DUE CARE PLAN (REVISION 5)

GENERAL MOTORS CORPORATION
PONTIAC NORTH CAMPUS FACILITY
PONTIAC, MICHIGAN

Prepared for

General Motors Corporation
Pontiac, Michigan

Prepared by

Environmental Corporate Remediation (ENCORE)

December 19, 2005

This Due Care Plan was reviewed by:

Name	Signature	Date	Date of 201 Criteria
Roger Johnson			**June 2000**
Roger Johnson			**December 2002**
Jeff Seibert			
Robert Fenn			

<u>Any Changes to the Plan will be incorporated and communicated to Plant Engineering, Plant Maintenance, and Plant Security, as appropriate.</u>

C O N T E N T S

Figures[1]

Tables

Appendices

[1] These Figures 1-1, 1-3, and 1-5 are from the RFI Supplemental Report No.1 (ENCORE 2003d). Figure 9-2 is from the Corrective Measures Proposal (ENCORE 2003e).

1.0 General Information Regarding the Plant and Surrounding Property

1.1 Site Description

The Pontiac North Campus Facility, hereafter referred to as the "Site" is comprised of approximately 595 acres, and is located in the City of Pontiac, Oakland County, Michigan (see Figure 1-1). The Site is bounded to the south by Montcalm Street, to the west by Baldwin Avenue and the Grand Trunk Western Railroad Line, to the east by Joslyn Avenue and a plant service road, and to the north by Walton Boulevard and the Grand Trunk Western Railroad Line. Surrounding areas consist of residential subdivisions and mixed commercial and light industrial use properties.

Buildings include the Powertrain Headquarters Building, the Powertrain Engineering Building, the Emissions Control Building, the ELPO Building, the wastewater treatment plant, and Plants 5, 11, 12, 14, 15, 17, 23, 25, 33, 49, 56, and 75. Plants 6, 8, 9, and 18 have been demolished.

There are no surface water bodies on site.

The topography of the Site is characterized by relatively low relief and is defined by glacial melt deposits.

Generic residential criteria are exceeded in one or more locations on this property; therefore, those portions of the property are defined as "Facilities" under Act 451, Part 201.

1.2 Operational History

The Site is divided into five onsite operational areas. Each of these areas and their associated Areas of Interest (AOIs) (Figure 1-5) are briefly described in the subsequent paragraphs with detailed discussions presented in the Current Conditions Report (CCR) (ENCORE 2001a) and CCR Addendum #1 (ENCORE 2002a). These areas are:

- Fiero;
- Demolition Area (DA);
- Metal Fabrication Division (MFD);
- Powertrain;
- Service Parts Operation (SPO)

1.2.1 Fiero

The Fiero plant area comprises approximately 81 acres located at the southwestern portion of the Site, including Plant 17 (Figure 1-3). The area is currently used for prototyping, storage and other non-manufacturing processes.

1.2.2 Demolition Area

The Demolition Area (DA) consists of approximately 48 acres of the south-central portion of the Site. There are currently no buildings or operations within the DA portion of the Site. The three former main operational buildings (the Foundry [Plant 6], Final Vehicle Assembly [Plant 8], and Engine Construction [Plant 9]) were demolished in 1995, 1997, and 1997, respectively. Since 1996, the DA has been the subject of ongoing soil and groundwater investigations. The former plant locations are shown on Figure 1-3.

1.2.3 Metal Fabrication Division

The Metal Fabrication Division (MFD) area consists of approximately 236 acres in the center of the Site (Figure 1-3). It also represents the most active area of the Site with regard to current manufacturing operations. Plants currently located in the MFD area include Plants 5, 11, 12, 14, 15, 23, 25, 33, 49, 56, and ELPO. Also present in the MFD area is a wastewater treatment plant (WWTP), which is located directly west of Plants 5 and 23.

1.2.4 Powertrain

The Powertrain area consists of approximately 150 acres located along the eastern portion of the Site (Figure 1-3). The Powertrain area primarily consists of office space contained within the Powertrain Headquarters Building and the Powertrain Engineering Building. A gasoline underground storage tank (UST) farm and fueling station occupy the southwest corner of the Powertrain Headquarters Building. Test laboratories and office space are located in the Emissions Control Building. Paved parking areas and roadways occupy much of the land. A vacant area exists where former Plant 18 was located.

1.2.5 Service Parts Operation

The Service Parts Operation (SPO) area consists of approximately 80 acres of land located at the northern portion of the Site (Figure 1-3) and includes Warehouse Storage and Shipping & Receiving operations, parts painting (Plant 75), and a large truck parking lot (north of Plants 25 and 33). The building and adjacent paved roadways and parking areas encompass nearly all of this area.

1.3 Geology

East-central Oakland County is characterized by glaciofluvial deposits that are common to Oakland County. The regional overburden material consists of glacial till composed mainly of clay and some sands. Overburden material is regionally underlain by shales of Early Mississippian age. Section 3 of the RFI Report (ENCORE 2002b) contains detailed discussions of the Site and Regional geology.

1.4 Hydrogeology

Regional groundwater flow is typically to the south and east corresponding in general to flow within the Clinton River watershed. Water-bearing formations exist in both the unconsolidated

and bedrock formations. In the Site area, four distinct water-bearing units are identified: unconfined water table aquifer, glacial aquifer, sand and gravel outwash aquifer and bedrock aquifer. A detailed description of these water-bearing units is included in Section 3 of the RFI Report (ENCORE 2002b).

Within the Site boundaries, surface water drainage is controlled by building and paved area drainage patterns. Storm water from the roofs of Site structures is directed through roof drains and downspouts to exterior Site surfaces or through underground piping to the storm water sewer system. The majority of the storm water runoff from exterior Site surfaces flows into catch basins that discharge to the storm water sewer system under National Pollutant Discharge Elimination System (NPDES) permits. There are six permitted storm water outfall points from the Site, which are discussed in detail in the RFI Report (ENCORE 2002b).

1.5 Land Use

The property is the site of an operating plant and is zoned industrial. There are no plans to change ownership of the property. A portion of the DA is under consideration as the location of a United States Post Office Distribution Center. There are no other plans to change the current land use.

1.5.1 Barriers

Barriers include fencing around portions the Site, 24-hour security on the property, and paving and building foundation in many areas.

1.5.2 Potential Receptors

There are no residential receptors on the Site as the property is and is anticipated to remain industrial. There will be routine workers in the plant operations, maintenance personnel in the equipment yards, and workers occasionally engaged in subsurface construction or maintenance activities. Trespassers are possible but would not be common due to security on Site.

The property is currently used for routine plant activities. Maintenance personnel work outside the plant buildings. There are also utility workers who occasionally work on the plant's underground utilities, and investigation and remediation personnel who could come into contact with subsurface soil and groundwater during sampling and remedial activities. These workers are present only during specified times of year. Analytes exceeding residential criteria constitute a "Facility" under Act 451, Part 201, and are noted in each area. However, only industrial personnel are reasonably expected potential receptors at this site. Therefore, only concentrations that are higher than the industrial criteria are considered potentially significant.

1.6 Potential Pathways/Media

1.6.1 Groundwater Pathways

Drinking Water - This is not a current or reasonably expected future pathway for the shallow, intermediate, or deep saturated zones underlying the Site. Potable water at the Site is obtained from Lake St. Clair through the City of Detroit and there will be future deed restrictions on the use of groundwater at this Site.

Groundwater Contact - This is a potential pathway in the shallow saturated zone during subsurface construction or maintenance activities because the water table at the Site at many locations is shallower than the expected maximum excavation depth of 10 to 12 ft bgs.

Inhalation (volatile) indoor air - This is a potential pathway in areas with occupied buildings.

1.6.2 Soil Pathways

Direct Contact - Direct contact with surface soil is a potential pathway for trespassers and workers engaged in routine activities in unpaved areas of the Site. Direct contact with subsurface soil is a potential pathway for workers engaged in subsurface construction or maintenance activities.

Inhalation (particulate) - This is a potential pathway in unvegetated and unpaved portions of the Site.

Inhalation (volatile) ambient - This is a potential pathway for workers engaged in routine activities and subsurface construction or maintenance activities.

Inhalation (volatile) indoor - This is a potential pathway in areas with occupied buildings.

1.6.3 Direct Contact with NAPL

This is a potential pathway for workers engaged in subsurface construction or maintenance activities in AOIs M-2, M-16, W-1, W-8, and W-10.

1.6.4 Surface Water Pathways

Direct Contact – Direct contact with surface water from Outfall 001 and the sewers is a potential exposure pathway for workers who conduct sampling or maintenance in these areas.

1.6.5 Sediment Pathways

Direct Contact – Direct contact with sediment on building rooftops or in the sewers is a potential exposure pathway for workers who conduct sampling or maintenance in these areas.

2.0 Areas of Investigation

Sampling on the Site has been done in conjunction with a RCRA Facility Investigation (RFI) and included analysis for Target Compound List VOCs, SVOCs, PCBs, dioxins, cyanide, and site-specific metals, see Appendix A of the RFI Report (ENCORE 2002b) for the complete analyte list. An additional investigation of the on-site sewers is ongoing. Details of the sampling and analysis completed during the RFI are provided in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

The following areas, discussed in the RFI Report, are not discussed in this Due Care Plan as they contain no locations where constituent concentrations in surface water, sediment, groundwater, soil, sewer water, sewer sediment, or rooftop sediment exceed the screening criteria for relevant pathways at the site, as discussed in Section 1.6 and 2.:

- F-08 – Former Paint Sludge Storage Area
- F-12 – Coal Storage Area
- F-13 – Former Oily Pea Gravel, Concrete, and Debris
- F-14 – Fuel AST Area
- M-04 – Plant 25 Former Gasoline UST and Current Gasoline AST Location
- M-11 – Plant 12 Former Gasoline Storage Area
- M-13 – AST Area West of Plant 14
- M-17 – Plant 15 Southern Piping Trench
- M-21 – Plant 14 Transformer Station
- M-23 – Plants 25, 33, and 75 Substation and Power Buildings
- M-24 – Plant 12 Transformer Oil Spill
- M-25 – Plant 33 Basement Sump Area
- P-06 – Emissions Control Building Former UST Farm and Former Stoddard Solvent AST
- P-10 – Former Plant 18
- W-03 – Former Plant 8 Flammable Liquid Storage Tank Farm
- W-11 – Salvage Yard Sump Drain
- W-13 – Montcalm Substation
- Plant 15 Rooftop
- Fiero Storm Sewer Outfall 002
- Fiero Storm Sewer Outfall 003
- New Sanitary Outfall
- Sanitary Sewer
- Sewers

The Due Care Plan discusses each of the areas investigated in the RFI and the Additional RFI Investigation where chemical concentrations are higher than residential criteria or LNAPL is present. The following areas are discussed in this section:

- Background Soil Sampling Locations
- F-07 – Wastewater Collection Sumps
- F-15 – Oil/Solvent Catch Basin

- M-01 – Wastewater Treatment Plant
- M-02 – Former Plating Operations Area
- M-05 – Former A-2 Fill Area
- M-07 – ELPO Building
- M-09 – Plant 11 Heat Treat Oil Storage Area
- M-16 – Plant 25 Basement Sump
- M-19 – Plant 5 Southern Access Railway
- P-09 – Former Plant 18 Pipeline Release Area
- P-11 – Trestle Pipeline Release
- W-01 – West Yard
- W-05 – Former Plant 8 Basement AST Area
- W-06 – Former Plant 8 Flammable Materials Storage Building
- W-08 – Former Plant 9 Basement AST Area
- W-09 – Former Central Foundry (Plant 6) Resin Spill and UST
- W-10 – Railroad Marshalling Area Drainage System
- SWHI – Sitewide Hydrogeologic Investigation
- Plant 17 (Fiero) Rooftop
- Storm Sewer Outfall 001
- Storm Sewer Outfall 002
- Fiero Storm Sewer Outfall 001
- Storm Water Detention Facility (SWDF)
- Groundwater as a Drinking Water Source

Tables 1 through 3 present concentrations exceeding either residential or industrial criterion. The entire data set used for this Due Care evaluation is included in Appendix E and M of the RFI Report (ENCORE 2002b), Appendix C of the RFI Supplemental Report No. 1 (ENCORE 2003d), the Draft Storm Sewer Interim Measures Report (ENCORE 2001b), the Sanitary Sewer Investigation (ENCORE 2003c), Draft Storm Sewer Remediation and Additional Investigations Report No. 1 (ENCORE 2004a), and the Draft Plant 17 (Fiero) Storm Sewer Investigation Report No. 1 (ENCORE 2004b).

2.1 Background Soil Sampling

This area consists of locations to the north and east of the Site that are believed to be unaffected by site activities.

2.1.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

There is no groundwater in this area.

Soil Pathway

Direct Contact – Arsenic exceeded the generic residential criteria at SB-02 (0-2 foot depth). Generic industrial criteria are not exceeded.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.1.2 Discussion

Generic industrial direct contact criteria are not exceeded for the current and reasonably expected future use of this area.

There is no Due Care issue at this area.

2.2 F-07 – Wastewater Collection Sumps

This area consists of a series of six wastewater collection sumps located in the Powerhouse, south of Plant 17. There has been no known release from the wastewater collection sumps. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.2.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Arsenic and lead exceeded the generic residential criteria at MWF7-01 (8-10 foot depth). Generic industrial criteria are not exceeded.

Inhalation (particulate) – Chromium (total) exceeded the generic industrial criteria for chromium VI at MWF7-01 (8-10 foot depth).

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.2.2 Discussion

Generic industrial direct contact criteria are not exceeded for the current and reasonably expected future use of this area.

Chromium (total) at the 8-10 ft depth interval exceeded the generic industrial particulate inhalation criterion, which includes assumptions regarding particulate emissions from vehicle traffic on unpaved roads. However, at this depth these exposures are not likely. The maximum Chromium (total) soil concentration (335 mg/kg) does not exceed particulate inhalation criteria during a heavy construction scenario (Appendix B).

The cumulative cancer risk and non-cancer HI estimates for inhalation of particulates during such activities are 2E-5 and 5E-1, respectively, as calculated using maximum detected concentrations. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and below the non-cancer HI limit of 1 (Table 4).

There is no Due Care issue at this AOI.

2.3 F-15 – Oil/Solvent Collection Sumps

This area is a catch basin that is located in the south loading dock at Fiero Plant 17. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.3.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Arsenic exceeded the generic residential direct contact criteria at MWF15 (8-10 foot depth). Generic industrial direct contact criteria were not exceeded.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – 1,1-dichloroethene exceeded generic residential volatilization-to-ambient-air inhalation criteria at BF15-02 (0-2 foot depth). Generic industrial volatilization-to-ambient air inhalation criteria were not exceeded.

Inhalation (volatile) indoor – 1,1-dichloroethene exceeded generic residential volatilization-to-indoor-air inhalation criteria at BF15-01 (0-2 foot depth) and BF15-02 (0-2 foot depth and 8-10 foot depth). Tetrachloroethene exceeded at BF15-01 (0-2 foot depth), BF15-02 (0-2 foot depth), and BF15-04 (0-2 foot depth). Generic industrial volatilization-to-indoor air inhalation criteria was exceeded for 1,1-dichloroethene and tetrachloroethene at BF15-02 (0-2 foot depth).

2.3.2 Discussion

Generic industrial direct contact and inhalation of ambient air criteria were not exceeded for the current and reasonably expected future use of this area.

1,1-Dichloroethene and tetrachloroethene exceeded the generic industrial inhalation criteria for indoor air in boring BF15-02. This boring is located within a former oil catch basin at the

loading dock of Plant 17 that was approximately 2 by 2 feet and 5 feet deep. This catch basin was taken out of service and filled with 5 feet of concrete in May 2002. The RFI data show that the extent of 1,1-dichloroethene and tetrachloroethene in soil under the basin is minimal. The sample immediately under the sump (5-7 feet below grade) had concentrations exceeding generic industrial indoor air criteria. However, the deeper intervals (13-15 and 25-29 feet below grade) from the boring did not have concentrations that exceed the criteria. Additionally, the samples from the boring located adjacent to the catch basin did not have concentrations that exceed the criteria at any of the sampled intervals (0-2, 8-10, and 18-20 feet below grade). The release from this location is limited in vertical and horizontal extent and potential exposure to industrial indoor air inhalation in minimal and does not constitute a Due Care issue.

There is no Due Care issue at this AOI.

2.4 M-01 – Wastewater Treatment Plant

This area of the WWTP is located west of Plants 5, 14, 23, and 56. This area is considered an AOI because of the type of materials stored and treated (industrial wastes), a history of documented releases, and its previous identification as a SWMU by EPA. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b).

2.4.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air – No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Cyanide (total) exceeded generic residential criteria at BM1-02 (0-2 foot depth). Arsenic exceeded generic residential criteria at MWM1-03, SM1-02, and SM1-09 (all at 0-2 foot depths). Lead exceeded generic residential criteria at SM1-03, SM1-04, and SM1-08 (all at 0-2 foot depths). PCBs (total) exceeded generic residential criteria at SM1-07 (0-2 foot depth), BM1-07 (0-2 and 2-4 foot depths), four grid sample locations around BM1-07 (0-2 and 2-4 foot depths), BM1-08 (0-2 and 2-4 foot depths), and five grid sample locations around BM1-08 (2-4 and 4-6 foot depths). The generic industrial criterion was exceeded only for PCBs (total) at BM1-07 (0-2 and 2-4 foot depths), BM1-08 (0-2 and 2-4 foot depth), and four of the grid sample locations around BM1-08 (2-4 and 4-6 foot depths).

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.4.2 Discussion

PCBs (total) exceeded generic industrial direct contact criteria in nine samples in this AOI. Of these nine samples, seven are not surface (0-2 foot) samples and could be contacted by workers

only during occasional subsurface construction or maintenance activities. There are potential exposure pathways to PCBs at this AOI.

The cumulative cancer risk and non-cancer HI estimates for direct contact during such activities are 2E-5 and 5E-1, respectively, as calculated using 95% nonparametric bootstrap UCL concentrations for cyanide (total) and PCBs (total), and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and below the non-cancer HI limit of 1 (Table 5).

There is no Due Care issue at this AOI.

2.5 M-02 – Former Plating Operations Area

This area consists of a Former Plating Operations Area located in the western portion of Plant 56 (old Plant 2), near Dock 34. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.5.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Cyanide (total) exceeded residential direct contact criteria at BM2-04 (4-6 foot depth), BM2-07 (0-2 and 4-6 foot depths), BM2-10 (4-6 foot depth), BM2-11 (4-6 foot depth), BM2-13 (0-2 foot depth), and MWM2-05 (0-2 foot depth). Generic industrial direct contact criteria were not exceeded.

Inhalation (particulate) – Manganese exceed industrial particulate inhalation criteria at MWM2-06 (6-8 foot depth).

Inhalation (volatile) ambient – 1,1-dichloroethene exceeded the generic residential volatilization-to-ambient-air inhalation criteria at BM2-10 (4-6 foot depth). Generic industrial volatilization-to-ambient-air inhalation criteria were not exceeded.

Inhalation (volatile) indoor – 1,1-dichloroethene exceeded residential and industrial criteria for indoor air at BM2-10 (4-6 and 8-10 foot depths).

NAPL Direct Contact and Vapor Inhalation

Potential exposure in this area is possible and is evaluated in Appendices F.2 and F.3 of the RFI Supplemental Report No.1 (ENCORE 2003d).

2.5.2 Discussion

Generic industrial direct contact and inhalation of ambient air criteria were not exceeded for the reasonably expected use of this area.

1,1-Dichloroethene exceeded the generic industrial volatilization-to-indoor-air inhalation criterion at BM2-10 at depths of 4-6 and 8-10 feet. There is an operational building at this location and potential exposures are possible. However, the 95% nonparametric bootstrap UCL concentration of 0.13 mg/kg does not exceed the generic industrial criterion of 0.33 mg/kg.

Manganese at the 6-8 ft depth interval exceeded the generic industrial particulate inhalation criterion, which includes assumptions regarding particulate emissions from vehicle traffic on unpaved roads. However, at this depth these exposures are not likely. The maximum manganese soil concentration (2,220 mg/kg) does not present an unacceptable risk for a heavy construction scenario (Appendix B). The cumulative cancer risk and non-cancer HI estimates for inhalation of particulates during such activities are 2E-5 and 1, respectively, as calculated using maximum detected concentrations. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and at the non-cancer HI limit of 1 (Table 5).

Construction activities within the extent of LNAPL need to be limited in extent and duration per Appendix F.2 of the RFI Supplemental Report No.1 (ENCORE 2003d), unless proper personal protection equipment (PPE) is used and appropriate air monitoring is conducted during such activities.

Potential indoor air exposure to constituents of the LNAPL under the building at AOI M-02 is not expected to pose an unacceptable risk, as summarized in Section 5 and discussed in in Appendix F.3 of the RFI Supplemental Report No.1 (ENCORE 2003d). Potential inhalation exposure is not expected to be significant because the estimated vapor concentrations in equilibrium with the LNAPL under AOI M-02 are lower than the occupational inhalation criteria. Actual concentrations of the LNAPL constituents in indoor air would be much lower than the estimated equilibrium vapor concentrations because migration of vapors from the LNAPL into indoor air, if any, would be accompanied by significant attenuation and dilution.

There is a Due Care issue at this AOI.

2.5.3 Procedures for Maintenance of Due Care

Excavation activities within the extent of LNAPL must be limited in size and duration, unless proper PPE is used during such activities. Additionally, persons conducting excavation activities within the extent of LNAPL must follow a Site Health and Safety Plan (HASP) and must be OSHA 40-hour HAZWOPER trained. This limitation will remain in effect until future work deems these restrictions unnecessary.

2.5.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.5.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

Remediation
Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.5.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.5.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and the health and safety requirements associated with working in this area.

Print Name	Signature	Date

2.6 M-05 – Former A-2 Fill Area

This area consists of the former A-2 fill area, which covers approximately 10 acres under Plants 25 and 33 (previously Plants 51 and 55), the east parking lot area in the MFD area, and under the SPO Building (Plant 75). More detailed information on this AOI is available in the RFI Report (ENCORE 2002b).

2.6.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxicity Equivalent (2,3,7,8-TCDD TEQ) and lead exceeded generic residential direct contact criteria at MWM5-01 (2-4 foot depth). The lead concentration at this location also exceeded generic industrial direct contact criteria.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.6.2 Discussion

Lead exceeded generic direct contact criteria at MWM5-01 at a depth of 2-4 feet. However, the arithmetic mean soil lead concentration of 148 mg/kg does not exceed either the generic residential criterion or the generic industrial criterion. The arithmetic mean soil lead concentration is the appropriate exposure point concentration for comparison with the soil lead criteria, to be consistent with the blood lead modeling assumptions used in deriving these criteria.

Generic industrial direct contact criteria were not exceeded for the current and reasonably expected future use of this AOI.

There is no Due Care issue at this AOI.

2.7 M-07 – ELPO Building

This area consists of the ELPO Building. The ELPO operation is located east of Plants 5 and 8 and southwest of Plant 18. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.7.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – No analytes exceeded these criteria.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – Tetrachloroethene exceeded generic residential volatilization-to-indoor-air inhalation criteria at MWM7-03 (0-2 foot depth). Generic industrial volatilization-to-indoor-air inhalation criteria were not exceeded.

2.7.2 Discussion

Generic industrial indoor air criteria were not exceeded for the current and reasonably expected future use of this area.

There is no Due Care issue at this AOI.

2.8 M-09 – Plant 11 Heat Treat Oil Storage Area

This area consists of four ASTs located near the eastern wall of Plant 11, contained inside a floor pit with a sump that discharges to the WWTP. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.8.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Arsenic exceeded generic residential direct contact criteria at MWM9-02 (0-2 and 8-10 foot depths). Generic industrial direct contact criteria were not exceeded.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.8.2 Discussion

Generic industrial direct contact criteria were not exceeded for the current and reasonably expected future use of this area.

There is no Due Care issue at this AOI.

2.9 M-16 – Plant 25 Basement Sump

This area consists of the basement area of Plant 25, which contains a sludge tank, pumping system, and several floor sumps. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b).

2.9.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – No analytes exceeded these criteria.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

NAPL Direct Contact and Vapor Inhalation

Potential exposure is possible and is evaluated in Appendices F.2 and F.3 of the RFI Supplemental Report No.1 (ENCORE 2003d).

2.9.2 Discussion

Generic industrial direct contact and inhalation criteria were not exceeded for the reasonably expected use of this area.

Construction activities within the extent of LNAPL need to be limited in extent and duration per Appendix F.2 of the RFI Supplemental Report No.1 (ENCORE 2003d), unless proper personal protection equipment (PPE) is used and appropriate air monitoring is conducted during such activities.

Potential indoor air exposure to constituents of the LNAPL under the building at AOI M-16 is not expected to pose an unacceptable risk, as summarized in Section 5 and discussed in Appendix F.3 of the RFI Supplemental Report No.1 (ENCORE 2003d). Potential inhalation exposure is not expected to be significant because the estimated vapor concentrations in equilibrium with the LNAPL under AOI M-16 are lower than the occupational inhalation criteria. Actual concentrations of the LNAPL constituents in indoor air would be much lower than the estimated equilibrium vapor concentrations because migration of vapors from the LNAPL into indoor air, if any, would be accompanied by significant attenuation and dilution.

There is a Due Care issue at this AOI.

2.9.3 Procedures for Maintenance of Due Care

Excavation activities within the extent of LNAPL must be limited in size and duration, unless proper PPE is used during such activities. Additionally, persons conducting excavation activities within the extent of LNAPL must follow a Site Health and Safety Plan (HASP) and must be OSHA 40-hour HAZWOPER trained. This limitation will remain in effect until future work deems these restrictions unnecessary.

2.9.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.9.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
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Remediation
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Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.9.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.9.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and the health and safety requirements associated with working in this area.

Print Name	Signature	Date

2.10 M-19 – Plant 5 Southern Access Railway

This area is located at the southwestern end of Plant 5. The railway is approximately 600 feet long and spans the western half of the building along the southern side. The railway was used to transport materials into and out of Plant 5. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b).

2.10.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Arsenic exceeded generic residential direct contact criteria at SM19-01, SM19-02, and SM19-03 (all at 0-2 foot depths). Lead exceeded generic residential direct contact criteria at SM19-01 (0-2 foot depth). Generic industrial direct contact criteria were not exceeded.

Inhalation (particulate) – Chromium (total) and manganese exceeded generic residential and industrial particulate inhalation criteria at SM19-05 and SM19-06 (both at 0-2 foot depths). Manganese exceeded generic industrial particulate inhalation criteria at SM19-04 and SM19-10 (both at 0-2 foot depths).

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.10.2 Discussion

Generic direct contact criteria are not exceeded for the current and reasonably expected future use of this area.

Chromium (total) exceeded generic industrial particulate inhalation criteria at two locations, both at depths of 0-2 feet. However, the surface soil was subsequently characterized for hexavalent and trivalent chromium. The Chromium VI concentrations were found to range from 0.3 to 1.9

mg/kg and the Chromium III concentrations were found to range from approximately 7 to 670 mg/kg, which do not exceed the residential or industrial criteria for Chromium VI or III. The maximum detected concentration of manganese (12,600 mg/kg in surface soil) exceeded the generic industrial particulate inhalation criteria, which includes assumptions regarding particulate emissions from vehicle traffic on unpaved roads. This AOI is a 50 ft by 700 ft railroad spur that is covered by gravel and pavement. Due to the limited size of this AOI and its location (between Plant 5 & 23 and Former Plant 8) high volumes of vehicular traffic on bare soil as assumed in the derivation of the generic industrial particulate inhalation criteria are unlikely. The generic industrial particulate inhalation criterion for manganese due to only wind erosion is 22,300 mg/kg (Appendix A). Manganese does not exceed the wind erosion particulate inhalation criterion, and therefore does not present a Due Care issue.

The cumulative cancer risk and non-cancer HI estimates for inhalation of particulates are 2E-5 and 7E-1, respectively, as calculated using 95% nonparametric bootstrap UCL concentrations for manganese, mercury, and PCBs (total), and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and below the non-cancer HI limit of 1 (Table 5).

There is no Due Care issue at this AOI.

2.11 P-09 – Pipeline Release Area

This area consists of the eastern portion of Former Plant 18. More detailed information on this AOI is available in the RFI Work Plan Addendum #5 (ENCORE 2003a) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.11.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air – No analytes exceeded these criteria.

Soil Pathway

Direct Contact – PCBs (total) exceeded generic residential direct contact criteria at BP9-08, PB9-10, and MWP9-02 (0-2 foot depth). Benzo(a)pyrene exceeded generic residential direct contact criteria at BP9-06, BP9-07, BP9-08, BP9-10, and MWP9-02 (0-2 foot depth). Dibenz(a,h)anthracene exceeded generic residential direct contact criteria at BP9-08 (0-2 foot depth). Generic industrial direct contact criteria were exceeded for benzo(a)pyrene at BP9-07 and BP9-08 (0-2 foot depth) and PCBs (total) at MWP9-02 (0-2 foot depth).

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.11.2 Discussion

Generic industrial groundwater and soil inhalation criteria are not exceeded for the current and reasonably expected future use of this area.

Benzo(a)pyrene exceeded generic industrial direct contact criteria at BP9-07 and BP9-08 at depths of 0-2 feet. PCBs (total) exceeded generic industrial direct contact criteria at MWP9-02 at a depth of 0-2 feet. At this depth, workers could come into direct contact with the soil during

routine activities and subsurface construction or maintenance activities. Potential exposures at this AOI are possible.

The cumulative cancer risk and non-cancer HI estimates for direct contact and inhalation of particulates during such activities are 9E-5 and 4E-1, respectively, as calculated using 95% nonparametric bootstrap UCL concentrations for PCBs, and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and at the non-cancer HI limit of 1 (Table 5).

There is no Due Care issue at this AOI.

2.12 P-11 – Trestle Pipeline Release

This area consists of the immediate area surrounding a release from an overhead trestle pipeline that occurred in March 2003 in western portion of Former Plant 18. More detailed information on this AOI is available in the RFI Work Plan Addendum #7 (ENCORE 2003b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.12.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air – No analytes exceeded these criteria.

Soil Pathway

Direct Contact – PCBs (total) exceeded generic residential direct contact criteria at MWP11-02 (0-2 foot depth). Generic industrial direct contact criteria were not exceeded.

Inhalation (particulate) – Manganese exceeded generic industrial particulate inhalation criteria at BP11-06 (0-2 foot depth).

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.12.2 Discussion

Generic direct contact criteria are not exceeded for the current and reasonably expected future use of this area.

Manganese at the 0-2 ft depth interval exceeded the generic industrial particulate inhalation criterion, which includes assumptions regarding particulate emissions from vehicle traffic on unpaved roads. However, the Trestle Pipeline Release area is in the western portion of Former Plant 18 and is covered with a mixture of pavement, weeds, grass, and gravel. High volumes of vehicular traffic on bare soil, as assumed in the derivation of the generic industrial particulate inhalation criteria, are unlikely in this area due to debris and other obstructions. The generic industrial particulate inhalation criterion for manganese due to only wind erosion is 22,300

mg/kg (Appendix A). Manganese does not exceed the wind erosion particulate inhalation criterion, and therefore does not present a Due Care issue.

There is no Due Care issue at this AOI.

2.13 W-01 – West Yard

This area consists of the West Yard, an area of approximately 20 acres located in the southwest corner of the DA. It is bounded to the south by Montcalm Street, to the west by the Grand Trunk Western Railroad, to the east by the former Foundry (Plant 6) and to the north by the former Plant 9 (demolished in 1997). The West Yard area also includes the former A-1 fill area. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.13.1 Exposure Pathways

Surface Water Pathway

No analytes exceeded these criteria.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – 2,3,7,8-TCDD TEQ generic groundwater contact criteria at MW-28-99 and MW-34-99. PCBs (total) exceeded generic groundwater contact criteria at MW-39-99.

Inhalation (volatile) acute - No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Benzo(a)pyrene exceeded generic residential direct contact criteria at BMWW1-02 (2-4 and 4-6 foot depths). PCBs (total) exceeded generic residential direct contact criteria at BMWW1-02 (2-4 and 4-6 foot depths), MWW1-01 (4-6 foot depth), and SBMW22 (16-18 foot depth). 2,3,7,8-TCDD TEQ exceeded generic residential direct contact criteria at BW1-03 (4-6 foot depth), BW1-10 (8-10 and 12-14 foot depths). Arsenic exceeded generic residential direct contact criteria at BW1-03 (4-6 foot depth), SBSB5 (4-6 foot depth), SSTT4 (0-6 foot depth), and the surficial Seep sample (SEEP1) collected at the southern boundary of this AOI. Iron and lead exceeded generic residential direct contact criteria at SBSB5 (4-6 foot depth).

Benzo(a)pyrene exceeded generic residential and industrial direct contact criteria at SSTT2 (0-6 foot depth). Butylbenzylphthalate exceeded generic residential and industrial direct contact criteria at SBTT3 (5-9 foot depth). PCBs (total) exceeded generic residential and industrial direct contact criteria at BW1-01 (8-10 foot depth), BW1-10 (8-10 and 12-14 foot depths), SBMW20 (23-25 foot depth), and SBTT3 (5-9

foot depth). 2,3,7,8-TCDD TEQ exceeded generic residential and industrial direct contact criteria at BW1-01 (8-10 foot depth). Arsenic exceeded generic residential and industrial direct contact criteria at SSTT5 (surface sample). Antimony exceeded generic residential and industrial direct contact criteria at SBSB5 (4-6 foot depth). Lead exceeded generic residential and industrial direct contact criteria at BW1-01 (8-10 foot depth), SBMW22 (16-18 foot depth), and SBWD2 (24-26 foot depth).

Inhalation (particulate) – Chromium (total) exceeded generic residential and industrial particulate inhalation criteria at BW1-01 (8-10 foot depth), BW1-03 (4-6 foot depth), BW1-11a (6-8 foot depth), SBSB5 (4-6 foot depth), SBTT4 (3-10 foot depth), SSTT4 and SSTT5 (both 0-6 foot depth). Manganese exceeded generic residential and industrial particulate inhalation criteria at BW1-02 (0-2 foot depth), BW1-03 (4-6 foot depth), BW1-07 (0-2 foot depth), BW1-08 (11-13 foot depth), BW1-11a (6-8 foot depth), SSTT4, and SSTT5 (both 0-6 foot depth). Manganese exceeded generic industrial particulate inhalation criteria only at BW1-04 (0-2 foot depth), BW1-09 (0-2 foot depth), SBSB5 (4-6 foot depth), and SBMW22 (16-18 foot depth).

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

NAPL Direct Contact and Vapor Inhalation

Potential exposure is possible and is evaluated in Appendix C.2 of the Environmental Indicators Report (ENVIRON 2002).

2.13.2 Discussion

PCBs (total) and 2,3,7,8-TCDD TEQ exceeded groundwater contact criteria in multiple locations at this AOI. These locations are where LNAPL has been observed in wells. The samples are believed to be part water and part LNAPL. For this reason, the generic direct contact criteria for contact with groundwater are not applicable. Risk calculations for contact with LNAPL and groundwater found that risk from exposure during occasional, short-duration contact would not result in unacceptable risk, even if no personal protective equipment (PPE) were worn (ENVIRON 2002). However, prolonged contact with LNAPL and groundwater during subsurface activities that are longer than assumed in the risk calculations could have a potential to cause adverse health effects if proper PPE is not used, and therefore should be avoided.

Lead exceeded generic industrial direct contact criteria at SBWD2 (24-26 foot depth). However, the arithmetic mean soil lead concentration of 153 mg/kg does not exceed either the generic residential criterion or the generic industrial criterion. The arithmetic mean soil lead concentration is the appropriate exposure point concentration for comparison with the soil lead criteria, to be consistent with the blood lead modeling assumptions used in deriving these criteria.

Benzo(a)pyrene and arsenic exceeded generic industrial direct contact criteria at the surface. Direct contact exposure, during routine activities, is possible at these areas.

Butylbenzylphthalate, PCBs (total), 2,3,7,8-TCDD TEQ, and antimony exceeded generic industrial direct contact criteria at depths of 4-6 to 23-25 feet deep. Direct contact exposure, during subsurface construction or maintenance, is possible where the depth is less than ten feet.

Chromium (total) exceeded generic industrial particulate inhalation criteria at seven locations, at depths ranging from surface to 8-10 feet. However, the surface and subsurface soil was subsequently characterized for hexavalent and trivalent chromium. The Chromium VI concentrations were non-detect in all samples and the Chromium III concentrations were found to range from approximately 13 to 376 mg/kg, which do not exceed the residential or industrial criteria for Chromium VI or III.

Manganese exceeded generic industrial particulate inhalation criteria in a number of locations in this AOI. The depths of these samples range from surface samples to over 10 feet deep. Particulate inhalation is a potential exposure both during routine activities and during subsurface activities. Potential exposure of routine workers to surface soil in unpaved areas and potential exposure of subsurface construction or maintenance workers to surface and subsurface soil at AOI W-1 are possible. The maximum detected concentration of manganese (7,260 mg/kg in soil) exceeded the generic industrial particulate inhalation criteria, which includes assumptions regarding particulate emissions from vehicle traffic on unpaved roads. However, the West Yard is in a former demolition area and is covered with a mixture of pavement, weeds, grass, and gravel. High volumes of vehicular traffic on bare soil as assumed in the derivation of the generic industrial particulate inhalation criteria are unlikely in this area due to the foundations of former buildings and the rail spur that runs though the West Yard. The generic industrial particulate inhalation criterion for manganese due to only wind erosion is 22,300 mg/kg (Appendix A). Manganese does not exceed the wind erosion particulate inhalation criterion, and therefore does not present a Due Care issue.

The cumulative cancer risk and non-cancer HI estimates for direct contact and inhalation of particulates during routine activities are 4E-5 and 1, respectively, as calculated using 95% nonparametric bootstrap UCL concentrations for benzene, xylenes (total), benzo(a)pyrene, 2-methylnaphthalene, naphthalene, PCBs, antimony, arsenic, chromium (total), copper, iron, manganese, mercury, thallium, and 2,3,7,8-TCDD TEQ, and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and at the non-cancer HI limit of 1 (Table 5).

The cumulative cancer risk and non-cancer HI estimates for ingestion, direct contact and inhalation during construction or maintenance activities are 9E-6 and 5E-1, respectively, as calculated using exposure factors appropriate for such activities, 95% nonparametric bootstrap UCL concentrations for 2-methylnaphthalene, naphthalene, PCBs, and manganese, and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and at the non-cancer HI limit of 1 (Table 5).

Construction activities within the extent of LNAPL need to be limited in extent and duration per Appendix C.2 of the EI Report (ENVIRON 2002), unless proper personal protection equipment (PPE) is used and appropriate air monitoring is conducted during such activities.

There is a Due Care issue at this AOI.

2.13.3 Procedures for Maintenance of Due Care

Excavation activities within the extent of LNAPL must be limited in size and duration, unless proper PPE is used and appropriate air monitoring is conducted during such activities. Additionally, persons conducting excavation activities within the extent of LNAPL must follow a Site Health and Safety Plan (HASP) and must be OSHA 40-hour HAZWOPER trained. This limitation will remain in effect until future work deems these restrictions unnecessary.

2.13.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.13.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

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Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.13.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.13.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

Print Name	Signature	Date

2.14 W-05 – Plant 8 Basement AST Area

This area previously consisted of seventeen ASTs located in the basement of the former Plant 8. All ASTs have been removed and Plant 8 has been decommissioned and was demolished in 1997. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b).

2.14.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – PCBs (total) exceeded generic residential direct contact criteria at BW5-02 (0-2 and 8-10 foot depths). PCBs (total) also exceeded generic industrial direct contact criteria at BW5-02 (8-10 foot depth).

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.14.2 Discussion

PCBs (total) exceed generic industrial direct contact criteria at BW5-02 at a depth of 8-10 feet. At this depth direct contact would only occur during subsurface construction or maintenance activities. Exposures at this AOI are possible. The cumulative cancer risk and non-cancer HI estimates for direct contact during such activities are 2E-5 and 6E-1, respectively, as calculated using 95% nonparametric bootstrap UCL concentrations for PCBs (total) and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and below the non-cancer HI limit of 1 (Table 5).

There is no Due Care issue at this AOI.

2.15 W-06 – Former Plant 8 Flammable Materials Storage Building

This area consists of the former Plant 8 Flammable Materials Storage Building located in the northwestern corner of the DA. The storage building was decommissioned and demolished prior to RFI activities. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b).

2.15.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – PCBs (total) exceeded generic residential direct contact criteria at BW6-05 (2-4 foot depth). Generic industrial direct contact criteria were not exceeded.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.15.2 Discussion

Generic industrial direct contact criteria were not exceeded for the current and reasonably expected future use at this area.

There is no Due Care issue at this AOI.

2.16 W-08 – Former Plant 9 Basement AST Area

This area consists of 12 Aboveground Storage Tanks formerly located in the Plant 9 basement. All tanks have been removed and Plant 9 has been decommissioned and demolished. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.16.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – 2,3,7,8-TCDD TEQ exceeded generic direct contact criteria at MWW8-08.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Benzo(a)pyrene exceeded generic residential direct contact criteria at BW8-06 (2-4 foot depth). Arsenic exceeded generic residential direct contact criteria at BW8-06, MWW8-02 and MWW8-05 (all at 0-2 foot depths). Copper exceeded generic residential direct contact criteria at BW8-06 (6-8 foot depth). Lead exceeded generic residential direct contact criteria at MWW8-02 (0-2 foot depth).

Arsenic exceeded the generic residential and industrial direct contact criteria at BW8-06 (6-8 foot depth). Lead exceeded the generic residential and industrial direct contact criteria at BW8-06 (2-4 and 6-8 foot depths).

Inhalation (particulate) – Chromium (total) exceeded generic residential and industrial particulate inhalation criteria at BW8-06 (0-2 and 2-4 foot depths), MWW8-02, and SW8-03 (both at 0-2 foot depths). Manganese exceeded generic industrial particulate inhalation criteria at MWW8-02, and SW8-04 (both at 0-2 foot depths).

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

NAPL Direct Contact and Vapor Inhalation

Potential exposure is possible and is evaluated in Appendix C.2 of the Environmental Indicators Report (ENVIRON 2002).

2.16.2 Discussion

2,3,7,8-TCDD TEQ exceeded groundwater contact criteria at MWW8-08 in this AOI. This location is where LNAPL has been observed in the well. The sample is believed to be part water and part LNAPL. For this reason, the generic direct contact criteria for contact with groundwater are not applicable. Risk calculations for contact with LNAPL and groundwater found that risk from exposure during occasional, short-duration contact would not result in unacceptable risk, even if no personal protective equipment (PPE) were worn (ENVIRON 2002). However, prolonged contact with LNAPL and groundwater during subsurface activities that are longer than assumed in the risk calculations could have a potential to cause adverse health effects is proper PPE is not used, and therefore should be avoided.

Arsenic and lead exceeded generic industrial direct contact criteria in the subsurface. Direct contact exposure, during intrusive construction or maintenance activities, is possible at these areas.

Chromium (total) exceeded generic industrial particulate inhalation criteria at three locations, at depths of 0-2 feet and at a depth of 2-4 feet at BW8-06. However, the surface soil was subsequently characterized for hexavalent and trivalent chromium. The Chromium VI concentrations were found to range from 0.6 to 1.3 mg/kg and the Chromium III concentrations were found to range from approximately 31 to 316 mg/kg, which do not exceed the residential or industrial criteria for Chromium VI or III.

Manganese exceeded generic industrial particulate inhalation criteria at depths of 0-2 feet. Exposure is possible at this AOI. The maximum detected concentration of 2,780 mg/kg exceeded the generic industrial particulate inhalation criterion, which includes assumptions regarding particulate emissions from vehicle traffic on unpaved roads. This area is in a former demolition area and consists of paved, gravel, and grass/weeds in the footprint of Former Plant 9. High volumes of vehicular traffic on bare soil as assumed in the derivation of the generic industrial particulate inhalation criteria are unlikely in this area due to the foundations of former buildings and uneven terrain. The generic industrial particulate inhalation criterion for manganese due to only wind erosion is 22,300 mg/kg (Appendix A). Manganese does not exceed the wind erosion particulate inhalation criterion, and therefore does not present a Due Care issue.

The cumulative cancer risk and non-cancer HI estimates for direct contact and the inhalation of particulates during industrial activities are 7E-5 and 9E-1, respectively, as calculated using 95% nonparametric bootstrap concentrations for antimony, chromium (total), copper, and mercury, and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and below the non-cancer HI limit of 1 (Table 5).

Construction activities within the extent of LNAPL need to be limited in extent and duration per Appendix C.2 of the EI Report (ENVIRON 2002), unless proper personal protection equipment (PPE) is used and appropriate air monitoring is conducted during such activities.

There is a Due Care issue at this AOI.

2.16.3 Procedures for Maintenance of Due Care

Excavation activities within the extent of LNAPL must be limited in size and duration, unless proper PPE is used and appropriate air monitoring is conducted during such activities. Additionally, persons conducting excavation activities within the extent of LNAPL must follow a Site Health and Safety Plan (HASP) and must be OSHA 40-hour HAZWOPER trained. This limitation will remain in effect until future work deems these restrictions unnecessary.

2.16.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.16.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
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An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.16.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.16.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

Print Name	Signature	Date

2.17 W-09 – Former Central Foundry (Plant 6) Resin Spill and UST

This area consists of the Former Central Foundry (Plant 6) previously located in the southeast corner of the DA, which was bordered on the south by Montcalm Street, on the west by the West Yard, on the east by Glenwood Avenue, and on the north by Former Plant 9. The former Central Foundry Building covered approximately 900,000 square feet. The Former Central Foundry (Plant 6) has been decommissioned and demolished. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b) and the RFI Supplemental Report No.1 (ENCORE 2003d).

2.17.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Benzo(a)pyrene exceeded generic residential direct contact criteria at SW9-07 (0-2 foot depth). PCBs (total) exceeded generic residential direct contact criteria at SW9-02 (0-2 foot depth), four grid sample locations around BW9-02 (0-2 and 2-4 foot depths), SW9-09 (8-10 foot depth), and at 46 grid sample locations around SW9-09 (at depths ranging from 0-2 to 14-16 feet).

Benzo(a)pyrene exceeded generic residential and industrial direct contact criteria at BW9-01 (8-10 foot depth). PCBs (total) exceeded generic residential and industrial direct contact criteria at BW9-01 (8-10 foot depth), BW9-02 (0-2 foot depth), 10 grid sample locations around BW9-02 (at 0-2 foot depth), SW9-09 (0-2 foot depth), and at 29 grid sample locations around SW9-09 (at depths ranging from 0-2 to 12-14 feet).

Inhalation (particulate) – Chromium (total) exceeded generic residential and industrial particulate inhalation criteria at SW9-02 (0-2 foot depth). Manganese exceeded generic residential and industrial particulate inhalation criteria at BW9-03 (0-2 foot depth). Manganese exceeded generic industrial particulate inhalation criteria at MWD4 and SW9-02 (both at 0-2 foot depths).

Inhalation (volatile) ambient – PCBs (total) exceeded generic residential volatilization-to-ambient-air inhalation criteria in two of the grid sample locations around BW9-02 (0-2 foot depths). Generic industrial inhalation of ambient air criteria were not exceeded.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.17.2 Discussion

Generic industrial inhalation of ambient air criteria were not exceeded for the current and reasonably expected future use of this area.

PCBs (total) exceeded generic industrial direct contact criteria in a number of locations and at multiple depths in this AOI. Chromium (total) and manganese exceeded generic industrial particulate inhalation criteria at the 0-2 foot depth. There is a potential for exposure during routine and subsurface activities.

The area around BW9-02, the former Cupola Material Yard, has unacceptable risk associated with routine activities and requires a Due Care Plan.

The remainder of the AOI does not pose unacceptable risks under current and reasonably expected future uses. The cumulative cancer risk and non-cancer HI estimates for direct contact during such activities are 4E-5 and 9E-1, respectively, as calculated using 95% nonparametric bootstrap UCL concentrations for benzo(a)pyrene, and PCBs (total), and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable cancer risk range of 1E-6 to 1E-4 and below the non-cancer HI limit of 1 (Table 5).

There is a Due Care issue at this AOI.

2.17.3 Procedures for Maintenance of Due Care

The area around BW9-02, the former Cupola Material Yard, has a 4 foot tall fence and warning signs to restrict access to this area, Figure 9-2 of the Corrective Measures Proposal (ENCORE 2003e). This area will remain access restricted until further delineation of PCB concentrations is complete, a remedial strategy has been implemented, and verification samples confirm the soil no longer poses unacceptable risks. The Due Care Plan only applies to the former Cupola Material Yard in AOI W-9.

2.17.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.17.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

Remediation
Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.17.6 Procedures to Document Due Care

Anyone who will be performing surface or subsurface work in the former Cupola Material Yard of W-09 must acknowledge (by signature below) that a Plant representative has reviewed available data for this area with them.

2.17.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

2.18 W-10 – Railroad Marshalling Area Drainage System

This area consists of a Railroad Marshalling Area that extends the entire length of the western boundary of the West Yard. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b).

2.18.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – PCBs (total) exceeded generic residential direct contact criteria at BW10-02 (8-10 and 12-14 foot depths) and BW10-06 (8-10 foot depth). Arsenic exceeded generic residential direct contact criteria at BW10-05 (0-2 foot depth) and BW10-06 (8-10 foot depth). Lead exceeded generic residential direct contact criteria at BW10-04 (8-10 foot depth) and MWW10-1 (4-6 foot depth). Generic industrial direct contact criteria were exceeded for lead at MWW10-1 (4-6 foot depth).

Inhalation (particulate) – Chromium (total) exceeded generic residential and industrial particulate inhalation criteria at BW10-04 and BW10-05 (both at 0-2 foot depths). Manganese exceeded generic residential and industrial particulate inhalation criteria at BW10-04 (0-2 foot depths). Manganese exceeded generic industrial particulate inhalation criteria at BMWW10-06 and BW10-05 (both at 0-2 foot depth).

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

NAPL Direct Contact and Vapor Inhalation

Potential exposure is possible and is evaluated in Appendix C.2 of the Environmental Indicators Report (ENVIRON 2002).

2.18.2 Discussion

Lead exceeded direct contact criteria at a depth of 4 to 6 feet. However, the arithmetic mean soil lead concentration of 184 mg/kg does not exceed either the generic residential criterion or the generic industrial criterion. The arithmetic mean soil lead concentration is the appropriate exposure point concentration for comparison with the soil lead criteria, to be consistent with the blood lead modeling assumptions used in deriving these criteria.

Chromium (total) exceeded generic industrial particulate inhalation criteria at two locations, both at depths of 0-2 feet. However, the surface soil was subsequently characterized for hexavalent and trivalent chromium. The Chromium VI concentrations were found to be non-detect in all samples and the Chromium III concentrations were found to range from approximately 11 to 60 mg/kg, which do not exceed the residential or industrial criteria for Chromium VI or III.

Manganese exceeded the generic industrial particulate inhalation criteria in multiple surface samples in this AOI. Potential exposure is possible at this AOI. The maximum detected concentration of manganese (10,000 mg/kg in soil) exceeded the generic industrial particulate inhalation criteria, which includes assumptions regarding particulate emissions from vehicle traffic on unpaved roads. However, this AOI is a 75 ft by 1050 ft railroad spur near a former demolition area that is covered by gravel. High volumes of vehicular traffic on bare soil as assumed in the derivation of the generic industrial particulate inhalation criteria are unlikely in this area due to its limited size and its position between the Montcalm substation and former demolition areas. The generic industrial particulate inhalation criterion for manganese due to only wind erosion is 22,300 mg/kg (Appendix A). Manganese does not exceed the wind erosion particulate inhalation criterion, and therefore does not present a Due Care issue.

The cumulative cancer risk and non-cancer HI estimates for inhalation of particulates during such activities are 1E-5 and 4E-1, respectively, as calculated using 95% nonparametric bootstrap UCL concentrations for PCBs (total), and manganese, and maximum detected concentrations for other chemicals. These risk estimates are within the EPA acceptable risk range of 1E-6 to 1E-4 and below the non-cancer HI limit of 1 (Table 5).

Construction activities within the extent of LNAPL need to be limited in extent and duration per Appendix C.2 of the EI Report (ENVIRON 2002), unless proper personal protection equipment (PPE) is used and appropriate air monitoring is conducted during such activities.

There is a Due Care issue at this AOI.

2.18.3 Procedures for Maintenance of Due Care

Excavation activities within the extent of LNAPL must be limited in size and duration, unless proper PPE is used and appropriate air monitoring is conducted during such activities. Additionally, persons conducting excavation activities within the extent of LNAPL must follow a Site Health and Safety Plan (HASP) and must be OSHA 40-hour HAZWOPER trained. This limitation will remain in effect until future work deems these restrictions unnecessary.

2.18.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.18.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

Remediation
Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.18.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.18.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

2.19 SWHI – Sitewide Hydrogeologic Investigation

This area consists of monitoring wells installed across the Site to provide information to aid in the determination of groundwater flow direction in the different zones across the Site as well as to determine the vertical hydraulic gradients between each of the zones. More detailed information on this AOI is available in the RFI Report (ENCORE 2002b).

2.19.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this AOI. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – No analytes exceeded these criteria.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.19.2 Discussion

Generic industrial criteria were not exceeded for the current and reasonably expected future use of this area.

There is no Due Care issue at this area.

2.20 Plant 17 (Fiero) Rooftop

This area consists of the roof of Plant 17 (Fiero). Samples were collected of dirt/debris that had accumulated on the roof of Plant 17 and could wash into the Fiero Outfall 001 and 002 storm sewer systems. Samples were analyzed for PCBs and inorganics.

2.20.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Rooftop Sediment Pathway

Direct Contact – Dirt/debris samples were collected from the Fiero rooftop (refer to Figure 20-1). PCBs (total), antimony, arsenic, and lead exceed the generic industrial direct contact criteria for soil at one or more roof sample locations (Table 7).

Inhalation (particulate & volatile) - This is not a current or reasonably expected future exposure to sediment in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Pathway

There is no groundwater in this area.

Soil Pathway

There is no soil in this area.

2.20.2 Discussion

Dirt/debris data from the Plant 17 Fiero rooftop were initially compared to the Michigan Part 201 generic industrial direct contact criteria (MDEQ 2004) as a conservative approach for evaluating the significance of potential exposure of workers to Fiero rooftop dirt/debris. The use of these generic criteria is conservative because potential exposure of receptors to dirt/debris on the rooftop is expected to be much lower than the exposure assumptions of industrial receptors implicit in the MDEQ generic criteria. Specifically, it is expected that workers will be in contact with rooftop dirt/debris from the Fiero rooftop no more than 20 days/year. This is in contrast to the dermal and ingestion exposure frequencies of 160 and 245 days/year, respectively, in the MDEQ soil DCC. Sediment direct contact criteria were calculated for constituents in sediment that exceeded the generic MDEQ soil DCC. The exposure assumptions and calculation of these values is discussed in Appendix D.

PCBs (total) exceeded the calculated maintenance worker criteria at Plant 17-6 and 17-12 sampling locations. The concentration of lead in sediment exceeded the calculated maintenance worker criteria at FIERO ROOF 4 and FIERO ROOF 6.

There is a Due Care issue at this AOI.

2.20.3 Procedures for Maintenance of Due Care

Repair and maintenance activities at the Fiero rooftop must be limited in duration, unless proper PPE is used and appropriate monitoring is conducted during such activities. Additionally, persons conducting activities at the Fiero rooftop must follow a Site Health and Safety Plan (HASP). This limitation will remain in effect until future work deems these restrictions unnecessary.

2.20.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.20.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

Remediation
Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.20.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.20.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

Print Name	Signature	Date

2.21 Storm Sewer Outfall 001

The Outfall 001 storm sewer system conveys stormwater to the Stormwater Detention Facility (SWDF), located on the south side of Montcalm Avenue. Treated stormwater is discharged from the SWDF to a manhole structure southeast of the SWDF, Outfall 001. Outfall 001receives storm water runoff from the parking area north of Plant 14, southward to Montcalm Avenue including Plants 14, 49, and 5 and 23, and the Demolition Area (DA). More detailed information on this area is available in the RFI Report (ENCORE 2002b).

2.21.1 Exposure Pathways

Sewer Water Pathway

Drinking Water – This is not a current or reasonably expected future use of the sewer water in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Direct Contact – PCBs (total) in the storm sewer water exceeded the generic industrial groundwater direct contact criteria at manholes ST5, ST202, and ST214A in the DA; and manhole ST14-4 in Plant 14.

Inhalation (Volatile) Indoor Air – This is not a current or reasonably expected future exposure to sewer water in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Sewer Sediment Pathway

Direct Contact – PCBs (total) in the storm sewer sediments exceeded the generic industrial direct contact criteria for soil at manholes ST337, ST339 and ST418.

Inhalation (particulate & volatile) - This is not a current or reasonably expected future exposure to sediment in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Pathway

There is no groundwater in this area.

Soil Pathway

There is no soil in this area.

2.21.2 Discussion

Storm sewer water data were compared to the Michigan Part 201 generic industrial groundwater direct contact criteria (MDEQ 2004), based on direct contact by workers conducting excavations. The use of these criteria is appropriate for evaluating sewer surface water because potential exposures of workers to storm sewer water in the Storm Sewer Outfall 001 storm sewer system is expected to be equivalent to the exposure assumed in derivation of the generic criteria.

PCBs (total) exceeded generic industrial direct contact criteria in storm sewer water at four manholes.

Storm sewer sediment data from Outfall 001 were initially compared to the Michigan Part 201 generic industrial direct contact criteria (MDEQ 2004) as a conservative approach for evaluating the significance of potential exposure of workers to sewer sediment. The use of these generic criteria is conservative because potential exposure of receptors to sediment in the sewers is expected to be much lower than the exposure assumptions of industrial receptors implicit in the MDEQ generic criteria. Specifically, it is expected that workers will be in contact with sewer sediment no more than 20 days/year. This is in contrast to the dermal and ingestion exposure frequencies of 160 and 245 days/year, respectively, in the MDEQ soil DCC. Sediment direct contact criteria were calculated for constituents in sediment that exceeded the generic MDEQ soil DCC. The exposure assumptions and calculation of these values is discussed in Appendix C.

PCBs (total) exceeded the calculated maintenance worker criteria only at sampling location ST339.

There is a Due Care issue at this AOI.

2.21.3 Procedures for Maintenance of Due Care

Repair and maintenance activities at Storm Sewer Outfall 001 must be limited in duration, unless proper PPE is used and appropriate monitoring is conducted during such activities. Additionally, persons conducting activities at Storm Sewer Outfall 001 must follow a Site Health and Safety Plan (HASP). This limitation will remain in effect until future work deems these restrictions unnecessary.

2.21.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.21.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

Remediation
Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.21.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.21.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

2.22 Storm Sewer Outfall 002

The Outfall 002 storm sewer system conveys stormwater to the Joslyn Drain, located east of the Site, under Joslyn Street, and ultimately to the Clinton River. Outfall 002 receives storm water runoff from the MFD areas north of the Plant 14 including Plants 12, 15, 25 and 33, and the former Plant 18 area. More detailed information on the area north of Plant 14 is available in the RFI Report (ENCORE 2002b).

2.22.1 Exposure Pathways

Sewer Water Pathway

Drinking Water – This is not a current or reasonably expected future use of the sewer water in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Direct Contact – PCBs (total) in the storm sewer water exceeded the generic industrial groundwater direct contact criteria at manhole ST125, located to the south of Plant 15.

Inhalation (Volatile) Indoor Air – This is not a current or reasonably expected future exposure to sewer water in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Sewer Sediment Pathway

Direct Contact –No analytes in the sewer sediment exceeded these criteria.

Inhalation (particulate & volatile) - This is not a current or reasonably expected future exposure to sediment in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Pathway

There is no groundwater in this area.

Soil Pathway

There is no soil in this area.

2.22.2 Discussion

Storm sewer water data were compared to the Michigan Part 201 generic industrial groundwater direct contact criteria (MDEQ 2004), based on direct contact by workers conducting excavations. The use of these criteria is appropriate for evaluating sewer surface water because potential exposures of workers to storm sewer water in the Storm Sewer Outfall 002 storm sewer system is expected to be equivalent to the exposure assumed in derivation of the generic criteria.

PCBs (total) exceeded generic industrial direct contact criteria in storm sewer water at manhole ST215.

Storm sewer sediment from Outfall 002 has been excavated.

There is a Due Care issue at this AOI.

2.22.3 Procedures for Maintenance of Due Care

Repair and maintenance activities at Storm Sewer Outfall 002 must be limited in duration, unless proper PPE is used and appropriate monitoring is conducted during such activities. Additionally, persons conducting activities at Storm Sewer Outfall 002 must follow a Site Health and Safety Plan (HASP). This limitation will remain in effect until future work deems these restrictions unnecessary.

2.22.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.22.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

Remediation
Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.22.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.22.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

Print Name	Signature	Date

2.23 Fiero Storm Sewer Outfall 001

The Fiero Outfall 001 storm sewer system conveys stormwater to the Industrial Wastewater Treatment Plant during dry weather and to Harris Lake during wet weather. Fiero Outfall 001 receives storm water runoff from the southern half of the Fiero Plant (Plant 17) rooftop and parking areas south of the plant. More detailed information on this area is available in the RFI Report (ENCORE 2002b).

2.23.1 Exposure Pathways

Sewer Water Pathway

Drinking Water – This is not a current or reasonably expected future use of the sewer water in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Direct Contact – Storm sewer water samples exceeded the generic industrial groundwater direct contact criteria for the following constituents at the following locations: benzo(a)anthracene, benzo(k)fluoranthene, and dibenz(a,h)anthracene at manhole STF40; benzo(a) pyrene, benzo(g,h,i)perylene, and indeno(1,2,3-c,d)pyrene at manholes STF40 and STF314A; and benzo (b)fluoranthene and chrysene at manholes STF40, STF46, and STF314A.

Inhalation (Volatile) Indoor Air – This is not a current or reasonably expected future exposure to sewer water in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Sewer Sediment Pathway

Direct Contact – Storm sewer sediment samples exceeded generic industrial direct contact criteria for soil for the following constituents at the following locations: benzo(a)pyrene at catch basin CBF-102, arsenic at catch basins CBF102, CBF103, CBF104, CBF105, CBF106; and lead at catch basins CBF102, CBF103, CBF105, CBF106.

Inhalation (particulate & volatile) - This is not a current or reasonably expected future exposure to sediment in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Pathway

There is no groundwater in this area.

Soil Pathway

There is no soil in this area.

2.23.2 Discussion

Storm sewer water data were compared to the Michigan Part 201 generic industrial groundwater direct contact criteria (MDEQ 2004), based on direct contact by workers conducting excavations. The use of these criteria is appropriate for evaluating sewer surface water because potential

exposures of workers to storm sewer water in the Fiero Storm Sewer Outfall 001 storm sewer system is expected to be equivalent to the exposure assumed in derivation of the generic criteria.

Several polycyclic aromatic hydrocarbons (PAHs) exceeded generic industrial direct contact criteria in storm sewer water at three manholes. The source of PAHs in sewer water is believed to be due to sediment particulates in the samples.

Storm sewer sediment data from Fiero Outfall 001 were initially compared to the Michigan Part 201 generic industrial direct contact criteria (MDEQ 2004) as a conservative approach for evaluating the significance of potential exposure of workers to sewer sediment. The use of these generic criteria is conservative because potential exposure of receptors to sediment in the sewers is expected to be much lower than the exposure assumptions of industrial receptors implicit in the MDEQ generic criteria. Specifically, it is expected that workers will be in contact with sewer sediment no more than 20 days/year. This is in contrast to the dermal and ingestion exposure frequencies of 160 and 245 days/year, respectively, in the MDEQ soil DCC. Sediment direct contact criteria were calculated for constituents in sediment that exceeded the generic MDEQ soil DCC. The exposure assumptions and calculation of these values is discussed in Appendix C.

Arsenic exceeded the calculated maintenance worker criteria at catch basin CBF102 in this area.

There is a Due Care issue at this AOI.

2.23.3 Procedures for Maintenance of Due Care

Repair and maintenance activities at the Fiero Storm Sewer Outfall 001 must be limited in duration, unless proper PPE is used and appropriate monitoring is conducted during such activities. Additionally, persons conducting activities at the Fiero Storm Sewer Outfall 001 must follow a Site Health and Safety Plan (HASP). This limitation will remain in effect until future work deems these restrictions unnecessary.

2.23.4 Record of Maintenance of Due Care

This Due Care Plan is enforced by Robert Fenn.

2.23.5 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

Remediation
Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.23.6 Procedures to Document Due Care

Anyone who will be performing subsurface work within the extent of LNAPL must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required health and safety procedures.

2.23.7 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

2.24 Storm Water Detention Facility (SWDF)

The SWDF is located on the south side of Montcalm Avenue. This storm water detention facility became operational in May 1982 and intercepts and treats the Site storm water discharged to Outfall 001. More detailed information on this unit is available in the RFI Supplemental Report No.1 (ENCORE 2003d).

2.24.1 Exposure Pathways

Surface Water Pathway

There is no surface water in this area.

Sediment Pathway

There is no sediment in this area.

Groundwater Pathway

Drinking Water – This is not a current or reasonably expected future use of the groundwater in this area. Therefore, these criteria were not used in the evaluation of Due Care.

Groundwater Contact – No analytes exceeded these criteria.

Inhalation (volatile) indoor air - No analytes exceeded these criteria.

Soil Pathway

Direct Contact – Lead exceeded the generic residential direct contact criteria at DP-03 (2.5-5 foot depth). No analytes exceeded the generic industrial direct contact criteria.

Inhalation (particulate) – No analytes exceeded these criteria.

Inhalation (volatile) ambient – No analytes exceeded these criteria.

Inhalation (volatile) indoor – No analytes exceeded these criteria.

2.24.2 Discussion

Generic industrial direct contact criteria were not exceeded for the current and reasonably expected future use of the area.

There is no Due Care issue at this area.

2.25 Groundwater as a Drinking Water Source

Drinking water is not a current or reasonably expected future pathway for the shallow, intermediate, or deep saturated zones underlying the Site. Potable water at the Site is obtained from Lake St. Clair through the City of Detroit.

Groundwater is not currently utilized on Site or in the vicinity of the Site for drinking water. Pontiac North Campus environmental personnel (Robert Fenn) will ensure that no potable wells will be installed. All subsurface work must be cleared through Environmental Engineering before activities take place and there is a work authorization form, which must be filled out (see Robert Fenn or Rob Fenn for work authorization). No potable wells will be allowed on site.

The deep and intermediate zones are the only zones where existing institutional controls do not prevent use of groundwater as a drinking water source. There are a few analytes that had concentrations higher than generic industrial drinking water criteria in the deep and intermediate zones at a few monitoring wells (Table 3) that are not necessarily related to the investigative units discussed in Sections 2.1 to 2.17. More recent groundwater monitoring data show that the concentrations of these analytes are not higher than generic industrial drinking water criteria, at most sampling locations. The more recent data are included in the RFI Supplemental Report No. 1 (ENCORE 2003c). Locations that did not exceed the drinking water criteria during the most recent round of sampling are not discussed further. Potential exposures to groundwater in these saturated zones are discussed below.

2.25.1 Exposure Pathways

Acetone exceeded generic residential and industrial drinking water criteria at IWM2.

2.25.2 Discussion

Acetone exceeded generic industrial drinking water criteria at IWM2. This exceedance is due to the use of coated bentonite pellets in the well construction process, see Appendix G (ENCORE 2002b). Drinking water is supplied from Lake St. Claire; therefore, groundwater is not a current drinking water source.

There is a Due Care issue for the shallow saturated zone, which prevents the installation of potable water wells at the Site.

There is a Due Care issue for the deep and intermediate saturated zones, which prevents the installation of intermediate or deep wells where water from the shallow saturated zone could potentially contaminate the deeper zones.

This Due Care Plan is enforced by Robert Fenn.

2.25.3 2.28 Contacts

Pontiac North Campus Environmental Engineering
Robert Fenn (248) 857-2287
Rob Fenn (248) 857-2287

Remediation
Robert Hare (248) 753-5641
Jean Caufield (248) 753-5774

GM Legal
Anthony Thrubis (313) 665-4768

An update review of this Due Care Plan will be performed if changes are proposed to the current uses of this area or new data are collected.

2.25.4 Procedures to Document Due Care

No potable wells will be installed in the shallow saturated zone at the Site. Additionally, anyone who will be performing work in or with intermediate or deep saturated zones must acknowledge (by signature below) that a Plant representative has reviewed with them available data for that area and required procedures to prevent the spread of contamination from the shallow saturated zone to the deeper zones.

2.25.5 Signatures

Please print your name and sign and date that you have reviewed analytical data pertinent to your activities presented in this plan and you understand the potential risks and health and safety requirements associated with working in this area.

Print Name	Signature	Date

3.0 References

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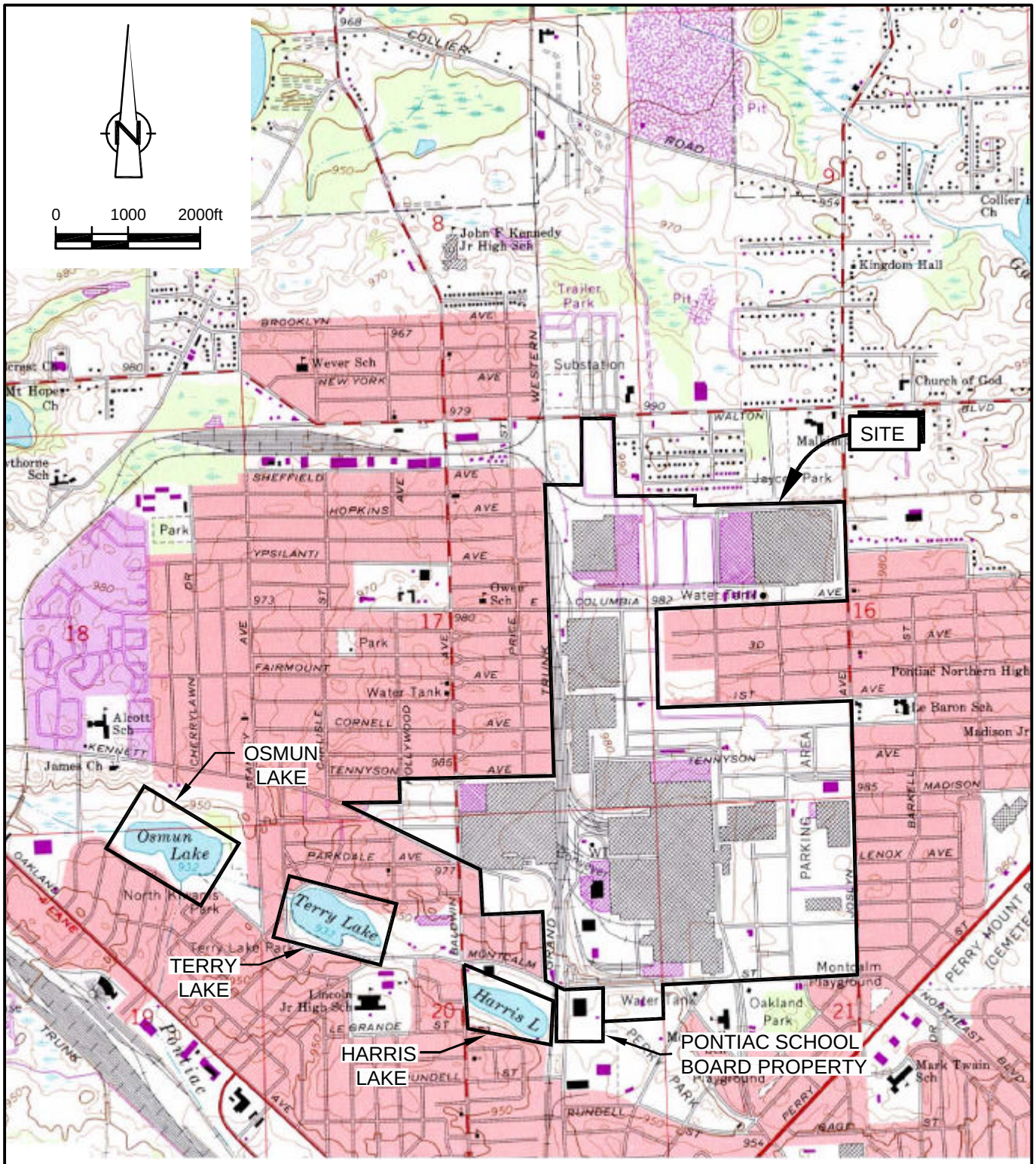
4.0 Signatures

Please print your name and sign and date that you have reviewed analytical information pertinent to your activities on this site

Name	Signature	Date

F I G U R E S



SOURCE: USGS QUADRANGLE MAP;
PONTIAC NORTH, MICHIGAN

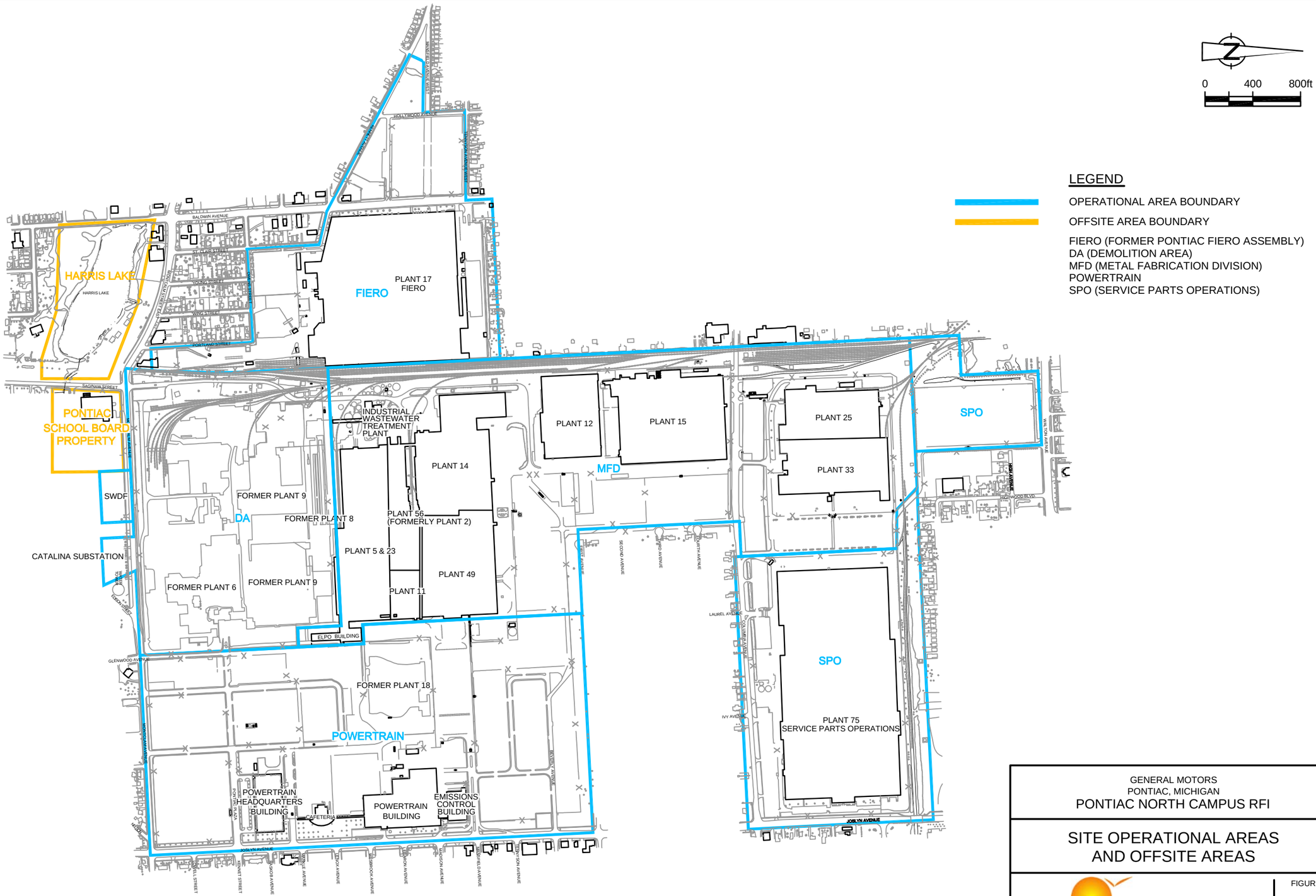
GENERAL MOTORS
PONTIAC, MICHIGAN
PONTIAC NORTH CAMPUS RFI

SITE LOCATION

ENCORE

FIGURE
1-1

17487-22(013)GN-WA001 NOV 24/2003



GENERAL MOTORS
PONTIAC, MICHIGAN
PONTIAC NORTH CAMPUS RFI

SITE OPERATIONAL AREAS
AND OFFSITE AREAS

ENCORE

FIGURE
1-3

17487-22(013)GN-WA003 NOV 24/2003

N

M-4
M-25
M-16
M-5
M-23
M-17
M-11
M-24
F-8
F-13
M-13
M-21
M-2
M-1
M-19
F-7
F-15
F-14
F-12
W-3
W-5
W-6
W-8
W-13
W-11
W-10
W-1
W-9
P-11
P-9
M-9
P-10
M-7
P-6
SWDF
OUTFALL 001
HARRIS LAKE
PONTIAC SCHOOL BOARD PROPERTY

WALTON AVENUE
HIGH AVENUE
HIGHWOOD BLVD
COLUMBIA AVENUE
LAUREL AVENUE
IVY AVENUE
JOSLYN AVENUE
FOURTH AVENUE
THIRD AVENUE
SECOND AVENUE
FIRST AVENUE
BEVERLY AVENUE
TENNYSON AVENUE
MANSFIELD AVENUE
MADISON AVENUE
LEBARON AVENUE
WESBROOK AVENUE
LENOX AVENUE
MARKLE AVENUE
RASKOB AVENUE
KENNET STREET
LOWELL STREET
MONTCALM AVENUE
TENNYSON AVENUE WEST
HOLMWOOD AVENUE
KENNETT AVENUE
OWENS STREET
BALDWIN AVENUE
ST CLAIR STREET
YOUNG STREET
WINS STREET
PORTLAND STREET
MONTCALM STREET EAST
SAGINAW STREET
WATER TOWER
EDISON STREET
GLENWOOD AVENUE
NELSON
PLANT 49
PLANT 14
PLANT 17 FIERO
PLANT 56 (FORMERLY PLANT 2)
PLANT 11
PLANT 5 & 23
PLANT 15
PLANT 6
PLANT 75
PLANT 33
INDUSTRIAL WASTEWATER TREATMENT PLANT
PLANT 75 PSERVICE PARTS OPERATIONS
FORMER PLANT 18
FORMER PLANT 9
FORMER PLANT 8
FORMER PLANT 6
ELPO BUILDING
EMISSIONS TEST BUILDING
POWERTRAIN BUILDING
POWERTRAIN HEADQUARTERS BUILDING
CAFETERIA
PONTIAC PLAZA

Legend:

- RAILROAD
- ROADS
- BUILDINGS
- AOI AND OFFSITE AREAS
- W- 9 AOI ID

0 125 250 500 750 1,000 Feet

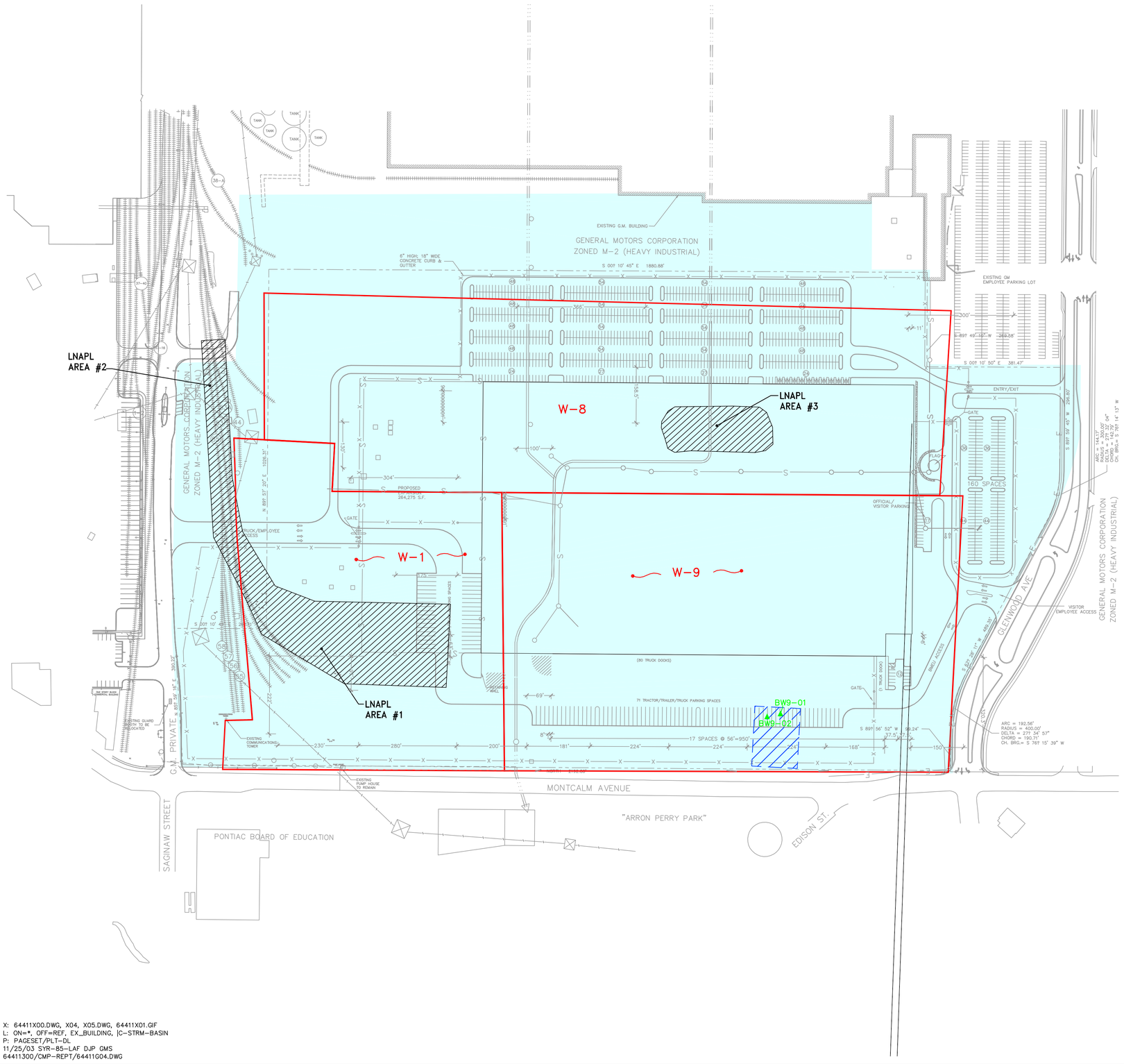
GENERAL MOTORS
PONTIAC, MICHIGAN
PONTIAC NORTH CAMPUS RFI

AREAS OF INTEREST AND OFFSITE AREAS

ENCORE

Figure
1-5

11/24/03 SYR-85 EIB TBR
PNC - 64411.310
PNC/RFI_NOV03/MXD/PontiacAOI.mxd



LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- EXISTING SEWER
- EXISTING ELECTRIC
- EXISTING STORM SEWER
- PROPOSED ELECTRIC
- APPROXIMATE LNAPL AREA
- W-9 — AOI AREA
- AREA TO BE EVALUATED FOR CAPPING
- APPROXIMATE AREA TO BE ADDRESSED BY INSTITUTIONAL CONTROLS AND CAP
- BW9-01 ▲ — SOIL BORING LOCATION

NOTES:

1. BASE MAP INFORMATION OBTAINED FROM THE CONFIDENTIAL SOURCE MAP ENTITLED "NORTHEAST METRO P&DC, PONTIAC, MICHIGAN" AT A SCALE OF 1"=50'.
2. ALL LOCATIONS ARE APPROXIMATE.

0 150' 300'
GRAPHIC SCALE

X: 64411X00.DWG, X04, X05.DWG, 64411X01.GIF
L: ON=*, OFF=REF, EX_BUILDING, |C-STRM-BASIN
P: PAGESET/PLT-DL
11/25/03 SYR-85-LAF DJP GMS
64411300/CMP-REPT/64411G04.DWG

GENERAL MOTORS
PONTIAC, MICHIGAN
PONTIAC NORTH CAMPUS CMP

AOI W-9 - SOIL CAP AND INSTITUTIONAL CONTROLS

ENCORE

FIGURE 9-2

T A B L E S

Table 1: Soil Results Exceeding MDEQ Part 201 Criteria
General Motors - Pontiac North Campus, Pontiac, Michigan

Area	Reference	Station ID	Sample ID	Top Depth (feet)	Bottom Depth (feet)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Validation Qualifier	QL mg/kg)	Site Specific Background (mg/kg)	Residential Soil Volatilization to Indoor Air Inhalation (mg/kg)	Residential Soil Volatilization to Ambient Air Inhalation (mg/kg)	Residential Particulate Soil Inhalation (mg/kg)	Residential Direct Contact (mg/kg)	Exceeds Residential Criteria	Industrial Soil Volatilization to Indoor Air Inhalation (mg/kg)	Industrial Soil Volatilization to Ambient Air Inhalation (mg/kg)	Industrial Particulate Soil Inhalation (mg/kg)	Industrial Direct Contact (mg/kg)	Exceeds Industrial Criteria
BG	1	SB-02	SB-02-S(0-2)-N	0	2	INORG	Arsenic	7440-38-2	2.26E+01		1.07E+00	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
F-07	2	MWF7-01	BMWF7-01-S(8-10)	8	10	INORG	Arsenic	7440-38-2	3.94E+01		4.43E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
F-07	2	MWF7-01	BMWF7-01-S(8-10)	8	10	INORG	Chromium (total)	7440-47-3	3.35E+02		5.61E-01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
F-07	2	MWF7-01	BMWF7-01-S(8-10)	8	10	INORG	Lead	7439-92-1	4.96E+02		3.54E-01	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	9.0E+02	NO
F-15	2	BF15-01	BF15-01-S(0-2)-N	0	2	VOC	1,1-Dichloroethene	75-35-4	1.50E-01	J	5.00E-01		**6.2E-02**	1.1E+00	6.2E+04	2.0E+02	YES	3.3E-01	3.7E+00	7.8E+04	5.7E+02	NO
F-15	2	BF15-01	BF15-01-S(0-2)-N	0	2	VOC	Tetrachloroethene	127-18-4	1.30E+01		5.00E-01		**1.1E+01**	1.8E+02	5.4E+06	8.8E+01	YES	6.0E+01	6.0E+02	6.8E+06	8.8E+01	NO
F-15	2	BF15-01	DUP-038-S(0-0)-N	0	2	VOC	1,1-Dichloroethene	75-35-4	6.60E-02	J	2.50E-01		**6.2E-02**	1.1E+00	6.2E+04	2.0E+02	YES	3.3E-01	3.7E+00	7.8E+04	5.7E+02	NO
F-15	2	BF15-02	BF15-02-S(0-2)DL	0	2	VOC	1,1-Dichloroethene	75-35-4	2.20E+00	J	1.70E-01		**6.2E-02**	**1.1E+00**	6.2E+04	2.0E+02	YES	**3.3E-01**	3.7E+00	7.8E+04	5.7E+02	YES
F-15	2	BF15-02	BF15-02-S(0-2)DL	0	2	VOC	Tetrachloroethene	127-18-4	8.10E+01		1.50E-01		**1.1E+01**	1.8E+02	5.4E+06	8.8E+01	YES	**6.0E+01**	6.0E+02	6.8E+06	8.8E+01	YES
F-15	2	BF15-02	BF15-02-S(8-10)DL	8	10	VOC	1,1-Dichloroethene	75-35-4	7.10E-02	J	1.60E-02		**6.2E-02**	1.1E+00	6.2E+04	2.0E+02	YES	3.3E-01	3.7E+00	7.8E+04	5.7E+02	NO
F-15	2	BF15-04	BF1504S(0-2)DL	0	2	VOC	Tetrachloroethene	127-18-4	2.10E+01		4.20E-02		**1.1E+01**	1.8E+02	5.4E+06	8.8E+01	YES	6.0E+01	6.0E+02	6.8E+06	8.8E+01	NO
F-15	2	MWF15-01	BMWF15-S(8-10)-N	8	10	INORG	Arsenic	7440-38-2	2.93E+01		5.97E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
M-01	1	BM1-02	BM1-02-S(0-2)-N	0	2	INORG	Cyanide (total)	57-12-5	2.59E+01		1.43E+01				2.5E+02	**1.2E+01**	YES			2.5E+02	2.5E+02	NO
M-01	1	BM1-07	BM1-07-S(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	3.16E+01	J	2.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-07	BM1-07-S(2-4)DL	2	4	P/PCB	PCBs (total)	1336-36-3	3.88E+01	J	4.80E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-07E2N1	BM1-07E2N1-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	7.04E+00	J	2.20E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
M-01	1	BM1-07W1	BM1-07W1-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	5.91E+00	J	4.60E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
M-01	1	BM1-07W2N1	BM1-07W2N1-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	4.84E+00	J	2.20E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
M-01	1	BM1-07W2S1	BM1-07W2S1-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	4.25E+00	J	2.30E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
M-01	1	BM1-08	BM1-08-S(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	4.37E+01	J	4.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-08	BM1-08-S(2-4)DL	2	4	P/PCB	PCBs (total)	1336-36-3	4.66E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-08-E2	BM1-08-E2-S(4-6)DL	4	6	P/PCB	PCBs (total)	1336-36-3	2.19E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-08-N1	BM1-08-N1-S(2-4)DL	2	4	P/PCB	PCBs (total)	1336-36-3	7.09E+01	J	4.80E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-08-N2	BM1-08-N2-S(2-4)DL	2	4	P/PCB	PCBs (total)	1336-36-3	3.44E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-08-N2	BM1-08-N2-S(4-6)DL	4	6	P/PCB	PCBs (total)	1336-36-3	8.55E+01	J	4.80E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-08-W1	BM1-08-W1-S(4-6)DL	4	6	P/PCB	PCBs (total)	1336-36-3	6.72E+01	J	4.70E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
M-01	1	BM1-08W1N1	BM1-08W1N1-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	1.98E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
M-01	1	MWM1-03	BMWM1-03-S(0-2)-N	0	2	INORG	Arsenic	7440-38-2	2.16E+01		5.67E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
M-01	1	SM1-02	SM1-02-S(0-2)-062001	0	2	INORG	Arsenic	7440-38-2	2.68E+01		3.41E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
M-01	1	SM1-03	SM1-03-S(0-2)-062001	0	2	INORG	Lead	7439-92-1	4.60E+02		2.59E-01	4.9E+01			1.0E+05	4.0E+02	NO			4.4E+04	9.0E+02	NO
M-01	1	SM1-04	SM1-04-S(0-2)-062001	0	2	INORG	Lead	7439-92-1	5.60E+02		2.74E-01	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	9.0E+02	NO
M-01	1	SM1-07	SM1-07-S(02)062001DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.47E+01	J	4.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
M-01	1	SM1-08	SM1-08-S(0-2)-062001	0	2	INORG	Lead	7439-92-1	6.58E+02		2.68E-01	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	9.0E+02	NO
M-01	1	SM1-09	SM1-09-S(0-2)-062001	0	2	INORG	Arsenic	7440-38-2	3.83E+01		3.75E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
M-02	2	BM2-04	BM2-04-S(4-6)-N	4	6	INORG	Cyanide (total)	57-12-5	3.66E+01		3.16E+00				2.5E+02	**1.2E+01**	YES			2.5E+02	2.5E+02	NO
M-02	2	BM2-07	BM2-07-S(0-2)DL	0	2	INORG	Cyanide (total)	57-12-5	2.20E+01		9.34E-01				2.5E+02	**1.2E+01**	YES			2.5E+02	2.5E+02	NO
M-02	2	BM2-07	BM2-07-S(4-6)DL	4	6	INORG	Cyanide (total)	57-12-5	5.18E+01		1.81E+00				2.5E+02	**1.2E+01**	YES			2.5E+02	2.5E+02	NO
M-02	2	BM2-10	BM2-10-S(4-6)DL	4	6	VOC	1,1-Dichloroethene	75-35-4	1.80E+00		1.20E-01		**6.2E-02**	**1.1E+00**	6.2E+04	2.0E+02	YES	**3.3E-01**	3.7E+00	7.8E+04	5.7E+02	YES
M-02	2	BM2-10	BM2-10-S(4-6)DL	4	6	INORG	Cyanide (total)	57-12-5	3.20E+01		9.69E-01				2.5E+02	**1.2E+01**	YES			2.5E+02	2.5E+02	NO
M-02	2	BM2-10	BM2-10-S(8-10)DL	8	10	VOC	1,1-Dichloroethene	75-35-4	9.90E-01		1.40E-02		**6.2E-02**	1.1E+00	6.2E+04	2.0E+02	YES	**3.3E-01**	3.7E+00	7.8E+04	5.7E+02	YES
M-02	2	BM2-11	BM2-11-S(4-6)DL	4	6	INORG	Cyanide (total)	57-12-5	3.74E+01		9.60E-01				2.5E+02	**1.2E+01**	YES			2.5E+02	2.5E+02	NO
M-02	2	BM2-13	BM2-13-S(0-2)DL	0	2	INORG	Cyanide (total)	57-12-5	2.65E+01		8.92E-01				2.5E+02	**1.2E+01**	YES			2.5E+02	2.5E+02	NO
M-02	2	MWM2-05	MWM2-05-S(0-2)DL	0	2	INORG	Cyanide (total)	57-12-5	2.04E+01		9.13E-01				2.5E+02	**1.2E+01**	YES			2.5E+02	2.5E+02	NO
M-02	2	MWM2-06	MWM2-06-S(6-8)DL	6	8	INORG	Manganese	7439-96-5	2.22E+03		8.61E-02	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
M-05	1	MWM5-01	BMWM5-01-S(2-4)	2	4	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	1.06E-04	J	7.64E-07				7.1E-02	**9.0E-05**	YES			8.9E-02	9.9E-04	NO
M-05	1	MWM5-01	BMWM5-01-S(2-4)DL	2	4	INORG	Lead	7439-92-1	1.56E+03		2.75E-01	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	**9.0E+02**	YES
M-07	2	MWM7-03	BMWM7-03-S(0-2)-N	0	2	VOC	Tetrachloroethene	127-18-4	5.00E+01		1.80E+00		**1.1E+01**	1.8E+02	5.4E+06	8.8E+01	YES	6.0E+01	6.0E+02	6.8E+06	8.8E+01	NO
M-09	2	MWM9-02	BMWM9-02-S(0-2)-N	0	2	INORG	Arsenic	7440-38-2	2.47E+01		1.63E+00	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
M-09	2	MWM9-02	BMWM9-02-S(8-10)-N	8	10	INORG	Arsenic	7440-38-2	2.36E+01		8.14E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
M-19	1	SM19-01	SM19-01-S(0-2)-N	0	2	INORG	Arsenic	7440-38-2	5.15E+01		5.83E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
M-19	1	SM19-01	SM19-01-S(0-2)-N	0	2	INORG	Lead	7439-92-1	6.06E+02		2.33E-01	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	9.0E+02	NO
M-19	1	SM19-02	SM19-02-S(0-2)-N	0	2	INORG	Arsenic	7440-38-2	5.56E+01		5.31E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
M-19	1	SM19-03	SM19-03-S(0-2)-N	0	2	INORG	Arsenic	7440-38-2	5.21E+01		1.10E+00	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
M-19	1	SM19-04	SM19-04-S(0-2)-N	0	2	INORG	Manganese	7439-96-5	2.25E+03		3.27E+00	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	1.7E+05	YES
M-19	1	SM19-05	SM19-05-S(0-2)-N	0	2	INORG	Chromium (total)	7440-47-3	5.15E+02		5.40E+00	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	1.7E+04	YES
M-19	1	SM19-05	SM19-05-S(0-2)-N	0	2	INORG	Manganese	7439-96-5	1.26E+04		1.08E+01	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	1.7E+05	YES
M-19	1	SM19-06	SM19-06-S(0-2)-N	0	2	INORG	Chromium (total)	7440-47-3	4.49E+02		1.10E+01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	1.7E+04	YES
M-19	1	SM19-06	SM19-06-S(0-2)-N	0	2	INORG	Manganese	7439-96-5	1.07E+04		1.10E+01	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	1.7E+05	YES
M-19	1	SM19-10	SM19-10-S(0-2)DL	0	2	INORG	Manganese	7439-96-5	2.31E+03	J	8.20E-02	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	1.7E+05	YES
P-09	2	BP9-06	BP9-06-S(0-2)DL	0	2	SVOC	Benzo(a)pyrene	50-32-8	6.30E+00		1.60E-01				1.5E+03	**2.0E+00**	YES			1.9E+03	8.0E+00	NO
P-09	2	BP9-07	BP9-07-S(0-2)DL	0	2	SVOC	Benzo(a)pyrene	50-32-8	1.10E+01		3.40E-01				1.5E+03	**2.0E+00**	YES			1.9E+03	**8.0E+00**	YES
P-09	2	BP9-08	BP9-08-S(0-2)DL	0	2	SVOC	Benzo(a)pyrene	50-32-8	1.20E+01	J	8.30E-01				1.5E+03	**2.0E+00**	YES			1.9E+03	**8.0E+00**	YES
P-09	2	BP9-08	BP9-08-S(0-2)DL	0	2	SVOC	Dibenz(a,h)anthracene	53-70-3	2.50E+00	J	1.00E+00					**2.0E+00**	YES				8.0E+00	NO
P-09	2	BP9-08	BP9-08-S(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	8.84E+00	J	4.90E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
P-09	2	BP9-10	BP9-10-S(0-2)DL	0	2	SVOC	Benzo(a)pyrene	50-32-8	2.10E+00		6.90E-02				1.5E+03	**2.0E+00**	YES			1.9E+03	8.0E+00	NO
P-09	2	BP9-10	BP9-10-S(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	5.00E+00	J	2.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
P-09	2	MWP9-02	DUP-058-042903DL	0	2	P/PCB	PCBs (total)	1336-36-3	5.89E+00	J	2.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO

Table 1: Soil Results Exceeding MDEQ Part 201 Criteria
General Motors - Pontiac North Campus, Pontiac, Michigan

Area	Reference	Station ID	Sample ID	Top Depth (feet)	Bottom Depth (feet)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Validation Qualifier	QL mg/kg)	Site Specific Background (mg/kg)	Residential Soil Volatilization to Indoor Air Inhalation (mg/kg)	Residential Soil Volatilization to Ambient Air Inhalation (mg/kg)	Residential Particulate Soil Inhalation (mg/kg)	Residential Direct Contact (mg/kg)	Exceeds Residential Criteria	Industrial Soil Volatilization to Indoor Air Inhalation (mg/kg)	Industrial Soil Volatilization to Ambient Air Inhalation (mg/kg)	Industrial Particulate Soil Inhalation (mg/kg)	Industrial Direct Contact (mg/kg)	Exceeds Industrial Criteria
P-09	2	MWP9-02	MWP9-02-S(0-2)DL	0	2	SVOC	Benzo(a)pyrene	50-32-8	2.70E+00		1.10E-01				1.5E+03	**2.0E+00**	YES			1.9E+03	8.0E+00	NO
P-09	2	MWP9-02	MWP9-02-S(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	2.36E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
P-11	2	BP11-06	BP1106S(0-2)DL	0	2	INORG	Manganese	7439-96-5	3.26E+03		2.12E-01	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
P-11	2	MWP11-02	MWP1102S(0-2)DLR2	0	2	P/PCB	PCBs (total)	1336-36-3	5.68E+00	J	2.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
SEEP	1	SEEP1	S-040501-DRD-001			INORG	Arsenic	7440-38-2	5.76E+01			1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
SWDF	2	DP-03	DP-03-S(2.5-5.0)	2.5	5	INORG	Lead	7439-92-1	4.71E+02		1.07E-01	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	9.0E+02	NO
W-01	2	BMWW1-02	BMWW1-02S(24)12180DL	2	4	SVOC	Benzo(a)pyrene	50-32-8	4.00E+00		2.90E-01				1.5E+03	**2.0E+00**	YES			1.9E+03	8.0E+00	NO
W-01	2	BMWW1-02	BMWW1-02S(24)12180DL	2	4	P/PCB	PCBs (total)	1336-36-3	5.89E+00	J	2.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-01	2	BMWW1-02	BMWW1-02S(46)12180DL	4	6	SVOC	Benzo(a)pyrene	50-32-8	3.30E+00		1.80E-01				1.5E+03	**2.0E+00**	YES			1.9E+03	8.0E+00	NO
W-01	2	BMWW1-02	BMWW1-02S(46)12180DL	4	6	P/PCB	PCBs (total)	1336-36-3	5.44E+00	J	2.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-01	2	BW1-01	BW1-01-S(8-10)	8	10	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	1.89E-03	J	3.84E-05				7.1E-02	**9.0E-05**	YES			8.9E-02	**9.9E-04**	YES
W-01	2	BW1-01	BW1-01-S(8-10)-N	8	10	P/PCB	PCBs (total)	1336-36-3	4.60E+01	J	4.40E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-01	2	BW1-01	BW1-01-S(8-10)-N	8	10	INORG	Chromium (total)	7440-47-3	1.52E+03		1.34E+01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-01	2	BW1-01	BW1-01-S(8-10)-N	8	10	INORG	Lead	7439-92-1	3.95E+03		2.68E+00	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	**9.0E+02**	YES
W-01	2	BW1-02	BW1-02-S(0-2)-N	0	2	INORG	Manganese	7439-96-5	6.33E+03		1.04E+01	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	9.0E+04	YES
W-01	2	BW1-03	BW1-03-S(4-6)	4	6	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	1.23E-04	J	2.78E-05				7.1E-02	**9.0E-05**	YES			8.9E-02	9.9E-04	NO
W-01	2	BW1-03	BW1-03-S(4-6)-N	4	6	INORG	Arsenic	7440-38-2	3.54E+01		1.14E+01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
W-01	2	BW1-03	BW1-03-S(4-6)-N	4	6	INORG	Chromium (total)	7440-47-3	6.39E+02		2.28E+01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-01	2	BW1-03	BW1-03-S(4-6)-N	4	6	INORG	Manganese	7439-96-5	4.25E+03		2.28E+01	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	9.0E+04	YES
W-01	2	BW1-04	BW1-04-S(0-2)-N	0	2	INORG	Manganese	7439-96-5	2.09E+03		2.29E+00	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
W-01	2	BW1-07	BW1-07-S(0-2)DL	0	2	INORG	Manganese	7439-96-5	4.62E+03		8.81E-02	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	9.0E+04	YES
W-01	2	BW1-08	BW1-08-S(11-13)DL	11	13	INORG	Manganese	7439-96-5	7.04E+03		8.43E-02	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	9.0E+04	YES
W-01	2	BW1-09	BW1-09-S(0-2)DL	0	2	INORG	Manganese	7439-96-5	3.67E+03		8.76E-02	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
W-01	2	BW1-10	BW1-10-S(12-14)-0111	12	14	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	5.71E-04	J	1.00E-04				7.1E-02	**9.0E-05**	YES			8.9E-02	9.9E-04	NO
W-01	2	BW1-10	BW1-10-S(12-14)DL	12	14	P/PCB	PCBs (total)	1336-36-3	2.50E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-01	2	BW1-10	BW1-10-S(8-10)-0111	8	10	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	1.35E-04	J	5.24E-05				7.1E-02	**9.0E-05**	YES			8.9E-02	9.9E-04	NO
W-01	2	BW1-10	BW1-10-S(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	6.27E+01	J	2.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-01	2	BW1-11a	BW111S(6-8)DL	6	8	INORG	Chromium (total)	7440-47-3	3.40E+02		3.74E-01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-01	2	BW1-11a	BW111S(6-8)DL	6	8	INORG	Manganese	7439-96-5	7.26E+03		2.07E-01	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	9.0E+04	YES
W-01	2	MWW1-01	BMWW1-01-S(4-6)-N	4	6	P/PCB	PCBs (total)	1336-36-3	4.25E+00	J	3.80E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-01	2	SBMW20	SBMW20-23.0	23	25	P/PCB	PCBs (total)	1336-36-3	4.75E+01	J	7.60E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-01	2	SBMW20	SBMW70-23.0	23	25	P/PCB	PCBs (total)	1336-36-3	5.28E+01	J	7.80E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-01	2	SBMW22	SBMW22-16.0	16	18	P/PCB	PCBs (total)	1336-36-3	8.20E+00	J			3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-01	2	SBMW22	SBMW22-16.0	16	18	INORG	Lead	7439-92-1	1.35E+03			4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	**9.0E+02**	YES
W-01	2	SBMW22	SBMW22-16.0	16	18	INORG	Manganese	7439-96-5	3.90E+03			5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
W-01	2	SBSB5	SBSB5-04.0	4	6	INORG	Antimony	7440-36-0	1.74E+03						1.3E+04	**1.8E+02**	YES			5.9E+03	**6.7E+02**	YES
W-01	2	SBSB5	SBSB5-04.0	4	6	INORG	Arsenic	7440-38-2	3.57E+01			1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
W-01	2	SBSB5	SBSB5-04.0	4	6	INORG	Chromium (total)	7440-47-3	1.02E+03			4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-01	2	SBSB5	SBSB5-04.0	4	6	INORG	Iron	7439-89-6	3.76E+05							**1.6E+05**	YES				5.8E+05	NO
W-01	2	SBSB5	SBSB5-04.0	4	6	INORG	Lead	7439-92-1	5.73E+02			4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	9.0E+02	NO
W-01	2	SBSB5	SBSB5-04.0	4	6	INORG	Manganese	7439-96-5	3.51E+03			5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
W-01	2	SBTT3	SBTT3-5.0	5	9	SVOC	Butylbenzylphthalate	85-68-7	1.10E+03						4.7E+07	**3.1E+02**	YES			2.1E+07	**3.1E+02**	YES
W-01	2	SBTT3	SBTT3-5.0	5	9	P/PCB	PCBs (total)	1336-36-3	9.28E+01	J	4.60E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-01	2	SBTT4	SBTT4-3.0	3	10	INORG	Chromium (total)	7440-47-3	3.40E+02			4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-01	2	SBWD2	SBWD2-24.0	24	26	INORG	Lead	7439-92-1	1.30E+03			4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	**9.0E+02**	YES
W-01	2	SSTT2	SSTT2 (0-6)	0	6	SVOC	Benzo(a)pyrene	50-32-8	8.60E+00	J					1.5E+03	**2.0E+00**	YES			1.9E+03	**8.0E+00**	YES
W-01	2	SSTT4	SSTT4 (0-6)	0	6	INORG	Arsenic	7440-38-2	4.43E+01			1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
W-01	2	SSTT4	SSTT4 (0-6)	0	6	INORG	Chromium (total)	7440-47-3	1.66E+03			4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-01	2	SSTT4	SSTT4 (0-6)	0	6	INORG	Manganese	7439-96-5	4.49E+03			5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	9.0E+04	YES
W-01	2	SSTT5	SSTT5 (0-6)	0	6	INORG	Arsenic	7440-38-2	6.71E+01	J		1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	**3.7E+01**	YES
W-01	2	SSTT5	SSTT5 (0-6)	0	6	INORG	Chromium (total)	7440-47-3	9.40E+02	J		4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-01	2	SSTT5	SSTT5 (0-6)	0	6	INORG	Manganese	7439-96-5	4.60E+03	J		5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	9.0E+04	YES
W-05	1	BW5-02	BW5-02-S(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.09E+01	J	5.61E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
W-05	1	BW5-02	BW5-02-S(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	2.48E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**2.0E+01**	YES
W-06	1	BW6-05	BW6-05-S(2-4)DL	2	4	P/PCB	PCBs (total)	1336-36-3	8.05E+00	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
W-08	2	BW8-06	BW806S(0-2)DL	0	2	INORG	Arsenic	7440-38-2	2.55E+01		1.66E+00	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
W-08	2	BW8-06	BW806S(0-2)DL	0	2	INORG	Chromium (total)	7440-47-3	7.26E+02	J	7.73E-01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-08	2	BW8-06	BW806S(2-4)DL	2	4	SVOC	Benzo(a)pyrene	50-32-8	6.10E+00	J	4.00E-01				1.5E+03	**2.0E+00**	YES			1.9E+03	8.0E+00	NO
W-08	2	BW8-06	BW806S(2-4)DL	2	4	INORG	Chromium (total)	7440-47-3	3.63E+02	J	1.46E+00	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-08	2	BW8-06	BW806S(2-4)DL	2	4	INORG	Lead	7439-92-1	2.82E+03		2.13E+00	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	**9.0E+02**	YES
W-08	2	BW8-06	BW806S(6-8)DL	6	8	INORG	Arsenic	7440-38-2	5.40E+01		3.18E+00	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	**3.7E+01**	YES
W-08	2	BW8-06	BW806S(6-8)DL	6	8	INORG	Copper	7440-50-8	2.58E+04		1.59E+00	3.2E+01			1.3E+05	**2.0E+04**	YES			5.9E+04	7.3E+04	NO
W-08	2	BW8-06	BW806S(6-8)DL	6	8	INORG	Lead	7439-92-1	8.44E+03		2.16E+00	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	**9.0E+02**	YES
W-08	2	MWW8-02	BMWW8-02-S(0-2)DL	0	2	INORG	Arsenic	7440-38-2	3.62E+01		3.56E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
W-08	2	MWW8-02	BMWW8-02-S(0-2)DL	0	2	INORG	Chromium (total)	7440-47-3	8.57E+02		4.51E-01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-08	2	MWW8-02	BMWW8-02-S(0-2)DL	0	2	INORG	Lead	7439-92-1	5.87E+02		2.85E-01	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	9.0E+02	NO
W-08	2	MWW8-02	BMWW8-02-S(0-2)DL	0	2	INORG	Manganese	7439-96-5	2.78E+03		1.78E-01	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES

Table 1: Soil Results Exceeding MDEQ Part 201 Criteria
General Motors - Pontiac North Campus, Pontiac, Michigan

Area	Reference	Station ID	Sample ID	Top Depth (feet)	Bottom Depth (feet)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Validation Qualifier	QL mg/kg)	Site Specific Background (mg/kg)	Residential Soil Volatilization to Indoor Air Inhalation (mg/kg)	Residential Soil Volatilization to Ambient Air Inhalation (mg/kg)	Residential Particulate Soil Inhalation (mg/kg)	Residential Direct Contact (mg/kg)	Exceeds Residential Criteria	Industrial Soil Volatilization to Indoor Air Inhalation (mg/kg)	Industrial Soil Volatilization to Ambient Air Inhalation (mg/kg)	Industrial Particulate Soil Inhalation (mg/kg)	Industrial Direct Contact (mg/kg)	Exceeds Industrial Criteria
W-08	2	MWW8-05	BMWW8-05-S(0-2)DL	0	2	INORG	Arsenic	7440-38-2	2.69E+01		3.38E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	3.7E+01	NO
W-08	2	SW8-03	SW8-03-S(0-2)DL	0	2	INORG	Chromium (total)	7440-47-3	1.26E+03		2.19E-01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-08	2	SW8-04	SW8-04-S(0-2)DL	0	2	INORG	Manganese	7439-96-5	2.77E+03		8.36E-02	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
W-09	2	BW9-01	BW9-01-S(8-10)-N	8	10	SVOC	Benzo(a)pyrene	50-32-8	8.80E+00		4.10E+00				1.5E+03	**2.0E+00**	YES			1.9E+03	**8.0E+00**	YES
W-09	2	BW9-01	BW9-01-S(8-10)-N	8	10	P/PCB	PCBs (total)	1336-36-3	2.03E+01	J	4.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02	BW9-02-S(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	4.74E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-E10S4	BW9-02E10S4-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.74E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-E11S1	BW9-02E11S1-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	3.95E+02	J	2.30E+01		3.0E+03	**2.4E+02**	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-E11S3	BW9-02E11S3-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	3.76E+02	J	2.30E+01		3.0E+03	**2.4E+02**	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-E15N1	BW9-02E15N1-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	5.87E+00	J	2.20E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	BW9-02-E15N3	BW9-02E15N3-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	5.86E+00	J	2.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	BW9-02-E1N1	BW9-02E1N1-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	6.08E+00	J	5.00E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	BW9-02-E1S2	BW9-02E1S2-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.97E+02	J	1.10E+01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-E2S2	BW9-02-E2S2(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.47E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	BW9-02-S1	BW9-02-S1-S(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	2.09E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-W1S3	BW9-02W1S3-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.98E+02	J	1.20E+01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-W2	BW9-02-W2(0-2)DL	0	2	P/PCB	PCBs (total)	1336-36-3	3.14E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-W2N1	BW9-02W2N1-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	2.27E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-W2S1	BW9-02W2S1-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.67E+02	J	1.10E+01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-02-W2S2	BW9-02W2S2-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	4.44E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	BW9-03	BW903S(0-2)DL	0	2	INORG	Manganese	7439-96-5	3.68E+03		1.93E-01	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
W-09	2	BW9-03	DUP071FDDL	0	2	INORG	Manganese	7439-96-5	5.96E+03		1.95E-01	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	9.0E+04	YES
W-09	2	MWD4	MWD4-S(0-2)-N	0	2	INORG	Manganese	7439-96-5	3.02E+03		1.04E+01	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
W-09	2	SW9-02	SW9-02-S(02)062701DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.05E+01	J	2.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-02	SW9-02-S(02)062701DL	0	2	INORG	Chromium (total)	7440-47-3	5.23E+02		3.91E-01	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	9.2E+03	YES
W-09	2	SW9-02	SW9-02-S(02)062701DL	0	2	INORG	Manganese	7439-96-5	2.65E+03		1.54E-01	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	9.0E+04	YES
W-09	2	SW9-07	SW9-07-S(02)062701DL	0	2	SVOC	Benzo(a)pyrene	50-32-8	5.90E+00		4.50E-01				1.5E+03	**2.0E+00**	YES			1.9E+03	8.0E+00	NO
W-09	2	SW9-09	SW9-09-S(02)062701DL	0	2	P/PCB	PCBs (total)	1336-36-3	2.93E+01	J	2.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09	SW9-09-S(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	7.38E+00	J	4.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E1	SW9-09E1-(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	1.54E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E1	SW9-09E1-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	3.05E+01	J	2.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E1N1	SW9-09E1N1(10-12)DL	10	12	P/PCB	PCBs (total)	1336-36-3	6.80E+00	J	4.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E1N1	SW9-09E1N1-6-8-N	6	8	P/PCB	PCBs (total)	1336-36-3	4.83E+00	J	3.70E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E1N2	SW9-09-E1N2(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	7.61E+00	J	4.60E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E1S2	SW9-09-E1S2(10-12)DL	10	12	P/PCB	PCBs (total)	1336-36-3	6.37E+00	J	4.30E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E1S2	SW9-09E1S2-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	4.84E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E1S2	SW9-09E1S2-4-6DL	4	6	P/PCB	PCBs (total)	1336-36-3	3.36E+01	J	2.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E2	SW9-09E2-12-14DL	12	14	P/PCB	PCBs (total)	1336-36-3	5.78E+00	J	4.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E2	SW9-09E2-8-10DL	8	10	P/PCB	PCBs (total)	1336-36-3	1.77E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E2N1	SW9-09E2N1-0-2-N	0	2	P/PCB	PCBs (total)	1336-36-3	6.24E+00	J	3.80E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E2N1	SW9-09E2N1-14-16DL	14	16	P/PCB	PCBs (total)	1336-36-3	4.26E+00	J	2.30E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E2N2	SW9-09E2N2-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	4.46E+01	J	2.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E2N2	SW9-09E2N2-4-6DL	4	6	P/PCB	PCBs (total)	1336-36-3	1.88E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E2S1	SW9-09E2S1-(10-12)DL	10	12	P/PCB	PCBs (total)	1336-36-3	7.42E+00	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E2S2	SW9-09E2S2-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	4.87E+00	J	4.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E2S2	SW9-09E2S2-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	4.77E+00	J	4.30E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E2S2	SW9-09E2S2-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	9.31E+00	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E3	SW9-09E3-10-12DL	10	12	P/PCB	PCBs (total)	1336-36-3	4.35E+00	J	2.30E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E3	SW9-09E3-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	4.94E+00	J	4.70E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E3	SW9-09-E3-S(2-4)DL	2	4	P/PCB	PCBs (total)	1336-36-3	1.69E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E3N1	SW9-09E3N1-10-12DL	10	12	P/PCB	PCBs (total)	1336-36-3	8.41E+00	J	4.60E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E3N2	SW9-09E3N2-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	2.48E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E3N2	SW9-09E3N2-12-14DL	12	14	P/PCB	PCBs (total)	1336-36-3	5.65E+00	J	2.30E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E3N2	SW9-09E3N2-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	6.10E+00	J	4.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E3N2	SW9-09E3N2-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	1.86E+01	J	2.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E3N2	SW9-09E3N2-8-10DL	8	10	P/PCB	PCBs (total)	1336-36-3	3.26E+01	J	2.40E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E3S1	SW9-09E3S1-10-12DL	10	12	P/PCB	PCBs (total)	1336-36-3	1.96E+01	J	2.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-E4	SW9-09E4-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	1.17E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E4	SW9-09E4-8-10DL	8	10	P/PCB	PCBs (total)	1336-36-3	5.64E+00	J	4.70E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E4N1	SW9-09E4N1-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	5.21E+00	J	4.60E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E4S1	SW9-09E4S1-10-12DL	10	12	P/PCB	PCBs (total)	1336-36-3	1.68E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-E4S2	SW9-09E4S2-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	2.34E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-N1	SW9-09-N1(10-12)DL	10	12	P/PCB	PCBs (total)	1336-36-3	7.90E+00	J	4.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-N1	SW9-09N1-12-14DL	12	14	P/PCB	PCBs (total)	1336-36-3	2.76E+01	J	2.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-N1	SW9-09N1-8-10DL	8	10	P/PCB	PCBs (total)	1336-36-3	2.17E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-N2	SW9-09-N2(10-12)DL	10	12	P/PCB	PCBs (total)	1336-36-3	5.04E+00	J	2.20E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-N2	SW9-09-N2(6-8)DL	6	8	P/PCB	PCBs (total)	1336-36-3	8.71E+00	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO

Table 1: Soil Results Exceeding MDEQ Part 201 Criteria
General Motors - Pontiac North Campus, Pontiac, Michigan

Area	Reference	Station ID	Sample ID	Top Depth (feet)	Bottom Depth (feet)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Validation Qualifier	QL mg/kg)	Site Specific Background (mg/kg)	Residential Soil Volatilization to Indoor Air Inhalation (mg/kg)	Residential Soil Volatilization to Ambient Air Inhalation (mg/kg)	Residential Particulate Soil Inhalation (mg/kg)	Residential Direct Contact (mg/kg)	Exceeds Residential Criteria	Industrial Soil Volatilization to Indoor Air Inhalation (mg/kg)	Industrial Soil Volatilization to Ambient Air Inhalation (mg/kg)	Industrial Particulate Soil Inhalation (mg/kg)	Industrial Direct Contact (mg/kg)	Exceeds Industrial Criteria
W-09	2	SW9-09-N2	SW9-09-N2(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	6.61E+00	J	4.60E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-N2	SW9-09N2-14-16DL	14	16	P/PCB	PCBs (total)	1336-36-3	1.07E+01	J	4.80E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-N2	SW9-09-N2-S(4-6)DL	4	6	P/PCB	PCBs (total)	1336-36-3	9.12E+00	J	4.70E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-S1	SW9-09S1-(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	2.56E+01	J	2.40E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-S2	SW9-09-S2-S(4-6)DL	4	6	P/PCB	PCBs (total)	1336-36-3	7.01E+00	J	4.60E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1	SW9-09W1-10-12DL	10	12	P/PCB	PCBs (total)	1336-36-3	6.52E+00	J	5.00E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1	SW9-09W1-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	1.87E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W1N1	SW9-09W1N1-14-16DL	14	16	P/PCB	PCBs (total)	1336-36-3	5.57E+00	J	2.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1N1	SW9-09W1N1-4-6DL	4	6	P/PCB	PCBs (total)	1336-36-3	1.67E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1N1	SW9-09W1N1-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	9.98E+00	J	4.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1N2	SW9-09W1N2-(10-12)DL	10	12	P/PCB	PCBs (total)	1336-36-3	2.59E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W1N2	SW9-09W1N2-(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	4.88E+01	J	2.50E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W1N2	SW9-09W1N2-14-16DL	14	16	P/PCB	PCBs (total)	1336-36-3	9.88E+00	J	4.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1N2	SW9-09W1N2-4-6DL	4	6	P/PCB	PCBs (total)	1336-36-3	5.08E+01	J	2.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W1N2	SW9-09W1N2-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	2.48E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W1S1	SW9-09W1S1-6-8DL	6	8	P/PCB	PCBs (total)	1336-36-3	1.44E+01	J	1.10E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1S1	SW9-09W1S1-8-10DL	8	10	P/PCB	PCBs (total)	1336-36-3	5.15E+00	J	2.30E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1S2	SW9-09W1S2-12-14DL	12	14	P/PCB	PCBs (total)	1336-36-3	4.61E+00	J	2.30E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1S2	SW9-09W1S2-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	6.33E+00	J	2.20E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W1S2	SW9-09W1S2-4-6DL	4	6	P/PCB	PCBs (total)	1336-36-3	8.38E+00	J	4.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W2	SW9-09W2-12-14DL	12	14	P/PCB	PCBs (total)	1336-36-3	4.76E+00	J	4.90E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W2	SW9-09-W2-S(4-6)DL	4	6	P/PCB	PCBs (total)	1336-36-3	9.54E+00	J	4.80E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W2N1	SW9-09W2N1-10-12DL	10	12	P/PCB	PCBs (total)	1336-36-3	2.58E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W2N1	SW9-09W2N1-14-16DL	14	16	P/PCB	PCBs (total)	1336-36-3	9.91E+00	J	5.40E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W2N1	SW9-09W2N1-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	1.47E+01	J	4.60E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W2N2	SW9-09W2N2-(6-8)DL	6	8	P/PCB	PCBs (total)	1336-36-3	3.36E+01	J	2.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W2N2	SW9-09W2N2-0-2DL	0	2	P/PCB	PCBs (total)	1336-36-3	1.68E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W2S1	SW9-09-W2S1(10-12)DL	10	12	P/PCB	PCBs (total)	1336-36-3	1.99E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W2S1	SW9-09W2S1-8-10DL	8	10	P/PCB	PCBs (total)	1336-36-3	3.88E+01	J	2.50E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W2S2	SW9-09W2S2-(10-12)DL	10	12	P/PCB	PCBs (total)	1336-36-3	1.90E+01	J	2.50E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W2S2	SW9-09W2S2-(12-14)DL	12	14	P/PCB	PCBs (total)	1336-36-3	3.69E+01	J	2.50E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W2S2	SW9-09W2S2-(4-6)DL	4	6	P/PCB	PCBs (total)	1336-36-3	1.58E+01	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W2S2	SW9-09W2S2-(6-8)DL	6	8	P/PCB	PCBs (total)	1336-36-3	6.37E+01	J	2.40E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W2S2	SW9-09W2S2-(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	4.87E+01	J	2.40E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W2S2	SW9-09W2S2-14-16DL	14	16	P/PCB	PCBs (total)	1336-36-3	1.13E+01	J	1.30E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-09	2	SW9-09-W2S2	SW9-09W2S2-2-4DL	2	4	P/PCB	PCBs (total)	1336-36-3	3.47E+01	J	2.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	**1.6E+01**	YES
W-09	2	SW9-09-W3	SW9-09W3-10-12DL	10	12	P/PCB	PCBs (total)	1336-36-3	8.89E+00	J	1.20E+00		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	1.6E+01	NO
W-10	1	BMWW10-06	BMWW10-06-0-2DL	0	2	INORG	Manganese	7439-96-5	2.26E+03		8.39E-02	5.1E+02			3.3E+03	2.5E+04	NO				**1.5E+03**	1.7E+05	YES
W-10	1	BW10-02	BW10-02-S(12-14)-N	12	14	P/PCB	PCBs (total)	1336-36-3	7.86E+00	J	7.25E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
W-10	1	BW10-02	BW10-02-S(8-10)-N	8	10	P/PCB	PCBs (total)	1336-36-3	5.08E+00	J	3.50E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
W-10	1	BW10-04	BW10-04-S(0-2)DL	0	2	INORG	Chromium (total)	7440-47-3	5.96E+02		4.20E+00	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	1.7E+04	YES
W-10	1	BW10-04	BW10-04-S(0-2)DL	0	2	INORG	Manganese	7439-96-5	1.00E+04		1.66E+00	5.1E+02			**3.3E+03**	2.5E+04	YES			**1.5E+03**	1.7E+05	YES
W-10	1	BW10-04	BW10-04-S(8-10)	8	10	INORG	Lead	7439-92-1	6.32E+02		2.81E-01	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	9.0E+02	NO
W-10	1	BW10-05	BW10-05-S(0-2)DL	0	2	INORG	Arsenic	7440-38-2	2.74E+01		3.19E+00	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
W-10	1	BW10-05	BW10-05-S(0-2)DL	0	2	INORG	Chromium (total)	7440-47-3	5.64E+02		4.04E+00	4.9E+01			**2.6E+02**	2.5E+03	YES			**2.4E+02**	1.7E+04	YES
W-10	1	BW10-05	BW10-05-S(0-2)DL	0	2	INORG	Manganese	7439-96-5	2.45E+03		1.60E+00	5.1E+02			3.3E+03	2.5E+04	NO			**1.5E+03**	1.7E+05	YES
W-10	1	BW10-06	BW10-06-S(8-10)	8	10	INORG	Arsenic	7440-38-2	2.38E+01	J	3.50E-01	1.3E+01			7.2E+02	**7.6E+00**	YES			9.1E+02	6.1E+01	NO
W-10	1	BW10-06	BW10-06-S(8-10)DL	8	10	P/PCB	PCBs (total)	1336-36-3	7.62E+00	J	4.70E-01		3.0E+03	2.4E+02	5.2E+03	**4.0E+00**	YES	1.6E+04	8.1E+02	6.5E+03	2.0E+01	NO
W-10	1	MWW10-1	BMWW10-01-S(4-6)-N	4	6	INORG	Lead	7439-92-1	4.02E+03		4.82E+00	4.9E+01			1.0E+05	**4.0E+02**	YES			4.4E+04	**9.0E+02**	YES

Notes:

1 - The evaluation of soil from these AOIs is from the RFI Report (ENCORE 2002), which used Michigan Department of Environmental Quality (MDEQ) Part 201 Generic Cleanup Criteria and Screening Levels, June 7 2000.

2 - The evaluation of soil from these AOIs is from the Supplemental RFI Report No.1 (ENCORE 2003c), which used Michigan Department of Environmental Quality (MDEQ) Part 201 Generic Cleanup Criteria and Screening Levels, December 2002.

Chem Group - Chemical Group

QL - Quantitation Limit

Table 2: Shallow Groundwater Results Exceeding MDEQ Part 201 Criteria
General Motors - Pontiac North Campus, Pontiac, Michigan

Area	WELLZONE	Station ID	Sample ID	Sample Date	Meas Basis	Chem Group	Chemical	CASRN	Conc (mg/L)	Validation Qualifier	QL (mg/L)	Residential Volatilization to Indoor Air (mg/L)	Exceeds Residential Criteria	Industrial Volatilization to Indoor Air (mg/L)	Exceeds Industrial Criteria	Groundwater Contact Criteria (mg/L)	Exceeds Contact Criteria
W-01	Shallow	MW-28-99	MW28-99-GW-010702	1/7/2002	T	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	1.77E-08	J	6.6E-09		NO		NO	1.0E-08	YES
W-01	Shallow	MW-34-99	DUP-043-GW-010702	1/7/2002	T	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	2.93E-08	J	7.3E-09		NO		NO	1.0E-08	YES
W-01	Shallow	MW-34-99	MW34-99-GW-010702	1/7/2002	T	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	1.38E-08	J	5.8E-09		NO		NO	1.0E-08	YES
W-01	Shallow	MW-39-99	MW-39-99-GW(25-30)-N	8/28/2001	T	P/PCB	PCBs (total)	1336-36-3	4.00E-03	J	8.0E-04	4.5E-02	NO	4.5E-02	NO	3.3E-03	YES
W-01	Shallow	MW-39-99	MW39-99-GWDL	1/10/2002	T	P/PCB	PCBs (total)	1336-36-3	4.59E-03	J	8.2E-04	4.5E-02	NO	4.5E-02	NO	3.3E-03	YES
W-08	Shallow	MWW8-08	MWW8-08-GW-02/15/02	2/15/2002	T	CDD/F	2,3,7,8-TCDD Equivalent	1746-01-6-TEF	1.97E-08	J	3.9E-08		NO		NO	1.0E-08	YES

Notes:

Chem Group - Chemical Group

Meas Basis - Measured Basis; T = Total, D = Dissolved

QL - Quantitation Limit

Criteria are Michigan Department of Environmental Quality (MDEQ) Part 201 Generic Cleanup Criteria and Screening Levels, December 2002.

The evaluation of shallow groundwater is from the Supplemental RFI Report No.1 (ENCORE 2003c).

Table 3: Deep and Intermediate Groundwater Results Exceeding MDEQ Part 201 Criteria
General Motors - Pontiac North Campus, Pontiac, Michigan

Area	Zone	Station ID	Sample ID	Sample Date	Meas Basis	Chem Group	Chemical	CASRN	Conc (mg/L)	Validation Qualifier	QL (mg/L)	Residential Drinking Water Criteria (mg/L)	Exceeds Residential Criteria	Industrial Drinking Water Criteria (mg/L)	Exceeds Industrial Criteria
SWHI	Deep	GWP6	GWP6-GW(82-92)-N	9/18/2001	T	VOC	Acetone	67-64-1	5.80E+00		8.3E-01	7.3E-01	YES	2.1E+00	YES
SWHI	Deep	GWP6	GWP6-GWDL	1/8/2002	T	VOC	Acetone	67-64-1	7.10E+00	J	6.4E-02	7.3E-01	YES	2.1E+00	YES
SWHI	Intermediate	IWF3	IWF3-GW(50-60)DL	9/10/2001	T	VOC	Acetone	67-64-1	7.80E-01	J	8.5E-03	7.3E-01	YES	2.1E+00	NO
SWHI	Intermediate	IWM2	IWM2-GWDL	1/7/2002	T	VOC	Acetone	67-64-1	2.60E+00	J	2.6E-02	7.3E-01	YES	2.1E+00	YES
SWHI	Intermediate	IWP5	IWP5-GW(50-60)	9/20/2001	D	INORG	Thallium	7440-28-0	6.10E-03	J	5.0E-03	2.0E-03	YES	2.0E-03	YES
SWHI	Intermediate	IWP5	IWP5-GW(50-60)DL	9/20/2001	T	VOC	Acetone	67-64-1	6.60E+00	J	5.1E-02	7.3E-01	YES	2.1E+00	YES
SWHI	Intermediate	IWP5	IWP5-GWDL	1/10/2002	T	VOC	Acetone	67-64-1	1.30E+01		1.3E-01	7.3E-01	YES	2.1E+00	YES
SWHI	Intermediate	IWP5	IWP5-GWDL02	11/14/2002	T	VOC	Acetone	67-64-1	1.40E+00	J	2.8E-02	7.3E-01	YES	2.1E+00	NO
W-01	Deep	GWD8	GWD8-GW(63-73)-N	9/14/2001	T	VOC	Acetone	67-64-1	3.10E+00		4.0E-01	7.3E-01	YES	2.1E+00	YES
W-01	Intermediate	IWD7	IWD7-GW	1/9/2002	T	SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	8.80E-03		2.7E-03	6.0E-03	YES	6.0E-03	YES
W-01	Intermediate	IWD7	IWD7-GW	1/9/2002	T	INORG	Lead	7439-92-1	1.35E-02		2.5E-03	4.0E-03	YES	4.0E-03	YES
W-01	Intermediate	IWD7	IWD7-GW	1/9/2002	T	INORG	Vanadium	7440-62-2	4.90E-03	J	8.2E-04	4.5E-03	YES	6.2E-02	NO
W-09	Deep	DWD12	DWD12W(115-125)	5/20/2003	T	VOC	Methylene Chloride	75-09-2	1.80E-02		2.9E-04	5.0E-03	YES	5.0E-03	YES

Notes:

Chem Group - Chemical Group

Meas Basis - Measured Basis; T = Total, D = Dissolved

QL - Quantitation Limit

Criteria are Michigan Department of Environmental Quality (MDEQ) Part 201 Generic Cleanup Criteria and Screening Levels, December 2002.

The evaluation of intermediate and deep groundwater is from the Supplemental RFI Report No.1 (ENCORE 2003c).

Table 4: Estimated Cumulative Cancer Risk and HI for AOIs with "Contaminated" Soil - Based on Maximum Concentrations General Motors - Pontiac North Campus, Pontiac, Michigan			
AOI	**Reference**	**Cumulative Risk**	**HI**
F-07	2	2E-05	5E-01
F-15	2	3E-05	2E-01
M-01	1	**1E-04**	**7E+00**
M-02	2	2E-05	1E+00
M-05	1	6E-06	2E-01
M-07	2	2E-05	1E-01
M-09	2	7E-06	9E-02
M-19	1	3E-05	**1E+00**
P-09	2	1E-04	1E+00
P-11	2	2E-05	7E-01
SWDF	2	1E-06	4E-02
W-01	2	**3E-04**	**2E+01**
W-05	1	3E-05	**2E+00**
W-08	2	7E-05	**3E+00**
W-09	2	**6E-04**	**4E+01**
W-10	1	2E-05	1E+00
Notes:			
1 - Cumulative Risks calculated in the RFI Report (ENCORE 2002).			
2 - Cumulative Risks calculated in the Supplemental RFI Report (ENCORE 2003c).			

Table 5: Estimated Cumulative Cancer Risk and HI for AOIs with "Contaminated" Soil - Based on Maximum Concentrations and 95% UCLs
General Motors - Pontiac North Campus, Pontiac, Michigan

AOI	Reference	Cumulative Risk	HI
M-01	1	2E-05	5E-01
M-19	1	2E-05	7E-01
W-01 (routine wrkr)	2	4E-05	1E+00
W-01 (const wrkr)	2	9E-06	5E-01
W-05	1	2E-05	6E-01
W-08	2	7E-05	9E-01
W-09	2	4E-05	9E-01
Notes:			
1 - Cumulative Risks calculated in the RFI Report (ENCORE 2002).			
2 - Cumulative Risks calculated in the Supplemental RFI Report (ENCORE 2003c).			

A P P E N D I C E S

Appendix A:

Discussion Paper
Michigan Part 201 Generic Soil Particulate Inhalation Criteria

DISCUSSION PAPER

MICHIGAN PART 201 GENERIC SOIL PARTICULATE INHALATION CRITERIA

Prepared for
General Motors Corporation
Detroit, Michigan

Prepared by
ENVIRON Corporation
Princeton, New Jersey

March 2000

DISCUSSION PAPER

MICHIGAN PART 201 GENERIC SOIL PARTICULATE INHALATION CRITERIA

1 Introduction

According to MDEQ's August 31, 1998 Part 201 Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document, the generic particulate soil inhalation criteria (PSIC) include the following assumptions:

- Soil particulate emissions include both a component from wind erosion and a component from vehicle traffic on unpaved roads (page 9); and
- A "safety" factor of two is necessary to account for short-term peaks in particulate ambient air concentrations (page 12).

These assumptions are not necessarily appropriate in all situations. This paper discusses situations in which these assumptions are not necessary and explains the derivation of alternate PSIC for these cases.

2 Wind Erosion and Vehicle Traffic

MDEQ's generic PSIC are calculated assuming that airborne soil particles are generated from both wind erosion and vehicle traffic on unpaved roads. However, where there is little or no potential for vehicle traffic on unpaved roads, the evaluation of potential exposures to respirable airborne soil particulates (PM_{10}) should use PSIC that are based on emissions from only wind erosion. In this case, the PSIC can be calculated using a particulate emission factor (PEF) of 2.99×10^8 m^3/kg, which is obtained by setting the Ev term to zero in the equation for PEF in Attachment A of the Technical Support Document. This PEF can then be substituted into Equations 15 and 17 to calculate PSIC that are based on only wind erosion.

Alternately, such PSIC also can be calculated by multiplying the MDEQ generic PSIC by the ratio of the PEF for only wind erosion to the MDEQ default PEF, as follows:

$$PSIC_w = PSIC \cdot \frac{PEF_w}{PEF} = PSIC \cdot \frac{2.99 \times 10^8}{3.95 \times 10^7} = PSIC \times 7.57$$

where:

$PSIC_w$	=	PSIC based on only wind erosion (mg/kg)
PSIC	=	MDEQ default PSIC, which includes both wind erosion and vehicle traffic (mg/kg)
PEF_w	=	PEF for wind erosion only (m^3/kg)
PEF	=	MDEQ default PEF for wind erosion and vehicle traffic (m^3/kg)

Likewise, a PSIC for only vehicle traffic $PSIC_v$ could be similarly calculated. Algebraic manipulation of Equation 15 or 17 gives the relationship between the PSIC that includes both wind erosion and vehicle traffic and the separate $PSIC_w$ and $PSIC_v$ is as follows:

$$PSIC = \left[\frac{1}{PSIC_w} + \frac{1}{PSIC_v} \right]^{-1}$$

3 Short-Term Peak Particulate Air Concentrations

The MDEQ generic PSIC for many chemicals are half of the values calculated from Equation 17 (PSIC based on noncancer effects). According to the Technical Support Document, the PSIC for "chemicals which are associated with quarterly, 24-hour, 8-hour, or 1-hour averaging times under the Air Toxics Rules" were divided by 2. The Technical Support Document explained that this adjustment was made to account for short-term peak particulate air concentrations, which are typically twice as high as annual average concentrations (page 12). MDEQ based its factor of two on a review of air monitoring data, which showed that the ratio of the 90th percentile 24-hour average air particulate concentration is approximately twice the annual average.

In accounting for the higher peak 24-hour air particulate concentrations, MDEQ's adjustment of the PSIC did not account for the proper use of short-term inhalation limits that are available for evaluating potential exposures over such a short exposure period. Short-term inhalation limits are higher (often by more than 10-fold) than the chronic reference concentrations (RfCs) used in Equation 17, which are highly conservative limits for protection over a lifetime of daily exposure. Clearly, the peak 24-hour air particulate concentrations considered by MDEQ occur no more frequently than 10% of the time. However, by dividing in half the PSIC calculated from Equation 17, MDEQ essentially used chronic RfCs to evaluate an acute exposure, which is a highly conservative approach.

For a chemical that has short-term inhalation limits, the MDEQ adjustment factor of 2 is unnecessary. For such chemicals, short-term PSIC should be calculated using short-term inhalation limits. For many chemicals, short-term inhalation limits are available from several sources, including the NIOSH and the ACGIH. These short-term limits should be used in place of the chronic RfC in Equation 17, when the PEF is divided by 2 to approximate peak 24-hour particulate air concentrations. The calculated short-term PSIC for a chemical then can be compared with its long-term PSIC (based on an annual average PEF and chronic RfC) to identify whether the short- or long-term PSIC is more stringent.

4 Example

MDEQ's generic PSIC for manganese (Mn) in soil at an industrial site is 1,500 mg/kg, as published in Operational Memorandum #18. However, the generic PSIC calculated using Equation 17 is 2,940 mg/kg, when the PEF given in Attachment A of the Technical Support Document is not divided by 2. This is the correct generic PSIC for evaluating potential long-term exposures to Mn in airborne soil particulate, because it is calculated using the chronic RfC

of 0.00005 mg/m^3 for Mn and a conservative estimate of the annual-average air particulate concentration.

Potential exposures to peak 24-hour air particulate concentrations of Mn can be evaluated by using short-term inhalation limits for Mn. The Occupational Safety and Health Administration (OSHA) has established a permissible exposure limit (PEL) of 1 mg/m^3 for Mn and a ceiling limit of 5 mg/m^3. The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended a threshold limit value of 0.2 mg/m^3 for Mn. The lowest of these inhalation limits is 4,000-fold higher than the chronic RfC. This increase in the allowable inhalation limit that corresponds to shortening the period of exposure from a chronic to an acute period more than offsets the doubling of the air particulate concentration. That is, a short-term PSIC would be much higher than the PSIC of 2,940 mg/kg calculated using Equation 17. Therefore the appropriate generic PSIC for Mn, accounting for both long- and short-term exposures would be 2,940 mg/kg.

The generic PSIC of 2,940 mg/kg accounts for both wind erosion and vehicle traffic. A generic $PSIC_w$ for wind erosion only would be approximately 22,300 mg/kg, which can be obtained from 2,940 mg/kg times 7.57 as discussed above. A generic $PSIC_v$ for only vehicle traffic using MDEQ's assumptions for industrial/commercial sites would be approximately 3,390 mg/kg. It can be verified that the $PSIC_w$ and $PSIC_v$ "add up" to the PSIC of 2,940 mg/kg (i.e., $[22{,}300^{-1}+3{,}390^{-1}]^{-1}$).

As noted in the Technical Support Document, site-specific adjustments to the MDEQ default assumptions regarding other parameters affecting emission and dispersion may be necessary (e.g., groundcover fraction, soil type, source size) before using the PSIC, $PSIC_w$, or $PSIC_v$ for site-specific evaluations.

Appendix B:

Heavy Construction Scenario
Particulate Inhalation Criteria and Risk Calculations for Soil
at AOIs F-07 and M-02

APPENDIX B

Heavy Construction Scenario
Particulate Inhalation Criteria and Risk Calculations at AOIs F-07 and M-02

1.0 Introduction

The calculations discussed in this appendix pertain to the potential exposures of workers via inhalation of particulates while performing excavations associated with maintenance or construction activities at AOIs F-07 or M-02.

This potential exposure scenario is evaluated separately because Michigan Department of Environmental Quality's Op Memo 18, Part 201 Generic Particulate Inhalation Criteria (MDEQ 2000) address' only particulate emissions from wind erosion and truck traffic. This evaluation is intended to address potential risks from exposure to manganese (AOI M-02) and chromium (total) (AOI F-07) via particulate inhalation during excavation activities.

2.0 Acute Exposures

The highest concentrations of each metal in the AOI are conservatively assumed to be the concentration of the chemical in PM_{10}. The concentrations of manganese, 2,220 mg/kg at 6-8 foot depth, and chromium (total), 335 mg/kg at 8-10 foot depth, are within the expected depths of an excavation, about 10 feet below ground surface (bgs).

The PM_{10} flux ($J_{10, C}$) is calculated from AP-42, 5th Edition, the calculations are shown in Table B-1 (tables are at the end of the text).

Dispersion (C/Q) is calculated from SCREEN3 (USEPA 1995) for a 15 x 15 foot excavation area and adjusted from a 1-hour maximum to an 8-hour maximum concentration using a factor of 0.7, SCREEN3 results are at the end of the text.

The air concentration of PM_{10} was calculated as follows:

$$AirConcPM_{10} = J_{10,C} \times C / Q$$

The chemical concentration in air (C_{air}) is calculated as follows:

$$C_{air} = AirConcPM_{10} \times ChemConcPM_{10}$$

C_{air} is then compared against OSHA permissible exposure limits (PELs) to determine if potential exposures would be within acceptable limits, see Table B-2.

3.0 Longer-Term Exposures

C/Q was adjusted for an annual maximum, instead of an 8-hour maximum. The C_{air} was calculated using the same equations that were used to derive the acute criterion.

3.1 Exposure Factors

Exposure Frequency and Duration

The total number of days of occasional maintenance or construction that involves actual excavation is assumed to be 50 days, which is assumed to occur at an exposure frequency of 5 days/year for an exposure duration of 10 years. This combination of exposure frequency and exposure duration is expected to be conservative for the amount of time these workers would actually be excavating soil (as opposed to the total time for maintenance or construction, which typically includes time not associated with excavation). For perspective, the frequency of 5 days/year is expected to be equivalent to the excavation time for a few minor underground repairs per year or one major repair. The duration of 10 years is more than twice the length of time that workers typically work at one location.

Averaging Time

The averaging time for evaluating cancer risk is equal to a lifetime of 70 years, and the averaging time for evaluating noncnancer risk is equal to the exposure duration (USEPA 1989).

3.2 Toxicity Values

The toxicity values used in the calculation of cancer and noncancer risks are shown in the accompanying tables. They are compiled from USEPA's Integrated Risk Information System (IRIS).

3.3 Cancer and noncancer risks for particulate inhalation

The inhalation cancer risk is calculated using the C_{air} and the URF, as follows:

$$Risk = C_{air} \cdot URF \cdot \frac{EF \cdot ED}{AT}$$

where EF is exposure frequency, ED is exposure duration, and AT is averaging time.

The inhalation HQ is calculated using C_{air} and the RfC, as follows:

$$HQ = \frac{C_{air}}{RfC} \cdot \frac{EF \cdot ED}{AT}$$

The calculated cancer risk and HQ for each constituent are provided in Table B-5.

4.0 Sensitivity analysis

As a sensitivity analysis the size of the excavation area was adjusted to 400 feet x 225 feet, which is the size of AOI M-02 (the larger of the two AOIs being discussed).

4.1 Acute Exposures

The C/Q was adjusted to the new excavation size. The C_{air} was calculated using the same equations discussed in Section 2.0. The adjusted air concentration of PM_{10} and C_{air} are shown in Tables B-6 and B-7, respectively.

4.2 Longer-Term Exposures

The C/Q was adjusted to the new excavation size and an annual maximum, instead of an 8-hour maximum (Table B-8). The C_{air} was calculated using the same equations discussed in Section 2.0.

4.2.1 Exposure Factors

The exposure frequency and duration were adjusted for the larger excavation (Table B-9). The total number of days of construction that involves actual excavation is assumed to be 125 days. This assumes an exposure frequency of 125 days/year (5 days a week for 25 weeks, i.e. half a working year) for an exposure duration of 1 year. This combination of exposure frequency and exposure duration is expected to be conservative for the amount of time these workers would actually be excavating soil (as opposed to the total time for construction, which typically includes time not associated with excavation).

4.3 Cancer and noncancer risks for particulate inhalation

Cumulative cancer and noncancer risks for particulate inhalation were calculated as discussed in Section 3.2. The calculated cancer risk and HQ for each constituent are provided in Table B-10.

5.0 References

Michigan Department of Environmental Protection (MDEQ). 2000. Part 201 Generic Cleanup Criteria and Screening Levels. June 7.

U. S. Environmental Protection Agency (USEPA). 1989. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual. Washington, DC. EPA/540-1-89-002. OSWER Directive 9285.7-01a. December.

U. S. Environmental Protection Agency (USEPA). 1995. Emissions, Monitoring, and Analysis Division. Office of Air Quality Planning and Standards. SCREEN3 Model user's guide. EPA-454/B-95-004.

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 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

15 by 15 ft excavation

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE                =         AREA
   EMISSION RATE (G/(S-M**2))  =      1.00000
   SOURCE HEIGHT (M)          =        .0000
   LENGTH OF LARGER SIDE (M)   =       4.5700
   LENGTH OF SMALLER SIDE (M)  =       4.5700
   RECEPTOR HEIGHT (M)        =        .0000
   URBAN/RURAL OPTION         =        URBAN
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION


BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC             U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
-------  ----------  ----  -----  -----  ------  ------  -------
     1.   .1349E+08    6     1.0    1.0 10000.0     .00     45.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
     4.   .1884E+08    6     1.0    1.0 10000.0     .00     45.

     **************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     **************************************

 CALCULATION        MAX CONC    DIST TO   TERRAIN
  PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
--------------    -----------   -------   -------
SIMPLE TERRAIN      .1884E+08        4.        0.


************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
************************************************
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 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

M-02 AOI Excavation

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE                =         AREA
   EMISSION RATE (G/(S-M**2))  =      1.00000
   SOURCE HEIGHT (M)          =        .0000
   LENGTH OF LARGER SIDE (M)   =     122.0000
   LENGTH OF SMALLER SIDE (M)  =      69.0000
   RECEPTOR HEIGHT (M)        =        .0000
   URBAN/RURAL OPTION         =        URBAN
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION


BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
-------  ----------  ----  -----  -----  ------  ------  -------
     1.   .4237E+08    6     1.0    1.0 10000.0     .00     24.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
    70.   .4936E+08    6     1.0    1.0 10000.0     .00     27.

     ************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ************************************

 CALCULATION        MAX CONC    DIST TO   TERRAIN
  PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
--------------    -----------   -------   -------
SIMPLE TERRAIN      .4936E+08       70.         0.


************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
************************************************
```

B-1: Acute Soil PM_{10} Emission from "Heavy Construction Operations"			
from AP-42, 5th Edition			
PM_{30} flux	ton/acre/month		1.2
conversion factor	kg/ton		907
conversion factor	acre/m^2		2.5E-04
conversion factor	month/s		3.8E-07
PM_{10}/PM_{30}			0.24
PM_{10} flux	kg/m^2-s	**$J_{10,C}$**	2.46E-08
C/Q (kg/m^3 per kg/m^2-s)		**C/Q**	13.3
Air Concentration of PM_{10}	kg/m^3		3.3E-07
Note			
C/Q is for a 15 x 15 ft source area adjusted for an 8-hour maximum.			

B-2: Acute Concentrations During "Heavy Construction Operations"

Area	Chemical	Chemical Conc in PM_{10} (mg/kg)	Air Conc of PM_{10} (kg/m^3)	C_{air} (mg/m^3)	PEL (mg/m^3)	Source
M-02	Manganese	2,220	3.27E-07	7.25E-04	1	OSHA
F-07	Chromium (total)	335	3.27E-07	1.09E-04	0.5	OSHA
Note						
OSHA PELs include an 8-hour time weighted average.						

B-3: Annual Soil PM_{10} Emission from "Heavy Construction Operations"			
from AP-42, 5th Edition			
PM_{30} flux	ton/acre/month		1.2
conversion factor	kg/ton		907
conversion factor	acre/m^2		2.5E-04
conversion factor	month/s		3.8E-07
PM_{10}/PM_{30}			0.24
PM_{10} flux	kg/m^2-s	**$J_{10,C}$**	2.46E-08
C/Q (kg/m^3 per kg/m^2-s)		**C/Q**	1.52
Air Concentration of PM_{10}	kg/m^3		3.7E-08
Note			
C/Q is for a 15 x 15 ft source area adjusted for an annual maximum.			

B-4: High-End Exposure Factors for "Heavy Construction Operations"			
			Industrial
Ambient Air Inhalation			**Construction**
Exposure Frequency	days/year	**EF**	5
Expoure Duration	years	**ED**	10
Averaging Time, cancer	days	**AT_c**	25,550
Averaging Time, noncancer	days	**AT_{nc}**	3,650

B-5: Air Concentrations and Risks During "Heavy Construction Operations"

		URF $(mg/m^3)^{-1}$			**RfC** (mg/m^3)								
Area	**Chemical**	**Value**	**Ref**	**Notes**	**Value**	**UF**	**Ref**	**Notes**	**Chemical Conc in PM_{10} (mg/kg)**	**Air Conc of PM_{10} (kg/m^3)**	**C_{air} (mg/m^3)**	**Risk**	**HQ**
M-02	Manganese				5.0E-05	1,000	1		2,220	3.73E-08	8.29E-05		2E-02
F-07	Chromium (total)	1.2E+01	1	8	1.0E-04	300	1	59,8	335	3.73E-08	1.25E-05	3E-07	2E-03
Reference													
1	USEPA. Integrated Risk Information System (IRIS). On-line database.												
Notes													
8	ENVIRON used Chromium VI [CASRN 18540-29-9] value from IRIS (reference 1) as a surrogate.												
59	Chromium VI Particulates.												

B-6: Acute Soil PM_{10} Emission from "Heavy Construction Operations" (sensitivity analysis)			
from AP-42, 5th Edition			
PM_{30} flux	ton/acre/month		1.2
conversion factor	kg/ton		907
conversion factor	acre/m^2		2.5E-04
conversion factor	month/s		3.8E-07
PM_{10}/PM_{30}			0.24
PM_{10} flux	kg/m^2-s	**$J_{10,C}$**	2.46E-08
C/Q (kg/m^3 per kg/m^2-s)		**C/Q**	34.3
Air Concentration of PM_{10}	kg/m^3		8.4E-07
Note			
C/Q is for a 400 x 225 ft source area adjusted for an 8-hour maximum.			

B-7: Air Concentrations and Risks During "Heavy Construction Operations" (sensitivity analysis)						
Area	**Chemical**	**Chemical Conc in PM_{10} (mg/kg)**	**Air Conc of PM_{10} (kg/m^3)**	**C_{air} (mg/m^3)**	**PEL (mg/m^3)**	**Soruce**
M-02	Manganese	2,220	8.43E-07	1.87E-03	1	OSHA
F-07	Chromium (total)	335	8.43E-07	2.82E-04	0.5	OSHA
Note						
OSHA PELs include an 8-hour time weighted average.						

B-8: Annual Soil PM_{10} Emission from "Heavy Construction Operations" (Sensitivity analysis)			
from AP-42, 5th Edition			
PM_{30} flux	ton/acre/month		1.2
conversion factor	kg/ton		907
conversion factor	acre/m^2		2.5E-04
conversion factor	month/s		3.8E-07
PM_{10}/PM_{30}			0.24
PM_{10} flux	kg/m^2-s	**$J_{10,C}$**	2.46E-08
C/Q (kg/m^3 per kg/m^2-s)		**C/Q**	3.92
Air Concentration of PM_{10}	kg/m^3		9.6E-08
Note			
C/Q is for a 400 x 225 ft source area adjusted for an annual maximum.			

B-9: High-End Exposure Factors for "Heavy Construction Operations" (sensitivity analysis)			
			Industrial
Ambient Air Inhalation			**Construction**
Exposure Frequency	days/year	**EF**	125
Expoure Duration	years	**ED**	1
Averaging Time, cancer	days	**AT_c**	25,550
Averaging Time, noncancer	days	**AT_{nc}**	365

B-10: Air Concentrations and Risks During "Heavy Construction Operations" (sensitivity analysis)

		URF ($mg/m^3)^{-1}$			**RfC** (mg/m^3)								
Area	**Chemical**	**Value**	**Ref**	**Notes**	**Value**	**UF**	**Ref**	**Notes**	**Chemical Conc in PM_{10} (mg/kg)**	**Air Conc of PM_{10} (kg/m^3)**	**C_{air} (mg/m^3)**	**Risk**	**HQ**
M-02	Manganese				5.0E-05	1,000	1		2,220	9.63E-08	2.14E-04		1E+00
F-07	Chromium (total)	1.2E+01	1	8	1.0E-04	300	1	59,8	335	9.63E-08	3.23E-05	2E-06	1E-01
Reference													
1	USEPA. Integrated Risk Information System (IRIS). On-line database.												
Notes													
8	ENVIRON used Chromium VI [CASRN 18540-29-9] value from IRIS (reference 1) as a surrogate.												
59	Chromium VI Particulates.												

Appendix C:

Criteria Calculations for LNAPL at M-02

Appendix C.1:

Vapor Concentrations due to LNAPL at AOI M-02

APPENDIX C.1

Vapor Concentrations due to LNAPL at AOI M-02

1.0 Introduction

The calculations discussed in this appendix pertain to the potential exposure of workers to vapors from light nonaqueous-phase liquids (LNAPLs) under the building at AOI M-02.

2.0 Vapor Concentrations

The estimated equilibrium vapor concentrations of LNAPL constituents are calculated using Raoult's Law, as follows:

$$C_{vapor} = \frac{VP \cdot MW_{LNAPL}}{R \cdot T} \cdot C_{LNAPL} \left(\frac{kg}{10^3 g} \right)$$

where:

C_{vapor}	=	Concentration of vapor from LNAPL (mg/m^3)
VP	=	Vapor pressure (mm-Hg)
MW_{LNAPL}	=	Molecular weight of the LNAPL (g/mole)
R	=	Gas constant (mm-Hg-m^3/mole/K)
T	=	Temperature (K)
C_{LNAPL}	=	Concentration in LNAPL (mg/kg)

Actual indoor air concentrations would be much lower than the estimated equilibrium vapor concentrations because migration of vapors from the LNAPL into indoor air would be accompanied by significant attenuation and dilution. Calculation of the equilibrium vapor concentrations are shown in the attached tables.

3.0 Evaluation of Exposures

The appropriate standards for evaluating potential inhalation of vapors emitted from the LNAPL under the building are the permissible exposure limits (PELs) established by the Occupational Safety and Health Administration (NIOSH 1997), or threshold limit values (TLVs) recommended by the American Conference of Government Industrial Hygienists (ACGIH 2001) for chemicals without PELs.

The ratios of the estimated equilibrium vapor concentrations and the occupational air standards are less than or equal to 1, as shown on the attached tables.

4.0 Reference

American Conference of Government Industrial Hygenists (ACGIH). 2001. 2001 TLVs and BEIs. ISBN: 1-882417-40-2.

National Institute for Occupational Safety and Health (NIOSH). 1997. NIOSH Pocket Guide to Chemical Hazards. DHHS 97-140. June.

Physical and Chemical Data

Chem Group	Chemical	CASRN	MW (g/mole)			K_{ow} (unitless)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			s (mg/L)			VP (mm Hg)			D_{air} (cm^2/s)			D_{water} (cm^2/s)			K_p (cm/hr)			ABS_d (unitless)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
VOC	Chloroform	67-66-3	1.19E+02	50		8.30E+01	40		3.98E+01	44					1.50E-01	44		7.92E+03	44		1.97E+02	50	92	1.04E-01	44		1.00E-05	44		8.90E-03	44				
VOC	Cumene	98-82-8	1.20E+02	50		3.80E+03	40		3.30E+03	40					4.74E+01	50	92	6.13E+01	50	92	4.50E+00	50	92							1.40E-01	1	70			
VOC	1,1-Dichloroethane	75-34-3	9.90E+01	50		6.20E+01	40		3.16E+01	44					2.30E-01	44		5.06E+03	44		2.27E+02	50	92	7.42E-02	44		1.05E-05	44		8.90E-03	44				
VOC	1,1-Dichloroethene	75-35-4	9.69E+01	50		1.30E+02	40		5.89E+01	44					1.07E+00	44		2.25E+03	44		6.00E+02	50	92	9.00E-02	44		1.04E-05	44		1.60E-02	44				
VOC	Ethyl Benzene	100-41-4	1.06E+02	50		1.38E+03	44		3.63E+02	44					3.23E-01	44		1.69E+02	44		9.60E+00	50	92	7.50E-02	44		7.80E-06	44		7.27E-02	44	70			
VOC	4-Methyl-2-pentanone	108-10-1	1.00E+02	50											5.64E-03	50	92				1.99E+01	50	92	7.50E-02	40		7.80E-06	40							
VOC	Methylcyclohexane	108-87-2	9.82E+01	63																															
VOC	Methylene Chloride	75-09-2	8.49E+01	50		1.80E+01	40		1.17E+01	44					8.98E-02	44		1.30E+04	44		4.33E+02	50	92	1.01E-01	44		1.17E-05	44		4.50E-03	44				
VOC	Tetrachloroethene	127-18-4	1.66E+02	50		4.70E+02	40		1.55E+02	44					7.54E-01	44		2.00E+02	44		1.86E+01	50	92	7.20E-02	44		8.20E-06	44		4.80E-02	44				
VOC	Toluene	108-88-3	9.21E+01	50		5.62E+02	44		1.82E+02	44					2.72E-01	44		5.26E+02	44		2.84E+01	50	92	8.70E-02	44		8.60E-06	44		4.68E-02	44	70			
VOC	1,1,1-Trichloroethane	71-55-6	1.33E+02	50		3.00E+02	40		1.10E+02	44					7.05E-01	44		1.33E+03	44		1.24E+02	50	92	7.80E-02	44		8.80E-06	44		1.70E-02	44				
VOC	Trichloroethene	79-01-6	1.31E+02	50		5.10E+02	40		1.66E+02	44					4.22E-01	44		1.10E+03	44		7.35E+01	50	92	7.90E-02	44		9.10E-06	44		1.60E-02	44				
VOC	Xylenes (total)	1330-20-7	1.06E+02	1					2.60E+02	34					1.71E-01	1	59				1.00E+01	1	65	8.00E-02	40		8.00E-06	40							
SVOC	Anthracene	120-12-7	1.78E+02	50		3.55E+04	44		2.95E+04	44					2.67E-03	44		4.34E-02	44		2.67E-06	50	92	3.24E-02	44		7.74E-06	44		2.65E-01	44	70	1.00E-01	62	
SVOC	Fluoranthene	206-44-0	2.02E+02	50		1.30E+05	40		1.07E+05	44					6.60E-04	44		2.06E-01	44		7.80E-06	50	94	3.02E-02	44		6.35E-06	44		3.60E-01	44		1.00E-01	62	
SVOC	Fluorene	86-73-7	1.66E+02	50		1.60E+04	40		1.38E+04	44					2.61E-03	44		1.98E+00	44		6.33E-04	50	92	3.63E-02	44		7.88E-06	44		1.80E-01	44	70	1.00E-01	62	
SVOC	2-Methylnaphthalene	91-57-6	1.42E+02	50		7.24E+03	1								2.12E-02	50	92	2.46E+01	50	92	5.50E-02	50	92							1.42E-01	1	70	1.00E-01	62	
SVOC	Phenanthrene	85-01-8	1.78E+02	50		2.88E+04	1		1.40E+04	3					9.52E-04	50	92	1.15E+00	50	92	1.12E-04	50	92							2.70E-01	44		1.00E-01	62	
SVOC	Pyrene	129-00-0	2.02E+02	50		1.30E+05	40		1.05E+05	44					4.51E-04	44		1.35E-01	44		4.59E-06	50	92	2.72E-02	44		7.24E-06	44		4.72E-01	44	70	1.00E-01	62	
P/PCB	Aroclor-1242	53469-21-9	2.67E+02	47		3.80E+05	47		3.10E+05	47	82				2.34E-02	47		2.40E-01	47		4.06E-04	47								4.27E-01	64	70	1.40E-01	62	
INORG	Antimony	7440-36-0	1.22E+02	50								4.50E+01	44	43																1.00E-03	44	96			
INORG	Arsenic	7440-38-2	7.49E+01	50								2.90E+01	44	43																1.00E-03	44	96	3.00E-02	62	
INORG	Barium	7440-39-3	1.37E+02	50								4.10E+01	44	43																1.00E-03	44	96			
INORG	Cadmium	7440-43-9	1.12E+02	50								7.50E+01	44	43																1.00E-03	44	96	1.00E-03	62	
INORG	Chromium (total)	7440-47-3	5.20E+01	50								1.90E+01	44	43,45																1.00E-03	44	96			
INORG	Cobalt	7440-48-4	5.89E+01	50								4.50E+01	35																	1.00E-03	44	96			
INORG	Copper	7440-50-8	6.35E+01	50								3.50E+01	35																	1.00E-03	44	96			
INORG	Cyanide (total)	57-12-5	2.60E+01	1								9.90E+00	44	43																1.00E-03	44	96			
INORG	Lead	7439-92-1	2.07E+02	50								9.00E+02	35																	1.00E-03	44	96			
INORG	Manganese	7439-96-5	5.49E+01	50								6.50E+01	35																	1.00E-03	44	96			
INORG	Nickel	7440-02-0	5.87E+01	50								6.50E+01	44	43																1.00E-03	44	96			
INORG	Silver	7440-22-4	1.08E+02	50								8.30E+00	44	43																1.00E-03	44	96			
INORG	Vanadium	7440-62-2	5.09E+01	50								1.00E+03	44	43																1.00E-03	44	96			
INORG	Zinc	7440-66-6	6.54E+01	50								6.20E+01	44	43																1.00E-03	44	96			

References:

1 USEPA. 1992. Handbook of RCRA Ground-Water Monitoring Constituents. Chemical and Physical Properties (40 CFR Part 264, Appendix IX). EPA-530-R-92-022. September.

3 USEPA. 1982. Mabey, W., J. Smith, R. Podoll, H. Johnson, T. Mill, T. Chou, J. Gates, I. Partridge, and D. Vandenberg. Aquatic Fate Process Data for Organic Priority Pollutants. Final. Office of Water Reg. & Standards. EPA-440/4-81-014. December.

34 USEPA. 1994. Technical Background for Soil Screening Guidance. Office of Emergency and Remedial Response. EPA/540/R-94/106. Review Draft. November.

35 Baes III, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor. 1984. A Review and Analysis of Parameters for Assessing Transport of Released Radionuclides through Agriculture (AD-89-T-2-A-106) (formerly EPA078-D-X0304), Oak Ridge National Laboratory, ORNL-5786.

40 Research Triangle Institute, Center for Environmental Analysis. 1995. Supplemental Technical Support Document for Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors--Volume 1, TABLE A-1. November 1995.

44 USEPA. 1996. Soil Screening Guidance: Technical Background Document and User Guide. Office of Emergency and Remedial Response. EPA/540/R-95/128. May.

47 USEPA. 1990. Guidance on Remedial Actions for Superfund Sites with PCB Contamination. EPA/540/G-90/007. August.

50 USEPA. 1997. Superfund Chemical Data Matrix (SCDM). Office of Emergency and Remedial Response. September 12.

62 USEPA. 2001. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim -- Review Draft-For Public Comment.

63 CambridgeSoft Corporation. ChemFinder Database and Internet Search Engine.

64 Agency for Toxic Substances and Disease Registry (ATSDR). November 2000. Toxicological Profile for Polychlorindated Biphenyls (PCBs).

Notes:

43 pH associate with values is 6.8

45 ENVIRON used the value for Chromium VI [CASRN 18540-29-9] presented in indicated reference as a surrogate.

59 min: max is 6.662E-3.

70 ENVIRON calculated Kp value using equation 5.8 (p.5-38) in reference 43 with log Kow from the indicated reference and the MW presented in table.

82 ENVIRON used the value for trans-1,2-Dichloroethene [CASRN 156-60-5] as a surrogate.

92 Indicated source cites CHEMFATE.

96 ENVIRON used the value for water [CASRN 7732-18-5] from the indicated reference as a surrogate.

Occupational Criteria

Chem Group	Chemical	CASRN	PEL (mg/m^3)			TLV-TWA (mg/m^3)		
			Value	Ref	Notes	Value	Ref	Notes
VOC	Chloroform	67-66-3	4.9E+01	47				
VOC	Cumene	98-82-8				2.5E+02	46	
VOC	1,1-Dichloroethane	75-34-3	4.0E+02	47		4.0E+02	46	
VOC	1,1-Dichloroethene	75-35-4	2.0E+01	47				
VOC	Ethyl Benzene	100-41-4	4.3E+02	47		4.4E+02	46	
VOC	4-Methyl-2-pentanone	108-10-1	2.0E+02	47		4.1E+02	46	
VOC	Methylcyclohexane	108-87-2				2.0E+03	46	
VOC	Methylene Chloride	75-09-2	1.7E+02	47		8.7E+01	46	
VOC	Tetrachloroethene	127-18-4	1.7E+02	47		6.8E+02	46	
VOC	Toluene	108-88-3	1.9E+02	47		7.5E+02	46	
VOC	1,1,1-Trichloroethane	71-55-6	1.9E+03	47		1.9E+03	46	
VOC	Trichloroethene	79-01-6	2.7E+02	47		5.4E+02	46	
VOC	Xylenes (total)	1330-20-7	4.3E+02	47		4.3E+02	46	
SVOC	Anthracene	120-12-7						
SVOC	Fluoranthene	206-44-0						
SVOC	Fluorene	86-73-7						
SVOC	2-Methylnaphthalene	91-57-6						
SVOC	Phenanthrene	85-01-8						
SVOC	Pyrene	129-00-0						
P/PCB	Aroclor-1242	53469-21-9	1.0E+00	47		1.0E+00	46	
INORG	Antimony	7440-36-0	5.0E-01	47		5.0E-01	46	
INORG	Arsenic	7440-38-2	1.0E-02	47		5.0E-01	46	
INORG	Barium	7440-39-3	5.0E-01	47		5.0E-01	46	
INORG	Cadmium	7440-43-9	1.0E-02	47		5.0E-03	46	
INORG	Chromium (total)	7440-47-3	5.0E-01	47		1.0E+00	46	
INORG	Cobalt	7440-48-4	2.0E-02	47		1.0E-01	46	
INORG	Copper	7440-50-8	2.0E-01	47		1.0E-01	46	
INORG	Cyanide (total)	57-12-5				5.0E+00	46	
INORG	Lead	7439-92-1	5.0E-02	47		5.0E-02	46	
INORG	Manganese	7439-96-5	2.0E-01	47				
INORG	Nickel	7440-02-0	1.0E-01	47		1.0E+00	46	
INORG	Silver	7440-22-4	1.0E-02	47		1.0E-02	46	
INORG	Vanadium	7440-62-2						
INORG	Zinc	7440-66-6						

References:

46	Department of Health and Human Services. 1997. NIOSH Pocket Guide to Chemical Hazards. DHHS(NIOSH) 97-140. June.
47	American Conference of Government Industrial Hygenists. 2001. 2001 TLVs and BEIs. ISBN: 1-882417-40-2.

Concentrations of Chemicals in LNAPL				
Chem Group	**Chemical**	**CASRN**	**Cancer Class**	**C_{LNAPL}** (mg/kg)
VOC	Chloroform	67-66-3	B2	4.20E-01
VOC	Cumene	98-82-8	D	7.90E-01
VOC	1,1-Dichloroethane	75-34-3	C	2.10E+01
VOC	1,1-Dichloroethene	75-35-4	C	2.40E+00
VOC	Ethyl Benzene	100-41-4	D	2.70E+00
VOC	4-Methyl-2-pentanone	108-10-1		3.40E-01
VOC	Methylcyclohexane	108-87-2		2.70E-01
VOC	Methylene Chloride	75-09-2	B2	1.30E+00
VOC	Tetrachloroethene	127-18-4	C-B2	1.10E+01
VOC	Toluene	108-88-3	D	3.30E+00
VOC	1,1,1-Trichloroethane	71-55-6	D	4.40E+00
VOC	Trichloroethene	79-01-6	C-B2	1.40E+00
VOC	Xylenes (total)	1330-20-7	D	1.00E+01
SVOC	Anthracene	120-12-7	D	1.20E+02
SVOC	Fluoranthene	206-44-0	D	1.30E+02
SVOC	Fluorene	86-73-7	D	1.70E+02
SVOC	2-Methylnaphthalene	91-57-6		5.90E+01
SVOC	Phenanthrene	85-01-8	D	6.60E+02
SVOC	Pyrene	129-00-0	D	1.70E+02
P/PCB	Aroclor-1242	53469-21-9	B2	1.70E+02
INORG	Antimony	7440-36-0		4.80E-01
INORG	Arsenic	7440-38-2	A	6.50E+00
INORG	Barium	7440-39-3	D	3.70E-01
INORG	Cadmium	7440-43-9	B1	3.60E-02
INORG	Chromium (total)	7440-47-3		2.70E+00
INORG	Cobalt	7440-48-4		8.40E-02
INORG	Copper	7440-50-8	D	3.20E+00
INORG	Cyanide (total)	57-12-5	D	1.20E-01
INORG	Lead	7439-92-1	B2	8.30E-01
INORG	Manganese	7439-96-5	D	9.50E-01
INORG	Nickel	7440-02-0	A	9.17E+01
INORG	Silver	7440-22-4	D	1.10E-01
INORG	Vanadium	7440-62-2		2.60E-01
INORG	Zinc	7440-66-6	D	1.90E+00
Notes:				
1. Concentrations in bold are nonparametric bootstrap 95% UCLs.				
	NAPL density	0.9	kg/L	
	Soil bulk density	1.5	kg/L	
	Soil total porosity	0.43		
	NAPL saturation	100%		

Estimated Equilibrium Vapor Concentrations (mg/m^3) from LNAPL at AOI M-02

TCL/TAL Group	Chemical	CASRN	C_{LNAPL} (mg/kg)	VP (mm Hg)	C_{vapor} (mg/m^3)		Criteria (mg/m^3)	Ratio of Conc to Criteria
VOC	Chloroform	67-66-3	4.20E-01	1.97E+02	1.25E+00		4.9E+01	3E-02
VOC	Cumene	98-82-8	7.90E-01	4.50E+00	5.37E-02		2.5E+02	2E-04
VOC	1,1-Dichloroethane	75-34-3	2.10E+01	2.27E+02	7.21E+01		4.0E+02	2E-01
VOC	1,1-Dichloroethene	75-35-4	2.40E+00	6.00E+02	2.17E+01		2.0E+01	1E+00
VOC	Ethyl Benzene	100-41-4	2.70E+00	9.60E+00	3.92E-01		4.3E+02	9E-04
VOC	4-Methyl-2-pentanone	108-10-1	3.40E-01	1.99E+01	1.02E-01		2.0E+02	5E-04
VOC	Methylcyclohexane	108-87-2	2.70E-01				2.0E+03	
VOC	Methylene Chloride	75-09-2	1.30E+00	4.33E+02	8.51E+00		1.7E+02	5E-02
VOC	Tetrachloroethene	127-18-4	1.10E+01	1.86E+01	3.08E+00		1.7E+02	2E-02
VOC	Toluene	108-88-3	3.30E+00	2.84E+01	1.42E+00		1.9E+02	8E-03
VOC	1,1,1-Trichloroethane	71-55-6	4.40E+00	1.24E+02	8.22E+00		1.9E+03	4E-03
VOC	Trichloroethene	79-01-6	1.40E+00	7.35E+01	1.55E+00		2.7E+02	6E-03
VOC	Xylenes (total)	1330-20-7	1.00E+01	1.00E+01	1.51E+00		4.3E+02	3E-03
SVOC	Anthracene	120-12-7	1.20E+02	2.67E-06	4.84E-06			
SVOC	Fluoranthene	206-44-0	1.30E+02	7.80E-06	1.53E-05			
SVOC	Fluorene	86-73-7	1.70E+02	6.33E-04	1.63E-03			
SVOC	2-Methylnaphthalene	91-57-6	5.90E+01	5.50E-02	4.90E-02			
SVOC	Phenanthrene	85-01-8	6.60E+02	1.12E-04	1.12E-03			
SVOC	Pyrene	129-00-0	1.70E+02	4.59E-06	1.18E-05			
P/PCB	Aroclor-1242	53469-21-9	1.70E+02	4.06E-04	1.04E-03		1.0E+00	1E-03
INORG	Antimony	7440-36-0	4.80E-01				5.0E-01	
INORG	Arsenic	7440-38-2	6.50E+00				1.0E-02	
INORG	Barium	7440-39-3	3.70E-01				5.0E-01	
INORG	Cadmium	7440-43-9	3.60E-02				1.0E-02	
INORG	Chromium (total)	7440-47-3	2.70E+00				5.0E-01	
INORG	Cobalt	7440-48-4	8.40E-02				2.0E-02	
INORG	Copper	7440-50-8	3.20E+00				2.0E-01	
INORG	Cyanide (total)	57-12-5	1.20E-01				5.0E+00	
INORG	Lead	7439-92-1	8.30E-01				5.0E-02	
INORG	Manganese	7439-96-5	9.50E-01				2.0E-01	
INORG	Nickel	7440-02-0	9.17E+01				1.0E-01	
INORG	Silver	7440-22-4	1.10E-01				1.0E-02	
INORG	Vanadium	7440-62-2	2.60E-01					
INORG	Zinc	7440-66-6	1.90E+00					
	Molecular Weight of NAPL	g/mole	**MW_{LNAPL}**	271				
	Temperature	K	**T**	287.7				
	Gas Constant	mmHg-m3/mole/K	**R**	0.062361				
Note:								
NAPL molecular weight is based on a 30% Asphalt, 70% No.2 fuel mixture.								

Appendix C.2:

Risk Calculations for Worker Exposure to LNAPL at AOI M-02

APPENDIX C.2

Risk Calculations for Worker Exposure to LNAPL at AOI M-02

1.0 Introduction

The calculations discussed in this appendix pertain to the potential exposure of workers who might contact light nonaqueous-phase liquids (LNAPLs) while performing excavations associated with occasional maintenance or construction activities at AOI M-02. The potential exposure pathways evaluated are the same as those in Appendix C.2 of the Environmental Indicators (EI) Report (ENVIRON 2002) and include the following:

- Incidental ingestion of soil in the smear zone that is saturated with residual-phase LNAPL
- Dermal contact with soil in the smear zone that is saturated with residual-phase LNAPL
- Dermal contact with LNAPL
- Inhalation of vapor from the LNAPL

2.0 Exposure Concentrations

The exposure concentrations for LNAPL, LNAPL-saturated soil, and vapor concentrations in air are calculated using the same methodology as was presented in Section 2 of Appendix C.2 of the EI Report (ENVIRON 2002) and thus not repeated here.

3.0 Exposure Factors

The exposure factors used for evaluating high-end exposure of workers performing excavations during occasional maintenance or constructions activities are identical to those presented in Section 3 of Appendix C.2 of the EI Report (ENVIRON 2002) and thus not repeated here.

4.0 Toxicity Values

The toxicity values used in the calculation of risk are shown in the accompanying tables. They are compiled following USEPA's hierarchy of sources, as follows:

1. Integrated Risk Information System (IRIS)
2. Health Effects Assessment Summary Tables (HEAST)
3. National Center for Environmental Assessment (NCEA)

The specific source of each toxicity value is noted on the accompanying tables.

5.0 Cumulative Cancer and Noncancer Risks

The risks associated with potential exposure to carcinogenic and noncarcinogenic chemicals is calculated using the methodology presented in Section 5 of Appendix C.2 of the EI Report (ENVIRON 2002) and thus not repeated here. The cumulative cancer risk and HI estimates for each exposure route are shown in the accompanying tables.

6.0 Reference

ENVIRON International Corporation (ENVIRON). 2002. Resource Conservation and Recovery Act Environmental Indicators Report, General Motors Corporation, Pontiac North Campus Facility, Pontiac, Michigan. July 30.

Toxicity Information

Chem Group	Chemical	CASRN	Cancer Class	SF_{oral} $(mg/kg/d)^{-1}$			RfD_{oral} (mg/kg/d)				URF $(ug/m^3)^{-1}$			RfC (mg/m^3)			
				Value	Ref	Notes	Value	UF	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes
VOC	Chloroform	67-66-3	B2				1.0E-02	1000	1		2.3E-05	1					
VOC	Cumene	98-82-8	D				1.0E-01	1000	1					4.0E-01	1000	1	
VOC	1,1-Dichloroethane	75-34-3	C				1.0E-01	1000	2	6, 26				5.0E-01	1000	2	3
VOC	1,1-Dichloroethene	75-35-4	C				5.0E-02	100	1					2.0E-01	30	1	
VOC	Ethyl Benzene	100-41-4	D				1.0E-01	1000	1					1.0E+00	300	1	
VOC	4-Methyl-2-pentanone	108-10-1					8.0E-02	3000	2	6				8.0E-02	1000	2	3
VOC	Methylcyclohexane	108-87-2															
VOC	Methylene Chloride	75-09-2	B2	7.5E-03	1		6.0E-02	100	1		4.7E-07	1		3.0E+00	100	2	
VOC	Tetrachloroethene	127-18-4	C-B2				1.0E-02	1000	1								
VOC	Toluene	108-88-3	D				2.0E-01	1000	1					4.0E-01	300	1	
VOC	1,1,1-Trichloroethane	71-55-6	D				2.8E-01	90	72					2.2E+00	90	73	
VOC	Trichloroethene	79-01-6	C-B2	1.1E-02	49						1.7E-06	49					
VOC	Xylenes (total)	1330-20-7	D				2.0E+00	100	1								
SVOC	Anthracene	120-12-7	D				3.0E-01	3000	1							2	18
SVOC	Fluoranthene	206-44-0	D				4.0E-02	3000	1								
SVOC	Fluorene	86-73-7	D				4.0E-02	3000	1								
SVOC	2-Methylnaphthalene	91-57-6					2.0E-02	3000	1	61				3.0E-03	3000	1	61
SVOC	Phenanthrene	85-01-8	D				3.0E-02	3000	1	20							
SVOC	Pyrene	129-00-0	D				3.0E-02	3000	1								
P/PCB	Aroclor-1242	53469-21-9	B2	2.0E+00	1	30,32,53	7.0E-05	100	1	16							
INORG	Antimony	7440-36-0					4.0E-04	1000	1								
INORG	Arsenic	7440-38-2	A	1.5E+00	1		3.0E-04	3	1		4.3E-03	1					
INORG	Barium	7440-39-3	D				7.0E-02	3	1							1	14
INORG	Cadmium	7440-43-9	B1				1.0E-03	10	1		1.8E-03	1					
INORG	Chromium (total)	7440-47-3					3.0E-03	900	1	8	1.2E-02	1	8	1.0E-04	300	1	8, 59
INORG	Cobalt	7440-48-4					6.0E-02		37					2.0E-05	100	36	
INORG	Copper	7440-50-8	D				4.0E-02	2	50	49							
INORG	Cyanide (total)	57-12-5	D				2.0E-02	500	1								
INORG	Lead	7439-92-1	B2														
INORG	Manganese	7439-96-5	D				1.4E-01	1	1	36				5.0E-05	1000	1	
INORG	Nickel	7440-02-0	A				2.0E-02	300	1		2.4E-04	1					
INORG	Silver	7440-22-4	D				5.0E-03	3	1								
INORG	Vanadium	7440-62-2					7.0E-03	100	2	6							
INORG	Zinc	7440-66-6	D				3.0E-01	3	1								

References:

1 USEPA. Integrated Risk Information System (IRIS). On-line database.

2 USEPA. 1997. Health Effects Assessment Summary Tables (HEAST). FY-1997 Update. EPA 540/R-97-036. July.

36 USEPA. NCEA. 1994. Risk Assessment Issue paper for: Derivation of a Provisional RfC for Cobalt [CASRN 7440-48-4]. August 4.

37 USEPA. ECAO (now NCEA). 1992. Oral Toxicity Assessment for Cobalt. March 12.

49 USEPA. NCEA. 1995. Risk Assessment Issue paper for: Carcinogenicity Information for Trichloroethylene (TCE) [CASRN 79-01-6]. September 6.

50 USEPA. 56 FR 26460, June 7, 1991. Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper. Final Rule.

72 USEPA. NCEA. 1999. Risk Assessment Issue paper for: Derivation of a Provisional Oral Chronic RfD and Subchronic RfDs for 1,1,1-Trichloroethane [CASRN 71-55-6]. August 4.

Toxicity Information

73	USEPA. NCEA. 1999. Risk Assessment Issue paper for: Derivation of a Provisional Oral Chronic and Subchronic RfCs for 1,1,1-Trichloroethane [CASRN 71-55-6]. August 4.
Notes:	
3	HEAST Alternate Method.
6	Under review, according to IRIS.
8	ENVIRON used Chromium VI [CASRN 18540-29-9] value from IRIS (reference 1) as a surrogate.
14	Data inadequate for quantitative risk assessment, according to IRIS.
16	ENVIRON used Aroclor 1016 [CASRN 12674-11-2] value from the indicated reference as a surrogate.
18	Not verifiable, according to IRIS.
20	ENVIRON used Pyrene [CASRN 129-00-0] value from IRIS (reference 1) as a surrogate.
26	USEPA obtained value by route-to-route extrapolation.
30	Upper-bound slope factor.
32	High risk & persistence tier.Use for: food chain exposure;sediment/soil ingestion;dust/aerosol inhalation;dermal exposure, if an absorption factor has been applied;presence of dioxin-like,tumor-promoting/persistent congeners;all early life exposures.
36	IRIS recommends applying a modifying factor of 3 when using this RfD in assessing exposures to drinking water or soil.
49	ENVIRON derived CRFDO from adverse health effect level value presented in the indicated reference.
53	ENVIRON used Polychlorinated Biphenyl [CASRN 1336-36-3] value from IRIS (Reference 1) as a surrogate.
59	Chromium VI Particulates.
61	ENVIRON used Naphthalene [CASRN 91-20-3] value from indicated reference as a surrogate.

Physical and Chemical Data

Chem Group	Chemical	CASRN	MW (g/mole)			K_{ow} (unitless)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			s (mg/L)			VP (mm Hg)			D_{air} (cm^2/s)			D_{water} (cm^2/s)			K_p (cm/hr)			ABS_d (unitless)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
VOC	Chloroform	67-66-3	1.19E+02	50		8.30E+01	40		3.98E+01	44					1.50E-01	44		7.92E+03	44		1.97E+02	50	92	1.04E-01	44		1.00E-05	44		8.90E-03	44				
VOC	Cumene	98-82-8	1.20E+02	50		3.80E+03	40		3.30E+03	40					4.74E+01	50	92	6.13E+01	50	92	4.50E+00	50	92							1.40E-01	1	70			
VOC	1,1-Dichloroethane	75-34-3	9.90E+01	50		6.20E+01	40		3.16E+01	44					2.30E-01	44		5.06E+03	44		2.27E+02	50	92	7.42E-02	44		1.05E-05	44		8.90E-03	44				
VOC	1,1-Dichloroethene	75-35-4	9.69E+01	50		1.30E+02	40		5.89E+01	44					1.07E+00	44		2.25E+03	44		6.00E+02	50	92	9.00E-02	44		1.04E-05	44		1.60E-02	44				
VOC	Ethyl Benzene	100-41-4	1.06E+02	50		1.38E+03	44		3.63E+02	44					3.23E-01	44		1.69E+02	44		9.60E+00	50	92	7.50E-02	44		7.80E-06	44		7.27E-02	44	70			
VOC	4-Methyl-2-pentanone	108-10-1	1.00E+02	50											5.64E-03	50	92				1.99E+01	50	92	7.50E-02	40		7.80E-06	40							
VOC	Methylcyclohexane	108-87-2	9.82E+01	63																															
VOC	Methylene Chloride	75-09-2	8.49E+01	50		1.80E+01	40		1.17E+01	44					8.98E-02	44		1.30E+04	44		4.33E+02	50	92	1.01E-01	44		1.17E-05	44		4.50E-03	44				
VOC	Tetrachloroethene	127-18-4	1.66E+02	50		4.70E+02	40		1.55E+02	44					7.54E-01	44		2.00E+02	44		1.86E+01	50	92	7.20E-02	44		8.20E-06	44		4.80E-02	44				
VOC	Toluene	108-88-3	9.21E+01	50		5.62E+02	44		1.82E+02	44					2.72E-01	44		5.26E+02	44		2.84E+01	50	92	8.70E-02	44		8.60E-06	44		4.68E-02	44	70			
VOC	1,1,1-Trichloroethane	71-55-6	1.33E+02	50		3.00E+02	40		1.10E+02	44					7.05E-01	44		1.33E+03	44		1.24E+02	50	92	7.80E-02	44		8.80E-06	44		1.70E-02	44				
VOC	Trichloroethene	79-01-6	1.31E+02	50		5.10E+02	40		1.66E+02	44					4.22E-01	44		1.10E+03	44		7.35E+01	50	92	7.90E-02	44		9.10E-06	44		1.60E-02	44				
VOC	Xylenes (total)	1330-20-7	1.06E+02	1					2.60E+02	34					1.71E-01	1	59				1.00E+01	1	65	8.00E-02	40		8.00E-06	40							
SVOC	Anthracene	120-12-7	1.78E+02	50		3.55E+04	44		2.95E+04	44					2.67E-03	44		4.34E-02	44		2.67E-06	50	92	3.24E-02	44		7.74E-06	44		2.65E-01	44	70	1.00E-01	62	
SVOC	Fluoranthene	206-44-0	2.02E+02	50		1.30E+05	40		1.07E+05	44					6.60E-04	44		2.06E-01	44		7.80E-06	50	94	3.02E-02	44		6.35E-06	44		3.60E-01	44		1.00E-01	62	
SVOC	Fluorene	86-73-7	1.66E+02	50		1.60E+04	40		1.38E+04	44					2.61E-03	44		1.98E+00	44		6.33E-04	50	92	3.63E-02	44		7.88E-06	44		1.80E-01	44	70	1.00E-01	62	
SVOC	2-Methylnaphthalene	91-57-6	1.42E+02	50		7.24E+03	1								2.12E-02	50	92	2.46E+01	50	92	5.50E-02	50	92							1.42E-01	1	70	1.00E-01	62	
SVOC	Phenanthrene	85-01-8	1.78E+02	50		2.88E+04	1		1.40E+04	3					9.52E-04	50	92	1.15E+00	50	92	1.12E-04	50	92							2.70E-01	44		1.00E-01	62	
SVOC	Pyrene	129-00-0	2.02E+02	50		1.30E+05	40		1.05E+05	44					4.51E-04	44		1.35E-01	44		4.59E-06	50	92	2.72E-02	44		7.24E-06	44		4.72E-01	44	70	1.00E-01	62	
P/PCB	Aroclor-1242	53469-21-9	2.67E+02	47		3.80E+05	47		3.10E+05	47	82				2.34E-02	47		2.40E-01	47		4.06E-04	47								4.27E-01	64	70	1.40E-01	62	
INORG	Antimony	7440-36-0	1.22E+02	50								4.50E+01	44	43																1.00E-03	44	96			
INORG	Arsenic	7440-38-2	7.49E+01	50								2.90E+01	44	43																1.00E-03	44	96	3.00E-02	62	
INORG	Barium	7440-39-3	1.37E+02	50								4.10E+01	44	43																1.00E-03	44	96			
INORG	Cadmium	7440-43-9	1.12E+02	50								7.50E+01	44	43																1.00E-03	44	96	1.00E-03	62	
INORG	Chromium (total)	7440-47-3	5.20E+01	50								1.90E+01	44	43,45																1.00E-03	44	96			
INORG	Cobalt	7440-48-4	5.89E+01	50								4.50E+01	35																	1.00E-03	44	96			
INORG	Copper	7440-50-8	6.35E+01	50								3.50E+01	35																	1.00E-03	44	96			
INORG	Cyanide (total)	57-12-5	2.60E+01	1								9.90E+00	44	43																1.00E-03	44	96			
INORG	Lead	7439-92-1	2.07E+02	50								9.00E+02	35																	1.00E-03	44	96			
INORG	Manganese	7439-96-5	5.49E+01	50								6.50E+01	35																	1.00E-03	44	96			
INORG	Nickel	7440-02-0	5.87E+01	50								6.50E+01	44	43																1.00E-03	44	96			
INORG	Silver	7440-22-4	1.08E+02	50								8.30E+00	44	43																1.00E-03	44	96			
INORG	Vanadium	7440-62-2	5.09E+01	50								1.00E+03	44	43																1.00E-03	44	96			
INORG	Zinc	7440-66-6	6.54E+01	50								6.20E+01	44	43																1.00E-03	44	96			

References:

1 USEPA. 1992. Handbook of RCRA Ground-Water Monitoring Constituents. Chemical and Physical Properties (40 CFR Part 264, Appendix IX). EPA-530-R-92-022. September.

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Notes:

43 pH associate with values is 6.8

45 ENVIRON used the value for Chromium VI [CASRN 18540-29-9] presented in indicated reference as a surrogate.

59 min: max is 6.662E-3.

70 ENVIRON calculated Kp value using equation 5.8 (p.5-38) in reference 43 with log Kow from the indicated reference and the MW presented in table.

82 ENVIRON used the value for trans-1,2-Dichloroethene [CASRN 156-60-5] as a surrogate.

92 Indicated source cites CHEMFATE.

96 ENVIRON used the value for water [CASRN 7732-18-5] from the indicated reference as a surrogate.

Concentrations of Chemicals in LNAPL				
Chem Group	**Chemical**	**CASRN**	**Cancer Class**	**C_{LNAPL}** (mg/kg)
VOC	Chloroform	67-66-3	B2	4.20E-01
VOC	Cumene	98-82-8	D	7.90E-01
VOC	1,1-Dichloroethane	75-34-3	C	2.10E+01
VOC	1,1-Dichloroethene	75-35-4	C	2.40E+00
VOC	Ethyl Benzene	100-41-4	D	2.70E+00
VOC	4-Methyl-2-pentanone	108-10-1		3.40E-01
VOC	Methylcyclohexane	108-87-2		2.70E-01
VOC	Methylene Chloride	75-09-2	B2	1.30E+00
VOC	Tetrachloroethene	127-18-4	C-B2	1.10E+01
VOC	Toluene	108-88-3	D	3.30E+00
VOC	1,1,1-Trichloroethane	71-55-6	D	4.40E+00
VOC	Trichloroethene	79-01-6	C-B2	1.40E+00
VOC	Xylenes (total)	1330-20-7	D	1.00E+01
SVOC	Anthracene	120-12-7	D	1.20E+02
SVOC	Fluoranthene	206-44-0	D	1.30E+02
SVOC	Fluorene	86-73-7	D	1.70E+02
SVOC	2-Methylnaphthalene	91-57-6		5.90E+01
SVOC	Phenanthrene	85-01-8	D	6.60E+02
SVOC	Pyrene	129-00-0	D	1.70E+02
P/PCB	Aroclor-1242	53469-21-9	B2	1.70E+02
INORG	Antimony	7440-36-0		4.80E-01
INORG	Arsenic	7440-38-2	A	6.50E+00
INORG	Barium	7440-39-3	D	3.70E-01
INORG	Cadmium	7440-43-9	B1	3.60E-02
INORG	Chromium (total)	7440-47-3		2.70E+00
INORG	Cobalt	7440-48-4		8.40E-02
INORG	Copper	7440-50-8	D	3.20E+00
INORG	Cyanide (total)	57-12-5	D	1.20E-01
INORG	Lead	7439-92-1	B2	8.30E-01
INORG	Manganese	7439-96-5	D	9.50E-01
INORG	Nickel	7440-02-0	A	9.17E+01
INORG	Silver	7440-22-4	D	1.10E-01
INORG	Vanadium	7440-62-2		2.60E-01
INORG	Zinc	7440-66-6	D	1.90E+00
Notes:				
1. Concentrations in bold are nonparametric bootstrap 95% UCLs.				
	NAPL density	0.9	kg/L	
	Soil bulk density	1.5	kg/L	
	Soil total porosity	0.43		
	NAPL saturation	100%		

High-End Exposure Factors			
			Industrial Construction Scenario
Soil Ingestion			
Ingestion Rate	mg-soil/day	**IR**	200
Conversion Factor	kg/mg	**CF**	1E-06
Fraction Contaminated	unitless	**FC**	1.0
Exposure Frequency	days/year	**EF**	5
Expoure Duration	years	**ED**	10
Body Weight	kg	**BW**	70
Averaging Time, cancer	days	**AT_c**	25,550
Averaging Time, noncancer	days	**AT_{nc}**	3,650
Soil Dermal Contact			
Adherence Factor	mg-soil/cm^2	**AD**	0.2
Skin Surface Area	cm^2/day	**SA**	3,300
Conversion Factor	kg/mg	**CF**	1E-06
Fraction Contaminated	unitless	**FC**	1.0
Exposure Frequency	days/year	**EF**	5
Expoure Duration	years	**ED**	10
Body Weight	kg	**BW**	70
Averaging Time, cancer	days	**AT_c**	25,550
Averaging Time, noncancer	days	**AT_{nc}**	3,650
Ambient Air Inhalation			
Exposure Frequency	days/year	**EF**	5
Expoure Duration	years	**ED**	10
Averaging Time, cancer	days	**AT_c**	25,550
Averaging Time, noncancer	days	**AT_{nc}**	3,650
Oil Dermal Contact			
Event Time	hr	**t**	2
Skin Surface Area	cm^2	**SA**	3,300
Events per Day	1/d	**EV**	1
Exposure Frequency	d/yr	**EF**	5
Exposure Duration	yr	**ED**	10
Body Weight	kg-bw	**BW**	70
Averaging Time, carc	d	**AT_c**	25,550
Averaging Time, noncarc	d	**AT_{nc}**	3,650

Estimated Ambient Air Concentration from Excavation Into Soil with Free-Phase NAPL at AOI M-02 LNAPL Area

TCL/TAL Group	Chemical	CASRN	C_{LNAPL} (mg/kg)	MW (g/mole)	K_{eq} (unitless)	D_{air} (cm^2/s)	Sc	k_G (m/s)	K (m/s)	J_L (mg/m^2-s)	$C_{air, worker}$ (mg/m^3)
VOC	Chloroform	67-66-3	4.20E-01	1.19E+02	3.50E-03	1.04E-01	1.34E+00	1.92E-03	6.74E-06	2.55E-03	2.79E-02
VOC	Cumene	98-82-8	7.90E-01	1.20E+02	7.99E-05						
VOC	1,1-Dichloroethane	75-34-3	2.10E+01	9.90E+01	4.03E-03	7.42E-02	1.88E+00	1.53E-03	6.19E-06	1.17E-01	1.282558
VOC	1,1-Dichloroethene	75-35-4	2.40E+00	9.69E+01	1.06E-02	9.00E-02	1.55E+00	1.75E-03	1.86E-05	4.02E-02	4.40E-01
VOC	Ethyl Benzene	100-41-4	2.70E+00	1.06E+02	1.70E-04	7.50E-02	1.86E+00	1.55E-03	2.63E-07	6.40E-04	7.01E-03
VOC	4-Methyl-2-pentanone	108-10-1	3.40E-01	1.00E+02	3.52E-04	7.50E-02	1.86E+00	1.55E-03	5.45E-07	1.67E-04	1.83E-03
VOC	Methylcyclohexane	108-87-2	2.70E-01	9.82E+01							
VOC	Methylene Chloride	75-09-2	1.30E+00	8.49E+01	7.69E-03	1.01E-01	1.38E+00	0.001887	1.45E-05	1.70E-02	0.186018
VOC	Tetrachloroethene	127-18-4	1.10E+01	1.66E+02	3.29E-04	7.20E-02	1.94E+00	1.50E-03	4.95E-07	4.90E-03	5.37E-02
VOC	Toluene	108-88-3	3.30E+00	9.21E+01	5.04E-04	8.70E-02	1.60E+00	1.71E-03	8.61E-07	2.56E-03	2.80E-02
VOC	1,1,1-Trichloroethane	71-55-6	4.40E+00	1.33E+02	2.20E-03	7.80E-02	1.79E+00	1.59E-03	3.49E-06	1.38E-02	1.51E-01
VOC	Trichloroethene	79-01-6	1.40E+00	1.31E+02	1.30E-03	7.90E-02	1.77E+00	1.60E-03	2.09E-06	2.63E-03	2.88E-02
VOC	Xylenes (total)	1330-20-7	1.00E+01	1.06E+02	1.77E-04	8.00E-02	1.74E+00	0.001614	2.86E-07	2.58E-03	0.028259
SVOC	Anthracene	120-12-7	1.20E+02	1.78E+02	4.74E-11	3.24E-02	4.31E+00	8.81E-04	4.17E-14	4.51E-09	4.94E-08
SVOC	Fluoranthene	206-44-0	1.30E+02	2.02E+02	1.38E-10	3.02E-02	4.62E+00	8.40E-04	1.16E-13	1.36E-08	1.49E-07
SVOC	Fluorene	86-73-7	1.70E+02	1.66E+02	1.12E-08	3.63E-02	3.84E+00	9.51E-04	1.07E-11	1.63E-06	1.79E-05
SVOC	2-Methylnaphthalene	91-57-6	5.90E+01	1.42E+02	9.76E-07						
SVOC	Phenanthrene	85-01-8	6.60E+02	1.78E+02	1.99E-09						
SVOC	Pyrene	129-00-0	1.70E+02	2.02E+02	8.15E-11	2.72E-02	5.13E+00	7.84E-04	6.38E-14	9.77E-09	1.07E-07
P/PCB	Aroclor-1242	53469-21-9	1.70E+02	2.67E+02	7.21E-09						
INORG	Antimony	7440-36-0	4.80E-01	1.22E+02							
INORG	Arsenic	7440-38-2	6.50E+00	7.49E+01							
INORG	Barium	7440-39-3	3.70E-01	1.37E+02							
INORG	Cadmium	7440-43-9	3.60E-02	1.12E+02							
INORG	Chromium (total)	7440-47-3	2.70E+00	5.20E+01							
INORG	Cobalt	7440-48-4	8.40E-02	5.89E+01							
INORG	Copper	7440-50-8	3.20E+00	6.35E+01							
INORG	Cyanide (total)	57-12-5	1.20E-01	2.60E+01							
INORG	Lead	7439-92-1	8.30E-01	2.07E+02							
INORG	Manganese	7439-96-5	9.50E-01	5.49E+01							
INORG	Nickel	7440-02-0	9.17E+01	5.87E+01							
INORG	Silver	7440-22-4	1.10E-01	1.08E+02							
INORG	Vanadium	7440-62-2	2.60E-01	5.09E+01							
INORG	Zinc	7440-66-6	1.90E+00	6.54E+01							
Notes:											
Physical Properties of Air											
	Pressure	1	atm	assumed							
	Molecular Weight	28.8	g/g mol	Perry and Chilton (1973)							
	Viscosity	1.80E-04	g/(cm.s)	Perry and Chilton (1973)							
	Density	0.00129	g/cm^3	Perry and Chilton (1973)							
Physical Properties of NAPL											

Estimated Ambient Air Concentration from Excavation Into Soil with Free-Phase NAPL at AOI M-02 LNAPL Area												
TCL/TAL Group	**Chemical**	**CASRN**	**C_{LNAPL}** (mg/kg)	**MW** (g/mole)	**K_{eq}** (unitless)	**D_{air}** (cm^2/s)	**Sc**	**k_G** (m/s)	**K** (m/s)	**J_L** (mg/m^2-s)	**$C_{air, worker}$** (mg/m^3)
	Molecular Weight	271	g/g mol								
	Density	0.9	g/cm^3								
Physical Characteristics of Excavation Pit											
	Windspeed	0.5	m/s	assumed							
	Surface Area	2.1.E+01	m^2								
	Effective Diameter of Area	5.2.E+00	m	calculated							

Construction Scenario Cancer Risk Calculations - AOI M-02 LNAPL Area

				Soil Ingestion				Soil Dermal Contact				NAPL Dermal Contact					Vapor Inhalation			
Chem Group	Chemical	CASRN	Cancer Class	C_{soil} (mg/kg)	LADD (mg/kg/d)	SF_{oral} $(mg/kg/d)^{-1}$	Risk	AF_{derm}	LADD (mg/kg/d)	SF_{derm} $(mg/kg/d)^{-1}$	Risk	C_{LNAPL} (mg/L)	DA (L/cm^2)	LADD (mg/kg/d)	SF_{derm} $(mg/kg/d)^{-1}$	Risk	C_{air} (mg/m^3)	C_{air} (mg/m^3)	URF (m^3/mg)	Risk
VOC	Chloroform	67-66-3	B2	1.08E-01	6.06E-10							3.78E-01	2.26E-04	7.87E-06			2.79E-02	5.46E-05	2.3E-02	1.3E-06
VOC	Cumene	98-82-8	D	2.04E-01	1.14E-09							7.11E-01	6.10E-05	4.00E-06						
VOC	1,1-Dichloroethane	75-34-3	C	5.42E+00	3.03E-08							1.89E+01	2.99E-04	5.22E-04			1.28E+00	2.51E-03		
VOC	1,1-Dichloroethene	75-35-4	C	6.19E-01	3.46E-09							2.16E+00	2.37E-04	4.73E-05			4.40E-01	8.62E-04		
VOC	Ethyl Benzene	100-41-4	D	6.97E-01	3.89E-09							2.43E+00	9.75E-05	2.19E-05			7.01E-03	1.37E-05		
VOC	4-Methyl-2-pentanone	108-10-1		8.77E-02	4.90E-10							3.06E-01					1.83E-03	3.58E-06		
VOC	Methylcyclohexane	108-87-2		6.97E-02	3.89E-10							2.43E-01								
VOC	Methylene Chloride	75-09-2	B2	3.35E-01	1.88E-09	7.5E-03	1.4E-11			7.5E-03		1.17E+00	5.21E-04	5.63E-05	7.5E-03	4.2E-07	1.86E-01	3.64E-04	4.7E-04	1.7E-07
VOC	Tetrachloroethene	127-18-4	C-B2	2.84E+00	1.59E-08							9.90E+00	8.51E-08	7.78E-08			5.37E-02	1.05E-04		
VOC	Toluene	108-88-3	D	8.51E-01	4.76E-09							2.97E+00	1.51E-04	4.14E-05			2.80E-02	5.48E-05		
VOC	1,1,1-Trichloroethane	71-55-6	D	1.14E+00	6.35E-09							3.96E+00	1.30E-04	4.73E-05			1.51E-01	2.96E-04		
VOC	Trichloroethene	79-01-6	C-B2	3.61E-01	2.02E-09	1.1E-02	2.2E-11			1.1E-02		1.26E+00	1.10E-04	1.28E-05	1.1E-02	1.4E-07	2.88E-02	5.64E-05	1.7E-03	9.6E-08
VOC	Xylenes (total)	1330-20-7	D	2.58E+00	1.44E-08							9.00E+00					2.83E-02	5.53E-05		
SVOC	Anthracene	120-12-7	D	3.10E+01	1.73E-07			1.00E-01	5.71E-08			1.08E+02	1.81E-08	1.80E-07			4.94E-08	9.67E-11		
SVOC	Fluoranthene	206-44-0	D	3.35E+01	1.88E-07			1.00E-01	6.19E-08			1.17E+02	9.95E-09	1.07E-07			1.49E-07	2.92E-10		
SVOC	Fluorene	86-73-7	D	4.39E+01	2.45E-07			1.00E-01	8.09E-08			1.53E+02	2.56E-08	3.61E-07			1.79E-05	3.50E-08		
SVOC	2-Methylnaphthalene	91-57-6		1.52E+01	8.51E-08			1.00E-01	2.81E-08			5.31E+01	4.09E-05	2.00E-04						
SVOC	Phenanthrene	85-01-8	D	1.70E+02	9.52E-07			1.00E-01	3.14E-07			5.94E+02	1.94E-08	1.06E-06						
SVOC	Pyrene	129-00-0	D	4.39E+01	2.45E-07			1.00E-01	8.09E-08			1.53E+02	9.95E-09	1.40E-07			1.07E-07	2.09E-10		
P/PCB	Aroclor-1242	53469-21-9	B2	4.39E+01	2.45E-07	2.0E+00	4.9E-07	1.40E-01	1.13E-07	2.0E+00	2.3E-07	1.53E+02	4.57E-09	6.45E-08	2.0E+00	1.3E-07				
INORG	Antimony	7440-36-0		1.24E-01	6.92E-10							4.32E-01	2.00E-06	7.97E-08						
INORG	Arsenic	7440-38-2	A	1.68E+00	9.38E-09	1.5E+00	1.4E-08	3.00E-02	9.28E-10	1.5E+00	1.4E-09	5.85E+00	2.00E-06	1.08E-06	1.5E+00	1.6E-06			4.3E+00	
INORG	Barium	7440-39-3	D	9.55E-02	5.34E-10							3.33E-01	2.00E-06	6.14E-08						
INORG	Cadmium	7440-43-9	B1	9.29E-03	5.19E-11			1.00E-03	1.71E-13			3.24E-02	2.00E-06	5.98E-09					1.8E+00	
INORG	Chromium (total)	7440-47-3		6.97E-01	3.89E-09							2.43E+00	2.00E-06	4.48E-07					1.2E+01	
INORG	Cobalt	7440-48-4		2.17E-02	1.21E-10							7.56E-02	2.00E-06	1.39E-08						
INORG	Copper	7440-50-8	D	8.26E-01	4.62E-09							2.88E+00	2.00E-06	5.31E-07						
INORG	Cyanide (total)	57-12-5	D	3.10E-02	1.73E-10							1.08E-01	2.00E-06	1.99E-08						
INORG	Lead	7439-92-1	B2	2.14E-01	1.20E-09							7.47E-01	2.00E-06	1.38E-07						
INORG	Manganese	7439-96-5	D	2.45E-01	1.37E-09							8.55E-01	2.00E-06	1.58E-07						
INORG	Nickel	7440-02-0	A	2.37E+01	1.32E-07							8.25E+01	2.00E-06	1.52E-05					2.4E-01	
INORG	Silver	7440-22-4	D	2.84E-02	1.59E-10							9.90E-02	2.00E-06	1.83E-08						
INORG	Vanadium	7440-62-2		6.71E-02	3.75E-10							2.34E-01	2.00E-06	4.32E-08						
INORG	Zinc	7440-66-6	D	4.90E-01	2.74E-09							1.71E+00	2.00E-06	3.16E-07						
				Cumulative Risk:		**5E-07**				**2E-07**					**2E-06**					**2E-06**

Construction Scenario Hazard Index Calculations - AOI M-02 LNAPL Area

Chem Group	Chemical	CASRN	Cancer Class	Soil Ingestion				Soil Dermal Contact				NAPL Dermal Contact					Vapor Inhalation			
				C_{soil} (mg/kg)	ADD (mg/kg/d)	RfD_{oral} (mg/kg/d)	HQ	AF_{derm}	ADD (mg/kg/d)	RfD_{derm} (mg/kg/d)	HQ	C_{LNAPL} (mg/L)	DA (L/cm^2)	ADD (mg/kg/d)	RfD_{derm} (mg/kg/d)	HQ	C_{air} (mg/m^3)	C_{air} (mg/m^3)	RfC (mg/m^3)	HQ
VOC	Chloroform	67-66-3	B2	1.08E-01	4.24E-09	1.0E-02	4.2E-07			1.0E-02		3.78E-01	2.26E-04	5.51E-05	1.0E-02	5.5E-03	2.79E-02	3.82E-04		
VOC	Cumene	98-82-8	D	2.04E-01	7.98E-09	1.0E-01	8.0E-08			1.0E-01		7.11E-01	6.10E-05	2.80E-05	1.0E-01	2.8E-04			4.0E-01	
VOC	1,1-Dichloroethane	75-34-3	C	5.42E+00	2.12E-07	1.0E-01	2.1E-06			1.0E-01		1.89E+01	2.99E-04	3.65E-03	1.0E-01	3.7E-02	1.28E+00	1.76E-02	5.0E-01	3.5E-02
VOC	1,1-Dichloroethene	75-35-4	C	6.19E-01	2.42E-08	5.0E-02	4.8E-07			5.0E-02		2.16E+00	2.37E-04	3.31E-04	5.0E-02	6.6E-03	4.40E-01	6.03E-03	2.0E-01	3.0E-02
VOC	Ethyl Benzene	100-41-4	D	6.97E-01	2.73E-08	1.0E-01	2.7E-07			1.0E-01		2.43E+00	9.75E-05	1.53E-04	1.0E-01	1.5E-03	7.01E-03	9.61E-05	1.0E+00	9.6E-05
VOC	4-Methyl-2-pentanone	108-10-1		8.77E-02	3.43E-09	8.0E-02	4.3E-08			8.0E-02		3.06E-01			8.0E-02		1.83E-03	2.50E-05	8.0E-02	3.1E-04
VOC	Methylcyclohexane	108-87-2		6.97E-02	2.73E-09							2.43E-01								
VOC	Methylene Chloride	75-09-2	B2	3.35E-01	1.31E-08	6.0E-02	2.2E-07			6.0E-02		1.17E+00	5.21E-04	3.94E-04	6.0E-02	6.6E-03	1.86E-01	2.55E-03	3.0E+00	8.5E-04
VOC	Tetrachloroethene	127-18-4	C-B2	2.84E+00	1.11E-07	1.0E-02	1.1E-05			1.0E-02		9.90E+00	8.51E-08	5.44E-07	1.0E-02	5.4E-05	5.37E-02	7.36E-04		
VOC	Toluene	108-88-3	D	8.51E-01	3.33E-08	2.0E-01	1.7E-07			2.0E-01		2.97E+00	1.51E-04	2.89E-04	2.0E-01	1.4E-03	2.80E-02	3.84E-04	4.0E-01	9.6E-04
VOC	1,1,1-Trichloroethane	71-55-6	D	1.14E+00	4.44E-08	2.8E-01	1.6E-07			2.8E-01		3.96E+00	1.30E-04	3.31E-04	2.8E-01	1.2E-03	1.51E-01	2.07E-03	2.2E+00	9.4E-04
VOC	Trichloroethene	79-01-6	C-B2	3.61E-01	1.41E-08							1.26E+00	1.10E-04	8.95E-05			2.88E-02	3.95E-04		
VOC	Xylenes (total)	1330-20-7	D	2.58E+00	1.01E-07	2.0E+00	5.0E-08			2.0E+00		9.00E+00			2.0E+00		2.83E-02	3.87E-04		
SVOC	Anthracene	120-12-7	D	3.10E+01	1.21E-06	3.0E-01	4.0E-06	1.00E-01	4.00E-07	3.0E-01	1.3E-06	1.08E+02	1.81E-08	1.26E-06	3.0E-01	4.2E-06	4.94E-08	6.77E-10		
SVOC	Fluoranthene	206-44-0	D	3.35E+01	1.31E-06	4.0E-02	3.3E-05	1.00E-01	4.33E-07	4.0E-02	1.1E-05	1.17E+02	9.95E-09	7.52E-07	4.0E-02	1.9E-05	1.49E-07	2.04E-09		
SVOC	Fluorene	86-73-7	D	4.39E+01	1.72E-06	4.0E-02	4.3E-05	1.00E-01	5.66E-07	4.0E-02	1.4E-05	1.53E+02	2.56E-08	2.53E-06	4.0E-02	6.3E-05	1.79E-05	2.45E-07		
SVOC	2-Methylnaphthalene	91-57-6		1.52E+01	5.96E-07	2.0E-02	3.0E-05	1.00E-01	1.97E-07	2.0E-02	9.8E-06	5.31E+01	4.09E-05	1.40E-03	2.0E-02	7.0E-02			3.0E-03	
SVOC	Phenanthrene	85-01-8	D	1.70E+02	6.66E-06	3.0E-02	2.2E-04	1.00E-01	2.20E-06	3.0E-02	7.3E-05	5.94E+02	1.94E-08	7.44E-06	3.0E-02	2.5E-04				
SVOC	Pyrene	129-00-0	D	4.39E+01	1.72E-06	3.0E-02	5.7E-05	1.00E-01	5.66E-07	3.0E-02	1.9E-05	1.53E+02	9.95E-09	9.83E-07	3.0E-02	3.3E-05	1.07E-07	1.47E-09		
P/PCB	Aroclor-1242	53469-21-9	B2	4.39E+01	1.72E-06	7.0E-05	2.5E-02	1.40E-01	7.93E-07	7.0E-05	1.1E-02	1.53E+02	4.57E-09	4.51E-07	7.0E-05	6.4E-03				
INORG	Antimony	7440-36-0		1.24E-01	4.85E-09	4.0E-04	1.2E-05			4.0E-04		4.32E-01	2.00E-06	5.58E-07	4.0E-04	1.4E-03				
INORG	Arsenic	7440-38-2	A	1.68E+00	6.56E-08	3.0E-04	2.2E-04	3.00E-02	6.50E-09	3.0E-04	2.2E-05	5.85E+00	2.00E-06	7.56E-06	3.0E-04	2.5E-02				
INORG	Barium	7440-39-3	D	9.55E-02	3.74E-09	7.0E-02	5.3E-08			7.0E-02		3.33E-01	2.00E-06	4.30E-07	7.0E-02	6.1E-06				
INORG	Cadmium	7440-43-9	B1	9.29E-03	3.64E-10	1.0E-03	3.6E-07	1.00E-03	1.20E-12	1.0E-03	1.2E-09	3.24E-02	2.00E-06	4.18E-08	1.0E-03	4.2E-05				
INORG	Chromium (total)	7440-47-3		6.97E-01	2.73E-08	3.0E-03	9.1E-06			3.0E-03		2.43E+00	2.00E-06	3.14E-06	3.0E-03	1.0E-03			1.0E-04	
INORG	Cobalt	7440-48-4		2.17E-02	8.48E-10	6.0E-02	1.4E-08			6.0E-02		7.56E-02	2.00E-06	9.76E-08	6.0E-02	1.6E-06			2.0E-05	
INORG	Copper	7440-50-8	D	8.26E-01	3.23E-08	4.0E-02	8.1E-07			4.0E-02		2.88E+00	2.00E-06	3.72E-06	4.0E-02	9.3E-05				
INORG	Cyanide (total)	57-12-5	D	3.10E-02	1.21E-09	2.0E-02	6.1E-08			2.0E-02		1.08E-01	2.00E-06	1.39E-07	2.0E-02	7.0E-06				
INORG	Lead	7439-92-1	B2	2.14E-01	8.38E-09							7.47E-01	2.00E-06	9.65E-07						
INORG	Manganese	7439-96-5	D	2.45E-01	9.59E-09	1.4E-01	6.9E-08			1.4E-01		8.55E-01	2.00E-06	1.10E-06	1.4E-01	7.9E-06			5.0E-05	
INORG	Nickel	7440-02-0	A	2.37E+01	9.26E-07	2.0E-02	4.6E-05			2.0E-02		8.25E+01	2.00E-06	1.07E-04	2.0E-02	5.3E-03				
INORG	Silver	7440-22-4	D	2.84E-02	1.11E-09	5.0E-03	2.2E-07			5.0E-03		9.90E-02	2.00E-06	1.28E-07	5.0E-03	2.6E-05				
INORG	Vanadium	7440-62-2		6.71E-02	2.63E-09	7.0E-03	3.8E-07			7.0E-03		2.34E-01	2.00E-06	3.02E-07	7.0E-03	4.3E-05				
INORG	Zinc	7440-66-6	D	4.90E-01	1.92E-08	3.0E-01	6.4E-08			3.0E-01		1.71E+00	2.00E-06	2.21E-06	3.0E-01	7.4E-06				
						Hazard Index:	**3E-02**				**1E-02**					**2E-01**				**7E-02**

Appendix D:

Sewer and Rooftop Maintenance Worker Scenario
Risk-Based Criteria Calculations

Table 6: Sewer Water Samples Exceeding Screening Criteria
GMC Pontiac North Campus, Pontiac, MI

Area	Location	Sample ID	Sample Date	Meas Basis	Chem Group	Chemical	CASRN	Conc (mg/L)	Qual	QL (mg/L)	Groundwater Contact Criteria (mg/L)	Ratio of Conc to Groundwater Contact Criteria
Fiero Outfall 001	STF314A	STF314A-SW-121902	12/19/2002	T	SVOC	Benzo(a)pyrene	50-32-8	3.20E-03	J	1.80E-03	1.0E-03	**3.2E+00**
Fiero Outfall 001	STF314A	STF314A-SW-121902	12/19/2002	T	SVOC	Benzo(b)fluoranthene	205-99-2	4.10E-03	J	2.40E-03	1.5E-03	**2.7E+00**
Fiero Outfall 001	STF314A	STF314A-SW-121902	12/19/2002	T	SVOC	Benzo(g,h,i)perylene	191-24-2	2.40E-03	J	2.10E-03	1.0E-03	**2.4E+00**
Fiero Outfall 001	STF314A	STF314A-SW-121902	12/19/2002	T	SVOC	Chrysene	218-01-9	4.00E-03	J	1.90E-03	1.6E-03	**2.5E+00**
Fiero Outfall 001	STF314A	STF314A-SW-121902	12/19/2002	T	SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	2.10E-03	J	1.60E-03	2.0E-03	**1.1E+00**
Fiero Outfall 001	STF40	STF40-SW-010803	1/8/2003	T	SVOC	Benzo(a)anthracene	56-55-3	2.20E-02		1.40E-03	9.4E-03	**2.3E+00**
Fiero Outfall 001	STF40	STF40-SW-010803	1/8/2003	T	SVOC	Benzo(a)pyrene	50-32-8	2.20E-02		1.50E-03	1.0E-03	**2.2E+01**
Fiero Outfall 001	STF40	STF40-SW-010803	1/8/2003	T	SVOC	Benzo(b)fluoranthene	205-99-2	2.70E-02		1.90E-03	1.5E-03	**1.8E+01**
Fiero Outfall 001	STF40	STF40-SW-010803	1/8/2003	T	SVOC	Benzo(g,h,i)perylene	191-24-2	1.30E-02		1.70E-03	1.0E-03	**1.3E+01**
Fiero Outfall 001	STF40	STF40-SW-010803	1/8/2003	T	SVOC	Benzo(k)fluoranthene	207-08-9	1.80E-02		1.70E-03	1.0E-03	**1.8E+01**
Fiero Outfall 001	STF40	STF40-SW-010803	1/8/2003	T	SVOC	Chrysene	218-01-9	2.50E-02		1.50E-03	1.6E-03	**1.6E+01**
Fiero Outfall 001	STF40	STF40-SW-010803	1/8/2003	T	SVOC	Dibenz(a,h)anthracene	53-70-3	3.40E-03	J	1.60E-03	2.0E-03	**1.7E+00**
Fiero Outfall 001	STF40	STF40-SW-010803	1/8/2003	T	SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	1.30E-02		1.30E-03	2.0E-03	**6.5E+00**
Fiero Outfall 001	STF46	STF46-SW-121702	12/17/2002	T	SVOC	Benzo(b)fluoranthene	205-99-2	3.90E-03	J	3.80E-03	1.5E-03	**2.6E+00**
Fiero Outfall 001	STF46	STF46-SW-121702	12/17/2002	T	SVOC	Chrysene	218-01-9	5.40E-03	J	3.00E-03	1.6E-03	**3.4E+00**
Outfall 001	ST14-4	ST14-4-SW-100202	10/2/2002	T	PCB	PCBs (total)	1336-36-3	6.79E-02	J	8.20E-03	3.3E-03	**2.1E+01**
Outfall 001	ST202	ST202-SW-091301	9/13/2001	T	PCB	PCBs (total)	1336-36-3	7.61E-03	J	3.10E-04	3.3E-03	**2.3E+00**
Outfall 001	ST214A	ST214A-SW-091101	9/11/2001	T	PCB	PCBs (total)	1336-36-3	7.78E-03	J	5.50E-04	3.3E-03	**2.4E+00**
Outfall 001	ST5	ST5-SW-111301	11/13/2001	T	PCB	PCBs (total)	1336-36-3	7.68E-03	J	5.50E-04	3.3E-03	**2.3E+00**
Outfall 002	ST125	ST125-SW-091201	9/12/2001	T	PCB	PCBs (total)	1336-36-3	8.46E-03	J	1.10E-03	3.3E-03	**2.6E+00**
Outfall 002	ST125	ST125-SW-111401	11/14/2001	T	PCB	PCBs (total)	1336-36-3	1.23E-02	J	3.10E-04	3.3E-03	**3.7E+00**
Outfall 002	ST125	ST125-SW-113001	11/30/2001	T	PCB	PCBs (total)	1336-36-3	5.12E-02	J	1.20E-03	3.3E-03	**1.6E+01**

Notes:

1. Ratios in bold and shading represent ratios of concentration to criteria greater than 1.
2. Meas Basis - Measured Basis; T = Total
3. Only samples with chemical concentrations above any criteria are shown.

Table 7: Sediment Samples Exceeding Screening Criteria
GMC Pontiac North Campus, Pontiac, MI

Area	Location	Sample ID	Sample Date	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	QL (mg/kg)	Site Specific Background (mg/kg)	Industrial/ Commercial II Direct Contact Criteria (mg/kg)	Ratio of Conc to Industrial/ Commercial II Direct Contact	Maintenance Worker Criteria (mg/kg)	Ratio of Conc to Maintenance Worker Criteria
Plant 17 (Fiero) Roof	FIERO ROOF 1	FIERO ROOF 1-SERF-071603	7/16/2003	INORG	Lead	7439-92-1	1.17E+03		1.98E+00	4.92E+01	9.0E+02	**1.2E+00**	1.1E+04	1.0E-01
Plant 17 (Fiero) Roof	FIERO ROOF 2	FIERO ROOF 2-SERF-071603	7/16/2003	INORG	Lead	7439-92-1	1.38E+03		1.93E-01	4.92E+01	9.0E+02	**1.5E+00**	1.1E+04	1.2E-01
Plant 17 (Fiero) Roof	FIERO ROOF 3	FIERO ROOF 3-SERF-071603	7/16/2003	INORG	Arsenic	7440-38-2	1.09E+02	J	3.99E-01	1.32E+01	3.7E+01	**2.6E+00**	3.4E+02	2.8E-01
Plant 17 (Fiero) Roof	FIERO ROOF 3	FIERO ROOF 3-SERF-071603	7/16/2003	INORG	Lead	7439-92-1	4.24E+03		1.35E+01	4.92E+01	9.0E+02	**4.7E+00**	1.1E+04	3.8E-01
Plant 17 (Fiero) Roof	FIERO ROOF 4	FIERO ROOF 4-SERF-071603	7/16/2003	INORG	Antimony	7440-36-0	3.01E+03	J	1.18E+01		6.7E+02	**4.5E+00**	1.0E+04	2.9E-01
Plant 17 (Fiero) Roof	FIERO ROOF 4	FIERO ROOF 4-SERF-071603	7/16/2003	INORG	Arsenic	7440-38-2	3.00E+02	J	2.87E-01	1.32E+01	3.7E+01	**7.8E+00**	3.4E+02	8.4E-01
Plant 17 (Fiero) Roof	FIERO ROOF 4	FIERO ROOF 4-SERF-071603	7/16/2003	INORG	Lead	7439-92-1	4.17E+04		9.75E+00	4.92E+01	9.0E+02	**4.6E+01**	1.1E+04	**3.8E+00**
Plant 17 (Fiero) Roof	FIERO ROOF 5	FIERO ROOF 5-SERF-071603	7/16/2003	INORG	Lead	7439-92-1	2.08E+03		9.66E+00	4.92E+01	9.0E+02	**2.3E+00**	1.1E+04	1.8E-01
Plant 17 (Fiero) Roof	FIERO ROOF 6	FIERO ROOF 6-SERF-071603	7/16/2003	INORG	Antimony	7440-36-0	1.13E+03	J	1.16E+01		6.7E+02	**1.7E+00**	1.0E+04	1.1E-01
Plant 17 (Fiero) Roof	FIERO ROOF 6	FIERO ROOF 6-SERF-071603	7/16/2003	INORG	Arsenic	7440-38-2	1.53E+02	J	1.41E-01	1.32E+01	3.7E+01	**3.8E+00**	3.4E+02	4.1E-01
Plant 17 (Fiero) Roof	FIERO ROOF 6	FIERO ROOF 6-SERF-071603	7/16/2003	INORG	Lead	7439-92-1	3.30E+04		9.58E+00	4.92E+01	9.0E+02	**3.7E+01**	1.1E+04	**3.0E+00**
Plant 17 (Fiero) Roof	FIERO ROOF 7	FIERO ROOF 7-SERF-071603	7/16/2003	INORG	Lead	7439-92-1	1.50E+03		4.93E-01	4.92E+01	9.0E+02	**1.6E+00**	1.1E+04	1.3E-01
Plant 17 (Fiero) Roof	Plant 17-10	BDF-100-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	3.85E+03		6.76E-01	4.92E+01	9.0E+02	**4.2E+00**	1.1E+04	3.4E-01
Plant 17 (Fiero) Roof	Plant 17-10	PLANT 17-10-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	4.67E+03		6.65E-01	4.92E+01	9.0E+02	**5.1E+00**	1.1E+04	4.2E-01
Plant 17 (Fiero) Roof	Plant 17-11	PLANT 17-11-SERF-090303	9/3/2003	INORG	Arsenic	7440-38-2	5.39E+01	J	1.21E+00	1.32E+01	3.7E+01	**1.1E+00**	3.4E+02	1.2E-01
Plant 17 (Fiero) Roof	Plant 17-11	PLANT 17-11-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	3.00E+03		1.54E+00	4.92E+01	9.0E+02	**3.3E+00**	1.1E+04	2.7E-01
Plant 17 (Fiero) Roof	Plant 17-12	PLANT 17-12-SERF-090403	9/4/2003	PCB	PCBs (total)	1336-36-3	2.62E+02	J	1.50E+00		1.6E+01	**1.6E+01**	1.3E+02	**2.1E+00**
Plant 17 (Fiero) Roof	Plant 17-12	PLANT 17-12-SERF-090403	9/4/2003	INORG	Lead	7439-92-1	1.72E+03	J	1.13E+00	4.92E+01	9.0E+02	**1.9E+00**	1.1E+04	1.5E-01
Plant 17 (Fiero) Roof	Plant 17-14	PLANT 17-14-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	2.24E+03		7.22E-01	4.92E+01	9.0E+02	**2.4E+00**	1.1E+04	2.0E-01
Plant 17 (Fiero) Roof	Plant 17-16	PLANT 17-16-SERF-090403	9/4/2003	INORG	Arsenic	7440-38-2	5.22E+01		5.65E-02	1.32E+01	3.7E+01	**1.1E+00**	3.4E+02	1.1E-01
Plant 17 (Fiero) Roof	Plant 17-17	BDF-101-SERF-090403	9/4/2003	INORG	Lead	7439-92-1	4.65E+03	J	8.06E-01	4.92E+01	9.0E+02	**5.1E+00**	1.1E+04	4.2E-01
Plant 17 (Fiero) Roof	Plant 17-17	PLANT 17-17-SERF-090403	9/4/2003	INORG	Lead	7439-92-1	4.60E+03	J	7.90E-01	4.92E+01	9.0E+02	**5.1E+00**	1.1E+04	4.1E-01
Plant 17 (Fiero) Roof	Plant 17-18	PLANT 17-18-SERF-090403	9/4/2003	INORG	Lead	7439-92-1	3.39E+03	J	1.92E+00	4.92E+01	9.0E+02	**3.7E+00**	1.1E+04	3.0E-01
Plant 17 (Fiero) Roof	Plant 17-2	PLANT 17-2-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	1.43E+03		1.62E-01	4.92E+01	9.0E+02	**1.5E+00**	1.1E+04	1.3E-01
Plant 17 (Fiero) Roof	Plant 17-20	PLANT 17-20-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	1.49E+03		1.42E+00	4.92E+01	9.0E+02	**1.6E+00**	1.1E+04	1.3E-01
Plant 17 (Fiero) Roof	Plant 17-21	PLANT 17-21-SERF-090303	9/3/2003	INORG	Arsenic	7440-38-2	6.19E+01	J	4.25E-01	1.32E+01	3.7E+01	**1.3E+00**	3.4E+02	1.4E-01
Plant 17 (Fiero) Roof	Plant 17-21	PLANT 17-21-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	1.43E+03		5.41E-01	4.92E+01	9.0E+02	**1.5E+00**	1.1E+04	1.3E-01
Plant 17 (Fiero) Roof	Plant 17-22	PLANT 17-22-SERF-090403	9/4/2003	INORG	Arsenic	7440-38-2	7.93E+01		2.84E-01	1.32E+01	3.7E+01	**1.8E+00**	3.4E+02	1.9E-01
Plant 17 (Fiero) Roof	Plant 17-22	PLANT 17-22-SERF-090403	9/4/2003	INORG	Lead	7439-92-1	2.38E+03	J	3.62E-01	4.92E+01	9.0E+02	**2.6E+00**	1.1E+04	2.1E-01
Plant 17 (Fiero) Roof	Plant 17-27	PLANT 17-27-SERF-090503	9/5/2003	INORG	Lead	7439-92-1	1.46E+03		1.65E-01	4.92E+01	9.0E+02	**1.6E+00**	1.1E+04	1.3E-01
Plant 17 (Fiero) Roof	Plant 17-29	PLANT 17-29-SERF-090403	9/4/2003	INORG	Lead	7439-92-1	1.11E+03	J	9.97E-01	4.92E+01	9.0E+02	**1.2E+00**	1.1E+04	9.6E-02
Plant 17 (Fiero) Roof	Plant 17-32	PLANT 17-32-SERF-090503	9/5/2003	INORG	Arsenic	7440-38-2	8.09E+01		9.51E-02	1.32E+01	3.7E+01	**1.8E+00**	3.4E+02	2.0E-01
Plant 17 (Fiero) Roof	Plant 17-34	PLANT 17-34-SERF-090503	9/5/2003	INORG	Arsenic	7440-38-2	3.49E+02		4.00E-01	1.32E+01	3.7E+01	**9.1E+00**	3.4E+02	9.8E-01
Plant 17 (Fiero) Roof	Plant 17-34	PLANT 17-34-SERF-090503	9/5/2003	INORG	Lead	7439-92-1	1.02E+03		5.10E-01	4.92E+01	9.0E+02	**1.1E+00**	1.1E+04	8.8E-02
Plant 17 (Fiero) Roof	Plant 17-37	PLANT 17-37-SERF-090503	9/5/2003	INORG	Lead	7439-92-1	2.57E+03		7.10E-01	4.92E+01	9.0E+02	**2.8E+00**	1.1E+04	2.3E-01
Plant 17 (Fiero) Roof	Plant 17-4	PLANT 17-4-SERF-090303	9/3/2003	INORG	Arsenic	7440-38-2	6.04E+01	J	1.86E+00	1.32E+01	3.7E+01	**1.3E+00**	3.4E+02	1.4E-01
Plant 17 (Fiero) Roof	Plant 17-4	PLANT 17-4-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	1.70E+03		2.37E+00	4.92E+01	9.0E+02	**1.8E+00**	1.1E+04	1.5E-01
Plant 17 (Fiero) Roof	Plant 17-6	PLANT 17-6-SERF-090503	9/5/2003	PCB	PCBs (total)	1336-36-3	1.51E+02	J	6.10E-01		1.6E+01	**9.4E+00**	1.3E+02	**1.2E+00**
Plant 17 (Fiero) Roof	Plant 17-7	PLANT 17-7-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	1.18E+03		1.19E-01	4.92E+01	9.0E+02	**1.3E+00**	1.1E+04	1.0E-01
Plant 17 (Fiero) Roof	Plant 17-8A	PLANT 17-8A-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	2.44E+03		7.22E-01	4.92E+01	9.0E+02	**2.7E+00**	1.1E+04	2.2E-01
Plant 17 (Fiero) Roof	Plant 17-9	PLANT 17-9-SERF-090303	9/3/2003	INORG	Lead	7439-92-1	3.28E+03		1.14E+00	4.92E+01	9.0E+02	**3.6E+00**	1.1E+04	2.9E-01
Fiero Outfall 001	CBF102	CBF102-SESS-062203	6/22/2003	SVOC	Benzo(a)pyrene	50-32-8	1.20E+01		6.20E-01		8.0E+00	**1.5E+00**	3.6E+01	3.3E-01
Fiero Outfall 001	CBF102	CBF102-SESS-062203	6/22/2003	INORG	Arsenic	7440-38-2	6.13E+02		9.70E-01	1.32E+01	3.7E+01	**1.6E+01**	3.4E+02	**1.8E+00**
Fiero Outfall 001	CBF102	CBF102-SESS-062203	6/22/2003	INORG	Lead	7439-92-1	1.15E+03		6.59E-01	4.92E+01	9.0E+02	**1.2E+00**	1.1E+04	1.0E-01
Fiero Outfall 001	CBF103	CBF103-SESS-062203	6/22/2003	INORG	Arsenic	7440-38-2	1.39E+02		1.05E+00	1.32E+01	3.7E+01	**3.4E+00**	3.4E+02	3.7E-01
Fiero Outfall 001	CBF103	CBF103-SESS-062203	6/22/2003	INORG	Lead	7439-92-1	2.02E+03		7.14E-01	4.92E+01	9.0E+02	**2.2E+00**	1.1E+04	1.8E-01
Fiero Outfall 001	CBF104	CBF104-SESS-062203	6/22/2003	INORG	Arsenic	7440-38-2	6.51E+01		1.39E+00	1.32E+01	3.7E+01	**1.4E+00**	3.4E+02	1.5E-01
Fiero Outfall 001	CBF105	CBF105-SESS-062203	6/22/2003	INORG	Arsenic	7440-38-2	1.52E+02		1.23E+00	1.32E+01	3.7E+01	**3.8E+00**	3.4E+02	4.1E-01
Fiero Outfall 001	CBF105	CBF105-SESS-062203	6/22/2003	INORG	Lead	7439-92-1	3.17E+03		8.37E-01	4.92E+01	9.0E+02	**3.5E+00**	1.1E+04	2.8E-01
Fiero Outfall 001	CBF106	CBF106-SESS-062203	6/22/2003	INORG	Arsenic	7440-38-2	2.13E+02		7.19E-01	1.32E+01	3.7E+01	**5.4E+00**	3.4E+02	5.8E-01
Fiero Outfall 001	CBF106	CBF106-SESS-062203	6/22/2003	INORG	Lead	7439-92-1	3.58E+03		4.88E-01	4.92E+01	9.0E+02	**3.9E+00**	1.1E+04	3.2E-01
Outfall 001	ST337	ST337-SD-111301	11/13/2001	PCB	PCBs (total)	1336-36-3	2.82E+01	J	2.80E+00		1.6E+01	**1.8E+00**	1.3E+02	2.2E-01

Table 7: Sediment Samples Exceeding Screening Criteria
GMC Pontiac North Campus, Pontiac, MI

Area	Location	Sample ID	Sample Date	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	QL (mg/kg)	Site Specific Background (mg/kg)	Industrial/ Commercial II Direct Contact Criteria (mg/kg)	Ratio of Conc to Industrial/ Commercial II Direct Contact	Maintenance Worker Criteria (mg/kg)	Ratio of Conc to Maintenance Worker Criteria
Outfall 001	ST339	ST339-SD-111301	11/13/2001	PCB	PCBs (total)	1336-36-3	4.12E+02	J	2.80E+01		1.6E+01	**2.6E+01**	1.3E+02	**3.3E+00**
Outfall 001	ST418	ST418-SD-111201	11/12/2001	PCB	PCBs (total)	1336-36-3	2.61E+01	J	1.70E-01		1.6E+01	**1.6E+00**	1.3E+02	2.1E-01

Notes:

1. Ratios in bold and shading represent ratios of concentration to criteria greater than 1.
2. Ratios are calculated using site-specific concentrations, which are those in excess of background.
3. Only samples with chemical concentrations above any criteria are shown.

APPENDIX D

Sewer and Rooftop Maintenance Worker Scenario
Risk-Based Criteria Calculation

1.0 Introduction

The calculations discussed in this appendix support the discussion in Section 2.20 through 2.23 of the Due Care Plan that relate to the potential for exposure of maintenance workers to sediments in storm sewers and on rooftop. Specifically, the calculations address potential worker exposures to sediments via incidental ingestion and dermal contact while performing activities associated with sewer or rooftop maintenance. The calculations do not include exposures via inhalation because airborne exposures are expected to be insignificant relative to ingestion and dermal contact since sediments in the sewers and on the rooftops are typically wet or otherwise have limited potential for emission.

2.0 Exposure Factors

Exposure factors for evaluating the potential significance of exposure to sediments are not well established. Therefore, as a conservative approach the exposure factors for evaluating the potential significance of exposure to soil were used. The exposure factors used for evaluating high-end exposure of workers who may contact sewer or rooftop sediments are discussed below and shown in the attached tables:

Ingestion Rate

The sediment ingestion rate of 50 mg/day is EPA's recommended value for evaluating high-end contact with soil by workers in industrial settings (USEPA 1991).

Dermal Contact Rate

The dermal contact rate is the product of the exposed skin surface area and the adherence factor. The surface area of 3,300 cm^2 and adherence factor of 0.2 mg/cm^2 are USEPA's recommended values for evaluating high-end contact with soil by workers in industrial settings (USEPA 2001).

Exposure Frequency

The total number of days of occasional maintenance or construction that involves contact with rooftop or sewer sediments is assumed to be 20 days per year. This exposure frequency is expected to be conservative for the amount of time these workers would

actually be contacting these sediments (as opposed to the total time for maintenance or construction, which typically includes time not associated with sediment contact). This exposure frequency is also comparable to the assumed frequency used in the MDEQ Part 201 Generic Groundwater Contact criteria.

Exposure Duration

The duration of 25 years is USEPA's recommended value for evaluating reasonable maximum exposure (RME) of workers in industrial settings (USEPA 1991).

Body Weight

The body weight of 70 kg is the standard USEPA-recommended value for assessing exposure of adults (USEPA 1989).

Averaging Time

The averaging time for evaluating cancer risk is equal to a lifetime of 70 years, and the averaging time for evaluating noncnancer risk is equal to the exposure duration (USEPA 1989).

3.0 Toxicity Values

The toxicity values (i.e., slope factor and reference dose) used in the calculation of risk-based criteria (RBC) are shown in the accompanying tables. They are compiled following USEPA's hierarchy of sources (USEPA 2003), as follows:

1. Integrated Risk Information System (IRIS)
2. Provisional Peer Reviewed Toxicity Values for Superfund (PPRTV)
3. Other (i.e, additional USEPA (e.g., HEAST) and non-EPA sources of toxicity information)

Toxicity values from IRIS were current as of September, 2005. The specific source of each toxicity value is noted on the accompanying tables.

4.0 Risk-Based Criteria

The RBC for the ingestion and dermal routes of exposure are calculated as follows:

$$RBC = \frac{TR}{LADD^* \cdot SF}$$

$$RBC = \frac{THQ \cdot RfD}{ADD^*}$$

The *TR* (target risk) and *THQ* (target hazard quotient) are 10^{-5} and 1, respectively. The *LADD** (normalized lifetime averaged daily dose) and *ADD** (normalized averaged daily dose) are calculated using the exposure factors for sewer and rooftop sediment contact discussed in Section 2.0.

The risk-based criteria for each route of exposure are then combined to give cancer and noncancer criteria that are based on the combination of both routes, as follows:

$$RBC = \left(\sum_i RBC_i^{-1} \right)^{-1}$$

The risk-based criteria are shown in the accompanying tables.

5.0 References

Michigan Department of Environmental Quality (MDEQ). 2004. Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as Amended. Generic Cleanup Criteria and Screening Levels. December.

U. S. Environmental Protection Agency (USEPA). 1989. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual. Washington, DC. EPA/540-1-89-002. OSWER Directive 9285.7-01a. December.

U. S. Environmental Protection Agency (USEPA). 1991. Human health evaluation manual, supplemental guidance: "Standard default exposure factors." Memorandum from T. Fields, Jr., Office of Emergency Remedial Response, to B. Diamond, Office of Waste Programs Enforcement. OSWER Directive 9285.6-03. March 25.

U. S. Environmental Protection Agency (USEPA). 2001. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Interim. Review Draft-For Public Comment. Washington, DC. EPA/540/R/99/005. OSWER Directive 9285.7-02EP. September.

U. S. Environmental Protection Agency (USEPA). 2003. Human Health Toxicity Value in Superfund Risk Assessment. Memorandum from Michael B. Cook to Regional Directors. OSWER Directive 9285.7-53. December 5.

Appendix D: High-End Exposure Factors For Sewer Construction/Maintenance Workers GMC Pontiac North Campus, Pontiac, Michigan			
Exposure Factors		**Sewer Construction Maintenance Worker**	
Soil Ingestion			
Ingestion Rate (mg/d)	IR	50	c
Conversion Factor (kg/mg)	CF	1E-06	
Fraction Contacted (unitless)	FC	1.0	
Exposure Frequency (d/yr)	EF	20	c
Exposure Duration (yr)	ED	25	c
Body Weight (kg-bw)	BW	70	a
Averaging Time, carc (d)	AT_c	25,550	a
Averaging Time, noncarc (d)	AT_{nc}	9,125	a
Soil Dermal Contact			
Adherence Factor (mg/cm^2)	AD	0.2	b
Skin Surface Area (cm^2/d)	SA	3,300	b
Conversion Factor (kg/mg)	CF	1E-06	
Fraction Contacted (unitless)	FC	1.0	
Exposure Frequency (d/yr)	EF	20	c
Exposure Duration (yr)	ED	25	c
Body Weight (kg-bw)	BW	70	a
Averaging Time, carc (d)	AT_c	25,550	a
Averaging Time, noncarc (d)	AT_{nc}	9,125	a
References:			
a. RAGS, Volume 1: Human Health Evaluation Manual, Part A (EPA 1989).			
b. RAGS, Volume 1: Human Health Evaluation Manual: Part E (EPA 2001).			
c. Based on professional judgment and site-specific considerations discussed in text.			

Appendix D: Toxicity Values
GMC Pontiac North Campus, Pontiac, Michigan

Chem Group	Chemical	CASRN	Cancer Classification			SF_{oral} (mg/kg/d)$^{-1}$			SF_{dermal} (mg/kg/d)$^{-1}$			RfD_{oral} (mg/kg/d)				RfD_{dermal} (mg/kg/d)			RfC (mg/m^3)				$SRfD_{oral}$ (mg/kg/d)				$SRfD_{dermal}$ (mg/kg/d)				SRfC (mg/m^3)			
			Group	Ref	Note	Value	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes
VOC	Acetone	67-64-1	ID	1								9.0E-01	1,000	1		9.0E-01	125	104	3.2E+00	1,000	1	4, 44	1.0E+00	100	2		1.0E+00	100	125	104	3.5E+00	100	2	4, 44
VOC	Benzene	71-43-2	A	1		5.5E-02	1	68	5.5E-02	125	104	4.0E-03	300	1		4.0E-03	125	104	3.0E-02	300	1		4.0E-03	300	1	62	4.0E-03	300	125	104	6.0E-02	100	94	50,69
VOC	Bromobenzene	108-86-1										2.0E-02		3		2.0E-02	125	104	1.1E-02		3	44	2.0E-02		3	62	2.0E-02		125	104	1.1E-02		3	44, 62
VOC	Bromochloromethane	74-97-5																																
VOC	Bromodichloromethane	75-27-4	B2	1		6.2E-02	1		6.2E-02	125	104	2.0E-02	1,000	1		2.0E-02	125	104	7.0E-02	1,000	1	4, 44	2.0E-02	1,000	2	2	2.0E-02	1000	125	104	7.0E-02	1,000	2	2, 4, 44
VOC	Bromoform	75-25-2	B2	1		7.9E-03	1		7.9E-03	125	104	2.0E-02	1,000	1		2.0E-02	125	104			2	90	2.0E-01	100	2		2.0E-01	100	125	104			2	90, 62
VOC	Bromomethane	74-83-9	D	1								1.4E-03	1,000	1		1.4E-03	125	104	5.0E-03	100	1		5.0E-03	300	25		5.0E-03	300	125	104	2.0E-01	30	24	
VOC	2-Butanone	78-93-3	ID	1								6.0E-01	1,000	1		6.0E-01	125	104	5.0E+00	300	1		2.0E+00	1,000	2		2.0E+00	1000	125	104	5.0E+00	300	1	62
VOC	n-Butylbenzene	104-51-8										4.0E-02		4		4.0E-02	125	104	1.4E-01		4	4, 44	4.0E-02		4	62	4.0E-02		125	104	1.4E-01		4	62, 4, 44
VOC	sec-Butylbenzene	135-98-8																																
VOC	tert-Butylbenzene	98-06-6										4.0E-02		4		4.0E-02	125	104	1.4E-01		4	4, 44	4.0E-02		4	62	4.0E-02		125	104	1.4E-01		4	62, 4, 44
VOC	Carbon Disulfide	75-15-0										1.0E-01	100	1		1.0E-01	125	104	7.0E-01	30	1		1.0E-01	100	2	2	1.0E-01	100	125	104	7.0E-01	30	2	2
VOC	Carbon Tetrachloride	56-23-5	B2	1		1.3E-01	1		1.3E-01	125	104	7.0E-04	1,000	1		7.0E-04	125	104					7.0E-03	100	78		7.0E-03	100	125	104	2.0E-02	300	79	
VOC	Chlorobenzene	108-90-7	D	1								2.0E-02	1,000	1		2.0E-02	125	104	6.0E-02	1,000	103		2.0E-02	1,000	1	62	2.0E-02	1000	125	104	6.0E-02	1,000	103	62
VOC	Chloroethane	75-00-3				2.9E-03	3		2.9E-03	125	104	4.0E-01		3		4.0E-01	125	104	1.0E+01	300	1		4.0E-01		3	62	4.0E-01		125	104	1.0E+01	300	2	2
VOC	Chloroform	67-66-3	B2	1								1.0E-02	1,000	1		1.0E-02	125	104	5.0E-02	100	117		1.0E-02	1,000	2	2	1.0E-02	1000	125	104	5.0E-02	100	117	
VOC	Chloromethane	74-87-3	D	1															9.0E-02	1,000	1										9.0E-02	1,000	1	62
VOC	2-Chlorotoluene	95-49-8																																
VOC	Cumene	98-82-8	D	1								1.0E-01	1,000	1		1.0E-01	125	104	4.0E-01	1,000	1		4.0E-01	300	2		4.0E-01	300	125	104	4.0E-01	1,000	1	62
VOC	Cyclohexane	110-82-7	ID	1															6.0E+00	300	1										6.0E+00	300	1	62
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	2		1.4E+00	2		1.4E+00	125	104								2.0E-04	1,000	1										2.0E-04	1,000	1	62
VOC	Dibromochloromethane	124-48-1	C	1		8.4E-02	1		8.4E-02	125	104	2.0E-02	1,000	1		2.0E-02	125	104	7.0E-02	1,000	1	4, 44	2.0E-01	100	2		2.0E-01	100	125	104	7.0E-01	100	2	4, 44
VOC	1,2-Dibromoethane	106-93-4	LC	1		2.0E+00	1		2.0E+00	125	104	9.0E-03	3,000	1		9.0E-03	125	104	9.0E-03	300	1		9.0E-03	3,000	1	62	9.0E-03	3000	125	104	9.0E-03	300	1	62
VOC	1,2-Dichlorobenzene	95-50-1	D	1								9.0E-02	1,000	1		9.0E-02	125	104	2.0E-01	1,000	2	3	9.0E-02	1,000	1	62	9.0E-02	1000	125	104	2.0E+00	100	2	3
VOC	1,3-Dichlorobenzene	541-73-1	D	1								9.0E-02	1,000	1	10	9.0E-02	125	104	1.4E-01	1,000	2	3, 10, 44	9.0E-02	1,000	1	10, 62	9.0E-02	1000	125	104	1.4E-01	1,000	2	3, 10, 44, 62
VOC	1,4-Dichlorobenzene	106-46-7	C	2		2.4E-02	2	6	2.4E-02	125	104	3.0E-02		3		3.0E-02	125	104	8.0E-01	100	1		3.0E-02		3	62	3.0E-02		125	104	2.5E+00	30	2	
VOC	Dichlorodifluoromethane	75-71-8										2.0E-01	100	1		2.0E-01	125	104	2.0E-01	10,000	2		9.0E-01	100	2		9.0E-01	100	125	104	2.0E+00	1,000	2	
VOC	1,1-Dichloroethane	75-34-3	C	1								2.0E-01		3		2.0E-01	125	104	5.0E-01	1,000	2	3	1.0E+00	100	2	26	1.0E+00	100	125	104	5.0E+00	100	2	3
VOC	1,2-Dichloroethane	107-06-2	B2	1		9.1E-02	1		9.1E-02	125	104	2.0E-02		3		2.0E-02	125	104	5.0E-03	3,000	102	92	2.0E-02		3	62	2.0E-02		125	104	5.0E-03	3,000	102	92, 62
VOC	1,1-Dichloroethene	75-35-4	C	1								5.0E-02	100	1		5.0E-02	125	104	2.0E-01	30	1		5.0E-02	100	1	62	5.0E-02	100	125	104	2.0E-01	30	1	62
VOC	cis-1,2-Dichloroethene	156-59-2	D	1								1.0E-02	3,000	126		1.0E-02	125	104	3.5E-02	3,000	126	4, 44	1.0E-01	300	126		1.0E-01	300	125	104	3.5E-01	300	126	4, 44
VOC	trans-1,2-Dichloroethene	156-60-5										2.0E-02	1,000	1		2.0E-02	125	104	6.0E-02		3	44	2.0E-01	100	2		2.0E-01	100	125	104	6.0E-02		3	44, 62
VOC	1,2-Dichloropropane	78-87-5	B2	2		6.8E-02	2	6	6.8E-02	125	104								4.0E-03	300	1										1.3E-02	100	2	
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1		1.0E-01	1	77	1.0E-01	125	104	3.0E-02	100	1		3.0E-02	125	104	2.0E-02	30	1		3.0E-02	100	1	62	3.0E-02	100	125	104	2.0E-02	30	2	2
VOC	Ethyl Benzene	100-41-4	D	1								1.0E-01	1,000	1		1.0E-01	125	104	1.0E+00	300	1		1.0E-01	1,000	126		1.0E-01	1000	125	104	1.0E+00	300	126	
VOC	2-Hexanone	591-78-6										4.0E-02	10,000	40		4.0E-02	125	104	5.0E-03	10,000	108		4.0E-02	10,000	40	62	4.0E-02	10000	125	104	5.0E-03	10,000	108	62
VOC	Methyl Acetate	79-20-9										1.0E+00	1,000	2		1.0E+00	125	104	3.5E+00	1,000	2	4, 44	1.0E+01	100	2		1.0E+01	100	125	104	3.5E+01	100	2	4, 44
VOC	Methyl tert-butyl ether	1634-04-4																	3.0E+00	100	1										3.0E+00	100	1	62
VOC	4-Methyl-2-pentanone	108-10-1	ID	1										1	90		125	104	3.0E+00	300	1				1	90, 62			125	104	3.0E+00	300	1	62
VOC	Methylcyclohexane	108-87-2																	3.0E+00	100	2										3.0E+00	100	2	
VOC	Methylene Chloride	75-09-2	B2	1		7.5E-03	1		7.5E-03	125	104	6.0E-02	100	1		6.0E-02	125	104	3.0E+00	100	2		6.0E-02	100	2	2	6.0E-02	100	125	104	3.0E+00	100	2	
VOC	Styrene	100-42-5										2.0E-01	1,000	1	6	2.0E-01	125	104	1.0E+00	30	1		2.0E-01	1,000	1	6, 62	2.0E-01	1000	125	104	3.0E+00	10	2	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	1		2.0E-01	1		2.0E-01	125	104	6.0E-02	300	101		6.0E-02	125	104			88	90	6.0E-02	300	101	62	6.0E-02	300	125	104			88	90, 62
VOC	Tetrachloroethene	127-18-4	C-B2	77		5.2E-02	77		5.2E-02	125	104	1.0E-02	1,000	1		1.0E-02	125	104	4.0E-01	300	109	94	1.0E-01	100	2		1.0E-01	100	125	104	4.0E-01	300	109	94, 62
VOC	Toluene	108-88-3	D	1								2.0E-01	1,000	1		2.0E-01	125	104	4.0E-01	300	1		2.0E+00	100	2		2.0E+00	100	125	104	1.0E+00	300	27	
VOC	1,2,4-Trichlorobenzene	120-82-1	D	1								1.0E-02	1,000	1		1.0E-02	125	104	2.0E-01	1,000	2		1.0E-02	1,000	2		1.0E-02	1000	125	104	2.0E+00	100	2	
VOC	1,1,1-Trichloroethane	71-55-6	D	1								2.8E-01		3		2.8E-01	125	104	2.2E+00	90	126		2.8E-01		3	62	2.8E-01		125	104	2.2E+01	90	126	
VOC	1,1,2-Trichloroethane	79-00-5	C	1		5.7E-02	1		5.7E-02	125	104	4.0E-03	1,000	1		4.0E-03	125	104					4.0E-02	100	2		4.0E-02	100	125	104				
VOC	Trichloroethene	79-01-6	C-B2	49	18	1.1E-02	49		1.1E-02	125	104	6.0E-03	3,000	46	6, 97	6.0E-03	125	104					6.0E-03	3,000	46	6, 97, 62	6.0E-03	3000	125	104				
VOC	Trichlorofluoromethane	75-69-4										3.0E-01	1,000	1		3.0E-01	125	104	7.0E-01	10,000	2	3	7.0E-01	1,000	2	93	7.0E-01	1000	125	104	7.0E+00	1,000	2	3
VOC	1,2,3-Trichloropropane	96-18-4	B2	98		2.0E+00	98		2.0E+00	125	104	6.0E-03	1,000	1		6.0E-03	125	104	5.0E-03	300	97		6.0E-02	100	2		6.0E-02	100	125	104	5.0E-03	300	97	62
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1										3.0E+01	10	1		3.0E+01	125	104	3.0E+01	100	2		3.0E+01	10	1	62	3.0E+01	10	125	104	3.0E+01	100	2	
VOC	1,2,4-Trimethylbenzene	95-63-6	ID	126								5.0E-02	3,000	126		5.0E-02	125	104	6.0E-03	3,000	126		5.0E-01	300	126	109	5.0E-01		125	104	6.0E-02	300	126	109
VOC	1,3,5-Trimethylbenzene	108-67-8	ID	126								5.0E-02	3,000	126		5.0E-02	125	104	6.0E-03	3,000	126		5.0E-01	300	126		5.0E-01		125	104	6.0E-02	300	126	
VOC	Vinyl Acetate	108-05-4										1.0E+00	100	2		1.0E+00	125	104	2.0E-01	30	1		1.0E+00	100	2		1.0E+00	100	125	104	2.0E-01	30	2	2
VOC	Vinyl Chloride	75-01-4	A	1		1.4E+00	1	78	1.4E+00	125	104	3.0E-03	30	1		3.0E-03	125	104	1.0E-01	30	1		3.0E-03	30	1	62	3.0E-03	30	125	104	1.0E-01	30	1	62
VOC	Xylenes (total)	1330-20-7	ID	1								2.0E-01	1,000	1		2.0E-01	125	104	1.0E-01	300	1		4.0E-01	1,000	64		4.0E-01	1000	125	104	1.0E-01	300	1	62
SVOC	Acenaphthene	83-32-9										6.0E-02	3,000	1		6.0E-02	125	104	2.1E-01	3,000	1	4, 44	6.0E-01	300	2		6.0E-01	300	125	104	2.1E+00	300	2	4, 44
SVOC	Acenaphthylene	208-96-8	D	1								3.0E-02	3,000	1	20	3.0E-02	125	104	1.1E-01	3,000	1	20, 4, 44	3.0E-01	300	2	20	3.0E-01	300	125	104	1.1E+00	300	2	20, 4, 44
SVOC	Acetophenone	98-86-2	D	1								1.0E-01	3,000	1		1.0E-01	125	104	3.5E-01	3,000	1	4, 44	1.0E+00	300	2		1.0E+00	300	125	104	3.5E+00	300	2	4, 44
SVOC	Anthracene	120-12-7	D	1								3.0E-01	3,000	1		3.0E-01	125	104			2	90	3.0E+00	300	2		3.0E+00	300	125	104			2	90, 62
SVOC	Atrazine	1912-24-9	C	2		2.2E-01	2		2.2E-01	125	104	3.5E-02	100	1		3.5E-02	125	104	1.2E-01	100	1	4, 44	3.5E-02	100	1	62	3.5E-02	100	125	104	1.2E-01	100	1	62, 4, 44
SVOC	Benzaldehyde	100-52-7										1.0E-01	1,000	1		1.0E-01	125	104	3.5E-01	1,000	1	4, 44	1.0E-01	1,000	1	62	1.0E-01	1000	125	104	3.5E-01	1,000	1	62, 4, 44
SVOC	Benzo(a)anthracene	56-55-3	B2	1		7.3E-01	10	5	7.3E-01	125	104																								
SVOC	Benzo(a)pyrene	50-32-8	B2	1		7.3E+00	1		7.3E+00	125	104																								
SVOC	Benzo(b)fluoranthene	205-99-2	B2	1		7.3E-01	10	5	7.3E-01	125	104																								
SVOC	Benzo(g,h,i)perylene	191-24-2	D	1								3.0E-02	3,000	1	20	3.0E-02	125	104	1.1E-01	3,000	1	20, 4, 44	3.0E-01	300	2	20	3.0E-01	300	125	104	1.1E+00	300	2	20, 4, 44
SVOC	Benzo(k)fluoranthene	207-08-9	B2	1		7.3E-02	10	5	7.3E-02	125	104																								
SVOC	Benzoic Acid	65-85-0	D	1								4.0E+00	1	1		4.0E+00	125	104	1.4E+01	1	1	4, 44	4.0E+00	1	2	2	4.0E+00	1	125	104	1.4E+01	1	2	2, 4, 44
SVOC	Benzyl Alcohol	100-51-6										3.0E-01	1,000	2		3.0E-01	125	104	1.1E+00	1,000	2	4, 44	1.0E+00	100	2		1.0E+00	100	125	104	3.5E+00	100	2	4, 44
SVOC	Biphenyl	92-52-4	D	1								5.0E-02	1,000	1		5.0E-02	125	104	1.8E-01	1,000	1	4, 44	5.0E-02	1,000	1	62	5.0E-02	1000	125	104	1.8E-01	1,000	1	62, 4, 44
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D	1																														
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1		1.1E+00	1		1.1E+00	125	104																								

Appendix D: Toxicity Values
GMC Pontiac North Campus, Pontiac, Michigan

Chem Group	Chemical	CASRN	Cancer Classification			SF_{oral} $(mg/kg/d)^{-1}$			SF_{dermal} $(mg/kg/d)^{-1}$			RfD_{oral} (mg/kg/d)				RfD_{dermal} (mg/kg/d)			RfC (mg/m^3)				$SRfD_{oral}$ (mg/kg/d)				$SRfD_{dermal}$ (mg/kg/d)				SRfC (mg/m^3)			
			Group	Ref	Note	Value	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1		1.4E-02	1		1.4E-02	125	104	2.0E-02	1,000	1		2.0E-02	125	104	7.0E-02	1,000	1	4, 44	2.0E-02	1,000	1	62	2.0E-02	1000	125	104	2.0E-01	100	16	
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D	1																													
SVOC	Butylbenzylphthalate	85-68-7	C	1		1.9E-03	3		1.9E-03	125	104	2.0E-01	1,000	1		2.0E-01	125	104	7.0E-01	1,000	1	4, 44	2.0E+00	100	2		2.0E+00	100	125	104	7.0E+00	100	2	4, 44
SVOC	Caprolactam	105-60-2										5.0E-01	100	1		5.0E-01	125	104	1.8E+00	100	1	4, 44	5.0E-01	100	2		5.0E-01	100	125	104	1.8E+00	100	2	4, 44
SVOC	Carbazole	86-74-8	B2	2		2.0E-02	2		2.0E-02	125	104																							
SVOC	4-Chloro-3-methylphenol	59-50-7																					2.0E+00	100	2		2.0E+00	100	125	104	7.0E+00	100	2	4, 44
SVOC	4-Chloroaniline	106-47-8				5.4E-02	3		5.4E-02	125	104	4.0E-03	3,000	1		4.0E-03	125	104	1.4E-02	3,000	1	4, 44	4.0E-03	3,000	2	2	4.0E-03	3000	125	104	1.4E-02	3,000	2	2, 4, 44
SVOC	2-Chloronaphthalene	91-58-7										8.0E-02	3,000	1		8.0E-02	125	104	2.8E-01	3,000	1	4, 44	8.0E-02	3,000	1	62	8.0E-02	3000	125	104	2.8E-01	3,000	1	62, 4, 44
SVOC	2-Chlorophenol	95-57-8										5.0E-03	1,000	1		5.0E-03	125	104	1.8E-02	1,000	1	4, 44	5.0E-02	100	2		5.0E-02	100	125	104	1.8E-01	100	2	4, 44
SVOC	4-Chlorophenol	106-48-9																															
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3																															
SVOC	Chrysene	218-01-9	B2	1		7.3E-03	10	5	7.3E-03	125	104																							
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	1		7.3E+00	10	5	7.3E+00	125	104																							
SVOC	Dibenzofuran	132-64-9	D	1								2.0E-03		3		2.0E-03	125	104	7.0E-03		3	4, 44	2.0E-03		3	62	2.0E-03		125	104	7.0E-03		3	62, 4, 44
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	1		4.5E-01	1		4.5E-01	125	104																							
SVOC	2,4-Dichlorophenol	120-83-2										3.0E-03	100	1		3.0E-03	125	104	1.1E-02	100	1	4, 44	3.0E-03	100	2	2	3.0E-03	100	125	104	1.1E-02	100	2	2, 4, 44
SVOC	Diethylphthalate	84-66-2	D	1								8.0E-01	1,000	1		8.0E-01	125	104	2.8E+00	1,000	1	4, 44	8.0E+00	100	2		8.0E+00	100	125	104	2.8E+01	100	2	4, 44
SVOC	2,4-Dimethylphenol	105-67-9										2.0E-02	3,000	1		2.0E-02	125	104	7.0E-02	3,000	1	4, 44	2.0E-01	300	2		2.0E-01	300	125	104	7.0E-01	300	2	4, 44
SVOC	Dimethylphthalate	131-11-3	D	1									100	2	90		125	104			2	90	1.0E+01	100	2		1.0E+01	100	125	104			2	90, 62
SVOC	Di-n-butylphthalate	84-74-2	D	1								1.0E-01	1,000	1	6	1.0E-01	125	104			1	90	1.0E+00	100	2		1.0E+00	100	125	104			1	90, 62
SVOC	4,6-Dinitro-2-methylphenol	534-52-1										1.0E-04		3		1.0E-04	125	104	3.5E-04		3	4, 44	1.0E-04		3	62	1.0E-04		125	104	3.5E-04		3	62, 4, 44
SVOC	2,4-Dinitrophenol	51-28-5										2.0E-03	1,000	1		2.0E-03	125	104			2	90	2.0E-03	1,000	2	2	2.0E-03	1000	125	104			2	90, 62
SVOC	2,4-Dinitrotoluene	121-14-2	B2	1	28	6.8E-01	1	28	6.8E-01	125	104	2.0E-03	100	1		2.0E-03	125	104			2	90	2.0E-03	100	2	2	2.0E-03	100	125	104			2	90, 62
SVOC	2,6-Dinitrotoluene	606-20-2	B2	1	28	6.8E-01	1	28	6.8E-01	125	104	1.0E-03		3		1.0E-03	125	104	3.5E-03		3	4, 44	1.0E-02	300	2		1.0E-02	300	125	104	3.5E-02	300	2	4, 44
SVOC	Di-n-octylphthalate	117-84-0										4.0E-02	1,000	126		4.0E-02	125	104			126	90	4.0E-01	100	126		4.0E-01	100	125	104			126	90
SVOC	Fluoranthene	206-44-0	D	1								4.0E-02	3,000	1		4.0E-02	125	104	1.4E-01	3,000	1	4, 44	4.0E-01	300	2		4.0E-01	300	125	104	1.4E+00	300	2	4, 44
SVOC	Fluorene	86-73-7	D	1								4.0E-02	3,000	1		4.0E-02	125	104	1.4E-01	3,000	1	4, 44	4.0E-01	300	2		4.0E-01	300	125	104	1.4E+00	300	2	4, 44
SVOC	Hexachlorobenzene	118-74-1	B2	1		1.6E+00	1		1.6E+00	125	104	8.0E-04	100	1		8.0E-04	125	104			1	90	8.0E-04	100	1	62	8.0E-04	100	125	104			1	90, 62
SVOC	Hexachlorobutadiene	87-68-3	C	1		7.8E-02	1		7.8E-02	125	104	3.0E-04		4		3.0E-04	125	104					7.0E-04	300	26		7.0E-04	300	125	104				
SVOC	Hexachlorocyclopentadiene	77-47-4	E	1								6.0E-03	1,000	1		6.0E-03	125	104	2.0E-04	100	1		7.0E-02	100	2		7.0E-02	100	125	104	7.0E-04	100	2	
SVOC	Hexachloroethane	67-72-1	C	1		1.4E-02	1		1.4E-02	125	104	1.0E-03	1,000	1		1.0E-03	125	104					1.0E-02	100	2		1.0E-02	100	125	104				
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	1		7.3E-01	10	5	7.3E-01	125	104																							
SVOC	Isophorone	78-59-1	C	1		9.5E-04	1		9.5E-04	125	104	2.0E-01	1,000	1		2.0E-01	125	104			2	90	2.0E+00	100	2		2.0E+00	100	125	104			2	90, 62
SVOC	2-Methylnaphthalene	91-57-6	ID	1								4.0E-03	1,000	1		4.0E-03	125	104	3.0E-03	3,000	1	61	4.0E-03	1,000	1	62	4.0E-03	1000	125	104	3.0E-03	3,000	1	61, 62
SVOC	Methylphenol (total)	1319-77-3										5.0E-02		1	99	5.0E-02	125	104	1.8E-01		1	99, 4, 44	5.0E-02		1	99, 62	5.0E-02		125	104	1.8E-01		1	99, 62, 4, 44
SVOC	Naphthalene	91-20-3	C	1								2.0E-02	3,000	1		2.0E-02	125	104	3.0E-03	3,000	1		2.0E-02	3,000	1	62	2.0E-02	3000	125	104	3.0E-03	3,000	1	62
SVOC	2-Nitroaniline	88-74-4										3.0E-03		3		3.0E-03	125	104	2.0E-04	10,000	2		3.0E-03		3	62	3.0E-03		125	104	2.0E-03	1,000	2	
SVOC	3-Nitroaniline	99-09-2	C	112		2.1E-02	112		2.1E-02	125	104	3.0E-04	1,000	110		3.0E-04	125	104	1.0E-03	3,000	111		3.0E-04	1,000	110	62	3.0E-04	1000	125	104	1.0E-03	3,000	111	62
SVOC	4-Nitroaniline	100-01-6	C	115		2.1E-02	115		2.1E-02	125	104	3.0E-03	100	113		3.0E-03	125	104	4.0E-03	1,000	114		3.0E-03	100	113	62	3.0E-03	100	125	104	4.0E-03	1,000	114	62
SVOC	Nitrobenzene	98-95-3	D	1								5.0E-04	10,000	1	6	5.0E-04	125	104	2.0E-03	10,000	2	3	5.0E-03	1,000	2	26	5.0E-03	1000	125	104	2.0E-02	1,000	2	3
SVOC	2-Nitrophenol	88-75-5																															
SVOC	4-Nitrophenol	100-02-7																															
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	1		4.9E-03	1		4.9E-03	125	104	2.0E-02	3,000	126		2.0E-02	125	104			126	90,98	2.0E-02	3,000	126	62	2.0E-02	3000	125	104			126	90,98
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	1		7.0E+00	1		7.0E+00	125	104																							
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	2		7.0E-02	2		7.0E-02	125	104	4.0E-02		1		4.0E-02	125	104					4.0E-02		2		4.0E-02		125	104				
SVOC	Pentachlorophenol	87-86-5	B2	1		1.2E-01	1		1.2E-01	125	104	3.0E-02	100	1		3.0E-02	125	104	1.1E-01	100	1	4, 44	3.0E-02	100	2		3.0E-02	100	125	104	1.1E-01	100	2	4, 44
SVOC	Phenanthrene	85-01-8	D	1								3.0E-02	3,000	1	20	3.0E-02	125	104	1.1E-01	3,000	1	20, 4, 44	3.0E-01	300	2	20	3.0E-01	300	125	104	1.1E+00	300	2	20, 4, 44
SVOC	Phenol	108-95-2	ID	1								3.0E-01	300	1		3.0E-01	125	104			1	90,98	3.0E-01	300	1	62	3.0E-01	300	125	104			1	90,98, 62
SVOC	Pyrene	129-00-0	D	1								3.0E-02	3,000	1		3.0E-02	125	104	1.1E-01	3,000	1	4, 44	3.0E-01	300	2		3.0E-01	300	125	104	1.1E+00	300	2	4, 44
SVOC	2,4,5-Trichlorophenol	95-95-4										1.0E-01	1,000	1		1.0E-01	125	104			2	90	1.0E+00	100	2		1.0E+00	100	125	104			2	90, 62
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1		1.1E-02	1		1.1E-02	125	104	1.0E-04		4		1.0E-04	125	104			2	90	1.0E-04		4	62	1.0E-04		125	104			2	90, 62
P/PCB	PCBs (total)	1336-36-3	B2	1		2.0E+00	1	30,32	2.0E+00	125	104	2.0E-05	300	1	72	2.0E-05	125	104					5.0E-05	100	2	72	5.0E-05	100	125	104				
INORG	Antimony	7440-36-0										4.0E-04	1,000	1		6.0E-05	125	104	1.4E-03	1,000	1	4, 44	4.0E-04	1,000	1	62	6.0E-05	1000	125	104	1.4E-03	1,000	1	62, 4, 44
INORG	Arsenic	7440-38-2	A	1		1.5E+00	1		1.5E+00	125	104	3.0E-04	3	1		3.0E-04	125	104					5.0E-03	10	100		5.0E-03	10	125	104				
INORG	Barium	7440-39-3	D	1								7.0E-02	3	1		4.9E-03	125	104			1	90	7.0E-02	3	2	2	4.9E-03	3	125	104			1	90, 62
INORG	Beryllium	7440-41-7	B1	1								2.0E-03	300	1		1.4E-05	125	104	2.0E-05	10	1		2.0E-03	300	1	62	1.4E-05	300	125	104	2.0E-05	10	1	62
INORG	Cadmium	7440-43-9	B1	1								1.0E-03	10	1	95	2.5E-05	125	104	2.0E-04		3	44	1.0E-03	10	1	95, 62	2.5E-05	10	125	104	9.0E-04		122	102
INORG	Chromium (total)	7440-47-3										3.0E-03	900	1	8	7.5E-05	125	104	1.0E-04	300	1	59, 8	2.0E-02	100	2	8	5.0E-04	100	125	104	1.0E-04	300	1	59, 8, 62
INORG	Cobalt	7440-48-4	B1	126								2.0E-02	10	126		2.0E-02	125	104	2.0E-05	100	126		2.0E-02	10	126	62	2.0E-02	10	125	104	2.0E-05	100	126	62
INORG	Copper	7440-50-8	D	1								4.0E-02	2	50	49	4.0E-02	125	104	1.4E-01	2	50	49, 4, 44	4.0E-02	2	50	49, 62	4.0E-02	2	125	104	1.4E-01	2	50	49, 62, 4, 44
INORG	Cyanide (total)	57-12-5	D	1								2.0E-02	500	1		2.0E-02	125	104	7.0E-02	500	1	4, 44	2.0E-02	500	2	2	2.0E-02	500	125	104	7.0E-02	500	2	2, 4, 44
INORG	Lead	7439-92-1	B2	1																													
INORG	Manganese	7439-96-5	D	1								1.4E-01	1	1		8.4E-03	125	104	5.0E-05	1,000	1		1.4E-01	1	1	62	8.4E-03	1	125	104	5.0E-05	1,000	1	62
INORG	Mercury	7439-97-6	D	1								3.0E-04	1,000	1	51	3.0E-04	125	104	3.0E-04	30	1		3.0E-04	1,000	2		3.0E-04	1000	125	104	3.0E-04	30	2	
INORG	Nickel	7440-02-0	A	1								2.0E-02	300	1		8.0E-04	125	104					2.0E-02	300	2	2	8.0E-04	300	125	104				
INORG	Selenium	7782-49-2	D	1								5.0E-03	3	1		5.0E-03	125	104	1.8E-02	3	1	4, 44	5.0E-03	3	2	2	5.0E-03	3	125	104	1.8E-02	3	2	2, 4, 44
INORG	Silver	7440-22-4	D	1								5.0E-03	3	1		2.0E-04	125	104	1.0E-05	1,000	83		5.0E-03	3	2	2	2.0E-04	3	125	104	1.0E-05	1,000	83	62
INORG	Thallium	7440-28-0										7.0E-05	3,000	52	49	7.0E-05	125	104	2.5E-04	3,000	52	49, 4, 44	7.0E-05	3,000	52	49, 62	7.0E-05	3000	125	104	2.5E-04	3,000	52	49, 62, 4, 44
INORG	Vanadium	7440-62-2										1.0E-03		3		2.6E-05	125	104	3.5E-03		3	4, 44	7.0E-03	100	2		1.8E-04	100	125	104	2.5E-02	100	2	4, 44
INORG	Zinc	7440-66-6	D	1								3.0E-01	3	1		3.0E-01	125	104	1.1E+00	3	1	4, 44	3.0E-01	3	2	2	3.0E-01	3	125	104	1.1E+00	3	2	2, 4, 44

Appendix D: References and Notes for Toxicity Values
GMC Pontiac North Campus, Pontiac, Michigan

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Appendix D: References and Notes for Toxicity Values
GMC Pontiac North Campus, Pontiac, Michigan

Notes:	
2	USEPA adopted chronic value as subchronic value.
3	HEAST Alternate Method.
4	ENVIRON obtained value by route-to-route extrapolation.
5	Based on analogy to Benzo(a)pyrene [CASRN 50-32-8] using USEPA relative potency described in the indicated reference.
6	Under review, according to IRIS.
8	ENVIRON used Chromium VI [CASRN 18540-29-9] value from IRIS (reference 1) as a surrogate.
10	ENVIRON used 1,2-Dichlorobenzene [CASRN 95-50-1] value from the indicated reference as a surrogate.
18	Not verifiable, according to IRIS.
20	ENVIRON used Pyrene [CASRN 129-00-0] value from IRIS (reference 1) as a surrogate.
26	USEPA obtained value by route-to-route extrapolation.
28	USEPA used 2,4-,2,6-Dinitrotolunene mixture value from IRIS (reference 1) as a surrogate.
30	Upper-bound slope factor.
32	High risk & persistence tier for: food chain exposure; sediment/soil ingestion; dust/aerosol inhalation; dermal exposure, if an absorption factor is applied; presence of dioxin-like, tumor-promoting/persistent congeners; and all early life exposures.
44	ENVIRON derived inhalation RfC from inhalation RfD value presented in the indicated reference, using standard USEPA methodology presented in HEAST.
45	ENVIRON derived inhalation URF from Inhalation Slope Factor value presented in the indicated reference, using standard USEPA methodology presented in HEAST.
49	ENVIRON derived oral RfD from adverse health effect level value presented in the indicated reference.
50	Personal communication with NCEA indicated the supporting paper had been retired.
51	ENVIRON used Mercuric Chloride [CASRN 7487-94-7] value from the indicated reference as a surrogate.
52	ENVIRON derived inhalation Slope Factor from inhalation URF value presented in the indicated reference, using standard USEPA methodology presented in HEAST.
59	This RfD is for particulates. The RfD for chromic acid mists and dissolved Chromium VI aerosols is 0.000008 mg/m3.
60	IRIS provides a range of 2.2E-6 to 7.8E-6 (ug/m3)-1 as the inhalation URF for Benzene.
61	ENVIRON used Naphthalene [CASRN 91-20-3] value from indicated reference as a surrogate.
62	ENVIRON used chronic value as a surrogate for the subchronic value.
63	ENVIRON derived inhalation RfD from inhalation RfC published in the indicated reference, using standard USEPA methodology presented in HEAST.
68	IRIS provides a range of 1.5E-2 to 5.5E-2 (mg/kg/d)-1 as the oral Slope Factor for Benzene.
69	Personal communication with NCEA indicated the retired paper should be used until a new value is published in IRIS.
72	ENVIRON used Aroclor 1254 [CASRN 11097-69-1] value from the indicated reference as a surrogate for PCBs [CASRN 1336-36-3].
77	IRIS provides an alternate slope factor of 5E-2; however, EPA does not recommend its use, due to the higher uncertainty in the delivered dose in the supporting study.
78	IRIS recommends an oral Slope Factor for Vinyl Chloride of 7.2E-1 (mg/kg/d)-1 to account for continuous lifetime exposure during adulthood; a twofold increase to 1.4 (mg/kg/d)-1 is recommended to account for continuous exposure from birth.
79	IRIS recommends an inhalation URF for Vinyl Chloride of 4.4E-6 (ug/m3)-1 to account for continuous lifetime exposure during adulthood; a twofold increase to 8.8E-6 (ug/m3)-1 is recommended to account for continuous exposure from birth.
90	Inadequate data exist to derive a toxicity value, according to the indicated reference.
92	NCEA directed ENVIRON to use outdated value.
93	Personal communication with NCEA indicated the HEAST LOAEL of 1000 mg and the subchronic RfD of 7E-1mg/kg-day both appear to be incorrect and recommended using the IRIS RfD of 3E-1 as the subchronic RfD.
94	Two provisional RfC values are presented in the indicated reference (4E-1 and 6E-1 mg/m3). Personal communication with NCEA indicated that either RfC is acceptable and the RfC should be chosen on a case-by-case basis.
95	This RfD is for dietary exposure. The RfD for drinking water exposure is 0.0005 mg/kg/day.
97	ENVIRON used withdrawn source.
98	Route-to-route extrapolation is not appropriate, according to the indicated reference.
99	ENVIRON used 3-Methylphenol [CASRN 108-39-4] values from the indicated reference as a surrogate.
102	A dose equivalency factor of 4.5 was applied to the chronic RfC to derive the subchronic RfC.
104	Dermal toxicity value is extrapolated from oral toxicity value in accordance with the referenced EPA guidance.
105	Adjustment for gastrointestinal absorption efficiencies should not be applied according to the indicated reference.
106	This ABSGI is for dietary exposure. The ABSGI for drinking water exposure is 0.050.
109	ENVIRON used 1,3,5-Trimethylbenzene [CASRN 108-67-8] values from the indicated reference as a surrogate.

Appendix D: Physical and Chemical Properties
GMC Pontiac North Campus, Pontiac, Michigan

Chem Group	Chemical	CASRN	MW (g/mole)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			s (mg/L)			VP (mm Hg)			D_{air} (m^2/d)			D_{water} (m^2/d)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
VOC	Acetone	67-64-1	5.81E+01	50		5.81E-01	44	82				1.59E-03	44		1.00E+06	44		2.30E+02	50	92	1.07E+00	44		9.85E-05	44	
VOC	Benzene	71-43-2	7.81E+01	50		5.82E+01	44	111				2.28E-01	44		1.75E+03	44		9.50E+01	50	92	7.60E-01	44		8.47E-05	44	
VOC	Bromobenzene	108-86-1				2.79E+02	1	111				8.53E-02	1		4.50E+02	1		3.30E+00	1							
VOC	Bromochloromethane	74-97-5	1.29E+02	46		1.57E+01	1	49, 111				5.89E-02	1	63	1.70E+04	1		1.16E+02	1		5.94E-01	69		8.64E-05	69	
VOC	Bromodichloromethane	75-27-4	1.64E+02	50		5.51E+01	44	111				6.56E-02	44		6.74E+03	44		5.00E+01	50	92	2.57E-01	44		9.16E-05	44	
VOC	Bromoform	75-25-2	2.53E+02	50		8.70E+01	44	111				2.19E-02	44		3.10E+03	44		5.51E+00	50	92	1.29E-01	44		8.90E-05	44	
VOC	Bromomethane	74-83-9	9.49E+01	50		1.05E+01	44	111				2.56E-01	44		1.52E+04	44		1.62E+03	50	92	6.29E-01	44		1.05E-04	44	
VOC	2-Butanone	78-93-3	7.21E+01	50		2.00E+00	69	111				2.28E-03	50	92	2.75E+05	69		9.53E+01	50	92	6.98E-01	69		8.47E-05	69	
VOC	n-Butylbenzene	104-51-8	1.34E+02	39		2.54E+03	1	111				5.11E-01	1		1.40E+01	1	55	1.00E+00	1							
VOC	sec-Butylbenzene	135-98-8				2.73E+03	1	111				4.66E-01	1		3.20E+02	1	55	1.10E+00	1							
VOC	tert-Butylbenzene	98-06-6				2.15E+03	1	111				4.78E-01	1		2.90E+02	1	55	1.50E+00	1							
VOC	Carbon Disulfide	75-15-0	7.61E+01	50		4.59E+01	44	111				1.24E+00	44		1.19E+03	44		3.59E+02	50	92	8.99E-01	44		8.64E-05	44	
VOC	Carbon Tetrachloride	56-23-5	1.54E+02	50		1.74E+02	44	111				1.25E+00	44		7.93E+02	44		1.15E+02	50	92	6.74E-01	44		7.60E-05	44	
VOC	Chlorobenzene	108-90-7	1.13E+02	50		2.20E+02	44	111				1.52E-01	44		4.72E+02	44		1.20E+01	50	92	6.31E-01	44		7.52E-05	44	
VOC	Chloroethane	75-00-3	6.45E+01	50		1.62E+01	69	111				3.60E-01	50	92	5.68E+03	50	92	1.01E+03	50	92	2.34E+00	69		9.94E-05	69	
VOC	Chloroform	67-66-3	1.19E+02	50		3.97E+01	44	111				1.50E-01	44		7.92E+03	44		1.97E+02	50	92	8.99E-01	44		8.64E-05	44	
VOC	Chloromethane	74-87-3	5.05E+01	50		3.97E+01	69	111				3.60E-01	50	92	5.33E+03	50	92	4.30E+03	50	92	1.09E+00	69		5.62E-05	69	
VOC	2-Chlorotoluene	95-49-8				6.12E+02	1	111								1	66	2.70E+00	1							
VOC	Cumene	98-82-8	1.20E+02	50		7.05E+02	69	111				4.74E+01	50	92	6.13E+01	50	92	4.50E+00	50	92	5.62E-01	69		6.13E-05	69	
VOC	Cyclohexane	110-82-7	8.42E+01	50		6.35E+02	39	111				7.97E+00	50	92	5.50E+01	50	92	9.69E+01	50	92	7.25E-01	69		7.86E-05	69	
VOC	1,2-Dibromo-3-chloropropane	96-12-8	2.36E+02	50		1.45E+02	1	111				6.01E-03	50	92	1.23E+03	50	92	5.80E-01	50	92	6.91E-01	40		6.91E-05	40	
VOC	Dibromochloromethane	124-48-1	2.08E+02	50		6.26E+01	44	111				3.21E-02	44		2.60E+03	44		4.90E+00	50	92	1.69E-01	44		9.07E-05	44	
VOC	1,2-Dibromoethane	106-93-4	1.88E+02	50		2.22E+01	1	111				3.04E-02	50	92	4.18E+03	50	92	1.33E+01	50	92	6.91E-01	40		6.91E-05	40	
VOC	1,2-Dichlorobenzene	95-50-1	1.47E+02	50		6.23E+02	44	111				7.79E-02	44		1.56E+02	44		1.36E+00	50	92	5.96E-01	44		6.83E-05	44	
VOC	1,3-Dichlorobenzene	541-73-1	1.47E+02	50		5.69E+02	69	111				1.27E-01	50	92	1.33E+02	50	93	2.15E+00	50	92	5.98E-01	69		6.79E-05	69	
VOC	1,4-Dichlorobenzene	106-46-7	1.47E+02	50		6.12E+02	44	111				9.96E-02	44		7.38E+01	44		1.00E+00	50	92	5.96E-01	44		6.83E-05	44	
VOC	Dichlorodifluoromethane	75-71-8	1.21E+02	50		6.15E+01	1	111				1.40E+01	50	92	2.80E+02	50	92	4.85E+03	50	92	6.91E-01	40		6.91E-05	40	
VOC	1,1-Dichloroethane	75-34-3	9.90E+01	50		3.13E+01	44	111				2.30E-01	44		5.06E+03	44		2.27E+02	50	92	6.41E-01	44		9.07E-05	44	
VOC	1,2-Dichloroethane	107-06-2	9.90E+01	50		1.75E+01	44	111				4.01E-02	44		8.52E+03	44		7.89E+01	50	92	8.99E-01	44		8.55E-05	44	
VOC	1,1-Dichloroethene	75-35-4	9.69E+01	50		5.82E+01	44	111				1.07E+00	44		2.25E+03	44		6.00E+02	50	92	7.78E-01	44		8.99E-05	44	
VOC	cis-1,2-Dichloroethene	156-59-2	9.69E+01	50		3.56E+01	44	111				1.67E-01	44		3.50E+03	44		2.03E+02	50	92	6.36E-01	44		9.76E-05	44	
VOC	trans-1,2-Dichloroethene	156-60-5	9.69E+01	50		5.22E+01	44	111				3.85E-01	44		6.30E+03	44		3.33E+02	50	92	6.11E-01	44		1.03E-04	44	
VOC	1,2-Dichloropropane	78-87-5	1.13E+02	50		4.35E+01	44	111				1.15E-01	44		2.80E+03	44		5.20E+01	50	92	6.76E-01	44		7.54E-05	44	
VOC	1,3-Dichloropropene (total)	542-75-6	1.11E+02	50		4.59E+01	44	111				7.26E-01	44		2.80E+03	44		3.40E+01	50	92	5.41E-01	44		8.64E-05	44	
VOC	Ethyl Benzene	100-41-4	1.06E+02	50		3.67E+02	44	111				3.23E-01	44		1.69E+02	44		9.60E+00	50	92	6.48E-01	44		6.74E-05	44	
VOC	2-Hexanone	591-78-6	1.00E+02	50		1.48E+01	39	111				7.15E-02	1		1.75E+04	39		1.16E+01	50	92						
VOC	Methyl Acetate	79-20-9	7.41E+01	55		1.66E+00	39	111				3.71E-03	69		2.44E+05	39		2.16E+02	39		8.27E-01	69		9.50E-05	69	
VOC	Methyl tert-butyl ether	1634-04-4	8.82E+01	1		1.15E+01	39	111				2.40E-02	69		5.10E+04	69		2.50E+02	69		7.42E-01	69		8.73E-05	69	
VOC	4-Methyl-2-pentanone	108-10-1	1.00E+02	50		1.05E+01	62	111				5.64E-03	50	92	1.90E+04	39		1.99E+01	50	92	6.48E-01	40		6.74E-05	40	
VOC	Methylcyclohexane	108-87-2	9.82E+01	55		2.66E+02	69	111				1.76E+01	69		1.40E+01	69		4.30E+01	69		6.35E-01	69		7.36E-05	69	
VOC	Methylene Chloride	75-09-2	8.49E+01	50		1.17E+01	44	111				8.98E-02	44		1.30E+04	44		4.33E+02	50	92	8.73E-01	44		1.01E-04	44	
VOC	Styrene	100-42-5	1.04E+02	50		7.77E+02	44	82				1.13E-01	44		3.10E+02	44		6.12E+00	50	92	6.13E-01	44		6.91E-05	44	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	1.68E+02	50		9.35E+01	44	111				1.41E-02	44		2.97E+03	44		4.62E+00	50	92	6.13E-01	44		6.83E-05	44	
VOC	Tetrachloroethene	127-18-4	1.66E+02	50		1.56E+02	44	111				7.54E-01	44		2.00E+02	44		1.86E+01	50	92	6.22E-01	44		7.08E-05	44	
VOC	Toluene	108-88-3	9.21E+01	50		1.80E+02	44	111				2.72E-01	44		5.26E+02	44		2.84E+01	50	92	7.52E-01	44		7.43E-05	44	
VOC	1,2,4-Trichlorobenzene	120-82-1	1.81E+02	50		1.79E+03	44	111				5.82E-02	44		3.00E+02	44		4.31E-01	50	92	2.59E-01	44		7.11E-05	44	
VOC	1,1,1-Trichloroethane	71-55-6	1.33E+02	50		1.10E+02	44	111				7.05E-01	44		1.33E+03	44		1.24E+02	50	92	6.74E-01	44		7.60E-05	44	
VOC	1,1,2-Trichloroethane	79-00-5	1.33E+02	50		5.03E+01	44	111				3.74E-02	44		4.42E+03	44		2.33E+01	50	92	6.74E-01	44		7.60E-05	44	
VOC	Trichloroethene	79-01-6	1.31E+02	50		1.68E+02	44	111				4.22E-01	44		1.10E+03	44		7.35E+01	50	92	6.83E-01	44		7.86E-05	44	
VOC	Trichlorofluoromethane	75-69-4	1.37E+02	50		1.21E+02	69	111				3.96E+00	50	92	1.10E+03	50	92	8.03E+02	50	92	7.52E-01	69		8.38E-05	69	
VOC	1,2,3-Trichloropropane	96-18-4	1.47E+02	50		4.43E+01	39	111				1.67E-02	50	92	1.75E+03	50	92	3.69E+00	50	92	6.13E-01	40		6.83E-05	40	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.87E+02	50		3.71E+02	40	111				1.97E+01	50	92	1.70E+02	50	92	3.32E+02	50	92	6.74E-01	40		7.08E-05	40	
VOC	1,2,4-Trimethylbenzene	95-63-6	1.20E+02	55		8.97E+02	1	111				2.30E-01	1		5.70E+01	1		1.00E+00	1		5.24E-01	69		6.84E-05	69	
VOC	1,3,5-Trimethylbenzene	108-67-8	1.20E+02	39		6.12E+02	1	111				2.40E-01	69		4.82E+01	69		2.48E+00	1		5.20E-01	69		7.49E-05	69	
VOC	Vinyl Acetate	108-05-4	8.61E+01	50		5.22E+00	44	82				2.10E-02	44		2.00E+04	44		9.02E+01	50	92	7.34E-01	44		7.95E-05	44	
VOC	Vinyl Chloride	75-01-4	6.25E+01	50		1.85E+01	44	111				1.11E+00	44		2.76E+03	44		2.98E+03	50	92	9.16E-01	44		1.06E-04	44	113
VOC	Xylenes (total)	1330-20-7	1.06E+02	50		3.86E+02	44	111				2.76E-01	44		1.75E+02	44		7.99E+00	50	92	6.74E-01	44		7.56E-05	44	
SVOC	Acenaphthene	83-32-9	1.54E+02	1		7.14E+03	44	82				6.36E-03	44		4.24E+00	44		2.50E-03	50	92	3.64E-01	44		6.64E-05	44	

Appendix D: Physical and Chemical Properties
GMC Pontiac North Campus, Pontiac, Michigan

Chem Group	Chemical	CASRN	MW (g/mole)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			s (mg/L)			VP (mm Hg)			D_{air} (m^2/d)			D_{water} (m^2/d)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
SVOC	Acenaphthylene	208-96-8	1.52E+02	50		7.47E+03	69	82				4.62E-03	50	92	1.61E+01	50	92	9.12E-04	50	92	3.88E-01	69		6.03E-05	69	
SVOC	Acetophenone	98-86-2	1.20E+02	50		3.58E+01	1	82				4.37E-04	50	92	6.13E+03	50	92	3.97E-01	50	92	6.91E-01	40		6.91E-05	40	
SVOC	Anthracene	120-12-7	1.78E+02	50		2.97E+04	44	82				2.67E-03	44		4.34E-02	44		2.67E-06	50	92	2.80E-01	44		6.69E-05	44	
SVOC	Atrazine	1912-24-9	2.16E+02	50		3.68E+02	69	82				2.50E-07	69		7.00E+01	50	92	3.00E-07	50	92	2.24E-01	69		5.76E-05	69	
SVOC	Benzaldehyde	100-52-7	1.06E+02	39		2.85E+01	39	82				9.73E-04	69		3.00E+03	39		9.00E-01	69		6.23E-01	69		7.84E-05	69	
SVOC	Benzo(a)anthracene	56-55-3	2.28E+02	50		4.01E+05	44	82				1.37E-04	44		9.40E-03	44		1.05E-07	50	92	4.41E-01	44		7.78E-05	44	
SVOC	Benzo(a)pyrene	50-32-8	2.52E+02	50		1.01E+06	44	82				4.63E-05	44		1.62E-03	44		5.49E-09	50	92	3.72E-01	44		7.78E-05	44	
SVOC	Benzo(b)fluoranthene	205-99-2	2.52E+02	50		1.24E+06	44	82				4.55E-03	44		1.50E-03	44		5.00E-07	50	92	1.95E-01	44		4.80E-05	44	
SVOC	Benzo(g,h,i)perylene	191-24-2	2.76E+02	50		1.28E+07	69	82				5.76E-06	50	92	2.60E-04	50	92	1.01E-10	50	92	1.88E-01	69		4.54E-05	69	
SVOC	Benzo(k)fluoranthene	207-08-9	2.52E+02	50		1.24E+06	44	82				3.40E-05	44		8.00E-04	44		2.00E-09	50	92	1.95E-01	44		4.80E-05	44	
SVOC	Benzoic Acid	65-85-0	1.22E+02	50		6.00E-01	44	43				6.31E-05	44		3.50E+03	44		5.16E-03	50	93	4.63E-01	44		6.89E-05	44	
SVOC	Benzyl Alcohol	100-51-6	1.08E+02	50		1.21E+01	69	82				1.59E-05	40		4.00E+04	50	92	6.26E-02	50	92	6.12E-01	69		7.75E-05	69	
SVOC	Biphenyl	92-52-4	1.54E+02	50		1.05E+04	39	82				1.23E-02	50	92	6.03E+00	50	93	9.64E-03	50	92	3.49E-01	69		7.04E-05	69	
SVOC	bis(2-Chloroethoxy)methane	111-91-1	1.73E+02	50		1.73E+01	69	82				6.95E-06	50	92	1.21E+05	50	92	1.40E-04	50	92	3.77E-01	69		7.31E-05	69	
SVOC	bis(2-Chloroethyl) ether	111-44-4	1.43E+02	50		1.55E+01	44	82				7.38E-04	44		1.72E+04	44		1.55E+00	50	92	5.98E-01	44		6.51E-05	44	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	3.91E+02	50		1.50E+07	44	82				4.18E-06	44		3.40E-01	44		6.45E-06	50	94	3.03E-01	44		3.16E-05	44	
SVOC	4-Bromophenyl-phenyl ether	101-55-3	2.49E+02	50		1.61E+04	1	82				4.78E-03	50	92	4.60E+00	50	92	1.50E-03	50	92	2.26E-01	69		5.88E-05	69	
SVOC	Butylbenzylphthalate	85-68-7	3.12E+02	50		5.73E+04	44	82				5.17E-05	44		2.69E+00	44		8.25E-06	50	92	1.50E-01	44		4.17E-05	44	
SVOC	Caprolactam	105-60-2	1.13E+02	39		6.51E-01	39	82				2.06E-07	69		7.72E+05	68		1.60E-03	39		5.98E-01	69		7.77E-05	69	
SVOC	Carbazole	86-74-8	1.67E+02	50		3.38E+03	44	82				6.26E-07	44		7.48E+00	44		5.19E-07	50	90	3.37E-01	44		6.07E-05	44	
SVOC	4-Chloro-3-methylphenol	59-50-7	1.43E+02	50		1.12E+03	1	82				1.63E-05	50	91	3.85E+03	50	94	8.17E-03	50	91	5.24E-01	69		8.22E-05	69	
SVOC	4-Chloroaniline	106-47-8	1.28E+02	50		6.61E+01	44					1.36E-05	44		5.30E+03	44		1.23E-02	50	92	4.17E-01	44		8.73E-05	44	
SVOC	2-Chloronaphthalene	91-58-7	1.63E+02	50		1.12E+04	1	82				1.28E-02	50	92	1.17E+01	50	92	7.98E-03	50	92	4.25E-01	69		7.59E-05	69	
SVOC	2-Chlorophenol	95-57-8	1.29E+02	50		3.88E+02	44	43				1.60E-02	44		2.20E+04	44		2.34E+00	50	92	4.33E-01	44		8.17E-05	44	
SVOC	4-Chlorophenol	106-48-9	1.29E+02	62																						
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3	2.05E+02	50		1.03E+04	1	82				8.99E-03	1	55	1.42E+00	50	90	2.70E-03	1		2.45E-01	69		6.61E-05	69	
SVOC	Chrysene	218-01-9	2.28E+02	50		4.01E+05	44	82				3.88E-03	44		1.60E-03	44		6.23E-09	50	92	2.14E-01	44		5.37E-05	44	
SVOC	Dibenz(a,h)anthracene	53-70-3	2.78E+02	50		3.77E+06	44	82				6.03E-07	44		2.49E-03	44		1.00E-10	50	92	1.75E-01	44		4.48E-05	44	
SVOC	Dibenzofuran	132-64-9	1.68E+02	50		2.07E+04	69	82				5.15E-04	50	92	1.00E+01	50	93	1.80E-04	50	92	2.06E-01	69		5.18E-05	69	
SVOC	3,3'-Dichlorobenzidine	91-94-1	2.53E+02	50		7.21E+02	44	111				1.64E-07	44		3.11E+00	44		3.71E-08	50	92	1.68E-01	44		5.82E-05	44	
SVOC	2,4-Dichlorophenol	120-83-2	1.63E+02	50		1.47E+02	44	43				1.30E-04	44		4.50E+03	44		6.70E-02	50	92	2.99E-01	44		7.58E-05	44	
SVOC	Diethylphthalate	84-66-2	2.22E+02	50		2.87E+02	44	82				1.85E-05	44		1.08E+03	44		1.65E-03	50	92	2.21E-01	44		5.49E-05	44	
SVOC	2,4-Dimethylphenol	105-67-9	1.22E+02	50		2.09E+02	44					8.20E-05	44		7.87E+03	44		9.80E-02	50	92	5.05E-01	44		7.51E-05	44	
SVOC	Dimethylphthalate	131-11-3	1.94E+02	50		6.89E+01	69	82				4.29E-06	50	92	4.00E+03	50	92	1.65E-03	50	92	4.91E-01	69		5.43E-05	69	
SVOC	Di-n-butylphthalate	84-74-2	2.78E+02	50		3.40E+04	44	82				3.85E-08	44		1.12E+01	44		7.30E-05	50	92	3.78E-01	44		6.79E-05	44	
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	1.98E+02	50		1.21E+02	69	82				1.75E-05	50	92	1.98E+02	50	92	3.24E-04	50	92	2.38E-01	69		5.97E-05	69	
SVOC	2,4-Dinitrophenol	51-28-5	1.84E+02	50		1.00E-02	44	43				1.82E-05	44		2.79E+03	44		5.10E-03	50	92	2.36E-01	44		7.83E-05	44	
SVOC	2,4-Dinitrotoluene	121-14-2	1.82E+02	50		9.46E+01	44	82				3.80E-06	44		2.70E+02	44		1.47E-04	50	92	1.75E+00	44		6.10E-05	44	
SVOC	2,6-Dinitrotoluene	606-20-2	1.82E+02	50		6.89E+01	44	82				3.06E-05	44		1.82E+02	44		5.67E-04	50	92	2.83E-01	44		6.27E-05	44	
SVOC	Di-n-octylphthalate	117-84-0	3.91E+02	50		8.38E+07	44	82				2.74E-03	44		2.00E-02	44		2.60E-06	50	92	1.30E-01	44		3.09E-05	44	
SVOC	Fluoranthene	206-44-0	2.02E+02	50		1.08E+05	44	82				6.60E-04	44		2.06E-01	44		7.80E-06	50	94	2.61E-01	44		5.49E-05	44	
SVOC	Fluorene	86-73-7	1.66E+02	50		1.38E+04	44	82				2.61E-03	44		1.98E+00	44		6.33E-04	50	92	3.14E-01	44		6.81E-05	44	
SVOC	Hexachlorobenzene	118-74-1	2.85E+02	50		5.53E+04	44	111				5.41E-02	44		6.20E+00	44		1.80E-05	50	92	4.68E-01	44		5.11E-05	44	
SVOC	Hexachlorobutadiene	87-68-3	2.61E+02	50		5.35E+04	44	82				3.34E-01	44		3.23E+00	44		2.21E-01	50	92	4.85E-01	44		5.32E-05	44	
SVOC	Hexachlorocyclopentadiene	77-47-4	2.73E+02	50		1.99E+05	44	82				1.11E+00	44		1.80E+00	44		5.96E-02	50	94	1.39E-01	44		6.23E-05	44	
SVOC	Hexachloroethane	67-72-1	2.37E+02	50		1.76E+03	44	111				1.59E-01	44		5.00E+01	44		2.10E-01	50	92	2.16E-02	44		5.88E-05	44	
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	2.76E+02	50		3.45E+06	44	82				6.56E-05	44		2.20E-05	44		1.00E-10	50	92	1.64E-01	44		4.89E-05	44	
SVOC	Isophorone	78-59-1	1.38E+02	50		4.69E+01	44	82				2.72E-04	44		1.20E+04	44		4.38E-01	50	92	5.38E-01	44		5.84E-05	44	
SVOC	2-Methylnaphthalene	91-57-6	1.42E+02	50		6.23E+03	1	82				2.12E-02	50	92	2.46E+01	50	92	5.50E-02	50	92	8.52E-01	52		6.70E-05	52	
SVOC	Methylphenol (total)	1319-77-3	1.08E+02	50	99	8.45E+01	1	99, 82				3.54E-05	50	92, 99	2.27E+04	50	92, 99	1.38E-01	50	92, 99	6.39E-01	40	99	8.64E-05	40	99
SVOC	Naphthalene	91-20-3	1.28E+02	50		2.01E+03	44	82				1.98E-02	44		3.10E+01	44		8.50E-02	50	92	5.10E-01	44		6.48E-05	44	
SVOC	2-Nitroaniline	88-74-4	1.38E+02	50		6.59E+01	69	82				6.53E-06	69		2.94E+02	50	90	1.42E-04	50	90	6.31E-01	69		6.91E-05	69	
SVOC	3-Nitroaniline	99-09-2	1.38E+02	50		2.22E+01	1	82				5.89E-06	50	92	1.21E+03	50	92	9.56E-05	50	92						
SVOC	4-Nitroaniline	100-01-6	1.38E+02	50		2.33E+01	1	82				8.46E-08	50	92	7.28E+02	50	92	8.28E-06	50	92	5.00E-01	69		7.41E-05	69	
SVOC	Nitrobenzene	98-95-3	1.23E+02	50		6.44E+01	44	82				9.84E-04	44		2.09E+03	44		2.45E-01	50	92	6.57E-01	44		7.43E-05	44	
SVOC	2-Nitrophenol	88-75-5	1.39E+02	50		5.75E+01	1	82				3.87E-04	50	92	2.19E+03	50	92	1.13E-01	50	92	4.66E-01	69		6.78E-05	69	
SVOC	4-Nitrophenol	100-02-7	1.39E+02	50		7.55E+01	69	82				1.70E-08	50	92	1.16E+04	50	92	4.10E-05	50	92	5.40E-01	69		8.30E-05	69	
SVOC	N-Nitrosodiphenylamine	86-30-6	1.98E+02	50		1.29E+03	44					2.05E-04	44		3.51E+01	44		6.69E-04	50	92	2.70E-01	44		5.49E-05	44	

Appendix D: Physical and Chemical Properties
GMC Pontiac North Campus, Pontiac, Michigan

Chem Group	Chemical	CASRN	MW (g/mole)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			s (mg/L)			VP (mm Hg)			D_{air} (m^2/d)			D_{water} (m^2/d)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
SVOC	N-Nitroso-di-n-propylamine	621-64-7	1.30E+02	50		2.40E+01	44					9.23E-05	44		9.89E+03	44		1.30E-01	50	92	4.71E-01	44		7.06E-05	44	
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	1.71E+02	50		2.56E+02	69	82				4.78E-03	50	92	1.70E+03	50	92	8.80E-01	50	92	5.20E-01	69		5.54E-05	69	
SVOC	Pentachlorophenol	87-86-5	2.66E+02	50		5.92E+02	44	43				1.00E-06	44		1.95E+03	44		3.17E-05	50	92	4.84E-01	44		5.27E-05	44	
SVOC	Phenanthrene	85-01-8	1.78E+02	50		2.42E+04	69	82				9.52E-04	50	92	1.15E+00	50	92	1.12E-04	50	92	3.24E-01	69		6.45E-05	69	
SVOC	Phenol	108-95-2	9.41E+01	50		2.88E+01	44					1.63E-05	44		8.28E+04	44		2.76E-01	50	92	7.08E-01	44		7.86E-05	44	
SVOC	Pyrene	129-00-0	2.02E+02	50		1.06E+05	44	82				4.51E-04	44		1.35E-01	44		4.59E-06	50	92	2.35E-01	44		6.26E-05	44	
SVOC	2,4,5-Trichlorophenol	95-95-4	1.97E+02	50		1.60E+03	44	43				1.78E-04	44		1.20E+03	44		2.00E-02	50	92	2.51E-01	44		6.07E-05	44	
SVOC	2,4,6-Trichlorophenol	88-06-2	1.97E+02	50		3.81E+02	44	43				3.19E-04	44		8.00E+02	44		2.40E-02	50	92	2.75E-01	44		5.40E-05	44	
P/PCB	PCBs (total)	1336-36-3	3.28E+02	64	116	2.45E+06	64	116, 82				8.17E-02	64	116	1.20E-02	64	116	7.71E-05	64	116	1.73E-01	40		4.32E-05	40	
INORG	Antimony	7440-36-0	1.22E+02	50					4.50E+01	44	43					1	61					40	48		40	48
INORG	Arsenic	7440-38-2	7.49E+01	50					2.90E+01	44	43					1	61					40	48		40	48
INORG	Barium	7440-39-3	1.37E+02	50					4.10E+01	44	43					1	60					40	48		40	48
INORG	Beryllium	7440-41-7	9.01E+00	50					7.90E+02	44	43					1	61					40	48		40	48
INORG	Cadmium	7440-43-9	1.12E+02	50					7.50E+01	44	43					1	61		40	48		40	48		40	48
INORG	Chromium (total)	7440-47-3	5.20E+01	50					1.90E+01	44	43, 45					1	61					40	48		40	48
INORG	Cobalt	7440-48-4	5.89E+01	50					4.50E+01	35						1	61									
INORG	Copper	7440-50-8	6.35E+01	50					3.50E+01	35						1	61					40	48		40	48
INORG	Cyanide (total)	57-12-5	2.60E+01	1					9.90E+00	44	43															
INORG	Lead	7439-92-1	2.07E+02	50					9.00E+02	35						1	61					40	48		40	48
INORG	Manganese	7439-96-5	5.49E+01	50					6.50E+01	35																
INORG	Mercury	7439-97-6	2.01E+02	67					1.00E+03	67		2.90E-01	67		5.60E-02	1		1.96E-03	50	92	2.65E-01	44		5.44E-05	44	
INORG	Nickel	7440-02-0	5.87E+01	50					6.50E+01	44	43					1	61					40	48		40	48
INORG	Selenium	7782-49-2	7.90E+01	50					5.00E+00	44	43					40	48		40	48		40	48		40	48
INORG	Silver	7440-22-4	1.08E+02	50					8.30E+00	44	43					1	61					40	48		40	48
INORG	Thallium	7440-28-0	2.04E+02	50					7.10E+01	44	43					1	61					40	48		40	48
INORG	Vanadium	7440-62-2	5.09E+01	50					1.00E+03	44	43					1	61		40	48		40	48		40	48
INORG	Zinc	7440-66-6	6.54E+01	50					6.20E+01	44	43					1	61					40	48		40	48

Appendix D: References and Notes For Physical and Chemical Properties
GMC Pontiac North Campus, Pontiac, Michigan

References:

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39	CHEMFATE data base. Syracuse Research Corporation.
40	Research Triangle Institute, Center for Environmental Analysis. 1995. Supplemental Technical Support Document for Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors--Volume 1, TABLE A-1. November 1995.
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50	USEPA. 1997. Superfund Chemical Data Matrix (SCDM). Office of Emergency and Remedial Response. September 12.
52	USEPA. 1997. CHEM9 Compound Properties Estimation and Data. Version 1.00. Office of Air Quality Planning and Standards. July.
55	W.G. Mallard and P.J. Linstrom, Eds., NIST Chemistry WebBook, NIST Standard Reference Database Number 69, March, 2003, National Institute of Standards and Technology, Gaithersburg MD, 20899
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64	Agency for Toxic Substances and Disease Registry (ATSDR). November 2000. Toxicological Profile for Polychlorindated Biphenyls (PCBs).
67	USEPA. 1997. Mercury Study Report to Congress. EPA's Office of Air Quality Planning and Standards and Office of Research and Development. December
68	PHYSPROP data base. Syracuse Research Corporation.
69	USEPA. 2004. WATER9. Version 2.0.0. Office of Air Quality Planning and Standards. July.

Notes:

43	pH associated with value is 6.8.
45	ENVIRON used the value for Chromium VI [CASRN 18540-29-9] presented in indicated reference as a surrogate.
48	Not Available or Not Applicable
49	At 25 degrees Celsius
55	Reference temperature is unspecified.
60	Hydrolyzes
61	Insoluble
63	min temperature: max is 25C
66	Slightly soluble
82	ENVIRON used Equation (70) from Reference 44 to calculate Koc value using Log Kow value from indicated reference.
90	Indicated source cites CHEMCALC.
91	Indicated source cites CHEMEST.
92	Indicated source cites CHEMFATE.
93	Indicated source cites FATE.
94	Indicated source cites LIVECHEM.
99	ENVIRON used the value for 3-Methylphenol [CASRN 108-39-4] value as a surrogate.
110	ENVIRON used the value for 4-Chlorobiphenyl [CASRN 2051-62-9] from the indicated reference as a surrogate.
111	ENVIRON used Equation (71) from Reference 44 to calculate Koc value using Log Kow value from indicated reference.
113	Personal communication with RCRA, Superfund & EPCRA Hotline on 9/15/2000; indicated reference presents the value which is off by an order of magnitude (1.23E-06 cm2/s). The database has the correct value of 1.23E-05 cm2/s.
114	A value of 1 is conservatively used because EPA guidance does not provide a default value.
115	ENVIRON calculated Kp value using equation 3.8 (p.3-8) in reference 62 with log Kow from the indicated reference and the MW presented in table.
116	ENVIRON used the value for Aroclor-1254 [CASRN 11097-69-1] from the indicated reference as a surrogate.
117	ENVIRON derived the FA based on Exhibit A-4 in the indicated reference.

Appendix D: Cancer Risk-Based Criteria for Sewer Construction/Maintenance Worker Exposure to Soil in Excavations
GMC Pontiac North Campus, Pontiac, Michigan

				Soil Incidental Ingestion			Soil Dermal Contact				
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**LADD** (mg/kg/d)	**SF_{oral}** $(mg/kg/d)^{-1}$	**RBC** (mg/kg)	**ABS_d**	**LADD** (mg/kg/d)	**SF_{derm}** $(mg/kg/d)^{-1}$	**RBC** (mg/kg)	**Combined RBC** (mg/kg)
VOC	Acetone	67-64-1	ID	1.4E-08							
VOC	Benzene	71-43-2	A	1.4E-08	5.5E-02	1.3E+04			5.5E-02		1.3E+04
VOC	Bromobenzene	108-86-1		1.4E-08							
VOC	Bromochloromethane	74-97-5		1.4E-08							
VOC	Bromodichloromethane	75-27-4	B2	1.4E-08	6.2E-02	1.2E+04			6.2E-02		1.2E+04
VOC	Bromoform	75-25-2	B2	1.4E-08	7.9E-03	9.1E+04			7.9E-03		9.1E+04
VOC	Bromomethane	74-83-9	D	1.4E-08							
VOC	2-Butanone	78-93-3	ID	1.4E-08							
VOC	n-Butylbenzene	104-51-8		1.4E-08							
VOC	sec-Butylbenzene	135-98-8		1.4E-08							
VOC	tert-Butylbenzene	98-06-6		1.4E-08							
VOC	Carbon Disulfide	75-15-0		1.4E-08							
VOC	Carbon Tetrachloride	56-23-5	B2	1.4E-08	1.3E-01	5.5E+03			1.3E-01		5.5E+03
VOC	Chlorobenzene	108-90-7	D	1.4E-08							
VOC	Chloroethane	75-00-3		1.4E-08	2.9E-03	2.5E+05			2.9E-03		2.5E+05
VOC	Chloroform	67-66-3	B2	1.4E-08							
VOC	Chloromethane	74-87-3	D	1.4E-08							
VOC	2-Chlorotoluene	95-49-8		1.4E-08							
VOC	Cumene	98-82-8	D	1.4E-08							
VOC	Cyclohexane	110-82-7	ID	1.4E-08							
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	1.4E-08	1.4E+00	5.1E+02			1.4E+00		5.1E+02
VOC	Dibromochloromethane	124-48-1	C	1.4E-08	8.4E-02	8.5E+03			8.4E-02		8.5E+03
VOC	1,2-Dibromoethane	106-93-4	LC	1.4E-08	2.0E+00	3.6E+02			2.0E+00		3.6E+02
VOC	1,2-Dichlorobenzene	95-50-1	D	1.4E-08							
VOC	1,3-Dichlorobenzene	541-73-1	D	1.4E-08							
VOC	1,4-Dichlorobenzene	106-46-7	C	1.4E-08	2.4E-02	3.0E+04			2.4E-02		3.0E+04
VOC	Dichlorodifluoromethane	75-71-8		1.4E-08							
VOC	1,1-Dichloroethane	75-34-3	C	1.4E-08							
VOC	1,2-Dichloroethane	107-06-2	B2	1.4E-08	9.1E-02	7.9E+03			9.1E-02		7.9E+03
VOC	1,1-Dichloroethene	75-35-4	C	1.4E-08							
VOC	cis-1,2-Dichloroethene	156-59-2	D	1.4E-08							
VOC	trans-1,2-Dichloroethene	156-60-5		1.4E-08							
VOC	1,2-Dichloropropane	78-87-5	B2	1.4E-08	6.8E-02	1.1E+04			6.8E-02		1.1E+04
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1.4E-08	1.0E-01	7.2E+03			1.0E-01		7.2E+03
VOC	Ethyl Benzene	100-41-4	D	1.4E-08							
VOC	2-Hexanone	591-78-6		1.4E-08							
VOC	Methyl Acetate	79-20-9		1.4E-08							
VOC	Methyl tert-butyl ether	1634-04-4		1.4E-08							

Appendix D: Cancer Risk-Based Criteria for Sewer Construction/Maintenance Worker Exposure to Soil in Excavations
GMC Pontiac North Campus, Pontiac, Michigan

				Soil Incidental Ingestion			Soil Dermal Contact				
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**LADD** (mg/kg/d)	**SF_{oral}** $(mg/kg/d)^{-1}$	**RBC** (mg/kg)	**ABS_d**	**LADD** (mg/kg/d)	**SF_{derm}** $(mg/kg/d)^{-1}$	**RBC** (mg/kg)	**Combined RBC** (mg/kg)
VOC	4-Methyl-2-pentanone	108-10-1	ID	1.4E-08							
VOC	Methylcyclohexane	108-87-2		1.4E-08							
VOC	Methylene Chloride	75-09-2	B2	1.4E-08	7.5E-03	9.5E+04			7.5E-03		9.5E+04
VOC	Styrene	100-42-5		1.4E-08							
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	1.4E-08	2.0E-01	3.6E+03			2.0E-01		3.6E+03
VOC	Tetrachloroethene	127-18-4	C-B2	1.4E-08	5.2E-02	1.4E+04			5.2E-02		1.4E+04
VOC	Toluene	108-88-3	D	1.4E-08							
VOC	1,2,4-Trichlorobenzene	120-82-1	D	1.4E-08							
VOC	1,1,1-Trichloroethane	71-55-6	D	1.4E-08							
VOC	1,1,2-Trichloroethane	79-00-5	C	1.4E-08	5.7E-02	1.3E+04			5.7E-02		1.3E+04
VOC	Trichloroethene	79-01-6	C-B2	1.4E-08	1.1E-02	6.5E+04			1.1E-02		6.5E+04
VOC	Trichlorofluoromethane	75-69-4		1.4E-08							
VOC	1,2,3-Trichloropropane	96-18-4	B2	1.4E-08	2.0E+00	3.6E+02			2.0E+00		3.6E+02
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		1.4E-08							
VOC	1,2,4-Trimethylbenzene	95-63-6	ID	1.4E-08							
VOC	1,3,5-Trimethylbenzene	108-67-8	ID	1.4E-08							
VOC	Vinyl Acetate	108-05-4		1.4E-08							
VOC	Vinyl Chloride	75-01-4	A	1.4E-08	1.4E+00	5.1E+02			1.4E+00		5.1E+02
VOC	Xylenes (total)	1330-20-7	ID	1.4E-08							
SVOC	Acenaphthene	83-32-9		1.4E-08			1.3E-01	2.4E-08			
SVOC	Acenaphthylene	208-96-8	D	1.4E-08			1.3E-01	2.4E-08			
SVOC	Acetophenone	98-86-2	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	Anthracene	120-12-7	D	1.4E-08			1.3E-01	2.4E-08			
SVOC	Atrazine	1912-24-9	C	1.4E-08	2.2E-01	3.2E+03	1.0E-01	1.8E-08	2.2E-01	2.4E+03	1.4E+03
SVOC	Benzaldehyde	100-52-7		1.4E-08			1.0E-01	1.8E-08			
SVOC	Benzo(a)anthracene	56-55-3	B2	1.4E-08	7.3E-01	9.8E+02	1.3E-01	2.4E-08	7.3E-01	5.7E+02	3.6E+02
SVOC	Benzo(a)pyrene	50-32-8	B2	1.4E-08	7.3E+00	9.8E+01	1.3E-01	2.4E-08	7.3E+00	5.7E+01	3.6E+01
SVOC	Benzo(b)fluoranthene	205-99-2	B2	1.4E-08	7.3E-01	9.8E+02	1.3E-01	2.4E-08	7.3E-01	5.7E+02	3.6E+02
SVOC	Benzo(g,h,i)perylene	191-24-2	D	1.4E-08			1.3E-01	2.4E-08			
SVOC	Benzo(k)fluoranthene	207-08-9	B2	1.4E-08	7.3E-02	9.8E+03	1.3E-01	2.4E-08	7.3E-02	5.7E+03	3.6E+03
SVOC	Benzoic Acid	65-85-0	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	Benzyl Alcohol	100-51-6		1.4E-08			1.0E-01	1.8E-08			
SVOC	Biphenyl	92-52-4	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1.4E-08	1.1E+00	6.5E+02	1.0E-01	1.8E-08	1.1E+00	4.9E+02	2.8E+02
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1.4E-08	1.4E-02	5.1E+04	1.0E-01	1.8E-08	1.4E-02	3.9E+04	2.2E+04
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	Butylbenzylphthalate	85-68-7	C	1.4E-08	1.9E-03	3.8E+05	1.0E-01	1.8E-08	1.9E-03	2.9E+05	1.6E+05

Appendix D: Cancer Risk-Based Criteria for Sewer Construction/Maintenance Worker Exposure to Soil in Excavations
GMC Pontiac North Campus, Pontiac, Michigan

				Soil Incidental Ingestion			Soil Dermal Contact				
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**LADD** (mg/kg/d)	**SF_{oral}** $(mg/kg/d)^{-1}$	**RBC** (mg/kg)	**ABS_d**	**LADD** (mg/kg/d)	**SF_{derm}** $(mg/kg/d)^{-1}$	**RBC** (mg/kg)	**Combined RBC** (mg/kg)
SVOC	Caprolactam	105-60-2		1.4E-08			1.0E-01	1.8E-08			
SVOC	Carbazole	86-74-8	B2	1.4E-08	2.0E-02	3.6E+04	1.0E-01	1.8E-08	2.0E-02	2.7E+04	1.5E+04
SVOC	4-Chloro-3-methylphenol	59-50-7		1.4E-08			1.0E-01	1.8E-08			
SVOC	4-Chloroaniline	106-47-8		1.4E-08	5.4E-02	1.3E+04	1.0E-01	1.8E-08	5.4E-02	1.0E+04	5.7E+03
SVOC	2-Chloronaphthalene	91-58-7		1.4E-08			1.0E-01	1.8E-08			
SVOC	2-Chlorophenol	95-57-8		1.4E-08			1.0E-01	1.8E-08			
SVOC	4-Chlorophenol	106-48-9		1.4E-08							
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3		1.4E-08			1.0E-01	1.8E-08			
SVOC	Chrysene	218-01-9	B2	1.4E-08	7.3E-03	9.8E+04	1.3E-01	2.4E-08	7.3E-03	5.7E+04	3.6E+04
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	1.4E-08	7.3E+00	9.8E+01	1.3E-01	2.4E-08	7.3E+00	5.7E+01	3.6E+01
SVOC	Dibenzofuran	132-64-9	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	1.4E-08	4.5E-01	1.6E+03	1.0E-01	1.8E-08	4.5E-01	1.2E+03	6.9E+02
SVOC	2,4-Dichlorophenol	120-83-2		1.4E-08			1.0E-01	1.8E-08			
SVOC	Diethylphthalate	84-66-2	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	2,4-Dimethylphenol	105-67-9		1.4E-08			1.0E-01	1.8E-08			
SVOC	Dimethylphthalate	131-11-3	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	Di-n-butylphthalate	84-74-2	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		1.4E-08			1.0E-01	1.8E-08			
SVOC	2,4-Dinitrophenol	51-28-5		1.4E-08			1.0E-01	1.8E-08			
SVOC	2,4-Dinitrotoluene	121-14-2	B2	1.4E-08	6.8E-01	1.1E+03	1.0E-01	1.8E-08	6.8E-01	8.0E+02	4.5E+02
SVOC	2,6-Dinitrotoluene	606-20-2	B2	1.4E-08	6.8E-01	1.1E+03	1.0E-01	1.8E-08	6.8E-01	8.0E+02	4.5E+02
SVOC	Di-n-octylphthalate	117-84-0		1.4E-08			1.0E-01	1.8E-08			
SVOC	Fluoranthene	206-44-0	D	1.4E-08			1.3E-01	2.4E-08			
SVOC	Fluorene	86-73-7	D	1.4E-08			1.3E-01	2.4E-08			
SVOC	Hexachlorobenzene	118-74-1	B2	1.4E-08	1.6E+00	4.5E+02	1.0E-01	1.8E-08	1.6E+00	3.4E+02	1.9E+02
SVOC	Hexachlorobutadiene	87-68-3	C	1.4E-08	7.8E-02	9.2E+03	1.0E-01	1.8E-08	7.8E-02	6.9E+03	4.0E+03
SVOC	Hexachlorocyclopentadiene	77-47-4	E	1.4E-08			1.0E-01	1.8E-08			
SVOC	Hexachloroethane	67-72-1	C	1.4E-08	1.4E-02	5.1E+04	1.0E-01	1.8E-08	1.4E-02	3.9E+04	2.2E+04
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	1.4E-08	7.3E-01	9.8E+02	1.3E-01	2.4E-08	7.3E-01	5.7E+02	3.6E+02
SVOC	Isophorone	78-59-1	C	1.4E-08	9.5E-04	7.5E+05	1.0E-01	1.8E-08	9.5E-04	5.7E+05	3.2E+05
SVOC	2-Methylnaphthalene	91-57-6	ID	1.4E-08			1.0E-01	1.8E-08			
SVOC	Methylphenol (total)	1319-77-3		1.4E-08			1.0E-01	1.8E-08			
SVOC	Naphthalene	91-20-3	C	1.4E-08			1.3E-01	2.4E-08			
SVOC	2-Nitroaniline	88-74-4		1.4E-08			1.0E-01	1.8E-08			
SVOC	3-Nitroaniline	99-09-2	C	1.4E-08	2.1E-02	3.4E+04	1.0E-01	1.8E-08	2.1E-02	2.6E+04	1.5E+04
SVOC	4-Nitroaniline	100-01-6	C	1.4E-08	2.1E-02	3.4E+04	1.0E-01	1.8E-08	2.1E-02	2.6E+04	1.5E+04
SVOC	Nitrobenzene	98-95-3	D	1.4E-08			1.0E-01	1.8E-08			
SVOC	2-Nitrophenol	88-75-5		1.4E-08			1.0E-01	1.8E-08			

Appendix D: Cancer Risk-Based Criteria for Sewer Construction/Maintenance Worker Exposure to Soil in Excavations
GMC Pontiac North Campus, Pontiac, Michigan

				Soil Incidental Ingestion			Soil Dermal Contact				
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**LADD** (mg/kg/d)	**SF_{oral}** $(mg/kg/d)^{-1}$	**RBC** (mg/kg)	**ABS_d**	**LADD** (mg/kg/d)	**SF_{derm}** $(mg/kg/d)^{-1}$	**RBC** (mg/kg)	**Combined RBC** (mg/kg)
SVOC	4-Nitrophenol	100-02-7		1.4E-08			1.0E-01	1.8E-08			
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	1.4E-08	4.9E-03	1.5E+05	1.0E-01	1.8E-08	4.9E-03	1.1E+05	6.3E+04
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	1.4E-08	7.0E+00	1.0E+02	1.0E-01	1.8E-08	7.0E+00	7.7E+01	4.4E+01
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	1.4E-08	7.0E-02	1.0E+04	1.0E-01	1.8E-08	7.0E-02	7.7E+03	4.4E+03
SVOC	Pentachlorophenol	87-86-5	B2	1.4E-08	1.2E-01	6.0E+03	2.5E-01	4.6E-08	1.2E-01	1.8E+03	1.4E+03
SVOC	Phenanthrene	85-01-8	D	1.4E-08			1.3E-01	2.4E-08			
SVOC	Phenol	108-95-2	ID	1.4E-08			1.0E-01	1.8E-08			
SVOC	Pyrene	129-00-0	D	1.4E-08			1.3E-01	2.4E-08			
SVOC	2,4,5-Trichlorophenol	95-95-4		1.4E-08			1.0E-01	1.8E-08			
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1.4E-08	1.1E-02	6.5E+04	1.0E-01	1.8E-08	1.1E-02	4.9E+04	2.8E+04
P/PCB	PCBs (total)	1336-36-3	B2	1.4E-08	2.0E+00	3.6E+02	1.4E-01	2.6E-08	2.0E+00	1.9E+02	1.3E+02
INORG	Antimony	7440-36-0		1.4E-08							
INORG	Arsenic	7440-38-2	A	1.4E-08	1.5E+00	4.8E+02	3.0E-02	5.5E-09	1.5E+00	1.2E+03	3.4E+02
INORG	Barium	7440-39-3	D	1.4E-08							
INORG	Beryllium	7440-41-7	B1	1.4E-08							
INORG	Cadmium	7440-43-9	B1	1.4E-08			1.0E-03	1.8E-10			
INORG	Chromium (total)	7440-47-3		1.4E-08							
INORG	Cobalt	7440-48-4	B1	1.4E-08							
INORG	Copper	7440-50-8	D	1.4E-08							
INORG	Cyanide (total)	57-12-5	D	1.4E-08							
INORG	Lead	7439-92-1	B2	1.4E-08							
INORG	Manganese	7439-96-5	D	1.4E-08							
INORG	Mercury	7439-97-6	D	1.4E-08							
INORG	Nickel	7440-02-0	A	1.4E-08							
INORG	Selenium	7782-49-2	D	1.4E-08							
INORG	Silver	7440-22-4	D	1.4E-08							
INORG	Thallium	7440-28-0		1.4E-08							
INORG	Vanadium	7440-62-2		1.4E-08							
INORG	Zinc	7440-66-6	D	1.4E-08							
Note:											
Criteria have been calculated using a target risk of 10^{-5}.											

Appendix D: Noncancer Risk-Based Criteria for Sewer Construction/Maintenance Worker Exposure to Soil in Excavations
GMC Pontiac North Campus, Pontiac, Michigan

				Soil Incidental Ingestion			Soil Dermal Contact				
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**ADD** (mg/kg/d)	**RfD_{oral}** (mg/kg/d)	**RBC** (mg/kg)	**ABS_d**	**ADD** (mg/kg/d)	**RfD_{derm}** (mg/kg/d)	**RBC** (mg/kg)	**Combined RBC** (mg/kg)
VOC	Acetone	67-64-1	ID	3.9E-08	9.0E-01	2.3E+07			9.0E-01		2.30E+07
VOC	Benzene	71-43-2	A	3.9E-08	4.0E-03	1.0E+05			4.0E-03		1.02E+05
VOC	Bromobenzene	108-86-1		3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
VOC	Bromochloromethane	74-97-5		3.9E-08							
VOC	Bromodichloromethane	75-27-4	B2	3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
VOC	Bromoform	75-25-2	B2	3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
VOC	Bromomethane	74-83-9	D	3.9E-08	1.4E-03	3.6E+04			1.4E-03		3.58E+04
VOC	2-Butanone	78-93-3	ID	3.9E-08	6.0E-01	1.5E+07			6.0E-01		1.53E+07
VOC	n-Butylbenzene	104-51-8		3.9E-08	4.0E-02	1.0E+06			4.0E-02		1.02E+06
VOC	sec-Butylbenzene	135-98-8		3.9E-08							
VOC	tert-Butylbenzene	98-06-6		3.9E-08	4.0E-02	1.0E+06			4.0E-02		1.02E+06
VOC	Carbon Disulfide	75-15-0		3.9E-08	1.0E-01	2.6E+06			1.0E-01		2.56E+06
VOC	Carbon Tetrachloride	56-23-5	B2	3.9E-08	7.0E-04	1.8E+04			7.0E-04		1.79E+04
VOC	Chlorobenzene	108-90-7	D	3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
VOC	Chloroethane	75-00-3		3.9E-08	4.0E-01	1.0E+07			4.0E-01		1.02E+07
VOC	Chloroform	67-66-3	B2	3.9E-08	1.0E-02	2.6E+05			1.0E-02		2.56E+05
VOC	Chloromethane	74-87-3	D	3.9E-08							
VOC	2-Chlorotoluene	95-49-8		3.9E-08							
VOC	Cumene	98-82-8	D	3.9E-08	1.0E-01	2.6E+06			1.0E-01		2.56E+06
VOC	Cyclohexane	110-82-7	ID	3.9E-08							
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	3.9E-08							
VOC	Dibromochloromethane	124-48-1	C	3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
VOC	1,2-Dibromoethane	106-93-4	LC	3.9E-08	9.0E-03	2.3E+05			9.0E-03		2.30E+05
VOC	1,2-Dichlorobenzene	95-50-1	D	3.9E-08	9.0E-02	2.3E+06			9.0E-02		2.30E+06
VOC	1,3-Dichlorobenzene	541-73-1	D	3.9E-08	9.0E-02	2.3E+06			9.0E-02		2.30E+06
VOC	1,4-Dichlorobenzene	106-46-7	C	3.9E-08	3.0E-02	7.7E+05			3.0E-02		7.67E+05
VOC	Dichlorodifluoromethane	75-71-8		3.9E-08	2.0E-01	5.1E+06			2.0E-01		5.11E+06
VOC	1,1-Dichloroethane	75-34-3	C	3.9E-08	2.0E-01	5.1E+06			2.0E-01		5.11E+06
VOC	1,2-Dichloroethane	107-06-2	B2	3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
VOC	1,1-Dichloroethene	75-35-4	C	3.9E-08	5.0E-02	1.3E+06			5.0E-02		1.28E+06
VOC	cis-1,2-Dichloroethene	156-59-2	D	3.9E-08	1.0E-02	2.6E+05			1.0E-02		2.56E+05
VOC	trans-1,2-Dichloroethene	156-60-5		3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
VOC	1,2-Dichloropropane	78-87-5	B2	3.9E-08							
VOC	1,3-Dichloropropene (total)	542-75-6	B2	3.9E-08	3.0E-02	7.7E+05			3.0E-02		7.67E+05
VOC	Ethyl Benzene	100-41-4	D	3.9E-08	1.0E-01	2.6E+06			1.0E-01		2.56E+06
VOC	2-Hexanone	591-78-6		3.9E-08	4.0E-02	1.0E+06			4.0E-02		1.02E+06
VOC	Methyl Acetate	79-20-9		3.9E-08	1.0E+00	2.6E+07			1.0E+00		2.56E+07
VOC	Methyl tert-butyl ether	1634-04-4		3.9E-08							

Appendix D: Noncancer Risk-Based Criteria for Sewer Construction/Maintenance Worker Exposure to Soil in Excavations
GMC Pontiac North Campus, Pontiac, Michigan

				Soil Incidental Ingestion			Soil Dermal Contact				
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**ADD** (mg/kg/d)	**RfD_{oral}** (mg/kg/d)	**RBC** (mg/kg)	**ABS_d**	**ADD** (mg/kg/d)	**RfD_{derm}** (mg/kg/d)	**RBC** (mg/kg)	**Combined RBC** (mg/kg)
VOC	4-Methyl-2-pentanone	108-10-1	ID	3.9E-08							
VOC	Methylcyclohexane	108-87-2		3.9E-08							
VOC	Methylene Chloride	75-09-2	B2	3.9E-08	6.0E-02	1.5E+06			6.0E-02		1.53E+06
VOC	Styrene	100-42-5		3.9E-08	2.0E-01	5.1E+06			2.0E-01		5.11E+06
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	3.9E-08	6.0E-02	1.5E+06			6.0E-02		1.53E+06
VOC	Tetrachloroethene	127-18-4	C-B2	3.9E-08	1.0E-02	2.6E+05			1.0E-02		2.56E+05
VOC	Toluene	108-88-3	D	3.9E-08	2.0E-01	5.1E+06			2.0E-01		5.11E+06
VOC	1,2,4-Trichlorobenzene	120-82-1	D	3.9E-08	1.0E-02	2.6E+05			1.0E-02		2.56E+05
VOC	1,1,1-Trichloroethane	71-55-6	D	3.9E-08	2.8E-01	7.2E+06			2.8E-01		7.15E+06
VOC	1,1,2-Trichloroethane	79-00-5	C	3.9E-08	4.0E-03	1.0E+05			4.0E-03		1.02E+05
VOC	Trichloroethene	79-01-6	C-B2	3.9E-08	6.0E-03	1.5E+05			6.0E-03		1.53E+05
VOC	Trichlorofluoromethane	75-69-4		3.9E-08	3.0E-01	7.7E+06			3.0E-01		7.67E+06
VOC	1,2,3-Trichloropropane	96-18-4	B2	3.9E-08	6.0E-03	1.5E+05			6.0E-03		1.53E+05
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		3.9E-08	3.0E+01	7.7E+08			3.0E+01		7.67E+08
VOC	1,2,4-Trimethylbenzene	95-63-6	ID	3.9E-08	5.0E-02	1.3E+06			5.0E-02		1.28E+06
VOC	1,3,5-Trimethylbenzene	108-67-8	ID	3.9E-08	5.0E-02	1.3E+06			5.0E-02		1.28E+06
VOC	Vinyl Acetate	108-05-4		3.9E-08	1.0E+00	2.6E+07			1.0E+00		2.56E+07
VOC	Vinyl Chloride	75-01-4	A	3.9E-08	3.0E-03	7.7E+04			3.0E-03		7.67E+04
VOC	Xylenes (total)	1330-20-7	ID	3.9E-08	2.0E-01	5.1E+06			2.0E-01		5.11E+06
SVOC	Acenaphthene	83-32-9		3.9E-08	6.0E-02	1.5E+06	1.3E-01	6.7E-08	6.0E-02	8.93E+05	5.64E+05
SVOC	Acenaphthylene	208-96-8	D	3.9E-08	3.0E-02	7.7E+05	1.3E-01	6.7E-08	3.0E-02	4.47E+05	2.82E+05
SVOC	Acetophenone	98-86-2	D	3.9E-08	1.0E-01	2.6E+06	1.0E-01	5.2E-08	1.0E-01	1.94E+06	1.10E+06
SVOC	Anthracene	120-12-7	D	3.9E-08	3.0E-01	7.7E+06	1.3E-01	6.7E-08	3.0E-01	4.47E+06	2.82E+06
SVOC	Atrazine	1912-24-9	C	3.9E-08	3.5E-02	8.9E+05	1.0E-01	5.2E-08	3.5E-02	6.77E+05	3.85E+05
SVOC	Benzaldehyde	100-52-7		3.9E-08	1.0E-01	2.6E+06	1.0E-01	5.2E-08	1.0E-01	1.94E+06	1.10E+06
SVOC	Benzo(a)anthracene	56-55-3	B2	3.9E-08			1.3E-01	6.7E-08			
SVOC	Benzo(a)pyrene	50-32-8	B2	3.9E-08			1.3E-01	6.7E-08			
SVOC	Benzo(b)fluoranthene	205-99-2	B2	3.9E-08			1.3E-01	6.7E-08			
SVOC	Benzo(g,h,i)perylene	191-24-2	D	3.9E-08	3.0E-02	7.7E+05	1.3E-01	6.7E-08	3.0E-02	4.47E+05	2.82E+05
SVOC	Benzo(k)fluoranthene	207-08-9	B2	3.9E-08			1.3E-01	6.7E-08			
SVOC	Benzoic Acid	65-85-0	D	3.9E-08	4.0E+00	1.0E+08	1.0E-01	5.2E-08	4.0E+00	7.74E+07	4.41E+07
SVOC	Benzyl Alcohol	100-51-6		3.9E-08	3.0E-01	7.7E+06	1.0E-01	5.2E-08	3.0E-01	5.81E+06	3.30E+06
SVOC	Biphenyl	92-52-4	D	3.9E-08	5.0E-02	1.3E+06	1.0E-01	5.2E-08	5.0E-02	9.68E+05	5.51E+05
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D	3.9E-08			1.0E-01	5.2E-08			
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	3.9E-08			1.0E-01	5.2E-08			
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	3.9E-08	2.0E-02	5.1E+05	1.0E-01	5.2E-08	2.0E-02	3.87E+05	2.20E+05
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D	3.9E-08			1.0E-01	5.2E-08			
SVOC	Butylbenzylphthalate	85-68-7	C	3.9E-08	2.0E-01	5.1E+06	1.0E-01	5.2E-08	2.0E-01	3.87E+06	2.20E+06

Appendix D: Noncancer Risk-Based Criteria for Sewer Construction/Maintenance Worker Exposure to Soil in Excavations
GMC Pontiac North Campus, Pontiac, Michigan

				Soil Incidental Ingestion			Soil Dermal Contact				
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**ADD** (mg/kg/d)	**RfD_{oral}** (mg/kg/d)	**RBC** (mg/kg)	**ABS_d**	**ADD** (mg/kg/d)	**RfD_{derm}** (mg/kg/d)	**RBC** (mg/kg)	**Combined RBC** (mg/kg)
SVOC	Caprolactam	105-60-2		3.9E-08	5.0E-01	1.3E+07	1.0E-01	5.2E-08	5.0E-01	9.68E+06	5.51E+06
SVOC	Carbazole	86-74-8	B2	3.9E-08			1.0E-01	5.2E-08			
SVOC	4-Chloro-3-methylphenol	59-50-7		3.9E-08			1.0E-01	5.2E-08			
SVOC	4-Chloroaniline	106-47-8		3.9E-08	4.0E-03	1.0E+05	1.0E-01	5.2E-08	4.0E-03	7.74E+04	4.41E+04
SVOC	2-Chloronaphthalene	91-58-7		3.9E-08	8.0E-02	2.0E+06	1.0E-01	5.2E-08	8.0E-02	1.55E+06	8.81E+05
SVOC	2-Chlorophenol	95-57-8		3.9E-08	5.0E-03	1.3E+05	1.0E-01	5.2E-08	5.0E-03	9.68E+04	5.51E+04
SVOC	4-Chlorophenol	106-48-9		3.9E-08							
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3		3.9E-08			1.0E-01	5.2E-08			
SVOC	Chrysene	218-01-9	B2	3.9E-08			1.3E-01	6.7E-08			
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	3.9E-08			1.3E-01	6.7E-08			
SVOC	Dibenzofuran	132-64-9	D	3.9E-08	2.0E-03	5.1E+04	1.0E-01	5.2E-08	2.0E-03	3.87E+04	2.20E+04
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	3.9E-08			1.0E-01	5.2E-08			
SVOC	2,4-Dichlorophenol	120-83-2		3.9E-08	3.0E-03	7.7E+04	1.0E-01	5.2E-08	3.0E-03	5.81E+04	3.30E+04
SVOC	Diethylphthalate	84-66-2	D	3.9E-08	8.0E-01	2.0E+07	1.0E-01	5.2E-08	8.0E-01	1.55E+07	8.81E+06
SVOC	2,4-Dimethylphenol	105-67-9		3.9E-08	2.0E-02	5.1E+05	1.0E-01	5.2E-08	2.0E-02	3.87E+05	2.20E+05
SVOC	Dimethylphthalate	131-11-3	D	3.9E-08			1.0E-01	5.2E-08			
SVOC	Di-n-butylphthalate	84-74-2	D	3.9E-08	1.0E-01	2.6E+06	1.0E-01	5.2E-08	1.0E-01	1.94E+06	1.10E+06
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		3.9E-08	1.0E-04	2.6E+03	1.0E-01	5.2E-08	1.0E-04	1.94E+03	1.10E+03
SVOC	2,4-Dinitrophenol	51-28-5		3.9E-08	2.0E-03	5.1E+04	1.0E-01	5.2E-08	2.0E-03	3.87E+04	2.20E+04
SVOC	2,4-Dinitrotoluene	121-14-2	B2	3.9E-08	2.0E-03	5.1E+04	1.0E-01	5.2E-08	2.0E-03	3.87E+04	2.20E+04
SVOC	2,6-Dinitrotoluene	606-20-2	B2	3.9E-08	1.0E-03	2.6E+04	1.0E-01	5.2E-08	1.0E-03	1.94E+04	1.10E+04
SVOC	Di-n-octylphthalate	117-84-0		3.9E-08	4.0E-02	1.0E+06	1.0E-01	5.2E-08	4.0E-02	7.74E+05	4.41E+05
SVOC	Fluoranthene	206-44-0	D	3.9E-08	4.0E-02	1.0E+06	1.3E-01	6.7E-08	4.0E-02	5.96E+05	3.76E+05
SVOC	Fluorene	86-73-7	D	3.9E-08	4.0E-02	1.0E+06	1.3E-01	6.7E-08	4.0E-02	5.96E+05	3.76E+05
SVOC	Hexachlorobenzene	118-74-1	B2	3.9E-08	8.0E-04	2.0E+04	1.0E-01	5.2E-08	8.0E-04	1.55E+04	8.81E+03
SVOC	Hexachlorobutadiene	87-68-3	C	3.9E-08	3.0E-04	7.7E+03	1.0E-01	5.2E-08	3.0E-04	5.81E+03	3.30E+03
SVOC	Hexachlorocyclopentadiene	77-47-4	E	3.9E-08	6.0E-03	1.5E+05	1.0E-01	5.2E-08	6.0E-03	1.16E+05	6.61E+04
SVOC	Hexachloroethane	67-72-1	C	3.9E-08	1.0E-03	2.6E+04	1.0E-01	5.2E-08	1.0E-03	1.94E+04	1.10E+04
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	3.9E-08			1.3E-01	6.7E-08			
SVOC	Isophorone	78-59-1	C	3.9E-08	2.0E-01	5.1E+06	1.0E-01	5.2E-08	2.0E-01	3.87E+06	2.20E+06
SVOC	2-Methylnaphthalene	91-57-6	ID	3.9E-08	4.0E-03	1.0E+05	1.0E-01	5.2E-08	4.0E-03	7.74E+04	4.41E+04
SVOC	Methylphenol (total)	1319-77-3		3.9E-08	5.0E-02	1.3E+06	1.0E-01	5.2E-08	5.0E-02	9.68E+05	5.51E+05
SVOC	Naphthalene	91-20-3	C	3.9E-08	2.0E-02	5.1E+05	1.3E-01	6.7E-08	2.0E-02	2.98E+05	1.88E+05
SVOC	2-Nitroaniline	88-74-4		3.9E-08	3.0E-03	7.7E+04	1.0E-01	5.2E-08	3.0E-03	5.81E+04	3.30E+04
SVOC	3-Nitroaniline	99-09-2	C	3.9E-08	3.0E-04	7.7E+03	1.0E-01	5.2E-08	3.0E-04	5.81E+03	3.30E+03
SVOC	4-Nitroaniline	100-01-6	C	3.9E-08	3.0E-03	7.7E+04	1.0E-01	5.2E-08	3.0E-03	5.81E+04	3.30E+04
SVOC	Nitrobenzene	98-95-3	D	3.9E-08	5.0E-04	1.3E+04	1.0E-01	5.2E-08	5.0E-04	9.68E+03	5.51E+03
SVOC	2-Nitrophenol	88-75-5		3.9E-08			1.0E-01	5.2E-08			

Appendix D: Noncancer Risk-Based Criteria for Sewer Construction/Maintenance Worker Exposure to Soil in Excavations
GMC Pontiac North Campus, Pontiac, Michigan

				Soil Incidental Ingestion			Soil Dermal Contact				
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**ADD** (mg/kg/d)	**RfD_{oral}** (mg/kg/d)	**RBC** (mg/kg)	**ABS_d**	**ADD** (mg/kg/d)	**RfD_{derm}** (mg/kg/d)	**RBC** (mg/kg)	**Combined RBC** (mg/kg)
SVOC	4-Nitrophenol	100-02-7		3.9E-08			1.0E-01	5.2E-08			
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	3.9E-08	2.0E-02	5.1E+05	1.0E-01	5.2E-08	2.0E-02	3.87E+05	2.20E+05
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	3.9E-08			1.0E-01	5.2E-08			
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	3.9E-08	4.0E-02	1.0E+06	1.0E-01	5.2E-08	4.0E-02	7.74E+05	4.41E+05
SVOC	Pentachlorophenol	87-86-5	B2	3.9E-08	3.0E-02	7.7E+05	2.5E-01	1.3E-07	3.0E-02	2.32E+05	1.78E+05
SVOC	Phenanthrene	85-01-8	D	3.9E-08	3.0E-02	7.7E+05	1.3E-01	6.7E-08	3.0E-02	4.47E+05	2.82E+05
SVOC	Phenol	108-95-2	ID	3.9E-08	3.0E-01	7.7E+06	1.0E-01	5.2E-08	3.0E-01	5.81E+06	3.30E+06
SVOC	Pyrene	129-00-0	D	3.9E-08	3.0E-02	7.7E+05	1.3E-01	6.7E-08	3.0E-02	4.47E+05	2.82E+05
SVOC	2,4,5-Trichlorophenol	95-95-4		3.9E-08	1.0E-01	2.6E+06	1.0E-01	5.2E-08	1.0E-01	1.94E+06	1.10E+06
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	3.9E-08	1.0E-04	2.6E+03	1.0E-01	5.2E-08	1.0E-04	1.94E+03	1.10E+03
P/PCB	PCBs (total)	1336-36-3	B2	3.9E-08	2.0E-05	5.1E+02	1.4E-01	7.2E-08	2.0E-05	2.77E+02	1.79E+02
INORG	Antimony	7440-36-0		3.9E-08	4.0E-04	1.0E+04			6.0E-05		1.02E+04
INORG	Arsenic	7440-38-2	A	3.9E-08	3.0E-04	7.7E+03	3.0E-02	1.5E-08	3.0E-04	1.94E+04	5.49E+03
INORG	Barium	7440-39-3	D	3.9E-08	7.0E-02	1.8E+06			4.9E-03		1.79E+06
INORG	Beryllium	7440-41-7	B1	3.9E-08	2.0E-03	5.1E+04			1.4E-05		5.11E+04
INORG	Cadmium	7440-43-9	B1	3.9E-08	1.0E-03	2.6E+04	1.0E-03	5.2E-10	2.5E-05	4.84E+04	1.67E+04
INORG	Chromium (total)	7440-47-3		3.9E-08	3.0E-03	7.7E+04			7.5E-05		7.67E+04
INORG	Cobalt	7440-48-4	B1	3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
INORG	Copper	7440-50-8	D	3.9E-08	4.0E-02	1.0E+06			4.0E-02		1.02E+06
INORG	Cyanide (total)	57-12-5	D	3.9E-08	2.0E-02	5.1E+05			2.0E-02		5.11E+05
INORG	Lead	7439-92-1	B2	3.9E-08							
INORG	Manganese	7439-96-5	D	3.9E-08	1.4E-01	3.6E+06			8.4E-03		3.58E+06
INORG	Mercury	7439-97-6	D	3.9E-08	3.0E-04	7.7E+03			3.0E-04		7.67E+03
INORG	Nickel	7440-02-0	A	3.9E-08	2.0E-02	5.1E+05			8.0E-04		5.11E+05
INORG	Selenium	7782-49-2	D	3.9E-08	5.0E-03	1.3E+05			5.0E-03		1.28E+05
INORG	Silver	7440-22-4	D	3.9E-08	5.0E-03	1.3E+05			2.0E-04		1.28E+05
INORG	Thallium	7440-28-0		3.9E-08	7.0E-05	1.8E+03			7.0E-05		1.79E+03
INORG	Vanadium	7440-62-2		3.9E-08	1.0E-03	2.6E+04			2.6E-05		2.56E+04
INORG	Zinc	7440-66-6	D	3.9E-08	3.0E-01	7.7E+06			3.0E-01		7.67E+06
Note:											
Criteria have been calculated using a target hazard quotient of 1.											