
GENERAL MOTORS CORPORATION
Pomtiac, Michigan

SOURCE: HYDROGEOLOGIC ATLAS OF MICHIGAN
WESTERN MICHIGAN UNIVERSITY, DEPARTMENT OF GEOLOGY

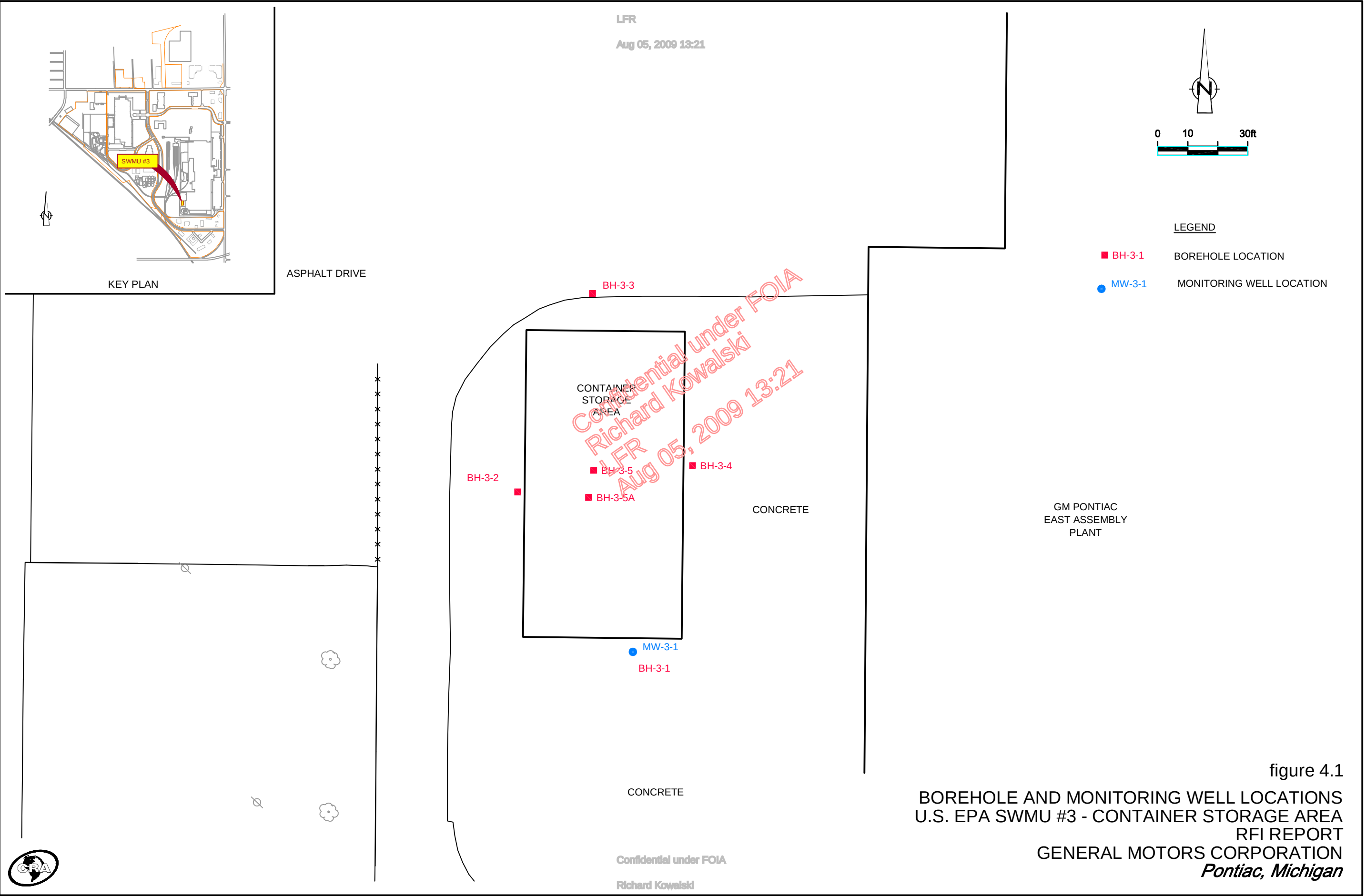
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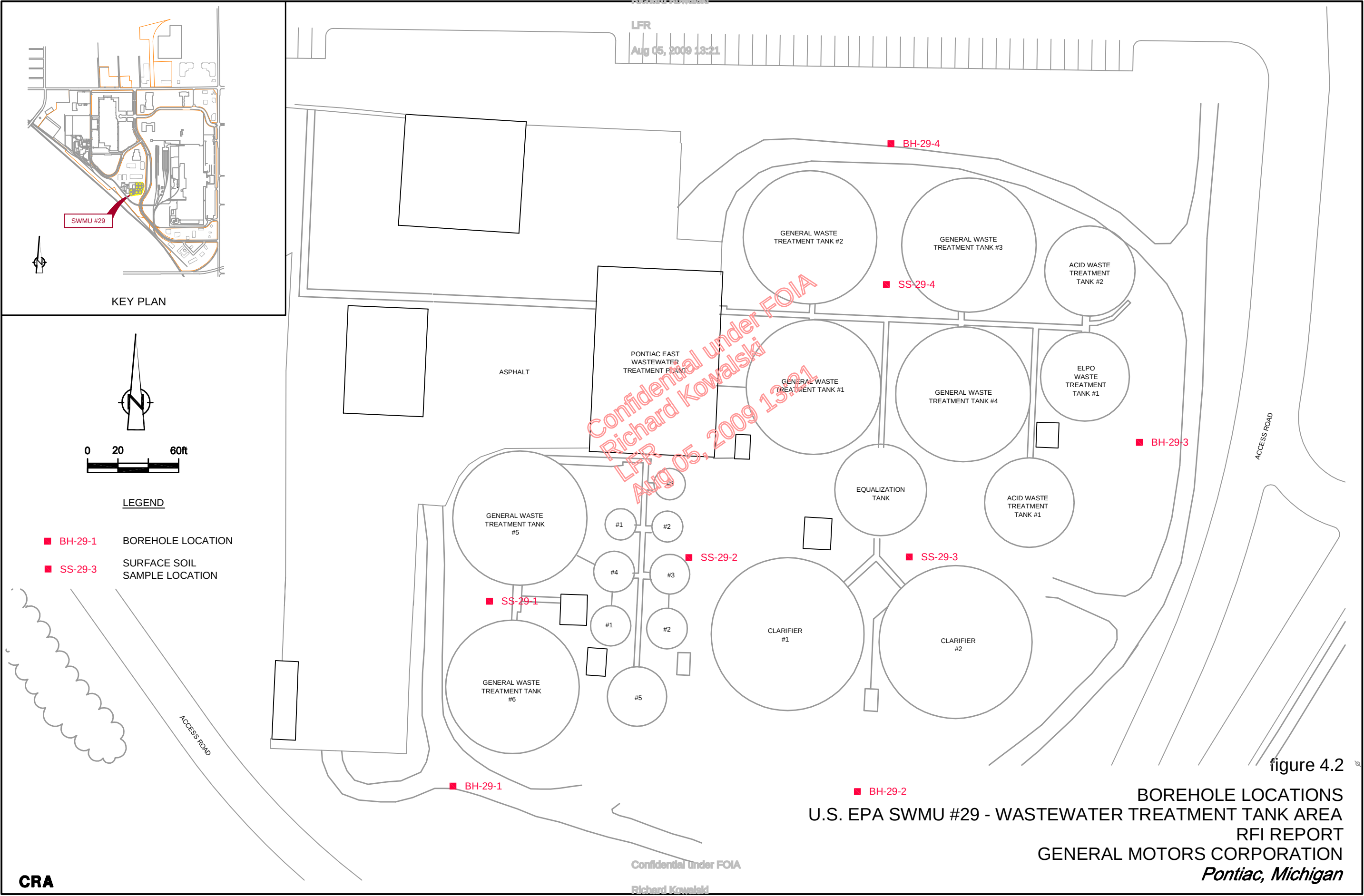
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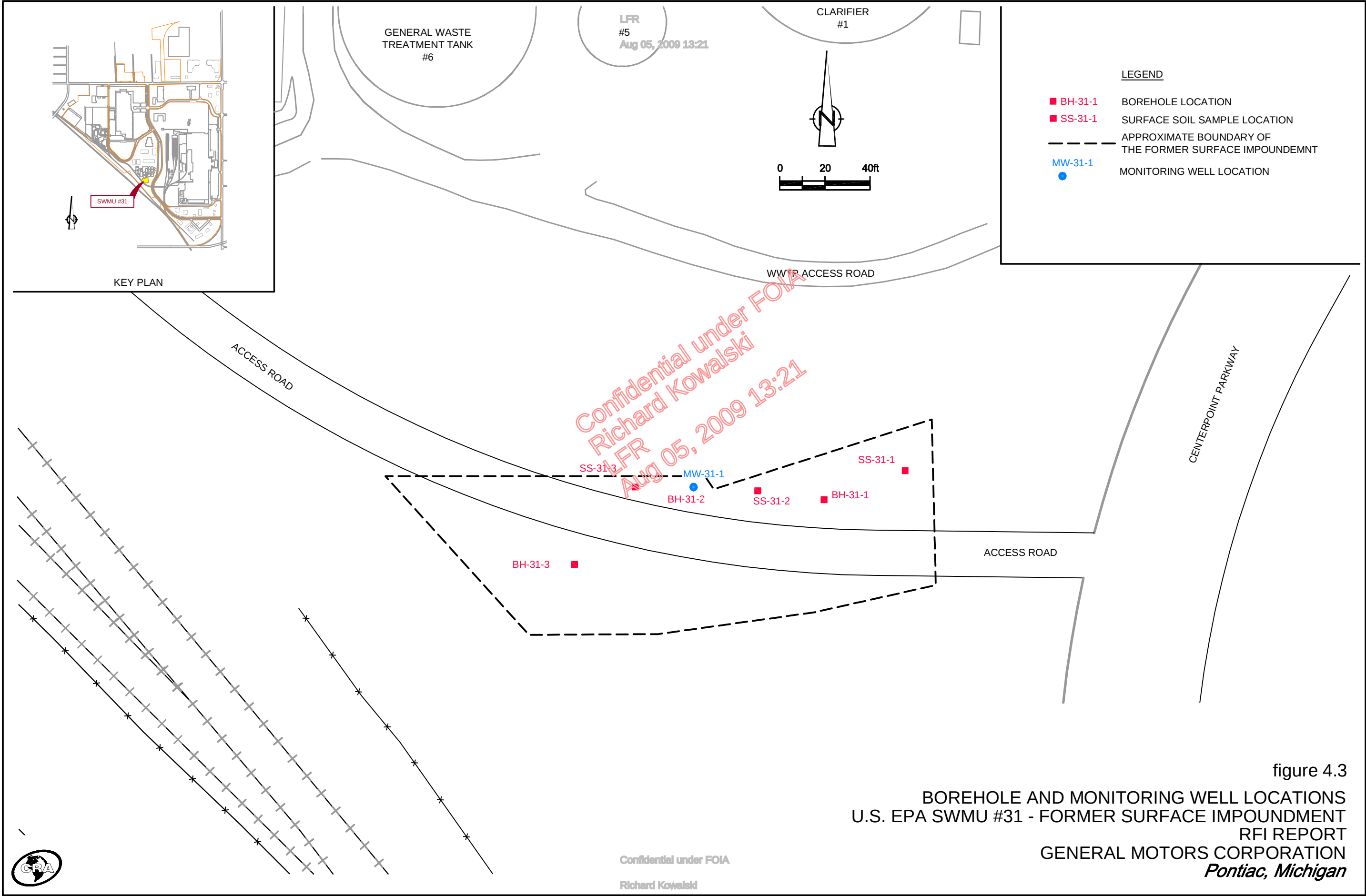
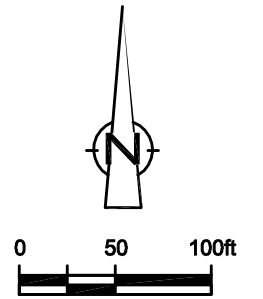


figure 4.3
BOREHOLE AND MONITORING WELL LOCATIONS
U.S. EPA SWMU #31 - FORMER SURFACE IMPOUNDMENT
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan

CENTERPOINT PARKWAY



KEY PLAN

SWMU #33

BH-33-1

BH-33-2

BH-33-6

BH-33-5

BH-33-3

BH-33-4

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LEGEND

■ BH-33-1

BOREHOLE LOCATION

APPROXIMATE BOUNDARY OF FORMER
SOUTH RETENTION POND

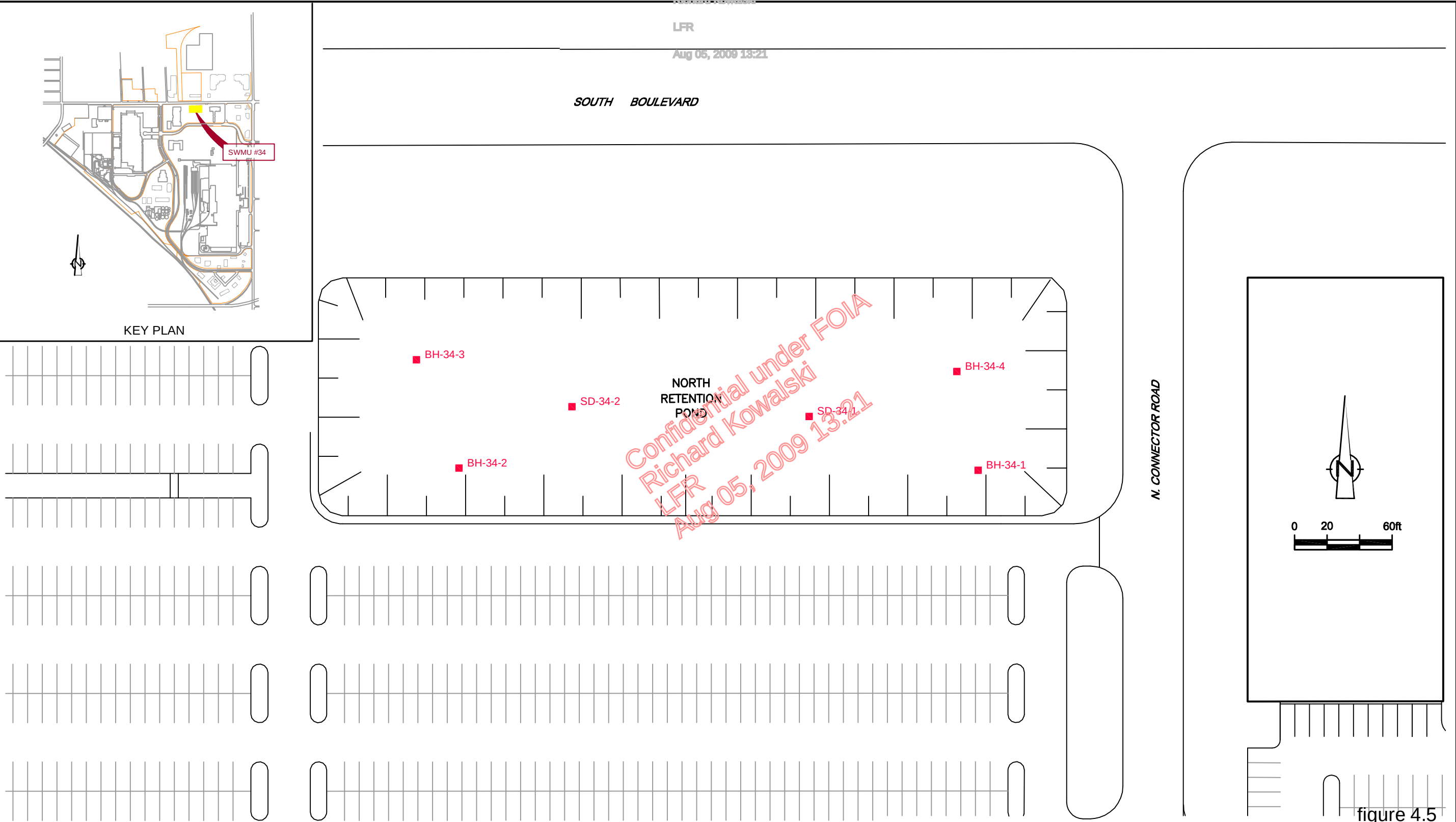
figure 4.4

BOREHOLE LOCATIONS
U.S. EPA SWMU #33 - FORMER SOUTH RETENTION POND
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan

CRA

07097-00(012)GN-DE008 JUN 18/99

SQUARE LAKE ROAD



LEGEND

■ BH-34-4

BOREHOLE LOCATION

■ SD-34-1

SEDIMENT SAMPLE

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BOREHOLE LOCATIONS
U.S. EPA SWMU #34-NORTH RETENTION POND
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan

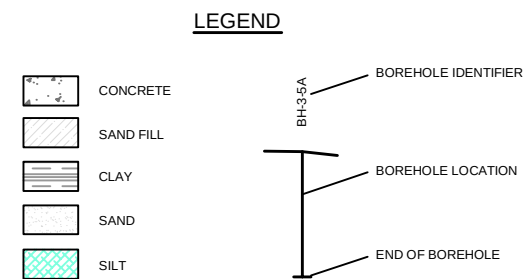
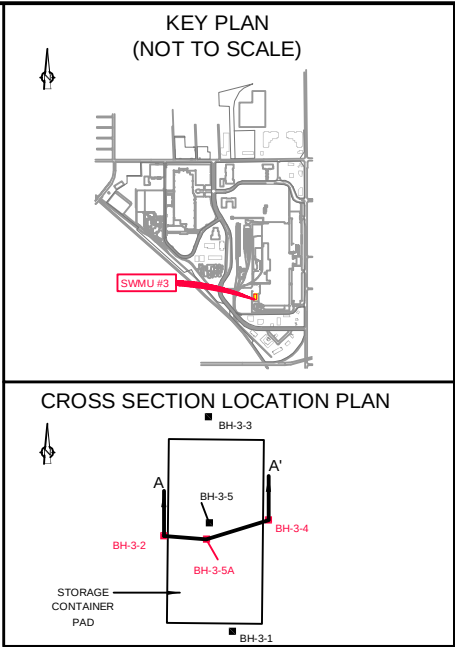
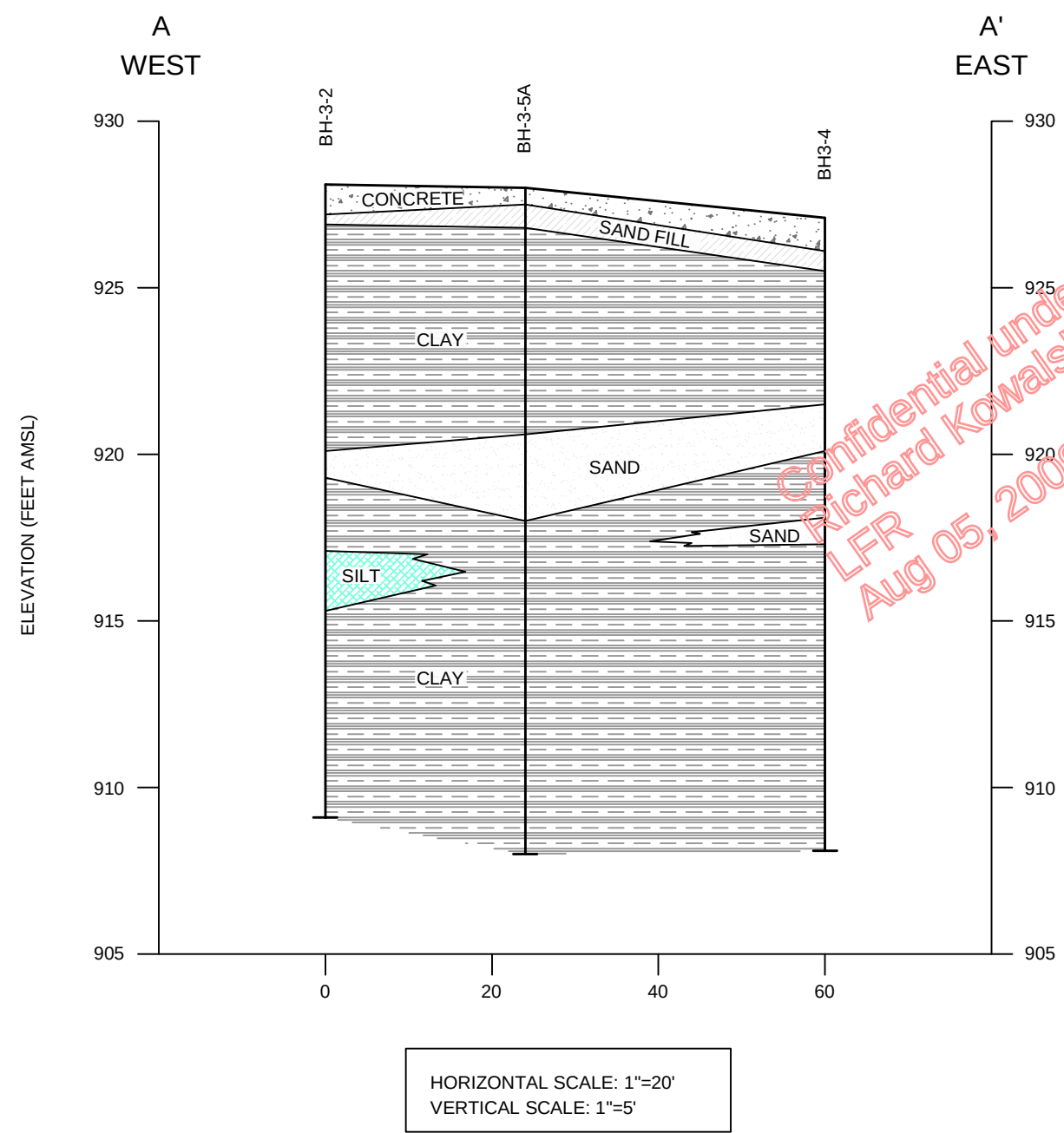


figure 5.1
EAST-WEST GEOLOGIC CROSS SECTION A-A'
SWMU #3-CONTAINER STORAGE AREA
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan

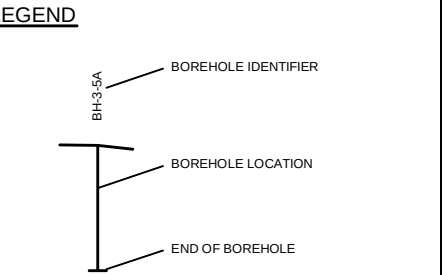
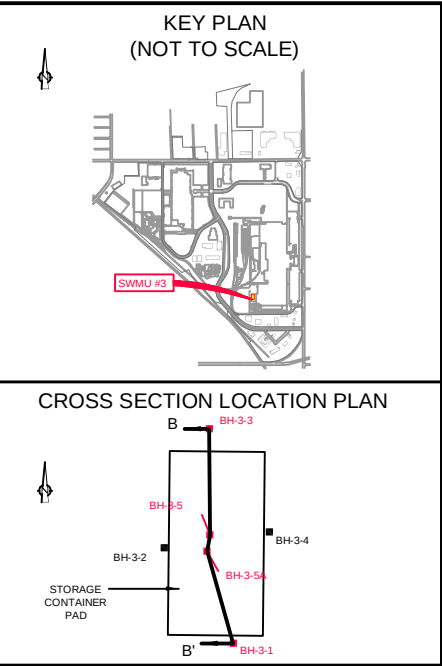
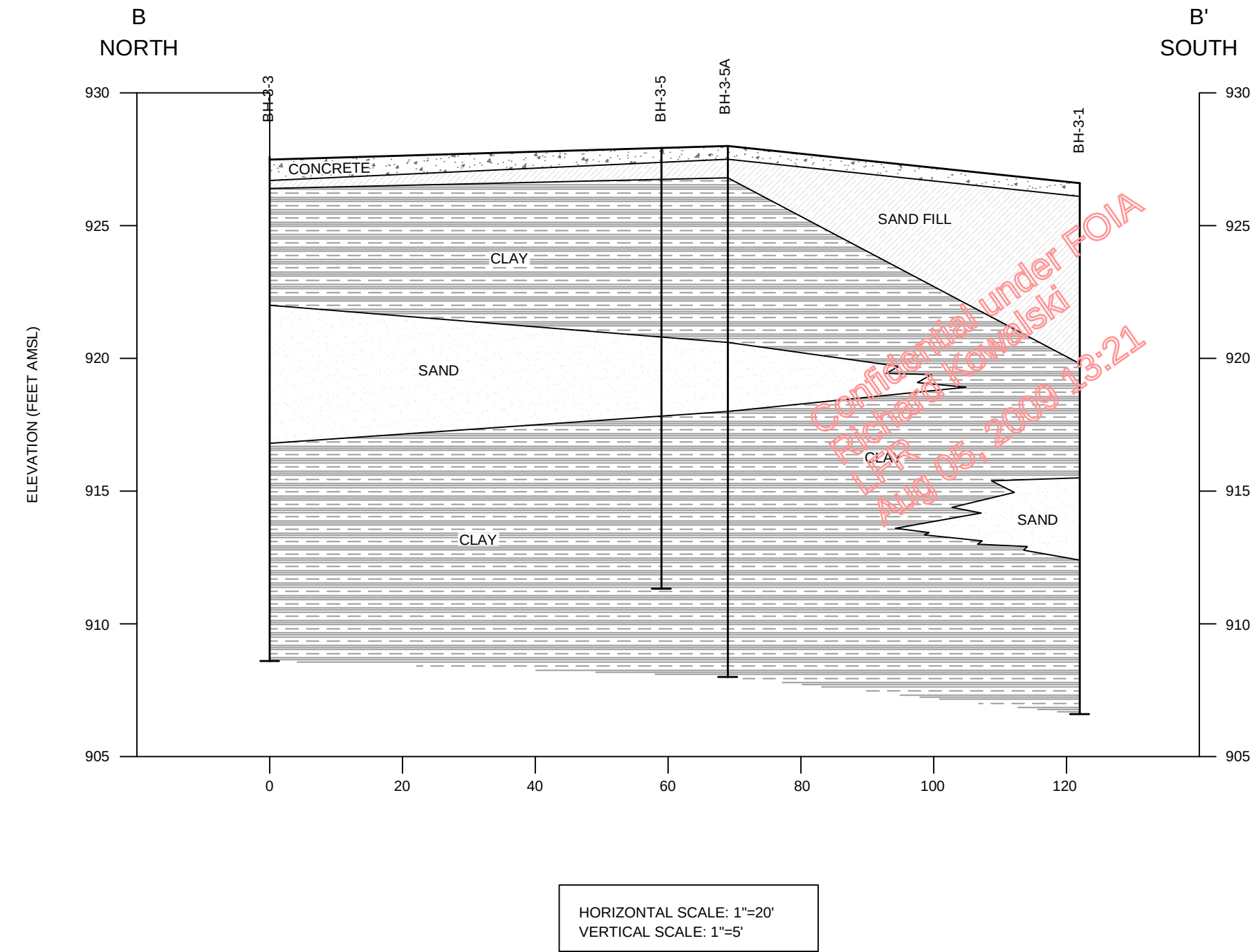
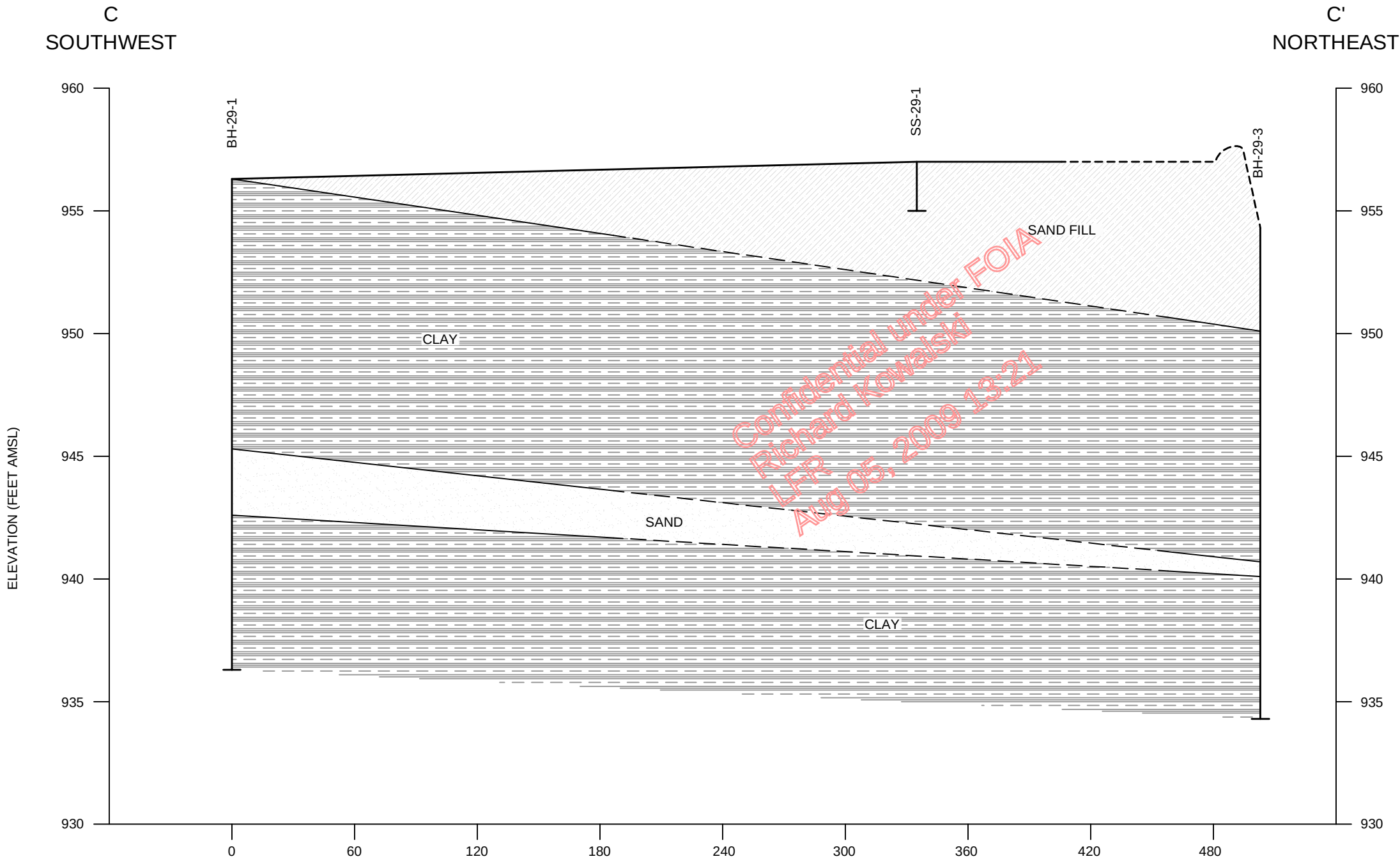
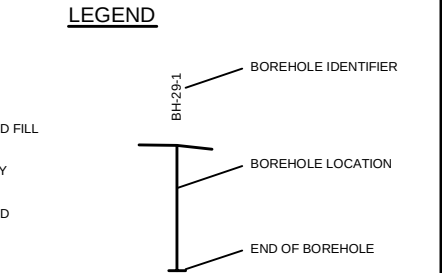
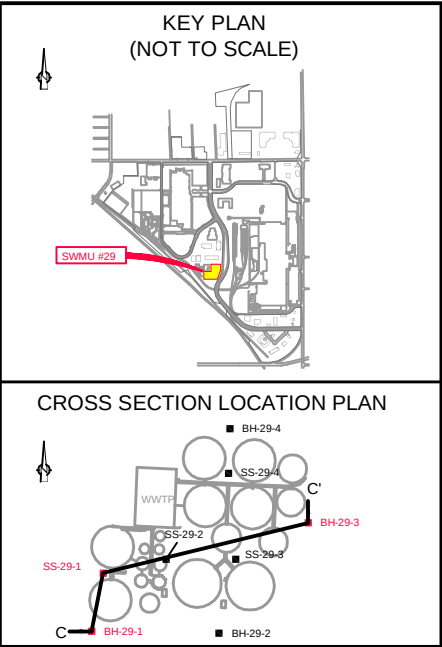


figure 5.2
NORTH-SOUTH GEOLOGIC CROSS SECTION B-B'
SWMU #3-CONTAINER STORAGE AREA
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan





HORIZONTAL SCALE: 1"=60'
VERTICAL SCALE: 1"=5'

figure 5.3
SOUTHWEST-NORTHEAST GEOLOGIC CROSS SECTION C-C'
SWMU #29-WASTEWATER TREATMENT TANK AREA
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan

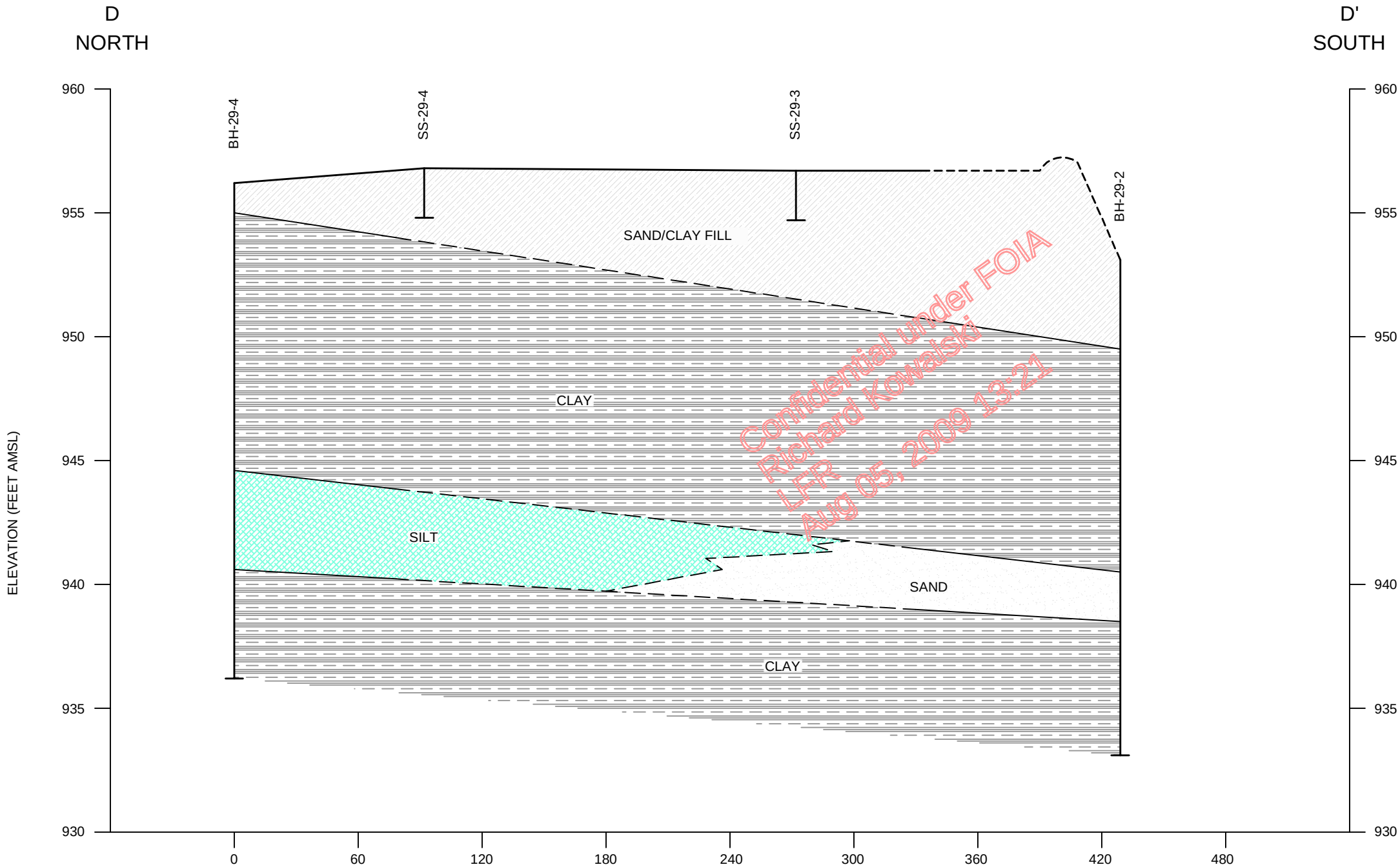
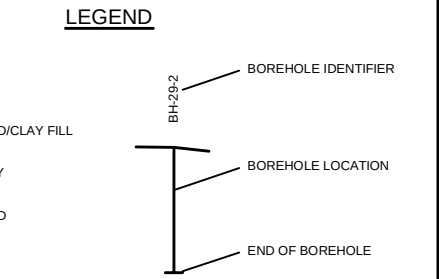
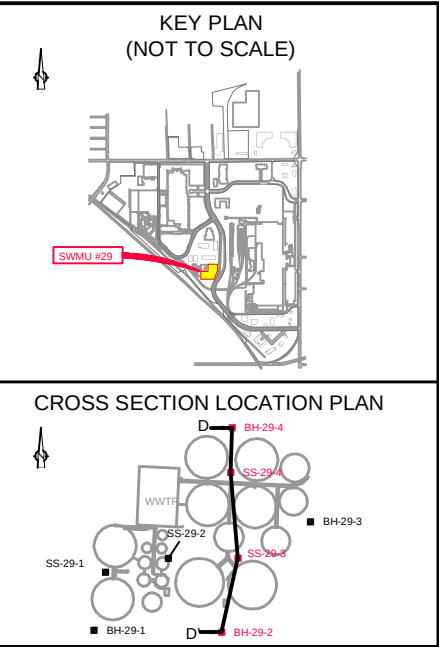
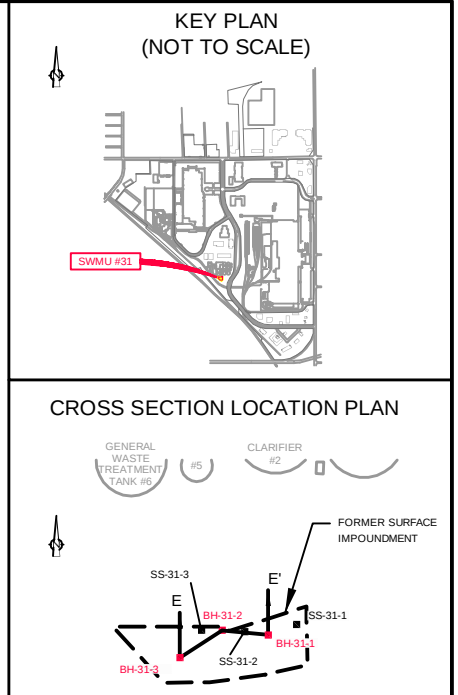
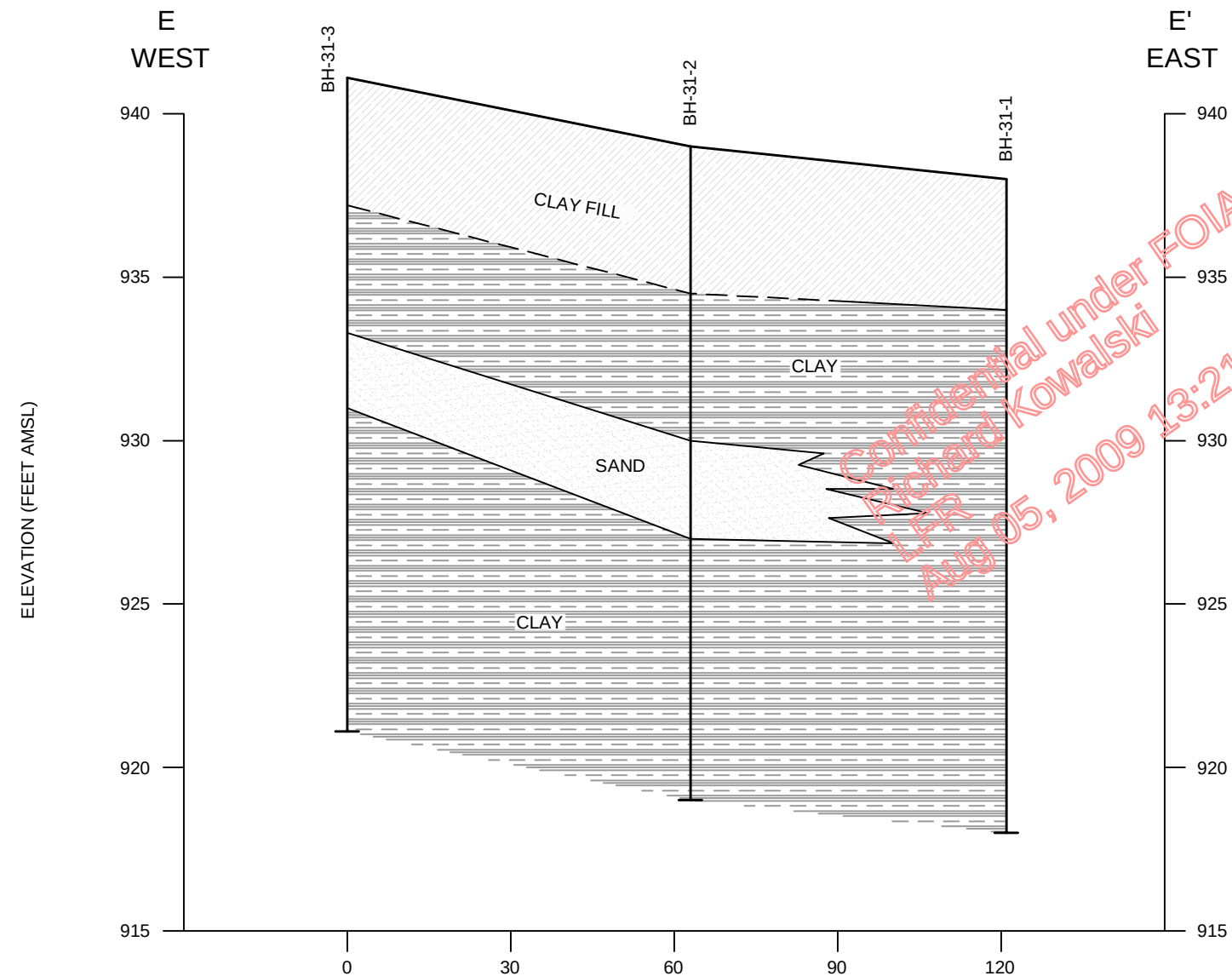


figure 5.4
NORTH-SOUTH GEOLOGIC CROSS SECTION D-D'
SWMU #29-WASTEWATER TREATMENT TANK AREA
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan



LEGEND

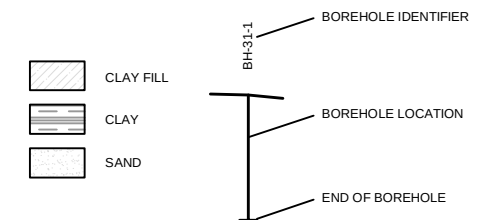


figure 5.5

EAST-WEST GEOLOGIC CROSS SECTION E-E'
SWMU #31-FORMER SURFACE IMPOUNDMENT
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan

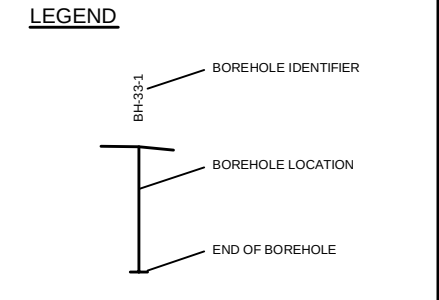
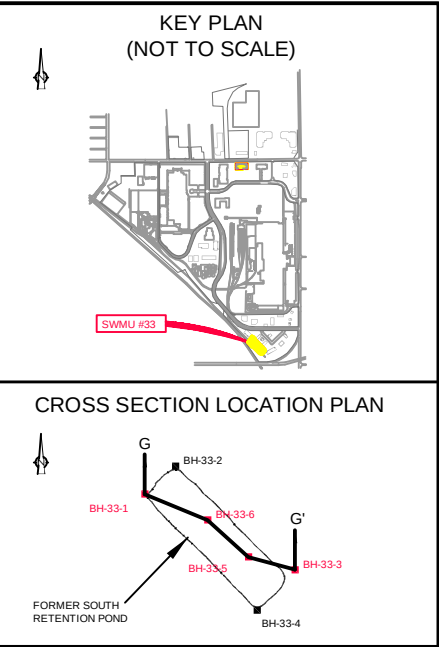
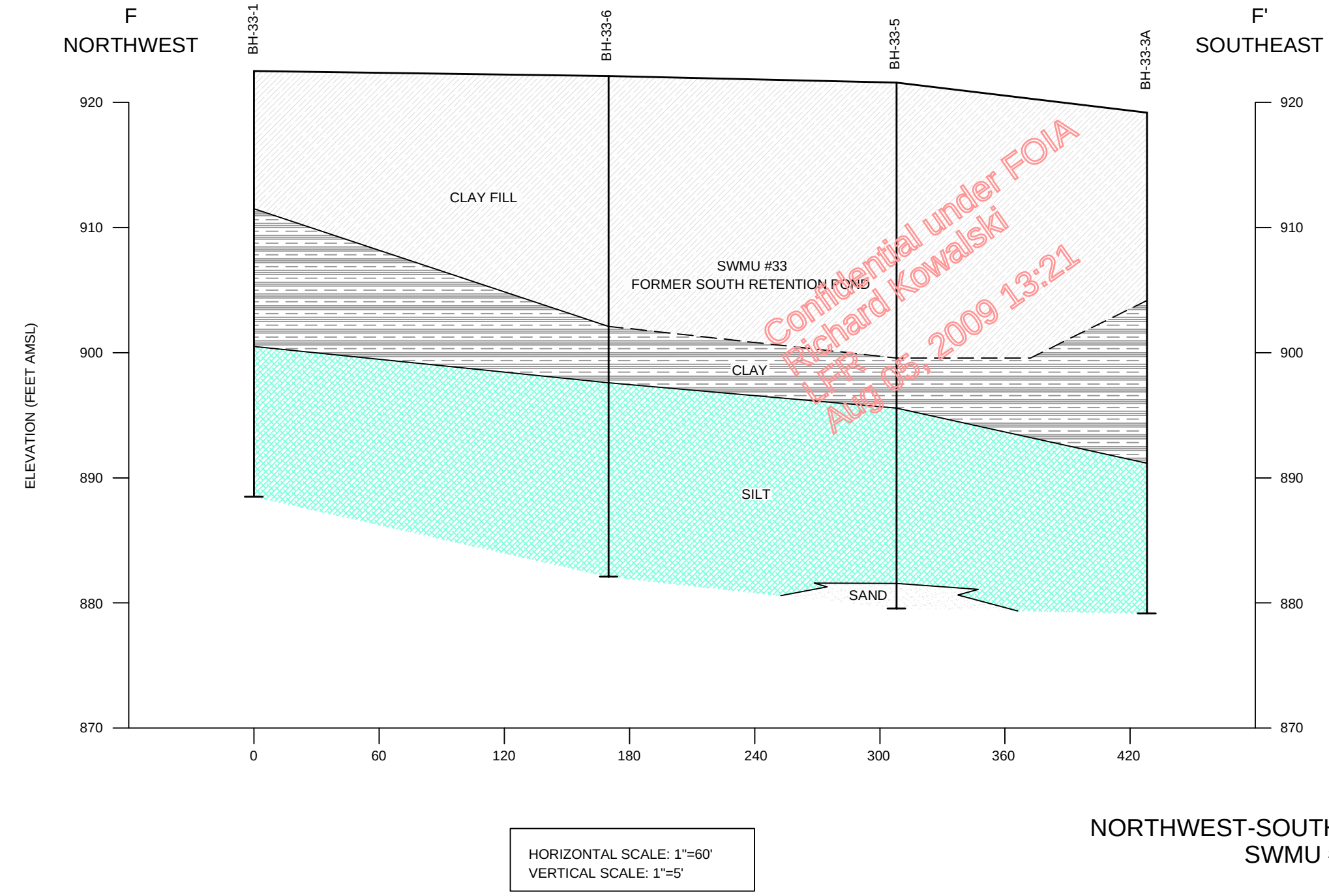
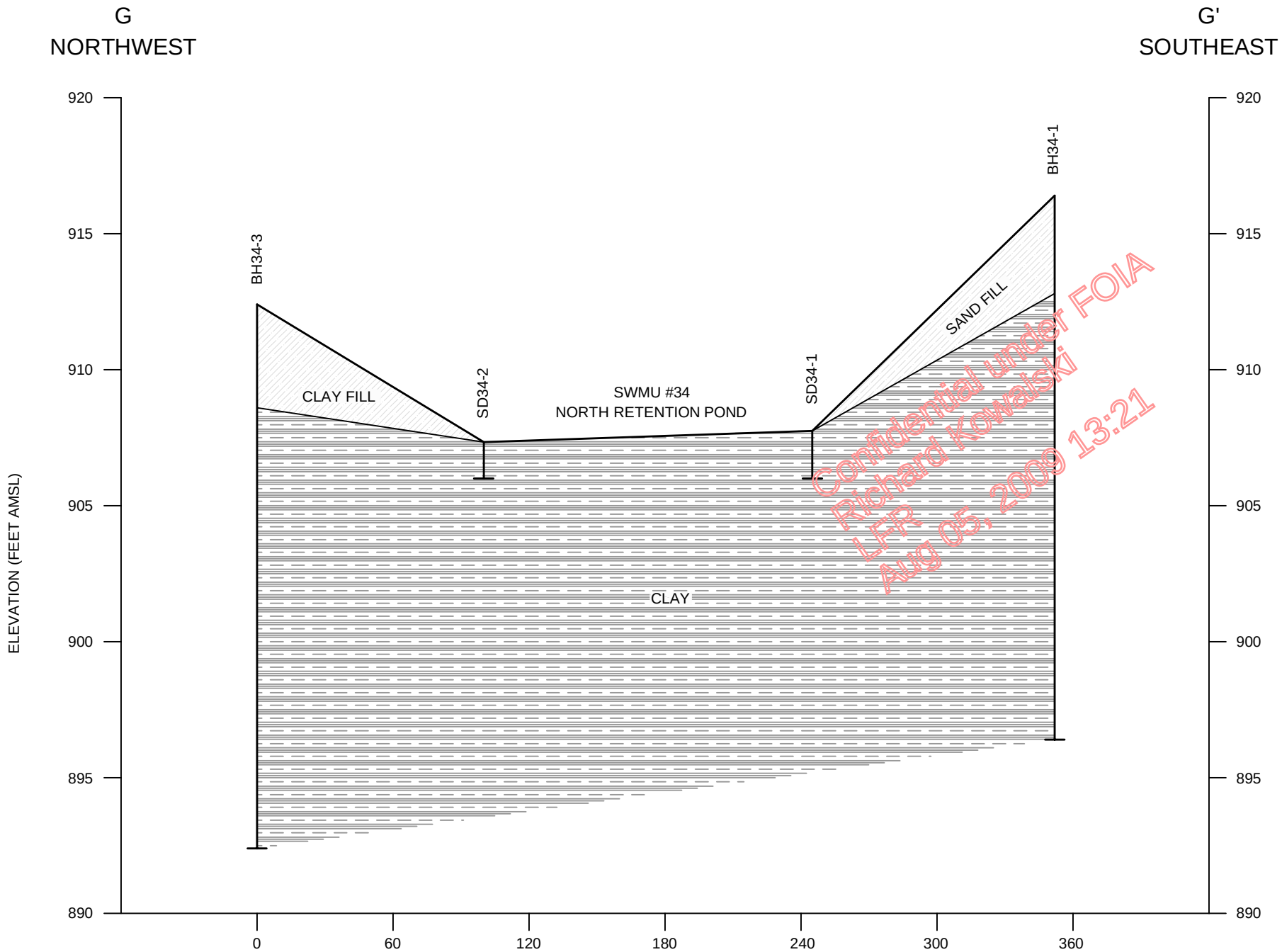
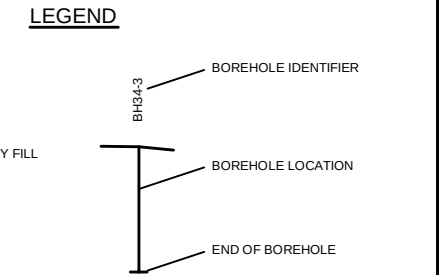
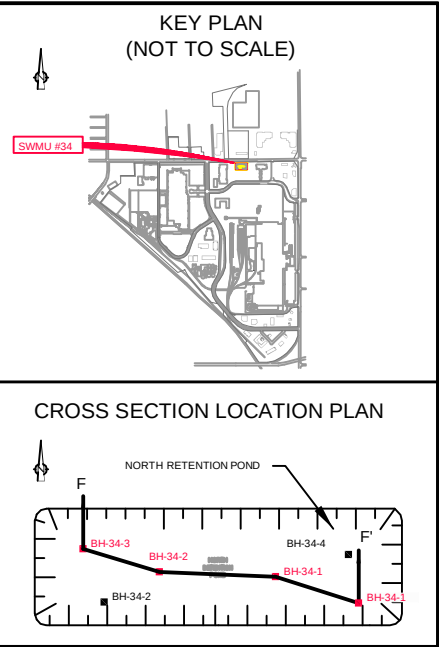


figure 5.6
NORTHWEST-SOUTHEAST GEOLOGIC CROSS SECTION F-F'
SWMU #33-FORMER SOUTH RETENTION POND
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan





HORIZONTAL SCALE: 1"=60'
VERTICAL SCALE: 1"=5'

figure 5.7
NORTHWEST-SOUTHEAST GEOLOGIC CROSS SECTION G-G'
SWMU #34-NORTH RETENTION POND
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan



① LOOKING EAST AT GUARD HOUSE RESTRICTING ACCESS THROUGH SWMU #31



④ LOOKING NORTH AT SWMU #31
(ROAD RUNS UNDERNEATH CENTERPOINT PARKWAY THROUGH SWMU #31)



② LOOKING NORTH AT ROAD THROUGH SWMU #31 (WWTP IN BACKGROUND)



③ STANDING NEAR WWTP LOOKING SOUTHEAST TOWARD SWMU #31 AND TUNNEL UNDER
CENTERPOINT PARKWAY (GUARD HOUSE BEYOND TUNNEL NOT SHOWN)

figure 6.1
SITE PHOTOGRAPHS
RFI REPORT
GENERAL MOTORS CORPORATION
Pontiac, Michigan



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**INVESTIGATION SUMMARY
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

SWMU # (1)	Description	Number of Boreholes	Number of Sediment Samples	Number of Surface Soil Samples	Number of Subsurface Soil Samples	Number of Perched Groundwater Samples	Number of QC Samples (Duplicate MS/MSD or Rinsate) (2)	Total Number of Investigative Samples	Analytical Parameters (4)
#3	Container Storage Area	6 ⁽⁵⁾	0	5	5	1	1 ⁽⁶⁾	10	TCL/TAL (3), Appendix IX ⁽⁷⁾
#29	Wastewater Treatment Tank Area	8	0	3	4	0	3	10	TCL/TAL (3), Appendix IX
#31	Former Surface Impoundment	6	0	4	2	1	2	8	TAL Inorganics, Appendix IX ⁽⁷⁾
#33	Former South Retention Pond (AOC)	7 ⁽⁵⁾	0	4	6	0	3	13	TCL/TAL (3), Appendix IX
#34	North Retention Pond (AOC)	4	2	0	4	0	2	8	TCL/TAL (3), Appendix IX
TOTAL		31	2	16	21	2	11	49	

Notes:

- (1) - See "Removal Action Design Report", March 1997, for a summary of SWMU #30 investigation activity (Appendix I). Consistent with the April 29, 1998 meeting between the U.. EPA and GM, the Coal Pile Storage Area (SWMU #32) will be addressed as an IM under separate cover.
- (2) - QA/QC samples (see QAPP, Appendix C, for frequency).
- (3) - TCL/TAL - Target Compound List/Target Analyte List (with the exception of pesticides/herbicides).
- (4) - RCRA Appendix IX samples (excluding pesticides, herbicides, dioxin, and furans) will be collected at a frequency of 1 per 10 investigative samples (or a minimum of one at each SWMU).
- (5) - Includes additional boring installed after one of the original borings was terminated after auger refusal conditions were encountered.
- (6) - Duplicate sample collected for perched groundwater.
- (7) - Perched groundwater samples were not analyzed for RCRA Appendix IX parameters.

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SAMPLE KEY

RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Sample Identification	Sample Location	Sample Interval (ft. bgs)	QA/QC	Analysis
A. Phase I: Soil Investigation				
S-7097-120198-TJ-019	BH-29-4	4 - 6	MS/MSD	TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120198-TJ-020	BH-29-3	4 - 6		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120198-TJ-021	BH-29-2	4 - 6		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120198-TJ-022	BH-29-1	10 - 12	Field Rinsate	TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
W-7097-120198-TJ-023	Split Spoon Sampler			TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SS-7097-120298-TJ-024	SS-29-4	10" - 2		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SS-7097-120298-TJ-025	SS-29-4	10" - 2	Duplicate	TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SS-7097-120298-TJ-026	SS-29-3	10" - 2		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SS-7097-120298-TJ-027	SS-29-2	10" - 2		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SS-7097-120298-TJ-028	SS-29-1	10" - 2		Appendix IX
SS-7097-120298-TJ-029	BH-3-3	1 - 3		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120298-TJ-030	BH-3-3	5 - 7		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SS-7097-120298-TJ-031	BH-3-2	1 - 3		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120298-TJ-032	BH-3-2	7 - 9		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SS-7097-120298-TJ-033	BH-3-1	6" - 2		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120298-TJ-034	BH-3-1	6 - 8		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SS-7097-120398-TJ-035	BH-3-4	1 - 3		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120398-TJ-036	BH-3-4	3 - 5		Appendix IX
SS-7097-120798-TJ-044	BH-3-5	8" - 2'		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120798-TJ-045	BH-3-5	4 - 6'		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
W-7097-120398-TJ-037	Split Spoon Sampler		Field Rinsate	Appendix IX
S-7097-120398-TJ-038	BH-34-3	2 - 4		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120498-TJ-039	BH-34-2	2 - 4		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SD-7097-120498-TJ-040	SD-34-1	0 - 1		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
SD-7097-120498-TJ-041	SD-34-2	0 - 1	Duplicate	Appendix IX
S-7097-120498-TJ-042	BH-34-1	2 - 4		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120498-TJ-043	BH-34-1	2 - 4		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120898-TJ-046	BH-34-4	2 - 4		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120998-DS-047	BH-33-5	28 - 30		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-120998-DS-048	BH-33-3	15 - 16		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
W-7097-121098-DS-049	BH-33-3		Field Rinsate	TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-121098-DS-052	BH-33-3	26 - 28	Duplicate	TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-121198-DS-057	BH-33-6	22 - 24		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-121698-DS-058	BH-33-4	16 - 18		Appendix IX
S-7097-121698-DS-059	BH-33-4	20 - 22		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-121698-DS-060	BH-33-4	20 - 22		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-121798-DS-063	BH-33-2	16 - 18		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-121798-DS-064	BH-33-2	34 - 36		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-121898-DS-065	BH-33-1	14-16		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
S-7097-121898-DS-066	BH-33-1	18-20		Appendix IX

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SAMPLE KEY

RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Sample Identification	Sample Location	Sample Interval (ft. bgs)	QA/QC	Analysis
S-7097-121898-DS-067	BH-33-1	18-20	Duplicate	Appendix IX
S-7097-121098-DS-050	BH-31-1	8 - 10	Duplicate	TAL Inorganics
S-7097-121098-DS-051	BH-31-1	8 - 10		TAL Inorganics
S-7097-121198-DS-053	BH-31-3	4 - 6		TAL Inorganics
S-7097-121198-DS-054 ¹	SS-31-1	0 - 2		TAL Inorganics
S-7097-121198-DS-055 ¹	SS-31-2	0 - 2	Field Rinsate	TCL VOC/TAL Inorganics
S-7097-121198-DS-056 ¹	SS-31-3	0 - 2		TAL Inorganics
S-7097-121798-DS-061	BH-31-2	1 - 1.5		Appendix IX
W-7097-121798-DS-062	BH-31-2	Split Spoon Sampler		TCL VOC/TAL Inorganics
B Phase II: Perched Groundwater Investigation				
GW-7097-081700-TJ-001	MW3-1	groundwater	Duplicate	TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
GW-7097-081700-TJ-002	MW3-1	groundwater		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics
GW-7097-081700-TJ-003	MW31-1	groundwater		TCL VOCs/TCL SVOCs/TCL PCBs/TAL Inorganics

Note:

1 - Labelled as "S" during field activities

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LFR TABLE 5.1

SWMU #3
CONTAMINATED AREA
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-3-1	BH-3-1	BH-3-2
Sample Interval:	0.5-2 ft.	6-8 ft.	1-3 ft.
Sample ID:	SS-7097-120298-TJ-033	S-7097-120298-TJ-034	SS-7097-120298-TJ-031
Sample Date:	12/2/1998	12/2/1998	12/2/1998

ParameterGIDCV (1)TCL Semi-volatile Organics (mg/kg)

2-METHYLNAPHTHALENE	40,000	ND(0.3)	ND(0.3)	ND(0.3)
ACENAPHTHENE	200,000	0.08 J	ND(0.3)	0.09 J
ANTHRACENE	1,000,000	0.2 J	ND(0.3)	0.3 J
BENZO(A)ANTHRACENE	100	0.4	0.1 J	0.5
BENZO(A)PYRENE	10	0.4	0.1 J	0.5
BENZO(B)FLUORANTHENE	100	0.4	0.1 J	0.5
BENZO(G,H,I)PERYLENE	9,100	0.2 J	0.06 J	0.3 J
BENZO(K)FLUORANTHENE	1,000	0.4	0.09 J	0.5
BIS(2-ETHYLHEXYL) PHTHALATE	10,000	ND(0.3)	ND(0.3)	0.1 J
CARBAZOLE	3,700	0.09 J	ND(0.3)	0.2 J
CHRYSENE	10,000	0.5	0.1 J	0.6
DIBENZ(A,H)ANTHRACENE	10	0.06 J	0.07 J	0.06 J
DIBENZOFURAN	ID	ND(0.3)	ND(0.3)	0.1 J
FLUORANTHENE	180,000	1.2	0.3 J	1.4
FLUORENE	130,000	0.08 J	ND(0.3)	0.2 J
INDENO(1,2,3-CD)PYRENE	100	0.3 J	ND(0.3)	0.3
NAPHTHALENE	80,000	ND(0.3)	ND(0.3)	0.09 J
PHENANTHRENE	8,000	0.9	0.2 J	1.2
PHENOL	12,000	0.3 J	0.1 J	ND(0.3)
PYRENE	110,000	1.1	0.3 J	1.2

TCL - Polychlorinated Biphenyls (PCBs) (mg/kg)

AROCLOR 1254	9.9 (3)	ND(0.33)	ND(0.33)	0.05 J
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TAL Metals (mg/kg)

ALUMINUM, TOTAL	660,000	5,160	5,600	6,660
ANTIMONY, TOTAL	1,200	8.03 J	0.03 J	0.08 J
ARSENIC, TOTAL	61	5.3	3.5	6.4
BARIUM, TOTAL	250,000	27	32	59
BERYLLIUM, TOTAL	3,100	0.28	0.22	0.45
CADMIUM, TOTAL	4,100	0.22	0.16	0.33
CALCIUM, TOTAL	NR	69,500	78,500	153,000
CHROMIUM, TOTAL	17,000 (2)	8.2	9.0	36
COBALT, TOTAL	18,000	4.54	3.77	3.23
COPPER, TOTAL	140,000	9.98	7.5	9.1
IRON, TOTAL	1,000,000	8,570	11,000	8,140
LEAD, TOTAL	900	9.44	8.19	16.2
MAGNESIUM, TOTAL	1,000,000	10,300	24,800	17,800
MANGANESE, TOTAL	170,000	286	380	397
MERCURY, TOTAL	1,100	0.02 J	0.03 J	0.04 J
NICKEL, TOTAL	270,000	11.6	9.6	11.2
POTASSIUM, TOTAL	NR	ND(400)	650	699
SELENIUM, TOTAL	18,000	U(0.6)	U(0.6)	U(0.7)
SILVER, TOTAL	17,000	0.04	0.05	0.07
SODIUM, TOTAL	1,000,000	192	234	450
THALLIUM, TOTAL	240	0.14	0.13	0.10
VANADIUM, TOTAL	10,000	14	15	16
ZINC, TOTAL	1,000,000	28	38	42

General Chemistry (mg/kg)

CYANIDE, TOTAL	250	ND(0.5)	ND(0.5)	ND(0.5)
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Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

☐ Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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LFR TABLE 5.1

SWMU #3
 CONTAMINATED AREA
 SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
 RCRA FACILITY INVESTIGATION REPORT
 GENERAL MOTORS CORPORATION
 PONTIAC, MICHIGAN

Location:	BH-3-2	BH-3-3	BH-3-3
Sample Interval:	7-9 ft.	1-3 ft.	5-7 ft.
Sample ID:	S-7097-120298-TJ-032	SS-7097-120298-TJ-029	S-7097-120298-TJ-030
Sample Date:	12/2/1998	12/2/1998	12/2/1998
Parameter	GIDCV (1)		
TCL Semi-volatile Organics (mg/kg)			
2-METHYLNAPHTHALENE	40,000	ND(0.3)	ND(0.3)
ACENAPHTHENE	200,000	ND(0.3)	ND(0.3)
ANTHRACENE	1,000,000	ND(0.3)	ND(0.3)
BENZO(A)ANTHRACENE	100	ND(0.3)	ND(0.3)
BENZO(A)PYRENE	10	ND(0.3)	ND(0.3)
BENZO(B)FLUORANTHENE	100	ND(0.3)	ND(0.3)
BENZO(G,H,I)PERYLENE	9,100	ND(0.3)	ND(0.3)
BENZO(K)FLUORANTHENE	1,000	ND(0.3)	ND(0.3)
BIS(2-ETHYLHEXYL) PHTHALATE	10,000	ND(0.3)	ND(0.3)
CARBAZOLE	3,700	ND(0.3)	ND(0.3)
CHRYSENE	10,000	ND(0.3)	ND(0.3)
DIBENZ(A,H)ANTHRACENE	10	ND(0.3)	ND(0.3)
DIBENZOFURAN	ID	ND(0.3)	ND(0.3)
FLUORANTHENE	180,000	ND(0.3)	ND(0.3)
FLUORENE	130,000	ND(0.3)	ND(0.3)
INDENO(1,2,3-CD)PYRENE	100	ND(0.3)	ND(0.3)
NAPHTHALENE	80,000	ND(0.3)	ND(0.3)
PHENANTHRENE	8,000	ND(0.3)	ND(0.3)
PHENOL	12,000	ND(0.3)	ND(0.3)
PYRENE	110,000	ND(0.3)	ND(0.3)
TCL - Polychlorinated Biphenyls (PCBs) (mg/kg)			
AROCLOR 1254	9.9 (3)	ND(0.33)	ND(0.33)
TAL Metals (mg/kg)			
ALUMINUM, TOTAL	660,000	8,620	9,040
ANTIMONY, TOTAL	1,200	0.03 J	0.03 J
ARSENIC, TOTAL	61	5.2	4.2
BARIUM, TOTAL	250,000	39	115
BERYLLIUM, TOTAL	3,100	0.52	0.40
CADMIUM, TOTAL	4,100	0.32	0.19
CALCIUM, TOTAL	NR	72,500	72,400
CHROMIUM, TOTAL	17,000 (2)	13.3	16
COBALT, TOTAL	18,000	8.79	7.75
COPPER, TOTAL	140,000	15.9	12.9
IRON, TOTAL	1,000,000	14,600	16,000
LEAD, TOTAL	900	9.85	8.44
MAGNESIUM, TOTAL	1,000,000	20,800	22,300
MANGANESE, TOTAL	170,000	300	344
MERCURY, TOTAL	1,100	0.02 J	0.02 J
NICKEL, TOTAL	270,000	24.1	21.3
POTASSIUM, TOTAL	NR	1,500	1,900
SELENIUM, TOTAL	18,000	U(0.5) J	U(0.8)
SILVER, TOTAL	17,000	0.06	0.07
SODIUM, TOTAL	1,000,000	166	2,440
THALLIUM, TOTAL	240	0.26	0.26
VANADIUM, TOTAL	10,000	21	23
ZINC, TOTAL	1,000,000	36	42
General Chemistry (mg/kg)			
CYANIDE, TOTAL	250	ND(0.5)	ND(0.5)

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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LFR TABLE 5.1

SWMU #3
 CONTAMINATED AREA
 SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
 RCRA FACILITY INVESTIGATION REPORT
 GENERAL MOTORS CORPORATION
 PONTIAC, MICHIGAN

Location:	BH-3-4	BH-3-5	BH-3-5
Sample Interval:	1-3 ft.	4-6 ft.	0.7-2 ft.
Sample ID:	SS-7097-120298-TJ-035	S-7097-120798-TJ-045	SS-7097-120798-TJ-044
Sample Date:	12/2/1998	12/7/1998	12/7/1998
Parameter	GIDCV (1)		
TCL Semi-volatile Organics (mg/kg)			
2-METHYLNAPHTHALENE	40,000	0.3	ND(0.3)
ACENAPHTHENE	200,000	1.5	ND(0.3)
ANTHRACENE	1,000,000	2.6	ND(0.3)
BENZO(A)ANTHRACENE	100	3.2	ND(0.3)
BENZO(A)PYRENE	10	2.6	ND(0.3)
BENZO(B)FLUORANTHENE	100	3.3	ND(0.3)
BENZO(G,H,I)PERYLENE	9,100	1.2	ND(0.3)
BENZO(K)FLUORANTHENE	1,000	1.4	ND(0.3)
BIS(2-ETHYLHEXYL) PHTHALATE	10,000	ND(0.3)	ND(0.3)
CARBAZOLE	3,700	1.6	ND(0.3)
CHRYSENE	10,000	2.9	ND(0.3)
DIBENZ(A,H)ANTHRACENE	10	0.4	ND(0.3)
DIBENZOFURAN	ID	1.2	ND(0.3)
FLUORANTHENE	180,000	9.7	ND(0.3)
FLUORENE	130,000	1.8	ND(0.3)
INDENO(1,2,3-CD)PYRENE	100	1.4	ND(0.3)
NAPHTHALENE	80,000	0.3	ND(0.3)
PHENANTHRENE	8,000	2.2	ND(0.3)
PHENOL	12,000	0.4	ND(0.3)
PYRENE	110,000	8.3	ND(0.3)
TCL - Polychlorinated Biphenyls (PCBs) (mg/kg)			
AROCLOR 1254	9.9 (3)	0.13 J	ND(0.33)
TAL Metals (mg/kg)			
ALUMINUM, TOTAL	660,000	5,500	7,990
ANTIMONY, TOTAL	1,200	0.12	U(0.03) J
ARSENIC, TOTAL	61	5.4	5.2
BARIUM, TOTAL	250,000	45	43
BERYLLIUM, TOTAL	3,100	0.42	0.42
CADMIUM, TOTAL	4,100	0.26	0.23
CALCIUM, TOTAL	NR	108,000	70,600
CHROMIUM, TOTAL	17,000 (2)	9	14
COBALT, TOTAL	18,000	4.7	6.74
COPPER, TOTAL	140,000	10	13.9
IRON, TOTAL	1,000,000	8,940	15,600
LEAD, TOTAL	900	14	7.33
MAGNESIUM, TOTAL	1,000,000	20,600	21,300
MANGANESE, TOTAL	170,000	334	260
MERCURY, TOTAL	1,100	ND(0.1)	ND(0.1)
NICKEL, TOTAL	270,000	12.6	20.9
POTASSIUM, TOTAL	NR	710	1,400
SELENIUM, TOTAL	18,000	0.9	0.5 J
SILVER, TOTAL	17,000	0.05	0.06 J
SODIUM, TOTAL	1,000,000	338	137
THALLIUM, TOTAL	240	0.13	0.24
VANADIUM, TOTAL	10,000	15	20
ZINC, TOTAL	1,000,000	39	42
General Chemistry (mg/kg)			
CYANIDE, TOTAL	250	ND(0.5)	0.4

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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LFR TABLE 5.2

Aug 05, 2009 13:21
SWMU #3

**CONTAINER STORAGE AREA
SUMMARY OF DETECTED APPENDIX IX RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

Location: BH-3-4
Sample Interval: 3-5 ft.
Sample ID: S-7097-120398-TJ-036
Sample Date: 12/3/1998

Parameter GIDCV (1)Appendix IX - Semi-Volatile Organics (mg/kg)

ACENAPHTHENE	200,000	0.2 J
ANTHRACENE	1,000,000	0.4
BENZO(A)ANTHRACENE	100	0.5
BENZO(A)PYRENE	10	0.4
BENZO(B)FLUORANTHENE	100	0.3
BENZO(G,H,I)PERYLENE	9,100	0.3 J
BENZO(K)FLUORANTHENE	1,000	0.3
CHRYSENE	10,000	0.5
DIBENZ(A,H)ANTHRACENE	10	0.06 J
DIBENZOFURAN	10	0.2 J
FLUORANTHENE	180,000	1.7
FLUORENE	130,000	0.3 J
INDENO(1,2,3-CD)PYRENE	100	0.3 J
NAPHTHALENE	80,000	0.06 J
PHENANTHRENE	8,000	1.7
PYRENE	110,000	1.1

Appendix IX - Metals (mg/kg)

ANTIMONY, TOTAL	1,200	0.09
ARSENIC, TOTAL	61	8.1
BARIUM, TOTAL	250,000	20.0
BERYLLIUM, TOTAL	3,100	0.31
CADMIUM, TOTAL	4,100	0.46
CHROMIUM, TOTAL	17,000 (2)	9.0
COBALT, TOTAL	18,000	6.05
COPPER, TOTAL	140,000	15.2
LEAD, TOTAL	900	9.48
NICKEL, TOTAL	270,000	21.9
SELENIUM, TOTAL	18,000	0.4 J
THALLIUM, TOTAL	240	0.42
VANADIUM, TOTAL	10,000	15.0
ZINC, TOTAL	1,000,000	65.0

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

	Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.
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LFR TABLE 5.3

Aug 05, 2009 13:21
SWM #3CONTAINER STORAGE AREA
SUMMARY OF DETECTED TIC RESULTS IN SOIL
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-3-1	BH-3-1	BH-3-2
Sample Interval:	0.5-2 ft.	6-8 ft.	1-3 ft.
Sample ID:	SS-7097-120298-TJ-033	S-7097-120298-TJ-034	SS-7097-120298-TJ-031
Sample Date:	12/2/1998	12/2/1998	12/2/1998

ParameterTCL Semi-volatile Organics TIC (mg/kg)

1,1'-BIPHENYL, 2-METHYL- A	NI	NI	NI
11H-BENZOFUORENE ISOMER A	NI	NI	NI
11H-BENZOFUORENE ISOMER B	NI	NI	NI
2-PROPANOL, 1-BUTOXY- A	NI	NI	NI
BENZO(G,H,I)FLUORANTHENE A	NI	NI	0.2 NJ
D-LIMONENE A	NI	NI	NI
DODECANE A	NI	NI	NI
EICOSANE A	0.2 NJ	NI	NI
ETHANOL, 2-BUTOXY-, PHOSPHATE (3:1) A	NI	NI	NI
HEPTADECANE A	0.3 NJ	0.2 NJ	0.2 NJ
HEXADECANE A	0.3 NJ	0.2 NJ	NI
NONADECANE A	0.3 NJ	NI	NI
OCTADECANE A	NI	NI	NI
PENTADECANE A	NI	NI	NI
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NI	0.2 NJ	NI
PROPANOL ISOMER A	NI	NI	NI
PROPANOL ISOMER B	NI	NI	NI
TETRADECANE A	NI	NI	0.2 NJ
TRIDECANE A	NI	NI	NI
UNDECANE A	NI	NI	NI
UNKNOWN A	0.7 NJ	0.4 NJ	0.5 NJ
UNKNOWN B	0.2 NJ	0.8 NJ	0.3 NJ
UNKNOWN C	0.4 NJ	0.2 NJ	NI
UNKNOWN D	NI	0.7 NJ	NI
UNKNOWN E	NI	0.3 NJ	NI
UNKNOWN ALCOHOL A	NI	0.5 NJ	NI
UNKNOWN ALCOHOL B	NI	1.1 NJ	NI
UNKNOWN ALCOHOL C	NI	NI	NI
UNKNOWN ALKANE A	0.2 NJ	NI	0.2 NJ
UNKNOWN ALKANE B	0.3 NJ	NI	0.2 NJ
UNKNOWN ALKANE C	0.2 NJ	NI	0.2 NJ
UNKNOWN ALKANE D	NI	NI	NI
UNKNOWN PAH A	NI	NI	0.2 NJ
UNKNOWN PAH B	NI	NI	0.2 NJ
UNKNOWN PAH C	NI	NI	NI

Appendix IX - Semi-volatile TIC (mg/kg)

BENZO(E)PYRENE A	NA	NA	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NA	NA	NA
UNKNOWN A	NA	NA	NA
UNKNOWN B	NA	NA	NA
UNKNOWN C	NA	NA	NA
UNKNOWN ALKANE A	NA	NA	NA
UNKNOWN ALKANE B	NA	NA	NA
UNKNOWN PAH A	NA	NA	NA
UNKNOWN PAH B	NA	NA	NA
UNKNOWN PAH C	NA	NA	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively identified compound (TIC) and represents an estimated value.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

LFR TABLE 5.3

SWM #3

CONTAINER STORAGE AREA
SUMMARY OF DETECTED TIC RESULTS IN SOIL
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-3-2	BH-3-3	BH-3-3
Sample Interval:	7-9 ft.	1-3 ft.	5-7 ft.
Sample ID:	S-7097-120298-TJ-032	SS-7097-120298-TJ-029	S-7097-120298-TJ-030
Sample Date:	12/2/1998	12/2/1998	12/2/1998

ParameterTCL Semi-volatile Organics TIC (mg/kg)

1,1'-BIPHENYL, 2-METHYL- A	NI	NI	NI
11H-BENZOFUORENE ISOMER A	NI	NI	NI
11H-BENZOFUORENE ISOMER B	NI	NI	NI
2-PROPANOL, 1-BUTOXY- A	NI	NI	0.7 NJ
BENZO(G,H,I)FLUORANTHENE A	NI	NI	NI
D-LIMONENE A	NI	0.7 NJ	NI
DODECANE A	0.5 NJ	0.4 NJ	NI
EICOSANE A	NI	NI	NI
ETHANOL, 2-BUTOXY-, PHOSPHATE (3:1) A	NI	NI	NI
HEPTADECANE A	0.5 NJ	0.4 NJ	0.3 NJ
HEXADECANE A	0.5 NJ	NI	NI
NONADECANE A	NI	NI	NI
OCTADECANE A	0.4 NJ	NI	0.3 NJ
PENTADECANE A	0.6 NJ	NI	0.2 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	0.6 NJ	0.6 NJ	0.4 NJ
PROPANOL ISOMER A	NI	NI	NI
PROPANOL ISOMER B	NI	NI	NI
TETRADECANE A	NI	NI	NI
TRIDECANE A	0.4 NJ	0.4 NJ	NI
UNDECANE A	0.5 NJ	NI	NI
UNKNOWN A	1.1 NJ	0.9 NJ	0.7 NJ
UNKNOWN B	0.6 NJ	NI	NI
UNKNOWN C	NI	NI	NI
UNKNOWN D	NI	NI	NI
UNKNOWN E	NI	NI	NI
UNKNOWN ALCOHOL A	NI	NI	0.6 NJ
UNKNOWN ALCOHOL B	NI	NI	1.1 NJ
UNKNOWN ALCOHOL C	NI	NI	0.4 NJ
UNKNOWN ALKANE A	NI	0.5 NJ	0.3 NJ
UNKNOWN ALKANE B	NI	0.5 NJ	NI
UNKNOWN ALKANE C	NI	0.4 NJ	NI
UNKNOWN ALKANE D	NI	0.5 NJ	NI
UNKNOWN PAH A	NI	NI	NI
UNKNOWN PAH B	NI	NI	NI
UNKNOWN PAH C	NI	NI	NI

Appendix IX - Semi-volatile TIC (mg/kg)

BENZO(E)PYRENE A	NA	NA	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NA	NA	NA
UNKNOWN A	NA	NA	NA
UNKNOWN B	NA	NA	NA
UNKNOWN C	NA	NA	NA
UNKNOWN ALKANE A	NA	NA	NA
UNKNOWN ALKANE B	NA	NA	NA
UNKNOWN PAH A	NA	NA	NA
UNKNOWN PAH B	NA	NA	NA
UNKNOWN PAH C	NA	NA	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively identified compound (TIC) and represents an estimated value.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

LFR TABLE 5.3

SWQ #3

CONTAINER STORAGE AREA
SUMMARY OF DETECTED TIC RESULTS IN SOIL
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-3-4	BH-3-4	BH-3-5
Sample Interval:	1-3 ft.	3-5 ft.	4-6 ft.
Sample ID:	SS-7097-120298-TJ-035	S-7097-120398-TJ-036	S-7097-120798-TJ-045
Sample Date:	12/2/1998	12/3/1998	12/7/1998

ParameterTCL Semi-volatile Organics TIC (mg/kg)

1,1'-BIPHENYL, 2-METHYL- A	0.3 NJ	NA	NI
11H-BENZOFLUORENE ISOMER A	0.5 NJ	NA	NI
11H-BENZOFLUORENE ISOMER B	0.3 NJ	NA	NI
2-PROPANOL, 1-BUTOXY- A	NI	NA	NI
BENZO(G,H,I)FLUORANTHENE A	0.3 NJ	NA	NI
D-LIMONENE A	NI	NA	NI
DODECANE A	NI	NA	NI
EICOSANE A	NI	NA	NI
ETHANOL, 2-BUTOXY-, PHOSPHATE (3:1) A	NI	NA	NI
HEPTADECANE A	NI	NA	0.4 NJ
HEXADECANE A	NI	NA	0.4 NJ
NONADECANE A	NI	NA	0.3 NJ
OCTADECANE A	NI	NA	0.3 NJ
PENTADECANE A	NI	NA	0.5 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NI	NA	0.5 NJ
PROPANOL ISOMER A	NI	NA	NI
PROPANOL ISOMER B	NI	NA	NI
TETRADECANE A	NI	NA	0.3 NJ
TRIDECANE A	NI	NA	NI
UNDECANE A	NI	NA	NI
UNKNOWN A	0.5 NJ	NA	0.9 NJ
UNKNOWN B	0.4 NJ	NA	0.3 NJ
UNKNOWN C	NI	NA	0.3 NJ
UNKNOWN D	NI	NA	NI
UNKNOWN E	NI	NA	NI
UNKNOWN ALCOHOL A	NI	NA	NI
UNKNOWN ALCOHOL B	NI	NA	NI
UNKNOWN ALCOHOL C	NI	NA	NI
UNKNOWN ALKANE A	0.3 NJ	NA	NI
UNKNOWN ALKANE B	NI	NA	NI
UNKNOWN ALKANE C	NI	NA	NI
UNKNOWN ALKANE D	NI	NA	NI
UNKNOWN PAH A	0.3 NJ	NA	NI
UNKNOWN PAH B	1 NJ	NA	NI
UNKNOWN PAH C	1.8 NJ	NA	NI

Appendix IX - Semi-volatile TIC (mg/kg)

BENZO(E)PYRENE A	NA	0.3 NJ	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NA	0.3 NJ	NA
UNKNOWN A	NA	0.6 NJ	NA
UNKNOWN B	NA	0.3 NJ	NA
UNKNOWN C	NA	0.2 NJ	NA
UNKNOWN ALKANE A	NA	0.2 NJ	NA
UNKNOWN ALKANE B	NA	0.2 NJ	NA
UNKNOWN PAH A	NA	0.2 NJ	NA
UNKNOWN PAH B	NA	0.2 NJ	NA
UNKNOWN PAH C	NA	0.3 NJ	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively identified compound (TIC) and represents an estimated value.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

LFR TABLE 5.3

SW 01 #3

CONTAINER STORAGE AREA
SUMMARY OF DETECTED TIC RESULTS IN SOIL
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location: BH-3-5
Sample Interval: 0.7-2 ft.
Sample ID: SS-7097-120798-TJ-044
Sample Date: 12/7/1998

ParameterTCL Semi-volatile Organics TIC (mg/kg)

1,1'-BIPHENYL, 2-METHYL- A	NI
11H-BENZOFLUORENE ISOMER A	NI
11H-BENZOFLUORENE ISOMER B	NI
2-PROPANOL, 1-BUTOXY- A	NI
BENZO(G,H,I)FLUORANTHENE A	NI
D-LIMONENE A	NI
DODECANE A	NI
EICOSANE A	NI
ETHANOL, 2-BUTOXY-, PHOSPHATE (3:1) A	1.6
HEPTADECANE A	NI
HEXADECANE A	NI
NONADECANE A	NI
OCTADECANE A	NI
PENTADECANE A	NI
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NI
PROPANOL ISOMER A	0.5
PROPANOL ISOMER B	0.3
TETRADECANE A	NI
TRIDECANE A	NI
UNDECANE A	NI
UNKNOWN A	0.5 E
UNKNOWN B	0.2
UNKNOWN C	0.2
UNKNOWN D	2
UNKNOWN E	0.2
UNKNOWN ALCOHOL A	NI
UNKNOWN ALCOHOL B	NI
UNKNOWN ALCOHOL C	NI
UNKNOWN ALKANE A	NI
UNKNOWN ALKANE B	NI
UNKNOWN ALKANE C	NI
UNKNOWN ALKANE D	NI
UNKNOWN PAH A	NI
UNKNOWN PAH B	NI
UNKNOWN PAH C	NI

Appendix IX - Semi-volatile TIC (mg/kg)

BENZO(E)PYRENE A	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NA
UNKNOWN A	NA
UNKNOWN B	NA
UNKNOWN C	NA
UNKNOWN ALKANE A	NA
UNKNOWN ALKANE B	NA
UNKNOWN PAH A	NA
UNKNOWN PAH B	NA
UNKNOWN PAH C	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively identified compound (TIC) and represents an estimated value.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

Richard Kowalski

LFR TABLE 5.4

SWMU #29
WASTE TREATMENT PLANT AREA
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-29-1	BH-29-2	BH-29-3
Sample Interval:	10-12 ft.	4-6 ft.	4-6 ft.
Sample ID:	S-7097-120198-TJ-022	S-7097-120198-TJ-021	S-7097-120198-TJ-020
Sample Date:	12/1/1998	12/1/1998	12/1/1998

Parameter	GIDCV (1)			
TCL Volatile Organics (mg/kg)				
ETHYLBENZENE	140	ND(0.05)	ND(0.05)	0.12
M,P-XYLENES	150	ND(0.10)	ND(0.10)	0.63
O-XYLENE	150	ND(0.05)	ND(0.05)	0.22
TETRACHLOROETHENE (PCE)	88	ND(0.05)	ND(0.05)	0.04 J
TOLUENE	250	ND(0.05)	ND(0.05)	0.043 J
TCL Semi-volatile Organics (mg/kg)				
ACENAPHTHENE	200,000	ND(0.3)	0.6	ND(0.3)
ANTHRACENE	1,000,000	ND(0.3)	0.5	ND(0.3)
BENZO(A)ANTHRACENE	100	ND(0.3)	0.8	ND(0.3)
BENZO(A)PYRENE	10	ND(0.3)	0.7	ND(0.3)
BENZO(B)FLUORANTHENE	100	ND(0.3)	0.7	ND(0.3)
BENZO(G,H,I)PERYLENE	9,100	ND(0.3)	0.3	ND(0.3)
BENZO(K)FLUORANTHENE	1,000	ND(0.3)	0.4	ND(0.3)
CARBAZOLE	3,700	ND(0.3)	0.2 J	ND(0.3)
CHRYSENE	10,000	ND(0.3)	0.7	ND(0.3)
DIBENZ(A,H)ANTHRACENE	10	ND(0.3)	0.08 J	ND(0.3)
DIBENZOFURAN	ID	ND(0.3)	0.8	ND(0.3)
FLUORANTHENE	180,000	0.1 J	1.7	ND(0.3)
FLUORENE	130,000	ND(0.3)	0.5	ND(0.3)
INDENO(1,2,3-CD)PYRENE	100	ND(0.3)	0.4	ND(0.3)
NAPHTHALENE	80,000	ND(0.3)	0.1 J	ND(0.3)
PHENANTHRENE	8,000	0.08 J	1.5	ND(0.3)
PYRENE	120,000	0.08 J	2	ND(0.3)
TCL - Polychlorinated Biphenyls (PCBs) (mg/kg)				
AROCLOR 1254	9.9 (3)	ND(0.33)	0.38	0.21 J
AROCLOR 1260	9.9 (3)	ND(0.33)	0.04 J	0.03 J
TAL Metals (mg/kg)				
ALUMINUM, TOTAL	660,000	4,160	6,800	6,310
ANTIMONY, TOTAL	1,200	0.04 J	0.09 J	0.03 J
ARSENIC, TOTAL	61	2.7	4.9	4.5
BARIUM, TOTAL	250,000	18	43	34
BERYLLIUM, TOTAL	3,100	0.14	0.30	0.28
CADMIUM, TOTAL	4,100	0.18	0.32	0.15
CALCIUM, TOTAL	NR	33,100	39,700	72,100
CHROMIUM, TOTAL	17,000 (2)	10	12	10
COBALT, TOTAL	18,000	2.95	5.33	5.4
COPPER, TOTAL	140,000	8.1	13.3	12.3
IRON, TOTAL	1,000,000	8,370	12,600	13,100
LEAD, TOTAL	900	4.13	24.1	6.47
MAGNESIUM, TOTAL	1,000,000	11,800	11,000	18,200
MANGANESE, TOTAL	170,000	244	299	290
MERCURY, TOTAL	1,100	ND(0.1)	ND(0.1)	ND(0.1)
NICKEL, TOTAL	270,000	7.6	13.4	15.6
POTASSIUM, TOTAL	NR	ND(400)	660	720
SELENIUM, TOTAL	18,000	ND(0.5)	0.7	0.4 J
SILVER, TOTAL	17,000	0.05	0.06	0.04
SODIUM, TOTAL	1,000,000	112	113	132
THALLIUM, TOTAL	240	0.09	0.18	0.18
VANADIUM, TOTAL	10,000	12	19	16
ZINC, TOTAL	1,000,000	31	45	37

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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SWMU #29
WASTE TREATMENT POND AREA
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-29-4	SS-29-2	SS-29-3
Sample Interval:	4-6 ft.	0.8-2 ft.	0.8-2 ft.
Sample ID:	S-7097-120198-TJ-019	SS-7097-120298-TJ-027	SS-7097-120298-TJ-026
Sample Date:	12/1/1998	12/2/1998	12/2/1998

Parameter	GIDCV (1)			
TCL Volatile Organics (mg/kg)				
ETHYLBENZENE	140	ND(0.05)	ND(0.05)	ND(0.05)
M,P-XYLENES	150	ND(0.10)	ND(0.10)	ND(0.10)
O-XYLENE	150	ND(0.05)	ND(0.05)	ND(0.05)
TETRACHLOROETHENE (PCE)	88	ND(0.05)	ND(0.05)	ND(0.05)
TOLUENE	250	ND(0.05)	ND(0.05)	ND(0.05)
TCL Semi-volatile Organics (mg/kg)				
ACENAPHTHENE	200,000	ND(0.3)	0.2 J	0.07 J
ANTHRACENE	1,000,000	ND(0.3)	0.3	0.09 J
BENZO(A)ANTHRACENE	100	ND(0.3)	1.1	0.3 J
BENZO(A)PYRENE	10	ND(0.3)	1	0.2 J
BENZO(B)FLUORANTHENE	100	ND(0.3)	1	0.3 J
BENZO(G,H,I)PERYLENE	9,100	ND(0.3)	0.5	0.2 J
BENZO(K)FLUORANTHENE	1,000	ND(0.3)	0.8	0.2 J
CARBAZOLE	3,700	ND(0.3)	0.1 J	0.04 J
CHRYSENE	10,000	ND(0.3)	1.2	0.3
DIBENZ(A,H)ANTHRACENE	10	ND(0.3)	0.2 J	0.04 J
DIBENZOFURAN	ID	ND(0.3)	0.1 J	ND(0.3)
FLUORANTHENE	180,000	ND(0.3)	1.8	0.7
FLUORENE	130,000	ND(0.3)	0.1 J	0.07 J
INDENO(1,2,3-CD)PYRENE	100	ND(0.3)	0.6	0.2 J
NAPHTHALENE	80,000	ND(0.3)	0.07 J	ND(0.3)
PHENANTHRENE	8,000	ND(0.3)	1.7	0.5
PYRENE	110,000	ND(0.3)	1.9	0.7
TCL - Polychlorinated Biphenyls (PCBs) (mg/kg)				
AROCLOR 1254	9.9 (3)	ND(0.33)	0.17 J	0.56
AROCLOR 1260	9.9 (3)	ND(0.33)	0.03 J	0.1 J
TAL Metals (mg/kg)				
ALUMINUM, TOTAL	660,000	8,250	2,680	4,600
ANTIMONY, TOTAL	1,200	0.05 J	0.2	0.09 J
ARSENIC, TOTAL	61	6.1	4	6
BARIUM, TOTAL	250,000	45	147	46
BERYLLIUM, TOTAL	3,100	0.47	0.19	0.31
CADMIUM, TOTAL	4,100	0.23	1.06	0.66
CALCIUM, TOTAL	NR	82,100	129,000	87,600
CHROMIUM, TOTAL	17,000 (2)	13	41	13.9
COBALT, TOTAL	18,000	9.62	2.67	4.86
COPPER, TOTAL	140,000	19.4	9.5	15.9
IRON, TOTAL	1,000,000	15,600	7,760	9,980
LEAD, TOTAL	900	10.9	67.9	31.0
MAGNESIUM, TOTAL	1,000,000	18,600	59,400	37,000
MANGANESE, TOTAL	170,000	361	194	249
MERCURY, TOTAL	1,100	ND(0.1)	0.07 J	0.05 J
NICKEL, TOTAL	270,000	23.9	45.8	15.5
POTASSIUM, TOTAL	NR	1,100	ND(400)	570
SELENIUM, TOTAL	18,000	0.4	U(1.0)	U(0.7)
SILVER, TOTAL	17,000	0.06	0.12	0.05
SODIUM, TOTAL	1,000,000	156	122	136
THALLIUM, TOTAL	240	0.27	0.17	0.21
VANADIUM, TOTAL	10,000	20	9	14
ZINC, TOTAL	1,000,000	40	224	55

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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LFR TABLE 5.4

SWMU #29
WASTE TREATMENT PLANT AREA
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location: SS-29-4 SS-29-4
Sample Interval: 0.8-2 ft. 0.8-2 ft.
Sample ID: SS-7097-120298-TJ-024 SS-7097-120298-TJ-025
Sample Date: 12/2/1998 12/2/1998
Duplicate

Parameter	GIDCV (1)		
<u>TCL Volatile Organics (mg/kg)</u>			
ETHYLBENZENE	140	ND(0.05)	ND(0.05)
M,P-XYLENES	150	ND(0.10)	ND(0.10)
O-XYLENE	150	ND(0.05)	ND(0.05)
TETRACHLOROETHENE (PCE)	88	ND(0.05)	ND(0.05)
TOLUENE	250	ND(0.05)	ND(0.05)
<u>TCL Semi-volatile Organics (mg/kg)</u>			
ACENAPHTHENE	200,000	ND(0.3)	ND(0.3)
ANTHRACENE	1,000,000	0.05 J	ND(0.3)
BENZO(A)ANTHRACENE	100	0.1 J	ND(0.3)
BENZO(A)PYRENE	10	0.1 J	ND(0.3)
BENZO(B)FLUORANTHENE	100	0.1 J	ND(0.3)
BENZO(G,H,I)PERYLENE	9,100	0.08 J	ND(0.3)
BENZO(K)FLUORANTHENE	1,000	0.1 J	ND(0.3)
CARBAZOLE	3,700	ND(0.3)	ND(0.3)
CHRYSENE	10,000	0.2 J	ND(0.3)
DIBENZ(A,H)ANTHRACENE	10	ND(0.3)	ND(0.3)
DIBENZOFURAN	ID	0.05	ND(0.3)
FLUORANTHENE	180,000	0.3 J	0.09 J
FLUORENE	130,000	ND(0.3)	ND(0.3)
INDENO(1,2,3-CD)PYRENE	100	0.08 J	ND(0.3)
NAPHTHALENE	80,000	ND(0.3)	ND(0.3)
PHENANTHRENE	8,000	0.2 J	ND(0.3)
PYRENE	130,000	0.3	0.09 J
<u>TCL - Polychlorinated Biphenyls (PCBs) (mg/kg)</u>			
AROCLOR 1254	9.9 (3)	ND(0.33)	ND(0.33)
AROCLOR 1260	9.9 (3)	ND(0.33)	ND(0.33)
<u>TAL Metals (mg/kg)</u>			
ALUMINUM, TOTAL	660,000	3,240	1,670
ANTIMONY, TOTAL	1,200	0.1	0.2
ARSENIC, TOTAL	61	4.4	2.1
BARIUM, TOTAL	250,000	85	50
BERYLLIUM, TOTAL	3,100	0.26	0.21
CADMIUM, TOTAL	4,100	0.58	0.31
CALCIUM, TOTAL	NR	158,000	184,000
CHROMIUM, TOTAL	17,000 (2)	5.6	2.8
COBALT, TOTAL	18,000	3.17	1.98
COPPER, TOTAL	140,000	8.40	4.88
IRON, TOTAL	1,000,000	4,690	2,450
LEAD, TOTAL	900	22.2	11.5
MAGNESIUM, TOTAL	1,000,000	78,200	98,200
MANGANESE, TOTAL	170,000	182	126
MERCURY, TOTAL	1,100	0.02 J	0.02 J
NICKEL, TOTAL	270,000	11.8	8.9
POTASSIUM, TOTAL	NR	ND(400)	ND(400)
SELENIUM, TOTAL	18,000	U(1.0)	U(1.0)
SILVER, TOTAL	17,000	0.03	0.04
SODIUM, TOTAL	1,000,000	131	154
THALLIUM, TOTAL	240	0.17	0.13
VANADIUM, TOTAL	10,000	11	7
ZINC, TOTAL	1,000,000	27	17

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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SWMU #29

WASTEWATER TREATMENT TANK AREA
SUMMARY OF DETECTED APPENDIX IX RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location: SS-29-1
Sample Interval: 0.8-2 ft.
Sample ID: SS-7097-120298-TJ-028
Sample Date: 12/2/1998

<u>Parameter</u>	<u>GIDCV (1)</u>	
<u>Appendix IX - Semi-Volatile Organics (mg/kg)</u>		
BENZO(G,H,I)PERYLENE	9,100	0.04 J
FLUORANTHENE	180,000	0.1 J
INDENO(1,2,3-CD)PYRENE	100	0.04 J
PYRENE	110,000	0.1 J
<u>Appendix IX - Polychlorinated Biphenyls (PCBs) (mg/kg)</u>		
AROCLOR 1254	9.9 (3)	0.14 J
AROCLOR 1260	9.9 (3)	0.03 J
<u>Appendix IX - Metals (mg/kg)</u>		
ANTIMONY, TOTAL	1,200	0.09 J
ARSENIC, TOTAL	67	2.3
BARIUM, TOTAL	250,000	52
BERYLLIUM, TOTAL	3,100	0.98
CADMIUM, TOTAL	4,100	0.28
CHROMIUM, TOTAL	17,000 (2)	10.2
COBALT, TOTAL	18,000	2.28
COPPER, TOTAL	140,000	6.9
LEAD, TOTAL	900	13.4
MERCURY, TOTAL	1,100	0.03 J
NICKEL, TOTAL	270,000	7.3
SELENIUM, TOTAL	18,000	U(1.0)
SILVER, TOTAL	17,000	0.07
THALLIUM, TOTAL	240	0.06
VANADIUM, TOTAL	10,000	11.0
ZINC, TOTAL	1,000,000	38.0

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U() - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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WASTEWATER TREATMENT PLANT
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-29-1	BH-29-2	BH-29-3
Sample Interval:	10-12 ft.	4-6 ft.	4-6 ft.
Sample ID:	S-7097-120198-TJ-022	S-7097-120198-TJ-021	S-7097-120198-TJ-020
Sample Date:	12/1/1998	12/1/1998	12/1/1998

ParameterTCL Volatile Organic Compounds TIC (mg/kg)

4-NONANONE, 2,6,8-TRIMETHYL- A	NI	NI	0.37 NJ
UNKNOWN A	NI	NI	0.4 NJ
UNKNOWN ALKANE A	NI	NI	0.15 NJ
UNKNOWN BRANCHED ALKANE A	NI	NI	0.22 NJ

TCL Semi-volatile Organics TIC (mg/kg)

4H-CYCLOPENTA[DEF]PHENANTHRENE A	NI	0.3 NJ	NI
BENZENEDICARBOXYLIC ACID ISOMER A	0.1 NJ	NI	NI
BENZENEDICARBOXYLIC ACID ISOMER B	0.3 NJ	NI	NI
BENZENEDICARBOXYLIC ACID ISOMER C	0.2 NJ	NI	NI
DIBENZOTHIOPHENE A	NI	0.2 NJ	NI
HEPTADECANE A	NI	0.3 NJ	NI
SULFUR A	NI	NI	NI
SULFUR, MOL. (S8) A	NI	NI	NI
UNKNOWN A	0.6 NJ	0.7 NJ	0.6 NJ
UNKNOWN B	0.4 NJ	0.3 NJ	0.2 NJ
UNKNOWN C	NI	0.2 NJ	NI
UNKNOWN D	NI	0.5 NJ	NI
UNKNOWN E	NI	NI	NI
UNKNOWN F	NI	NI	NI
UNKNOWN G	NI	NI	NI
UNKNOWN H	NI	NI	NI
UNKNOWN ALCOHOL A	NI	NI	NI
UNKNOWN ALKANE A	NI	0.2 NJ	0.3 NJ
UNKNOWN ALKANE B	NI	0.5 NJ	NI
UNKNOWN ALKANE C	NI	0.4 NJ	NI
UNKNOWN HALOGENATED HYDROCARBON A	0.2 NJ	NI	0.3 NJ
UNKNOWN PAH A	NI	NI	NI

Appendix IX - Semi-volatile TIC (mg/kg)

SULFUR, MOL. (S8) A	NA	NA	NA
UNKNOWN A	NA	NA	NA
UNKNOWN B	NA	NA	NA
UNKNOWN C	NA	NA	NA
UNKNOWN D	NA	NA	NA
UNKNOWN E	NA	NA	NA
UNKNOWN F	NA	NA	NA
UNKNOWN ALCOHOL A	NA	NA	NA
UNKNOWN ALCOHOL B	NA	NA	NA
UNKNOWN ALCOHOL C	NA	NA	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentatively identified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

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WASTEWATER TREATMENT PLANT
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:**Sample Interval:****Sample ID:**

020

Sample Date:**Parameter**TCL Volatile Organic Compounds TIC (mg/kg)

4-NONANONE, 2,6,8-TRIMETHYL- A
UNKNOWN A
UNKNOWN ALKANE A
UNKNOWN BRANCHED ALKANE A

TCL Semi-volatile Organics TIC (mg/kg)

4H-CYCLOPENTA[DEF]PHENANTHRENE A
BENZENEDICARBOXYLIC ACID ISOMER A
BENZENEDICARBOXYLIC ACID ISOMER B
BENZENEDICARBOXYLIC ACID ISOMER C
DIBENZOTHIOPHENE A
HEPTADECANE A
SULFUR A
SULFUR, MOL. (S8) A
UNKNOWN A
UNKNOWN B
UNKNOWN C
UNKNOWN D
UNKNOWN E
UNKNOWN F
UNKNOWN G
UNKNOWN H
UNKNOWN ALCOHOL A
UNKNOWN ALKANE A
UNKNOWN ALKANE B
UNKNOWN ALKANE C
UNKNOWN HALOGENATED HYDROCARBON A
UNKNOWN PAH A

Appendix IX - Semi-volatile TIC (mg/kg)

SULFUR, MOL. (S8) A
UNKNOWN A
UNKNOWN B
UNKNOWN C
UNKNOWN D
UNKNOWN E
UNKNOWN F
UNKNOWN ALCOHOL A
UNKNOWN ALCOHOL B
UNKNOWN ALCOHOL C

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively identified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

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WASTEWATER TREATMENT PLANT
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-29-4	SS-29-1	SS-29-2
Sample Interval:	4-6 ft.	0.8-2 ft.	0.8-2 ft.
Sample ID:	S-7097-120198-TJ-019	SS-7097-120298-TJ-028	SS-7097-120298-TJ-
Sample Date:	12/1/1998	12/2/1998	12/2/1998

ParameterTCL Volatile Organic Compounds TIC (mg/kg)

4-NONANONE, 2,6,8-TRIMETHYL- A	NI	NA	NI
UNKNOWN A	NI	NA	NI
UNKNOWN ALKANE A	NI	NA	NI
UNKNOWN BRANCHED ALKANE A	NI	NA	NI

TCL Semi-volatile Organics TIC (mg/kg)

4H-CYCLOPENTA[DEF]PHENANTHRENE A	NI	NA	NI
BENZENEDICARBOXYLIC ACID ISOMER A	NI	NA	NI
BENZENEDICARBOXYLIC ACID ISOMER B	NI	NA	NI
BENZENEDICARBOXYLIC ACID ISOMER C	NI	NA	NI
DIBENZOTHIOPHENE A	NI	NA	NI
HEPTADECANE A	NI	NA	NI
SULFUR A	NI	NA	NI
SULFUR, MOL. (S8) A	NI	NA	NI
UNKNOWN A	0.4 NJ	NA	0.4 NJ
UNKNOWN B	0.4 NJ	NA	0.4 NJ
UNKNOWN C	0.2 NJ	NA	0.5 NJ
UNKNOWN D	NI	NA	0.6 NJ
UNKNOWN E	NI	NA	1.4 NJ
UNKNOWN F	NI	NA	5.8 NJ
UNKNOWN G	NI	NA	0.7 NJ
UNKNOWN H	NI	NA	0.6 NJ
UNKNOWN ALCOHOL A	NI	NA	0.6 NJ
UNKNOWN ALKANE A	NI	NA	NI
UNKNOWN ALKANE B	NI	NA	NI
UNKNOWN ALKANE C	NI	NA	NI
UNKNOWN HALOGENATED HYDROCARBON A	0.2 NJ	NA	NI
UNKNOWN PAH A	NI	NA	0.3 NJ

Appendix IX - Semi-volatile TIC (mg/kg)

SULFUR, MOL. (S8) A	NA	1.4 NJ	NA
UNKNOWN A	NA	0.1 NJ	NA
UNKNOWN B	NA	0.7 NJ	NA
UNKNOWN C	NA	0.2 NJ	NA
UNKNOWN D	NA	0.4 NJ	NA
UNKNOWN E	NA	0.2 NJ	NA
UNKNOWN F	NA	1 NJ	NA
UNKNOWN ALCOHOL A	NA	0.3 NJ	NA
UNKNOWN ALCOHOL B	NA	0.8 NJ	NA
UNKNOWN ALCOHOL C	NA	0.2 NJ	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively identified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

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WASTEWATER TREATMENT PLANT
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

*Location:**Sample Interval:**Sample ID:*

027

*Sample Date:*ParameterTCL Volatile Organic Compounds TIC (mg/kg)

4-NONANONE, 2,6,8-TRIMETHYL- A
UNKNOWN A
UNKNOWN ALKANE A
UNKNOWN BRANCHED ALKANE A

TCL Semi-volatile Organics TIC (mg/kg)

4H-CYCLOPENTA[DEF]PHENANTHRENE A
BENZENEDICARBOXYLIC ACID ISOMER A
BENZENEDICARBOXYLIC ACID ISOMER B
BENZENEDICARBOXYLIC ACID ISOMER C
DIBENZOTHIOPHENE A
HEPTADECANE A
SULFUR A
SULFUR, MOL. (S8) A
UNKNOWN A
UNKNOWN B
UNKNOWN C
UNKNOWN D
UNKNOWN E
UNKNOWN F
UNKNOWN G
UNKNOWN H
UNKNOWN ALCOHOL A
UNKNOWN ALKANE A
UNKNOWN ALKANE B
UNKNOWN ALKANE C
UNKNOWN HALOGENATED HYDROCARBON A
UNKNOWN PAH A

Appendix IX - Semi-volatile TIC (mg/kg)

SULFUR, MOL. (S8) A
UNKNOWN A
UNKNOWN B
UNKNOWN C
UNKNOWN D
UNKNOWN E
UNKNOWN F
UNKNOWN ALCOHOL A
UNKNOWN ALCOHOL B
UNKNOWN ALCOHOL C

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively identified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

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WASTEWATER TREATMENT PLANT
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	SS-29-3	SS-29-4	SS-29-4
Sample Interval:	0.8-2 ft.	0.8-2 ft.	0.8-2 ft.
Sample ID:	SS-7097-120298-TJ-026	SS-7097-120298-TJ-024	SS-7097-120298-TJ-025
Sample Date:	12/2/1998	12/2/1998	12/2/1998
			Duplicate

ParameterTCL Volatile Organic Compounds TIC (mg/kg)

4-NONANONE, 2,6,8-TRIMETHYL- A	NI	NI	NI
UNKNOWN A	NI	NI	NI
UNKNOWN ALKANE A	NI	NI	NI
UNKNOWN BRANCHED ALKANE A	NI	NI	NI

TCL Semi-volatile Organics TIC (mg/kg)

4H-CYCLOPENTA[DEF]PHENANTHRENE A	NI	NI	NI
BENZENEDICARBOXYLIC ACID ISOMER A	NI	NI	NI
BENZENEDICARBOXYLIC ACID ISOMER B	NI	NI	NI
BENZENEDICARBOXYLIC ACID ISOMER C	NI	NI	NI
DIBENZOTHIOPHENE A	NI	NI	NI
HEPTADECANE A	NI	NI	NI
SULFUR A	NI	0.2 NJ	NI
SULFUR, MOL. (S8) A	NI	NI	0.2 NJ
UNKNOWN A	0.1 NJ	0.4 NJ	0.6 NJ
UNKNOWN B	0.5 NJ	0.3 NJ	0.3 NJ
UNKNOWN C	0.4 NJ	0.2 NJ	0.2 NJ
UNKNOWN D	0.1 NJ	NI	NI
UNKNOWN E	0.4 NJ	NI	NI
UNKNOWN F	NI	NI	NI
UNKNOWN G	NI	NI	NI
UNKNOWN H	NI	NI	NI
UNKNOWN ALCOHOL A	NI	NI	NI
UNKNOWN ALKANE A	NI	NI	NI
UNKNOWN ALKANE B	NI	NI	NI
UNKNOWN ALKANE C	NI	NI	NI
UNKNOWN HALOGENATED HYDROCARBON A	NI	NI	NI
UNKNOWN PAH A	NI	NI	NI

Appendix IX - Semi-volatile TIC (mg/kg)

SULFUR, MOL. (S8) A	NA	NA	NA
UNKNOWN A	NA	NA	NA
UNKNOWN B	NA	NA	NA
UNKNOWN C	NA	NA	NA
UNKNOWN D	NA	NA	NA
UNKNOWN E	NA	NA	NA
UNKNOWN F	NA	NA	NA
UNKNOWN ALCOHOL A	NA	NA	NA
UNKNOWN ALCOHOL B	NA	NA	NA
UNKNOWN ALCOHOL C	NA	NA	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively identified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

LFR TABLE 5.7

Aug 05, 2009 13:21

FORMER SURFACE IMPOUNDMENT
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-31-1	BH-31-1	BH-31-3
Sample Interval:	8-10 ft.	8-10 ft.	4-6 ft.
Sample ID:	S-7097-121098-DS-050	S-7097-121098-DS-051	S-7097-121198-DS-053
Sample Date:	12/10/1998	12/10/1998	12/11/1998

Parameter **GIDCV (1)**

TCL Volatile Organics (mg/kg)

ACETONE	110,000	--	--	--
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TAL Metals (mg/kg)

ALUMINUM, TOTAL	660,000	5,650	4,950	38,800
ANTIMONY, TOTAL	1,200	0.06	0.04 J	44.6
ARSENIC, TOTAL	61	4.3	4.5	140
BARIUM, TOTAL	250,000	31	30	689
BERYLLIUM, TOTAL	3,100	0.29	0.29	5.45
CADMIUM, TOTAL	4,100	0.23	0.19	37.5
CALCIUM, TOTAL	NR	72,909	71,800	98,600
CHROMIUM, TOTAL	17,000 (2)	11	10	4970
COBALT, TOTAL	18,000	5.24	5.19	30.4
COPPER, TOTAL	140,000	12	11.9	228
IRON, TOTAL	1,000,000	11,600	10,800	15,900
LEAD, TOTAL	900	6.54	6.92	2,780
MAGNESIUM, TOTAL	1,000,000	22,400	21,500	15,100
MANGANESE, TOTAL	170,000	285	274	670
MERCURY, TOTAL	1,100	ND(0.02)	ND(0.02)	7.2
NICKEL, TOTAL	270,000	14.7	15.1	613
POTASSIUM, TOTAL	NR	110	900	1,700
SELENIUM, TOTAL	18,000	0.4 J	0.5 J	25.3
SILVER, TOTAL	17,000	0.07 J	0.05 J	16.8 J
SODIUM, TOTAL	1,000,000	174	176	1,700
THALLIUM, TOTAL	240	0.23	0.22	5.10
VANADIUM, TOTAL	10,000	17	14	58
ZINC, TOTAL	1,000,000	35	49	10,000

General Chemistry (mg/kg)

CYANIDE, TOTAL	250	ND(1) UJ	ND(1) UJ	2.6 J
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Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

UJ - Report limit is an estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

--

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

LFR TABLE 5.7

Aug 05, 2009 13:21

FORMER SURFACE IMPOUNDMENT
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	SS-31-1	SS-31-2	SS-31-3
Sample Interval:	0-2 ft.	0-2 ft.	0-2 ft.
Sample ID:	S-7097-121198-DS-054	S-7097-121198-DS-055	S-7097-121198-DS-056
Sample Date:	12/11/1998	12/11/1998	12/11/1998

Parameter GIDCV (1)

TCL Volatile Organics (mg/kg)

ACETONE	110,000	--	11	--
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TAL Metals (mg/kg)

ALUMINUM, TOTAL	660,000	11,100	6,540	11,500
ANTIMONY, TOTAL	1,200	0.9 J	0.2	1.7
ARSENIC, TOTAL	61	27.3	5.7	20.7
BARIUM, TOTAL	250,000	102	59	315
BERYLLIUM, TOTAL	3,100	1.04	0.42	1.40
CADMIUM, TOTAL	4,100	5.60	0.63	5.79
CALCIUM, TOTAL	NR	65,900	67,500	51,800
CHROMIUM, TOTAL	17,000 (2)	341	51	167
COBALT, TOTAL	18,000	12.1	5.39	9.46
COPPER, TOTAL	140,000	93.4	17.1	40.9
IRON, TOTAL	1,000,000	17,100	12,300	15,700
LEAD, TOTAL	900	765	51.1	279
MAGNESIUM, TOTAL	1,000,000	17,000	20,200	14,500
MANGANESE, TOTAL	170,000	372	367	431
MERCURY, TOTAL	1,100	0.09 J	0.06 J	1.8
NICKEL, TOTAL	270,000	259	24.6	39.1
POTASSIUM, TOTAL	NR	1,400	1,100	1,500
SELENIUM, TOTAL	18,000	4.1	0.6	3.4
SILVER, TOTAL	17,000	0.73 J	0.36 J	2.47 J
SODIUM, TOTAL	1,000,000	335	511	3,450
THALLIUM, TOTAL	240	0.81	0.24	1.12
VANADIUM, TOTAL	10,000	24	17	29
ZINC, TOTAL	1,000,000	896	222	1,760

General Chemistry (mg/kg)

CYANIDE, TOTAL	250	ND(1) UJ	ND(1) UJ	ND(1) UJ
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Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

UJ - Report limit is an estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

☐ Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

Richard Kowalski

LFR TABLE 5.8

Aug 05, 2009 13:21

SWMU #31

**FORMER SURFACE IMPOUNDMENT
SUMMARY OF DETECTED APPENDIX IX RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

Location: BH-31-2
Sample Interval: 1-1.5 ft.
Sample ID: S-7097-121798-DS-061
Sample Date: 12/17/1998

Parameter **GIDCV (1)**

Appendix IX - Semi-Volatile Organics (mg/kg)

4-CHLOROANILINE	NR	0.3
ACENAPHTHENE	200,000	0.07 J
ACENAPHTHYLENE	8,000	0.06 J
ANTHRACENE	1,000,000	0.06 J
BIS(2-ETHYLHEXYL) PHTHALATE	10,000	4.3
BUTYL BENZYL PHTHALATE	310	0.2 J
DI-N-BUTYL PHTHALATE	760	0.5 J
DIBENZOFURAN	ID	0.1 J
FLUORANTHENE	180,000	0.2 J
NAPHTHALENE	80,000	0.5
PHENANTHRENE	8,000	0.3
PYRENE	110,000	0.3 J

Appendix IX - Pesticides/Herbicides (mg/kg)

AROCLOR 1254	9.9 (3)	0.1 J
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Appendix IX - Metals (mg/kg)

ANTIMONY, TOTAL	1,200	34.5
ARSENIC, TOTAL	61	117
BARIUM, TOTAL	250,000	657
BERYLLIUM, TOTAL	3,100	3.28
CADMIUM, TOTAL	4,100	34.1
CHROMIUM, TOTAL	17,000 (2)	1,570
COBALT, TOTAL	18,000	20
COPPER, TOTAL	140,000	155
LEAD, TOTAL	900	1,790
MERCURY, TOTAL	1,100	5
NICKEL, TOTAL	270,000	486
SELENIUM, TOTAL	18,000	10.9
SILVER, TOTAL	17,000	15.3
THALLIUM, TOTAL	240	4.12
TIN, TOTAL	NR	153
VANADIUM, TOTAL	10,000	52
ZINC, TOTAL	1,000,000	7,030

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

☐ Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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Aug 05, 2009 13:21

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TABLE 5.9

Aug 05, 2009 13:21

SWMU #31

**FORMER SURFACE IMPOUNDMENT
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

<i>Location:</i>	<i>BH-31-2</i>	<i>SS-31-2</i>
<i>Sample Interval:</i>	<i>1-1.5 ft.</i>	<i>0-2 ft.</i>
<i>Sample ID:</i>	<i>S-7097-121798-DS-061</i>	<i>S-7097-121198-DS-055</i>
<i>Sample Date:</i>	<i>12/17/1998</i>	<i>12/11/1998</i>

ParameterTCL Volatile Organic Compounds TIC (mg/kg)

ISOPROPYL ALCOHOL A	NA	0.3 NJ
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Appendix IX - Semi-volatile TIC (mg/kg)

PENTADECANE A	0.6 NJ	NA
TETRADECANE A	0.6 NJ	NA
UNKNOWN A	1.1 NJ	NA
UNKNOWN B	0.9 NJ	NA
UNKNOWN C	0.7 NJ	NA
UNKNOWN D	2.5 NJ	NA
UNKNOWN E	5 NJ	NA
UNKNOWN F	8.8 NJ	NA
UNKNOWN ALCOHOL A	6.5 NJ	NA
UNKNOWN ALKANE A	0.8 NJ	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively indentified compound (TIC) and represents an estimated value.

J - Parameter is estimated value.

NR - No regularatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified.

LFR TABLE 5.10

SVI 115-#13
Aug 05, 2009 13:21

FORMER SOUTH RETENTION POND
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-33-1	BH-33-1	BH-33-1
Sample Interval:	14-16 ft.	18-20 ft.	18-20 ft.
Sample ID:	S-7097-121898-DS-065	S-7097-121898-DS-066	S-7097-121898-DS-067
Sample Date:	12/18/1998	12/18/1998	12/18/1998
			Duplicate

<u>Parameter</u>	<u>GIDCV (1)</u>			
<u>TCL Semi-volatile Organics (mg/kg)</u>				
2-METHYLNAPHTHALENE	40,000	ND(0.3)	0.2 J	0.2 J
PHENANTHRENE	8,000	ND(0.3)	0.1 J	0.09 J
<u>TAL Metals (mg/kg)</u>				
ALUMINUM, TOTAL	660,000	6,400	--	--
ANTIMONY, TOTAL	1,200	0.07	0.08 J	0.09 J
ARSENIC, TOTAL	61	4.2	8.5	8.3
BARIUM, TOTAL	250,000	38	41	40
BERYLLIUM, TOTAL	3,100	0.29	0.30	0.31
CADMIUM, TOTAL	4,100	0.19	0.66	0.31
CALCIUM, TOTAL	NR	82,300	--	--
CHROMIUM, TOTAL	17,000 (2)	12	12	11
COBALT, TOTAL	18,000	5.99	7.20	7.66
COPPER, TOTAL	140,000	13.4	17.2	16.3
IRON, TOTAL	1,000,000	15,100	--	--
LEAD, TOTAL	900	7.00	8.04	12.4
MAGNESIUM, TOTAL	1,000,000	23,900	--	--
MANGANESE, TOTAL	170,000	369	--	--
MERCURY, TOTAL	1,100	ND(0.1)	ND(0.1)	ND(0.1)
NICKEL, TOTAL	270,000	17.1	22.2	23.3
POTASSIUM, TOTAL	NR	1,100	--	--
SELENIUM, TOTAL	18,000	0.23	0.3	0.4
SILVER, TOTAL	17,000	0.06	0.08	0.07
SODIUM, TOTAL	1,000,000	141	--	--
THALLIUM, TOTAL	240	0.23	0.50	0.50
VANADIUM, TOTAL	10,000	18	18	17
ZINC, TOTAL	1,000,000	39	65	65
<u>Miscellaneous (%)</u>				
SOLIDS, TOTAL	NR	83.1	88.1	88.5

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

LFR TABLE 5.10

SVI #13
Aug 05, 2009 13:21

**FORMER SOUTH RETENTION POND
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

Location:	BH-33-2	BH-33-2	BH-33-3
Sample Interval:	16-18 ft.	34-36 ft.	15-16 ft.
Sample ID:	S-7097-121798-DS-063	S-7097-121798-DS-064	S-7097-120998-DS-048
Sample Date:	12/17/1998	12/17/1998	12/9/1998

Parameter GIDCV (1)TCL Semi-volatile Organics (mg/kg)

2-METHYLNAPHTHALENE	40,000	ND(0.3)	ND(0.3)	ND(0.3)
PHENANTHRENE	8,000	ND(0.3)	ND(0.3)	ND(0.3)

TAL Metals (mg/kg)

ALUMINUM, TOTAL	660,000	6,020	1,750	6,060
ANTIMONY, TOTAL	1,200	0.1	0.06 J	0.05 J
ARSENIC, TOTAL	61	6.1	2.3	4.4
BARIUM, TOTAL	250,000	34	12	30
BERYLLIUM, TOTAL	3,100	0.31	0.07	0.37
CADMIUM, TOTAL	4,100	0.39	0.1	0.19
CALCIUM, TOTAL	NR	79,900	70,400	74,800
CHROMIUM, TOTAL	17,000 (2)	11	5	12
COBALT, TOTAL	18,000	6.27	2.15	6.12
COPPER, TOTAL	140,000	13.3	5.6	13.0
IRON, TOTAL	1,000,000	3,900	5,310	13,100
LEAD, TOTAL	900	7.57	3.04	7.08
MAGNESIUM, TOTAL	1,000,000	26,100	14,600	22,700
MANGANESE, TOTAL	170,000	331	235	306
MERCURY, TOTAL	1,100	ND(0.1)	ND(0.1)	ND(0.1)
NICKEL, TOTAL	270,000	17.5	6.7	18.3
POTASSIUM, TOTAL	NR	1,200	ND(400)	1,200
SELENIUM, TOTAL	18,000	ND(0.5)	ND(0.5)	0.6
SILVER, TOTAL	17,000	0.06	0.02	0.08
SODIUM, TOTAL	1,000,000	167	110	123
THALLIUM, TOTAL	240	0.27	0.08	0.26
VANADIUM, TOTAL	10,000	17	7	17
ZINC, TOTAL	1,000,000	54	26	43

Miscellaneous (%)

SOLIDS, TOTAL	NR	90.1	97.4	--
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Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

LFR TABLE 5.10

SVI# 13-21

FORMER SOUTH RETENTION POND
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-33-3	BH-33-4	BH-33-4
Sample Interval:	26-28 ft.	16-18 ft.	20-22 ft.
Sample ID:	S-7097-121098-DS-052	S-7097-121698-DS-058	S-7097-121698-DS-059
Sample Date:	12/10/1998	12/16/1998	12/16/1998

<u>Parameter</u>	<u>GIDCV (1)</u>			
<u>TCL Semi-volatile Organics (mg/kg)</u>				
2-METHYLNAPHTHALENE	40,000	0.1 J	ND(0.3)	0.1 J
PHENANTHRENE	8,000	0.09 J	ND(0.3)	ND(0.3)
<u>TAL Metals (mg/kg)</u>				
ALUMINUM, TOTAL	660,000	7,010	4,780	5,920
ANTIMONY, TOTAL	1,200	0.05 J	0.1	0.1
ARSENIC, TOTAL	61	6.7	3.8	6.6
BARIUM, TOTAL	250,000	43	26	36
BERYLLIUM, TOTAL	3,100	0.42	0.22	0.28
CADMIUM, TOTAL	4,100	0.39	0.18	0.27
CALCIUM, TOTAL	NR	73,700	71,100	71,600
CHROMIUM, TOTAL	17,000 (2)	14	9	13
COBALT, TOTAL	18,000	9.01	5.12	6.21
COPPER, TOTAL	140,000	22.1	10.9	14.2
IRON, TOTAL	1,000,000	16,400	11,000	15,200
LEAD, TOTAL	900	10.2	5.65	6.97
MAGNESIUM, TOTAL	1,000,000	24,500	20,900	24,200
MANGANESE, TOTAL	170,000	340	279	292
MERCURY, TOTAL	1,100	0.021	ND(0.1)	ND(0.1)
NICKEL, TOTAL	270,000	27.2	14.2	18.9
POTASSIUM, TOTAL	NR	1400	730	1,200
SELENIUM, TOTAL	18,000	0.7	ND(0.5)	0.5
SILVER, TOTAL	17,000	0.09	0.05	0.06
SODIUM, TOTAL	1,000,000	138	105	120
THALLIUM, TOTAL	240	0.61	0.20	0.38
VANADIUM, TOTAL	10,000	19	14	18
ZINC, TOTAL	1,000,000	49	39	42
<u>Miscellaneous (%)</u>				
SOLIDS, TOTAL	NR	--	90.5	89.8

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

LFR TABLE 5.10

SVI# 13-21
Aug 05, 2009 13:21

**FORMER SOUTH RETENTION POND
SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

Location:	BH-33-4	BH-33-5	BH-33-6
Sample Interval:	20-22 ft.	28-30 ft.	22-24 ft.
Sample ID:	S-7097-121698-DS-060	S-7097-120998-DS-047	S-7097-121198-DS-057
Sample Date:	12/16/1998	12/9/1998	12/11/1998

<u>Parameter</u>	<u>GIDCV (1)</u>	<u>Duplicate</u>		
<u>TCL Semi-volatile Organics (mg/kg)</u>				
2-METHYLNAPHTHALENE	40,000	0.1 J	ND(0.3)	0.2 J
PHENANTHRENE	8,000	0.08 J	ND(0.3)	0.08 J
<u>TAL Metals (mg/kg)</u>				
ALUMINUM, TOTAL	660,000	6,280	4,080	6,750
ANTIMONY, TOTAL	1,200	0.2	0.05 J	0.05 J
ARSENIC, TOTAL	61	8.0	4.4	7.2
BARIUM, TOTAL	250,000	38	30	38
BERYLLIUM, TOTAL	3,100	0.31	0.23	0.42
CADMIUM, TOTAL	4,100	0.28	0.22	0.37
CALCIUM, TOTAL	NR	11,700	77,200	76,100
CHROMIUM, TOTAL	17,000 (2)	12	9	13
COBALT, TOTAL	18,000	7.24	5.13	7.41
COPPER, TOTAL	140,000	16.1	10.3	15.5
IRON, TOTAL	1,000,000	15,200	10,200	14,900
LEAD, TOTAL	900	9.10	4.94	8.52
MAGNESIUM, TOTAL	1,360,000	21,700	23,000	21,000
MANGANESE, TOTAL	170,000	314	317	284
MERCURY, TOTAL	1,100	ND(0.1)	ND(0.1)	ND(0.1)
NICKEL, TOTAL	270,000	23.0	12.7	22.7
POTASSIUM, TOTAL	NR	1,200	680	1,500
SELENIUM, TOTAL	18,000	0.4 J	0.4 J	0.7
SILVER, TOTAL	17,000	0.08	0.06	0.09 J
SODIUM, TOTAL	1,000,000	122	140	140
THALLIUM, TOTAL	240	0.54	0.19	0.51
VANADIUM, TOTAL	10,000	18	14	20
ZINC, TOTAL	1,000,000	45	35	48
<u>Miscellaneous (%)</u>				
SOLIDS, TOTAL	NR	89.3	--	--

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

☐ Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

LFR

TABLE 5.11

Aug 05, 2009 13:21

SWMU #33

**FORMER SOUTH RETENTION POND
SUMMARY OF DETECTED APPENDIX IX RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

Location:	BH-33-1	BH-33-1
Sample Interval:	18-20 ft.	18-20 ft.
Sample ID:	S-7097-121898-DS-066	S-7097-121898-DS-067
Sample Date:	12/18/1998	12/18/1998

Duplicate

ParameterGIDCV (1)Appendix IX - Semi-Volatile Organics (mg/kg)

2-METHYLNAPHTHALENE	40,000	0.2 J	0.2 J
NAPHTHALENE	80,000	0.07 J	0.07 J
PHENANTHRENE	8,000	0.1 J	0.09 J

Appendix IX - Metals (mg/kg)

ANTIMONY, TOTAL	1,200	0.68 J	0.09 J
ARSENIC, TOTAL	61	8.3	8.3
BARIUM, TOTAL	250,000	41	40
BERYLLIUM, TOTAL	5,100	0.3	0.31
CADMIUM, TOTAL	4,133	0.66	0.31
CHROMIUM, TOTAL	17,000 (2)	12	11
COBALT, TOTAL	18,000	7.2	7.66
COPPER, TOTAL	140,000	17.2	16.3
LEAD, TOTAL	900	8.04	12.4
NICKEL, TOTAL	270,000	22.2	23.3
SELENIUM, TOTAL	18,000	0.3 J	0.4 J
SILVER, TOTAL	17,000	0.08	0.07
THALLIUM, TOTAL	240	0.5	0.5
VANADIUM, TOTAL	10,000	18	17
ZINC, TOTAL	1,000,000	65	65

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

☐ Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

LFR TABLE 5.12

SWMU #33
FORMER SOUTH PONTIAC POND
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-33-1	BH-33-1	BH-33-1
Sample Interval:	14-16 ft.	18-20 ft.	18-20 ft.
Sample ID:	S-7097-121898-DS-065	S-7097-121898-DS-066	S-7097-121898-DS-067
Sample Date:	12/18/1998	12/18/1998	12/18/1998
			Duplicate

ParameterTCL Volatile Organic Compounds TIC (mg/kg)

ISOPROPYL ALCOHOL A	NI	NA	NA
SUBSTITUTED ALKANE A	NI	NA	NA
SUBSTITUTED ALKANE #1 A	NI	NA	NA
UNDECANE A	NI	NA	NA
UNKNOWN ALKANE A	NI	NA	NA
UNKNOWN ALKANE #1 A	NI	NA	NA

TCL Semi-volatile Organics TIC (mg/kg)

DECANE A	NI	NA	NA
HEPTADECANE A	0.5 NJ	NA	NA
HEXADECANE A	0.5 NJ	NA	NA
NONADECANE A	0.5 NJ	NA	NA
PENTADECANE A	0.6 NJ	NA	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL A	NI	NA	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	0.5 NJ	NA	NA
TETRADECANE A	0.5 NJ	NA	NA
TRIDECAE A	0.5 NJ	NA	NA
TRIDECAE B	NI	NA	NA
UNKNOWN A	0.2 NJ	NA	NA
UNKNOWN B	NI	NA	NA
UNKNOWN C	NI	NA	NA
UNKNOWN ALKANE A	0.5 NJ	NA	NA
UNKNOWN ALKANE B	0.5 NJ	NA	NA
UNKNOWN ALKANE C	NI	NA	NA
UNKNOWN ALKANE D	NI	NA	NA
UNKNOWN ALKANE E	NI	NA	NA
UNKNOWN ALKANE #1 A	NI	NA	NA
UNKNOWN ALKANE #2 A	NI	NA	NA
UNKNOWN HALOGENATED HYDROCARBON A	NI	NA	NA

Appendix IX - Semi-volatile TIC (mg/kg)

DECANE A	NA	0.8 NJ	0.8 NJ
HEPTADECANE A	NA	0.8 NJ	0.8 NJ
HEXADECANE A	NA	0.7 NJ	0.8 NJ
ISOPROPYL ALCOHOL A	NA	NI	NI
NONADECANE A	NA	NI	0.7 NJ
PENTADECANE A	NA	1 NJ	1 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NA	1.2 NJ	NI
TETRADECANE A	NA	1 NJ	1 NJ
TRIDECAE A	NA	1 NJ	1.2 NJ
TRIDECAE B	NA	0.7 NJ	NI
UNKNOWN A	NA	NI	NI
UNKNOWN B	NA	NI	NI
UNKNOWN ALKANE A	NA	0.1 NJ	0.26 NJ
UNKNOWN ALKANE B	NA	0.7 NJ	1.2 NJ
UNKNOWN ALKANE C	NA	0.7 NJ	0.7 NJ
UNKNOWN ALKANE D	NA	NI	0.7 NJ
UNKNOWN ALKANE #1 A	NA	0.13 NJ	0.29 NJ
UNKNOWN ALKANE #2 A	NA	NI	0.15 NJ
UNKNOWN ALKANE #3 A	NA	NI	0.17 NJ

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively indentified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified

LFR TABLE 5.12

SWMU #33
FORMER SOUTH PONTIAC POND
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-33-2	BH-33-2	BH-33-3
Sample Interval:	16-18 ft.	34-36 ft.	15-16 ft.
Sample ID:	S-7097-121798-DS-063	S-7097-121798-DS-064	S-7097-120998-DS-048
Sample Date:	12/17/1998	12/17/1998	12/9/1998

ParameterTCL Volatile Organic Compounds TIC (mg/kg)

ISOPROPYL ALCOHOL A	NI	NI	NI
SUBSTITUTED ALKANE A	NI	NI	NI
SUBSTITUTED ALKANE #1 A	NI	NI	NI
UNDECANE A	NI	NI	NI
UNKNOWN ALKANE A	NI	NI	NI
UNKNOWN ALKANE #1 A	NI	NI	NI

TCL Semi-volatile Organics TIC (mg/kg)

DECANE A	NI	NI	NI
HEPTADECANE A	0.4 NJ	NI	0.5 NJ
HEXADECANE A	0.4 NJ	NI	0.5 NJ
NONADECANE A	NI	0.1 NJ	NI
PENTADECANE A	0.5 NJ	NI	0.7 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL A	NI	NI	0.8 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NI	NI	NI
TETRADECANE A	0.5 NJ	NI	0.6 NJ
TRIDECANE A	0.5 NJ	NI	0.7 NJ
TRIDECANE B	NI	NI	NI
UNKNOWN A	0.7 NJ	0.6 NJ	1.5 NJ
UNKNOWN B	NI	0.2 NJ	NI
UNKNOWN C	NI	NI	NI
UNKNOWN ALKANE A	0.12 NJ	0.2 NJ	0.5 NJ
UNKNOWN ALKANE B	0.7 NJ	NI	0.5 NJ
UNKNOWN ALKANE C	0.4 NJ	NI	0.5 NJ
UNKNOWN ALKANE D	0.4 NJ	NI	NI
UNKNOWN ALKANE E	0.4 NJ	NI	NI
UNKNOWN ALKANE #1 A	NI	NI	NI
UNKNOWN ALKANE #2 A	NI	NI	NI
UNKNOWN HALOGENATED HYDROCARBON A	NI	0.2 NJ	NI

Appendix IX - Semi-volatile TIC (mg/kg)

DECANE A	NA	NA	NA
HEPTADECANE A	NA	NA	NA
HEXADECANE A	NA	NA	NA
ISOPROPYL ALCOHOL A	NA	NA	NA
NONADECANE A	NA	NA	NA
PENTADECANE A	NA	NA	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NA	NA	NA
TETRADECANE A	NA	NA	NA
TRIDECANE A	NA	NA	NA
TRIDECANE B	NA	NA	NA
UNKNOWN A	NA	NA	NA
UNKNOWN B	NA	NA	NA
UNKNOWN ALKANE A	NA	NA	NA
UNKNOWN ALKANE B	NA	NA	NA
UNKNOWN ALKANE C	NA	NA	NA
UNKNOWN ALKANE D	NA	NA	NA
UNKNOWN ALKANE #1 A	NA	NA	NA
UNKNOWN ALKANE #2 A	NA	NA	NA
UNKNOWN ALKANE #3 A	NA	NA	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively indentified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified

LFR TABLE 5.12

SWMU #33
 FORMER SOUTH DETENTION POND
 SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
 RCRA FACILITY INVESTIGATION REPORT
 GENERAL MOTORS CORPORATION
 PONTIAC, MICHIGAN

Location:	BH-33-3	BH-33-4	BH-33-4
Sample Interval:	26-28 ft.	16-18 ft.	20-22 ft.
Sample ID:	S-7097-121098-DS-052	S-7097-121698-DS-058	S-7097-121698-DS-059
Sample Date:	12/10/1998	12/16/1998	12/16/1998

ParameterTCL Volatile Organic Compounds TIC (mg/kg)

ISOPROPYL ALCOHOL A	3 NJ	NA	NI
SUBSTITUTED ALKANE A	0.16 NJ	NA	NI
SUBSTITUTED ALKANE #1 A	0.24 NJ	NA	NI
UNDECANE A	0.27 NJ	NA	NI
UNKNOWN ALKANE A	0.15 NJ	NA	NI
UNKNOWN ALKANE #1 A	0.47 NJ	NA	NI

TCL Semi-volatile Organics TIC (mg/kg)

DECANE A	0.7 NJ	NA	0.7 NJ
HEPTADECANE A	0.9 NJ	NA	0.6 NJ
HEXADECANE A	0.7 NJ	NA	0.6 NJ
NONADECANE A	NI	NA	NI
PENTADECANE A	1 NJ	NA	0.8 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL A	1.3 NJ	NA	NI
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NI	NA	1 NJ
TETRADECANE A	1 NJ	NA	0.7 NJ
TRIDECANE A	0.9 NJ	NA	0.9 NJ
TRIDECANE B	0.8 NJ	NA	NI
UNKNOWN A	NI	NA	0.7 NJ
UNKNOWN B	NI	NA	NI
UNKNOWN C	NI	NA	NI
UNKNOWN ALKANE A	0.7 NJ	NA	0.12 NJ
UNKNOWN ALKANE B	0.7 NJ	NA	0.6 NJ
UNKNOWN ALKANE C	NI	NA	0.6 NJ
UNKNOWN ALKANE D	NI	NA	NI
UNKNOWN ALKANE E	NI	NA	NI
UNKNOWN ALKANE #1 A	NI	NA	0.14 NJ
UNKNOWN ALKANE #2 A	NI	NA	NI
UNKNOWN HALOGENATED HYDROCARBON A	NI	NA	NI

Appendix IX - Semi-volatile TIC (mg/kg)

DECANE A	NA	NI	NA
HEPTADECANE A	NA	0.4 NJ	NA
HEXADECANE A	NA	0.4 NJ	NA
ISOPROPYL ALCOHOL A	NA	0.61 NJ	NA
NONADECANE A	NA	NI	NA
PENTADECANE A	NA	0.5 NJ	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NA	0.6 NJ	NA
TETRADECANE A	NA	0.5 NJ	NA
TRIDECANE A	NA	0.4 NJ	NA
TRIDECANE B	NA	NI	NA
UNKNOWN A	NA	1 NJ	NA
UNKNOWN B	NA	0.4 NJ	NA
UNKNOWN ALKANE A	NA	0.4 NJ	NA
UNKNOWN ALKANE B	NA	0.4 NJ	NA
UNKNOWN ALKANE C	NA	NI	NA
UNKNOWN ALKANE D	NA	NI	NA
UNKNOWN ALKANE #1 A	NA	NI	NA
UNKNOWN ALKANE #2 A	NA	NI	NA
UNKNOWN ALKANE #3 A	NA	NI	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively indentified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified

LFR TABLE 5.12

SWMU #33
 FORMER SOUTH PONTIAC POND
 SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
 RCRA FACILITY INVESTIGATION REPORT
 GENERAL MOTORS CORPORATION
 PONTIAC, MICHIGAN

Location:	BH-33-4	BH-33-5	BH-33-6
Sample Interval:	20-22 ft.	28-30 ft.	22-24 ft.
Sample ID:	S-7097-121698-DS-060	S-7097-120998-DS-047	S-7097-121198-DS-057
Sample Date:	12/16/1998	12/9/1998	12/11/1998
	Duplicate		

ParameterTCL Volatile Organic Compounds TIC (mg/kg)

ISOPROPYL ALCOHOL A	NI	NI	NI
SUBSTITUTED ALKANE A	NI	NI	0.13 NJ
SUBSTITUTED ALKANE #1 A	NI	NI	NI
UNDECANE A	NI	NI	0.14 NJ
UNKNOWN ALKANE A	NI	NI	0.26 NJ
UNKNOWN ALKANE #1 A	NI	NI	0.25 NJ

TCL Semi-volatile Organics TIC (mg/kg)

DECANE A	0.7 NJ	NI	0.8 NJ
HEPTADECANE A	0.8 NJ	NI	0.8 NJ
HEXADECANE A	0.7 NJ	NI	0.7 NJ
NONADECANE A	NI	NI	NI
PENTADECANE A	0.9 NJ	NI	1 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL A	NI	NI	NI
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	0.2 NJ	NI	NI
TETRADECANE A	0.9 NJ	NI	0.9 NJ
TRIDECANE A	1 NJ	NI	0.9 NJ
TRIDECANE B	0.7 NJ	NI	0.7 NJ
UNKNOWN A	0.9 NJ	0.8 NJ	NI
UNKNOWN B	NI	0.2 NJ	NI
UNKNOWN C	NI	0.2 NJ	NI
UNKNOWN ALKANE A	0.17 NJ	NI	1.2 NJ
UNKNOWN ALKANE B	0.7 NJ	NI	0.7 NJ
UNKNOWN ALKANE C	NI	NI	0.7 NJ
UNKNOWN ALKANE D	NI	NI	NI
UNKNOWN ALKANE E	NI	NI	NI
UNKNOWN ALKANE #1 A	0.17 NJ	NI	NI
UNKNOWN ALKANE #2 A	0.12 NJ	NI	NI
UNKNOWN HALOGENATED HYDROCARBON A	NI	0.6 NJ	NI

Appendix IX - Semi-volatile TIC (mg/kg)

DECANE A	NA	NA	NA
HEPTADECANE A	NA	NA	NA
HEXADECANE A	NA	NA	NA
ISOPROPYL ALCOHOL A	NA	NA	NA
NONADECANE A	NA	NA	NA
PENTADECANE A	NA	NA	NA
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NA	NA	NA
TETRADECANE A	NA	NA	NA
TRIDECANE A	NA	NA	NA
TRIDECANE B	NA	NA	NA
UNKNOWN A	NA	NA	NA
UNKNOWN B	NA	NA	NA
UNKNOWN ALKANE A	NA	NA	NA
UNKNOWN ALKANE B	NA	NA	NA
UNKNOWN ALKANE C	NA	NA	NA
UNKNOWN ALKANE D	NA	NA	NA
UNKNOWN ALKANE #1 A	NA	NA	NA
UNKNOWN ALKANE #2 A	NA	NA	NA
UNKNOWN ALKANE #3 A	NA	NA	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

NJ - Parameter is a tentively indentified compound (TIC) and represents an estimated value.

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

NA - Parameter not analyzed.

NI - Not identified

Richard Kowalski

LFR TABLE 5.13

SWMW #34
NORTH PONTIAC WARDSUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	SD-34-1	BH-34-1	BH-34-1
Sample Interval:	0-1 ft.	2-4 ft.	2-4 ft.
Sample ID:	SD-7097-120498-TJ-040	S-7097-120398-TJ-043	S-7097-120398-TJ-042
Sample Date:	12/4/1998	12/3/1998	12/3/1998

Parameter	GIDCV (1)			
<u>TCL Semi-volatile Organics (mg/kg)</u>				
2-METHYLNAPHTHALENE	40,000	0.2 J	ND(0.3)	ND(0.3)
ACENAPHTHENE	200,000	1.9	ND(0.3)	ND(0.3)
ANTHRACENE	1,000,000	4.5	ND(0.3)	ND(0.3)
BENZO(A)ANTHRACENE	100	12	0.1 J	ND(0.3)
BENZO(A)PYRENE	10	12	0.1 J	ND(0.3)
BENZO(B)FLUORANTHENE	100	13	0.1 J	ND(0.3)
BENZO(G,H,I)PERYLENE	9,100	4.2	0.1 J	ND(0.3)
BENZO(K)FLUORANTHENE	1,000	11	0.1 J	ND(0.3)
BIS(2-ETHYLHEXYL) PHTHALATE	10,000	4.1	ND(0.3)	ND(0.3)
CARBAZOLE	3,700	2.9	ND(0.3)	ND(0.3)
CHRYSENE	10,000	14	0.2 J	ND(0.3)
DI-N-OCTYL PHTHALATE	28,000	0.1 J	ND(0.3)	ND(0.3)
DIBENZ(A,H)ANTHRACENE	10	1.4	ND(0.3)	ND(0.3)
DIBENZOFURAN	ID	1.3	ND(0.3)	ND(0.3)
FLUORANTHENE	180,000	33	0.4	ND(0.3)
FLUORENE	130,000	2.8	ND(0.3)	ND(0.3)
INDENO(1,2,3-CD)PYRENE	100	7	0.1 J	ND(0.3)
NAPHTHALENE	80,000	0.3	ND(0.3)	ND(0.3)
PHENANTHRENE	8,000	26	0.2 J	ND(0.3)
PYRENE	110,000	28	0.3 J	ND(0.3)
<u>TAL Metals (mg/kg)</u>				
ALUMINUM, TOTAL	660,000	2,320	6,540	6,680
ANTIMONY, TOTAL	1,200	U(0.04) J	U(0.05) J	U(0.03) J
ARSENIC, TOTAL	61	3.9	5.7	4.3
BARIUM, TOTAL	250,000	15	32	35
BERYLLIUM, TOTAL	3,100	0.17	0.28	0.23
CADMIUM, TOTAL	4,100	0.33	0.21	0.23
CALCIUM, TOTAL	NR	58,400	37,600	49,800
CHROMIUM, TOTAL	17,000 (2)	6	10	11
COBALT, TOTAL	18,000	4.12	4.69	4.76
COPPER, TOTAL	140,000	10.1	10.7	10.4
IRON, TOTAL	1,000,000	6,440	11,500	13,000
LEAD, TOTAL	900	15.5	11	6.38
MAGNESIUM, TOTAL	1,000,000	11,900	11,800	13,600
MANGANESE, TOTAL	170,000	228	323	353
MERCURY, TOTAL	1,100	ND(0.1)	0.03 J	ND(0.1)
NICKEL, TOTAL	270,000	11.4	12.9	13.1
POTASSIUM, TOTAL	NR	ND(400)	660	680
SELENIUM, TOTAL	18,000	0.6	0.7	0.9
SILVER, TOTAL	17,000	0.03	0.06	0.05
SODIUM, TOTAL	1,000,000	510	187	262
THALLIUM, TOTAL	240	0.16	0.19	0.18
VANADIUM, TOTAL	10,000	9	17	17
ZINC, TOTAL	1,000,000	59	44	39

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not -detect at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

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Aug 05, 2009 13:21

LFR TABLE 5.13

SWMW #34
 NORTH PONTIAC WARD
 SUMMARY OF DETECTED TCL/TAL RESULTS IN SOIL SAMPLES
 RCRA FACILITY INVESTIGATION REPORT
 GENERAL MOTORS CORPORATION
 PONTIAC, MICHIGAN

Location:	BH-34-2	BH-34-3	BH-34-4
Sample Interval:	2-4 ft.	2-4 ft.	2-4 ft.
Sample ID:	S-7097-120398-TJ-038	S-7097-120398-TJ-038	S-7097-120898-TJ-046
Sample Date:	12/3/1998	12/3/1998	12/8/1998

<u>Parameter</u>	<u>GIDCV (1)</u>			
<u>TCL Semi-volatile Organics (mg/kg)</u>				
2-METHYLNAPHTHALENE	40,000	ND(0.3)	ND(0.3)	ND(0.3)
ACENAPHTHENE	200,000	ND(0.3)	ND(0.3)	ND(0.3)
ANTHRACENE	1,000,000	ND(0.3)	ND(0.3)	ND(0.3)
BENZO(A)ANTHRACENE	100	ND(0.3)	ND(0.3)	ND(0.3)
BENZO(A)PYRENE	10	ND(0.3)	ND(0.3)	ND(0.3)
BENZO(B)FLUORANTHENE	100	ND(0.3)	ND(0.3)	ND(0.3)
BENZO(G,H,I)PERYLENE	9,100	ND(0.3)	ND(0.3)	ND(0.3)
BENZO(K)FLUORANTHENE	1,000	ND(0.3)	ND(0.3)	ND(0.3)
BIS(2-ETHYLHEXYL) PHTHALATE	10,000	ND(0.3)	ND(0.3)	ND(0.3)
CARBAZOLE	3,700	ND(0.3)	ND(0.3)	ND(0.3)
CHRYSENE	10,000	ND(0.3)	ND(0.3)	ND(0.3)
DI-N-OCTYL PHTHALATE	28,000	ND(0.3)	ND(0.3)	ND(0.3)
DIBENZ(A,H)ANTHRACENE	10	ND(0.3)	ND(0.3)	ND(0.3)
DIBENZOFURAN	ID	ND(0.3)	ND(0.3)	ND(0.3)
FLUORANTHENE	180,000	ND(0.3)	ND(0.3)	ND(0.3)
FLUORENE	130,000	ND(0.3)	ND(0.3)	ND(0.3)
INDENO(1,2,3-CD)PYRENE	100	ND(0.3)	ND(0.3)	ND(0.3)
NAPHTHALENE	80,000	ND(0.3)	ND(0.3)	ND(0.3)
PHENANTHRENE	8,000	ND(0.3)	ND(0.3)	ND(0.3)
PYRENE	130,000	0.06 J	ND(0.3)	ND(0.3)
<u>TAL Metals (mg/kg)</u>				
ALUMINUM, TOTAL	550,000	6,360	6,390	6,370
ANTIMONY, TOTAL	1,200	U(0.08) J	0.07	U(0.03) J
ARSENIC, TOTAL	51	5.4	5.08	6.5
BARIUM, TOTAL	250,000	35	28	37
BERYLLIUM, TOTAL	3,100	0.32	0.24	0.31
CADMIUM, TOTAL	4,100	0.22	0.29	0.19
CALCIUM, TOTAL	NR	64,400	64,500	70,300
CHROMIUM, TOTAL	17,000 (2)	12	11	11
COBALT, TOTAL	18,000	5.52	4.85	6.39
COPPER, TOTAL	140,000	12.8	12.5	31.2
IRON, TOTAL	1,000,000	13,700	15,900	15,300
LEAD, TOTAL	900	8.94	7.08	7.41
MAGNESIUM, TOTAL	1,000,000	18,300	20,500	20,800
MANGANESE, TOTAL	170,000	277	298	306
MERCURY, TOTAL	1,100	0.03 J	ND(0.1)	ND(0.1)
NICKEL, TOTAL	270,000	15.7	15.3	18.2
POTASSIUM, TOTAL	NR	1,040	1,070	1,230
SELENIUM, TOTAL	18,000	0.6	0.4 J	0.4 J
SILVER, TOTAL	17,000	0.06	ND(0.02)	0.07 J
SODIUM, TOTAL	1,000,000	189	410	131
THALLIUM, TOTAL	240	0.20	0.27	0.35
VANADIUM, TOTAL	10,000	19	19	16
ZINC, TOTAL	1,000,000	44	50	43

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not -detect at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

 Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

LFR TABLE 5.14

Aug 05, 2009 13:21

SWMU #34

NORTH RETENTION POND
SUMMARY OF DETECTED APPENDIX IX RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location: SD-34-2
Sample Interval: 0-1 ft.
Sample ID: SD-7097-120398-TJ-041
Sample Date: 12/3/1998

Parameter GIDCV (1)

Appendix IX - Semi-Volatile Organics (mg/kg)

BENZO(A)ANTHRACENE	100	0.2 J
BENZO(A)PYRENE	10	0.3
BENZO(B)FLUORANTHENE	100	0.3
BENZO(G,H,I)PERYLENE	9,100	0.2 J
BENZO(K)FLUORANTHENE	1,000	0.3
BIS(2-ETHYLHEXYL) PHTHALATE	10,000	0.1 J
CHRYSENE	10,000	0.4
DIBENZ(A,H)ANTHRACENE	10	0.04 J
FLUORANTHENE	180,000	0.9
INDENO(1,2,3-CD)PYRENE	100	0.3 J
PHENANTHRENE	8,000	0.4
PYRENE	110,000	0.6

Appendix IX - Metals (mg/kg)

ANTIMONY, TOTAL	1,200	U(0.04) J
ARSENIC, TOTAL	61	5.4
BARIUM, TOTAL	250,000	36
BERYLLIUM, TOTAL	3,100	0.31
CADMIUM, TOTAL	4,100	0.21
CHROMIUM, TOTAL	17,000 (2)	13
COBALT, TOTAL	18,000	6.35
COPPER, TOTAL	140,000	13.3
LEAD, TOTAL	900	8.25
MERCURY, TOTAL	1,100	0.02 J
NICKEL, TOTAL	270,000	17.1
SELENIUM, TOTAL	18,000	0.9
SILVER, TOTAL	17,000	0.05
THALLIUM, TOTAL	240	0.24
VANADIUM, TOTAL	10,000	20
ZINC, TOTAL	1,000,000	55

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.

U () - Parameter is qualified as not-detected at the limit stated in parenthesis.

J - Parameter is estimated value.

NR - No regulatory criteria established.

ID - Inadequate data to develop criterion.

ft. - Feet below ground surface.

-- Parameter not sampled.

(1) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(2) - Value is for Chromium VI.

(3) - Criteria for total PCB's.

Boxed values represent parameters which exceeded Generic Industrial Soil Direct Contact Value Criteria.

LFR TABLE 5.15

SVTUS #34
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NORTH RETENTION POND
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	SD-34-1	SD-34-2	BH-34-1
Sample Interval:	0-1 ft.	0-1 ft.	2-4 ft.
Sample ID:	SD-7097-120498-TJ-040	SD-7097-120398-TJ-041	S-7097-120398-TJ-043
Sample Date:	12/4/1998	12/3/1998	12/3/1998

ParameterTCL Volatile Organic Compounds (mg/kg)

UNKNOWN A	0.29 NJ	NA	NI
UNKNOWN ALKANE A	NI	NA	NI
UNKNOWN ALKANE #1 A	NI	NA	NI
UNKNOWN ALKANE #2 A	NI	NA	NI
UNKNOWN ALKANE #3 A	NI	NA	NI

TCL Semi-volatile Organics (mg/kg)

(6H)CYCLOBUTAJ[K]PHENANTHRENE A	4.9 NJ	NA	NI
.GAMMA.-SITOSTEROL A	NI	NA	0.4 NJ
11H-BENZOFLUORENE ISOMER A	4.8 NJ	NA	NI
11H-BENZOFLUORENE ISOMER B	3.7 NJ	NA	NI
2-PROPENOIC ACID, 2-METHYL-, DODECY A	3.8 NJ	NA	NI
7H-BENZ[DE]ANTHRACEN-7-ONE A	2.5 NJ	NA	NI
9,10-ANTHRACENEDIONE A	2.1 NJ	NA	NI
BENZO(E)PYRENE A	8.1 NJ	NA	NI
DODECANE A	NI	NA	NI
HEPTADECANE A	NI	NA	NI
HEXADECANE A	NI	NA	NI
METHYLPYRENE ISOMER A	1.9 NJ	NA	NI
NONADECANE A	NI	NA	NI
PENTADECANE A	NI	NA	0.3 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NI	NA	NI
TETRADECANE A	NI	NA	NI
TRIDECAN A	NI	NA	NI
UNKNOWN A	2.3 NJ	NA	0.6 NJ
UNKNOWN B	NI	NA	0.3 NJ
UNKNOWN C	NI	NA	0.5 NJ
UNKNOWN ALDEHYDE A	NI	NA	0.3 NJ
UNKNOWN ALKANE A	NI	NA	0.4 NJ
UNKNOWN ALKANE B	NI	NA	0.5 NJ
UNKNOWN ALKANE C	NI	NA	0.5 NJ
UNKNOWN ALKANE D	NI	NA	0.3 NJ
UNKNOWN PAH A	3.1 NJ	NA	NI

Appendix IX - Semi-volatile TIC (mg/kg)

HEPTADECANE A	NA	0.4 NJ	NA
HEXADECANE A	NA	0.3 NJ	NA
PENTADECANE A	NA	0.4 NJ	NA
TETRADECANE A	NA	0.4 NJ	NA
UNKNOWN A	NA	0.8 NJ	NA
UNKNOWN ALKANE A	NA	0.5 NJ	NA
UNKNOWN ALKANE B	NA	0.3 NJ	NA
UNKNOWN ALKANE C	NA	0.3 NJ	NA
UNKNOWN ALKANE D	NA	0.3 NJ	NA
UNKNOWN ALKANE E	NA	0.4 NJ	NA

Notes:

ND () - Parameter not-detected at the limit stated in parenthesis.
 NJ - Parameter is tentively identified compound (TIC) and represents an estimated value.
 J - Parameter is estimated value.
 NR - No regularatory criteria established.
 ID - Inadequate data to develop criterion.
 ft. - Feet below ground surface.
 NA - Parameter not analyzed.
 NI - Not identified.

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SVTU #34
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NORTH RETENTION POND
SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Location:	BH-34-1	BH-34-2	BH-34-3	BH-34-4
Sample Interval:	2-4 ft.	2-4 ft.	2-4 ft.	2-4 ft.
Sample ID:	S-7097-120398-TJ-042	S-7097-120398-TJ-039	S-7097-120398-TJ-038	S-7097-120898-TJ-
Sample Date:	12/3/1998	12/3/1998	12/3/1998	12/8/1998
	Duplicate			

ParameterTCL Volatile Organic Compounds (mg/kg)

UNKNOWN A	0.36 NJ	NI	NI	0.14 NJ
UNKNOWN ALKANE A	NI	NI	NI	0.36 NJ
UNKNOWN ALKANE #1 A	NI	NI	NI	0.39 NJ
UNKNOWN ALKANE #2 A	NI	NI	NI	0.22 NJ
UNKNOWN ALKANE #3 A	NI	NI	NI	0.21 NJ

TCL Semi-volatile Organics (mg/kg)

(6H)CYCLOBUTA[J]K]PHENANTHRENE A	NI	NI	NI	NI
.GAMMA.-SITOSTEROL A	NI	NI	NI	NI
11H-BENZOFUORENE ISOMER A	NI	NI	NI	NI
11H-BENZOFUORENE ISOMER B	NI	NI	NI	NI
2-PROPENOIC ACID, 2-METHYL-, DODECY A	NI	NI	NI	NI
7H-BENZ[DE]ANTHRACEN-7-ONE A	NI	NI	NI	NI
9,10-ANTHRACENEDIONE A	NI	NI	NI	NI
BENZO(E)PYRENE A	NI	NI	NI	NI
DODECANE A	NI	NI	NI	0.9 NJ
HEPTADECANE A	0.2 NJ	0.3 NJ	0.2 NJ	0.7 NJ
HEXADECANE A	0.2 NJ	NI	0.2 NJ	0.7 NJ
METHYLPYRENE ISOMER A	NI	NI	NI	NI
NONADECANE A	NI	NI	NI	0.6 NJ
PENTADECANE A	0.3 NJ	0.4 NJ	0.2 NJ	0.9 NJ
PENTADECANE, 2,6,10,14-TETRAMETHYL- A	NI	0.5 NJ	0.4 NJ	1.1 NJ
TETRADECANE A	0.2 NJ	0.3 NJ	NI	0.9 NJ
TRIDECAN A	NI	0.3 NJ	NI	0.9 NJ
UNKNOWN A	0.5 NJ	0.6 NJ	0.3 NJ	1 NJ
UNKNOWN B	0.3 NJ	0.4 NJ	0.3 NJ	NI
UNKNOWN C	0.2 NJ	0.6 NJ	NI	NI
UNKNOWN ALDEHYDE A	NI	NI	NI	NI
UNKNOWN ALKANE A	0.4 NJ	0.4 NJ	0.2 NJ	0.6 NJ
UNKNOWN ALKANE B	0.3 NJ	0.5 NJ	0.2 NJ	NI
UNKNOWN ALKANE C	0.3 NJ	NI	0.2 NJ	NI
UNKNOWN ALKANE D	NI	NI	0.2 NJ	NI
UNKNOWN PAH A	NI	NI	NI	NI

Appendix IX - Semi-volatile TIC (mg/kg)

HEPTADECANE A	NA	NA	NA	NA
HEXADECANE A	NA	NA	NA	NA
PENTADECANE A	NA	NA	NA	NA
TETRADECANE A	NA	NA	NA	NA
UNKNOWN A	NA	NA	NA	NA
UNKNOWN ALKANE A	NA	NA	NA	NA
UNKNOWN ALKANE B	NA	NA	NA	NA
UNKNOWN ALKANE C	NA	NA	NA	NA
UNKNOWN ALKANE D	NA	NA	NA	NA
UNKNOWN ALKANE E	NA	NA	NA	NA

Notes:

ND () - Parameter not-detected at the limit state
 NJ - Parameter is tentively identified compound (TIC) and represents an estimated value.
 J - Parameter is estimated value.
 NR - No regularatory criteria established.
 ID - Inadequate data to develop criterion.
 ft. - Feet below ground surface.
 NA - Parameter not analyzed.
 NI - Not identified.

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LFR TABLE 5.15

SVTU #14

NORTH RETENTION POND

SUMMARY OF DETECTED TIC RESULTS IN SOIL SAMPLES
 RCRA FACILITY INVESTIGATION REPORT
 GENERAL MOTORS CORPORATION
 PONTIAC, MICHIGAN

*Location:**Sample Interval:**Sample ID:*

046

*Sample Date:*ParameterTCL Volatile Organic Compounds (mg/kg)

UNKNOWN A
 UNKNOWN ALKANE A
 UNKNOWN ALKANE #1 A
 UNKNOWN ALKANE #2 A
 UNKNOWN ALKANE #3 A

TCL Semi-volatile Organics (mg/kg)

(6H)CYCLOBUTA[JK]PHENANTHRENE A
 .GAMMA.-SITOSTEROL A
 11H-BENZOFUORENE ISOMER A
 11H-BENZOFUORENE ISOMER B
 2-PROPENOIC ACID, 2-METHYL-, DODECY A
 7H-BENZ[DELAN]THACEN-7-ONE A
 9,10-ANTHRACENEDIONE A
 BENZO[5]PYRENE A
 DODECANE A
 HEPTADECANE A
 HEXADECANE A
 METHYL PYRENE ISOMER A
 NONADECANE A
 PENTADECANE A
 PENTADECANE-3,8,10,14-TETRAMETHYL- A
 TETRADECANE A
 TRIDEDECANE A
 UNKNOWN A
 UNKNOWN B
 UNKNOWN C
 UNKNOWN ALDEHYDE A
 UNKNOWN ALKANE A
 UNKNOWN ALKANE B
 UNKNOWN ALKANE C
 UNKNOWN ALKANE D
 UNKNOWN PAH A

Appendix IX - Semi-volatile TIC (mg/kg)

HEPTADECANE A
 HEXADECANE A
 PENTADECANE A
 TETRADECANE A
 UNKNOWN A
 UNKNOWN ALKANE A
 UNKNOWN ALKANE B
 UNKNOWN ALKANE C
 UNKNOWN ALKANE D
 UNKNOWN ALKANE E

Notes:

ND () - Parameter not-detected at the limit stated
 NJ - Parameter is tentively identified compound ()
 J - Parameter is estimated value.
 NR - No regulatory criteria established.
 ID - Inadequate data to develop criterion.
 ft. - Feet below ground surface.
 NA - Parameter not analyzed.
 NI - Not identified.

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LFR TABLE 5.16

**SUMMARY OF DETECTED ANALYTES
IN PERCHED GROUNDWATER
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

<i>Sample Location</i> <i>Sample ID # GW-7097-081700</i> <i>Date Sampled</i> <i>QA/QC</i>	<i>Federal Maximum Contaminant Level</i>	<i>Industrial & Commercial Drinking Water Criteria¹</i>	<i>Groundwater Contact Criteria²</i>	<i>MW3-1 -TJ-001 8/17/2000 Groundwater</i>	<i>MW3-1 -TJ-002 8/17/2000 Groundwater/Duplicate</i>	<i>MW31-1 -TJ-003 8/17/2000 Groundwater</i>
<u>Volatile Organic Compounds (µg/L)</u>						
Benzene	5	5	11,000	ND(0.50) ⁴	ND(0.50)	3.0
cis-1,2-Dichloroethene	70	70	200,000	ND(0.50)	ND(0.50)	1.0
Vinyl Chloride	2	2	570	ND(0.50)	ND(0.50)	14
<u>Semi-Volatile Organic Compounds (µg/L)</u>						
	714	714	NA	ND	ND	ND
<u>Polychlorinated Biphenyls (PCBs) (µg/L)</u>						
	0.5	0.5	3.3	ND(0.08)	ND(0.08)	ND(0.08)
<u>Total Metals (µg/L)</u>						
Aluminum	50-200 (SMCL) ⁶	50	64,000,000	116	ND(50)	1,220
Antimony	6	6	68,000	0.25	ND(0.25)	ND(0.25)
Arsenic	50	50	4,300	24.2	25.8	33.3
Barium	2000	2,000	14,000,000	429	434	252
Calcium	NV	ID ³	ID	323,000	327,000	186000 J
Copper	1,000 (AL) ⁷	1,000	7,400,000	ND(10)	ND(10)	12.3
Iron	300 (SMCL)	300	58,000,000	11,100	11,300	14,700
Lead	15 (AL)	4	ID	0.75	0.56	5.06
Magnesium	NV	1,100,000	1,000,000,000	95,400	95,000	52,600
Manganese	50 (SMCL)	50	9,100,000	1,360	1,330	1,340
Nickel	NV	100	74,000,000	224	228	ND(20)
Potassium	NV	NV	NV	9,200	9,290	7,770
Selenium	50	50	970,000	23.3	27.4	ND(10)
Silver	100 (SMCL)	98	1,500,000	0.36	ND(0.25)	ND(0.25)
Sodium	NV	350,000	1,000,000,000	790,000	810,000	570,000
Zinc	5000 (SMCL)	5,000	110,000,000	ND(10)	ND(10)	33.5
<u>Dissolved Metals (µg/L)</u>						
Antimony	6	6	68,000	0.39	1.2	0.93

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SUMMARY OF DETECTED ANALYTES
IN PERCHED GROUNDWATER
RCRA FACILITY INVESTIGATION REPORT
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Sample Location	Federal	Industrial &	Groundwater	MW3-1	MW3-1	MW31-1
Sample ID # GW-7097-081700	Maximum	Commercial	Contact	-TJ-001	-TJ-002	-TJ-003
Date Sampled	Contaminant	Drinking Water	Criteria ²	8/17/2000	8/17/2000	8/17/2000
QA/QC	Level	Criteria ¹		Groundwater	Groundwater/Duplicate	Groundwater
Arsenic	50	50	4,300	25.9	25.8	37.6
Barium	2000	2,000	14,000,000	455	444	251
Calcium	NV	ID	ID	335,000	310,000	176,000
Copper	1,000 (AL)	1,000	7,400,000	ND(10)	ND(10)	15.4
Iron	300 (SMCL)	300	58,000,000	11,800	11,000	10,600
Lead	15 (AL)	4	ID	0.32	0.37	ND(0.10)
Magnesium	NV	1,100,000	1,000,000,000	98,100	90,300	49,900
Manganese	50 (SMCL)	50	9,100,000	1,400	1,370	1,280
Nickel	NV	100	74,000,000	244	196	ND(20)
Potassium	NV	ID	ID	9,430	10,100	7,830
Selenium	50	50	970,000	29.4	29.7	13.7
Sodium	NV	350,000	1,000,000,000	835,000	775,000	562,000
Zinc	5000 (SMCL)	5,000	110,000,000	ND(10)	10.4	ND(10)

Notes:

NV - No Value

¹ Industrial & Commercial Drinking Water Criteria - MDEQ Operational Memorandum #18, June 6, 2000² Groundwater Contact Criteria - MDEQ Operational Memorandum #18, June 6, 2000³ ID - Insufficient Data⁴ ND - Not detected at or above the detection limit in parentheses⁵ NA - Not Applicable⁶ SMCL - Secondary Maximum Contaminant Level⁷ AL - Action Level Underlined value exceeds Act 451, Part 201 Industrial/Commercial Drinking Water Criteria Italicized value exceeds Federal Maximum Contaminant Level Boxed value exceeds Act 451, Part 201 Industrial Groundwater Contact Criteria

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LFR TABLE 5.17

**SUMMARY OF CHEMICALS OF POTENTIAL CONCERN (COPC) FOR SWMU #3
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

Parameter	Units	DETECTION	RANGE OF	MEAN	95% UCL	Screening	COPC
		FREQUENCY (1) Detects / Total	DETECTS (1) Min. - Max.			Level GIDCV (2)	
<u>Semi-volatile Organics</u>							
2-METHYLNAPHTHALENE	mg/kg	1 / 10	0.3	0.17	0.19	40,000	
ACENAPHTHENE	mg/kg	4 / 10	0.08 J - 1.5	0.28	0.50	200,000	
ANTHRACENE	mg/kg	4 / 10	0.2 J - 2.6	0.44	0.87	1,000,000	
BENZO(A)ANTHRACENE	mg/kg	5 / 10	0.1 J - 3.2	0.55	1.42	100	
BENZO(A)PYRENE	mg/kg	5 / 10	0.1 J - 2.6	0.48	1.13	10	
BENZO(B)FLUORANTHENE	mg/kg	5 / 10	0.1 J - 3.3	0.54	1.30	100	
BENZO(G,H,I)PERYLENE	mg/kg	5 / 10	0.06 J - 1.2	0.28	0.53	9,100	
BENZO(K)FLUORANTHENE	mg/kg	5 / 10	0.09 J - 1.4	0.34	0.70	1,000	
BIS(2-ETHYLHEXYL) PHTHALATE	mg/kg	1 / 10	0.1 J	0.15	0.16	10,000	
CARBAZOLE	mg/kg	3 / 9	0.09 J - 1.6	0.31	0.62	3,700	
CHRYSENE	mg/kg	5 / 10	0.1 J - 2.9	0.54	1.47	10,000	
DIBENZO(A,H)ANTHRACENE	mg/kg	5 / 10	0.06 - 0.4	0.14	0.23	10	
DIBENZOFURAN	mg/kg	3 / 10	0.1 J - 1.2	0.26	0.41	ID	
FLUORANTHENE	mg/kg	5 / 10	0.3 J - 2.7	1.51	11.02	180,000	
FLUORENE	mg/kg	4 / 10	0.08 J - 1.8	0.33	0.62	130,000	
INDENO(1,2,3-CD)PYRENE	mg/kg	4 / 10	0.03 - 1.4	0.32	0.55	100	
NAPHTHALENE	mg/kg	3 / 10	0.05 J - 0.8	0.20	0.33	80,000	
PHENANTHRENE	mg/kg	5 / 10	0.2 J - 1.2	1.68	11.88	8,000	
PHENOL	mg/kg	3 / 10	0.1 J - 0.4	0.19	0.24	12,000	
PYRENE	mg/kg	6 / 10	0.07 J - 8.3	1.27	9.10	110,000	
<u>Polychlorinated Biphenyls (PCBs)</u>							
AROCLOR 1254	mg/kg	2 / 10	0.05 J - 0.13	0.13	0.40	9.9 (3)	
<u>Metals</u>							
ALUMINUM, TOTAL	mg/kg	9 / 9	2,370 - 9,040	5,871.11	7,326.97	660,000	
ANTIMONY, TOTAL	mg/kg	8 / 10	0.03 J - 0.12	0.05	0.07	1,200	
ARSENIC, TOTAL	mg/kg	10 / 10	3.5 - 8.1	5.34	6.06	61	
BARIUM, TOTAL	mg/kg	10 / 10	12 - 115	40.50	73.80	250,000	
BERYLLIUM, TOTAL	mg/kg	10 / 10	0.16 - 0.52	0.34	0.41	3,100	
CADMIUM, TOTAL	mg/kg	10 / 10	0.16 - 0.46	0.26	0.31	4,100	
CALCIUM, TOTAL	mg/kg	9 / 9	49,200 - 153,000	82,655.56	104,385.94	NR	
CHROMIUM, TOTAL	mg/kg	10 / 10	4.9 - 36	12.47	19.53	17,000	
COBALT, TOTAL	mg/kg	10 / 10	3.23 - 8.79	5.27	6.40	18,000	
COPPER, TOTAL	mg/kg	10 / 10	7.5 - 15.9	11.61	13.34	140,000	
IRON, TOTAL	mg/kg	9 / 9	6,030 - 16,000	10,666.67	12,995.32	1,000,000	
LEAD, TOTAL	mg/kg	10 / 10	5.14 - 16.2	9.32	11.35	900	
MAGNESIUM, TOTAL	mg/kg	9 / 9	10,300 - 24,800	18,288.89	21,405.65	1,000,000	
MANGANESE, TOTAL	mg/kg	9 / 9	196 - 397	300.22	344.36	170,000	
MERCURY, TOTAL	mg/kg	5 / 9	0.02 J - 0.04 J	0.04	0.05	1,100	
NICKEL, TOTAL	mg/kg	10 / 10	9.6 - 24.1	15.49	19.94	270,000	
POTASSIUM, TOTAL	mg/kg	6 / 9	650 - 1,900	828.78	1,219.26	NR	
SELENIUM, TOTAL	mg/kg	4 / 10	0.3 J - 0.9	0.40	0.51	18,000	
SILVER, TOTAL	mg/kg	9 / 9	0.04 J - 0.07	0.05	0.06	17,000	
SODIUM, TOTAL	mg/kg	9 / 9	137 - 2,440	503.56	1,106.34	1,000,000	
THALLIUM, TOTAL	mg/kg	10 / 10	0.1 - 0.42	0.20	0.26	240	
VANADIUM, TOTAL	mg/kg	10 / 10	8 - 23	15.70	18.41	10,000	
ZINC, TOTAL	mg/kg	10 / 10	26 - 65	40.20	46.35	1,000,000	
<u>General Chemistry</u>							
CYANIDE, TOTAL	mg/kg	2 / 10	0.3 - 0.4	0.27	0.30	250	

Notes:

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Insufficient data to develop criterion.

-- Not Applicable

COPC - Chemical of Potential Concern

(1) Based on data collected from SWMU #3 sampling locations : BH-3-1, BH-3-2, BH-3-3, BH-3-4, BH-3-5.

(2) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(3) - Criteria for total PCB's.

(4) - Value is for Chromium VI.

(5) - Criteria for total xylenes.

☐ - Exceed Screening level

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LFR TABLE 5.18

**SUMMARY OF CHEMICALS OF POTENTIAL CONCERN (COPC) IN SWMU #29
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

Parameter	Units	DETECTION	RANGE OF	MEAN (1)	95% UCL (1)	Screening	COPC
		FREQUENCY (1) Detects / Total	DETECTS (1) Min. - Max.			Level GIDCV (2)	
<u>Volatile Organics</u>							
ETHYLBENZENE	mg/kg	1 / 8	0.12	0.04	0.06	140	
M,P-XYLENES	mg/kg	1 / 7	0.63	0.13	0.46	150 (5)	
O-XYLENE	mg/kg	1 / 7	0.22	0.05	0.14	150 (5)	
TETRACHLOROETHENE (PCE)	mg/kg	1 / 8	0.04 J	0.03	0.03	88	
TOLUENE	mg/kg	1 / 8	0.043 J	0.03	0.03	250	
<u>Semi-volatile Organics</u>							
ACENAPHTHENE	mg/kg	3 / 8	0.07 J - 0.6	0.20	0.36	200,000	
ANTHRACENE	mg/kg	4 / 8	0.05 J - 0.5	0.20	0.34	1,000,000	
BENZO(A)ANTHRACENE	mg/kg	4 / 8	0.1 J - 1.1	0.37	1.00	100	
BENZO(A)PYRENE	mg/kg	4 / 8	0.1 J - 1	0.33	0.80	10	
BENZO(B)FLUORANTHENE	mg/kg	4 / 8	0.1 J - 1	0.34	0.85	100	
BENZO(G,H,I)PERYLENE	mg/kg	5 / 8	0.04 J - 0.5	0.20	0.30	9,100	
BENZO(K)FLUORANTHENE	mg/kg	4 / 8	0.1 J - 0.8	0.27	0.50	1,000	
CARBAZOLE	mg/kg	3 / 7	0.04 J - 0.02 J	0.13	0.17	3,700	
CHRYSENE	mg/kg	4 / 8	0.2 J - 1.2	0.37	0.95	10,000	
DIBENZ(A,H)ANTHRACENE	mg/kg	3 / 8	0.04 J - 0.2 J	0.13	0.22	10	
DIBENZOFURAN	mg/kg	3 / 8	0.09 - 0.8	0.22	0.40	ID	
FLUORANTHENE	mg/kg	6 / 8	0.09 J - 1.8	0.61	4.39	180,000	
FLUORENE	mg/kg	3 / 8	0.07 J - 0.5	0.19	0.31	130,000	
INDENO(1,2,3-CD)PYRENE	mg/kg	5 / 8	0.04 J - 0.6	0.23	0.61	100	
NAPHTHALENE	mg/kg	2 / 8	0.07 J - 0.1 J	0.13	0.17	80,000	
PHENANTHRENE	mg/kg	5 / 8	0.08 J - 1.7	0.55	3.17	8,000	
PYRENE	mg/kg	6 / 8	0.08 J - 2	0.66	6.03	110,000	
<u>Polychlorinated Biphenyls (PCBs)</u>							
AROCOR 1254	mg/kg	5 / 8	0.14 J - 0.56	0.24	0.38	9.9 (3)	
AROCOR 1260	mg/kg	5 / 8	0.03 J - 0.1 J	0.09	0.25	9.9 (3)	
<u>Metals</u>							
ALUMINUM, TOTAL	mg/kg	7 / 7	1,670 - 8,250	5,036.43	6,629.51	660,000	
ANTIMONY, TOTAL	mg/kg	8 / 8	0.03 J - 0.2	0.09	0.13	1,200	
ARSENIC, TOTAL	mg/kg	8 / 8	2.1 - 6.1	4.22	5.17	61	
BARIUM, TOTAL	mg/kg	8 / 8	18 - 147	56.56	101.63	250,000	
BERYLLIUM, TOTAL	mg/kg	8 / 8	0.14 - 0.98	0.36	0.36	3,100	
CADMIUM, TOTAL	mg/kg	8 / 8	0.15 - 1.06	0.42	0.62	4,100	
CALCIUM, TOTAL	mg/kg	7 / 7	33,100 - 184,000	87,800.00	123,532.19	NR	
CHROMIUM, TOTAL	mg/kg	8 / 8	2.8 - 41	14.29	26.62	17,000 (4)	
COBALT, TOTAL	mg/kg	8 / 8	1.98 - 9.62	4.46	6.11	18,000	
COPPER, TOTAL	mg/kg	8 / 8	4.88 - 19.4	11.51	14.56	140,000	
IRON, TOTAL	mg/kg	7 / 7	2,450 - 15,600	10,140.00	13,086.90	1,000,000	
LEAD, TOTAL	mg/kg	8 / 8	4.13 - 67.9	21.84	67.86	900	
MAGNESIUM, TOTAL	mg/kg	7 / 7	11,000 - 98,200	34,885.71	56,285.93	1,000,000	
MANGANESE, TOTAL	mg/kg	7 / 7	126 - 361	255.86	306.45	170,000	
MERCURY, TOTAL	mg/kg	4 / 8	0.02 J - 0.07 J	0.05	0.06	1,100	
NICKEL, TOTAL	mg/kg	8 / 8	7.3 - 45.8	17.43	31.83	270,000	
POTASSIUM, TOTAL	mg/kg	4 / 7	570 - 1,100	521.43	773.29	NR	
SELENIUM, TOTAL	mg/kg	3 / 8	0.4 J - 0.7	0.45	0.54	18,000	
SILVER, TOTAL	mg/kg	8 / 8	0.03 - 0.12	0.06	0.08	17,000	
SODIUM, TOTAL	mg/kg	7 / 7	112 - 156	130.50	142.29	1,000,000	
THALLIUM, TOTAL	mg/kg	8 / 8	0.06 - 0.27	0.16	0.21	240	
VANADIUM, TOTAL	mg/kg	8 / 8	7 - 20	13.75	16.61	10,000	
ZINC, TOTAL	mg/kg	8 / 8	17 - 224	61.50	120.92	1,000,000	

Notes:

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Insufficient data to develop criterion.

-- Not Applicable

COPC - Chemical of Potential Concern

(1) Based on data collected from SWMU #29 sampling locations : BH-29-1, BH-29-2, BH-29-3, BH-29-4, SS-29-1, SS-29-2, SS-29-3, SS-29-4.

(2) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(3) - Criteria for total PCB's.

(4) - Value is for Chromium VI.

(5) - Criteria for total xylenes.

☐ - Exceed Screening level

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TABLE 5.19
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SUMMARY OF CHEMICALS OF POTENTIAL CONCERN (COPC) FOR SWMU #31
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Parameter	Units	DETECTION	RANGE OF	MEAN	95% UCL	Screening	COPC
		FREQUENCY (1)	DETECTS (1)			Level	
DETECTS / Total							
Min. - Max.							
(1)							
(1)							
GIDCV (2)							

Notes:

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Insufficient data to develop criterion.

-- Not Applicable

COPC - Chemical of Potential Concern

(1) Based on data collected from SWMU #31 sampling locations : BH-31-1, BH-31-2, BH-31-3, SS-31-1, SS-31-2, SS-31-3.

(2) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(3) - Criteria for total PCB's.

(4) - Value is for Chromium VI.

(5) - Criteria for total xylenes.

☐ - Exceed Screening level

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**SUMMARY OF CHEMICALS OF POTENTIAL CONCERN (COPC) FOR SWMU #33
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

Parameter	Units	DETECTION	RANGE OF	MEAN	95% UCL	Screening	COPC
		FREQUENCY (1) Detects / Total	DETECTS (1) Min. - Max.			Level GIDCV (2)	
<u>Semi-volatile Organics</u>							
2-METHYLNAPHTHALENE	mg/kg	5 / 11	0.1 J - 0.2 J	0.15	0.18	40,000	
NAPHTHALENE	mg/kg	1 / 11	0.07 J	0.14	0.16	80,000	
PHENANTHRENE	mg/kg	5 / 11	0.08 J - 0.1 J	0.13	0.15	8,000	
<u>Metals</u>							
ALUMINUM, TOTAL	mg/kg	9 / 9	1,750 - 7,010	5,438.89	6,470.78	660,000	
ANTIMONY, TOTAL	mg/kg	11 / 11	0.05 J - 0.2	0.08	0.10	1,200	
ARSENIC, TOTAL	mg/kg	11 / 11	2.3 - 8.5	5.75	6.86	61	
BARIUM, TOTAL	mg/kg	11 / 11	12 - 43	33.55	38.38	250,000	
BERYLLIUM, TOTAL	mg/kg	11 / 11	0.07 - 0.42	0.29	0.35	3,100	
CADMIUM, TOTAL	mg/kg	11 / 11	0.1 - 0.66	0.29	0.36	4,100	
CALCIUM, TOTAL	mg/kg	9 / 9	70,400 - 82,300	75,238.89	77,758.86	NR	
CHROMIUM, TOTAL	mg/kg	11 / 11	5 - 14	10.95	12.31	17,000 (4)	
COBALT, TOTAL	mg/kg	11 / 11	2.15 - 9.01	6.25	7.22	18,000	
COPPER, TOTAL	mg/kg	11 / 11	5.6 - 22.1	13.89	16.20	140,000	
IRON, TOTAL	mg/kg	9 / 9	3,310 - 16,400	12,790.00	14,935.72	1,000,000	
LEAD, TOTAL	mg/kg	11 / 11	3.04 - 12.4	7.50	8.76	900	
MAGNESIUM, TOTAL	mg/kg	9 / 9	14,600 - 25,100	22,183.33	24,212.95	1,000,000	
MANGANESE, TOTAL	mg/kg	9 / 9	235 - 369	304.89	328.42	170,000	
MERCURY, TOTAL	mg/kg	1 / 11	0.02 J	0.05	0.06	1,100	
NICKEL, TOTAL	mg/kg	11 / 11	6.7 - 27.2	18.44	21.58	270,000	
POTASSIUM, TOTAL	mg/kg	9 / 9	680 - 1,500	1,023.33	1,278.06	NR	
SELENIUM, TOTAL	mg/kg	8 / 11	0.23 - 0.7	0.41	0.51	18,000	
SILVER, TOTAL	mg/kg	11 / 11	0.02 - 0.09	0.07	0.08	17,000	
SODIUM, TOTAL	mg/kg	9 / 9	105 - 167	131.67	143.44	1,000,000	
THALLIUM, TOTAL	mg/kg	11 / 11	0.08 - 0.61	0.35	0.44	240	
VANADIUM, TOTAL	mg/kg	11 / 11	7 - 20	16.27	19.67	10,000	
ZINC, TOTAL	mg/kg	11 / 11	26 - 65	46.05	52.59	1,000,000	
<u>Miscellaneous</u>							
SOLIDS, TOTAL	%	6 / 6	83.1 - 97.4	89.83	93.60	NR	

Notes:

J - Parameter concentration is estimated value.

NR - No regulatory criteria established.

ID - Insufficient data to develop criterion.

-- Not Applicable

COPC - Chemical of Potential Concern

(1) Based on data collected from SWMU #33 sampling locations : BH-33-1, BH-33-2, BH-33-3, BH-33-4, BH-33-5, BH-33-6.

(2) - Generic Industrial Soil Direct Contact Value, MDEQ ERD Operational Memorandum No. 18, June 6, 2000.

(3) - Criteria for total PCB's.

(4) - Value is for Chromium VI.

(5) - Criteria for total xylenes.

☐ - Exceed Screening level

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SUMMARY OF TOXICOLOGICAL DATA
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

Parameter	CASRN	IRIS Reference Number	Tox. Class (2)	RfD (3)				CSF (4)			
				Oral (mg/kg-day)	Oral to Dermal Adjustment Factor (7)	Dermal (5) (mg/kg-day)	Inhalation (mg/kg-day)	Oral (1/mg/kg-day))	Oral to Dermal Adjustment Factor (7)	Dermal (6) (1/mg/kg-day))	Inhalation (1/mg/kg-day))
Arsenic	7440-38-2	278	A (1)	0.0003 (1)	100%	0.0003	--	1.5 (1)	100%	1.50	15 (1)

NOTES :

-- = Not Available

(1) USEPA Integrated Risk Information System database (IRIS), March 3, 1999.

(2) Tox. Class. : Toxicological Classification

EPA Weight of Evidence Ranking

A - Known human carcinogen.

(3) RfD : Reference Dose

(4) CSF : Cancer Slope Factor

(5) Adjusted Dermal RfD = Oral RfD x Adjustment Factor.

(6) Adjusted Dermal CSF = Oral CSF/Adjustment Factor.

(7) Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Supplemental Guidance: Dermal Risk Assessment, March 14, 1999.

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TABLE 6.2

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**DERIVATION OF THE RISK-BASED REMEDIATION GOAL FOR LEAD
ASSUMING FUTURE SOIL EXCAVATION/CONSTRUCTION ON SITE - CONSTRUCTION WORKERS
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

$$RBRG \text{ for Lead (PRG) (ug/g)} = \frac{(PbB_{adult, central, goal} - PbB_{adult, 0}) \bullet AT}{(BKSF \bullet IR_s \bullet AF_s \bullet EF_s)}$$

where:

$$PbB_{adult, central, goal} = \frac{PbB_{fetal, 0.95, goal}}{GSD_{i, adult}^{1.645} \bullet R_{fetal / maternal}}$$

<i>Model Parameters</i>	<i>units</i>	<i>Typical Value</i>	<i>Input Values</i>
95th Percentile PbB in fetus	(ug/dL)	10	10
Individual geometric standard deviation (GSDi)	--	1.8 - 2.1	2
Rfetal/maternal	--	0.9	0.9
Baseline blood lead value (PbBO)	(ug/dL)	1.7 - 2.2	2.0
Biokinetic slope factor (BKSF)	(ug/dL per ug/day)	0.4	0.4
Soil ingestion rate (IRs)	(g/day)	0.05 - 0.10	0.1
Soil Exposure Frequency (EFs)	(days/yr)	250	20
Absolute absorption fraction of lead in soil (AFs)	--	0.12	0.12
Averaging Time (AT)	(days)	365	365

Risk-Based Remediation Goal for Lead (RBRG) (mg/kg) : **5,904**

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APPENDIX A

STRATIGRAPHIC AND INSTRUMENTATION LOGS

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(DL-17)
Page 1 of 1

PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-3-1
DATE COMPLETED: DECEMBER 2, 1998
DRILLING METHOD: 4 1/2" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	N' VALUE	PID (ppm)
	GROUND SURFACE	926.6					
2.5	CONCRETE, gravel mixed, white gray	926.1		1SS	X	4	0.0
	SAND (FILL), little clay and fine subrounded gravel, trace silt, medium grained, well graded, orange brown, very moist, oxidized			2SS	X	8	0.0
5.0	- trace clay and fine subrounded gravel			3SS	X	10	0.0
	- olive brown to olive gray			4SS	X	8	0.0
	- medium to coarse grained			5SS	X	12	0.0
7.5	CL-CLAY (TILL), little silt, trace fine grained sand and fine subrounded gravel, firm to stiff low plasticity, homogeneous, olive gray, moist	919.8		6SS	X	7	0.0
	- stiff			7SS	X	3	0.0
10.0	- trace fine and coarse rounded gravel			8SS	X	10	0.0
	- firm			9SS	X	10	0.0
12.5	SP-SAND (NATIVE), trace silt, loose, medium grained, poorly graded, orange brown, very moist, oxidized	915.6		10SS	X	12	0.0
	- dark gray, medium to coarse grained, wet, not oxidized						
15.0	- little silt	912.4					
17.5	CL-CLAY (TILL), little silt, trace fine grained sand and fine subrounded gravel, stiff low plasticity, homogeneous, dark gray, moist						
	- some silt						
20.0	END OF HOLE @ 20.0ft BGS	906.6					
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▼ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(DL-18)
Page 1 of 1

PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-3-2
DATE COMPLETED: DECEMBER 2, 1998
DRILLING METHOD: 4X" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	928.1					
	CONCRETE, gravel mixed, white gray	927.2					
-2.5	SAND (FILL), trace silt and fine subrounded gravel, fine and medium grained, poorly graded, dark gray, moist	926.9		1SS	X	10	0.8
-5.0	CL-CLAY (NATIVE), little silt, trace fine grained sand and fine subrounded gravel, stiff, low plasticity, banded, moist, oxidized - hard (potentially pushing stone)		8"Ø BOREHOLE	2SS	X	10	0.0
-7.5	- stiff			3SS	X	30	0.0
	SP-SAND (NATIVE), trace silt, medium dense, medium grained, poorly graded, orange brown, very moist, oxidized	926.3		4SS	X	14	0.0
-10.0	CL-CLAY (TILL), little silt, trace fine grained sand and fine subrounded gravel, stiff, low plasticity, homogeneous, dark gray, moist	919.3	BENTONITE CHIPS	5SS	X	14	0.0
-12.5	ML-SILT (TILL), trace clay, fine grained sand and fine subrounded gravel, dense, poorly graded, dark gray, moist	917.1		6SS	X	48	0.0
-15.0	CL-CLAY (TILL), little silt, trace fine subrounded gravel, stiff, low plasticity, homogeneous, dark gray, moist	915.3		7SS	X	13	0.0
-17.5				8SS	X	11	0.0
-20.0	END OF HOLE @ 19.0ft BGS	909.1	2"Ø SPLIT SPOON	9SS	X	14	0.0
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▼ STATIC WATER LEVEL ▼

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(DL-19)
Page 1 of 1

PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-3-3
DATE COMPLETED: DECEMBER 2, 1998
DRILLING METHOD: 4 1/2" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	927.8					
	CONCRETE, gravel mixed, white gray						
-2.5	SAND (FILL), trace silt and fine subrounded gravel, fine and medium grained, poorly graded, dark gray, moist	926.7 926.4	 8" Ø BOREHOLE BENTONITE CHIPS 2" Ø SPLIT SPOON	1SS	X	8	1.8
-5.0	CL-CLAY (NATIVE), little silt, trace fine grained and and fine subrounded gravel, firm to stiff, low plasticity, homogeneous, gray, moist			2SS	X	8	2.3
-7.5	- little fine grained sand, dark brown, oxidized	922.0		3SS	X	7	3.8
-10.0	- firm			4SS	X	8	2.3
	SAND (NATIVE), trace silt and fine rounded gravel, fine grained, loose, poorly graded, orange brown, oxidized (utility corridor)			5SS	X	5	1.3
-12.5	- medium grained	916.8		6SS	X	11	3.4
-15.0	CL-CLAY (TILL), little silt and fine grained sand, trace fine subrounded gravel, stiff, low plasticity, homogeneous, brown gray, moist			7SS	X	3	0.8
-17.5	- some fine grained sand, soft, gray, very moist			8SS	X	13	0.0
-20.0	- stiff			9SS	X	9	0.0
-20.0	END OF HOLE @ 19.0ft BGS	908.8					
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▼ STATIC WATER LEVEL ▼

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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Page 1 of 1

PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-3-4
DATE COMPLETED: DECEMBER 3, 1998
DRILLING METHOD: 4 1/2" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	927.1					
	CONCRETE, gravel mixed, white gray						
-2.5	SAND (FILL), little clay and fine subrounded gravel, trace silt, medium grained, well graded, orange brown, moist, oxidized	926.1 925.5		1SS	X	8	52.0
-5.0	CL-CLAY (NATIVE), little fine grained sand, trace silt and fine subrounded gravel, firm to stiff, low plasticity, banded, orange brown, moist, oxidized - firm, dark brown	921.5		2SS	X	6	18.3
-7.5	SP-SAND (NATIVE), trace silt and fine subrounded gravel, loose, medium grained, poorly graded, light brown, moist	920.1		3SS	X	6	9.7
-10.0	CL-CLAY (TILL), little silt, trace fine grained sand and fine subrounded gravel, stiff, low plasticity, brown gray, moist, slight oxidation	918.1		4SS	X	10	0.0
-12.5	SP-SAND (NATIVE), trace silt, loose, medium grained, poorly graded, gray, wet	917.3		5SS	X	4	0.0
-15.0	CL-CLAY (TILL), little fine grained sand, trace silt and fine subrounded gravel, soft to firm, low plasticity, homogeneous, gray, moist - stiff - little to some silt			6SS	X	10	0.0
-17.5				7SS	X	9	0.0
-20.0	END OF HOLE @ 19.0ft BGS	908.1		8SS	X	9	0.0
-22.5				9SS	X	12	0.0
-25.0							
-27.5							
-30.0							
-32.5							

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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▼ STATIC WATER LEVEL ▼

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(DL-21)
Page 1 of 1

PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-3-5A
DATE COMPLETED: DECEMBER 8, 1998
DRILLING METHOD: 4 1/2" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	928.0					
	CONCRETE, gravel mixed, white gray	927.5					
	SAND (FILL), little fine subangular gravel, medium grained, well graded, olive brown, moist	926.8		1SS	X	9	3.9
-2.5	CL-CLAY (NATIVE), little silt, trace fine grained sand and fine to coarse, subrounded gravel, stiff, low plasticity, banded, light brown, moist, oxidized		8"Ø BOREHOLE	2SS	X	13	1.1
-5.0	- very stiff			3SS	X	19	2.0
-7.5		920.5		4SS	X	23	9.8
	SP-SAND (NATIVE), trace silt and fine subrounded gravel, medium dense, fine grained, poorly graded, light brown, moist		BENTONITE CHIPS	5SS	X	19	4.1
-10.0	CL-CLAY (TILL), little silt, trace fine grained sand and fine subrounded gravel, stiff, low plasticity, homogeneous, dark gray, moist	918.0		6SS	X	24	NA
-12.5				7SS	X	9	6.4
-15.0	- stiff			8SS	X	25	0.8
-17.5				9SS	X	12	0.0
-20.0	END OF HOLE @ 20.0ft BGS	908.0	2"Ø SPLIT SPOON	10SS	X	10	0.0
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-29-1
DATE COMPLETED: DECEMBER 1, 1998
DRILLING METHOD: 4X" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	956.3					
-2.5	CL-CLAY (NATIVE), some sand, trace silt, fine, subrounded gravel and vegetation (grass, roots), stiff, slight plasticity, banded, dark brown, moist, oxidized - no vegetation (grass, roots)		 8"Ø BOREHOLE BENTONITE CHIPS 2"Ø SPLIT SPOON	1SS	X	14	0.0
-5.0	- very stiff			2SS	X	12	0.0
-7.5				3SS	X	13	0.0
-10.0	- soft to firm			4SS	X	19	0.0
-12.5	SP-SAND (NATIVE), trace silt, loose, medium grained, poorly graded, orange-brown, moist, oxidized - trace fine and coarse subrounded gravel medium dense	945.3		5SS	X	15	0.0
-15.0	CL-CLAY (TILL), some silt, trace fine grained sand and fine, subrounded gravel, soft, low plasticity, homogeneous, light brown, moist - trace fine grained interbedded sand seams <1/2", firm, moist to very moist - little fine grained sand, light gray - gray	942.6		6SS	X	4	0.0
-17.5				7SS	X	10	0.0
-20.0	END OF HOLE @ 20.0ft BGS	936.3		8SS	X	3	0.0
-22.5				9SS	X	5	0.0
-25.0				10SS	X	7	0.0
-27.5							
-30.0							
-32.5							

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-29-2
DATE COMPLETED: DECEMBER 1, 1998
DRILLING METHOD: 4X" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	"N" VALUE	PID (ppm)
	GROUND SURFACE	953.1					
-2.5	SAND (FILL), little clay and silt, little to trace fine subangular gravel, fine and medium grained, well graded, dark brown, moist, slight potential black staining		 8"Ø BOREHOLE BENTONITE CHIPS 2"Ø SPLIT SPOON	1SS	X	32	0.0
		949.5		2SS	X	39	0.0
-5.0	CL-CLAY (NATIVE), little fine grained sand and coarse subangular gravel, trace silt, stiff, slight plasticity, banded, dark brown, moist, oxidized			3SS	X	15	0.8
-7.5	- dark olive gray, potential slight petroleum like staining			4SS	X	10	0.0
-10.0	- some fine grained sand, brown, oxidized, no staining			5SS	X	11	NA
	- no recovery (pushing coarse subangular stone)			6SS	X	4	0.0
-12.5	- soft to firm			7SS	X	16	0.0
	SP-SAND (NATIVE), trace silt, medium dense, medium grained, poorly graded, dark brown, wet	940.5		8SS	X	14	0.0
-15.0	CL-CLAY (TILL), little silt and fine grained sand, trace fine subrounded gravel, stiff, slight plasticity, homogeneous, dark brown, moist	938.5		9SS	X	12	0.0
-17.5	- trace fine grained sand			10SS	X	12	0.0
-20.0	END OF HOLE @ 20.0ft BGS	933.1					
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▼ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-29-3
DATE COMPLETED: DECEMBER 1, 1998
DRILLING METHOD: 4 1/2" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	954.3					
-2.5	SAND (FILL), little clay and fine subangular gravel and trace silt, medium grained, well graded, grayish brown, moist - trace black staining	950.1	 8"Ø BOREHOLE BENTONITE CHIPS 2"Ø SPLIT SPOON	1SS	X	32	0.0
				2SS	X	39	0.0
-5.0	CL-CLAY (NATIVE), little silt, trace fine grained sand and fine subrounded gravel, stiff, low plasticity, banded, moist, oxidized			3SS	X	15	0.0
-7.5	- firm to stiff			4SS	X	10	0.0
-10.0	- no recovery (pushing coarse, subrounded stone in split spoon)	5SS		X	11	0.0	
-12.5	- very stiff (potentially influenced by stone)	6SS		X	4	NA	
		7SS		X	16	0.0	
-15.0	SM-SAND (NATIVE), some silt, trace clay, medium dense, fine grained, poorly graded, orange brown, moist	8SS		X	14	0.0	
-17.5	CL-CLAY (TILL), little silt, trace fine grained sand and fine subrounded gravel, stiff, low plasticity, homogeneous, light gray, moist - no recovery (pushing coarse, subrounded stone in split spoon)	9SS		X	12	0.0	
-20.0	END OF HOLE @ 20.0ft BGS	934.3			10SS	X	12
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-29-4
DATE COMPLETED: DECEMBER 1, 1998
DRILLING METHOD: 4 1/2" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	956.2					
-2.5	CLAY (FILL), some sand, trace fine subangular gravel, vegetation (grass) and silt, slight plasticity, brownish black, moist, faint petroleum like odor	955.0	 8"Ø BOREHOLE BENTONITE CHIPS 2"Ø SPLIT SPOON	1SS	X	14	5.6
-5.0	CL-CLAY (NATIVE), little silt and fine grained sand, trace fine subrounded gravel, stiff, slight plasticity, banded, brown, moist, oxidized - very stiff			2SS	X	13	4.8
-7.5				3SS	X	21	7.8
-10.0	- firm to stiff			4SS	X	22	0.0
-12.5		941.6		5SS	X	18	0.0
-15.0	ML-SILT (TILL), little fine grained sand, trace clay, loose, poorly graded, reddish brown, moist, oxidized - no clay, medium dense - light gray, very moist (not oxidized) - loose			6SS	X	8	0.0
-17.5	CL-CLAY (TILL), little silt, trace fine grained sand and fine subrounded gravel, stiff, low plasticity, homogeneous, olive-gray, moist	940.6		7SS	X	11	0.0
-20.0	END OF HOLE @ 20.0ft BGS	936.2		8SS	X	7	0.0
-22.5				9SS	X	10	0.0
-25.0				10SS	X	12	0.0
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: SS-29-1
DATE COMPLETED: DECEMBER 2, 1998
DRILLING METHOD: 4X" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	958.8					
	GRAVEL (FILL), little fine grained sand, trace silt, fine and coarse well graded, gray, moist, subangular	958.5	 BENTONITE CHIPS 3"Ø SPLIT SPOON	ISS	X	19	4.1
-2.5	SAND (FILL), little fine, subangular gravel, trace silt and clay, medium grained, well graded, brown, moist - little clay	954.8					
-5.0	END OF HOLE @ 2.0ft BGS						
-7.5							
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: SS-29-2
DATE COMPLETED: DECEMBER 2, 1998
DRILLING METHOD: 4X" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	P10 (ppm)
	GROUND SURFACE	957.0					
	GRAVEL (FILL), little fine grained sand, trace silt, fine and coarse well graded, gray, moist, subangular	958.7	 BENTONITE CHIPS 3"Ø SPLIT SPOON	ISS	X	11	7.1
-2.5	SAND (FILL), little fine, subangular gravel, trace silt and clay, medium grained, well graded, brown, moist - little clay	955.0					
-5.0	END OF HOLE @ 2.0ft BGS						
-7.5							
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION

HOLE DESIGNATION: SS-29-3

PROJECT NUMBER: 7097

DATE COMPLETED: DECEMBER 2, 1998

CLIENT: GENERAL MOTORS

DRILLING METHOD: 4 1/2" HSA

LOCATION: PONTIAC, MICHIGAN

CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	956.7					
	GRAVEL (FILL), little fine grained sand, trace silt, fine and coarse well graded, gray, moist, subangular	956.4	 BENTONITE CHIPS 3"Ø SPLIT SPOON	ISS	X	25	7.3
-2.5	SAND (FILL), little fine, subangular gravel, trace silt and clay, medium grained, well graded, brown, moist - little clay	954.7					
-5.0	END OF HOLE @ 2.0ft BGS						
-7.5							
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: SS-29-4
DATE COMPLETED: DECEMBER 2, 1998
DRILLING METHOD: 4" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	956.8					
	GRAVEL (FILL), little fine grained sand, trace silt, fine and coarse well graded, gray, moist, subangular	956.5	 BENTONITE CHIPS 3" Ø SPLIT SPOON	ISS		20	2.5
-2.5	SAND (FILL), little fine, subangular gravel, trace silt and clay, medium grained, well graded, brown, moist - little clay	954.8					
-5.0	END OF HOLE @ 2.0ft BGS						
-7.5							
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-31-1
DATE COMPLETED: DECEMBER 10, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	938.0					
-2.5	CL-CLAY, some gravel, some silt, little sand, stiff, low plasticity. medium brown, dry to moist, concrete fragments (FILL)	934.0		1SS		11	3.5
				2SS		14	3.4
-5.0	CI-CLAY, some silt, trace gravel, trace sand, firm to very stiff, moderate plasticity, dark gray, moist			3SS		16	3.2
-7.5				4SS		8	4.6
-10.0				5SS		8	6.1
-12.5				6SS		8	3.2
-15.0				7SS		10	1.9
-17.5	- sand seam (moist)			8SS		11	2.4
-20.0	END OF HOLE @ 20.0ft BGS	918.0		9SS		13	1.5
-22.5				10SS		12	1.2
-25.0							
-27.5							
-30.0							
-32.5							

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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-31-2
DATE COMPLETED: DECEMBER 17, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	939.0					
-2.5	CL-CLAY (FILL), silty, little gravel, little sand, firm to very stiff, low, plasticity, medium brown, moist - black staining (1.0-1.9)			1SS	X	5	0
	- sand and slag (3.9-4.4)			2SS	X	9	0
-5.0	- saturated			3SS	X	10	0
-7.5				4SS	X	17	0
		930.0		5SS	X	19	0
-10.0	SW-SAND, gravelly, little silt, medium dense, fine to medium coarse grained, well graded, medium gray, saturated			6SS	X	28	0
-12.5	CI-CLAY, silty, little sand, trace gravel, firm to hard, moderate plasticity, medium gray, moist	927.0		7SS	X	8	0
-15.0				8SS	X	8	0
-17.5	- thin sand seams			9SS	X	50	0
-20.0	END OF HOLE @ 20.0ft BGS	919.0		10SS	X	14	0
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-31-3
DATE COMPLETED: DECEMBER 11, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	"N" VALUE	PID (ppm)
	GROUND SURFACE	941.1					
-2.5	CL-CLAY (FILL), silty, little gravel, little sand, very soft to stiff, low, plasticity, dark brown, moist			1SS	X	10	0
				2SS	X	7	0.1
-5.0	- black staining (4.5-6.0)			3SS	X	2	1.7
-7.5				4SS	X	8	1.3
	SW-SAND, gravelly, little silt, little clay, loose, medium to coarse grained, well graded, gray/brown, wet to saturated	933.0		5SS	X	9	2.1
-10.0				6SS	X	5	1.9
	CI-CLAY, silty, some sand, trace gravel, firm to stiff, moderate plasticity, dark gray, moist	931.0		7SS	X	6	1.4
-12.5				8SS	X	8	1.2
-15.0				9SS	X	9	1.4
-17.5				10SS	X	8	1.1
-20.0	END OF HOLE @ 20.0ft BGS	921.1					
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-33-1
DATE COMPLETED: DECEMBER 18, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	922.5					
-2.5	CL-CLAY, some gravel, some silt, little sand, firm to very stiff, low plasticity, medium brown, moist			1SS	X	27	0
-5.0				2SS	X	23	0
-7.5				3SS	X	12	0
-10.0				4SS	X	5	0
-12.5				5SS	X	11	0
-15.0	CI-CLAY, trace gravel, trace sand, soft to firm, moderate plasticity, dark gray, moist - native material	911.5		6SS	X	6	2.7
-17.5				7SS	X	7	0
-20.0				8SS	X	6	0
-22.5				9SS	X	6	0
-25.0				10SS	X	4	3.6
-27.5	ML-SILT, some gravel, little sand, low plasticity, medium brown, dry - trace gravel - some sand, little gravel	900.5		11SS	X	6	0
-30.0				12SS	X	141	0
-32.5				13SS	X	25+	0
				14SS	X	35	0
				15SS	X	40	0
				16SS	X	59	0
				17SS	X	130	0
	END OF HOLE @ 34.0ft BGS	888.5					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-33-2
DATE COMPLETED: DECEMBER 17, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	923.4					
-2.5	CL-CLAY, silty, little gravel, little sand, soft to very stiff, low plasticity, medium brown, moist			1SS		8	0
-5.0				2SS		14	0
-7.5				3SS		12	0
-10.0				4SS		11	0
-12.5				5SS		12	NR
-15.0	- dark gray - native material			6SS		8	0
-17.5				7SS		3	0
-20.0				8SS		5	0
-22.5				9SS		11	0
-25.0	- silty gravel seam	899.4		10SS		8	0
-27.5	ML-SILT, some gravel, some clay, little sand, hard, low plasticity, medium brown, dry			11SS		5	0
-30.0	- little gravel			12SS		20	0
-32.5				13SS		75	0
-35.0				14SS		40	0.2
-37.5				15SS		78	0.4
				16SS		70	1.2
				17SS		195	0.8
				18SS		210	1.8
	END OF HOLE @ 36.0ft BGS	887.4					
	- NOTE: - NR-NO RECOVERY						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ☒ STATIC WATER LEVEL ☒
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(DL-34)
Page 1 of 1

PROJECT NAME: PONTIAC EAST ASSEMBLY

PROJECT NUMBER: 7097

CLIENT: GENERAL MOTORS

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-33-3

DATE COMPLETED: DECEMBER 10, 1998

DRILLING METHOD: 4 1/4" HSA

CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	919.4					
-2.5	ML-SILT, some clay, little sand, trace gravel, very stiff to hard, low plasticity, medium brown, dry to moist		 BENTONITE CHIPS 8" Ø BOREHOLE	1SS	X	19	0
-5.0				2SS	X	37	0
-7.5	CL-CLAY, silty, little sand, trace gravel, soft to very stiff, low plasticity, gray/brown, dry to moist - medium gray, low to moderate plasticity	913.4		3SS	X	27	0
-10.0				4SS	X	19	0.2
-12.5				5SS	X	10	0
-15.0	- sand seam (moist, 13.0-13.5)			6SS	X	11	0
-17.5				7SS	X	8	0.3
-20.0	- native material			8SS	X	3	1.1
-22.5				9SS	X	10	1
-25.0				10SS	X	8	0.3
-27.5	ML-SILT, little sand, little clay, low plasticity, light brown, dry	893.4		11SS	X	28	0
-30.0	END OF HOLE @ 28.0ft BGS - NOTE: - NR-NO RECOVERY - OBSTRUCTION ENCOUNTERED AT 28.0 ft. BGS	891.4		12SS	X	11	1.1
-32.5				13SS	X	19	NR
				14SS	X	125+	2.7

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ▽ STATIC WATER LEVEL ▽

CHEMICAL ANALYSIS ○

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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Page 1 of 1

PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-33-3A
DATE COMPLETED: DECEMBER 10, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	919.4					
	(0'-28' BGS) SEE BH-33-3 FOR STRATIGRAPHY						
-2.5							
-5.0							
-7.5							
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0	ML-SILT, little sand, little clay, low plasticity, light brown, dry	891.4		1SS		52	0
-32.5				2SS		57	1.1
-35.0	- some gravel, some sand			3SS		74	1.4
-37.5				4SS		49	0
				5SS		105	0.5
				6SS		83	0
	END OF HOLE @ 40.0ft BGS	879.4					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-33-4
DATE COMPLETED: DECEMBER 16, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	918.9					
-2.5	CL-CLAY, silty, some sand, little gravel, soft to stiff, low plasticity, medium brown, moist		 BENTONITE CHIPS 8" Ø BOREHOLE	1SS		12	0.5
-5.0				2SS		13	2.8
-7.5				3SS		6	6.1
-10.0				4SS		3	3.9
-12.5				5SS		7	4.1
-15.0	SW-SAND, loose, medium to coarse grained, well graded, medium gray, saturated	905.4		6SS		5	2.6
-17.5	CI-CLAY, silty, little sand, trace gravel, stiff to very stiff, moderate plasticity, dark gray, moist - coarse sand seam, wet (17.5-18.0)	902.9		7SS		17	3.4
-20.0				8SS		8	4.6
-22.5				9SS		13	1.4
-25.0				10SS		15	3
-27.5	- some gravel, little sand, medium brown			11SS		11	7.5
-30.0	ML-SILT, some sand, trace gravel, low plasticity, medium brown, dry	889.9		12SS		12	2.5
-32.5	END OF HOLE @ 31.5ft BGS - NOTE: - OBSTRUCTION ENCOUNTERED AT 31.5 ft. BGS	887.4		13SS		15	3.7
				14SS		18	2.1
				15SS		27	0.5
				16SS		37	2.6

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ▽ STATIC WATER LEVEL ▽

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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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Page 1 of 1

PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-33-5
DATE COMPLETED: DECEMBER 9, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	"N" VALUE	PID (ppm)
	GROUND SURFACE	921.8					
2.5	OL-CLAY, silty, little sand, trace gravel, low plasticity, medium brown, moist, loam	920.8	 BENTONITE CHIPS 8" Ø BOREHOLE	1SS	X	21	10.2
	ML-SILT, clayey, some sand, trace gravel, very stiff, low plasticity, gray/brown, moist			2SS	X	20	6.8
5.0				3SS	X	16	3.4
7.5	CL-CLAY, silty, little sand, trace gravel, firm to very stiff, low plasticity, gray/brown, moist	916.3		4SS	X	13	4.4
10.0				5SS	X	11	5.5
12.5				6SS	X	6	3.6
15.0				7SS	X	13	7
17.5				8SS	X	8	7.3
20.0	- sand seam, medium grained (9.5-9.7)			9SS	X	18	6.2
22.5	- medium gray, native material			10SS	X	24	8.6
25.0				11SS	X	17	1.3
27.5				12SS	X	6	7.1
30.0				13SS	X	8	2.6
32.5	ML-SILT, sandy, some gravel, little clay, hard, low plasticity, medium gray, moist	895.8		14SS	X	60+	3.9
35.0				15SS	X	124+	4.6
37.5				16SS	X	98	3.2
40.0				17SS	X	240	3.7
				18SS	X	225+	1.5
				19SS	X	148	0.1
				20SS	X	103+	0
				21SS	X	90	0
	SW-SAND, little silt, trace gravel, extremely dense, fine to coarse grained, well graded, medium brown, moist to wet	881.8					
	END OF HOLE @ 42.0ft BGS						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ▽ STATIC WATER LEVEL ▽

CHEMICAL ANALYSIS ○

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-33-6
DATE COMPLETED: DECEMBER 11, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	922.1					
-2.5	CL-CLAY, silty, some sand, little gravel, firm to very stiff, low plasticity, medium brown, moist - little sand, dark gray			1SS	X	7	0.1
-5.0				2SS	X	9	2.1
-7.5				3SS	X	9	1.9
-10.0				4SS	X	11	0.9
-12.5				5SS	X	8	2.2
-15.0				6SS	X	9	1.2
-17.5				7SS	X	19	0
-20.0				8SS	X	12	0
-22.5				9SS	X	9	0
-25.0				10SS	X	24	0
-27.5	ML-SILT, some sand, trace gravel, hard, low plasticity, light brown, dry	897.6		11SS	X	9	0
-30.0				12SS	X	10	3
-32.5				13SS	X	108	0
-35.0				14SS	X	184	0
-37.5				15SS	X	100	0
				16SS	X	79	1.9
				17SS	X	78	1.4
				18SS	X	180	0.9
				19SS	X	119	0.6
				20SS	X	166	0.2
	END OF HOLE @ 40.0ft BGS	882.1					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-34-1
DATE COMPLETED: DECEMBER 4, 1998
DRILLING METHOD: 4" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	916.4					
-2.5	SAND (FILL), little clay and silt, trace vegetation (grass, roots), medium grained, poorly graded, light brown, very moist - little to some clay	912.8	 8" Ø BOREHOLE BENTONITE CHIPS 2" Ø SPLIT SPOON	1SS	X	2	0.0
-5.0	CL-CLAY (TILL), little fine grained sand and silt, trace fine subrounded gravel, stiff, slight plasticity, homogeneous, dark gray, moist - trace fine grained sand - very stiff			2SS	X	6	0.0
-7.5	- trace coarse subangular gravel - little medium grained sand - firm			3SS	X	10	0.0
-10.0	- stiff			4SS	X	17	0.0
-12.5				5SS	X	7	0.0
-15.0	- trace to little fine subrounded gravel, very stiff - stiff			6SS	X	9	0.0
-17.5	- very stiff			7SS	X	9	0.0
-20.0	END OF HOLE @ 20.0ft BGS			8SS	X	16	0.0
-22.5				9SS	X	11	0.0
-25.0				10SS	X	17	0.0
-27.5		896.4					
-30.0							
-32.5							

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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-34-2
DATE COMPLETED: DECEMBER 4, 1998
DRILLING METHOD: 4K" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	913.9					
-2.5	CLAY (FILL), some fine and medium grained sand, trace vegetation (grass, roots) and coarse subrounded gravel, slight plasticity, banded orange brown, moist, oxidized - little medium grained sand	910.3	 8"Ø BOREHOLE BENTONITE CHIPS 2"Ø SPLIT SPOON	1SS	X	4	0.0
-5.0	CL-CLAY (NATIVE), little silt, trace fine grained sand and fine subrounded gravel, soft to firm, slight plasticity, banded, brown, moist, oxidized - hard			2SS	X	4	0.0
-7.5	- trace coarse subrounded gravel - very stiff, brown gray			3SS	X	58	0.0
-10.0	CL-CLAY (TILL), little silt, trace fine grained sand and fine subrounded gravel, very stiff, low plasticity, homogeneous, dark gray, moist - stiff	4SS		X	32	0.0	
-12.5		5SS		X	16	0.0	
-15.0		6SS		X	13	0.0	
-17.5	- very stiff - interbedded medium grained sand, very moist	7SS		X	13	0.0	
-20.0	END OF HOLE @ 20.0ft BGS	8SS		X	9	0.0	
-22.5		9SS		X	13	0.0	
-25.0		10SS		X	28	0.0	
-27.5							
-30.0							
-32.5							

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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM TRUCK GROUP-RCRA INVESTIGATION
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-34-3
DATE COMPLETED: DECEMBER 3, 1998
DRILLING METHOD: 4X" HSA
CRA SUPERVISOR: T. JOHNSON

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	GROUND SURFACE	912.4					
-2.5	CLAY (FILL), little fine grained sand, trace silt, vegetation (grass, roots), and fine subrounded gravel, low plasticity, banded orange brown, moist, oxidized		 8"Ø BOREHOLE BENTONITE CHIPS 2"Ø SPLIT SPOON	1SS	X	5	0.0
		908.6		2SS	X	11	0.0
-5.0	CL-CLAY (NATIVE), some fine grained sand, trace silt and fine subrounded gravel, stiff, slight plasticity, banded, light brown, very moist - very stiff	906.6		3SS	X	29	0.0
-7.5	CL-CLAY (TILL), little silt, trace fine subrounded gravel, very stiff, low plasticity homogeneous, dark gray, moist			4SS	X	24	0.0
-10.0				5SS	X	19	0.0
-12.5	- some silt			6SS	X	20	0.0
-15.0	- little silt - some silt			7SS	X	22	0.0
-17.5	- little silt and fine grained sand - hard			8SS	X	20	0.0
-20.0	END OF HOLE @ 20.0ft BGS	892.4		9SS	X	20	0.0
-22.5				10SS	X	44	0.0
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: PONTIAC EAST ASSEMBLY
PROJECT NUMBER: 7097
CLIENT: GENERAL MOTORS
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BH-34-4
DATE COMPLETED: DECEMBER 8, 1998
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: D. SOUTTER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	N' VALUE	PID (ppm)
	GROUND SURFACE	912.8					
	OL-CLAY, silty, little sand, trace gravel, low plasticity, gray/brown, moist, loam	911.3		1SS	X	12	0.6
-2.5	CI-CLAY, silty, little sand, trace gravel, very stiff, low plasticity, gray/brown, moist			2SS	X	22	1.5
-5.0	CI-CLAY, silty, little sand, trace gravel, moderate plasticity, medium gray, moist to wet	907.8		3SS	X	13	1.4
-7.5				4SS	X	11	1.3
-10.0	- sand seam, dry (10.8-10.9)			5SS	X	10	0.9
-12.5				6SS	X	10	1.5
-15.0				7SS	X	9	0.8
-17.5				8SS	X	19	0.4
-20.0				9SS	X	12	0.4
-22.5				10SS	X	36	0.3
-25.0	END OF HOLE @ 20.0ft BGS	892.8					
-27.5							
-30.0							
-32.5							

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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
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APPENDIX B

LABORATORY ANALYTICAL DATA REPORTS

(ONE COPY OF FULL ANALYTICAL DATA SET HAS BEEN PROVIDED TO U.S. EPA -
ANALYTICAL DATA IS AVAILABLE FROM CRA UPON REQUEST)

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APPENDIX C

SOIL CUTTINGS WASTE CHARACTERIZATION ANALYTICAL RESULTS

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GM Pontiac Truck & Bus

Sample: 91131-6586 Matrix: Soil / Composite
 Client Sample: Drums 17-32 Comp. Location:
 COLLECTED: 03/19/1999 09:45 Project: 32 Soil Borings
 RECEIVED: 03/22/1999 : Sampled By: JY

Test Description	Result	Unit	Spike Recovery	Regulatory Limit	Reporting Detection Limit	Method	Date/Analyst
<u>TCLP VOLATILES SW-846 Method 1311</u>							
TCLP Extraction Volatiles	-	-	-	-	-	TCLP Extraction SW-846 Mtd. 8260B	03/22/99 WD
Vinyl Chloride	ND	mg/L	86	0.2	0.01	"	03/26/99 PJG
1,1-Dichloroethylene	ND	mg/L	93	0.7	0.01	"	03/26/99 PJG
Methyl Ethyl Ketone	ND	mg/L	80	200	0.1	"	03/26/99 PJG
Chloroform	ND	mg/L	101	6	0.01	"	03/26/99 PJG
Carbon Tetrachloride	ND	mg/L	95	0.5	0.01	"	03/26/99 PJG
1,2-Dichloroethane	ND	mg/L	91	0.5	0.01	"	03/26/99 PJG
Benzene	ND	mg/L	82	0.5	0.01	"	03/26/99 PJG
Trichloroethene	ND	mg/L	75	0.5	0.01	"	03/26/99 PJG
Tetrachloroethene	ND	mg/L	85	0.7	0.01	"	03/26/99 PJG
Chlorobenzene	ND	mg/L	96	100	0.01	"	03/26/99 PJG
1,4-Dichlorobenzene	ND	mg/L	96	7.5	0.01	"	03/26/99 PJG
<u>TCLP SEMI-VOLATILES SW1311</u>							
TCLP Semi-Volatiles	-	-	-	-	-	TCLP Extraction SW-846 Mtd. 8270C	03/22/99 WD
p-Cresol & m-Cresol	ND J,M	mg/L	1	200	0.02	"	03/25/99 JDS
o-Cresol	ND J,M	mg/L	0	200	0.02	"	03/25/99 JDS
Total Cresol	ND J,M	mg/L	1	200	0.06	"	03/25/99 JDS
Hexachlorobenzene	ND	mg/L	47	0.13	0.02	"	03/25/99 JDS
Hexachloroethane	ND	mg/L	27	3	0.02	"	03/25/99 JDS
Nitrobenzene	ND	mg/L	30	2	0.02	"	03/25/99 JDS
Pyridine	ND	mg/L	15	5	0.04	"	03/25/99 JDS
2,4,6-Trichlorophenol	ND J,M	mg/L	3	2	0.02	"	03/25/99 JDS
2,4,5-Trichlorophenol	ND J,M	mg/L	3	400	0.02	"	03/25/99 JDS
2,4-Dinitrotoluene	ND	mg/L	24	0.13	0.02	"	03/25/99 JDS
Hexachlorobutadiene	ND	mg/L	24	0.5	0.02	"	03/25/99 JDS
Pentachlorophenol	ND J,M	mg/L	12	100	0.02	"	03/25/99 JDS

J,M - The result should be considered estimated due to matrix interference.

ORGANIC PREPS

TCLP Semi Volatiles Prep.

SW-846 Mtd. 3510C 03/23/99 LJ

ND = Non Detectable

All Solid/Soil samples are reported on dry weight basis unless otherwise noted.

Project Manager

Jason A. Asher
 Jason A. Asher

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Reported : 03/30/1999

Certification Numbers: WI #999959180; MI #0021; AK UST #048; ND R-081; MD #266; IN C-MI-01

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GM Pontiac Truck & Bus

Sample:	91131-6586	Matrix:	Soil / Composite
Client Sample:	Drums 17-32 Comp	Location:	
COLLECTED:	03/19/1999 09:45	Project:	32 Soil Borings
RECEIVED:	03/22/1999	Sampled By:	JY

Test Description	Result	Unit	Spike Recovery	Regulatory Limit	Reporting Detection Limit	Method	Date/Analyst
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HAZARDOUS WASTE CHARACTERIZATION

Corrosivity	NC	s.u.				SW-846 Mtd. 7.2.2	03/24/99 JL
				NC = Non Corrosive			
Ignitability	NI	-				SW-846 Mtd. 7.1	03/24/99 WD
				Note: NI = Non Ignitable / I - Ignitable			
				Capable, under standard temperature and pressure,			
				of causing fire through friction, absorption of			
				moisture, or spontaneous chemical changes, and			
				when ignited, burns so vigorously and persistently			
				that it creates a hazard			
Reactive Cyanide	ND	mg/kg		250	25	SW-846 7.3.3.2	03/29/99 LS
Reactive Sulfide	ND	mg/kg		500	50	SW-846 7.3.4.2	03/29/99 LS

PHYSICAL PROPERTY ANALYSIS

pH (laboratory)	8.3	s.u.			0.1	SW-846 Mtd. 9045C	03/24/99 JL
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INORGANIC PREPS

ICP Digestion (Silver)	-	-				SW-846 Mtd. 7760A	03/24/99 WD
ICP Digestion TCLP Metals	-	-				SW-846 Mtd. 3010A	03/24/99 WD

TCLP METAL ANALYSIS SW-846 Method 1311

TCLP ACT 64 Metals	-	-				TCLP Extraction	03/22/99 WD
Arsenic (ICAP)	ND	mg/L	110	5	0.02	SW-846 Mtd. 6010B	03/24/99 JC
Barium (ICAP)	0.92	mg/L	94	100	0.005	"	03/24/99 JC
Cadmium (ICAP)	ND	mg/L	91	1	0.02	"	03/24/99 JC
Chromium, Total (ICAP)	ND	mg/L	91	5	0.05	"	03/24/99 JC
Copper (ICAP)	0.07	mg/L	106	100	0.02	"	03/24/99 JC
Lead (ICAP)	ND	mg/L	98	5	0.005	"	03/24/99 JC
Mercury (Cold Vapor)	0.0044	mg/L	91	0.2	0.0002	SW-846 Mtd. 7470A	03/29/99 SMM
Selenium (ICAP)	ND	mg/L	111	1	0.02	SW-846 Mtd. 6010B	03/24/99 JC
Silver (ICAP)	ND	mg/L	105	5	0.004	"	03/24/99 JC
Zinc (ICAP)	0.66	mg/L	92	500	0.02	"	03/24/99 JC

ND = Non Detectable

All Solid/Soil samples are reported on dry weight basis unless otherwise noted.

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Reported : 03/30/1999

Certification Numbers: WI #99995915, Richard Kowalski, K UST #048; ND R-081; MD #266; IN C-M1-01

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Aug 05, 2009 13:21

Richard Kowalski



CT&E Environmental Services Inc.

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Aug 05, 2009 13:21

Page 2 of 4

GM Pontiac Truck & Bus

Sample: 91131-6585 Matrix: Soil / Composite
 Client Sample: Drums 1-16 Comp. Location:
 COLLECTED: 03/19/1999 09:30 Project: 32 Soil Borings
 RECEIVED: 03/22/1999 : Sampled By: JY

Test Description	Result	Unit	Spike Recovery	Regulatory Limit	Reporting Detection Limit	Method	Date/Analyst
<u>TCLP VOLATILES SW-846 Method 1311</u>							
TCLP Extraction Volatiles	-	-	-	-	-	TCLP Extraction	03/22/99 WD
Vinyl Chloride	ND	mg/L	86	0.2	0.01	SW-846 Mtd. 8260B	03/26/99 PJG
1,1-Dichloroethylene	ND	mg/L	93	0.7	0.01	"	03/26/99 PJG
Methyl Ethyl Ketone	ND	mg/L	80	200	0.01	"	03/26/99 PJG
Chloroform	ND	mg/L	101	6	0.01	"	03/26/99 PJG
Carbon Tetrachloride	ND	mg/L	96	0.5	0.01	"	03/26/99 PJG
1,2-Dichloroethane	ND	mg/L	91	0.5	0.01	"	03/26/99 PJG
Benzene	ND	mg/L	82	0.5	0.01	"	03/26/99 PJG
Trichloroethene	ND	mg/L	75	0.7	0.01	"	03/26/99 PJG
Tetrachloroethene	ND	mg/L	85	100	0.01	"	03/26/99 PJG
Chlorobenzene	ND	mg/L	96	7.5	0.01	"	03/26/99 PJG
1,4-Dichlorobenzene	ND	mg/L	96				

TCLP SEMI-VOLATILES SW1311

TCLP Semi-Volatiles	-	-	-	-	-	TCLP Extraction	03/22/99 WD
p-Cresol & m-Cresol	ND	J,M mg/L	1	200	0.04	SW-846 Mtd. 8270C	03/25/99 JDS
o-Cresol	ND	J,M mg/L	0	200	0.02	"	03/25/99 JDS
Total Cresol	ND	J,M mg/L	1	200	0.06	"	03/25/99 JDS
Hexachlorobenzene	ND	mg/L	47	0.13	0.02	"	03/25/99 JDS
Hexachloroethane	ND	mg/L	27	3	0.02	"	03/25/99 JDS
Nitrobenzene	ND	mg/L	30	2	0.02	"	03/25/99 JDS
Pyridine	ND	mg/L	15	5	0.04	"	03/25/99 JDS
2,4,6-Trichlorophenol	ND	J,M mg/L	3	2	0.02	"	03/25/99 JDS
2,4,5-Trichlorophenol	ND	J,M mg/L	3	400	0.02	"	03/25/99 JDS
2,4-Dinitrotoluene	ND	mg/L	24	0.13	0.02	"	03/25/99 JDS
Hexachlorobutadiene	ND	mg/L	24	0.5	0.02	"	03/25/99 JDS
Pentachlorophenol	ND	J,M mg/L	12	100	0.02	"	03/25/99 JDS

J,M - The result should be considered estimated
 due to matrix interference.

ORGANIC PREPS

TCLP Semi Volatiles Prep.

SW-846 Mtd. 3510C 03/23/99 LJ

ND = Non Detectable

All Solid/Soil samples are reported on
 dry weight basis unless otherwise noted.

Project Manager

Jason A. Asher

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Reported : 03/30/1999

Certification Numbers: WI #999953 Richard Kowalski AK UST #048; ND R-081; MD #266; IN C-M1-01

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GM Pontiac Truck & Bus

Sample:	91131-6585	Matrix:	Soil / Composite
Client Sample:	Drums 1-16 Comp.	Location:	
COLLECTED:	03/19/1999 09:30	Project:	32 Soil Borings
RECEIVED:	03/22/1999 :	Sampled By:	JY

Test Description	Result	Unit	Spike Recovery	Regulatory Limit	Reporting Detection Limit	Method	Date/Analyst
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HAZARDOUS WASTE CHARACTERIZATION

Corrosivity	NC	s.u.	-	-	-	SW-846 Mtd. 7.2.2	03/24/99 JL
Ignitability	NI	-	-	-	-	SW-846 Mtd. 7.1	03/24/99 WD

Note: NI - Non Ignitable / I - Ignitable
Capable, under standard temperature and pressure,
of causing fire through friction, absorption of
moisture, or spontaneous chemical changes, and
when ignited, burns so vigorously and persistently
that it creates a hazard.

Reactive Cyanide	ND	mg/kg	250	25	SW-846 7.3.3.2	03/29/99 LS
Reactive Sulfide	ND	mg/kg	500	50	SW-846 7.3.4.2	03/29/99 LS

PHYSICAL PROPERTY ANALYSIS

pH (laboratory)	7.3	s.u.	-	0.1	SW-846 Mtd. 9045C	03/24/99 JL
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INORGANIC PREPS

ICP Digestion (Silver)	-	-	-	-	SW-846 Mtd. 7760A	03/24/99 WD
ICP Digestion TCLP Metals	-	-	-	-	SW-846 Mtd. 3010A	03/24/99 WD

TCLP METAL ANALYSIS SW-846 Method 1311

TCLP ACT 64 Metals	-	-	-	-	TCLP Extraction	03/22/99 WD
Arsenic (ICAP)	ND	mg/L	110	5	0.02	SW-846 Mtd. 6010B 03/24/99 JC
Barium (ICAP)	0.92	mg/L	94	100	0.005	" 03/24/99 JC
Cadmium (ICAP)	0.007	mg/L	91	1	0.001	" 03/24/99 JC
Chromium, Total (ICAP)	ND	mg/L	91	5	0.05	" 03/24/99 JC
Copper (ICAP)	ND	mg/L	106	100	0.02	" 03/24/99 JC
Lead (ICAP)	ND	mg/L	98	5	0.03	" 03/24/99 JC
Mercury (Cold Vapor)	ND	mg/L	91	0.2	0.0002	SW-846 Mtd. 7470A 03/29/99 SMM
Selenium (ICAP)	ND	mg/L	111	1	0.03	SW-846 Mtd. 6010B 03/24/99 JC
Silver (ICAP)	ND	mg/L	105	5	0.003	" 03/24/99 JC
Zinc (ICAP)	0.31	mg/L	92	500	0.02	" 03/24/99 JC

ND = Non Detectable

All Solid/Soil samples are reported on
dry weight basis unless otherwise noted.

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Reported : 03/30/1999

Certification Numbers: WI #999959180; MI #0021; AK UST #048; ND R-081; MD #266; IN C-MI-01

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Chain of Custody

CT&F Environmental Services Inc.

⑥ Anatech Division, 1200 Conrad Industrial Dr., Ludington, MI 49431-2681

Page

Lab ID#

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APPENDIX D

LABORATORY ASSESSMENT AND VALIDATION REPORTS

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Richard Kowalski

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Aug 05, 2009 13:21



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TELEPHONE: (734) 942-0909

FACSIMILE: (734) 942-1858

MEMORANDUM

TO: Scott Green

REF. NO.: 7097

FROM: Paul Wiseman/rm/12/Det. 

DATE: February 26, 1999

RE: Data Quality Assessment and Validation for Soil Samples Collected from
the GM Truck Group Site in Pontiac, Michigan

The following details a quality assessment and validation of the analytical data resulting from the November 30, 1998, collection of 16 soil and two (2) water samples from the General Motors (GM) Truck Group Site in Pontiac, Michigan. The samples identified in Table 1 were selectively analyzed for polychlorinated biphenyls (PCB) and target analyte list (TAL) inorganics. Sample analysis was completed at Columbia Analytical Services, Kelso, Washington facility (CAS) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. The samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by CAS, were prepared and analyzed within the required holding time periods.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for PCB analyses requires that five (5) calibration standards be analyzed with a percent relative standard deviation (RSD) of the calibration factors for each compound of 20 percent or less. If the percent RSD exceeds 20 percent, a linear regression curve may be used if the correlation efficient is greater than or equal to 0.990. The initial calibration percent RSD criteria were met indicating the instruments were capable of acceptable performance prior to analysis.

The calibration criteria for inorganic analyses require that a specific number of standards be analyzed. The initial calibration is verified with an initial calibration verification (ICV) standard. The initial calibration and ICV acceptance criteria were met indicating the instruments were capable of acceptable performance prior to analysis.

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Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for PCB analysis required that compound response meet a maximum percent difference from the true value. The continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were evaluated against the same criteria used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating no laboratory-attributable contamination occurred.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored at the beginning and end of each analytical sequence. The data were within the established acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses served as a monitor of the overall performance of all steps in the organic and inorganic analyses. The LCS analytes met the established control limit criteria.

Surrogate Compound Percent Recoveries

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate percent recovery acceptance criteria was met for all samples.

Matrix Spike Analysis - Inorganic Analyses

Matrix spike samples were monitored to determine the effects of sample matrix on the laboratories digestion and measurement methods. The inorganic matrix spike recoveries were within acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

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Matrix Spike/Matrix Spike Duplicate Percent Recoveries - PCB Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the recoveries were determined. The MS/MSD percent recovery and RPD acceptance criteria were met for the PCB analyses.

Sample Quantitation

Sample analysis for TAL inorganics and PCB resulted in several analytes or compounds reported below the laboratory's method reporting limit (MRL) but above their method detection limit (MDL). These results were identified by the laboratory with a "J" flag and should be considered as estimated values.

Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted of two (2) field equipment blanks samples, and two (2) field duplicate sample sets.

To assess the efficiency of field decontamination procedures, two (2) equipment blank samples (W-7097-113098-TJ-009 and W-7097-113098-TJ-017) were collected and analyzed for PCB and TAL inorganics and TAL metals respectively. A number of the TAL Metals were reported detected in the two (2) equipment blank samples. Although these concentrations cannot be directly correlated to soil concentrations, all values were 1,000 times less than the reported data for subsequent samples indicating no appreciable impact. The remaining analytes were reported as not detected in the equipment blanks.

Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sample sets. Table 4 summarizes the results of the detected analytes in the field duplicate sample sets. The data indicate that an adequate level of precision was achieved for the sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

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TABLE 1

**SAMPLE IDENTIFICATION NUMBERS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

SS-7097-113098-TJ-001
SS-7097-113098-TJ-002
SS-7097-113098-TJ-003
SS-7097-113098-TJ-004
SS-7097-113098-TJ-005
SS-7097-113098-TJ-006
SS-7097-113098-TJ-007
SS-7097-113098-TJ-008
W-7097-113098-TJ-009
SS-7097-113098-TJ-010
SS-7097-113098-TJ-012
SS-7097-113098-TJ-013
SS-7097-113098-TJ-014
SS-7097-113098-TJ-015
SS-7097-113098-TJ-016
W-7097-113098-TJ-017
SS-7097-113098-TJ-018

TABLE 2
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**SUMMARY OF ANALYTICAL METHODS
 GM TRUCK GROUP SITE
 PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Method</i>
Polychlorinated biphenyls	SW-846 8082 ¹
TAL Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A/7470A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Thallium	SW-846 6020
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B

¹ "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd Edition, and promulgated updates, November 1986.

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TABLE 3

**HOLDING TIME PERIODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Holding Time Period</i>
PCB	- 14 days (soil), 7 days (water) from sample collection to extraction - 40 days from extraction to completion of analysis
TAL Inorganics -	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Total Cyanide	- 14 days from sample collection to completion of analysis

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TABLE 4
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**SUMMARY OF DETECTED ANALYTES IN FIELD DUPLICATE SAMPLE SETS
 GM TRUCK GROUP SITE
 PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Investigative Sample</i>	<i>Duplicate Sample</i>	<i>RPD¹</i>
	SS-7097-113098-TJ-004	SS-7097-113098-TJ-005	
TAL Metals			
Aluminum	6,930	5,600	21
Antimony	0.06	0.05	18
Arsenic	4.5	5.1	13
Barium	33	28	16
Beryllium	0.25	0.25	0
Cadmium	0.20	0.19	5.1
Calcium	73,700	86,800	16
Chromium	12	9	29
Cobalt	4.76	5.04	5.7
Copper	8.5	11.1	14
Iron	12,700	10,600	18
Lead	5.26	5.87	11
Magnesium	22,100	23,900	7.8
Manganese	307	261	16
Nickel	13.1	14.7	12
Potassium	1,300	960	30
Selenium	0.4 J ²	0.4 J	0
Silver	0.03	0.03	0
Sodium	196	208	5.9
Thallium	0.16	0.18	12
Vanadium	19	16	17
Zinc	37	30	21

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TABLE 4

**SUMMARY OF DETECTED ANALYTES IN FIELD DUPLICATE SAMPLE SETS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Investigative Sample</i>	<i>Duplicate Sample</i>	<i>RPD¹</i>
	SS-7097-113098-TJ-013	SS-7097-113098-TJ-014	
TAL Metals			
Aluminum	5,100	6,140	19
Antimony	0.10	0.12	18
Arsenic	5.3	4.9	7.8
Barium	30	39	26
Beryllium	0.36	0.45	22
Cadmium	0.53	0.31	52
Calcium	104,000	116,000	11
Chromium	46	19	17
Cobalt	4.35	3.93	10
Copper	12.3	11.2	9.4
Iron	10,500	9,540	10
Lead	8.30	9.57	14
Magnesium	22,500	20,300	10
Manganese	439	382	14
Nickel	15.1	13.1	14
Potassium	710	830	16
Selenium	0.6	0.6	0
Sodium	568	597	5.0
Thallium	0.20	0.13	42
Vanadium	17	18	5.7
Zinc	37	32	14

¹RPD - Relative Percent Difference

²J - The associated numerical value is an estimated quantity.

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 Suite #160, Romulus, Michigan 48174

TELEPHONE: (734) 942-0909

FACSIMILE: (734) 942-1858

MEMORANDUM

TO: Scott Green REF. NO.: 7097

FROM: Mary Cameron/lr/13/Det. DATE: April 6, 1999

RE: Data Quality Assessment and Validation for Soil Samples Collected from the GM Truck Group Site in Pontiac, Michigan

The following details a quality assessment and validation of the analytical data resulting from the December 1, 1998 collection of four (4) soil and one (1) water sample from the General Motors (GM) Truck Group Site in Pontiac, Michigan. The samples identified in Table 1 were analyzed for target compound list (TCL) volatile organic compounds (VOC); TCL semi-volatile organic compounds (SVOC); polychlorinated biphenyls (PCB); and target analyte list (TAL) inorganics. Sample analysis was completed at Columbia Analytical Services, in Kelso, Washington (CAS) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).¹

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. The samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by CAS, were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for TCL VOC and TCL SVOC analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB) and decafluorotriphenylphosphine (DFTPP), respectively. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for TCL VOC, SVOC and PCB analyses required that all compounds meet a method-specific minimum mean response factor (RF) and maximum percent relative standard deviation (%RSD). The initial calibration data for TCL VOC, SVOC and PCB analyses were within the acceptance criteria indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

¹ Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

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Initial Calibration (Cont'd)

The calibration criteria for inorganic analyses requires a specific number of standards be analyzed with a correlation coefficient of ≥ 0.995 . The initial calibration verification (ICV) results must fall within the percent recovery control limits of 80–120 percent for mercury and 90–110 percent for the remaining TAL metals and cyanide. The initial calibration acceptance criteria were met indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for TCL VOC, SVOC and PCB analyses required that compounds meet a method-specific minimum RF and maximum percent difference (%D) between the initial calibration mean RF and the continuing calibration RF. The continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were evaluated against the same criteria as used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. The samples presented in Table 4 should be qualified due to laboratory contamination. The remaining method blank samples were reported to be free from detectable levels of target analytes, indicating no laboratory-attributable contamination occurred.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses served as a monitor of the overall performance of all steps in the organic and inorganic analyses. The LCS percent recoveries were within the laboratory control limits, indicating that an acceptable level of overall performance was achieved.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all samples.

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Matrix Spike Analysis - Inorganic Analyses

Matrix spike samples were monitored to determine the effects of sample matrix on the laboratories digestion and measurement methods. The inorganic matrix spike recoveries were within acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the recoveries were determined. The MS/MSD percent recoveries and RPDs were met for all analyses.

Internal Standard Summaries

Overall instrument stability and performance for the TCL VOC and TCL SVOC analyses was monitored using internal standard peak area and retention time data. The TCL VOC and TCL SVOC internal standard and retention time data were within the acceptance criteria.

Sample Quantitation

Sample analysis for TAL inorganics resulted in several analytes or compounds reported below the laboratory's method reporting limit (MRL) but above their method detection limit (MDL). These results were identified by the laboratory with a "J" flag and should be considered estimated values.

Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted of one (1) field blank (rinsate) sample, and one (1) trip blank sample.

To assess the efficiency of field decontamination procedures, one (1) rinsate sample (W-7097-120198-TJ-023) was collected and analyzed for all parameters. Several compounds were detected in the rinsate blank but the associated sample results were either ten (10) times higher or reported as non-detect. No qualification was required. No additional targeted analytes were reported as detected in the rinsate sample.

To monitor potential cross-contamination of VOC during aqueous sample transportation and storage, a trip blank was submitted to the laboratory for VOC analysis with each shipping cooler. No target analytes were reported as detected in the trip blank sample.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

Richard Kowalski

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**SAMPLE IDENTIFICATION NUMBERS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

S-7097-120198-TJ-019

S-7097-120198-TJ-020

S-7097-120198-TJ-021

S-7097-120198-TJ-022

W-7097-120198-TJ-023

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**SUMMARY OF ANALYTICAL METHODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Method</i>
TCL VOC	SW-846 5035/8260B ¹
TCL SVOC	SW-846 8270
Polychlorinated biphenyls (PCB)	SW-846 8082
TAL Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A/7470A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Thallium	SW-846 6020
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B

¹ "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and promulgated updates, November 1986.

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TABLE 3

**HOLDING TIME PERIODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Holding Time Period</i>
TCL VOC	- 48 hours (soil) from sample collection to extraction - 14 days (soil) from sample extraction to analysis - 14 days (water) from sample collection to completion of analysis
TCL SVOC, PCB	- 14 days (soil), 7 days (water) from sample collection to extraction - 40 days from extraction to completion of analysis
TAL Inorganics -	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Total Cyanide	- 14 days from sample collection to completion of analysis

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**SUMMARY OF QUALIFIED SAMPLE DATA DUE TO
METHOD BLANK CONTAMINATION
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Parameter</i>	<i>Associated Samples</i>	<i>Qualified¹ Sample Result (µg/kg)</i>
TAL inorganics	Antimony	S-7097-120198-TJ-019	U (0.1)
		S-7097-120198-TJ-020	U (0.1)
		S-7097-120198-TJ-021	U (0.1)
		S-7097-120198-TJ-022	U (0.1)
	Selenium	S-7097-120198-TJ-021	U (0.7)

¹ The parameter should be qualified for the listed samples as:

U() - The analyte was analyzed for, but was not detected above the reported sample quantitation limit in parenthesis.



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MEMORANDUM

TO: Scott Green REF. NO.: 7097

FROM: Mary Cameron/lr/14/Det. DATE: May 24, 1999

RE: **Data Quality Assessment and Validation for Soil Samples Collected from the RCRA Facility Investigation (RFI) at the GM Truck Group Site in Pontiac, Michigan**

The following details a quality assessment and validation of the analytical data resulting from the December 2, 1998 collection of twelve (12) soil samples from the RCRA Facility Investigation (RFI) at General Motors (GM) Truck Group Site in Pontiac, Michigan. The samples identified in Table 1 were selectively analyzed for target compound list (TCL) or Appendix IX volatile organic compounds (VOC); TCL or Appendix IX semi-volatile organic compounds (SVOC), polychlorinated biphenyls (PCB) and target analyte list (TAL) or Appendix IX inorganics. Sample analysis was completed at Columbia Analytical Services, in Kelso, Washington (CAS) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).¹

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. The reported PCB results for samples SS-7097-120298-TJ-024 and S-7097-120298-TJ-032, re-extracted on December 22, 1998, should be disregarded. These samples were previously extracted within holding time and are qualified due to violation of surrogate percent recoveries. The re-extracted results confirmed the initial reported results. The remaining samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by CAS, were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for TCL VOC and TCL SVOC analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB) and decafluorotriphenylphosphine (DFTPP), respectively. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

¹ Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

CRA MEMORANDUMInitial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for TCL VOC, SVOC and PCB analyses required that all compounds meet a method-specific minimum mean response factor (RF) and maximum percent relative standard deviation (%RSD). The initial calibration data for TCL VOC, SVOC and PCB analyses were within the acceptance criteria indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

The calibration criteria for inorganic analyses requires a specific number of standards be analyzed with a correlation coefficient of ≥ 0.995 . The initial calibration verification (ICV) results must fall within the percent recovery control limits of 80–120 percent for mercury and 90–110 percent for the remaining TAL metals and cyanide. The initial calibration acceptance criteria were met indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for TCL VOC, SVOC and PCB analyses required that compounds meet a method-specific minimum RF and maximum percent difference (%D) between the initial calibration mean RF and the continuing calibration RF. The continuing calibration verification data were within the acceptance criteria

Continuing calibration criteria for inorganic analyses were evaluated against the same criteria as used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. The samples presented in Table 4 should be qualified due to laboratory contamination. The remaining method blank samples were reported to be free from detectable levels of target analytes, indicating no laboratory-attributable contamination occurred.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

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Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses served as a monitor of the overall performance of all steps in the organic and inorganic analyses. The LCS percent recoveries were within the laboratory control limits, indicating that an acceptable level of overall performance was achieved.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The sample analyses that violated surrogate acceptance criteria are identified and qualified in Table 5. The remaining surrogate recovery acceptance criteria was met for all samples.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the recoveries were determined. The MS/MSD percent recoveries and RPDs were met for all analyses.

Matrix Spike Analysis - Inorganic Analyses

Matrix spike samples were monitored to determine the effects of sample matrix on the laboratories digestion and measurement methods. The inorganic matrix spike recoveries were within acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

Internal Standard Summaries

Overall instrument stability and performance for the TCL VOC and TCL SVOC analyses was monitored using internal standard peak area and retention time data. The TCL VOC and TCL SVOC internal standard and retention time data were within the acceptance criteria.

Tentatively Identified Compounds

Laboratory analysis for TCL and Appendix IX VOC and SVOC included the identification of non-target compounds by conducting a forward library search against the EPA/NIST Mass Spectral Library. The identified non-target compounds were flagged by the laboratory with a "J". These compounds should be qualified as (NJ) tentatively identified compounds (TIC) with approximate concentrations.

Sample Quantitation

Sample analyses resulted in several analytes or compounds reported below the laboratory's method reporting limit (MRL) but above their method detection limit (MDL). These results were identified by the laboratory with a "J" flag and should be considered estimated values.

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CRA MEMORANDUMField Quality Assurance/Quality Control

The field quality assurance/quality control consisted of one (1) field duplicate sample set. Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sample set. Table 6 summarizes the results of the detected analytes in the field duplicate sample set. The data indicate that an adequate level of precision was achieved for the sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

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TABLE 1

**SAMPLE IDENTIFICATION NUMBERS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

SS-7097-120298-TJ-024

SS-7097-120298-TJ-025

SS-7097-120298-TJ-026

SS-7097-120298-TJ-027

SS-7097-120298-TJ-028

SS-7097-120298-TJ-029

S-7097-120298-TJ-030

SS-7097-120298-TJ-031

S-7097-120298-TJ-032

SS-7097-120298-TJ-033

S-7097-120298-TJ-034

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TABLE 2

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**SUMMARY OF ANALYTICAL METHODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Method</i>
TCL VOC, Appendix IX VOC	SW-846 5035/8260B ¹
TCL SVOC, Appendix IX SVOC	SW-846 8270C
Polychlorinated biphenyls (PCB)	SW-846 8082
TAL Inorganics, Appendix IX Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Sulfide	SW-846 9030B
Tin	SWW-846 6020
Thallium	SW-846 6020
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B

¹ "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and promulgated updates, November 1986.

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**HOLDING TIME PERIODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Holding Time Period</i>
TCL VOC, Appendix IX VOC	- 48 hours from sample collection to extraction - 14 days from sample extraction to analysis
TCL SVOC, Appendix IX SVOC, PCB	- 14 days (soil) from sample collection to extraction - 40 days from extraction to completion of analysis
TAL and Appendix IX Inorganics -	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Total Cyanide	- 14 days from sample collection to completion of analysis
Sulfide	- 7 days from sample collection to completion of analysis

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TABLE 4

**SUMMARY OF QUALIFIED SAMPLE DATA DUE TO
METHOD BLANK CONTAMINATION
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Parameter</i>	<i>Associated Samples</i>	<i>Qualified¹ Sample Result (mg/kg)</i>
TAL Inorganics	Selenium	SS-7097-120298-TJ-024	U (1.0)
		SS-7097-120298-TJ-025	U (1.0)
		SS-7097-120298-TJ-026	U (0.7)
		SS-7097-120298-TJ-027	U (1.0)
		SS-7097-120298-TJ-028	U (1.0)
		SS-7097-120298-TJ-029	U (0.8)
		S-7097-120298-TJ-030	U (0.5)
		SS-7097-120298-TJ-031	U (0.7)
		S-7097-120298-TJ-032	U (0.5)
		SS-7097-120298-TJ-033	U (0.6)
		S-7097-120298-TJ-034	U (0.6)

¹ The parameter should be qualified for the listed samples as:

U() - The analyte was analyzed for, but was not detected above the reported sample quantitation limit in parenthesis.

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**SUMMARY OF QUALIFIED SAMPLE DATA DUE TO
VIOLATION OF SURROGATE PERCENT RECOVERY CRITERIA
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Parameter</i>	<i>Associated Samples</i>	<i>Qualifier¹</i>
PCB	Aroclor 1016	SS-7097-120298-TJ-024	UJ
	Aroclor 1221	S-7097-120298-TJ-032	UJ
	Aroclor 1232		
	Aroclor 1242		
	Aroclor 1248		
	Aroclor 1254		
	Aroclor 1260		

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¹ The analysis parameter results should be qualified for the associated samples as:

- UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is estimated and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (for non-detected parameters).

TABLE 6

**SUMMARY OF DETECTED ANALYTIES IN FIELD DUPLICATE SAMPLE SETS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter (mg/kg)</i>	<i>Investigative Sample</i>	<i>Duplicate Sample</i>	<i>RPD¹</i>
	SS-7097-120298-TJ-024	SS-7097-120298-TJ-025	
TCL SVOC			
Phenanthrene	0.2 J ²	ND (0.3) ³	NC ⁴
Anthracene	0.05 J	ND (0.3)	NC
Fluoranthene	0.3 J	0.09 J	110
Pyrene	0.3	0.09 J	110
Benzo(a)anthracene	0.1 J	ND (0.3)	NC
Chrysene	0.2 J	ND (0.3)	NC
Benzo(b)fluoranthene	0.1 J	ND (0.3)	NC
Benzo(k)fluoranthene	0.1 J	ND (0.3)	NC
Benzo(a)pyrene	0.1 J	ND (0.3)	NC
Indeno(1,2,3-cd)pyrene	0.08 J	ND (0.3)	NC
Benzo(g,h,i)perylene	0.08 J	ND (0.3)	NC
TAL Inorganics			
Aluminum	3,240	1,670	64
Antimony	0.1	0.2	67
Arsenic	4.4	2.1	71
Barium	85	50	52
Beryllium	0.26	0.21	21
Cadmium	0.58	0.31	61



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MEMORANDUM

TO: Scott Green REF. NO.: 7097

FROM: Mary Cameron/lr/15/Det. DATE: May 24, 1999

RE: Data Quality Assessment and Validation for Soil and Water Samples Collected from the RCRA Facility Investigation (RFI) at the GM Truck Group Site in Pontiac, Michigan

The following details a quality assessment and validation of the analytical data resulting from the December 3, 1998 collection of three (3) soil and one (1) water sample from the RCRA Facility Investigation (RFI) at the General Motors (GM) Truck Group Site in Pontiac, Michigan. The samples identified in Table 1 were selectively analyzed for target compound list (TCL) or Appendix IX volatile organic compounds (VOC); TCL or Appendix IX semi-volatile organic compounds (SVOC); polychlorinated biphenyls (PCB); target analyte list (TAL) or Appendix IX inorganics and sulfide. Sample analysis was completed at Columbia Analytical Services, in Kelso, Washington (CAS) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. The samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by CAS, were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for TCL VOC and TCL SVOC analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB) and decafluorotriphenylphosphine (DFTPP), respectively. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for TCL VOC, SVOC and PCB analyses required that all compounds meet a method-specific minimum mean response factor (RF) and maximum percent relative standard deviation (%RSD). The initial calibration data for TCL VOC, SVOC and PCB analyses were within

¹ Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

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Initial Calibration (Cont'd)

the acceptance criteria indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

The calibration criteria for inorganic analyses requires a specific number of standards be analyzed with a correlation coefficient of ≥ 0.995 . The initial calibration verification (ICV) results must fall within the percent recovery control limits of 80–120 percent for mercury and 90–110 percent for the remaining TAL metals and cyanide. The initial calibration acceptance criteria were met indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for TCL VOC, SVOC and PCB analyses required that compounds meet a method-specific minimum RF and maximum percent difference (%D) between the initial calibration mean RF and the continuing calibration RF. Continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were evaluated against the same criteria as used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. Several compounds were reported detected in the metals method blank. The associated sample results were reported as ten times higher than the method blanks therefore no qualification was required. The remaining method blank samples were reported to be free from detectable levels of target analytes, indicating no laboratory-attributable contamination occurred.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses served as a monitor of the overall performance of all steps in the organic and inorganic analyses. The cyanide and TCL VOC LCS results exceeded the laboratory control limits. The associated samples were reported as non detect, therefore no qualification was required. The remaining LCS percent recoveries were within the laboratory control limits, indicating that an acceptable level of overall performance was achieved.

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Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all samples.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the recoveries were determined. The MS/MSD percent recoveries and RPDs were met for all analyses.

Matrix Spike Analysis - Inorganic Analyses

Matrix spike samples were monitored to determine the effects of sample matrix on the laboratories digestion and measurement methods. The sulfide quantitation limit reported for sample W-7097-120398-TJ-037 should be qualified as an estimated (U) quantitation limit due to outlying matrix spike percent recovery. The remaining inorganic matrix spike recoveries were within acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

Internal Standard Summaries

Overall instrument stability and performance for the TCL VOC and TCL SVOC analyses was monitored using internal standard peak area and retention time data. The TCL VOC and TCL SVOC internal standard and retention time data were within the acceptance criteria.

Tentatively Identified Compounds

Laboratory analysis for TCL and Appendix IX VOC and SVOC included the identification of non-target compounds by conducting a forward library search against the EPA/NIST Mass Spectral Library. The identified non-target compounds were flagged by the laboratory with a "J". These compounds should be qualified as (NJ) tentatively identified compounds (TIC) with approximate concentrations.

Sample Quantitation

Sample analyses resulted in several analytes or compounds reported below the laboratory's method reporting limit (MRL) but above their method detection limit (MDL). These results were identified by the laboratory with a "J" flag and should be considered estimated values.

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Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted on one (1) field blank (rinsate) sample. To assess the efficiency of field decontamination procedures, one (1) rinsate sample (W-7097-120398-TJ-037) was collected and analyzed for Appendix IX parameters and PCBs. Several compounds were reported as detected in the field rinsate. The associated samples results for these compounds were reported as non-detect, therefore no qualification was required. No additional targeted analytes were reported as detected in the rinsate sample.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

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**SAMPLE IDENTIFICATION NUMBERS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

SS-7097-120398-TJ-035

S-7097-120398-TJ-036

W-7097-120398-TJ-037

S-7097-120398-TJ-038

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TABLE 2

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**SUMMARY OF ANALYTICAL METHODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Method</i>
TCL VOC, Appendix IX VOC	SW-846 5035/8260B ¹
TCL SVOC, Appendix IX SVOC	SW-846 8270C
Polychlorinated biphenyls (PCB)	SW-846 8082
TAL Inorganics, Appendix IX Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Sulfide	SW-846 9030B
Tin	SWW-846 6020
Thallium	SW-846 6020
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B

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¹ "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and promulgated updates, November 1986.

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**HOLDING TIME PERIODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

Analysis

Holding Time Period

TCL VOC, Appendix IX VOC

- 48 hours (soil) from sample collection to extraction
- 14 days (soil) from sample extraction to analysis

TCL SVOC, Appendix IX SVOC,
PCB

- 14 days (soil) from sample collection to extraction
- 40 days from extraction to completion of analysis

TAL and Appendix IX Inorganics -

Metals (except Mercury)

- 180 days from sample collection to completion of analysis

Mercury

- 28 days from sample collection to completion of analysis

Total Cyanide

- 14 days from sample collection to completion of analysis

Sulfide

- 7 days from sample collection to completion of analysis

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MEMORANDUM

TO: Paul Wiseman REF. NO.: 7097

FROM: Paul McMahon/lr/1 DATE: June 7, 1999

RE: Data Quality Assessment and Validation for Soil Samples Collected from the GM Truck Group Site in Pontiac, Michigan

The following details a quality assessment and validation of the analytical data resulting from the December 4, 1998 collection of five (5) soil samples from the General Motors (GM) Truck Group Site in Pontiac, Michigan. The samples identified in Table 1 were selectively analyzed for target compound list (TCL) volatile organic compounds (VOC); Appendix IX VOC; TCL semi-volatile organic compounds (SVOC), Appendix IX SVOC; polychlorinated biphenyls (PCB); target analyte list (TAL) inorganics; and Appendix IX inorganics. Sample analysis was completed at Columbia Analytical Services, in Kelso, Washington (CAS) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).¹

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. Samples that violated the sulfide holding time period are detailed in Table 4. The remaining samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by CAS, were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for VOC and SVOC analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB) and decafluorotriphenylphosphine (DFTPP), respectively. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for VOC, SVOC and PCB analyses require that compounds meet a method-specific minimum mean response factor (RF) and maximum percent relative standard deviation (%RSD). The initial calibration data for VOC, SVOC and PCB analyses were within the

¹ Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

CRA MEMORANDUMInitial Calibration (Cont'd)

acceptance criteria indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

The calibration criteria for inorganic analyses require that a specific number of standards be analyzed with a resulting correlation coefficient of ≥ 0.995 . Inductively coupled plasma (ICP) instrumentation requires calibration with a blank and at least one standard. The initial calibration verification (ICV) results must fall within the percent recovery control limits of 80–120 percent for mercury and 90–110 percent for the remaining metals, sulfide, and cyanide. The initial calibration acceptance criteria were met indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for VOC, SVOC and PCB analyses require that compounds meet a method-specific minimum RF and maximum percent difference (%D) between the initial calibration mean RF and the continuing calibration RF. The continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were evaluated against the same criteria used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. The samples presented in Table 5 should be qualified due to method blank contamination. The remaining method blank samples were reported to be free from detectable levels of target analytes, indicating no laboratory-attributable contamination occurred.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses served as a monitor of the overall performance of all steps in the organic and inorganic analyses. A single TCL VOC LCS percent recovery exceedance appeared to be anomalously caused by rounding and LCS spike preparation. No qualification of data is required. The remaining LCS percent recoveries were within the laboratory control limits, indicating an acceptable level of performance.

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Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all samples.

Matrix Spike Analysis - Inorganic Analyses

Matrix spike samples were monitored to determine the effects of sample matrix on the laboratory's digestion and measurement methods. The inorganic matrix spike recoveries were within acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the recoveries were determined. The MS/MSD percent recoveries and RPDs were acceptable for all analyses.

Internal Standard Summaries

Overall instrument stability and performance for the VOC and SVOC analyses was monitored using internal standard peak area and retention time data. The sample results that should be qualified due to outlying internal standard retention time criteria are summarized in Table 6. The remaining VOC and SVOC internal standard recoveries and retention time data were within the acceptance criteria.

Tentatively Identified Compounds

Laboratory analysis for TCL and Appendix IX VOC and SVOC included the identification of non-target compounds by conducting a forward library search against the EPA/NIST Mass Spectral Library. The identified non-target compounds were flagged by the laboratory with a "J". These compounds should be qualified as (NJ) tentatively identified compounds (TIC) with approximate concentrations.

Sample Quantitation

Sample analyses resulted in several analytes or compounds reported below the laboratory's method reporting limit (MRL) but above their method detection limit (MDL). These results were identified by the laboratory with a "J" flag and should be considered estimated values.

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Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted of one (1) field duplicate sample set.

Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sample set. Table 7 summarizes the results of the detected analytes in the field duplicate set. The data indicate that an adequate level of precision was achieved for the sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

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TABLE 1

**SAMPLE IDENTIFICATION NUMBERS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

S-7097-120498-TJ-039

SD-7097-120498-TJ-040

SD-7097-120498-TJ-041

S-7097-120498-TJ-042

S-7097-120498-TJ-043

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TABLE 2

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**SUMMARY OF ANALYTICAL METHODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Method</i>
TCL VOC, Appendix IX VOC	SW-846 5035/8260B ¹
TCL SVOC, Appendix IX SVOC	SW-846 8270C
Polychlorinated biphenyls (PCB)	SW-846 8082
TAL Inorganics, Appendix IX Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A/7470 A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Sulfide	SW-846 9030B
Tin	SWW-846 6020
Thallium	SW-846 6020
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B

¹ "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and promulgated updates, November 1986.

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**HOLDING TIME PERIODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Holding Time Period</i>
TCL VOC, Appendix IX VOC	- 48 hours from sample collection to extraction - 14 days from sample extraction to analysis
TCL SVOC, Appendix IX SVOC, PCB	- 14 days from sample collection to extraction - 40 days from extraction to completion of analysis
TAL and Appendix IX Inorganics -	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Total Cyanide	- 14 days from sample collection to completion of analysis
Sulfide	- 7 days from sample collection to completion of analysis

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TABLE 4

SUMMARY OF QUALIFIED SAMPLE DATA
DUE TO HOLDING TIME PERIOD VIOLATIONS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN

<i>Analysis</i>	<i>Associated Samples</i>	<i>Qualifier¹</i>
Sulfide	SD-7097-120498-TJ-041	UJ

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¹The sample parameter results should be qualified as:

- UJ -The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is estimated and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (for non-detected parameters).

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TABLE 5

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO
METHOD BLANK CONTAMINATION
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN

<i>Analysis</i>	<i>Parameter</i>	<i>Associated Samples</i>	<i>Qualified¹ Sample Result (mg/Kg)</i>
Metals	Antimony	S-7097-120498-TJ-039	U(0.08)
		SD-7097-120498-TJ-040	U(0.04)
		SD-7097-120498-TJ-041	U(0.04)
		S-7097-120498-TJ-042	U(0.03)
		S-7097-120498-TJ-043	U(0.05)

¹ The analyte should be qualified for the listed samples as:

U() - The analyte was analyzed for, but was not detected above the reported sample quantitation limit in parenthesis.

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TABLE 6

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO
OUTLYING INTERNAL STANDARD RECOVERIES
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN

<i>Analysis</i>	<i>IS</i>	<i>Sample</i>	<i>Compounds</i>	<i>Qualifier¹</i>
SVOC	Naph-d8	SD-7097-120498-TJ-040	Naphthalene	J
			2-Methylnaphthalene	J

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¹ The samples should be qualified for the listed parameters as:

J - The analyte was positively identified; the associated numerical value is the estimated concentration of the analyte in the sample (for detected parameters).

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TABLE 7

**SUMMARY OF DETECTED ANALYTES IN FIELD DUPLICATE SAMPLE SET
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Investigative Sample</i>	<i>Duplicate Sample</i>	<i>RPD¹</i>
	S-7097-120498-TJ-043	S-7097-120498-TJ-042	
TAL Metals			
Aluminum	6,540	6,680	2.1
Antimony	0.05 ² J	0.03 J	50
Arsenic	5.7	4.3	28
Barium	32	35	9.0
Beryllium	0.28	0.23	20
Cadmium	0.21	0.23	9.1
Calcium	37,600	49,800	28
Chromium	10	11	10
Cobalt	4.69	4.76	1.5
copper	10.7	10.4	2.8
Iron	11,500	13,000	12
Lead	11.0	6.38	53
Magnesium	11,800	13,600	14
Manganese	323	353	8.9
Nickel	12.9	13.1	1.5
Potassium	660	680	3.0
Selenium	0.7	0.9	25
Silver	0.06	0.05	18
Sodium	187	262	33
Thallium	0.19	0.18	5.4
Vanadium	17	17	0
Zinc	44	39	12

Notes:¹RPD - Relative Percent Difference²J - The associated numerical value is an estimated quantity.

Richard Kowalski



CONESTOGA-ROVERS & ASSOCIATES
 2055 Niagara Falls Blvd., Suite Three
 Niagara Falls, NY 14304

TELEPHONE: (716) 297-6150
 FAX: (716) 297-2265

MEMORANDUM

TO: Paul Wiseman REF. NO.: 7097

FROM: Paul McMahon/lr/2 DATE: June 7, 1999

RE: **Data Quality Assessment and Validation for Soil Samples Collected from the GM Truck Group Site in Pontiac, Michigan**

The following details a quality assessment and validation of the analytical data resulting from the December 7 and 8, 1998 collection of three (3) soil samples from the General Motors (GM) Truck Group Site in Pontiac, Michigan. The samples identified in Table 1 were analyzed for target compound list (TCL) volatile organic compounds (VOC); TCL semi-volatile organic compounds (SVOC); polychlorinated biphenyls (PCB); and target analyte list (TAL) inorganics. Sample analysis was completed at Columbia Analytical Services, in Kelso, Washington (CAS) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).¹

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. The samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by CAS, were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for TCL VOC and TCL SVOC analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB) and decafluorotriphenylphosphine (DFTPP), respectively. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for TCL VOC, SVOC and PCB analyses require that compounds meet a method-specific minimum mean response factor (RF) and maximum percent relative standard deviation (%RSD). The initial calibration data for TCL VOC, SVOC and PCB analyses were within the

¹ Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

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Initial Calibration (Cont'd)

acceptance criteria indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

The calibration criteria for inorganic analyses require that a specific number of standards be analyzed with a resulting correlation coefficient of ≥ 0.995 . Inductively coupled plasma (ICP) instrumentation requires calibration with a blank and at least one standard. The initial calibration verification (ICV) results must fall within the percent recovery control limits of 80–120 percent for mercury and 90–110 percent for the remaining TAL metals and cyanide. The initial calibration acceptance criteria were met indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for TCL VOC, SVOC and PCB analyses require that compounds meet a method-specific minimum RF and maximum percent difference (%) between the initial calibration mean RF and the continuing calibration RF. The continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were evaluated against the same criteria used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. Several metals were detected in the laboratory blank analyses. The samples presented in Table 4 should be qualified due to method blank contamination. All remaining method blank samples were reported to be free from detectable levels of target analytes, indicating no laboratory-attributable contamination occurred.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses served as a monitor of the overall performance of all steps in the organic and inorganic analyses. One TCL VOC and one TCL SVOC percent recovery exceeded the laboratory LCS percent criteria. The TCL VOC exceedance appeared to be an anomaly caused by rounding and LCS spike preparation. The TCL SVOC associated sample results were non-detect. No qualification of TCL VOC or TCL SVOC was required. The remaining LCS percent recoveries were within the laboratory control limits, indicating an acceptable level of performance.

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Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all samples.

Matrix Spike Analysis - Inorganic Analyses

Matrix spike samples were monitored to determine the effects of sample matrix on the laboratory's digestion and measurement methods. The sample results that should be qualified due to violation of matrix spike percent recovery criteria is summarized in Table 5. The remainder of the data were within the acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the recoveries were determined. The MS/MSD percent recoveries and RPDs were acceptable for all analyses.

Internal Standard Summaries

Overall instrument stability and performance for the TCL VOC and TCL SVOC analyses was monitored using internal standard peak area and retention time data. The TCL VOC and TCL SVOC internal standard recoveries and retention time data were within the acceptance criteria.

Tentatively Identified Compounds

Laboratory analysis for TCL and Appendix IX VOC and SVOC included the identification of non-target compounds by conducting a forward library search against the EPA/NIST Mass Spectral Library. The identified non-target compounds were flagged by the laboratory with a "J". These compounds should be qualified as (NJ) tentatively identified compounds (TIC) with approximate concentrations.

Sample Quantitation

Sample analyses resulted in several analytes or compounds reported below the laboratory's method reporting limit (MRL) but above their method detection limit (MDL). These results were identified by the laboratory with a "J" flag and should be considered estimated values.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

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TABLE 1

**SAMPLE IDENTIFICATION NUMBERS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

SS-7097-120798-TJ-044

S-7097-120798-TJ-045

S-7097-120897-DS-046

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LFR **TABLE 2**

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**SUMMARY OF ANALYTICAL METHODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Method</i>
TCL VOC	SW-846 5035/8260B ¹
TCL SVOC	SW-846 8270C
Polychlorinated Biphenyls (PCB)	SW-846 8082
TAL Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A/7470A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Thallium	SW-846 6020
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B

¹ "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and promulgated updates, November 1986.

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TABLE 3

**HOLDING TIME PERIODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Holding Time Period</i>
TCL VOC, Appendix IX VOC	- 48 hours from sample collection to extraction - 14 days from sample extraction to analysis
TCL SVOC, Appendix IX SVOC, PCB	- 14 days from sample collection to extraction - 40 days from extraction to completion of analysis
TAL and Appendix IX Inorganics -	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Total Cyanide	- 14 days from sample collection to completion of analysis
Sulfide	- 7 days from sample collection to completion of analysis

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**SUMMARY OF QUALIFIED SAMPLE DATA DUE TO
METHOD BLANK CONTAMINATION
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Parameter</i>	<i>Associated Samples</i>	<i>Qualified¹ Sample Result (mg/Kg)</i>
TAL Metals	Antimony	SS-7097-120798-TJ-044	U(0.03)
		S-7097-120798-TJ-045	U(0.03)
		S-7097-120898-DS-046	U(0.03)

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¹ The analyte should be qualified for the listed samples as:

U() - The analyte was analyzed for, but was not detected above the reported sample quantitation limit in parenthesis.

TABLE 5

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO OUTLYING
MATRIX SPIKE RECOVERY DATA-INORGANICS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN

<i>Analysis</i>	<i>Parameters</i>	<i>Associated Samples</i>	<i>Qualifier¹</i>
TAL Metals	Silver	SS-7097-120798-TJ-044	J
		S-7097-120798-TJ-045	J
		S-7097-120898-DS-046	J

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¹ The parameter results should be qualified for the listed samples as:

J - The associated value is an estimated quantity (for detected parameters).

Richard Kowalski



CONESTOGA-ROVERS & ASSOCIATES
 2055 Niagara Falls Blvd., Suite Three
 Niagara Falls, NY 14304

TELEPHONE: (716) 297-6150
 FAX: (716) 297-2265

MEMORANDUM

TO: Paul Wiseman REF. NO.: 7097

FROM: Paul McMahon/lr/3 DATE: June 7, 1999

RE: Data Quality Assessment and Validation for Soil Samples Collected from the GM Truck Group Site in Pontiac, Michigan

The following details a quality assessment and validation of the analytical data resulting from the December 9, 10 and December 11, 1998 collection of ten (10) soil samples and one (1) rinsate blank from the General Motors (GM) Truck Group Site in Pontiac, Michigan. The samples identified in Table 1 were selectively analyzed for target compound list (TCL) volatile organic compounds (VOC); TCL semi-volatile organic compounds (SVOC); polychlorinated biphenyls (PCB); and target analyte list (TAL) inorganics. Sample analysis was completed at Columbia Analytical Services, in Kelso, Washington (CAS) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).¹

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. Samples that violated the cyanide holding time period are detailed in Table 4. The remaining samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by CAS, were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for TCL VOC and TCL SVOC analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB) and decafluorotriphenylphosphine (DFTPP), respectively. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for TCL VOC, SVOC and PCB analyses require that compounds meet a method-specific minimum mean response factor (RF) and maximum percent relative standard deviation (%RSD). The initial calibration data for TCL VOC, SVOC and PCB analyses were within the

¹ Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

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Initial Calibration (Cont'd)

acceptance criteria indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

The calibration criteria for inorganic analyses require that a specific number of standards be analyzed with a resulting correlation coefficient of ≥ 0.995 . Inductively coupled plasma (ICP) instrumentation requires calibration with a blank and at least one standard. The initial calibration verification (ICV) results must fall within the percent recovery control limits of 80–120 percent for mercury and 90–110 percent for the remaining TAL metals and cyanide. The initial calibration acceptance criteria were met indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for TCL VOC, SVOC and PCB analyses require that compounds meet a method-specific minimum RF and maximum percent difference (%D) between the initial calibration mean RF and the continuing calibration RF. The continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were evaluated against the same criteria used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. Several metals were detected in the laboratory blank analyses. The associated samples results were either reported as non-detect or five (5) times the method blank results, therefore no qualification was required. All remaining method blank samples were reported to be free from detectable levels of target analytes, indicating no laboratory-attributable contamination occurred.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses served as a monitor of the overall performance of all steps in the organic and inorganic analyses. Several TCL SVOC and TCL VOC LCS percent recoveries exceeded the laboratory LCS percent criteria. This exceedance appeared to be an anomaly caused by rounding and LCS spike preparation, therefore no qualification was required. The remaining LCS percent recoveries were within the laboratory control limits, indicating an acceptable level of overall performance was achieved.

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Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all samples.

Matrix Spike Analysis - Inorganic Analyses

Matrix spike samples were monitored to determine the effects of sample matrix on the laboratory's digestion and measurement methods. The samples that should be qualified due to violation of matrix spike recovery criteria are outlined in Table 5. The remainder of the data were within the acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the recoveries were determined. The MS/MSD percent recoveries and RPDs were acceptable for all analyses.

Internal Standard Summaries

Overall instrument stability and performance for the TCL VOC and TCL SVOC analyses was monitored using internal standard peak area and retention time data. The sample results that should be qualified due to outlying internal standard retention time criteria are summarized in Table 6. The remaining TCL VOC and TCL SVOC internal standard recoveries and retention time data were within the acceptance criteria.

Tentatively Identified Compounds

Laboratory analysis for TCL and Appendix IX VOC and SVOC included the identification of non-target compounds by conducting a forward library search against the EPA/NIST Mass Spectral Library. The identified non-target compounds were flagged by the laboratory with a "J". These compounds should be qualified as (NJ) tentatively identified compounds (TIC) with approximate concentrations.

Sample Quantitation

Sample analyses resulted in several analytes or compounds reported below the laboratory's method reporting limit (MRL) but above their method detection limit (MDL). These results were identified by the laboratory with a "J" flag and should be considered estimated values.

Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted on one (1) field duplicate set, one (1) field blank (rinsate) sample, and one (1) trip blank sample.

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Field Quality Assurance/Quality Control (Cont'd)

To assess the efficiency of field decontamination procedures, one (1) rinsate sample (W-7097-121098-DS-049) was collected and analyzed for all organic parameters. Several TCL VOC and TCL SVOC were detected in the rinsate blanks but associated sample results were reported as non-detect. No qualification was required. No additional target analytes were reported as detected in the rinsate samples.

To monitor potential cross-contamination of VOC during aqueous sample transportation and storage, a trip blank was submitted to the laboratory for VOC analysis with each shipping cooler. No target analytes were reported as detected in the trip blank sample.

Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate set. Table 7 summarize the results of the detected analytes in the field duplicate set. The data indicate that an adequate level of precision achieved for the sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

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TABLE 1

**SUMMARY IDENTIFICATION NUMBERS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

S-7097-120998-DS-047

S-7097-120998-DS-048

W-7097-121098-DS-049

S-7097-121098-DS-050

S-7097-121098-DS-051

S-7097-121098-DS-052

S-7097-121198-DS-053

S-7097-121198-DS-054

S-7097-121198-DS-055

S-7097-121198-DS-056

S-7097-121198-DS-057

TABLE 2

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**SUMMARY OF ANALYTICAL METHODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Method</i>
TCL VOC	SW-846 5035/8260B ¹
TCL SVOC	SW-846 8270
Polychlorinated Biphenyls (PCB)	SW-846 8082
TAL Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A/7470A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Thallium	SW-846 6020
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B

¹ "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and promulgated updates, November 1986.

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TABLE 3

**HOLDING TIME PERIODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Holding Time Period</i>
TCL VOC	- 48 hours (soil) from sample collection to extraction - 14 days (soil) from sample extraction to analysis - 14 days (water) from sample collection to completion of analysis
TCL SVOC, PCB	- 14 days (soil), 7 days (water) from sample collection to extraction - 40 days from extraction to completion of analysis
TAL Inorganics -	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Total Cyanide	- 14 days from sample collection to completion of analysis

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TABLE 4

**SUMMARY OF QUALIFIED SAMPLE DATA
DUE TO HOLDING TIME PERIOD VIOLATIONS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Associated Samples</i>	<i>Qualifier¹</i>
Cyanide	S-7097-120998-DS-047	UJ/J
	S-7097-120998-DS-048	
	S-7097-121098-DS-050	
	S-7097-121098-DS-051	
	S-7097-121098-DS-052	
	S-7097-121198-DS-053	
	S-7097-121198-DS-054	
	S-7097-121198-DS-055	
	S-7097-121198-DS-056	
	S-7097-121198-DS-057	

¹The sample parameter results should be qualified as:

- J - The analyte was positively identified; the associated numerical value is the estimated concentration of the analyte in the sample (for detected parameters).
- UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is estimated and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (for non-detected parameters).

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TABLE 5

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO OUTLYING
MATRIX SPIKE RECOVERY DATA-INORGANICS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN

<i>Analysis</i>	<i>Parameters</i>	<i>Associated Samples</i>	<i>Qualifier¹</i>
TAL Metals	Silver	S-7097-120998-DS-047	J
		S-7097-120998-DS-048	
		S-7097-121098-DS-050	
		S-7097-121098-DS-051	
		S-7097-121098-DS-052	
		S-7097-121198-DS-053	
		S-7097-121198-DS-054	
		S-7097-121198-DS-055	
		S-7097-121198-DS-056	
		S-7097-121198-DS-057	

¹ The parameter results should be qualified for the listed samples as:

J - The associated value is an estimated quantity (for detected parameters).

TABLE 6

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO
OUTLYING INTERNAL STANDARD RECOVERIES
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN

<i>Analysis</i>	<i>IS</i>	<i>Sample</i>	<i>Compounds</i>	<i>Qualifier¹</i>
Semi-Volatiles	Acen-d10	S-7097-121098-DS-052	Phenanthrene	J

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¹ The samples should be qualified for the listed parameters as:

J - The analyte was positively identified; the associated numerical value is the estimated concentration of the analyte in the sample (for detected parameters).

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**SUMMARY OF DETECTED ANALYTES IN FIELD DUPLICATE SAMPLE SET
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Investigative Sample</i>	<i>Duplicate Sample</i>	<i>RPD¹</i>
	S-7097-121098-DS-50	S-7097-121098-DS-50	
TAL Metals			
Aluminum	5,650	4,950	13
Antimony	0.06	0.04 J ²	40
Arsenic	4.3	4.5	4.5
Barium	31	30	3.3
Beryllium	0.29	0.29	0
Cadmium	0.23	0.19	19
Calcium	72,900	71,800	1.5
Chromium	11	10	10
Cobalt	5.24	5.19	0.96
Copper	12.0	11.9	0.84
Iron	11,600	10,800	7.1
Lead	6.54	6.92	5.7
Magnesium	22,400	21,500	4.1
Manganese	285	274	3.9
Nickel	14.7	15.1	2.7
Potassium	110	900	160
Selenium	0.4 J	0.5 J	22
Silver	0.07	0.05	33
Sodium	174	176	1.1
Thallium	0.23	0.22	4.4
Vanadium	17	14	19
Zinc	35	49	33

¹RPD - Relative Percent Difference

²J - The associated numerical value is an estimated quantity.

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CONESTOGA-ROVERS & ASSOCIATES
 2055 Niagara Falls Blvd., Suite Three
 Niagara Falls, NY 14304

TELEPHONE: (716) 297-6150

FAX: (716) 297-2265

MEMORANDUM

TO: Paul Wiseman

REF. NO.: 7097

FROM: Paul McMahon/lr/4

DATE: June 7, 1999

RE: **Data Quality Assessment and Validation for Soil Samples Collected from the GM Truck Group Site in Pontiac, Michigan**

The following details a quality assessment and validation of the analytical data resulting from the December 16, 17 and 18, 1998 collection of nine (9) soil samples and one (1) rinsate blank from the General Motors (GM) Truck Group Site in Pontiac, Michigan. The samples identified in Table 1 were selectively analyzed for target compound list (TCL) volatile organic compounds (VOC); Appendix IX VOC; TCL semi volatile organic compounds (SVOC); Appendix IX SVOC; polychlorinated biphenyls (PCB); target analyte list (TAL) inorganics; and Appendix IX inorganics. Sample analysis was completed at Columbia Analytical Services, in Kelso, Washington (CAS) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).¹

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. Samples that violated the sulfide holding time period are detailed in Table 4. The remaining samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by CAS, were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for VOC and SVOC analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB) and decafluorotriphenylphosphine (DFTPP), respectively. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for VOC, SVOC and PCB analyses require that compounds meet a method-specific minimum mean response factor (RF) and maximum percent relative standard

¹ Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

CRA MEMORANDUMInitial Calibration (Cont'd)

deviation (%RSD). The initial calibration data for VOC, SVOC and PCB analyses were within the acceptance criteria indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

The calibration criteria for inorganic analyses require that a specific number of standards be analyzed with a resulting correlation coefficient of ≥ 0.995 . Inductively coupled plasma (ICP) instrumentation requires calibration with a blank and at least one standard. The initial calibration verification (ICV) results must fall within the percent recovery control limits of 80–120 percent for mercury and 90–110 percent for the remaining metals, sulfide, and cyanide. The initial calibration acceptance criteria were met indicating the instruments were capable of generating acceptable quantitative data prior to analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for VOC, SVOC and PCB analyses require that compounds meet a method-specific minimum RF and maximum percent difference (%D) between the initial calibration mean RF and the continuing calibration RF. The continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were evaluated against the same criteria used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. Calcium and copper were reported as detected in the metals method blanks. The associated samples results were reported as five (5) times the method blank results, therefore no qualification was required. The remaining method blank samples were reported to be free from detectable concentrations of target analytes, indicating no laboratory-attributable contamination occurred.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses served as a monitor of the overall performance of all steps in the organic and inorganic analyses. All LCS percent recoveries were within the laboratory control limits, indicating that an acceptable level of overall performance was achieved.

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Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all samples.

Matrix Spike Analysis - Inorganic Analyses

Matrix spike samples were monitored to determine the effects of sample matrix on the laboratory's digestion and measurement methods. Sulfide MS percent recovery exceeded the acceptance criteria but the associated sample result was reported as non-detect, therefore no qualification was required. The remaining inorganic matrix spike recoveries were within acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the recoveries were determined. The MS/MSD percent recoveries and RPDs were acceptable for all analyses.

Internal Standard Summaries

Overall instrument stability and performance for the VOC and SVOC analyses was monitored using internal standard peak area and retention time data. The VOC and SVOC internal standard recoveries and retention time data were within the acceptance criteria.

Tentatively Identified Compounds

Laboratory analysis for TCL and Appendix IX VOC and SVOC included the identification of non-target compounds by conducting a forward library search against the EPA/NIST Mass Spectral Library. The identified non-target compounds were flagged by the laboratory with a "J". These compounds should be qualified as (NJ) tentatively identified compounds (TIC) with approximate concentrations.

Sample Quantitation

Sample analyses resulted in several analytes or compounds reported below the laboratory's method reporting limit (MRL) but above their method detection limit (MDL). These results were identified by the laboratory with a "J" flag and should be considered estimated values.

Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted of two (2) field duplicate sets and one (1) field blank (rinsate) sample.

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Field Quality Assurance/Quality Control (Cont'd)

To assess the efficiency of field decontamination procedures, one (1) rinsate sample (W-7097-121798-DS-062) was collected and analyzed for VOC and metals parameters. Several TCL VOCs and metals were detected in the rinsate blank, but the associated sample results were either reported as non-detect or were five (5) times the rinsate blanks. No qualification was required. No additional analytes were reported as detected in the rinsate sample.

Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sets. Tables 5 summarize the results of the detected analytes in the field duplicate sets. All data indicate that an adequate level of precision was achieved for the sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

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TABLE 1

**SAMPLE IDENTIFICATION NUMBERS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

S-7097-121698-DS-058

S-7097-121698-DS-059

S-7097-121698-DS-060

S-7097-121798-DS-061

W-7097-121798-DS-062

S-7097-121798-DS-063

S-7097-121798-DS-064

S-7097-121898-DS-065

S-7097-121898-DS-066

S-7097-121898-DS-067

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TABLE 2

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**SUMMARY OF ANALYTICAL METHODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Parameter</i>	<i>Method</i>
TCL VOC, Appendix IX VOC	SW-846 5035/8260B ¹
TCL SVOC, Appendix IX SVOC	SW-846 8270C
Polychlorinated biphenyls (PCB)	SW-846 8082
TAL Inorganics, Appendix IX Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A/7470 A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Sulfide	SW-846 9030B
Tin	SWW-846 6020
Thallium	SW-846 6020
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B

¹ "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and promulgated updates, November 1986.

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TABLE 3

**HOLDING TIME PERIODS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Holding Time Period</i>
TCL VOC, Appendix IX VOC	- 48 hours (soil) from sample collection to extraction - 14 days (soil) from sample extraction to analysis - 14 days (water) from sample collection to completion of analysis
TCL SVOC, Appendix IX SVOC, PCB	- 14 days (soil), 7 days (water) from sample collection to extraction - 40 days from extraction to completion of analysis
TAL and Appendix IX Inorganics -	
Metals (except Mercury)	- 140 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Total Cyanide	- 14 days from sample collection to completion of analysis
Sulfide	- 7 days from sample collection to completion of analysis

TABLE 4

**SUMMARY OF QUALIFIED SAMPLE DATA
DUE TO HOLDING TIME PERIOD VIOLATIONS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Associated Samples</i>	<i>Qualifier¹</i>
Sulfide	S-7097-121698-DS-058 S-7097-121798-DS-061 S-7097-121898-DS-066 S-7097-121898-DS-067	UJ

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¹The sample parameter results should be qualified as:

- UJ -The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is estimated and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (for non-detected parameters).

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TABLE 3

**SUMMARY OF DETECTED ANALYTES IN FIELD DUPLICATE SAMPLE SETS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Investigative Sample</i>	<i>Duplicate Sample</i>	<i>RPD¹</i>
	S-7097-121898-DS-059	S-7097-121898-DS-060	
TCL Semi-Volatiles			
2-Methylnaphthalene	0.12 J ²	0.1J	0
TAL Metals			
Aluminum	5,920	6,280	5.9
Antimony	0.1	0.2	67
Arsenic	6.6	8.0	19
Barium	36	38	5.4
Beryllium	0.28	0.31	10
Cadmium	0.27	0.28	3.6
Calcium	71,600	71,700	0.14
Chromium	13	12	8.0
Cobalt	6.21	7.24	15
Copper	14.2	16.1	13
Iron	15,200	15,200	0
Lead	6.97	9.10	27
Magnesium	24,200	21,700	11
Manganese	292	314	7.3
Nickel	18.9	23.0	20
Potassium	1,200	1,200	0
Selenium	0.5	0.4 J	22
Silver	0.06	0.08	29
Sodium	120	122	1.7
Thallium	0.38	0.54	35
Vanadium	18	18	0
Zinc	42	45	6.9

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TABLE 5

**SUMMARY OF DETECTED ANALYTES IN FIELD DUPLICATE SAMPLE SETS
GM TRUCK GROUP SITE
PONTIAC, MICHIGAN**

<i>Analysis</i>	<i>Investigative Sample</i>	<i>Duplicate Sample</i>	<i>RPD¹</i>
	S-7097-121898-DS-059	S-7097-121898-DS-060	
	S-7097-121898-DS-066	S-7097-121898-DS-067	
Appendix IX - SVOCs			
2-Methylnaphthalene	0.2 J	0.2 J	0
Naphthalene	0.07 J	0.07 J	0
Phenanthrene	0.1 J	0.09 J	11
Appendix IX - Metals			
Antimony	0.08 J	0.09 J	12
Arsenic	8.5	8.3	2.4
Barium	41	40	2.5
Beryllium	0.3	0.31	3.3
Cadmium	0.66	0.31	72
Chromium	12	11	8.7
Cobalt	7.2	7.66	6.2
Copper	17.2	16.3	5.3
Lead	8.04	12.4	43
Nickel	22.2	23.3	4.8
Selenium	0.3J	0.4J	29
Silver	0.08	0.07	13
Thallium	0.5	0.5	0
Vanadium	18	17	5.7
Zinc	65	65	0

¹RPD - Relative Percent Difference²J - The associated numerical value is an estimated quantity.

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APPENDIX E

MDEQ GENERIC CLEANUP CRITERIA AND SCREENING LEVELS

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JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

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INTERNET: www.deq.state.mi.us

RUSSELL J. HARDING, Director

REPLY TO:

ENVIRONMENTAL RESPONSE DIVISION
KNAPPS CENTRE
PO BOX 30426
LANSING MI 48909-7926

May 28, 1999

TO: Interested Parties

FROM: Alan J. Howard, Chief, Environmental Response Division (ERD)

SUBJECT: Revised Part 201 Operational Memorandum #18 Cleanup Criteria Tables

Attached are the revised Part 201 Operational Memorandum #18 (Op Memo #18) cleanup criteria tables and footnotes. Preceding the tables is a list of criteria changes. Replace the January 1999 criteria tables and footnotes in your hard copy of Op Memo #18 with the attached criteria tables, the footnotes, and the list of changes. The original text and Attachment B of Op Memo #18 have not changed. The revised materials are also available on the Internet via the Environmental Response Division (ERD) homepage (<http://www.deq.state.mi.us/erd>).

The list of changes preceding the tables is a list of hazardous substances for which criteria have changed since the January 1999 version of Op Memo #18. If the hazardous substances on the list are of interest to you, the actual values can be obtained from the tables. We will continue to provide this listing in future revisions of the criteria tables, which are scheduled every four months. Mark on your calendars that the next published revisions are scheduled for September of this year. Finalization and publication of the Op Memo #18 criteria tables and the Part 201 Training Material Criteria Tables will be synchronized. Any criteria that become available or are revised between the scheduled updates will not be considered official or final until the next publication of the criteria tables. However, anyone inquiring about new or revised criteria prior to finalization/publication of those criteria will be informed of the impending changes. These criteria will be considered draft until published. Decisions related to specific facilities can be made with the draft criteria in mind.

Questions related to the cleanup criteria can be directed to ERD's Toxicology Unit at 517-241-7651.

Attachments

cc: Flint Watt, DWRPD
Harold Fitch, GSD
Paul Zugger, Acting Chief, STD
Jim Sygo, WMD

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ATTACHMENT A GROUNDWATER: RESIDENTIAL AND INDUSTRIAL-COMMERCIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELS

May 28, 1999
Page A.1

Developed under the authority of the

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994 PA 451, AS AMENDED

Groundwater criteria were calculated using currently available toxicological and chemical-specific data. These criteria may change as new data become available. They are not necessarily final cleanup standards. Current criteria are available on the ERD Homepage at www.deq.state.mi.us/erd. Scientific notation is represented by E+ or E- a value, for example 2×10^6 is reported as 2.0E+6. Please refer to Operational Memorandum #6 for analytical methods and method detection limits. All values are expressed in units of parts per billion (ug/L). Changes made since the last revision of the tables (January 1999) are shaded.

Chemical	Chemical Abstract Service Number	#1 Residential & Commercial I Drinking Water Criteria	#2 Industrial & Commercial II, III & IV Drinking Water Criteria	#3 Groundwater Surface Water Interface Criteria	#4 Residential & Commercial I Groundwater Volatilization to Indoor Air Inhalation Criteria	#5 Industrial & Commercial II, III & IV Groundwater Volatilization to Indoor Air Inhalation Criteria	#6 Groundwater Contact Criteria (AA)	#7 Water Solubility	#8 Flammability and Explosivity Screening Level	#9 Acute Inhalation Screening Level
Benzene	83329	1,300	3,800	13	4,200 (S)	4,200 (S)	4,200 (S)	4,240	ID	ID
Benzaldehyde	208988	26	75	ID	3,900 (S)	3,900 (S)	3,900 (S)	3,930	ID	ID
Benzonitrile	75070	950	2,700	NA	1E+6	2.3E+6	4.2E+7	1.0E+9	4.4E+8	2.0E+7
Benzophenone	64197	18,000 (M)	18,000 (M)	18,000 (M)	1E+6	NLV	1.8E+8	6.0E+9	4.8E+8	1.0E+8 (D)
Benzothiazole	67641	730	2,100	1,300	1.0E+8 (D)	1.0E+8 (D)	3.1E+7	1.0E+9	7.5E+8	1.0E+8 (D)
Benzotrifluoride	75058	140	400	NA	1.4E+6	2.0E+8 (S)	6.7E+8	2.00E+8	1.0E+7	2.0E+8 (S)
Acrolein	107028	120	330	NA	2,100	2,200	3.4E+8	2.10E+8	3.3E+8	3.4E+6
Acrylamide	78081	0.5 (M)	0.78	NA	NLV	NLV	8,700	2.20E+9	ID	ID
Acrylic acid	78107	3,900	11,000	NA	1.2E+7	2.8E+7	7.4E+7	1.0E+9	1.0E+9 (D)	ID
Acrylonitrile	107131	16	6.4	4.9 (X)	14,000	1.9E+6	8,100	7.50E+7	3.2E+8	ID
Alachlor	15972808	2.0 (A)	2.0 (A)	11 (X)	NLV	NLV	ID	1.83E+5	ID	ID
Aldicarb	116083	3.0 (A)	3.0 (A)	NA	NLV	NLV	1.2E+6	6.00E+6	ID	ID
Aldicarb sulfide	1846873	4.0 (A)	4.0 (A)	NA	NLV	NLV	3.2E+6	2.80E+7	ID	ID
Aldicarb sulfone	1846884	2.0 (A)	2.0 (A)	NA	NLV	NLV	2.6E+6	7.80E+6	ID	ID
Aldrin	309002	0.05	0.2	NA	180 (S)	180 (S)	0.12	180	ID	ID
Aluminum (B)	7429905	50 (V)	50 (V)	NA	NLV	NLV	7.0E+7	NA	ID	ID
Ammonia	7664417	ID (N)	ID (N)	AC	3.2E+6	7.2E+6	ID	5.30E+8	ID	3.5E+6
Aniline (I)	62533	150	610	IP	NLV	NLV	3.7E+6	3.80E+7	ID	ID
Anthracene	120127	43 (S)	43 (S)	ID	43 (S)	43 (S)	43 (S)	43.4	ID	ID
Antimony (B)	7440360	8.0 (A)	8.0 (A)	ID	NLV	NLV	75,000	NA	ID	ID
Arsenic (B)	7440382	50 (A)	50 (A)	150 (X)	NLV	NLV	4,700	NA	ID	ID
Asbestos (AB)	1332214	7.0E+6 f/ml	7.0E+6 f/ml	NA	NLV	NLV	ID	NA	ID	ID

ATTACHMENT A
GROUNDWATER: RESIDENTIAL AND INDUSTRIAL-COMMERCIAL
PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELS

May 28, 1999
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Chemical	Chemical Abstract Service Number	#1 Residential & Commercial I Drinking Water Criteria	#2 Industrial & Commercial II, III & IV Drinking Water Criteria	#3 Groundwater Surface Water Interface Criteria	#4 Residential & Commercial I Groundwater Volatilization to Indoor Air Inhalation Criteria	#5 Industrial & Commercial II, III & IV Groundwater Volatilization to Indoor Air Inhalation Criteria	#6 Groundwater Contact Criteria (AA)	#7 Water Solubility	#8 Flammability and Explosivity Screening Level	#9 Acute Inhalation Screening Level
Alfrazine	1912249	3.0 (A)	3.0 (A)	7.3 (X)	NLV	NLV	1,800	70,000	ID	ID
Azobenzene	103333	7.7	32	NA	6,400 (S)	6,400 (S)	410	8,400	ID	ID
Barium (B)	7440393	2,000 (A)	2,000 (A)	190	NLV	NLV	1.5E+7	NA	ID	ID
Benzene (I)	71432	5.0 (A)	5.0 (A)	200 (X)	5,600	36,000	9,400	1.75E+8	34,000	67,000
Benzidine	92875	0.3 (M)	0.3 (M)	ID	NLV	NLV	8.8	5.20E+5	ID	ID
Benzo(a)anthracene (Q)	58553	5.0 (M)	5.0 (M)	NA	NLV	NLV	5.0 (M)	9.4	ID	ID
Benzo(b)fluoranthene (Q)	205992	5.0 (M)	5.0 (M)	ID	ID	ID	5.0 (M)	1.5	ID	ID
Benzo(k)fluoranthene (Q)	207089	12	48	NA	NLV	NLV	21	-0.8	ID	ID
Benzo(g,h,i)perylene	191242	26	75	NA	NLV	NLV	6.0 (M)	0.28	ID	ID
Benzo(a)pyrene (Q)	50328	6.0 (M)	5.0 (M)	ID	NLV	NLV	5.0 (M)	1.82	ID	ID
Benzoic acid	85850	32,000	92,000	NA	NLV	NLV	3.6E+8 (S)	3.50E+6	ID	ID
Benzyl alcohol	100516	10,000	29,000	NA	NLV	NLV	4.4E+7 (S)	4.40E+7	ID	ID
Benzyl chloride	100447	5.0	20	NA	12,000	77,000	2,000	4.90E+5	ID	ID
Beryllium (B)	7440417	4.0 (A)	4.0 (A)	(G)	NLV	NLV	1.1E+6	NA	ID	ID
bis(2-chloroethoxy)ethane	112265	ID	ID	NA	NLV	NLV	ID	1.98E+7	ID	ID
bis(2-Chloroethyl)ether (I)	111444	5.0 (M)	5.0 (M)	NA	38,200	2.1E+5	2,100	1.72E+7	1.7E+7 (S)	1.7E+7 (S)
bis(2-Ethylhexyl)phthalate	117817	6.0 (A)	6.0 (A)	32	NLV	NLV	47	340	ID	340 (S)
Boron (B)	7440428	500 (F)	500 (F)	1,900	NLV	NLV	8.8E+7	NA	ID	ID
Bromobenzene (I)	108861	18	50	NA	1.9E+5	3.9E+5	9,900	4.13E+5	ID	ID
Bromodichloromethane	75274	100 (A,W)	100 (A,W)	ID	4,800	38,000	11,000	6.74E+6	ID	ID
Bromoform	75252	100 (A,W)	100 (A,W)	ID	4.9E+5	3.1E+6 (S)	1.0E+5	3.10E+6	ID	ID
Bromomethane	74839	10	29	35	4,000	9,000	65,000	1.45E+7	ID	ID
n-Butanol (I)	71363	950	2,700	NA	NLV	NLV	8.2E+6	7.40E+7	2.4E+7	7.4E+7 (S)
2-Butanone (MEK) (I)	78933	13,000	38,000	2,200	2.4E+8 (S)	2.4E+8 (S)	2.4E+8 (S)	2.40E+8	ID	2.4E+8 (S)
n-Butyl acetate (I)	123864	550	1,800	NA	6.7E+8 (S)	6.7E+8 (S)	1.9E+6	6.70E+6	1.2E+6	6.7E+6 (S)
n-Butyl alcohol (I)	75650	3,900	11,000	NA	1.0E+9 (D)	1.0E+9 (D)	7.7E+7	1.0E+9	3.0E+7	ID
Butyl benzyl phthalate	85687	1,200	2,700 (S)	14 (X)	NLV	NLV	2,700 (S)	2,690	ID	ID
n-Butylbenzene	104518	80	230	NA	ID	ID	ID	NA	ID	ID
sec-Butylbenzene	135988	80	230	NA	ID	ID	ID	NA	ID	ID
tert-Butylbenzene (I)	98066	80	230	NA	ID	ID	ID	NA	ID	ID

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Cadmium (B)	740439	5.0 (A)	5.0 (A)	(G,X)	NLV	NLV	2.1E+5	NA	ID	ID
Camphene (I)	79925	ID	ID	NA	ID	ID	ID	33,400	ID	ID
Caprolactam	105602	5,800	17,000	NA	NLV	NLV	4.2E+8	5.2E+9	ID	1.0E+9 (D)
Carbaryl	63252	700	2,000	NA	ID	ID	1.3E+5 (S)	1.2E+5	ID	ID
Carbazole	66748	43	170	10 (M)	NLV	NLV	2,900	7,480	ID	ID
Carbolaran	1563682	40 (A)	40 (A)	NA	NLV	NLV	3.3E+5	7,00E+5	ID	ID
Carbon disulfide (I,R)	75150	800	2,300	ID	2.5E+5	5.5E+5	1.1E+8	1.19E+8	6,400	86,000
Carbon tetrachloride	56235	5.0 (A)	5.0 (A)	45 (X)	3 (S)	2,400	1,800	7.93E+5	ID	ID
Chloroform (J)	57749	2.0 (A)	2.0 (A)	IP	58 (S)	58 (S)	11	58	ID	ID
Chloroform (B)	16887006	2.5E+5 (E)	2.5E+5 (E)	NA	NLV	NLV	ID	NA	ID	ID
Chlorobenzene (I)	108907	100 (A)	100 (A)	4 (X)	2.1E+5	4.7E+5 (S)	68,000	4.72E+5	79,000	ID
Chlorobenzene (I)	75003	220	910	ID	5.7E+5 (S)	5.7E+5 (S)	2.0E+5	6.74E+6	56,000	ID
2-Chloroethyl vinyl ether	110758	ID	ID	NA	ID	ID	ID	1.50E+7	ID	ID
Chloroform	67863	100 (A,W)	100 (A,W)	170 (X)	28,000	1.2E+5	98,000	7.92E+6	ID	ID
Chloromethane (I)	74873	88	270	ID	8,600	52,000	1.1E+5	6.34E+6	18,000	2.1E+6
4-Chloro-3-methylphenol	59507	150	420	NA	NLV	NLV	62,000	3.90E+8	ID	ID
beta-Chloronaphthalene	91587	1,800	5,200	NA	ID	ID	6,740	2.20E+7	ID	ID
2-Chlorophenol	85578	45	130	22	ID	ID	82,000	3.73E+5	ID	ID
o-Chlorotoluene (I)	95498	150	420	NA	3.7E+5 (S)	3.7E+5 (S)	35,000	2.20E+7	ID	ID
Chlorpyrifos	2921882	22	63	NA	2.9	6.6	1,100 (S)	1.120	ID	ID
Chromium (III) (B,H)	18065831	100 (A)	100 (A)	(G,X)	NLV	NLV	3.2E+8	NA	ID	ID
Chromium (VI) (B,H)	18540289	100 (A)	100 (A)	11	NLV	NLV	1.0E+8	NA	ID	ID
Chrysene (Q)	218019	120	480	ID	ID	ID	5.0 (M)	1.8	ID	ID
Cobalt (B)	7440484	50 (M)	100	100	NLV	NLV	1.1E+8	NA	ID	ID
Copper (B)	7440508	1,000 (E)	1,000 (E)	(G)	NLV	NLV	8.1E+8	NA	ID	ID
Cyanazine	21725462	10 (M)	10 (M)	56 (X)	NLV	NLV	1,700	1.70E+5	ID	ID
Cyanide (R)	57125	200 (A)	200 (A)	20 (M)	NLV	NLV	6.5E+5	NA	ID	ID
Cyclohexanone (I)	108941	33,000	94,000	NA	1,400	3,300	2.3E+7 (S)	2.30E+7	ID	ID
Dachal	1861321	73	210	NA	NLV	NLV	500 (S)	500	ID	ID
Dalapon	75690	200 (A)	200 (A)	NA	NLV	NLV	1.2E+7	5.02E+8	ID	ID

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4,4'-DDD	72548	3.5	14	NA	NLV	NLV	12	90	ID	ID
4,4'-DDE	72559	2.5	10	NA	ID	ID	11	120	ID	ID
4,4'-DDT	50293	2.5	10	0.02 (M)	NLV	NLV	5.3	25	ID	ID
Decabromodiphenyl ether	1163195	30 (S)	30 (S)	NA	30 (S)	30 (S)	30 (S)	30	ID	ID
Di-n-butyl phthalate	84742	880	2,500	9.7	NLV	NLV	11,000 (S)	11,200	ID	ID
Di(2-ethylhexyl) adipate	103231	400 (A)	400 (A)	NA	NLV	NLV	470 (S)	471	ID	ID
Di-n-octyl phthalate	117840	130	380	ID	NLV	NLV	250	3,000	ID	ID
Dibutyl sebacate	123422	ID	ID	NA	NLV	NLV	ID	1.0E+9	ID	ID
Dibutyltin dilaurate	333415	1.3	3.8	NA	NLV	NLV	1,100	68,800	ID	ID
Dibenzofuran	53703	5.0 (M)	5.0 (M)	ID	NLV	NLV	5.0 (M)	2.48	ID	ID
Dibenzofuran	132649	ID	ID	4.0	ID	ID	ID	10,000	ID	ID
Dibromochloromethane	124481	100 (A,W)	100 (A,W)	ID	15,000	1.1E+6	9,500	2,80E+6	ID	ID
Dibromochloropropane	98128	0.2 (A)	0.2 (A)	NA	1,200 (S)	1.2E+6 (S)	300	NA	ID	ID
Dibromomethane	74953	80	230	NA	ID	ID	6.1E+6	1.10E+7	ID	ID
1,2-Dichlorobenzene	95501	600 (A)	600 (A)	16	1.5E+6 (S)	1.5E+6 (S)	1.6E+6 (S)	1.6E+6 (S)	ID	1.6E+6 (S)
1,3-Dichlorobenzene	541731	600	600	38	1.5E+6 (S)	1.5E+6 (S)	1.1E+6 (S)	1.11E+6	ID	ID
1,4-Dichlorobenzene	106467	75 (A)	75 (A)	13	16,000	74,000 (S)	2,800	73,800	ID	ID
3,3'-Dichlorobenzidine	91941	1.9	7.7	0.3 (M,X)	NLV	NLV	270	3,110	ID	ID
Dichlorodifluoromethane	75718	1,700	4,800	ID	2.2E+5	3.0E+5 (S)	3.0E+5 (S)	3,00E+5	ID	ID
1,1-Dichloroethane (I)	75343	880	2,500	ID	5.1E+6 (S)	5.1E+6 (S)	2.1E+6	5.08E+6	ID	ID
1,2-Dichloroethane (I)	107082	5.0 (A)	5.0 (A)	360 (X)	9,600	59,000	11,000	8.52E+6	ID	ID
1,1-Dichloroethylene (I)	75354	7.0 (A)	7.0 (A)	65 (X)	200	1,300	9,000	2.25E+6	48,000	1.4E+6
cis-1,2-Dichloroethylene (I)	158592	70 (A)	70 (A)	ID	3.5E+6 (S)	3.5E+6 (S)	1.7E+6	3.50E+6	2.7E+6	ID
trans-1,2-Dichloroethylene	158605	100 (A)	100 (A)	ID	6.3E+6 (S)	6.3E+6 (S)	1.9E+6	6.30E+6	1.2E+6	ID
2,6-Dichloro-4-nitroaniline	99309	2,200	6,300	NA	NLV	NLV	7,000 (S)	7,000	ID	ID
2,4-Dichlorophenol	120832	73	210	19	NLV	NLV	40,000	4.50E+6	ID	ID
2,4-Dichlorophenoxyacetic acid	94757	70 (A)	70 (A)	220	NLV	NLV	1.1E+6	6.80E+5	ID	ID
1,2-Dichloropropane (I)	78875	5.0 (A)	5.0 (A)	290 (X)	16,000	38,000	7,500	2.80E+6	2.7E+6	2.8E+6 (S)
1,3-Dichloropropene (I,J)	542758	4.7	19	NA	300	2,000	2,600	2.80E+6	68,000	ID
Dichloroethene	92737	2.9	12	NA	NLV	NLV	11,000	1.60E+7	ID	ID

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Dicyclohexyl phthalate	84817	ID	ID	NA	ID	ID	ID	4,000	ID	ID
Dieldrin	60571	0.053	0.22	0.02 (M)	200 (S)	200 (S)	0.9	195	ID	ID
Diethyl ether (I)	60297	10 (E,M)	10 (E,M)	ID	6.1E+7 (S)	6.1E+7 (S)	3.3E+7	6.10E+7	3.2E+6	6.1E+7 (S)
Diethyl phthalate	84862	5,500	16,000	NA	NLV	NLV	1.1E+8 (S)	1.08E+8	ID	ID
Diethylene glycol monobutyl ether	112345	88	250	NA	NLV	NLV	4.3E+8	1.0E+9	ID	ID
Diisopropylamine (I)	108189	5.8	16	NA	ID	ID	19,000	3.88E+7	2.3E+6	ID
Dimethyl phthalate	131113	73,000	2.1E+5	NA	NLV	NLV	4.2E+8 (S)	4.19E+8	ID	ID
N,N-Diethylethylacetamide	127195	160	520	4.10E+5 (X)	1.3E+6 (S)	1.3E+6 (S)	2.8E+7	1.0E+9	ID	ID
N,N-Diethylaniline	121687	16	46	NA	3.4E+6	1.3E+6 (S)	18,000	1.27E+8	ID	1.3E+8 (S)
Dimethylformamide (I)	68122	700	2,000	NA	NLV	NLV	1.3E+8	1.0E+9	ID	ID
2,4-Dimethylphenol	105679	370	1,000	12	NLV	NLV	4.4E+5	7.87E+8	ID	ID
2,6-Dimethylphenol	576281	13	13	NA	NLV	NLV	5,300	6.14E+8	ID	ID
3,4-Dimethylphenol	95858	10	29	NA	NLV	NLV	15,000	4.93E+8	ID	ID
Dimethyl sulfoxide	67885	2.2E+5	6.3E+5	1.9E+5	NLV	NLV	1.7E+8 (S)	1.68E+8	ID	ID
2,4-Dinitrotoluene	121142	5.0 (M)	5.1	NA	NLV	NLV	1,300	2.70E+5	ID	ID
Dinoseb	88857	7.0 (A)	7.0 (A)	NA	ID	ID	6,100	52,000	ID	ID
1,4-Dioxane (I)	123811	77	320	2,800 (X)	NLV	NLV	1.7E+8	9,00E+8	7.2E+7	ID
Diquat	85007	20 (A)	20 (A)	NA	NLV	NLV	7,00E+5 (S)	7,00E+5	ID	ID
Diuron	330541	31	90	NA	NLV	NLV	37,000 (S)	37,300	ID	ID
Endosulfan (J)	115287	1.7	4.8	NA	ID	ID	510 (S)	610	ID	ID
Endothall	145733	100 (A)	100 (A)	NA	NLV	NLV	3.0E+7	1,00E+8	ID	ID
Endrin	72208	2.0 (A)	2.0 (A)	IP	NLV	NLV	120	250	ID	ID
Epichlorohydrin (I)	108898	86	350	NA	3.2E+5	6.3E+5	6.8E+5	6.80E+7	2.3E+7	ID
Ethanol (I)	64175	1.9E+6	3.8E+6	IP	NLV	NLV	1.0E+9 (D)	1.0E+9	4.8E+7	ID
Ethyl acetate (I)	141786	6,800	19,000	NA	6.4E+7 (S)	6.4E+7 (S)	6.4E+7 (S)	6.40E+7	2.1E+8	ID
Ethylbenzene (I)	100414	74 (E)	74 (E)	16	1.7E+6 (S)	1.7E+6 (S)	1.7E+6 (S)	1.98E+5	22,000	1.7E+5 (S)
Ethylene dibromide	108934	0.05 (A)	0.05 (A)	NA	2,400	15,000	16	4.20E+8	ID	ID
Ethylene glycol	107211	15,000	42,000	NA	NLV	NLV	1.0E+9 (S)	1.0E+9	ID	1.0E+9 (D)
Ethylene glycol monobutyl ether	111762	200	560	NA	53,000	1.2E+5	2.8E+6	2.24E+8	ID	ID
Fluoranthene	208440	210 (S)	210 (S)	1.6	210 (S)	210 (S)	210 (S)	206	ID	ID

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Fluorene	86737	880	2,000 (S)	12	2,000 (S)	2,000 (S)	2,000 (S)	1,980	ID	ID
Fluorine (soluble fluoride) (B)	7782414	2,000 (A,E)	2,000 (A,E)	NA	NLV	NLV	1.3E+7	NA	ID	ID
Formaldehyde	50000	1,300	3,800	120	63,000	3.8E+5	2.9E+7	5.50E+8	ID	61,000
Formic acid (I,U)	64186	18,000 (M)	29,000	ID	7.7E+8	1.5E+7	6.2E+8	1.0E+9	6.6E+8	3.5E+8
1-Formylpiperidine	2591868	80	230	NA	ID	ID	ID	NA	ID	ID
Gentian violet	548629	8.5	35	NA	NLV	NLV	4.9E+5	1.00E+6	ID	ID
Glyphosate	1071838	700 (A)	700 (A)	NA	NLV	NLV	ID	1.18E+7	ID	ID
Hexachlorocyclopentadiene (C-58)	78448	0.4 (A)	0.4 (A)	NA	180 (S)	180 (S)	0.71	180	ID	ID
Hexachlorocyclopentadiene (C-48)	1024573	0.2 (A)	0.2 (A)	NA	NLV	NLV	3.1	200	ID	ID
Hexachlorocyclopentadiene (C-58)	142825	32,000	92,000	NA	2,700 (S)	2,700 (S)	2,700 (S)	2,690	100	2,700 (S)
Hexachlorocyclopentadiene (C-58)	87821	10 (M)	10 (M)	ID	ID	ID	10 (M)	0.17	ID	ID
Hexachlorocyclopentadiene (C-58)	118741	1.0 (A)	1.0 (A)	ID	440	2,000	2.0	6,200	ID	ID
Hexachlorocyclopentadiene (C-58)	87883	11	45	ID	1,800	3,230 (S)	200	3,230	ID	ID
alpha-Hexachlorocyclohexane	319846	0.14	0.55	NA	2,000 (S)	2,000 (S)	18	2,000	ID	ID
beta-Hexachlorocyclohexane	319857	0.47	1.9	NA	NLV	NLV	54	240	ID	ID
Hexachlorocyclopentadiene (C-58)	77474	50 (A)	50 (A)	ID	ID	ID	1,400	1,800	ID	ID
Hexachloroethane	87721	61	250	6.7 (X)	27,000	50,000 (S)	1,500	50,000	ID	ID
n-Hexane (I)	110543	3,000	8,800	NA	12,000 (S)	12,000 (S)	12,000 (S)	12,000	12,000 (S)	ID
2-Hexanone (I)	591786	1,000	2,900	NA	4.2E+6	8.8E+8	4.9E+8	1.80E+7	ID	ID
Indeno(1,2,3-cd)pyrene (Q)	193395	5.0 (M)	5.0 (M)	ID	NLV	NLV	5.0 (M)	0.022	ID	ID
Iron (B)	7438896	300 (E)	300 (E)	NA	NLV	NLV	ID	NA	ID	ID
Isobutyl alcohol (I)	78631	2,300	6,700	NA	7.6E+7 (S)	7.6E+7 (S)	2.4E+7	7.60E+7	ID	ID
Isophorone	78591	900	3,700	570 (X)	NLV	NLV	1.1E+8	1.20E+7	ID	1.2E+7 (S)
Isopropyl alcohol (I)	67630	470	1,300	NA	NLV	NLV	1.3E+7	1.0E+9	3.0E+7	1.0E+9 (D)
Isopropyl benzene (I)	98828	800	2,300	ID	58,000 (S)	58,000 (S)	56,000 (S)	56,000	16,000	ID
Lead (B)	7439921	4.0 (L)	4.0 (L)	(G,X)	NLV	NLV	ID	NA	ID	ID
Lindane	58869	0.2 (A)	0.2 (A)	0.027	ID	ID	86	6,800	ID	ID
Lithium (B)	7439932	170	350	25	NLV	NLV	6.0E+8	NA	ID	ID
Magnesium (B)	7439954	4.2E+5	1.2E+6	NA	NLV	NLV	1.0E+9 (D)	NA	ID	ID

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Chemical	Chemical Abstract Service Number	#1	#2	#3	#4	#5	#6	#7	#8	#9
		Residential & Commercial I Drinking Water Criteria	Industrial & Commercial II, III & IV Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential & Commercial I Volatilization to Indoor Air Inhalation Criteria	Industrial & Commercial II, III & IV Groundwater Volatilization to Indoor Air Inhalation Criteria	Groundwater Contact Criteria (AA)	Water Solubility	Flammability and Explosivity Screening Level	Acute Inhalation Screening Level
Manganese (B)	7439985	50 (E)	50 (E)	(G,X)	NLV	NLV	1.0E+7	NA	ID	ID
Mercury (Inorganic) (B)	7439976	2.0 (A)	2.0 (A)	0.2 (M)	NLV	NLV	56 (S)	56	ID	ID
Methane	74828	ID	ID	ID	(K)	(K)	ID	NA	(K)	ID
Methanol (I)	67561	3,700	10,000	ID	2.5E+6	6.0E+6	2.9E+7 (S)	2.90E+7	2.3E+6	2.9E+7 (S)
Methoxychlor	72435	40 (A)	40 (A)	NA	ID	ID	45 (S)	45	ID	ID
2-Methoxyethanol (I)	109864	7.3	20	NA	NLV	NLV	9.1E+5	1.0E+6	ID	ID
2-Methyl-4-chlorophenoxyacetic acid	94746	7.3	21	NA	NLV	NLV	8,200	9,24E+5	ID	ID
Methyl-4,6-dinitrophenol	534521	20 (M)	20 (M)	NA	NLV	NLV	8,800	2,00E+5	ID	ID
Methyl parathion	298000	1.8	5.2	NA	NLV	NLV	2,700	50,000	ID	ID
2-Methyl-2-pentanone (MIBK) (I)	108101	1,800	5,200	ID	2.0E+7 (S)	2.0E+7 (S)	1.2E+7	2,00E+7	ID	2.0E+7 (S)
Methyl-tert-butyl ether (MTBE)	1834044	40 (E)	40 (E)	730 (X)	4.7E+7 (S)	4.7E+7 (S)	6.5E+5	4.88E+7	ID	ID
Methylmorpholine (I)	109024	20	56	NA	NLV	NLV	1.8E+6	1.0E+6	ID	ID
Methylcyclopentane (I)	96377	ID	ID	NA	ID	ID	ID	73,890	ID	ID
4,4'-Methylene-bis-2-chloroaniline (MBOCA)	101144	0.88	3.6	NA	NLV	NLV	71	14,000	ID	ID
Methylene chloride	75092	5.0 (A)	5.0 (A)	940 (X)	2.2E+5	1.1E+5	1.1E+5	1,70E+7	ID	ID
2-Methylnaphthalene	91576	280	750	ID	ID	ID	32,000	24,600	ID	ID
2-Methylphenol	95467	370	1,000	82	NLV	NLV	7.1E+5	2,80E+7	ID	ID
3-Methylphenol	106394	370	1,000	NA	NLV	NLV	7.3E+5	2,30E+7	ID	ID
4-Methylphenol	106445	37	100	ID	NLV	NLV	76,000	2,30E+7	ID	ID
Melolachlor	51218452	160	670	NA	NLV	NLV	55,000	5,30E+5	ID	ID
Molybdenum (B)	7439987	37	100	800 (X)	NLV	NLV	1.1E+6	NA	ID	ID
Naphthalene	91203	280	750	13	31,000 (S)	31,000 (S)	31,000 (S)	31,000	31,000 (S)	31,000 (S)
Nickel (B)	7440020	100 (A)	100 (A)	(G)	NLV	NLV	1.6E+7	NA	ID	ID
Nitrate (B,N)	14797558	10,000 (A,N)	10,000 (A,N)	NA	NLV	NLV	3.4E+8	NA	ID	ID
Nitrite (B,N)	14797650	1,000 (A,N)	1,000 (A,N)	NA	NLV	NLV	2.1E+7	NA	ID	ID
Nitrobenzene (I)	98953	5.0 (M)	9.6	180 (X)	2.1E+6 (S)	2.1E+6 (S)	9,600	2,09E+6	ID	ID
2-Nitrophenol	88755	20	56	ID	NLV	NLV	72,000	2,50E+6	ID	ID
n-Nitroso-di-n-propylamine	621847	5.0 (M)	5.0 (M)	NA	NLV	NLV	220	9,89E+6	ID	ID
N-Nitrosodiphenylamine	86306	170	710	NA	NLV	NLV	30,000	35,100	ID	ID
Oxamyl	23135220	200 (A)	200 (A)	NA	NLV	NLV	7.4E+7	2,80E+6	ID	ID

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Chemical	Chemical Abstract Service Number	#1 Residential & Commercial I Drinking Water Criteria	#2 Industrial & Commercial II, III & IV Drinking Water Criteria	#3 Groundwater Surface Water Interface Criteria	#4 Residential & Commercial I Groundwater Volatilization to Indoor Air Inhalation Criteria	#5 Industrial & Commercial II, III & IV Groundwater Volatilization to Indoor Air Inhalation Criteria	#6 Groundwater Contact Criteria (AA)	#7 Water Solubility	#8 Flammability and Explosivity Screening Level	#9 Acute Inhalation Screening Level
Oxo-hexyl acetate	88230357	73	210	NA	ID	ID	ID	NA	ID	ID
Pendimethalin	40487421	280 (S)	280 (S)	NA	NLV	NLV	280 (S)	275	ID	ID
Pentachlorobenzene	808935	6.1	17	NA	ID	ID	170	650	ID	ID
Pentachloronitrobenzene	82888	32 (S)	32 (S)	NA	32 (S)	32 (S)	32 (S)	32	ID	ID
Pentachlorophenol	87865	1.0 (A)	1.0 (A)	(G,X)	NLV	NLV	85	1.86E+6	ID	ID
Pentane (I)	109660	ID	ID	NA	38,000 (S)	38,000 (S)	ID	38,200	ID	38,000 (S)
2-Pentene (I)	109682	ID	ID	NA	ID	ID	ID	2,03E+5	ID	ID
Phenanthrene	85018	28	75	5.0 (M)	1,000 (S)	1,000 (S)	1,000 (S)	1,000	ID	ID
Phenol	108952	4,400	13,000	210	NLV	NLV	2.8E+7	8,28E+7	ID	ID
Phosphorus (total)	7723140	83,000	2.4E+5	NA	NLV	NLV	ID	NA	ID	ID
Picram	1918021	500 (A)	500 (A)	NA	NLV	NLV	4.3E+5 (S)	4,30E+5	ID	ID
Pipridine	110894	3.2	9.2	NA	NLV	NLV	32,000	1.0E+9	ID	ID
Polybrominated biphenyls (I)	37324235	0.086	0.39	IP	NLV	NLV	ID	1.0E+7	ID	ID
Polychlorinated biphenyls (PCBs) (I,T)	1338363	0.5 (A)	0.5 (A)	0.2 (M)	15 (S)	4 (S)	2.30	44.7	ID	ID
Prometon	1810180	180	480	NA	NLV	NLV	1.8E+5	7.50E+5	ID	ID
Propachlor	1918167	95	270	NA	NLV	NLV	4.2E+5	6.65E+5	ID	ID
Propazine	139402	200	560	NA	NLV	NLV	8,600 (S)	8,600	ID	ID
Propionic acid (I)	78094	18,000 (M)	35,000 (M)	ID	NLV	NLV	2.7E+8	1.0E+9	ID	ID
Propyl alcohol (I)	71238	1,400	4,000	NA	NLV	NLV	2.7E+7	1.0E+9	ID	ID
n-Propylbenzene (I)	103851	80	230	ID	ID	ID	ID	NA	ID	1.0E+9 (D)
Propylene glycol	57556	1.5E+5	4.2E+5	NA	NLV	NLV	1.0E+9 (D)	1.0E+9	ID	ID
Pyrene	128000	140 (S)	140 (S)	ID	NLV	NLV	140 (S)	135	ID	ID
Pyridine (I)	110861	7.3	21	NA	5,500	12,000	90,000	3,00E+5	ID	ID
Selenium (B)	7782492	50 (A)	50 (A)	5.0	NLV	NLV	1.1E+6	NA	ID	ID
Silver (B)	7440224	34	98	0.2 (M)	NLV	NLV	1.0E+6	NA	ID	ID
Silvex (2,4,5-TP)	93721	50 (A)	50 (A)	NA	NLV	NLV	37,000	1.40E+5	ID	ID
Simazine	122349	4.0 (A)	4.0 (A)	NA	NLV	NLV	4,500 (S)	4,470	ID	ID
Sodium (B)	7440235	1.8E+5	4.5E+5	NA	NLV	NLV	1.0E+9 (D)	NA	ID	ID
Strontium (B)	7440246	4,900	13,000	780	NLV	NLV	1.3E+8	NA	ID	ID
Styrene (I)	100425	100 (A)	100 (A)	80	1.6E+5	3.1E+5 (S)	3,200	3.10E+5	68,000	3.1E+5 (S)

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Sulfate	14808798	2.5E+5 (E)	2.5E+5 (E)	NA	NLV	NLV	ID	NA	ID	ID
Tetrahuron	34014181	510	1,500	NA	NLV	NLV	2.5E+6 (S)	2.50E+6	ID	ID
2,3,7,8-Tetrabromodibenzo-p-dioxin (O)	50585416	(O)	(O)	NA	NLV	NLV	1.0E-4 (M)	0.00898	ID	ID
1,2,4,5-Tetrachlorobenzene	95943	1,300 (S)	1,300 (S)	IP	ID	ID	1,300 (S)	1,300	ID	ID
2,3,7,8-Tetrachlorodibenzo-p-dioxin (O)	1746016	3.0E-5 (A)	3.0E-5 (A)	1.0E-5 (M)	NLV	NLV	1.0E-5 (M)	0.019	ID	ID
1,1,1,2-Tetrachloroethane	630208	33	130	NA	15,000	98,000	11,000	1.10E+6	ID	ID
1,1,2,2-Tetrachloroethane	78345	4.3	17	18 (X)	12,000	77,000	2,100	2.97E+6	ID	ID
Tetrachloroethylene	127184	5.0 (A)	5.0 (A)	45 (X)	25,000	1.7E+5	5,100	2.0E+5	ID	ID
Tetrahydrofuran (I)	109899	240	680	11,000 (X)	6,900 (X)	1.8E+7	3.9E+6	1.0E+9	30,000	3.0E+6 (S)
Thallium (B)	7440280	2.0 (A)	2.0 (A)	3.7 (X)	NLV	NLV	14,000	NA	ID	ID
Toluene (I)	108883	780 (E)	780 (E)	NA	5.3E+5 (S)	5.3E+5 (S)	5.3E+5 (S)	5.28E+5	31,000	2.0E+6 (S)
Toluene (B)	108490	4.5	18	NA	NLV	NLV	6,500	7.60E+6	ID	ID
Toluene	8001352	3.0 (A)	3.0 (A)	1.0 (M)	NLV	NLV	13	740	ID	740 (S)
Triphenylene	2303175	95	270	NA	ID	ID	4,000 (S)	4,000	ID	ID
Triethylamine	102829	10	29	ID	14,000	75,000 (S)	880	75,400	ID	ID
1,2,4-Trichlorobenzene	120821	70 (A)	70 (A)	30	3.0E+5 (S)	2.0E+6 (S)	15,000	3,00E+6	ID	3.0E+5 (S)
1,1,1-Trichloroethane	71556	200 (A)	200 (A)	200	8E+5	1.3E+6 (S)	2.2E+5	1.33E+6	ID	1.3E+6 (S)
1,1,2-Trichloroethane	78005	5.0 (A)	5.0 (A)	330 (X)	17,000	1.1E+5	9,500	4.42E+6	1.8E+6	ID
Trichloroethylene	78016	5.0 (A)	5.0 (A)	200 (X)	15,000	97,000	11,000	1.10E+6	ID	1.1E+6 (S)
Trichlorofluoromethane	75694	2,800	7,300	NA	1.1E+6 (S)	1.1E+6 (S)	1.1E+6 (S)	1.10E+6	ID	1.1E+6 (S)
2,4,5-Trichlorophenol	95954	730	2,100	NA	NLV	NLV	1.3E+5	1.20E+6	ID	ID
2,4,6-Trichlorophenol	88062	77	320	0 (M)	NLV	NLV	5,500	8,00E+5	ID	ID
1,2,3-Trichloropropane	88184	42	120	NA	ID	ID	74,000	1.90E+6	ID	ID
1,1,2-Trichloro-1,2,2-trifluoroethane	78131	1.7E+5 (S)	1.7E+5 (S)	NA	1.7E+5 (S)	1.7E+5 (S)	1.7E+5 (S)	1.70E+5	ID	1.7E+5 (S)
Triethanolamine	102716	3,700	10,000	NA	NLV	NLV	1.0E+9 (D)	1.0E+9	ID	ID
3-Trifluoromethyl-4-nitrophenol	88302	4,500	13,000	NA	NLV	NLV	4.7E+6	5.00E+6	ID	ID
Trifluralin	1582098	110	450	NA	ID	ID	1,500	8,100	ID	ID
2,2,4-Trimethyl pentane	540841	ID	ID	NA	ID	ID	ID	2,330	ID	ID
2,2,4-Trimethyl-2-pentene (I)	107404	ID	ID	NA	ID	ID	ID	11,900	ID	ID
1,2,4-Trimethylbenzene (I)	95636	63 (E)	63 (E)	ID	58,000 (S)	58,000 (S)	1.8E+5	55,890	37,000	ID

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		Residential & Commercial I Drinking Water Criteria	Industrial & Commercial II, III & IV Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential & Commercial I Groundwater Volatilization to Indoor Air Inhalation Criteria	Industrial & Commercial II, III & IV Groundwater Volatilization to Indoor Air Inhalation Criteria	Groundwater Contact Criteria (AA)	Water Solubility	Flammability and Explosivity Screening Level	Acute Inhalation Screening Level
1,3,5-Trimethylbenzene (I)	108678	72 (E)	72 (E)	ID	61,000 (S)	61,000 (S)	2.1E+5	61,150	ID	ID
Triphenyl phosphite	115666	1,200	1,400 (S)	NA	NLV	NLV	1,400 (S)	1,430	ID	ID
Tris(2,3-Dibromopropyl)phosphite	126727	0.47	1.9	NA	4,700 (S)	4,700 (S)	1,500	4,700	ID	ID
Urea	57138	ID (N)	ID (N)	NA	NLV	NLV	ID	NA	ID	ID
Vanadium (B)	7440822	84	180	12	NLV	NLV	1.9E+6	NA	ID	ID
Vinyl acetate (I)	108054	840	1,800	NA	1.1E+6	8.9E+6	7.7E+6	2.00E+7	8.8E+6	4.8E+6
Vinyl chloride	75014	2.0 (A)	2.0 (A)	15	1.1E+6	890	290	2.76E+6	17,000	ID
White phosphorus (R)	12185103	0.11	0.31	NA	NLV	NLV	3,200	NA	ID	ID
Xylenes (I)	1330207	280 (E)	280 (E)	35	1.9E+6 (S)	1.9E+6 (S)	1.9E+5 (S)	1.86E+5	35,000	1.9E+5 (S)
Zinc (B)	7440668	2,400	5,000 (E)	3	NLV	NLV	7.0E+7	NA	ID	ID

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Developed under the authority of the

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994 PA 451, AS AMENDED

Residential and Commercial I soil criteria were calculated using currently available toxicological and chemical-specific data. These criteria may change as new data become available. They are not necessarily final cleanup standards. Current criteria are available on the ERD Homepage at www.deq.state.mi.us/erd. Scientific notation is represented by E+ or E- a value, for example 2×10^6 is reported as 2.0E+6. Please refer to Operational Memorandum #6 for analytical methods and method detection limits. All values are expressed in units of parts per billion (ug/Kg). Changes made since the last revision of the tables (January 1999) are shaded.

Chemical	Chemical Abstract Service Number	#10 Statewide Default Background Levels	Groundwater Protection			#14 Indoor Air	Ambient Air (Y)				Direct Contact	
			#11 Drinking Water Protection Criteria	#12 Groundwater Surface Interface Protection Criteria	#13 Groundwater Contact Protection Criteria		#15 Infinite Source Volatile Soil Inhalation Criteria (V8IC)	#16 Finite V8IC for 5 Meter Source Thickness	#17 Finite V8IC for 2 Meter Source Thickness	#18 Particulate Soil Inhalation Criteria	#19 Direct Contact Criteria	#20 Soil Saturation Concentration Screening Levels
Acetophenone	83329	NA	3.0E+5	4,300	8.0E+5	3.2E+6	8.1E+7	8.1E+7	8.1E+7	1.4E+10	7.8E+7	NA
Acetophenone	208988	NA	2,900	ID	4.4E+5	1.0E+9	2.2E+8	2.2E+8	2.2E+8	2.3E+9	1.5E+8	NA
Acetaldehyde (I)	75070	NA	19,000	NA	1.1E+6 (C)	2.2E+5	1.7E+5	1.7E+5	2.8E+5	6.0E+8	1.4E+7	1.1E+8
Acetic acid (I)	64197	NA	9.0E+5 (M)	9.0E+5 (M)	6.0E+6 (C)	NA	NLV	NLV	NLV	1.7E+10	6.3E+7	8.5E+8
Acetone (I)	67641	NA	15,000	34,000	1.1E+5 (C)	1.1E+7 (D)	1.3E+8	1.3E+8	1.9E+8	3.9E+11	1.1E+7	1.1E+8
Acetonitrile (I)	75056	NA	2,800	NA	2.2E+7 (C)	2.2E+7 (C)	2.2E+8	9.2E+8	1.2E+7	2.3E+10	2.1E+8	2.2E+7
Acrolein (I)	107028	NA	2,400	NA	2.3E+7 (C)	410	310	310	610	1.3E+8	1.8E+8	2.3E+7
Acrylamide	79061	NA	10	NA	1.7E+5	NLV	NLV	NLV	NLV	2.4E+8	2,200	NA
Acrylic acid (I)	79107	NA	78,000	NA	1.3E+8 (C)	2.5E+8	2.3E+5	2.3E+5	2.3E+5	6.7E+7	5.8E+7	1.3E+8
Acrylonitrile (I)	107131	NA	32	98 (X)	1.0E+5	3.9E+9	5,000	5,100	10,000	4.6E+7	4,700	6.3E+8
Alachlor	15972608	NA	52	280 (X)	ID	NLV	NLV	NLV	NLV	ID	1.2E+5	NA
Aldicarb	116063	NA	60	NA	2.4E+8	NLV	NLV	NLV	NLV	ID	4.2E+5	NA
Aldicarb sulfide	1646873	NA	80	NA	6.4E+7	NLV	NLV	NLV	NLV	ID	5.5E+5	NA
Aldicarb sulfone	1646884	NA	50 (M)	NA	5.2E+7	NLV	NLV	NLV	NLV	ID	4.6E+5	NA
Aldrin	309002	NA	NLL	NLL	NLL	1.3E+8	59,000	59,000	59,000	6.4E+6	590	NA
Aluminum (B)	7429905	6.9E+6	1,000	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	ID	4.2E+7	NA
Ammonia	7664417	NA	ID (N)	NA	ID	ID	ID	ID	ID	6.7E+9	ID	1.0E+7
Aniline (I)	62533	NA	3,000	IP	4.5E+8 (C)	NLV	NLV	NLV	NLV	6.7E+7	1.7E+8	4.5E+6
Anthracene	120127	NA	41,000	ID	41,000	1.0E+9 (D)	1.4E+9	1.4E+9	1.4E+9	6.7E+10	4.2E+8	NA
Antimony (B)	7440390	NA	4,300	ID	5.4E+7	NLV	NLV	NLV	NLV	3.3E+8	1.6E+5	NA
Arsenic (B)	7440382	5,900	23,000	70,000 (X)	2.2E+8	NLV	NLV	NLV	NLV	7.2E+5	8,800	NA
Asbestos (AB)	1332214	NA	ID	NA	ID	NLV	NLV	NLV	NLV	1.0E+7 (M)	1.0E+7	NA
Atrazine	1912249	NA	60	150 (X)	32,000	NLV	NLV	NLV	NLV	ID	45,000	NA

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			#11	#12	#13		#15	#16	#17	#18	#19	#20
			Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinitesimal Source Volatile Soil Inhalation Criteria (V8IC)	Finite VSIC for 8 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Azobenzene	103333	NA	1,400	NA	78,000	1.1E+5	ID	ID	ID	1.0E+8	90,000	NA
Barium (B)	7440393	75,000	1.3E+6	1.3E+5	1.0E+9 (D)	NLV	NLV	NLV	NLV	3.3E+8	3.0E+7	NA
Benzene (I)	71432	NA	100	4,000 (X)	1.9E+5	1,900	13,000	34,000	79,000	3.8E+8	88,000	4.0E+5
Benzidine	92876	NA	1,000 (M)	ID	1,000 (M)	NLV	NLV	NLV	NLV	46,000	1,000 (M)	NA
Benzo(a)anthracene (Q)	56553	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	14,000	NA
Benzo(b)fluoranthene (Q)	205982	NA	NLL	NLL	NLL	ID	ID	ID	ID	ID	14,000	NA
Benzo(k)fluoranthene (Q)	207089	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	14,000	NA
Benzofluorene	191242	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	1.4E+5	NA
Benzofuran	50328	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	8.0E+8	1.5E+8	NA
Benzopyrene (Q)	65850	NA	6.4E+5	NA	7.3E+7	NLV	NLV	NLV	NLV	1.5E+8	1,400	NA
Benzosulfonic acid	100518	NA	2.0E+5	NA	5.8E+6 (C)	NLV	NLV	NLV	NLV	ID	1.0E+9 (D)	NA
Benzyl alcohol	100447	NA	100	NA	40,000	6,300	14,000	14,000	17,000	6.2E+7	15,000	5.8E+6 (C)
Beryllium (B)	7440417	NA	51,000	(G)	1.0E+9	NLV	NLV	NLV	NLV	1.3E+8	2.1E+8	2.3E+5
bis(2-chloroethoxy)ethane	112285	NA	ID	NA	ID	NLV	NLV	NLV	NLV	ID	ID	NA
bis(2-chloroethyl)ether (I)	111444	NA	330 (M)	NA	42,000	5,300	2,800	3,600	3,600	9.4E+8	2,300	2.2E+6
bis(2-ethoxyethyl)phthalate	117817	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	7.0E+8	7.0E+5	1.0E+7
Boron (B)	7440428	NA	10,000	3,000	2.8E+8	NLV	NLV	NLV	NLV	ID	2.2E+6	NA
Bromobenzene (I)	108881	NA	530	NA	3.0E+5	3.1E+6	4.5E+5	4.5E+5	4.5E+5	5.3E+8	4.1E+4	7.8E+5
Bromodichloromethane	75274	NA	2,000 (W)	ID	2.2E+5	1,200	9,100	9,100	19,000	8.4E+7	41,000	1.5E+6
Bromoforn	75252	NA	2,000 (W)	NA	8.7E+5 (C)	1.5E+5	9.0E+5	9.0E+5	9.0E+5	2.8E+9	3.2E+5	8.7E+5
Bromomethane	74839	NA	200	700	1.3E+6	860	11,000	57,000	1.4E+5	3.3E+8	1.5E+5	2.2E+6
n-Butanol (I)	71363	NA	19,000	NA	8.7E+6 (C)	NLV	NLV	NLV	NLV	2.3E+10	8.7E+6 (C)	8.7E+6
2-Butanone (MEK) (I)	78933	NA	2.8E+5	44,000	2.7E+7 (C)	2.7E+7 (C)	2.9E+7	2.9E+7	3.5E+7	6.7E+10	2.7E+7 (C)	2.7E+7
n-Butyl acetate (I)	123864	NA	11,000	NA	1.1E+6 (C)	1.1E+6 (C)	ID	ID	ID	6.3E+10	1.1E+6 (C)	1.1E+6
n-Butyl alcohol (I)	75650	NA	78,000	NA	1.1E+6 (C)	1.1E+6 (C)	ID	ID	ID	2.0E+11	5.9E+7	1.1E+8
Butyl benzyl phthalate	85887	NA	3.1E+5 (C)	28,000 (X)	3.1E+5 (C)	NLV	NLV	NLV	NLV	4.7E+10	3.1E+5 (C)	3.1E+5
n-Butylbenzene	104518	NA	1,600	NA	ID	ID	ID	ID	ID	ID	1.2E+6	1.0E+7
sec-Butylbenzene	135988	NA	1,600	NA	ID	ID	ID	ID	ID	ID	1.20E+08	1.0E+7
tert-Butylbenzene (I)	98066	NA	1,600	NA	ID	ID	ID	ID	ID	ID	1.2E+6	1.0E+7
Cadmium (B)	7440439	1,200	6,000	(G,X)	2.5E+8	NLV	NLV	NLV	NLV	1.7E+6	1.2E+6	NA

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			#11	#12	#13		#14	#15	#16	#17	#18	#19
		Statewide Default Background Levels	Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (V5IC)	Finite V5IC for 9 Meter Source Thickness	Finite V5IC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Camphene (I)	79925	NA	ID	NA	ID	ID	ID	ID	ID	ID	ID	NA
Caprolactam	105602	NA	1.2E+5	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	6.7E+8	3.4E+8	NA
Carbaryl	63252	NA	14,000	NA	2.6E+8	ID	ID	ID	ID	ID	4.1E+7	NA
Carbazole	86748	NA	860	330 (M)	3.2E+5	NLV	NLV	NLV	NLV	ID	1.3E+5	NA
Carboluran	1563662	NA	800	NA	6.8E+8	NLV	NLV	NLV	NLV	ID	5.5E+5	NA
Carbon disulfide (I,R)	75150	NA	18,000	ID	2.3E+9 (C)	76,000	1.3E+6	7.9E+6	1.9E+7	4.7E+10	2.8E+5 (C)	2.8E+5
Carbon tetrachloride	56235	NA	100	900 (X)	32,000	190	3,500	12,000	28,000	1.3E+8	20,000	5.0E+5
Chlordane (I)	57749	NA	NLL	NLL	NLL	1.2E+7	1.2E+6	1.2E+6	1.2E+6	3.1E+7	1.7E+4	NA
Chloride (I)	16887008	NA	5.0E+6	NA	ID	NLV	NLV	NLV	NLV	ID	5.0E+5 (F)	NA
Chlorobenzene (I)	108907	NA	2,000	940	2.6E+5 (C)	1.2E+6	7.7E+5	9.8E+5	2.1E+6	4.7E+8	2.6E+5 (C)	2.6E+5
Chloroethane (I)	75003	NA	4,400	ID	9.7E+5 (C)	9.7E+5 (C)	3.1E+7	1.2E+8	2.8E+8	6.7E+11	6.7E+5	9.7E+5
2-Chloro-1-vinyl ether	110768	NA	ID	NA	ID	ID	ID	ID	ID	ID	ID	1.9E+6
Chloroform	67663	NA	2,000 (W)	3,400 (X)	1.5E+6 (C)	7,200	75,000	1.2E+5	2.7E+5	1.3E+9	4.2E+5	1.5E+6
Chloromethane (I)	74873	NA	1,300	ID	1.1E+6 (C)	2,300	5,000	4.1E+5	1.0E+6	4.9E+9	2.0E+5	1.1E+6
4-Chloro-3-methylphenol	59507	NA	5,600	NA	2.4E+6	NLV	NLV	NLV	NLV	ID	2.2E+8	NA
Beta-Chloronaphthalene	81587	NA	6.5E+5	NA	2.3E+6	ID	ID	ID	ID	ID	2.7E+7	NA
2-Chlorophenol	95578	NA	909	440	1.6E+6	ID	ID	ID	ID	ID	6.8E+5	8.1E+6
o-Chlorotoluene (I)	95498	NA	3,300	NA	5.0E+5 (C)	5.0E+5 (C)	ID	ID	ID	1.7E+11	5.0E+5 (C)	5.0E+5
Chlorpyrifos	2921882	NA	17,000	NA	8.4E+5	ID	ID	ID	ID	1.3E+8	1.3E+8	NA
Chromium (III) (B,H)	16065831	18,000 (total)	1.0E+9 (D)	(G,X)	1.0E+9 (D)	NLV	NLV	NLV	NLV	3.3E+8	6.3E+8	NA
Chromium (VI) (B,H)	18540289	18,000 (total)	30,000	3,300	3.0E+8	NLV	NLV	NLV	NLV	2.6E+5	2.0E+6	NA
Chrysene (Q)	218019	NA	NLL	NLL	NLL	ID	ID	ID	ID	ID	1.4E+6	NA
Cobalt (B)	7440484	6,800	1,000	2,000	2.2E+7	NLV	NLV	NLV	NLV	1.3E+7	2.1E+6	NA
Copper (B)	7440508	32,000	1.6E+8	(G)	1.0E+9 (D)	NLV	NLV	NLV	NLV	1.3E+8	1.8E+7	NA
Cyanazine	21725462	NA	500 (M)	1,100 (X)	34,000	NLV	NLV	NLV	NLV	ID	17,000	NA
Cyanide (R)	57125	NA	4,000	400	2.5E+5 (P)	NLV	NLV	NLV	NLV	2.5E+5 (P)	2.5E+5 (P)	NA
Cyclohexanone (I)	108941	NA	5.2E+6	NA	2.2E+8 (C)	17,000	ID	ID	ID	6.7E+10	2.2E+8 (C)	2.2E+8
Dacthal	1861321	NA	50,000	NA	3.4E+5	NLV	NLV	NLV	NLV	ID	4.2E+6	NA
Dalapon	75990	NA	4,000	NA	5.9E+7 (C)	NLV	NLV	NLV	NLV	ID	9.3E+6	5.9E+7
4,4'-DDD	72546	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	41,000	NA

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			#11 Drinking Water Protection Criteria	#12 Groundwater Surface Interface Protection Criteria	#13 Groundwater Contact Protection Criteria		#15 Infinite Source Volatile Soil Inhalation Criteria (V8IC)	#16 Finite VSIC for 5 Meter Source Thickness	#17 Finite VSIC for 2 Meter Source Thickness	#18 Particulate Soil Inhalation Criteria	#19 Direct Contact Criteria	#20 Soil Saturation Concentration Screening Levels
4,4'-DDE	72559	NA	NLL	NLL	NLL	ID	ID	ID	ID	ID	29,000	NA
4,4'-DDT	50283	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	3.2E+7	29,000	NA
Decabromodiphenyl ether	1163195	NA	1.4E+5	NA	1.4E+5	1.0E+9 (D)	ID	ID	ID	2.3E+9	4.2E+8	NA
Di-n-butyl phthalate	84742	NA	7.6E+5 (C)	11,000	7.6E+5 (C)	NLV	NLV	NLV	NLV	3.3E+9	7.9E+5 (C)	7.9E+5
Di(2-ethylhexyl) adipate	103231	NA	9.6E+5 (C)	NA	9.6E+5 (C)	NLV	NLV	NLV	NLV	ID	9.9E+5 (C)	9.9E+5
Di-n-octyl phthalate	117840	NA	1.0E+8	ID	1.4E+8 (C)	NLV	NLV	NLV	NLV	ID	7.9E+8	1.4E+8
Diacetone alcohol (I)	123422	NA	ID	NA	ID	ID	NLV	NLV	NLV	1.8E+11	ID	1.1E+9
Diazinon	333415	NA	85	NA	80,000	NLV	NLV	NLV	NLV	ID	76,000	3.1E+5
Dibenz(a,h)pyrene (Q)	53703	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	1,400	NA
Dibenzofuran	132849	NA	ID	1,700	ID	ID	ID	ID	ID	ID	ID	NA
Dibromochloroethane	124481	NA	2,000 (W)	ID	1.9E+5	3,900	21,000	24,000	33,000	1.3E+8	31,000	6.1E+5
Dibromochloropropane	96128	NA	4.0	NA	1,200 (C)	1,200 (C)	1,200 (C)	1,200 (C)	1,200 (C)	1,200 (C)	300	1.1E+9
Dibromomethane	74953	NA	1,600	NA	1.9E+6	ID	ID	ID	ID	ID	2.0E+8 (C)	2.0E+8
1,2-Dichlorobenzene	95501	NA	13,000	340	2.1E+5 (C)	2.7E+5 (C)	3.9E+7	3.9E+7	5.2E+7	1.0E+11	2.1E+5 (C)	2.1E+5
1,3-Dichlorobenzene	541731	NA	17,000	1,100	2.0E+5 (C)	ID	ID	ID	ID	ID	2.0E+5 (C)	2.0E+5
1,4-Dichlorobenzene	108467	NA	1,600	280	60,000	19,000	77,000	77,000	1.1E+5	4.5E+8	1.1E+5	NA
3,3'-Dichlorobenzidine	91841	NA	2,000 (M)	2,000 (M,X)	6,900	NLV	NLV	NLV	NLV	6.5E+6	5,700	NA
Dichlorodifluoromethane	75718	NA	83,000	ID	1.0E+6 (C)	9.0E+5	5.3E+7	5.3E+7	1.4E+9	3.3E+12	1.0E+6 (C)	1.0E+6
1,1-Dichloroethane (I)	75343	NA	18,000	IP	7.9E+5 (C)	7.9E+5 (C)	3.0E+7	9.0E+7	2.3E+8	6.4E+11	7.9E+5 (C)	7.9E+5
1,2-Dichloroethane (I)	107082	NA	100	7,200 (X)	2.2E+5	2,100	6,100	11,000	28,000	1.2E+8	28,000	1.2E+8
1,1-Dichloroethylene (I)	75354	NA	140	1,300 (X)	1.8E+5	62	1,100	5,300	13,000	6.2E+7	99,000	5.9E+5
cis-1,2-Dichloroethylene (I)	158592	NA	1,400	ID	6.4E+5 (C)	6.4E+5 (C)	4.0E+7	9.9E+7	2.2E+8	5.3E+11	6.4E+5 (C)	6.4E+5
trans-1,2-Dichloroethylene	156605	NA	2,000	ID	1.4E+6 (C)	1.4E+6 (C)	3.1E+7	9.4E+7	2.2E+8	5.3E+11	1.4E+6 (C)	1.4E+6
2,6-Dichloro-4-nitroaniline	98309	NA	44,000	NA	1.4E+5	NLV	NLV	NLV	NLV	ID	1.3E+8	NA
2,4-Dichlorophenol	120832	NA	2,600	680	1.5E+6	NLV	NLV	NLV	NLV	5.1E+9	4.2E+6	1.0E+7
2,4-Dichlorophenoxyacetic acid	94757	NA	1,400	4,400	2.2E+6	NLV	NLV	NLV	NLV	6.7E+9	4.2E+6	NA
1,2-Dichloropropane (I)	78876	NA	100	5,800 (X)	1.5E+5	4,000	25,000	50,000	1.1E+5	2.7E+8	38,000	6.6E+5
1,3-Dichloropropane (I,J)	542756	NA	94	NA	52,000	79	1,400	5,200	12,000	8.0E+7	14,000	6.2E+5
Dichloroacetic acid	62737	NA	58	NA	2.2E+5	NLV	NLV	NLV	NLV	3.3E+7	34,000	2.6E+6

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			#11 Drinking Water Protection Criteria	#12 Groundwater Surface Water Interface Protection Criteria	#13 Groundwater Contact Protection Criteria		#15 Infinite Source Volatile Soil Inhalation Criteria (V9IC)	#16 Finite V9IC for 8 Meter Source Thickness	#17 Finite V9IC for 2 Meter Source Thickness	#18 Particulate Soil Inhalation Criteria	#19 Direct Contact Criteria	#20 Soil Saturation Concentration Screening Levels
Dicyclohexyl phthalate	84617	NA	ID	NA	ID	ID	ID	ID	ID	ID	ID	NA
Dieldrin	60571	NA	NLL	NLL	NLL	1.4E+5	19,000	19,000	19,000	8.8E+5	620	NA
Diethyl ether (I)	60297	NA	100 (M)	ID	7.4E+8 (C)	7.4E+8 (C)	8.6E+7	1.5E+8	3.4E+8	8.0E+11	7.4E+8 (C)	7.4E+8
Diethyl phthalate	84682	NA	1.1E+5	NA	7.4E+5 (C)	NLV	NLV	NLV	NLV	3.3E+9	7.4E+5 (C)	7.4E+5
Diethylene glycol monobutyl ether	112345	NA	1,800	NA	8.8E+7	NLV	NLV	NLV	NLV	1.3E+9	5.1E+8	1.1E+8
Diisopropylamine (I)	108189	NA	110	NA	3.8E+5	ID	ID	ID	ID	ID	85,000	6.7E+8
Dimethyl phthalate	131113	NA	7.8E+5 (C)	NA	7.9E+5 (C)	NLV	NLV	NLV	NLV	3.3E+9	7.9E+5 (C)	7.3E+5
N,N-Dimethylacetamide	127195	NA	3,600	82,000 (X)	1.1E+8 (C)	NLV	NLV	NLV	NLV	ID	2.7E+8	1.1E+8
N,N-Dimethyl aniline	121697	NA	320	NA	3.2E+5	1.7E+5	ID	ID	ID	2.8E+8	2.4E+5	8.0E+5
Dichloromethane (I)	88122	NA	14,000	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	2.0E+9	1.1E+7	1.1E+8
2,4-Dimethylphenol	105679	NA	7,400	330 (M)	3.0E+5	NLV	NLV	NLV	NLV	4.7E+9	2.5E+5	NA
2,6-Dimethylphenol	576261	NA	330 (M)	NA	1.1E+5	NLV	NLV	NLV	NLV	ID	2.8E+5	NA
3,4-Dimethylphenol	95658	NA	330 (M)	NA	3.0E+5	NLV	NLV	NLV	NLV	ID	5.9E+5	NA
Dimethyl siloxide	67685	NA	4.4E+6	3.8E+8	1.8E+7 (C)	NLV	NLV	NLV	NLV	ID	1.8E+7 (C)	1.8E+7
2,4-Dinitrochlorobenzene	121142	NA	15,000	NA	3.8E+8	NLV	NLV	NLV	NLV	1.8E+7	15,000	NA
Dinoseb	88857	NA	290	NA	1.4E+5 (C)	ID	ID	ID	ID	ID	1.4E+5 (C)	1.4E+5
1,4-Dioxane (I)	123911	NA	1,500	56,000 (X)	3.4E+7	NLV	NLV	NLV	NLV	5.7E+8	2.3E+5	9.7E+7
Diquat	85007	NA	400	NA	1.4E+7	NLV	NLV	NLV	NLV	ID	9.3E+5	NA
Diuron	330541	NA	620	NA	7.5E+5	NLV	NLV	NLV	NLV	ID	1.8E+8	NA
Endosulfan (J)	115297	NA	NLL	NLL	NLL	ID	ID	ID	ID	ID	97,000	NA
Endosulfan	145733	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	2.3E+9	7.2E+8	NA
Endrin	72208	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	72,000	NA
Epichlorohydrin (I)	106898	NA	1,700	NA	7.3E+8 (C)	64,000	31,000	31,000	35,000	6.7E+7	2.8E+5	7.3E+8
Ethanol (I)	64175	NA	3.8E+7	IP	1.1E+8 (C)	NLV	NLV	NLV	NLV	1.3E+12	1.1E+8 (C)	1.1E+8
Ethyl acetate (I)	141786	NA	1.3E+5	NA	7.5E+8 (C)	7.5E+8 (C)	4.9E+7	4.9E+7	9.8E+7	2.1E+11	7.5E+8 (C)	7.5E+8
Ethylbenzene (I)	100414	NA	1,500	360	1.4E+5 (C)	1.4E+5 (C)	9.5E+8	1.4E+7	3.0E+7	6.7E+10	1.4E+5 (C)	1.4E+5
Ethylene dibromide	108934	NA	10 (M)	NA	320	670	1,700	1,700	3,300	1.4E+7	30	8.9E+5
Ethylene glycol	107211	NA	3.0E+5	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	8.3E+10	1.1E+8 (C)	1.1E+8
Ethylene glycol monobutyl ether	111782	NA	9,900	NA	2.1E+7 (C)	14,000	3.3E+5	2.7E+8	6.6E+8	1.8E+10	2.0E+8	4.1E+7
Fluoranthene	208440	NA	7.2E+5	5,500	7.2E+5	1.0E+9 (D)	7.4E+8	7.4E+8	7.4E+8	9.3E+9	5.1E+7	NA

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Chemical	Chemical Abstract Service Number	Statewide Default Background Levels	Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSI(C))	Finite VSI(C) for 5 Meter Source Thickness	Finite VSI(C) for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Fluorene	88737	NA	3.9E+5	2,400	8.9E+5	5.8E+8	1.3E+8	1.3E+8	1.3E+8	9.3E+8	5.1E+7	NA
Fluorine (soluble fluoride) (B)	7782414	NA	40,000	NA	2.6E+8	NLV	NLV	NLV	NLV	ID	2.5E+7	NA
Formaldehyde	50000	NA	26,000	2,400	6.0E+7 (C)	12,000	13,000	23,000	52,000	2.4E+8	2.0E+7	6.0E+7
Formic acid (I,U)	64186	NA	9.0E+5 (M)	ID	1.1E+8 (C)	1.5E+8	9.0E+5 (M)	9.0E+5 (M)	9.0E+5 (M)	1.3E+8	1.1E+8 (C)	1.1E+8
1-Formylpiperidine	2591868	NA	1,600	NA	ID	ID	ID	ID	ID	ID	1.2E+8	1.0E+7
Gentian violet	548528	NA	170	NA	9.8E+5	NLV	NLV	NLV	NLV	ID	99,000	NA
Glyphosate	1071836	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	4.2E+7	NA
Heptachlor epoxide	78448	NA	NLL	NLL	NLL	3.5E+5	61,000	61,000	61,000	2.4E+8	2,200	NA
n-Heptane (I)	1024573	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	1.2E+8	1,100	NA
Hexachlorobenzene	142825	NA	2.4E+5 (C)	NA	2.4E+5 (C)	2.4E+5 (C)	ID	ID	ID	2.3E+11	2.4E+5 (C)	2.4E+5
Hexachlorobenzene (C-56)	87821	NA	5,400	ID	1.0E+7	ID	ID	ID	ID	ID	1.2E+8	NA
Hexachlorobenzene (C-66)	118741	NA	1,800	ID	3,500	41,000	13,000	16,000	16,000	6.8E+8	6,200	NA
Hexachlorobenzene (C-46)	87883	NA	19,000	ID	3.4E+5	1.3E+5	1.3E+5	1.3E+5	1.3E+5	1.4E+8	1.3E+8	3.5E+8
alpha-Hexachlorocyclohexane	319848	NA	25	NA	2,800	3E+5	25,000	25,000	25,000	1.7E+8	1,800	NA
beta-Hexachlorocyclohexane	319857	NA	85	NA	10,000	NLV	NLV	NLV	NLV	5.9E+8	6,500	NA
Hexachlorocyclopentadiene (C-56)	77474	NA	38,000	ID	81,000 (C)	ID	ID	ID	ID	ID	81,000 (C)	81,000
Hexachloroethane	87721	NA	17,000	1,800 (X)	4.1E+5	1.8E+5	1.2E+8	1.2E+8	1.2E+8	2.3E+8	1.8E+8	NA
n-Hexane (I)	110543	NA	44,000 (C)	NA	44,000 (C)	44,000 (C)	ID	ID	ID	1.3E+10	44,000 (C)	44,000
2-Hexanone (I)	591788	NA	20,000	NA	2.5E+8 (C)	9.8E+5	ID	ID	ID	2.7E+8	2.6E+8 (C)	2.6E+8
Indeno(1,2,3-cd)pyrene (Q)	193395	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	14,000	NA
Iron (B)	7439898	1.2E+7	6,000	NA	ID	NLV	NLV	NLV	NLV	ID	ID	NA
Isobutyl alcohol (I)	76831	NA	48,000	NA	8.9E+8 (C)	8.9E+8 (C)	7.9E+7	7.9E+7	7.9E+7	1.0E+11	8.9E+8 (C)	8.9E+8
Isophorone	78591	NA	18,000	11,000 (X)	2.4E+8 (C)	NLV	NLV	NLV	NLV	1.9E+10	2.4E+8 (C)	2.4E+8
Isopropyl alcohol (I)	67630	NA	9,400	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	1.5E+10	7.0E+8	1.1E+8
Isopropyl benzene (I)	98828	NA	90,000	ID	3.9E+5 (C)	3.9E+5 (C)	1.7E+8	ID	ID	5.8E+8	3.9E+5 (C)	3.9E+5
Lead (B)	7439821	21,000	1,000 (M)	(G,M,X)	ID	NLV	NLV	NLV	NLV	1.0E+8	4.0E+6	NA
Lindane	58899	NA	20 (M)	20 (M)	3,200	ID	ID	ID	ID	ID	7,800	NA
Lithium (B)	7439932	9,800	3,400	500	1.2E+8	NLV	NLV	NLV	NLV	ID	1.9E+7	NA
Magnesium (B)	7439954	NA	6.4E+6	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	6.7E+9	1.0E+9 (D)	NA

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			#11	#12	#13		#14	#15	#16	#17	#18	#19
		Statewide Default Background Levels	Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSIC)	Finite VSIC for 5 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Manganese (B)	7439965	4.4E+5	2,000 (M)	(G,X)	2.0E+8	NLV	NLV	NLV	NLV	3.3E+8	2.0E+7	NA
Mercury (Inorganic) (B)	7439976	130	1,700	170	47,000	NLV	NLV	NLV	NLV	ID	1.3E+5	NA
Methane	74828	NA	ID	ID	ID	(K)	ID	ID	ID	ID	ID	ID
Methanol (I)	67561	NA	74,000	ID	3.1E+8 (C)	6.0E+5	3.1E+7	4.4E+7	9.6E+7	2.2E+11	3.1E+8 (C)	3.1E+8
Methoxychlor	72435	NA	1.3E+5	NA	1.4E+5	ID	ID	ID	ID	ID	2.1E+8	NA
2-Methoxyethanol (I)	109864	NA	150	ID	1.8E+7	NLV	NLV	NLV	NLV	1.3E+9	1.1E+5	1.1E+8
2-Methyl-4-chlorophenoxyacetic acid	94746	NA	390	NA	4.3E+8	NLV	NLV	NLV	NLV	ID	4.2E+5	NA
2-Ethyl-3-dinitrophenol	534521	NA	1,700 (M)	NA	1.2E+5	NLV	NLV	NLV	NLV	ID	1.5E+6	NA
Methyl parathion	298000	NA	44	NA	66,000	NLV	NLV	NLV	NLV	ID	1.1E+5	NA
4-Ethyl-2-pentanone (MIBK) (I)	108101	NA	36,000	ID	2.7E+8 (C)	2.7E+8 (C)	4.5E+7	4.5E+7	6.7E+7	1.4E+11	2.7E+8 (C)	2.7E+8
M-tyl-tert-butyl ether (MTBE)	1634044	NA	800	15,000 (X)	6.0E+8 (C)	6.0E+8 (C)	2.8E+7	3.9E+7	6.7E+7	2.0E+11	8.5E+5	6.0E+8
N-Ethyl-pyrrolidone (I)	109024	NA	400	NA	3.2E+7	NLV	NLV	NLV	NLV	ID	3.0E+5	1.1E+8
Methylcyclopentane (I)	96377	NA	ID	NA	ID	ID	ID	ID	ID	ID	ID	3.4E+5
4,4'-Methylene-bis-2-chloroaniline (MBOCA)	101144	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	6.4E+7	10,000	NA
Methylene chloride	75092	NA	100	19,000 (X)	2.2E+8	45,000	3.1E+5	5.9E+5	1.4E+8	6.6E+9	3.4E+5	2.3E+8
2-Methylnaphthalene	91578	NA	57,000	ID	7.1E+6	ID	ID	ID	ID	ID	1.5E+7	NA
2-Methylphenol	95487	NA	7,400	1,600	1.4E+7	NLV	NLV	NLV	NLV	6.7E+9	5.5E+6	NA
3-Methylphenol	108394	NA	7,400	NA	4.5E+8 (C)	NLV	NLV	NLV	NLV	ID	4.5E+8 (C)	4.5E+8
4-Methylphenol	108445	NA	740	ID	1.5E+8	NLV	NLV	NLV	NLV	ID	2.1E+6	NA
Melolachlor	51218452	NA	3,200	NA	4.4E+5 (C)	NLV	NLV	NLV	NLV	ID	4.4E+5 (C)	4.4E+5
Molybdenum (B)	7439987	NA	740	16,000 (X)	2.2E+7	NLV	NLV	NLV	NLV	ID	2.1E+6	NA
Naphthalene	91203	NA	17,000	850	2.0E+8	4.2E+7	4.9E+7	4.9E+7	4.9E+7	3.3E+10	1.5E+7	NA
Nickel (B)	7440020	20,000	1.0E+5	(G)	1.0E+8 (D)	NLV	NLV	NLV	NLV	1.3E+7	3.2E+7	NA
Nitrate (B,N)	14787558	NA	2.0E+5 (N)	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	ID	ID	NA
Nitrite (B,N)	14787650	NA	20,000 (N)	NA	4.2E+8	NLV	NLV	NLV	NLV	ID	ID	NA
Nitrobenzene (I)	98953	NA	330 (M)	3,600 (X)	1.9E+5	4.9E+6 (C)	3.9E+6	3.9E+6	3.9E+6	3.3E+9	51,000	4.9E+5
2-Nitrophenol	98755	NA	400	ID	1.4E+8	NLV	NLV	NLV	NLV	ID	1.2E+6	NA
n-Nitroso-di-n-propylamine	621647	NA	330 (M)	NA	4,400	NLV	NLV	NLV	NLV	1.6E+8	370	1.5E+8
N-Nitrosodiphenylamine	96306	NA	3,400	NA	6.0E+5	NLV	NLV	NLV	NLV	ID	5.2E+5	NA
Oxamyl	23135220	NA	4,000	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	ID	1.6E+7	NA

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			#11	#12	#13		#15	#16	#17	#18	#19	#20
			Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (V8IC)	Finite VSIC for 6 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Oxo-hexyl acetate	88230357	NA	1,500	NA	ID	ID	ID	ID	ID	6.4E+9	1.1E+6	1.0E+7
Pendimethalin	40487421	NA	1.1E+6	NA	1.1E+6	NLV	NLV	NLV	NLV	ID	5.1E+7	NA
Pentachlorobenzene	608935	NA	29,000	NA	1.9E+5 (C)	ID	ID	ID	ID	ID	1.9E+5 (C)	1.9E+5
Pentachloronitrobenzene	82688	NA	37,000	NA	37,000	1.2E+5	2.3E+5	2.3E+5	2.3E+5	3.3E+8	3.2E+6	NA
Pentachlorophenol	87865	NA	3,200	(G,X)	2.7E+5	NLV	NLV	NLV	NLV	1.0E+8	6,100	NA
Pentane (I)	109660	NA	ID	NA	ID	2.4E+5 (C)	ID	ID	ID	1.2E+12	ID	2.4E+5
2-Pentene (I)	109882	NA	ID	NA	ID	ID	ID	ID	ID	ID	ID	2.2E+5
Phenyl acetate	85018	NA	12,000	2,300	4.5E+5	1.5E+7	1.3E+5	6.2E+5	6.2E+5	1.3E+8	1.5E+6	NA
Phenol	108952	NA	88,000	4,200	1.2E+7 (C)	NLV	NLV	NLV	NLV	4.0E+10	1.2E+7 (C)	1.2E+7
Phosphorus (total)	7723140	NA	1.3E+6	NA	ID	NLV	NLV	NLV	NLV	ID	1.0E+9 (D)	NA
Picloric acid	1918021	NA	10,000	NA	ID	NLV	NLV	NLV	NLV	ID	3.0E+7	NA
Picropic acid	110894	NA	84	NA	6.4E+5	NLV	NLV	NLV	NLV	ID	48,000	1.2E+8
Polybrominated biphenyls (J)	37324235	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	1,100	NA
Polychlorinated biphenyls (PCBs) (J,T)	1336363	NA	NLL	NLL	NLL	3.0E+8	3.4E+8	7.9E+6	7.9E+6	5.2E+8	(T)	NA
Prometon	1610180	NA	4,800	NA	4.9E+6	NLV	NLV	NLV	NLV	ID	9.3E+6	NA
Propachlor	1918187	NA	1,800	NA	8.4E+6	NLV	NLV	NLV	NLV	ID	5.8E+6	NA
Propazine	139402	NA	4,000	NA	1.7E+5	NLV	NLV	NLV	NLV	ID	1.1E+7	NA
Propionic acid (I)	79094	NA	3.8E+5	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	2.0E+10	1.1E+8 (C)	1.1E+8
Propyl alcohol (I)	71238	NA	28,000	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	4.8E+10	2.1E+7	1.1E+8
n-Propylbenzene (I)	103651	NA	1,600	NA	ID	ID	ID	ID	ID	1.3E+9	1.2E+6	1.0E+7
Propylene glycol	57556	NA	3.0E+6	NA	1.0E+7 (C)	NLV	NLV	NLV	NLV	4.0E+11	1.0E+7 (C)	1.0E+7
Pyrene	129000	NA	4.7E+5	ID	4.7E+5	1.0E+9 (D)	6.5E+8	6.5E+8	6.5E+8	6.7E+9	3.2E+7	NA
Pyridine (I)	110881	NA	330 (M)	NA	37,000 (C)	1,100	8,200	40,000	97,000	2.3E+8	37,000 (C)	37,000
Selenium (B)	7782492	410	4,000	400	8.8E+7	NLV	NLV	NLV	NLV	1.3E+8	2.1E+8	NA
Silver (B)	7440224	1,000	4,500	500 (M)	2.3E+8	NLV	NLV	NLV	NLV	6.7E+6	2.0E+6	NA
Silvex (2,4,5-TP)	93721	NA	3,700	NA	2.8E+6	NLV	NLV	NLV	NLV	ID	3.2E+6	NA
Simazine	122349	NA	80	NA	90,000	NLV	NLV	NLV	NLV	ID	2.2E+6	NA
Sodium (B)	7440235	NA	3.2E+6	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	ID	1.0E+9 (D)	NA
Strontium (B)	7440246	NA	92,000	15,000	1.0E+9 (D)	NLV	NLV	NLV	NLV	ID	2.7E+8	NA
Styrene (I)	100425	NA	2,700	2,200	85,000	2.4E+5	9.4E+5	9.4E+5	1.4E+6	5.3E+8	85,000	5.2E+5

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			#11	#12	#13		#15	#16	#17	#18	#19	#20
Sulfate	14808798	NA	5.0E+6	NA	ID	Soil Volatilization to Indoor Air Inhalation Criteria	NLV	NLV	NLV	ID	ID	NA
Tetralin	34014181	NA	10,000	NA	5.0E+7	NLV	NLV	NLV	NLV	ID	3.0E+7	NA
2,3,7,8-Tetrabromodibenzo-p-dioxin (O)	50585418	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	(O)	(O)	NA
1,2,4,5-Tetrachlorobenzene	95943	NA	1.5E+6	IP	1.5E+6	ID	ID	ID	ID	ID	1.4E+8	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin (O)	1746016	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	71	0.09	NA
1,1,1,2-Tetrachloroethane	630206	NA	660	NA	2.2E+5	12,000	57,000	65,000	1.1E+5	4.2E+8	99,000	9.8E+5
1,1,2,2-Tetrachloroethane	79345	NA	88	1,800 (X)	4,000	4,300	10,000	10,000	11,000	5.4E+7	13,000	8.7E+5
1,2,3,4-Tetrachlorobenzene	127184	NA	100	800 (X)	88,000 (C)	1,700	1.8E+5	4.8E+5	1.1E+6	5.4E+9	50,000	83,000
1,2,3,4-Tetrachlorobenzene (I)	109899	NA	4,800	2.2E+5 (X)	7.9E+7	1.3E+8	ID	ID	ID	3.9E+11	3.8E+8	1.2E+8
1,2,3,4-Tetrachlorobenzene (I)	7440280	NA	2,300	4,200 (X)	1.5E+7	NLV	NLV	NLV	NLV	ID	28,000	NA
1,2,3,4-Tetrachlorobenzene (I)	108883	NA	16,000	2,800	2.5E+5 (C)	2.5E+5 (C)	2.8E+8	3.0E+7	3.0E+7	2.7E+10	2.5E+5 (C)	2.5E+5
1,2,3,4-Tetrachlorobenzene (I)	108490	NA	660 (M)	NA	1.3E+5	NLV	NLV	NLV	NLV	1.0E+8	52,000	1.2E+8
1,2,3,4-Tetrachlorobenzene (I)	8001352	NA	2,800	660	11,000	NLV	NLV	NLV	NLV	9.7E+6	2,300	NA
1,2,3,4-Tetrachlorobenzene (I)	2303175	NA	95,000	NA	2.5E+5 (C)	ID	ID	ID	ID	ID	2.5E+5 (C)	2.5E+5
1,2,3,4-Tetrachlorobenzene (I)	102829	NA	7,800	ID	5.3E+5	5.8E+5	2.8E+7	2.8E+7	2.8E+7	4.7E+8	1.5E+5	3.7E+8
1,2,3,4-Tetrachlorobenzene (I)	120821	NA	4,200	1,800	8.9E+5	1.1E+8 (C)	2.8E+7	2.8E+7	2.8E+7	2.5E+10	1.1E+8 (C)	1.1E+8
1,1,1,1-Tetrachloroethane	71556	NA	4,000	4,000	4.8E+5 (C)	2.5E+5	3.8E+8	1.4E+7	3.0E+7	6.7E+10	4.8E+5 (C)	4.8E+5
1,1,2,2-Tetrachloroethane	78005	NA	100	6,600 (X)	1.9E+5	4,600	17,000	19,000	42,000	1.9E+8	45,000	9.2E+5
1,1,2,2-Tetrachloroethane	78016	NA	100	4,000 (X)	2.2E+5	7,000	78,000	1.5E+5	3.9E+5	1.8E+9	1.8E+5	5.0E+5
1,1,2,2-Tetrachloroethane	75994	NA	52,000	NA	5.8E+5 (C)	5.8E+5 (C)	9.2E+7	1.2E+11	1.2E+11	3.9E+12	5.8E+5 (C)	5.8E+5
2,4,5-Trichlorophenol	95954	NA	1.6E+5	NA	2.9E+7	NLV	NLV	NLV	NLV	2.3E+10	4.2E+7	NA
2,4,6-Trichlorophenol	88062	NA	11,000	700	7.9E+5	NLV	NLV	NLV	NLV	1.0E+9	9.0E+5	NA
1,2,3-Trichloropropane	96184	NA	840	NA	8.3E+5 (C)	ID	ID	ID	ID	ID	8.3E+5 (C)	8.3E+5
1,1,2-Trichloro-1,2,2-trifluoroethane	76131	NA	5.6E+5 (C)	NA	5.9E+5 (C)	5.8E+5 (C)	1.8E+8	8.8E+8	2.1E+9	5.1E+12	5.6E+5 (C)	5.6E+5
Trifluoromethane	102716	NA	74,000	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	3.3E+9	5.6E+7	1.1E+8
3-Trifluoromethyl-4-nitrophenol	88302	NA	1.1E+5	NA	1.1E+8	NLV	NLV	NLV	NLV	ID	2.8E+8	NA
Trifluoromethane	1592088	NA	5.7E+5	NA	7.9E+8	ID	ID	ID	ID	ID	1.3E+6	NA
2,2,4,4-Tetramethylpentane	540841	NA	ID	NA	ID	ID	ID	ID	ID	ID	ID	19,000
2,2,4,4-Trimethyl-2-pentene (I)	107404	NA	ID	NA	ID	ID	ID	ID	ID	ID	ID	56,000
1,2,4-Trimethylbenzene (I)	95636	NA	1,100	ID	1.1E+5 (C)	1.1E+5 (C)	2.1E+7	5.0E+8	5.0E+8	8.2E+10	1.1E+5 (C)	1.1E+5

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			#11 Drinking Water Protection Criteria	#12 Groundwater Surface Water Interface Protection Criteria	#13 Groundwater Contact Protection Criteria		#15 Infinite Source Volatile Soil Inhalation Criteria (V8IC)	#16 Finite V8IC for 5 Meter Source Thickness	#17 Finite V8IC for 2 Meter Source Thickness	#18 Particulate Soil Inhalation Criteria	#19 Direct Contact Criteria	#20 Soil Saturation Concentration Screening Levels
1,3,5-Trimethylbenzene (I)	108878	NA	1,800	ID	94,000 (C)	94,000 (C)	1.8E+7	3.8E+8	3.8E+8	8.2E+10	94,000 (C)	94,000
Triphenyl phosphate	115866	NA	1.1E+5 (C)	NA	1.1E+5 (C)	ID	ID	ID	ID	ID	1.1E+5 (C)	1.1E+5
Iris(2,3-Dibromopropyl)phosphate	128727	NA	43	NA	27,000 (C)	27,000 (C)	18,000	18,000	18,000	5.9E+8	5,500	27,000
Urea	57136	NA	ID (M)	NA	ID	NLV	NLV	NLV	NLV	ID	ID	NA
Vanadium (B)	7440822	NA	1.0E+6	240	1.0E+9 (D)	NLV	NLV	NLV	NLV	ID	3.7E+8	NA
Vinyl acetate (I)	108054	NA	13,000	NA	2.4E+5 (C)	2.4E+5 (C)	1.7E+6	2.6E+6	5.8E+6	1.3E+10	2.4E+8 (C)	2.4E+6
Vinyl chloride	75014	NA	40	300	5,900	5,900	440	3,100	7,600	3.7E+7	1,200	4.9E+5
White phosphorus (R)	12185103	NA	100 (M)	NA	94,000	NLV	NLV	NLV	NLV	ID	8,300	NA
Xylene (I)	1330207	NA	5,800	700	1.5E+5 (C)	1.5E+5 (C)	4.8E+7	6.1E+7	1.3E+8	2.9E+11	1.5E+5 (C)	1.5E+5
Zinc (B)	7440866	47,000	2.4E+6	(G)	1.0E+6 (G)	NLV	NLV	NLV	NLV	ID	1.4E+8	NA

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Developed under the authority of the

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994 PA 451, AS AMENDED

Industrial and Commercial II, III and IV soil criteria were calculated using currently available toxicological and chemical-specific data. These criteria may change as new data become available. They are not necessarily final cleanup standards. Current criteria are available on the ERD Homepage at www.deq.state.mi.us/erd. Scientific notation is represented by E+ or E- a value, for example 2×10^6 is reported as 2.0E+6. Please refer to Operational Memorandum #6 for analytical methods and method detection limits. All values are expressed in units of parts per billion (ug/Kg). Changes made since the last revision of the tables (January 1999) are shaded.

Chemical	Chemical Abstract Service Number	#10 Statewide Default Background Levels	Groundwater Protection				#22 Indoor Air	Ambient Air (Y)				Direct Contact			
			#21		#12	#13		#23	#24	#25	#26	#27	#28	#29	#30
			Residential Drinking Water Protection Criteria	Industrial And Commercial Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria (V5IC)	Infinite Source Volatile Soil Inhalation Criteria (V5IC)	Finite V5IC Source Thickness	Finite V5IC Source Thickness	Particulate Soil Inhalation Criteria	Industrial and Commercial II	Commercial III	Commercial IV	Soil Saturation Concentration Screening Levels
Acenaphthene	53329	NA	3.0E+5	8.7E+5	4,300	9.3E+5	9.7E+7	9.7E+7	9.7E+7	9.7E+7	6.2E+9	8.1E+8	1.0E+9 (D)	1.0E+9 (D)	NA
Acenaphthylene	208968	NA	2,900	8,500	ID	4.1E+5	2.7E+6	2.7E+6	2.7E+6	2.7E+6	1.0E+9	1.8E+7	2.3E+7	5.4E+7	NA
Acetaldehyde (I)	75070	NA	19,000	54,000	NA	1.1E+8 (C)	2.1E+5	2.1E+5	2.1E+5	2.9E+5	2.8E+8	9.7E+7	1.1E+8 (C)	1.1E+8 (C)	1.1E+8
Acetic acid (I)	64187	NA	9.0E+5 (M)	9.0E+5 (M)	9.0E+5 (M)	6.5E+8 (C)	NLV	NLV	NLV	NLV	7.4E+9	4.2E+8	5.9E+8	6.5E+8 (C)	6.5E+8
Acetone (I)	67841	NA	15,000	42,000	34,000	1.1E+8 (C)	1.9E+8	1.6E+8	2.0E+6	2.0E+6	1.7E+11	7.4E+7	1.0E+8	1.1E+8 (C)	1.1E+8
Acetonitrile (I)	75058	NA	2,800	8,000	NA	2.2E+7 (C)	1.3E+7	1.1E+7	1.2E+7	1.2E+7	1.0E+10	1.4E+7	2.0E+7	2.2E+7 (C)	2.2E+7
Acrolein (I)	107028	NA	2,400	6,600	NA	2.3E+7 (C)	3.1E+7	3.70E+7	630	630	6.9E+5	1.2E+7	1.7E+7	2.3E+7 (C)	2.3E+7
Acrylamide	78061	NA	10	16	NA	1.7E+5	NLV	NLV	NLV	NLV	3.0E+8	33,000	47,000	1.1E+5	NA
Acrylic acid (I)	79107	NA	78,000	2.2E+5	NA	1.3E+8 (C)	2.8E+5	2.7E+5	2.7E+5	2.7E+5	2.9E+7	1.3E+8 (C)	1.3E+8 (C)	1.3E+8 (C)	1.3E+8
Acrylonitrile (I)	107131	NA	32	130	98 (X)	1.6E+5	17,000	17,000	31,000	31,000	5.8E+7	46,000	64,000	1.3E+5	6.3E+6
Alachlor	15872608	NA	52	52	280 (X)	ID	NLV	NLV	NLV	NLV	ID	1.9E+6	2.6E+6	6.2E+6	NA
Adicarb	116063	NA	60	60	NA	2.4E+6	NLV	NLV	NLV	NLV	ID	4.5E+6	6.3E+6	1.5E+7	NA
Adicarb sulfoxide	1846873	NA	80	80	NA	6.4E+7	NLV	NLV	NLV	NLV	ID	5.9E+6	6.2E+6	1.9E+7	NA
Adicarb sulfone	1846884	NA	50 (M)	70	NA	5.2E+7	NLV	NLV	NLV	NLV	ID	5.0E+6	7.0E+6	1.6E+7	NA
Aldrin	309002	NA	NLL	NLL	NLL	NLL	2.0E+5	2.0E+5	2.0E+5	2.0E+5	8.0E+5	8,800	12,000	29,000	NA
Aluminum (B)	7429805	6.9E+6	1,000	1,000	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	ID	3.0E+8	3.0E+8	3.0E+8	NA
Ammonia	7884417	NA	ID (N)	ID (N)	(AC)	ID	ID	ID	ID	ID	2.9E+9	ID	ID	ID	1.0E+7
Aniline (I)	82533	NA	3,000	12,000	IP	4.5E+6 (C)	NLV	NLV	NLV	NLV	2.9E+7	4.5E+6 (C)	4.5E+6 (C)	4.5E+6 (C)	4.5E+6
Anthracene	120127	NA	41,000	41,000	ID	41,000	1.6E+9	1.6E+9	1.6E+9	1.6E+9	2.9E+10	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA
Anilmon (B)	7440360	NA	4,300	4,300	ID	5.4E+7	NLV	NLV	NLV	NLV	1.5E+8	1.6E+8	2.2E+8	5.2E+8	NA
Arsenic (B)	7440382	5,800	23,000	23,000	70,000 (X)	2.2E+6	NLV	NLV	NLV	NLV	9.1E+5	1.0E+5	1.4E+5	3.3E+5	NA
Asbestos	1332214	NA	ID	ID	NA	ID	NLV	NLV	NLV	NLV	1.0E+7 (M)	2.4E+8	3.4E+8	1.0E+9 (D)	ID
Atrazine	1912249	NA	60	60	150 (X)	32,000	NLV	NLV	NLV	NLV	ID	6.8E+5	9.5E+5	2.3E+6	NA

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			#21		#12	#13		#23	#24	#25	#26	#27	#28	#29	#30
			Residential Drinking Water Protection Criteria	Industrial And Commercial Drinking Water Protection Criteria											
Azobenzene	103333	NA	1,400	5,900	NA	78,000	5.9E+5	ID	ID	1.3E+8	1.4E+8	1.9E+8	4.5E+8	NA	
Barium (B)	7440383	75,000	1.3E+6	1.3E+8	1.3E+5	1.0E+9 (D)	NLV	NLV	NLV	1.5E+8	3.2E+8	4.4E+8	1.0E+9 (D)	NA	
Benzene (I)	71432	NA	100	100	4,000 (X)	1.8E+5	8,400	45,000	99,000	4.7E+8	4.0E+5 (C)	4.0E+5 (C)	4.0E+5 (C)	4.0E+5	
Benzidine	92875	NA	1,000 (M)	1,000 (M)	ID	1,000 (M)	NLV	NLV	NLV	59,000	1,000 (M)	1,000 (M)	2,100	NA	
Benzo(a)anthracene (Q)	56553	NA	NLL	NLL	NLL	NLL	NLV	ID	ID	ID	2.1E+5	2.9E+5	6.8E+5	NA	
Benzo(b)fluoranthene (Q)	205992	NA	NLL	NLL	NLL	NLL	ID	ID	ID	ID	2.1E+5	2.9E+5	6.8E+5	NA	
Benzo(k)fluoranthene (Q)	207089	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	ID	2.1E+5	2.9E+5	6.8E+5	NA	
Benz(g,h,i)perylene	191242	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	3.5E+8	1.9E+7	2.3E+7	5.4E+7	NA	
Benzo(a)pyrene (C)	50328	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	1.9E+8	21,000	29,000	68,000	NA	
Benzocyclopentadiene	65850	NA	6.4E+5	1.8E+6	NA	7.0E+7	NLV	NLV	NLV	ID	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA	
Benzyl alcohol	100516	NA	2.0E+5	5.8E+5	NA	5.8E+6 (C)	NLV	NLV	NLV	1.5E+11	5.8E+6 (C)	5.8E+6 (C)	5.8E+6 (C)	5.8E+6	
Benzyl chloride	100447	NA	100	400	NA	40,000	33,000	45,000	48,000	7.8E+7	1.9E+5	2.0E+5	2.3E+5 (C)	2.3E+5	
Beryllium (B)	7440417	NA	51,000	51,000	(G)	1.0E+9	NLV	NLV	NLV	1.6E+6	2.3E+7	3.2E+7	7.4E+7	NA	
bis(2-chloroethoxy)amine	112285	NA	ID	ID	NA	ID	NLV	NLV	NLV	ID	ID	ID	ID	2.7E+6	
bis(2-chloroethyl)ether (I)	111444	NA	330 (M)	330 (M)	NA	42,000	44,000	13,000	13,000	1.2E+7	23,000	32,000	63,000	2.2E+6	
bis(2-ethylhexyl)phthalate	117817	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	8.9E+8	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7	
Boron (B)	7440428	NA	10,000	10,000	36,000	2.8E+8	NLV	NLV	NLV	ID	2.7E+8	2.7E+8	2.1E+8	NA	
Bromobenzene (I)	108881	NA	530	1,600	NA	3.0E+5	5.8E+5	5.7E+5	5.4E+5	2.4E+8	7.8E+5 (C)	7.8E+5 (C)	7.8E+5 (C)	7.8E+5	
Bromodichloromethane	75274	NA	2,000 (W)	2,000 (W)	ID	2.2E+5	6,400	31,000	31,000	1.1E+8	4.0E+5	5.8E+5	1.1E+8	1.5E+8	
Bromoform	75252	NA	2,000 (W)	2,000 (W)	NA	8.7E+5 (C)	7.7E+5	3.1E+8	3.1E+8	3.8E+9	8.7E+5 (C)	8.7E+5 (C)	8.7E+5 (C)	8.7E+5	
Bromomethane	74839	NA	200	580	700	1.3E+6	1,800	13,000	57,000	1.4E+5	1.0E+8	1.5E+8	2.2E+8	2.2E+8	
n-Butanol (I)	71363	NA	19,000	54,000	NA	8.7E+6 (C)	NLV	NLV	NLV	1.0E+10	8.7E+6 (C)	8.7E+6 (C)	8.7E+6 (C)	8.7E+6	
2-Butanone (MEK) (I)	78933	NA	2.8E+5	7.6E+5	44,000	2.7E+7 (C)	2.7E+7 (C)	3.8E+7	3.5E+7	2.9E+10	2.7E+7 (C)	2.7E+7 (C)	2.7E+7 (C)	2.7E+7	
n-Butyl acetate (I)	123884	NA	11,000	32,000	NA	1.1E+6 (C)	1.1E+6 (C)	ID	ID	2.8E+10	1.1E+6 (C)	1.1E+6 (C)	1.1E+6 (C)	1.1E+6	
n-Butyl alcohol (I)	75650	NA	78,000	2.2E+5	NA	1.1E+6 (C)	1.1E+6 (C)	ID	ID	8.8E+10	1.1E+6 (C)	1.1E+6 (C)	1.1E+6 (C)	1.1E+6	
Butyl benzyl phthalate	85687	NA	3.1E+5 (C)	3.1E+5 (C)	3.1E+5 (C)	3.1E+5 (C)	NLV	NLV	NLV	2.1E+10	3.1E+5 (C)	3.1E+5 (C)	3.1E+5 (C)	3.1E+5	
n-Butylbenzene	104518	NA	1,600	4,600	NA	ID	ID	ID	ID	ID	6.2E+6	1.0E+7 (C)	1.0E+7 (C)	1.0E+7	
sec-Butylbenzene	135988	NA	1,600	4,600	NA	ID	ID	ID	ID	ID	6.2E+6	1.0E+7 (C)	1.0E+7 (C)	1.0E+7	
tert-Butylbenzene (I)	98066	NA	1,600	4,600	NA	ID	ID	ID	ID	ID	6.2E+6	1.0E+7 (C)	1.0E+7 (C)	1.0E+7	

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Chemical	Chemical Abstract Service Number	#10 Statewide Default Background Levels	Groundwater Protection				Indoor Air	Ambient Air (Y)				Direct Contact						
			#21		#12 Groundwater Surface Water Interface Protection Criteria	#13 Groundwater Contact Protection Criteria		#22 Soil Volatilization to Indoor Air Inhalation Criteria	#23 Infinite Source Volatile Soil Inhalation Criteria (V51C)	#24 Finite V51C for 5 Meter Source Thickness	#25 Finite V51C for 2 Meter Source Thickness	#26 Particulate Soil Inhalation Criteria	#27 Industrial and Commercial II	#28 Commercial III	#29 Commercial IV	#30 Soil Saturation Concentration Screening Levels		
			Residential Drinking Water Protection Criteria	Industrial And Commercial Drinking Water Protection Criteria														
Cadmium (B)	7440439	1,200	6,000	6,000	(G,X)	2.5E+8	NLV	NLV	NLV	NLV	NLV	2.2E+8	4.0E+8	ID	Commercial III	Commercial IV	Soil Saturation Concentration Screening Levels	
Camphene (I)	79925	NA	ID	ID	NA	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	NA	
Caprolactam	105802	NA	1.2E+5	3.4E+5	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	NLV	2.9E+8	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA	
Carbaryl	63252	NA	14,000	40,000	NA	2.6E+8	ID	ID	ID	ID	ID	ID	4.3E+8	6.1E+8	1.0E+9 (D)	1.0E+9 (D)	NA	
Carbazole	86748	NA	800	19,000	330 (M)	3.2E+5	NLV	NLV	NLV	NLV	NLV	ID	1.2E+8	1.7E+8	3.5E+8	3.5E+8	NA	
Carbrotan	1563662	NA	800	800	NA	6.8E+8	NLV	NLV	NLV	NLV	NLV	ID	3.7E+8	5.2E+8	1.0E+7	1.0E+7	NA	
Carbon disulfide (I,R)	75150	NA	18,000	46,000	ID	3.2E+5 (C)	1.2E+5	1.9E+8	1.9E+8	8.0E+6	1.9E+7	2.1E+10	2.8E+5 (C)	2.9E+5 (C)	2.9E+5 (C)	2.9E+5 (C)	2.8E+5	
Carbon tetrachloride	56235	NA	100	100	900 (X)	32,000	32,000	12,000	12,000	34,000	79,000	1.7E+8	1.9E+5	2.7E+5	2.7E+5	3.9E+5 (C)	3.9E+5	
Chlordane (J)	57749	NA	NLL	NLL	NLL	NLL	5.9E+7	2.7E+8	2.7E+8	4.2E+6	4.2E+6	2.1E+7	1.7E+5	2.4E+5	2.4E+5	4.8E+5 (C)	4.8E+5	NA
Chloride (B)	16887006	NA	5.0E+6	5.0E+6	NA	ID	NLV	NLV	NLV	NLV	NLV	ID	5.0E+5 (F)	5.0E+5 (F)	5.0E+5 (F)	5.0E+5 (F)	5.0E+5	NA
Chlorobenzene (I)	108907	NA	2,000	2,000	940	2.6E+5 (C)	2.2E+5	2.2E+5	2.2E+5	1.1E+6	2.1E+6	2.1E+9	2.8E+5 (C)	2.9E+5 (C)	2.9E+5 (C)	2.9E+5 (C)	2.9E+5	2.8E+5
Chloroethane (I)	75003	NA	4,400	18,000	ID	9.7E+5 (C)	3.7E+5 (C)	2.9E+7	2.9E+7	1.2E+8	2.8E+8	2.9E+11	9.7E+5 (C)	9.7E+5 (C)	9.7E+5 (C)	9.7E+5 (C)	9.7E+5	9.7E+5
2-Chloroethyl vinyl ether	110758	NA	ID	ID	NA	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	1.9E+8
Chloroform	67683	NA	2,000 (W)	2,000 (W)	3,400 (X)	1.5E+8 (C)	36,000	1.5E+8	1.5E+8	3.4E+5	7.9E+5	1.6E+9	1.5E+8 (C)	1.5E+8 (C)	1.5E+8 (C)	1.5E+8 (C)	1.5E+8	1.5E+8
Chloromethane (I)	74873	NA	1,300	5,400	ID	1.1E+8 (C)	12,000	1.4E+5	1.4E+5	1.2E+8	2.9E+8	6.1E+9	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8	1.1E+8
4-Chloro-3-methylphenol	59507	NA	5,600	16,000	NA	2.4E+8	NLV	NLV	NLV	NLV	NLV	ID	1.5E+7	2.1E+7	2.1E+7	4.1E+7	4.1E+7	NA
beta-Chloronaphthalene	91587	NA	8.5E+5	1.8E+8	NA	2.3E+8	ID	ID	ID	ID	ID	ID	1.9E+8	2.8E+8	2.8E+8	5.2E+8	5.2E+8	NA
2-Chlorophenol	95578	NA	900	2,800	440	1.6E+8	ID	ID	ID	ID	ID	ID	4.6E+8	6.6E+8	6.6E+8	8.1E+8 (C)	8.1E+8	8.1E+8
o-Chlorotoluene (I)	95498	NA	3,300	9,300	NA	5.0E+5 (C)	5.0E+5 (C)	5.0E+5 (C)	5.0E+5 (C)	ID	ID	7.6E+10	5.0E+5 (C)	5.0E+5 (C)	5.0E+5 (C)	5.0E+5 (C)	5.0E+5	5.0E+5
Chlorpyrifos	2921882	NA	17,000	48,000	NA	8.4E+6	ID	ID	ID	ID	ID	5.9E+7	1.4E+7	1.9E+7	1.9E+7	4.5E+7	4.5E+7	NA
Chromium (III) (B,H)	18065831	18,000 (total)	1.0E+9 (D)	1.0E+9 (D)	(G,X)	1.0E+9 (D)	NLV	NLV	NLV	NLV	NLV	1.5E+8	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	1.0E+9	NA
Chromium (VI) (B,H)	18540298	18,000 (total)	30,000	30,000	3,300	3.0E+8	NLV	NLV	NLV	NLV	NLV	3.3E+5	2.2E+7	3.0E+7	3.0E+7	7.1E+7	7.1E+7	NA
Chrysene (Q)	218019	NA	NLL	NLL	NLL	NLL	ID	ID	ID	ID	ID	ID	2.1E+7	2.9E+7	2.9E+7	6.8E+7	6.8E+7	NA
Cobalt (B)	7440484	6,800	1,000	2,000	2,000	2.2E+7	NLV	NLV	NLV	NLV	NLV	5.9E+8	2.3E+7	3.2E+7	3.2E+7	7.4E+7	7.4E+7	NA
Copper (B)	7440508	32,000	1.8E+8	1.6E+8	(G)	1.0E+9 (D)	NLV	NLV	NLV	NLV	NLV	5.9E+7	1.7E+8	2.4E+8	2.4E+8	5.8E+8	5.8E+8	NA
Cyanazine	21725462	NA	500 (M)	500 (M)	1,100 (X)	34,000	NLV	NLV	NLV	NLV	NLV	ID	2.8E+5	3.6E+5	3.6E+5	8.5E+5	8.5E+5	NA
Cyanide (R)	57125	NA	4,000	4,000	400	2.5E+5 (P)	NLV	NLV	NLV	NLV	NLV	2.5E+5 (P)	2.5E+5 (P)	2.5E+5 (P)	2.5E+5 (P)	2.5E+5 (P)	2.5E+5 (P)	NA
Cyclohexanone (I)	108941	NA	5.2E+8	1.5E+7	NA	2.2E+8 (C)	32,000	ID	ID	ID	ID	2.9E+10	2.2E+8 (C)	2.2E+8 (C)	2.2E+8 (C)	2.2E+8 (C)	2.2E+8	2.2E+8
Dachai	1961321	NA	50,000	1.4E+5	NA	3.4E+5	NLV	NLV	NLV	NLV	NLV	ID	4.5E+7	6.3E+7	6.3E+7	1.5E+8	1.5E+8	NA

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Chemical	Chemical Abstract Service Number	#10	Groundwater Protection				Indoor Air	Ambient Air (V)				Direct Contact			
			#21	#12	#13	#14		#23	#24	#25	#26	#27	#28	#29	#30
			Residential Drinking Water Protection Criteria	Industrial and Commercial Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSIC)	Finite VSIC for 3 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Industrial and Commercial II	Commercial III	Commercial IV	Soil Saturation Concentration Screening Levels
Dalapon	75980	NA	4,000	4,000	NA	5.9E+7 (C)	NLV	NLV	NLV	NLV	ID	5.9E+7 (C)	5.9E+7 (C)	5.9E+7 (C)	5.9E+7
4,4'-DDD	72548	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	8.3E+5	8.8E+5	2.1E+6	NA
4,4'-DDE	72559	NA	NLL	NLL	NLL	NLL	ID	ID	ID	ID	ID	4.4E+5	6.2E+5	1.5E+6	NA
4,4'-DDT	50293	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	4.0E+7	4.4E+5	6.2E+5	1.5E+6	NA
Decabromodiphenyl ether	1163185	NA	1.4E+5	1.4E+5	NA	1.4E+5	NLV	ID	ID	ID	1.0E+9	4.4E+5	6.2E+5	1.5E+6	NA
Di-n-butyl phthalate	84742	NA	7.6E+5 (C)	7.6E+5 (C)	11,000	7.6E+5 (C)	NLV	NLV	NLV	NLV	1.5E+9	7.6E+5 (C)	7.6E+5 (C)	7.6E+5 (C)	7.6E+5
Di(2-ethylhexyl) adipate	103231	NA	9.6E+5 (C)	9.6E+5 (C)	NA	9.6E+5 (C)	NLV	NLV	NLV	NLV	ID	9.6E+5 (C)	9.6E+5 (C)	9.6E+5 (C)	9.6E+5
Di-n-octyl phthalate	117640	NA	1.0E+6	1.4E+6 (C)	ID	1.4E+6 (C)	NLV	NLV	NLV	NLV	ID	8.1E+7	1.1E+8	1.4E+8 (C)	1.4E+8
Diacetone alcohol (I)	123422	NA	ID	ID	NA	ID	NLV	NLV	NLV	NLV	7.1E+10	ID	ID	ID	1.1E+8
Diazinon	333415	NA	95	280	NA	80,000	NLV	NLV	NLV	NLV	ID	3.1E+5 (C)	3.1E+5 (C)	3.1E+5 (C)	3.1E+5
Dibenz(a,h)anthracene (Q)	53703	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	21,000	28,000	68,000	NA
Dibenzofuran	132649	NA	ID	ID	1,700	ID	ID	ID	ID	ID	ID	ID	ID	ID	NA
Dibromochloromethane	124481	NA	2,000 (W)	2,000 (W)	ID	1.9E+5	21,000	80,000	80,000	80,000	1.6E+8	3.0E+5	4.1E+5	6.1E+5 (C)	6.1E+5
Dibromochloropropane	96128	NA	4.0	4.0	NA	1.2E+5 (C)	1.2E+5 (C)	1.2E+5 (C)	1.2E+5 (C)	1.2E+5 (C)	1.2E+5 (C)	1.2E+5 (C)	1.2E+5 (C)	1.2E+5 (C)	1.2E+5
Dibromomethane	74953	NA	1,600	4,600	NA	1.9E+6	ID	ID	ID	ID	ID	2.0E+8 (C)	2.0E+8 (C)	2.0E+8 (C)	2.0E+8
1,2-Dichlorobenzene	95501	NA	13,000	13,000	340	2.1E+5 (C)	2.1E+5 (C)	2.1E+5 (C)	2.1E+5 (C)	2.1E+5 (C)	4.4E+10	2.1E+5 (C)	2.1E+5 (C)	2.1E+5 (C)	2.1E+5
1,3-Dichlorobenzene	541731	NA	17,000	18,000	1,100	2.0E+5 (C)	ID	ID	ID	ID	ID	2.0E+5 (C)	2.0E+5 (C)	2.0E+5 (C)	2.0E+5
1,4-Dichlorobenzene	106487	NA	1,600	1,700	280	60,000	1.0E+5	2.6E+5	2.6E+5	2.6E+5	5.7E+8	1.0E+8	1.4E+8	2.9E+8	NA
3,3'-Dichlorobenzidine	91941	NA	2,000 (M)	2,000 (M)	2,000 (M,X)	6,800	NLV	NLV	NLV	NLV	8.2E+6	55,000	77,000	1.5E+6	NA
Dichlorodifluoromethane	75718	NA	93,000	2.7E+5	ID	1.0E+6 (C)	1.0E+6 (C)	6.3E+7	5.5E+8	1.4E+9	1.5E+12	1.0E+6 (C)	1.0E+6 (C)	1.0E+6 (C)	1.0E+6
1,1-Dichloroethane (I)	75343	NA	18,000	50,000	IP	7.9E+5 (C)	7.9E+5 (C)	3.6E+7	9.7E+7	2.3E+8	2.4E+11	7.9E+5 (C)	7.9E+5 (C)	7.9E+5 (C)	7.9E+5
1,2-Dichloroethane (I)	107062	NA	100	100	7,200 (X)	2.2E+5	11,000	21,000	33,000	74,000	1.5E+8	2.7E+5	3.8E+5	7.6E+5	1.2E+6
1,1-Dichloroethylene (I)	75354	NA	140	140	1,300 (X)	1.8E+5	330	3,700	15,000	37,000	7.8E+7	5.8E+5 (C)	5.8E+5 (C)	5.8E+5 (C)	5.8E+5
cis-1,2-Dichloroethylene (I)	156592	NA	1,400	1,400	ID	8.4E+5 (C)	8.4E+5 (C)	4.7E+7	9.8E+7	2.3E+8	2.3E+11	6.4E+5 (C)	6.4E+5 (C)	6.4E+5 (C)	6.4E+5
trans-1,2-Dichloroethylene	156605	NA	2,000	2,000	ID	1.4E+6 (C)	1.4E+6 (C)	3.7E+7	9.8E+7	2.2E+8	2.3E+11	1.4E+6 (C)	1.4E+6 (C)	1.4E+6 (C)	1.4E+6
2,6-Dichloro-4-nitroaniline	99309	NA	44,000	1.3E+5	NA	1.4E+5	NLV	NLV	NLV	NLV	ID	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA
2,4-Dichlorophenol	120932	NA	2,600	7,700	680	1.5E+6	NLV	NLV	NLV	NLV	2.3E+9	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7
2,4-Dichlorophenoxyacetic acid	94757	NA	1,400	1,400	4,400	2.2E+6	NLV	NLV	NLV	NLV	2.9E+9	4.5E+7	6.3E+7	1.9E+8	NA
1,2-Dichloropropane (I)	78875	NA	100	100	5,800 (X)	1.5E+5	7,400	30,000	51,000	1.2E+5	1.2E+8	3.6E+5	5.1E+5	5.5E+5 (C)	5.5E+5

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			#21 Residential Drinking Water Protection Criteria	#21 Industrial And Commercial Drinking Water Protection Criteria	#12 Groundwater Surface Water Interface Protection Criteria	#13 Groundwater Contact Protection Criteria		#23 Infinite Source Volatile Soil Inhalation Criteria (V8IC)	#24 Finite V8IC for 9 Meter Source Thickness	#25 Finite V8IC for 2 Meter Source Thickness	#26 Particulate Soil Inhalation Criteria	#27 Industrial and Commercial II	#28 Commercial III	#29 Commercial IV	#30 Soil Saturation Concentration Screening Levels
1,3-Dichloropropane (I, J)	542756	NA	94	380	NA	52,000	420	4,500	15,000	38,000	7.5E+7	1.4E+5	1.9E+5	3.8E+5	6.2E+5
Dichlorovos	62737	NA	58	240	NA	2.2E+5	NLV	NLV	NLV	NLV	1.5E+7	5.2E+5	7.2E+5	1.7E+6	2.5E+6
Dicyclohexyl phthalate	84617	NA	ID	ID	NA	ID	ID	ID	ID	ID	ID	ID	ID	ID	NA
Dieldrin	60571	NA	NLL	NLL	NLL	NLL	7.3E+5	64,000	64,000	64,000	6.5E+5	9,400	13,000	31,000	NA
Diethyl ether (I)	60297	NA	100 (M)	100 (M)	ID	7.4E+6 (C)	7.4E+5 (C)	1.0E+8	1.0E+8	3.5E+8	3.5E+11	7.4E+6 (C)	7.4E+6 (C)	7.4E+6 (C)	7.4E+6
Diethyl phthalate	84662	NA	1.1E+5	3.2E+5	NA	7.4E+5 (C)	NLV	NLV	NLV	NLV	1.5E+9	7.4E+5 (C)	7.4E+5 (C)	7.4E+5 (C)	7.4E+5
Dihydroxy glycol monobutyl ether	112345	NA	1,800	5,000	NA	7.8E+7	NLV	NLV	NLV	NLV	5.9E+8	5.4E+7	7.6E+7	1.1E+8	1.1E+8
Dihydroxyamine (I)	108189	NA	110	320	NA	1.9E+5	7.3E+5	ID	ID	ID	ID	5.7E+5	6.0E+5	1.6E+6	6.7E+6
Dimethyl phthalate	131113	NA	7.9E+5 (C)	7.9E+5 (C)	NA	7.8E+5 (C)	NLV	NLV	NLV	NLV	1.5E+9	7.9E+5 (C)	7.9E+5 (C)	7.9E+5 (C)	7.9E+5
N,N-Dimethylacetamide	127185	NA	3,600	10,000	82,000 (X)	1.1E+8 (C)	NLV	NLV	NLV	NLV	ID	1.9E+7	2.8E+7	6.2E+7	1.1E+8
N,N-Dimethylformamide	121697	NA	320	920	NA	3.2E+5	8.0E+5 (C)	ID	ID	ID	ID	8.0E+5 (C)	8.0E+5 (C)	8.0E+5 (C)	8.0E+5
Dimethylformamide (I)	68122	NA	14,000	40,000	NA	1.1E+8 (C)	NLV	4.4E+5	NLV	NLV	3.3E+8	8.0E+5 (C)	8.0E+5 (C)	8.0E+5 (C)	8.0E+5
2,4-Dimethylphenol	105879	NA	7,400	20,000	330 (M)	8.8E+6	NLV	NLV	NLV	NLV	8.8E+8	7.1E+7	1.0E+8	1.1E+8	1.1E+8
2,6-Dimethylphenol	576261	NA	330 (M)	330 (M)	NA	1.1E+5	NLV	NLV	NLV	NLV	2.1E+9	2.3E+8	3.2E+8	7.4E+8	NA
3,4-Dimethylphenol	95658	NA	330 (M)	580	NA	3.0E+5	NLV	NLV	NLV	NLV	ID	2.7E+6	3.8E+6	6.9E+6	NA
Dimethylsulfoxide	67685	NA	4.4E+6	1.3E+7	3.8E+6	1.8E+7 (C)	NLV	NLV	NLV	NLV	ID	1.8E+7 (C)	1.8E+7 (C)	2.1E+7	NA
2,4-Dinitrotoluene	121142	NA	15,000	15,000	NA	3.8E+6	NLV	NLV	NLV	NLV	ID	2.2E+6	3.1E+6	7.3E+6	NA
Dinoseb	88857	NA	280	300	NA	1.4E+5 (C)	ID	ID	ID	ID	ID	1.4E+5 (C)	1.4E+5 (C)	1.4E+5 (C)	1.4E+5
1,4-Dioxane (I)	123911	NA	1,500	6,400	58,000 (X)	3.4E+7	NLV	NLV	NLV	NLV	7.1E+8	2.3E+6	3.2E+6	6.3E+6	9.7E+7
Diquat	85007	NA	400	400	NA	1.4E+7	NLV	NLV	NLV	NLV	ID	9.9E+6	1.4E+7	3.3E+7	NA
Duron	330541	NA	620	1,800	NA	7.5E+5	NLV	NLV	NLV	NLV	ID	1.9E+7	2.7E+7	6.4E+7	NA
Endosulfan (J)	115297	NA	NLL	NLL	NLL	NLL	ID	ID	ID	ID	ID	1.0E+6	1.5E+6	3.4E+6	NA
Endosulfan	145733	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	1.0E+9	7.7E+7	1.1E+8	2.5E+8	NA
Endrin	72208	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	7.7E+5	1.1E+6	2.5E+6	NA
Epithiorhydrin (I)	106898	NA	1,700	7,000	NA	7.3E+6 (C)	1.2E+5	37,000	37,000	37,000	2.9E+7	2.3E+6	3.5E+6	7.0E+6	7.3E+6
Ethanol (I)	64175	NA	3.8E+7	7.8E+7	IP	1.1E+8 (C)	NLV	NLV	NLV	NLV	5.6E+11	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8
Ethyl acetate (I)	141786	NA	1.3E+5	3.8E+5	NA	7.5E+6 (C)	7.5E+6 (C)	5.9E+7	5.9E+7	1.0E+8	9.4E+10	7.5E+6 (C)	7.5E+6 (C)	7.5E+6 (C)	7.5E+6
Ethylbenzene (I)	100414	NA	1,500	1,500	360	1.4E+5 (C)	1.4E+5 (C)	1.1E+7	1.4E+7	3.0E+7	2.9E+10	1.4E+5 (C)	1.4E+5 (C)	1.4E+5 (C)	1.4E+5
Ethylene dibromide	106934	NA	10 (M)	10 (M)	NA	320	3,800	5,800	5,800	9,800	1.8E+7	290	410	810	8.9E+5

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			#21		#12 Groundwater Surface Water Interface Protection Criteria	#13 Groundwater Contact Protection Criteria		#23 Infinite Source Volatile Soil Inhalation Criteria (VSIIC)	#24 Finite VSIIC for 5 Meter Source Thickness	#25 Finite VSIIC for 2 Meter Source Thickness	#26 Particulate Soil Inhalation Criteria	#27 Industrial and Commercial II	#28 Commercial III	#29 Commercial IV	#30 Soil Saturation Concentration Screening Levels
			Residential Drinking Water Protection Criteria	Industrial And Commercial Drinking Water Protection Criteria											
Ethylene glycol	107211	NA	3.0E+5	8.4E+5	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	3.7E+10	1.1E+8 (C)	1.1E+8 (C)	1.1E+8	
Ethylene glycol monobutyl ether	111782	NA	7.2E+5	11,000	NA	4.1E+7 (C)	ID	3.9E+5	2.7E+8	8.9E+8	7.1E+9	2.0E+7	2.0E+7	4.1E+7	
Fluoranthene	208440	NA	7.2E+5	7.2E+5	8,600	7.2E+5	1.0E+9 (D)	8.9E+8	8.9E+8	8.9E+8	4.1E+9	5.4E+8	7.6E+8	1.0E+9 (D)	
Fluorene	66737	NA	3.9E+5	8.9E+5	2,400	8.9E+5	1.0E+9 (D)	1.5E+8	1.5E+8	1.5E+8	4.1E+9	5.4E+8	7.6E+8	1.0E+9 (D)	
Fluorine (soluble fluoride) (B)	7782414	NA	40,000	40,000	NA	2.8E+8	NLV	NLV	NLV	NLV	ID	2.7E+8	3.8E+8	8.9E+8	
Formaldehyde	50000	NA	26,000	76,000	2,400	6.0E+7 (C)	62,000	43,000	68,000	1.5E+5	3.0E+8	6.0E+7 (C)	6.0E+7 (C)	6.0E+7	
Formic acid (I, U)	64186	NA	9.0E+5 (M)	9.0E+5 (M)	ID	1.1E+8 (C)	2.3E+8	2.3E+8	9.0E+5 (M)	9.0E+5 (M)	5.9E+7	1.1E+8 (C)	1.1E+8 (C)	1.1E+8	
1-Fenylpyridine	2591868	NA	1,600	4,600	NA	NA	ID	ID	ID	ID	ID	8.2E+8	1.0E+7 (C)	1.0E+7 (C)	
Gentian violet	548829	NA	170	700	NA	9.8E+2	NLV	NLV	NLV	NLV	ID	1.3E+8	2.1E+8	5.0E+8	
Glyphosate	1071836	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	4.9E+8	6.3E+8	1.0E+9 (D)	
Heptachlor	76448	NA	NLL	NLL	NLL	NLL	1.9E+8	2.7E+5	2.1E+5	2.1E+5	3.0E+8	33,000	47,000	1.1E+6	
Heptachlor epoxide	1024573	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	1.5E+8	16,000	23,000	54,000	
n-Heptane (I)	142825	NA	2.4E+5 (C)	2.4E+5 (C)	NA	2.4E+5 (C)	2.4E+5 (C)	ID	ID	ID	1.0E+11	2.4E+5 (C)	2.4E+5 (C)	2.4E+5	
Hexabromobenzene	87821	NA	5,400	5,400	ID	1.0E+7	ID	ID	ID	ID	ID	1.3E+7	1.8E+7	4.2E+7	
Hexachlorobenzene (C-66)	118741	NA	1,800	1,800	ID	3,500	2.2E+5	58,000	58,000	58,000	8.5E+8	94,000	1.3E+5	3.1E+5	
Hexachlorobutadiene (C-46)	87683	NA	19,000	77,000	ID	3.4E+5	3.5E+5 (C)	2.7E+5	4.6E+5	1.6E+5	1.0E+8	3.9E+5 (C)	3.5E+5 (C)	3.5E+5	
alpha-Hexachlorocyclohexane	319846	NA	25	98	NA	2,800	6.8E+5	2,000	68,000	58,000	2.1E+8	24,000	33,000	79,000	
beta-Hexachlorocyclohexane	319857	NA	85	350	NA	10,000	NLV	NLV	NLV	NLV	7.4E+8	83,000	1.2E+5	2.8E+5	
Hexachlorocyclopentadiene (C-56)	77474	NA	38,000	38,000	ID	81,000 (C)	ID	ID	ID	ID	ID	81,000 (C)	81,000 (C)	81,000	
Hexachloroethane	67721	NA	17,000	69,000	1,800 (X)	4.1E+5	3.7E+5	1.4E+8	1.4E+8	1.4E+8	1.0E+8	1.9E+8	2.5E+8	4.9E+8	
n-Hexane (I)	110543	NA	44,000 (C)	44,000 (C)	NA	ID	44,000 (C)	ID	ID	ID	5.9E+9	44,000 (C)	44,000 (C)	44,000	
2-Hexanone (I)	591786	NA	20,000	58,000	NA	2.5E+8 (C)	1.9E+8	ID	ID	ID	1.2E+9	2.5E+8 (C)	2.5E+8 (C)	2.5E+8	
Indeno(1,2,3-cd)pyrene (Q)	193395	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	2.1E+5	2.9E+5	6.8E+5	
Iron (B)	7439896	1.2E+7	6,000	6,000	NA	ID	NLV	NLV	NLV	NLV	ID	ID	ID	ID	
Isobutyl alcohol (I)	78831	NA	48,000	1.3E+5	NA	8.9E+8 (C)	8.9E+8 (C)	9.5E+7	9.5E+7	9.5E+7	4.4E+10	8.9E+8 (C)	8.9E+8 (C)	8.9E+8	
Isophorone	78591	NA	18,000	74,000	1,000 (X)	2.4E+8 (C)	NLV	NLV	NLV	NLV	8.2E+9	2.4E+8 (C)	2.4E+8 (C)	2.4E+8	
Isopropyl alcohol (I)	87630	NA	9,400	28,000	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	6.5E+9	4.8E+7	6.7E+7	1.1E+8	
Isopropyl benzene (I)	98828	NA	90,000	2.8E+5	ID	3.9E+5 (C)	3.9E+5 (C)	2.0E+8	ID	ID	2.8E+9	3.9E+5 (C)	3.9E+5 (C)	3.9E+5	
Lead (B)	7439921	21,000	1,000 (M)	1,000 (M)	(G,M,X)	ID	NLV	NLV	NLV	NLV	4.4E+7	9.0E+5 (M)	4.0E+5	4.0E+5	

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			Groundwater Protection				Indoor Air	Ambient Air (Y)				Direct Contact			
		#10	#21		#12	#13	#22	#23	#24	#25	#26	#27	#28	#29	#30
	Chemical Abstract Service Number	Statewide Default Background Levels	Residential Drinking Water Protection Criteria	Industrial And Commercial Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (V5IC)	Finite V5IC for 6 Meter Source Thickness	Finite V5IC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Industrial and Commercial II	Commercial III	Commercial IV	Soil Saturation Concentration Screening Levels
Lindane	58899	NA	20 (M)	20 (M)	20 (M)	3,200	ID	ID	ID	ID	ID	1.2E+5	1.6E+5	3.8E+5	NA
Lithium (B)	7439832	9,800	3,400	7,000	500	1.2E+8	NLV	NLV	NLV	NLV	ID	2.6E+7	2.6E+7	2.8E+7	NA
Magnesium (B)	7439854	NA	8.4E+6	2.4E+7	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	2.9E+9	1.0E+8 (D)	1.0E+8 (D)	1.0E+8 (D)	NA
Manganese (B)	7439865	4.4E+5	2,000 (M)	2,000 (M)	(G,X)	2.0E+8	NLV	NLV	NLV	NLV	1.5E+6	2.1E+8	3.0E+8	7.0E+8	NA
Mercury (Inorganic) (B)	7439976	130	1,700	1,700	170	47,000	NLV	NLV	NLV	NLV	ID	1.4E+6	1.9E+6	4.5E+6	NA
Methane	74828	NA	ID	ID	ID	ID	(N)	ID	ID	ID	ID	ID	ID	ID	ID
Methanol (I)	67561	NA	74,000	2.0E+5	ID	3.7E+6 (N)	1.1E+8	3.7E+7	4.8E+7	9.7E+7	9.6E+10	3.1E+8 (C)	3.1E+8 (C)	3.1E+8 (C)	3.1E+8
Methoxychlor	72435	NA	1.3E+5	1.3E+5	NA	1.2E+5	(C)	ID	ID	ID	ID	2.3E+7	3.2E+7	7.4E+7	NA
2-Methoxyethanol (I)	109864	NA	150	400	ID	1.2E+7	NLV	NLV	NLV	NLV	5.9E+8	7.4E+5	1.0E+6	2.1E+6	1.1E+6
2-Methyl-4-chlorophenoxyacetic acid	94746	NA	390	1,100	NA	4.3E+5	NLV	NLV	NLV	NLV	ID	4.5E+6	6.3E+6	1.5E+7	NA
2-Methyl-4-chlorophenol	534521	NA	1,700 (M)	1,700 (M)	NA	1.8E+5	NLV	NLV	NLV	NLV	ID	1.8E+6	2.2E+6	5.2E+6	NA
Methyl parathion	298000	NA	44	130	NA	68,000	NLV	NLV	NLV	NLV	ID	1.1E+6	1.6E+6	3.7E+6	NA
4-Methyl-2-pentanol (MIBK) (I)	108101	NA	36,000	1.0E+5	ID	2.7E+6 (C)	2.7E+6 (C)	5.9E+7	5.3E+7	7.0E+7	6.0E+10	2.7E+6 (C)	2.7E+6 (C)	2.7E+6 (C)	2.7E+6
Methyl-tert-butyl ether (MTBE)	1634044	NA	800	800	15,000 (X)	6.0E+6 (C)	6.0E+6 (C)	3.1E+7	3.1E+7	8.9E+7	8.9E+10	6.0E+6 (C)	6.0E+6 (C)	6.0E+6 (C)	6.0E+6
N-Methyl-morpholine (I)	108024	NA	400	1,100	NA	3.2E+7	NLV	NLV	NLV	NLV	ID	2.0E+6	2.8E+6	6.8E+6	1.1E+6
Methylcyclopentane (I)	86377	NA	ID	ID	NA	ID	ID	ID	ID	ID	ID	ID	ID	ID	3.4E+5
4,4'-Methylene-bis-2-chloroaniline (MBOCA)	101144	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	1.1E+8	1.6E+5	2.2E+6	5.1E+5	NA
Methylene chloride	75092	NA	100	100	19,000 (X)	2.2E+6	2.4E+5	7.9E+5	1.7E+6	4.0E+6	8.3E+9	2.3E+6 (C)	2.3E+6 (C)	2.3E+6 (C)	2.3E+6
2-Methylnaphthalene	91576	NA	57,000	1.7E+5	ID	7.1E+6	ID	ID	ID	ID	ID	1.6E+6	2.3E+6	5.4E+6	NA
2-Methylphenol	95487	NA	7,400	20,000	1,600	1.4E+7	NLV	NLV	NLV	NLV	2.9E+9	3.7E+7	5.2E+7	1.0E+8	NA
3-Methylphenol	108394	NA	7,400	20,000	NA	4.5E+6 (C)	NLV	NLV	NLV	NLV	ID	4.5E+6 (C)	4.5E+6 (C)	4.5E+6 (C)	4.5E+6
4-Methylphenol	106445	NA	740	2,000	ID	1.5E+6	NLV	NLV	NLV	NLV	ID	2.3E+7	3.2E+7	7.4E+7	NA
Metolchlor	51218452	NA	3,200	13,000	NA	4.4E+5 (C)	NLV	NLV	NLV	NLV	ID	4.4E+5 (C)	4.4E+5 (C)	4.4E+5 (C)	4.4E+5
Molybdenum (B)	7439987	NA	740	2,000	18,000 (X)	2.2E+7	NLV	NLV	NLV	NLV	ID	2.3E+7	3.2E+7	7.4E+7	NA
Naphthalene	91203	NA	17,000	50,000	850	2.0E+6	7.7E+7	5.9E+7	5.9E+7	5.9E+7	1.5E+10	1.8E+8	2.3E+8	5.4E+8	NA
Nickel (B)	7440020	20,000	1.0E+5	1.0E+5	(G)	1.0E+8 (D)	NLV	NLV	NLV	NLV	1.6E+7	3.4E+8	4.8E+8	1.0E+9 (D)	NA
Nitrate (B,N)	14787558	NA	2.0E+5 (N)	2.0E+5 (N)	NA	1.0E+8 (D)	NLV	NLV	NLV	NLV	ID	ID	ID	ID	NA
Nitrite (B,N)	14787650	NA	20,000 (N)	20,000 (N)	NA	4.2E+8	NLV	NLV	NLV	NLV	ID	ID	ID	ID	NA
Nitrobenzene (I)	98953	NA	330 (M)	330 (M)	3,600 (X)	1.9E+5	4.9E+5 (C)	4.8E+6	4.8E+6	4.8E+6	1.5E+9	3.4E+5	4.8E+5	4.9E+5 (C)	4.9E+5

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			#21		#12	#13		#22	#23	#24	#25	#26	#27	#28	#29	#30		
			Residential Drinking Water Protection Criteria	Industrial And Commercial Drinking Water Protection Criteria													Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria
2-Nitrophenol	88755	NA	400	1,200	ID	1.4E+6	NLV	NLV	NLV	NLV	NLV	ID	1.3E+7	1.0E+7	4.2E+7	Commercial III	Commercial IV	Soil Saturation Concentration Screening Levels
n-Nitroso-di-n-propylamine	821647	NA	330 (M)	330 (M)	NA	4,400	NLV	NLV	NLV	NLV	NLV	2.0E+6	3,500	6,000	9,900	6,000	9,900	1.5E+6
N-Nitrosodiphenylamine	86308	NA	3,400	14,000	NA	6.0E+6	NLV	NLV	NLV	NLV	NLV	ID	5.1E+6	7.1E+6	1.4E+7	7.1E+6	1.4E+7	NA
Oxamyl	23135220	NA	4,000	4,000	NA	1.0E+9 (D)	NLV	NLV	NLV	NLV	NLV	ID	1.7E+6	2.4E+6	5.6E+6	2.4E+6	5.6E+6	NA
Oxo-hexyl acetate	88230357	NA	1,500	4,200	NA	ID	ID	ID	ID	ID	ID	2.4E+9	7.4E+6	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7
Pendimethalin	40487421	NA	1.1E+6	1.1E+6	NA	1.1E+6	NLV	NLV	NLV	NLV	NLV	ID	5.4E+6	7.6E+6	1.0E+8 (D)	7.6E+6	1.0E+8 (D)	NA
Pentachlorobenzene	608935	NA	29,000	81,000	NA	1.0E+5 (C)	NLV	ID	ID	ID	ID	ID	1.9E+5 (C)	1.9E+5 (C)	1.9E+5 (C)	1.9E+5 (C)	1.9E+5 (C)	1.0E+5
Pentachlorobenzene	82688	NA	37,000	37,000	NA	2.7E+5	2.2E+5	2.2E+5	2.8E+5	2.8E+5	1.5E+6	1.5E+6	3.4E+7	4.7E+7	1.1E+8	4.7E+7	1.1E+8	NA
Pentachlorobenzene	87865	NA	3,200	3,200	(G,X)	2.7E+5	NLV	NLV	NLV	NLV	NLV	1.3E+8	63,000	89,000	1.7E+8	89,000	1.7E+8	NA
Pentane (I)	109660	NA	ID	ID	NA	ID	ID	2.4E+6 (C)	ID	ID	ID	5.2E+11	ID	ID	ID	ID	ID	2.4E+5
2-Pentene	109682	NA	ID	ID	NA	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	2.2E+5
Phenanthrene	85018	NA	12,000	34,000	2,300	4.5E+5	2.5E+7	1.2E+5	7.2E+5	7.2E+5	5.9E+7	5.9E+7	1.6E+7	2.3E+7	5.4E+7	2.3E+7	5.4E+7	NA
Phenol	108952	NA	88,000	2.6E+5	4,200	1.2E+7 (C)	NLV	NLV	NLV	NLV	1.8E+10	1.8E+10	1.2E+7 (C)	1.2E+7 (C)	1.2E+7 (C)	1.2E+7 (C)	1.2E+7 (C)	1.2E+7
Phosphorus (total)	7723140	NA	1.3E+6	4.8E+6	NA	ID	NLV	NLV	NLV	NLV	ID	ID	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA
Picloram	1918021	NA	10,000	10,000	NA	ID	NLV	NLV	NLV	NLV	ID	ID	3.2E+6	4.4E+6	1.0E+9 (D)	4.4E+6	1.0E+9 (D)	NA
Piperidine	110894	NA	64	180	NA	6.4E+5	NLV	NLV	NLV	NLV	4.1E+9	4.1E+9	3.3E+5	4.6E+5	9.1E+5	4.6E+5	9.1E+5	1.2E+6
Polybrominated biphenyls (J)	37324235	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV	ID	ID	17,000	24,000	56,000	24,000	56,000	NA
Polychlorinated biphenyls (PCBs) (J,T)	1336363	NA	NLL	NLL	NLL	NLL	1.6E+7	6.3E+5	2.8E+7	2.8E+7	6.5E+6	6.5E+6	(T)	(T)	(T)	(T)	(T)	NA
Prometon	1610180	NA	4,900	14,000	NA	4.9E+6	NLV	NLV	NLV	NLV	ID	ID	9.9E+7	1.4E+8	3.3E+8	1.4E+8	3.3E+8	NA
Propachlor	1918187	NA	1,800	5,400	NA	8.4E+6	NLV	NLV	NLV	NLV	ID	ID	5.9E+7	6.2E+7	1.9E+8	6.2E+7	1.9E+8	NA
Propazine	139402	NA	4,000	11,000	NA	1.7E+5	NLV	NLV	NLV	NLV	ID	ID	1.2E+8	1.7E+8	4.0E+8	1.7E+8	4.0E+8	NA
Propionic acid (I)	76094	NA	3.6E+5	7.0E+5	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	8.8E+9	8.8E+9	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8
Propyl alcohol (I)	71238	NA	28,000	80,000	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	2.1E+10	2.1E+10	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8
n-Propylbenzene (I)	103651	NA	1,900	4,600	NA	ID	ID	ID	ID	ID	ID	6.9E+8	8.2E+6	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7
Propylene glycol	57558	NA	3.0E+6	8.4E+6	NA	1.0E+7 (C)	NLV	NLV	NLV	NLV	1.8E+11	1.8E+11	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7 (C)	1.0E+7
Pyrene	129000	NA	4.7E+5	4.7E+5	ID	4.7E+5	1.0E+9 (D)	7.7E+8	7.7E+8	7.7E+8	2.9E+9	2.9E+9	3.4E+6	4.7E+6	1.0E+9 (D)	4.7E+6	1.0E+9 (D)	NA
Pyridine (I)	110861	NA	330 (M)	420	NA	37,000 (C)	2,000	9,800	40,000	97,000	1.0E+8	1.0E+8	37,000 (C)	37,000 (C)	37,000 (C)	37,000 (C)	37,000 (C)	37,000
Selenium (B)	7782482	410	4,000	4,000	400	8.9E+7	NLV	NLV	NLV	NLV	5.9E+7	5.9E+7	2.3E+7	3.2E+7	7.4E+7	3.2E+7	7.4E+7	NA
Silver (B)	7440224	1,000	4,500	13,000	500 (M)	2.3E+6	NLV	NLV	NLV	NLV	2.8E+6	2.8E+6	2.1E+7	3.0E+7	7.0E+7	3.0E+7	7.0E+7	NA

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			#21 Residential Drinking Water Protection Criteria	#21 Industrial And Commercial Drinking Water Protection Criteria	#12 Groundwater Surface Water Interface Protection Criteria	#13 Groundwater Contact Protection Criteria	#23 Infinite Source Volatile Soil Inhalation Criteria (V9IC)	#24 Finite VSIC for 5 Meter Source Thickness	#25 Finite VSIC for 2 Meter Source Thickness	#26 Particulate Soil Inhalation Criteria	#27 Industrial and Commercial II	#28 Commercial III	#29 Commercial IV	#30 Soil Saturation Concentration Screening Levels
Silvex (2,4,5-TP)	93721	NA	3,700	3,700	NA	2.8E+6	NLV	NLV	NLV	ID	3.4E+7	4.7E+7	1.1E+8	NA
Sinazine	122349	NA	80	80	NA	90,000	NLV	NLV	NLV	ID	2.3E+7	3.3E+7	7.7E+7	NA
Sodium (B)	7440235	NA	3.2E+6	9.0E+6	NA	1.0E+9 (D)	NLV	NLV	NLV	ID	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA
Strontium (B)	7440246	NA	92,000	2.6E+5	15,000	1.0E+9 (D)	NLV	NLV	NLV	ID	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA
Styrene (I)	100425	NA	2,700	2,700	2,200	85,000	3.2E+6	3.2E+6	4.0E+6	6.0E+9	5.2E+6 (C)	5.2E+6 (C)	5.2E+6 (C)	5.2E+5
Sulfate	14809798	NA	5.0E+6	5.0E+6	NA	ID	NLV	NLV	NLV	ID	ID	ID	ID	NA
Tributyltin	34014181	NA	10,000	30,000	NA	5.0E+7	NLV	NLV	NLV	ID	3.2E+8	4.4E+8	1.0E+9 (D)	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin (O)	50585416	NA	NLL	NLL	NLL	1.5E+6	NLV	NLV	NLV	ID	(O)	(O)	(O)	NA
1,2,4,5-Tetrachlorobenzene	95943	NA	1.5E+6	1.5E+6	ID	1.5E+6	ID	ID	ID	ID	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin (O)	1746016	NA	NLL	NLL	NLL	NLL	NLV	NLV	NLV	89	0.99	1.4	2.9	NA
1,1,1,2-Tetrachloroethane	630206	NA	660	26,000	NA	2.2E+5	65,000	2.1E+5	3.3E+5	5.3E+8	9.5E+6	9.8E+6 (C)	9.8E+6 (C)	9.8E+5
1,1,2,2-Tetrachloroethane	78345	NA	86	340	1,600 (X)	42,000	2,000	34,000	34,000	6.0E+7	1.2E+6	1.7E+6	3.5E+5	8.7E+5
Tetrachloroethylene	127184	NA	100	100	900 (X)	98,000 (C)	6.0E+5	1.4E+6	3.3E+6	6.0E+9	89,000 (C)	89,000 (C)	89,000 (C)	89,000
Tetrahydrofuran (I)	109999	NA	4,800	14,000	2,28E+5 (X)	7.8E+7	ID	ID	ID	1.7E+11	2.5E+7	3.4E+7	6.8E+7	1.2E+8
Thallium (B)	7440280	NA	2,300	2,300	4,200 (X)	1.8E+7	NLV	NLV	NLV	ID	3.0E+6	4.2E+6	1.0E+6	NA
Toluene (I)	108883	NA	16,000	16,000	2,800	2.5E+5 (C)	3.3E+6	3.6E+7	3.6E+7	1.2E+10	2.5E+6 (C)	2.5E+6 (C)	2.5E+6 (C)	2.5E+5
p-Toluidine	106490	NA	660 (M)	660 (M)	NA	1.3E+5	NLV	NLV	NLV	1.3E+8	7.9E+6	1.1E+6	1.2E+6 (C)	1.2E+6
Toxaphene	8001352	NA	2,800	2,800	660	11,000	NLV	NLV	NLV	1.2E+7	23,000	32,000	63,000	NA
Trifluorethane	2303175	NA	85,000	2.8E+5 (C)	NA	2.5E+5 (C)	ID	ID	ID	ID	2.5E+6 (C)	2.5E+6 (C)	2.5E+6 (C)	2.5E+5
Tributylamine	102829	NA	7,800	23,000	ID	5.3E+5	ID	ID	ID	2.1E+8	1.0E+6	1.5E+6	2.9E+6	3.7E+6
1,2,4-Trichlorobenzene	120821	NA	4,200	4,200	1,800	8.9E+5	3.4E+7	3.4E+7	3.4E+7	1.1E+10	1.1E+6 (C)	1.1E+6 (C)	1.1E+6 (C)	1.1E+6
1,1,1-Trichloroethane	71556	NA	4,000	4,000	4,000	4.6E+5 (C)	4.5E+6	1.5E+7	3.1E+7	2.9E+10	4.6E+6 (C)	4.6E+6 (C)	4.6E+6 (C)	4.6E+5
1,1,2-Trichloroethane	79005	NA	100	100	6,600 (X)	1.9E+5	57,000	57,000	1.2E+5	2.5E+8	4.4E+5	6.1E+5	9.2E+5 (C)	9.2E+5
Trichloroethylene	79016	NA	100	100	4,000 (X)	2.2E+5	2.8E+5	4.4E+5	1.1E+6	2.3E+9	5.0E+5 (C)	5.0E+5 (C)	5.0E+5 (C)	5.0E+5
Trichlorofluoromethane	75694	NA	52,000	1.5E+5	NA	5.6E+5 (C)	1.1E+6	1.4E+11	1.4E+11	1.7E+12	5.6E+5 (C)	5.6E+5 (C)	5.6E+5 (C)	5.6E+5
2,4,5-Trichlorophenol	95954	NA	1.8E+5	4.6E+5	NA	2.9E+7	NLV	NLV	NLV	1.0E+10	4.5E+8	6.3E+8	1.0E+9 (D)	NA
2,4,6-Trichlorophenol	80002	NA	11,000	45,000	700	7.8E+5	NLV	NLV	NLV	1.3E+9	1.4E+7	1.9E+7	4.5E+7	NA
1,2,3-Trichloropropane	96184	NA	840	2,400	NA	8.3E+5 (C)	ID	ID	ID	ID	8.3E+6 (C)	8.3E+6 (C)	8.3E+6 (C)	8.3E+5
1,1,2-Trichloro-1,2,2-trifluoroethane	76131	NA	5.6E+5 (C)	5.6E+5 (C)	NA	5.6E+5 (C)	2.1E+8	8.9E+8	2.1E+9	2.3E+12	5.6E+5 (C)	5.6E+5 (C)	5.6E+5 (C)	5.6E+5

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Chemical	Chemical Abstract Service Number	#10	Groundwater Protection				Indoor Air	Ambient Air (V)				Direct Contact			
			#21	#12	#13	#22		#23	#24	#25	#26	#27	#28	#29	#30
			Residential Drinking Water Protection Criteria	Industrial And Commercial Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Groundwater Contact Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (V8IC)	Finite V8IC for 5 Meter Source Thickness	Finite V8IC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Industrial and Commercial II	Commercial III	Commercial IV	Soil Saturation Concentration Screening Levels
Triethanolamine	102716	NA	74,000	2.0E+5	NA	1.1E+8 (C)	NLV	NLV	NLV	NLV	1.5E+9	1.1E+8 (C)	1.1E+8 (C)	1.1E+8 (C)	1.1E+8
3-Trifluoromethyl-4-nitrophenol	86302	NA	1.1E+5	3.1E+5	NA	1.1E+8	NLV	NLV	NLV	NLV	ID	1.0E+9 (D)	1.0E+9 (D)	1.0E+9 (D)	NA
Trifluralin	1582096	NA	5.7E+5	2.3E+8	NA	7.8E+8	ID	ID	ID	ID	ID	2.0E+7	2.7E+7	6.4E+7	NA
2,2,4-Trimethyl pentane	540841	NA	ID	ID	NA	ID	ID	ID	ID	ID	ID	ID	ID	ID	19,000
2,2,4-Trimethyl-2-pentene (I)	107404	NA	ID	ID	NA	ID	ID	ID	ID	ID	ID	ID	ID	ID	19,000
1,2,4-Trimethylbenzene (I)	95838	NA	2,100	2,100	ID	1.1E+5 (C)	1.5E+5 (C)	2.5E+7	6.0E+8	6.0E+8	3.9E+10	1.1E+5 (C)	1.1E+5 (C)	1.1E+5 (C)	50,000
1,3,5-Trimethylbenzene (I)	108678	NA	1,800	1,800	ID	94,000 (C)	24,000 (C)	1.9E+7	4.6E+8	4.6E+8	3.9E+10	94,000 (C)	94,000 (C)	94,000 (C)	1.1E+5
Triphenyl phosphine	115866	NA	1.1E+5 (C)	1.1E+5 (C)	NA	1.1E+5 (C)	NLV	ID	ID	ID	ID	1.1E+5 (C)	1.1E+5 (C)	1.1E+5 (C)	1.1E+5
Tri(2,3-Dibromopropyl)phosphate	126727	NA	43	180	NA	27,000 (C)	27,000 (C)	60,000	60,000	60,000	7.4E+8	27,000 (C)	27,000 (C)	27,000 (C)	27,000
Urea	57136	NA	ID (N)	ID (N)	NA	ID	NLV	NLV	NLV	NLV	ID	ID	ID	ID	NA
Vanadium (E)	7440622	NA	1.0E+6	2.9E+8	240	1.0E+8 (D)	NLV	NLV	NLV	NLV	ID	3.9E+7	5.5E+7	1.3E+8	NA
Vinyl acetate (I)	108054	NA	13,000	36,000	NA	2.4E+8 (C)	1.5E+8	2.5E+8	2.7E+8	5.9E+8	6.9E+9	2.4E+8 (C)	2.4E+8 (C)	2.4E+8 (C)	2.4E+8
Vinyl chloride	75014	NA	40	40	300	5,800	160	1,500	1,500	22,000	4.7E+7	11,000	16,000	31,000	4.9E+6
White phosphorus (I)	12185103	NA	100 (M)	100 (M)	NA	64,000	NLV	NLV	NLV	NLV	ID	68,000	95,000	2.2E+6	NA
Xylenes (I)	1330207	NA	5,600	5,600	700	1.5E+5 (C)	1.5E+5 (C)	5.4E+7	6.5E+7	1.3E+8	1.3E+11	1.5E+5 (C)	1.5E+5 (C)	1.5E+5 (C)	1.5E+5
Zinc (B)	7440666	47,000	2.4E+8	5.0E+8	(G)	1.0E+8 (D)	NLV	NLV	NLV	NLV	ID	1.0E+8 (D)	1.0E+8 (D)	1.0E+8 (D)	NA

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- {A} Criterion is the State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976.
- {B} Background, as defined in Rule 299.5701(c), may be substituted if higher than the calculated cleanup criteria. Background levels may not exceed criteria for all inorganic compounds.
- {C} Value presented is a screening level based on the chemical-specific generic soil saturation concentration (C_{sat}) since the calculated risk-based criterion is greater than C_{sat}. Concentrations greater than C_{sat} are acceptable cleanup criteria for this pathway where a site-specific demonstration indicates that free-phase contaminant is not present. Consult the Generic Soil Saturation Concentrations: Technical Support Document (August 31, 1998) for further guidance on development of site-specific C_{sat} values. Risk-based criteria are available by contacting an ERD toxicologist.
- {D} Calculated criterion exceeds 100%, hence it is reduced to 100% (i.e., 1.0E+9 ppb). Evaluation of free phase contaminant, environmental impacts, adverse aesthetics and acute or local toxicity is required.
- {E} Criterion is the aesthetic drinking water value, as required by Sec. 20120(1)(5).
- {F} Criterion is based on adverse impacts to plant life (i.e., phytotoxicity).
- {G} GSI value is pH or water hardness dependent. The Final Chronic Value (FCV) for the protection of aquatic life must be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO₃/L, use 400 mg CaCO₃/L for the FCV calculation. The FCV formula provides values in units of ug/L (ppb). The dissolved to total metal translator (T) is used to convert from a dissolved to a total FCV value. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV) and the surface water human non-drinking water value (HNDV). For these chemicals, the soil GSI protection criteria will be based on the final generic GSI criterion determined by the process described in this footnote. Contact an ERD toxicologist for further guidance.

Chemical	FCV Formula ug/L	FCV Conversion Factor (CF)	Dissolved to Total Metal Translator (T)	WV ug/L	HNDV ug/L
Beryllium	$\text{EXP}(2.5279 * (\text{LnH}) - 10.7689)$	NA	NA	NA	1,200
Cadmium	$((\text{EXP}(0.7852 * (\text{LnH}) - 2.715)) * \text{CF}(\text{Cd})) * \text{T}$	$\text{CF}(\text{Cd}) = 1.10167 - [(\text{LnH}) * (0.04184)]$	2.1	NA	130
Chromium (III)	$((\text{EXP}(0.819 * (\text{LnH}) + 0.6848)) * 0.86) * \text{T}$	NA	1.5	NA	9,400
Copper	$((\text{EXP}(0.8545 * (\text{LnH}) - 1.702)) * 0.96) * \text{T}$	NA	1.5	NA	64,000
Lead	$((\text{EXP}(1.273 * (\text{LnH}) - 3.296)) * \text{CF}(\text{Pb})) * \text{T}$	$\text{CF}(\text{Pb}) = 1.46203 - [(\text{LnH}) * (0.14571)]$	4.5	NA	190
Manganese	$\text{EXP}(0.859 * (\text{LnH}) + 1.957)$	NA	NA	NA	59,000
Nickel	$((\text{EXP}(0.846 * (\text{LnH}) + 0.0584)) * 0.997) * \text{T}$	NA	$1 + (0.49 * (\text{SS})^{0.4281})$	NA	2.1E+5
Pentachlorophenol	$\text{EXP}(1.005 * (\text{pH}) - 5.134)$	NA	NA	NA	2.8
Zinc	$((\text{EXP}(0.8473 * (\text{LnH}) + 0.884)) * 0.986) * \text{T}$	NA	2.1	NA	22,000

Where,

EXP(x) = The base of the natural logarithm raised to power x (e^x).LnH = The natural logarithm of water hardness in mg CaCO₃/L.

SS = Total suspended solids in mg/L

* = The multiplication symbol.

- {H} Valence-specific chromium data (Cr III and Cr VI) must be compared to the corresponding valence-specific cleanup criteria. If analytical data are provided for "total" chromium only, then values for Cr VI must be applied as the cleanup criteria. Cr III cleanup criterion for protection of drinking water can only be used at sites where groundwater is prevented from being used as a public water supply, currently and in the future.

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- {I} Chemical may exhibit the characteristic of ignitability as defined in 40 CFR 261.21. Contact an ERD toxicologist for further direction.
- {J} Chemical may be present in several isomer forms. Isomer-specific concentrations must be added together for comparison to criteria. Contact an ERD toxicologist if further explanation is needed.
- {K} Chemical may be flammable and/or explosive. Criteria are under development. Contact an ERD toxicologist for further direction.
- {L} Higher groundwater concentrations (up to 15 ug/L) may be acceptable if the soil concentration is less than 400 ppm and groundwater migrating off-site will not result in unacceptable exposures. Contact an ERD toxicologist if further explanation is needed.
- {M} Calculated criterion is below the analytical Target Detection Limit (TDL), therefore, the criterion defaults to the TDL.
- {N} The concentrations of all potential sources of nitrate-nitrogen (e.g., ammonia-N, nitrite-N, nitrate-N) must be added together and compared to nitrate criteria. Contact an ERD toxicologist if further direction is needed.
- {O} All polychlorinated and polybrominated dibenzodioxins and dibenzofurans are considered as one hazardous substance. The concentration of all isomers present at a facility, expressed as an equivalent concentration of 2,3,7,8-tetrachlorodibenzo-p-dioxin based upon their relative potency, must be added together and compared to the criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin. Contact an ERD toxicologist for details.
- {P} Comparison of on-site cyanide concentrations to groundwater criteria is based on amenable analysis. Comparison of cyanide concentrations to soil criteria is based on total cyanide analysis. The cyanide soil DCC of $2.5E+5$ ug/kg is the EPA action level for releasable cyanide. Higher total cyanide concentrations may be acceptable if analytical data are provided to demonstrate that levels of releasable cyanide do not exceed the action level. Amendable analysis for soil leachate testing may be used to demonstrate compliance with soil criteria protective of groundwater. Alternative analytical methods may be acceptable with site-specific approval. Contact an ERD toxicologist if further direction is needed.
- {Q} Criteria for carcinogenic polycyclic aromatic hydrocarbons (PAHs) were developed using "relative potential potencies" (RPPs) to benzo(a)pyrene.
- {R} Chemical may exhibit the characteristic of reactivity as defined in 40 CFR 261.23. Contact an ERD toxicologist for further direction.
- {S} Criterion defaults to the chemical-specific water solubility limit.
- {T} Refer to the Toxic Substances Control Act (TSCA), 40 CFR 761, Subparts D and G, as amended to determine the applicability of TSCA cleanup standards. Alternatives to compliance with the standards listed below are possible under Subpart D. New releases may be subject to the standards identified in Subpart G. Use Part 201 soil direct contact criteria in the table below where TSCA standards are not applicable.

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LAND USE CATEGORY	TSCA, Subpart D	PART 201
Residential & Commercial I	1,000 ppb, or 10,000 ppb if capped	1,200 ppb
Industrial & Commercial II	1,000 ppb, or 10,000 ppb if capped	9,900 ppb
Commercial III	1,000 ppb, or 10,000 ppb if capped	14,000 ppb
Commercial IV	25,000 ppb, or 50,000 ppb if fenced and marked, or 1.0E+5 ppb if capped	26,000 ppb

- {U} Chemical may exhibit the characteristic of corrosivity as defined in 40 CFR 261.22. Contact an ERD toxicologist for further direction.
- {V} Criterion is the aesthetic drinking water value (secondary maximum contaminant level), as required by Sec. 20120(a)(5). Higher concentrations (up to 200 ug/L) may be acceptable on a case-by-case basis. Contact an ERD toxicologist for further explanation.
- {W} Concentrations of trihalomethanes in groundwater must be added together to determine compliance with the State of Michigan Drinking Water Standard of 100 ug/L. Concentrations of trihalomethanes in soil must be added together to determine compliance with the drinking water protection criterion of 2,000 ug/kg.
- {X} The GSI criterion shown is not protective for surface water that is used as a drinking water source. For groundwater discharges to the Great Lakes and their connecting waters or discharges in close proximity to water supply intake(s) in inland surface waters, the generic GSI criterion is the Surface Water Drinking Water Value (SWDWV) listed in the table below except for those SWDWV indicted with an asterisk. For SWDWV with an asterisk, the generic GSI criterion is the lesser of the SWDWV, the W₁ and the calculated FCV (see table in footnote {G}). Soil protection criteria based on the SWDWV are listed below except for those values with an asterisk. Soil protection criteria for compounds with an asterisk are calculated based on the GSI criteria developed using the procedure described in {G}. Contact an ERD toxicologist if further guidance is needed.

Chemical	Chemical Abstract Service Number	Surface Water Drinking Water Values (SWDWV) (ug/L)	Soil Protection Criteria for SWDWV (ug/Kg)
Acrylonitrile	107131	0.87	17
Alachlor	15972608	3.5	70
Arsenic	7440382	50	16,000
Atrazine	1912249	4.3	86
Benzene	71432	12	240
Butyl benzyl phthalate	85687	6.9	1,300
Cadmium	7440439	2.5*	*
Carbon tetrachloride	56235	5.6	110
Chloroform	67663	77	1,500
Chromium (III)	16065831	120*	*
Cyanazine	21725462	10 (M)	200
3,3'-Dichlorobenzidine	91941	0.3 (M)	500
1,2-Dichloroethane	107062	6	120
1,1-Dichloroethylene	75354	24	480

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Chemical	Chemical Abstract Service Number	Surface Water Drinking Water Values (SWDWW) (ug/L)	Soil Protection Criteria for SWDWW (ug/Kg)
1,2-Dichloropropane	78875	9.1	180
N,N-Dimethylacetamide	127195	700	14,000
1,4-Dioxane	123911	34	680
Hexachloroethane	67721	5.3	1,500
Isophorone	78591	310	6,200
Lead	7439921	14*	*
Methyl-tert-butyl ether (MTBE)	1634044	120	2,400
Methylene chloride	75092	47	940
Molybdenum	7439987	120	2,400
Nitrobenzene	98953	4.7	94
Pentachlorophenol	87865	1.8*	*
1,2,4,5-Tetrachlorobenzene	95943	2.8	3,300
1,1,2,2-Tetrachloroethane	79345	3.2	64
Tetrachloroethylene	127184	11	220
Tetrahydrofuran	109999	350	7,000
Thallium	7440280	1.2	910
1,1,2-Trichloroethane	79105	12	240
Trichloroethylene	79016	29	580

- {Y} Source size modifiers for Soil Inhalation Criteria (SIC) for Ambient Air. Consult the Technical Support Document (TSD) for the SIC or contact an ERD toxicologist if further guidance is needed.

Source Size sq. feet or acres	Modifier
400 sq feet	3.17
1000 sq feet	2.2
2000 sq feet	1.76
1/2 acre	1
1 acre	0.87
5 acre	0.66
10 acre	0.6
32 acre	0.5
100 acre	0.43

- {Z} Groundwater concentrations at or less than the health-based drinking water criterion are likely to have adverse odors. Development of an aesthetic drinking water criterion is in process. The soil health-based drinking water protection criterion may also not be protective of adverse aesthetic impacts. Adverse odors in groundwater and soil values protective of these effects must be addressed qualitatively until an aesthetic criterion is finalized.
- {AA} Certain contaminants detected in groundwater may be adsorbed to particulates rather than dissolved in water. Physiochemical properties which indicate high particulate adsorption include low water solubility (S), a high water-organic carbon partition coefficient (Koc) and a high octanol-water partition coefficient (Kow). Contaminants exhibiting these characteristics are not likely to be found in the dissolved phase. For these compounds, filtered groundwater samples may be more appropriate for comparison to the GCC. Examples are some PAHs, PCBs and some pesticides.

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- {AB} The state drinking water standard for asbestos is in units of fibers per milliliter of water (f/mL) longer than 10 millimicrons. Soil concentrations of asbestos are determined by polarized light microscopy (PLM). Consult an ERD toxicologist if further guidance is needed.
- {AC} The GSI criteria for unionized ammonia are 29 ug/L and 53 ug/L for coldwater and warmwater streams, respectively. The unionized ammonia concentration for comparison to the GSI is calculated from the measured total ammonia concentration based on pH and temperature for the receiving surface water and the discharge plume. The soil GSI PC are 580 ug/Kg and 1,100 ug/Kg for coldwater and warmwater streams, respectively. Consult an ERD toxicologist for further assistance.

ID = *Inadequate data* to develop criterion.

IP = Development of generic GSI value *in process*. This notation is used for those chemicals on the Rule 57 Water Quality Values table where the NLS (no literature search) notation is indicated for one or more of the endpoints required for development of a generic GSI. Additional work needed to address these endpoints may either be underway, or not yet initiated by the Surface Water Quality Division. Consult an ERD toxicologist for further assistance.

NA = Criterion or value is *not available* or, as is the case for Csat, *not applicable*.

NLL = Chemical is *not likely to leach* under most soil conditions.

NLV = Chemical is *not likely to volatilize* under most conditions.

Part 201 Cleanup Criteria Changes for May 28, 1999

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Chemical	CAS #	Criteria	Column Number
Acrylonitrile	107131	FESL	8
Ammonia	766441	GSI	3
		GSI PC	12
Boron	744042	GSI	3
		GSI PC	12
t-Butyl alcohol	75650	FESL	8
Butyl benzyl phthalate	85587	GSI	3
		GSI PC	12
Cadmium	744043	Res DCC	19
		Ind DCC	27
		Com III DCC	28
		Com IV DCC	29
Carbazole	86748	GSI	3
		GSI PC	12
Carbon disulfide	75150	FESL	8
Chlorobenzene	108907	FESL	8
Chloroethane	75003	FESL	8
Di-n-octyl phthalate	117840	GSI	3
		GSI PC	12
Diacetone alcohol	123422	FESL	8
Dibenzofuran	132649	GSI	3
		GSI PC	12

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Chemical	LFR CAS #	Criteria	Column Number
Dibromochloropropane	96128	Res GVIC	4
		Ind/Com GVIC	5
		GCC	6
		GCC PC	13
		Res SVIC	14
		Res Infinite VSIC	15
		Res VSIC 5M	16
		Res VSIC 2M	17
		Res PSIC	18
		Csat	20
		Ind/Com SVIC	22
		Ind/Com Infinite VSIC	23
		Ind/Com VSIC 5M	24
		Ind/Com VSIC 2M	25
		Ind/Com PSIC	26
		Ind DCC	27
		Com III DCC	28
		Com IV DCC	29
Dichlorodifluoromethane	75718	GSI	3
		GSI PC	12
1,1-Dichloroethane	75343	FESL	8
1,2-Dichloroethane	107062	FESL	8
1,3-Dichloropropene	542756	FESL	8
Diisopropylamine	108189	FESL	8
1,4-Dioxane	123911	FESL	8
Epichlorohydrin	106898	FESL	8
Ethanol	64175	Res DWC	1
		Ind/Com DWC	2
		FESL	8
		Res DW PC	11
		Ind/Com DW PC	21
Ethyl acetate	141786	FESL	8

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Chemical	LFR	CAS #	Criteria	Column Number
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Ethylene glycol monobutyl ether		111762	Res DWC	1
			Ind/Com DWC	2
			GCC	6
			Res DW PC	11
			GCC PC	13
			Res DCC	19
			Ind/Com DW PC	21
			Ind DCC	27
			Com III DCC	28
			Com IV DCC	29
Fluoranthene		206440	GSI	3
			GSI PC	12
Formic acid		64183	GSI	3
			GSI PC	12
Hexabromobenzene		37821	GSI	3
			GSI PC	12
Hexachlorocyclopentadiene (C-56)		77474	GSI	3
			GSI PC	12
n-Hexane		110543	FESL	8
Isophorone		78591	GSI	3
			GSI PC	12
Isopropyl benzene		98828	FESL	8
Manganese		743996	GSI	3
			GSI PC	12
Methyl-tert-butyl ether (MTBE)		163404	Res DWC	1
			Ind/Com DWC	2
			Res DW PC	11
			Ind/Com DW PC	21
Nitrobenzene		98953	GSI	3
			GSI PC	12
Polybrominated biphenyls		373242	GSI	3

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Chemical	CAS #	Criteria	Column Number
Pyridine	110861	FESL	8
1,2,4,5-Tetrachlorobenzene	95943	GSI	3
		GSI PC	12
Tetrahydrofuran	109999	GSI	3
		GSI PC	12
1,2,4-Trimethylbenzene	95636	Res DWC	1
		Ind/Com DWC	2
		FESL	8
		Res DW PC	11
		Ind/Com DW PC	21
1,3,5-Trimethylbenzene	108679	Res DWC	1
		Ind/Com DWC	2
		Res DW PC	11
		Ind/Com DW PC	21

Res DWC	= Residential Drinking Water Criteria
Ind/Com DWC	= Industrial/Commercial Drinking Water Criteria
GSI	= Groundwater Surface Water Interface Criteria
FESL	= Flammability and Explosivity Screening Level
Res DW PC	= Residential Drinking Water Protection Criteria for Soil
GSI PC	= Groundwater Surface Water Interface Protection Criteria for Soil
Res Infinite VSIC	= Residential Infinite Volatile Soil Inhalation Criteria
Res VSIC 5M	= Residential Volatile Soil Inhalation Criteria for 5 Meter Source Thickness
Res VSIC 2M	= Residential Volatile Soil Inhalation Criteria for 2 Meter Source Thickness
Res PSIC	= Residential Particulate Soil Inhalation Criteria
Res DCC	= Residential Soil Direct Contact Criteria
Csat	= Soil Saturation Concentration Screening Level
Ind/Com DW PC	= Industrial/Commercial Drinking Water Protection Criteria for Soil
Ind/Com Infinite VSIC	= Industrial/Commercial Infinite Volatile Soil Inhalation Criteria
Ind/Com VSIC 5M	= Industrial/Commercial Volatile Soil Inhalation Criteria for 5 Meter Source Thickness
Ind/Com VSIC 2M	= Industrial/Commercial Volatile Soil Inhalation Criteria for 2 Meter Source Thickness
Ind/Com PSIC	= Industrial/Commercial Particulate Soil Inhalation Criteria
Ind DCC	= Industrial Soil Direct Contact Criteria
Com III DCC	= Commercial III Soil Direct Contact Criteria
Com IV DCC	= Commercial IV Soil Direct Contact Criteria

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APPENDIX F

PRELIMINARY RISK EVALUATION CALCULATIONS

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TABLE : F1

**EXPOSURE SCENARIO : CONSTRUCTION WORKER
FUTURE FACILITY CONDITION
INCLUDES INGESTION AND DERMAL CONTACT WITH CHEMICALS IN SOIL
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN**

$$\text{EQUATION : INTAKE (mg/kg-day)} = \frac{\text{CS} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}} + \frac{\text{CS} \times \text{IR} \times \text{ABS} \times \text{CF} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

CS = Chemical Concentration in Soil (mg/kg)

IR = Ingestion Rate (mg soil/day)

SA = Skin Surface Area Available for Contact (cm²/event)

CF = Conversion Factor (10E-06 kg/mg)

EF = Exposure Frequency (days/years)

ED = Exposure Duration (years)

BW = Body Weight (kg)

AT = Averaging Time (period over which exposure is averaged --- days)

AF = Soil to Skin Adherence Factor (mg/cm²)

ABS = Absorption Factor (unitless)

VARIABLE ASSUMPTIONS

CS (mg/kg)	Mean	95% UCL	RAGS (1, 2)
IR (ADULT) (mg soil/day)	100	100	RAGS (1, 2)
SA (ADULT) (cm2)	3300	3300	RAGS (3)
CF (kg/mg)	0.000001	0.000001	RAGS (1, 2)
EF (days/year)	10 (2 weeks)	20 (1 month)	PROFESSIONAL JUDGEMENT
ED- CARCINOGEN (adult) (years)	1	1	PROFESSIONAL JUDGEMENT
ED- NON-CARCINOGEN (years)	1	1	PROFESSIONAL JUDGEMENT
BW (ADULT) (kg)	70	70	RAGS (1, 2)
AT - CARCINOGEN (yrs x days/yr)	25550	25550	RAGS (1, 2)
AT - NON-CARC. (yrs x days/yr)	365	365	RAGS (1, 2)
AF (mg/cm2)	0.02	0.20	RAGS (3)
ABS ORAL	chemical specific		
DERMAL	chemical specific		

NOTE:

(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND MANUAL, DECEMBER 1989, EPA/540/1-89/002.

(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991

(3) EPA RAGS, VOLUME 1: HUMAN HEALTH EVALUATION MANUAL, SUPPLEMENTAL GUIDANCE, DERMAL RISK ASSESSMENT, MARCH 14, 1999.

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TABLE : F2

MEDIA CONCENTRATIONS AND CHEMICAL CONSTANTS
EXPOSURE SCENARIO : CONSTRUCTION WORKER
FUTURE FACILITY CONDITION
INCLUDES INGESTION AND DERMAL CONTACT WITH CHEMICALS IN SOIL
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

SITE : GENERAL MOTORS CORPORATION
SECTOR : SWMU #31
LOCATION : ON-SITE
MEDIA : SOIL
POPULATION : ADULTS
EXPOSURE SCENARIO : CONSTRUCTION WORKER

PARAMETER	MEDIA CONCENTRATION				DERMAL RfD mg/kg/d	ORAL RfD mg/kg/d		DERMAL BIOAVAIL. FACTOR MEAN %/100		ORAL BIOAVAIL. FACTOR MEAN %/100		DERMAL BIOAVAIL. FACTOR MEAN %/100	
	MEAN mg/kg	RME mg/kg	ORAL CSF 1/(mg/kg/d)	DERMAL CSF 1/(mg/kg/d)		ORAL RfD mg/kg/d	DERMAL RfD mg/kg/d	BIOAVAIL. FACTOR MEAN %/100	RME %/100	BIOAVAIL. FACTOR MEAN %/100	RME %/100	BIOAVAIL. FACTOR MEAN %/100	RME %/100
<u>METALS</u>													
ARSENIC	5.25E+01	1.02E+02	1.50E+00	1.68E+00	2.85E-04	3.30E-04	2.85E-04	0.50	0.50	0.03	0.03	0.03	0.03

NOTE :
NA = NOT AVAILABLE

Richard Kowalski

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TABLE : F3

ESTIMATED CANCER RISKS
EXPOSURE SCENARIO : CONSTRUCTION WORKER
FUTURE FACILITY CONDITION
INCLUDES INGESTION AND DERMAL CONTACT WITH CHEMICALS IN SOIL
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

SITE : GENERAL MOTORS CORPORATION
SECTOR : SWMU #31
LOCATION : ON-SITE
MEDIA : SOIL
POPULATION : ADULTS
EXPOSURE SCENARIO : CONSTRUCTION WORKER

PARAMETER	INGESTION				DERMAL			
	LIFETIME AVERAGE		LIFETIME UPPER BOUND		LIFETIME AVERAGE		LIFETIME UPPER BOUND	
	DAILY INTAKE (mg/kg/day)	MEAN	RME	EXCESS CANCER RISK	DAILY INTAKE (mg/kg/day)	MEAN	RME	EXCESS CANCER RISK
<u>METALS</u> ARSENIC	1.47E-08	5.70E-08	2.20E-08	8.55E-08	5.81E-10	2.26E-08	9.18E-10	3.57E-08
	Ingestion :		2.20E-08	8.55E-08	Dermal :		9.18E-10	3.57E-08
TOTAL LIFETIME ADDED CANCER RISK :		2.29E-08					1.21E-07	

TABLE: F4

HAZARD INDEX
EXPOSURE SCENARIO : CONSTRUCTION WORKER
FUTURE FACILITY CONDITION
INCLUDES INGESTION AND DERMAL CONTACT WITH CHEMICALS IN SOIL
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

SITE : GENERAL MOTORS CORPORATION
SECTOR : SWMU #31
LOCATION : ON-SITE
MEDIA : SOIL
POPULATION : ADULTS
EXPOSURE SCENARIO : CONSTRUCTION WORKER

PARAMETER	INGESTION				DERMAL			
	ANNUAL AVERAGE		HAZARD QUOTIENT		ANNUAL AVERAGE		HAZARD QUOTIENT	
	DAILY INTAKE (mg/kg/d)	MEAN	RME	CDI/RfD	DAILY INTAKE (mg/kg/d)	MEAN	RME	CDI/RfD
METALS								
ARSENIC	1.03E-06	3.99E-06	3.42E-03	1.33E-02	1.13E-11	4.79E-10	4.33E-08	1.68E-06
Ingestion : 3.42E-03								
Dermal : 4.33E-08								
HAZARD INDEX: 3.42E-03								