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**Site-Wide Groundwater
Monitoring Report for 2003**

General Motors Corporation
Moraine, Ohio

February 27, 2004



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Executive Summary

This Site-Wide Groundwater Monitoring Report presents the groundwater monitoring activities completed in 2003 at the following General Motors Corporation (GM) facilities located in Moraine, Ohio (Figure 1): former Delphi Harrison Thermal Systems Moraine Plant (former Delphi Thermal Moraine [leased to Delphi Corporation between 1999 and September 2003]), former General Motors Powertrain Group, Moraine Engine Plant (former Moraine Engine), and General Motors Truck Group, Moraine Assembly Plant (Moraine Assembly). These monitoring activities were completed as part of the on-going Resource Conservation and Recovery Act (RCRA) Corrective Action being implemented at the facilities. The U.S. EPA approved the Site-Wide Groundwater Monitoring Plan in a letter dated June 16, 2000. The site-wide groundwater monitoring is also designed to meet the objectives of Ohio EPA's RCRA post-closure monitoring at the two closed lagoons located at the Delphi Thermal Moraine facility. Ohio EPA approved the Site-Wide Groundwater Monitoring Plan in a letter dated December 24, 2003. The objectives of groundwater monitoring at the GM Moraine Facilities are as follows:

1. Monitor groundwater quality upgradient and downgradient of the closed North and South Settling Lagoons;
2. Monitor groundwater quality upgradient and downgradient of Landfills L1, L2, and L3;
3. Monitor the effectiveness of and the need for current groundwater capture systems in the upper and lower aquifers at the southern, downgradient property boundary; and,
4. Monitor the effectiveness of corrective measures remediation activities in Reactive Zones (RZ) RZ-1, RZ-2 and RZ-3, to address VOCs related to the Former Oil House Area.
5. Monitor an appropriate list of wells once corrective measures objectives (defined in the Draft Interim Measures/Corrective Measures Report [ARCADIS Geraghty & Miller, Inc. 2001]) have been met to verify that these objectives continue to be met without active measures.

The groundwater monitoring conducted in 2003 met these objectives, with the following results:

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- Using the methodology developed in the RCRA Facility Investigation (RFI) baseline risk assessment for assessing potential impacts to groundwater receptors from releases at the Moraine facilities, GM determined that the data from the wells downgradient of the closed North and South Settling Lagoons do not indicate that these units are significantly affecting groundwater quality. Therefore, no changes in the monitoring program for these closed lagoons are proposed.
- Data collected from upper and lower aquifer wells located upgradient of the facilities confirms that upgradient sources of VOCs, not related to GM operations, do exist in the local area. Notwithstanding these upgradient contributions of VOCs to on-site groundwater, the monitoring data indicate a site-wide decrease in total VOC concentrations since the baseline sampling event conducted in 1999. Landfills L1, L2, and L3 are not significantly affecting groundwater quality. In addition, VOC concentrations at the off-site downgradient upper aquifer well GM-26 (the short-/intermediate-term goal point of compliance well for the upper aquifer) have always been below Safe Drinking Water Act, Maximum Contaminant Levels (MCLs). However, concentrations of certain VOCs remained above MCLs in downgradient lower aquifer wells GM-11, GM-15 and GM-20D (the short-/intermediate-term goal point of compliance wells for the lower aquifer).
- Groundwater elevation monitoring indicates that the capture zone corrective measures continue to be effective at maintaining hydraulic control in both the upper and lower aquifers at the southern end of the former Delphi Thermal Moraine. Further, the decreasing concentrations in the wells downgradient of the site, compared to the RFI data and 1999 baseline groundwater sampling data, is likely attributable to the effects of corrective measures pumping at TW-2, pumping at DN-13, the effects of the in-situ reactive zones and on-going natural attenuation of the VOCs. Based on the effective performance of the pumping program during the 2003 monitoring period, no changes to the hydraulic control component of the ongoing corrective measures are proposed.
- Groundwater quality monitoring at and downgradient of the reductive dechlorination treatment zones (RZ-1, RZ-2 and RZ-3) indicates that this in-situ treatment program has generally been effective at developing reducing conditions in the upper aquifer that have led to reductions in the VOC concentrations in groundwater and this in-situ component of the corrective measures will be continued. GM is conducting additional investigations in RZ-3 East so that suitable modifications can be undertaken to achieve the desired reduction in VOCs downgradient of this area.

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- Based on the data collected during the 2003 monitoring period, GM believes that the monitoring program defined for the upper aquifer, in terms of the monitoring locations, the constituents monitored and the frequency of monitoring, continue to provide sufficient data for a comprehensive evaluation of these corrective action goals. GM will continue monitoring arsenic and barium downgradient of the reactive zones (upper aquifer wells GM-28, ME-3, GM-32, and GM-21) and at the property boundary wells (upper aquifer wells GM-6, TW-2, 4S, and GM-2). These constituents will be included in the site-wide monitoring program for the 2004 sampling events to continue demonstrating that the random detection of these two metals does not pose a concern at this site.
- Based on the data collected during the 2003 monitoring period, GM believes that the monitoring program defined for the lower aquifer, in terms of the monitoring locations, the constituents monitored and the frequency of monitoring, continue to provide sufficient data for a comprehensive evaluation of these corrective action goals in regard to evaluating the downgradient point of compliance performance goals. Replacement wells GM-39, GM-40, GM-41 and GM-42 will be sampled during future site-wide groundwater monitoring events.

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1. Introduction

This Site-Wide Groundwater Monitoring Report presents the groundwater monitoring activities completed in 2003 at the following General Motors Corporation (GM) facilities located in Moraine, Ohio (Figure 1): former Delphi Harrison Thermal Systems Moraine Plant (former Delphi Thermal Moraine), former General Motors Powertrain Group, Moraine Engine Plant (former Moraine Engine), and General Motors Truck Group, Moraine Assembly Plant (Moraine Assembly). A multi-phased Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was completed for these facilities and approved by the United States Environmental Protection Agency (U.S. EPA) in June 2000 (ARCADIS Geraghty & Miller, Inc. 2000a and b, ENVIRON 2000a and b). The RFI identified that the primary source area of volatile organic compounds (VOCs) in shallow groundwater at the three facilities is located at the Area of Interest (AOI) 7 - Former Oil House Area, in the northern portion of the former Moraine Engine facility (Figure 2). The Baseline Risk Assessment concluded that under current site conditions there was no unacceptable risk associated with constituents detected in soil/waste at the AOIs and Solid Waste Management Units (SWMUs) investigated in the RFI. However, constituents detected in groundwater at the Former Oil House Area may migrate to the extent that reasonably expected future uses of groundwater might be affected. Therefore, the focus of the Interim Measures/Corrective Measures Report (ARCADIS Geraghty & Miller, Inc. 2001) was a site-wide remedy that addressed the source of the VOCs in groundwater and the downgradient plume. The final remedy incorporates:

- The Former Oil House Area corrective measures (in-situ remediation technologies downgradient of the source area, Figure 2);
- The capture zone corrective measures (hydraulic control with a pump and treat system for the upper aquifer and hydraulic control for the lower aquifer, Figure 2) until no longer required;
- Institutional actions (the site will remain industrial and groundwater use will be restricted to nonpotable purposes); and
- A site-wide groundwater monitoring program.

This report addresses several components of the final remedy, including the site-wide groundwater monitoring program (Table 1) and the performance of the corrective measures. All groundwater monitoring for the facilities was conducted in accordance

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with the approved Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002).

1.1 Site Description

The former Moraine Engine and Moraine Assembly facilities occupy approximately 300 acres, while the adjacent former Delphi Thermal Moraine facility occupies approximately 165 acres. The facilities are located in the City of Moraine in Montgomery County in southwestern Ohio. A small portion of the Moraine Assembly facility is located in the City of Kettering. Figure 1 presents the location of each facility, property boundaries, and site features.

The GM site has been used for industrial purposes since the property was acquired in the mid-1920's. Frigidaire (a division of GM) produced appliances from the late 1920's until 1979. GM announced the shut down of all Frigidaire operations in January 1979. During 1980 and 1981, the majority of the former Frigidaire Plant 2 was converted to the former Moraine Engine facility, and the former Frigidaire Plant 3 and the northeast corner of former Frigidaire Plant 2 were converted to the Moraine Assembly facility. Since 1981, former Moraine Engine operations have included the machining, painting (this operation was discontinued in September 1995), and assembly of diesel truck engines. Former Moraine Engine operations ceased in the fall of 2000. The plant building has undergone decommissioning and demolition, and the majority of this site has been covered with a parking surface. GM operates a regional haulway at the location of the former Moraine Engine plant, which is now referred to as the Vehicle Distribution Center. Since 1981, Moraine Assembly operations included the manufacture, assembly, and painting of small trucks. Currently Chevrolet TrailBlazers, GM Envoys, and Buick Rainiers are produced at this facility. Former Delphi Thermal Moraine's major operations, which began in 1941, included the machining and assembly of automotive air conditioning compressors, accumulator dehydrators, and miscellaneous air conditioning valves. Operations at the former Delphi Thermal Moraine Building 14 ceased in September 2003 and the building is undergoing decommissioning. As of October 1, 2003, management of the building has reverted to GM.

1.2 Groundwater Monitoring Program Objectives

The objectives of groundwater monitoring at the GM Moraine Facilities are as follows:

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1. Monitor groundwater quality upgradient and downgradient of the closed North and South Settling Lagoons;
2. Monitor groundwater quality upgradient and downgradient of Landfills L1, L2, and L3;
3. Monitor the effectiveness of and the need for current groundwater capture systems in the upper and lower aquifers at the southern, downgradient property boundary;
4. Monitor the effectiveness of corrective measures remediation activities in In-Situ Reactive Zones (RZ) RZ-1, RZ-2 and RZ-3, to address VOCs related to the Former Oil House Area; and
5. Monitor an appropriate list of wells once corrective measures objectives (defined in the Draft Interim Measures/Corrective Measures Report [ARCADIS Geraghty & Miller, Inc. 2001]) have been met to verify that these objectives continue to be met without active measures.

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2. Groundwater Monitoring Summary for 2003

In accordance with the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002), groundwater monitoring was conducted in 2003 to evaluate groundwater quality upgradient and downgradient of the closed lagoons, performance of the RZs and the performance of the capture zones (as discussed in Section 3.2). A summary of the activities and methodologies that were completed in 2003 are presented in Section 2.1 and the groundwater monitoring results are presented in Section 2.2.

To provide a basis for evaluating the performance of the Corrective Measures, a comprehensive site-wide groundwater sampling event for VOCs was conducted in September 1999 to establish a baseline data set. The next site-wide groundwater sampling event was completed between September and October 2000. During the 2000 sampling event, at the request of U.S. EPA, groundwater samples were analyzed for Appendix IX VOCs by Method 8260 and cis-1,2-dichloroethene (cis-DCE), semi-volatile organic compounds (SVOCs) and metals to verify that current groundwater conditions were consistent with previous site conditions. The results of this one-time sampling event confirmed that VOCs were the only constituents of potential concern in groundwater at the site. SVOCs were not detected and metals were not detected above levels of concern during the 2000 sampling event. The analytical results from the 1999 baseline event and the 2000 site-wide event are presented in the Draft Interim Measures/Corrective Measures Report (ARCADIS Geraghty & Miller, Inc. 2001). As presented in the Site-Wide Groundwater Monitoring Plan, rounds of groundwater sampling were also completed in 2001 and 2002. The analytical results from these sampling events are presented in the Site-Wide Groundwater Monitoring Report for 2001/2002 (ARCADIS, Inc. 2003). The 1999 baseline through 2002 groundwater quality data for the site-specific VOC parameter list are reproduced in tables in Appendix A of this report to support the evaluation of the on-going remedial activities.

2.1 Groundwater Monitoring Activities/Methodologies

In order to meet the objectives of the groundwater monitoring program, the scope of work presented in Section 3.0 of the Site-Wide Groundwater Monitoring Plan was implemented during 2003. The following sections summarize the collection of water-level measurements, the monthly groundwater monitoring, and the site-wide groundwater monitoring.

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2.1.1 Water-Level Measurements

Water-level elevations were measured on September 15 and 16, 2003, in upper aquifer monitoring wells shown on Figure 3 and lower aquifer wells shown on Figure 4. The measured wells included all on-site monitoring wells at the three facilities. Water-level elevations were also measured in former Delphi Thermal Moraine production wells (where accessible), Moraine Assembly fire wells, three lower aquifer wells (MT68, MT596M, and MT576M) located east of the Moraine Assembly and the former Moraine Engine plants, and one lower aquifer well (MT69) located south of the Dryden Road North Wellfield. Water-level measurements were collected in accordance with procedures defined in the RFI Sampling and Analysis Plan, Standard Operating Procedure (SOP) #4 (Geraghty & Miller, Inc. 1997a) and recorded on a field data sheet.

2.1.2 Monthly Groundwater Recovery System Monitoring

The Air Permit and NPDES Permit issued to GM for the groundwater recovery and treatment system requires periodic monitoring and reporting of water quality in the influent and effluent streams, and pumping flow rates. Samples of groundwater being pumped through the air stripping treatment tower were collected and analyzed monthly for the parameters required in the permits. GM's air permit for the air stripper tower expired on June 20, 2003 and the Regional Air Pollution Control Agency approved renewal of this permit through June 20, 2008 as a registration status permit due to the negligible organic compound emissions from the tower. GM continued to collect influent tower samples during the July to December sampling events to evaluate the tower performance. Table 2 summarizes the VOC results for the monthly air stripper tower influent stream during 2003. The monthly air stripper influent data is also presented in Figure 5, for the period from the initial start-up in January 1996 through December 2003. Table 3 summarizes the VOC results for the monthly air stripper tower effluent stream during 2003. Table 4 summarizes the VOC results for the monthly DN-13 sampling during 2003. All analyses were conducted in accordance with methods specified in the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995).

2.1.3 Site-Wide Groundwater Monitoring

In accordance with the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002), monitoring wells were sampled during two events in 2003. The wells upgradient and downgradient of the RZs were sampled in May, while the site-wide

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sampling event was conducted in September. Four new replacement lower aquifer monitoring wells were installed in November 2003 and these wells were sampled for VOCs in December 2003. These wells were installed to replace production wells 28, 31 (or 39), 32 and 42 as monitoring points. Boring logs and well construction logs for these wells are presented in Appendix B. A summary of the 2003 sampling events, including number of wells and analytical parameters are presented on Table 1. Well construction and survey data for the wells used in the site-wide program are presented in Table 5.

Groundwater samples were collected from specified wells using low-flow sampling procedures from selected monitoring wells. Field parameters including pH, specific conductance, temperature, oxidation/reduction potential, and dissolved oxygen were measured during purging of each well using a multi-parameter flow-through cell. SOP #21 was followed when sampling monitoring wells (ARCADIS G&M, Inc., 2002). One groundwater sample from a production well was collected through the sampling valve according to SOP #28 (ARCADIS G&M, Inc., 2002).

All groundwater samples were collected and managed under standard chain-of-custody procedures, and validated in accordance with the approved Supplemental RFI Work Plan and the RFI Quality Assurance Project Plan (Geraghty & Miller, Inc., 1997a). All pertinent field data were recorded on groundwater sampling logs. The sampling logs for 2003 are presented in Appendix B. Analytical results are presented and discussed in Section 2.2.3.

2.1.4 Laboratory Analytical Methods

Groundwater samples were analyzed for the site-specific parameter list using SW 846 Method 8260. This parameter list was developed after evaluating data from the September 1999 baseline groundwater sampling event and the one-time sampling event conducted in September/October 2000 (which included analysis of Appendix IX VOCs and cis-DCE, SVOCs, and metals), conducted as part of the Former Oil House Area interim measures. The site-specific parameter list includes: benzene, 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), cis-DCE, trans-1,2-dichloroethene (trans-DCE), ethylbenzene, tetrachloroethene (PCE), toluene, 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), vinyl chloride, and xylenes. Select groundwater samples from upper aquifer monitoring wells were also analyzed for the biogeochemical indicator parameters nitrate, nitrite, nitrogen (ammonia), manganese (total and dissolved), iron (total and dissolved), sulfate, sulfide, total organic carbon (TOC), chlorides, light hydrocarbons (ethane and ethene), and methane.

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Groundwater samples collected from the four new lower aquifer monitoring wells were analyzed for Appendix IX VOCs plus cis-DCE, although not required by the work plan. Groundwater samples from select upper aquifer wells were analyzed for arsenic and barium to demonstrate that the random detection of these two metals does not pose a concern at the site. Table 1 lists specific field, laboratory, and biogeochemical indicator parameters, and field and laboratory analytical methods. All samples were submitted to Severn Trent Laboratory in North Canton, Ohio (STL North Canton) or Microseeps in Pittsburgh, Pennsylvania for ethene, ethane, methane analysis only. The complete set of groundwater results, including QA/QC samples, is presented in Appendix C.

2.2 Groundwater Monitoring Program Results

2.2.1 Groundwater Elevation Monitoring

As part of the site-wide assessment of current groundwater conditions, water-level elevations were measured to determine groundwater flow directions in the upper and lower aquifers and to determine vertical gradients between the two aquifers. Water-level measurements from 2003 are presented on Table 6. Additional rounds of water-level measurements were collected in March and June for the former lagoon monitoring program. Water-level measurements and groundwater contour maps for these additional sampling events are presented in Appendix D. Water levels were also collected in a focused area near RZ-3 to support the evaluation of the performance of this zone. This data is presented and discussed in Appendix E.

2.2.1.1 Upper Aquifer

The water-table surface on September 15 and 16, 2003 (Figure 6 and Appendix D) shows that flow in the upper aquifer is generally from northeast to southwest. A southwestern deflection in groundwater flow occurs north of Landfill L1 and trends towards capture well TW-2, located near the southwest corner of Landfill L1. A groundwater capture zone, centered on well TW-2, encompassed the southwest corner of Landfill L1. TW-2 was in operation during water-level elevation measurement collection in 2003. Water-level measurements show the water level in TW-2 is lower than the water levels to the west in monitoring well GM-16, to the southwest in monitoring well GM-17, and to the south in monitoring well WSU-24, indicating a reversal of groundwater flow south and southwest of well TW-2.

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Table 7 presents the 2003 monthly precipitation totals, recorded by the National Weather Service, and the deviation from calculated average amounts. The 2003 annual total precipitation recorded at the Dayton, Ohio monitoring station was 43.53 inches, which was 3.95 inches above average. Precipitation for the months of January, February, March, April, and December was below normal, while precipitation for all other months was above normal.

The average hydraulic gradient of the upper aquifer, calculated from site-wide groundwater elevation measurements in September 2003 was 0.0004 foot/foot (ft/ft). The groundwater flow velocity for the upper aquifer was calculated using the following equation:

$$V_w = Ki/N_e$$

where

V_w = groundwater flow velocity (feet per day [ft/day])

K = hydraulic conductivity (ft/day)

i = hydraulic gradient (ft/ft)

N_e = effective porosity

Hydraulic characteristics of the upper aquifer were determined by evaluation of data from pumping tests conducted in 1985 and in 1989. The median hydraulic conductivity value estimated from pumping test data was 1,650 ft/day, and effective porosity was assumed to be 0.3 to 0.5. Using hydraulic gradients for September 2003, groundwater flow velocities in the upper aquifer ranged from 1.29 ft/day to 2.15 ft/day. Assuming the most extreme condition (i.e., no retardation or retardation factor [R_d] equal to 0), the rate of VOC migration could equal the rate of groundwater flow. However, it is likely that some soil-VOC interaction is occurring, and that actual VOC migration rates are slower than that of groundwater flow. Most of the VOCs detected in the upper aquifer at the GM facilities are likely to have a R_d ranging from 2 to 10 (Walton 1985), so the rate of migration of the VOCs in the upper aquifer in September 2003 could be as low as 0.13 ft/day.

During the Supplemental RFI, as part of the August 1998 investigation at the Former Oil House Area, slug tests were conducted on three monitor wells (GM-23, GM-27 and

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GM-28) to assess groundwater flow conditions in this area of the site. These slug tests determined that hydraulic conductivity in the upper aquifer in this area is lower than the hydraulic conductivity calculated on a site-wide basis. Hydraulic conductivity of the portion of the aquifer above the upper clay till at the Former Oil House Area was determined to be approximately 43 ft/day. Below the upper clay till, the hydraulic conductivity was determined to be 54 ft/day. Using hydraulic gradients from September 2003, groundwater flow velocities in the upper aquifer above the upper clay till ranged from 0.54 ft/day to 0.90 ft/day.

2.2.1.2 Lower Aquifer

The potentiometric surface (lower aquifer) on September 15 and 16, 2003 (Figure 7 and Appendix D figures for March 24 and 25, 2003 and June 23 and 24, 2003) shows groundwater flow in the lower aquifer to be generally from northeast to southwest, with a groundwater capture zone centered around well DN-13. County Well DN-13, located south of the Delphi Thermal facility in the Dryden Road North Wellfield, was in operation during water-level elevation measurement collection in 2003.

The average hydraulic gradient of the potentiometric surface in the lower aquifer, calculated from groundwater elevation measurements in September 2003 was 0.0006 ft/ft. Assuming a porosity of 0.3 to 0.5 and using the equation presented earlier ($V_w = K_i/N_e$), groundwater flow velocity in the lower aquifer ranged between 0.50 ft/day and 0.84 ft/day. As discussed above, most of the VOCs detected in the upper aquifer groundwater at the GM facilities are likely to have a R_d ranging from 2 to 10 (Walton 1985), so the rate of migration of the VOCs in the lower aquifer in September 2003 could be as low as 0.05 ft/day.

2.2.2 Vertical Gradients

The water-level measurements collected on September 15 and 16, 2003 were used to determine the direction and magnitude of vertical gradients between the upper and lower aquifers (Table 8). The magnitude and direction of vertical gradients indicate whether the potential exists for groundwater to move from one aquifer to another through a confining unit, and which direction it will move.

At the northern (upgradient) end of the site, vertical gradients were downward in shallow/deep monitoring well pairs HR- 9/HR-10 and there was no vertical gradient at well pair HR-11/HR-12 in September 2003. In 2002, the vertical gradients were downward. The vertical gradient in these monitoring well pairs have always fluctuated

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from upward to no vertical gradient to downward, with the predominant direction being upward.

In September 2003, well pairs immediately downgradient (south) of the closed North Settling Lagoon (W-3-N/HR-15, W-4-N/HR-14, HR-3/HR-13 [side gradient to the lagoon]) showed downward vertical gradients (consistent with historical data). Well pairs in the vicinity of Landfill L1 (GM-16/GM-15, GM-2/GM-1, GM-18/GM-13, GM-6/GM-3, GM17/GM-11) all showed downward vertical gradients, with the exception of well pair GM-8/GM-7R which showed an upward gradient (since June 1995 the vertical gradient was upward 50 percent of the time and downward 50 percent of the time). The downward vertical gradient at wells near Landfill L1 is likely due to the proximity of these well pairs to lower aquifer extraction well DN-13. Downgradient of the site, the vertical gradient was downward in well pair GM-26/MT69 in September 2003. The vertical gradient in well pair GM-10/GM-9 was not calculated in September 2003 due to a measurement error; however, it was downward in March 2003 and June 2003.

At AOI 7, water-level measurements in upper aquifer well pair GM-23/GM-27 (above the upper clay till/beneath the upper clay till) were used to evaluate the vertical gradient in the upper aquifer. An upward vertical gradient was present across the upper clay till in September 2003.

2.2.3 Groundwater Monitoring Analytical Results

As described in Section 2.1.4, groundwater at the site was evaluated for the presence of the site-specific list of VOCs. Tables 9 through 12 present the VOC results upgradient and downgradient of the reactive zones. Tables 13 through 16 present the bioattenuation parameter results upgradient and downgradient of the RZs. These results are discussed in Section 3.2.1 as they pertain to the performance of the RZ corrective measures. Table 17 presents the VOC results for the site-wide groundwater sampling event completed in September 2003 for the upper and lower aquifer wells. Table 18 presents the 2003 arsenic and barium results from select upper aquifer wells (HR-17, GM-28, GM-32, ME-3, GM-21, GM-6, TW-2, 4S, GM-2). Data for 1999 through 2003 groundwater sampling events are presented on Figures 8 and 9 for the upper and lower aquifer wells, respectively. The groundwater results are presented in this section and evaluated based on groundwater quality upgradient of the site, on site, and downgradient of the site. The complete set of groundwater results, including QA/QC samples, is presented in Appendix C. The 1999 baseline sampling data used

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as a point of comparison for the 2003 groundwater results are presented in Appendix A.

2.2.3.1 Upper Aquifer Groundwater Quality

The following sections include a discussion of the groundwater quality in upper aquifer monitoring wells shown on Figure 3 that are part of the site-wide program.

2.2.3.1.1 Upgradient Groundwater Quality

In 2003, two upgradient upper aquifer monitoring wells exhibited the presence of VOCs:

- HR-9, total VOCs were 70.5 micrograms per liter (ug/L) in 2003, compared to a 1999 baseline total VOC concentration of 116 ug/L.
- HR-11, total VOCs were 11.7 ug/L in 2003, compared to a 1999 baseline total VOC concentration of 17.3 ug/L.

Two key observations can be made relative to upgradient groundwater quality. First, the detected VOCs are consistent with historical values for upgradient groundwater quality as indicated in the Description of Current Conditions (DOCC) (Geraghty & Miller, Inc. 1991 and 1997b) and RFI Reports (ARCADIS Geraghty & Miller, Inc. 2000a and 2000b) for the GM Moraine facilities (including the 1999 baseline sampling results). This confirms that upgradient sources of VOCs not related to GM operations do exist in the local area. The highest concentrations of upgradient VOCs are 1,1,1-TCA, TCE and the breakdown products DCA and cis-DCE, suggesting that the upgradient releases have been migrating long enough to allow for degradation of the chlorinated VOCs 1,1,1-TCA and TCE to occur. Second, the types of VOCs detected upgradient are similar to those detected further downgradient beneath the site, indicating that total VOC concentrations detected beneath the site may be affected by both upgradient (off-site) and on-site contributions.

2.2.3.1.2 On-Site Groundwater Quality

To evaluate the primary source area of VOCs at the site, five upper aquifer monitoring wells (GM-23, GM-27, GM-28, GM-29, GM-30) were sampled in 2003. With the exception of GM-27, all of these wells are screened above the upper clay till present at the Former Oil House Area.

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- GM-30 (northern most AOI 7 well, located next to the former tank farm) - total VOC concentrations decreased from 37,350 ug/L in the 1999 baseline to 8,240 ug/L in 2003. This well predominantly contained ethylbenzene, toluene and xylenes.
- GM-23 (located next to the Former Oil House building) - total VOC concentrations increased from 17,853.3 ug/L in the 1999 baseline sampling to 20,090 ug/L in 2003. This well predominantly contained PCE, TCE, DCE, and vinyl chloride. This well is upgradient of RZ-1.
- GM-27 (paired with GM-23 and screened below the upper clay till) - exhibited a decrease of total VOCs between the 1999 baseline (145.7 ug/L) and 2003 (116 ug/L). This well is upgradient of RZ-1.
- GM-29 (serves as an upgradient well for RZ-1) - total VOC concentrations increased from 1,256.3 ug/L in the 1999 baseline to 1,796 ug/L in 2003 primarily due to an increase in daughter products; however, TCE concentrations have decreased since the baseline sampling event. This well is also upgradient/sidegradient of RZ-1.
- GM-28 (serves as the downgradient well for RZ-1; the VOC and bioattenuation parameter results for this well are discussed in greater detail in Section 3.3) - total VOC concentrations decreased from 1,292.4 ug/L in 1999 to 10.01 ug/L in 2003.

Based on historical and current groundwater flow directions, on-site wells located south of the Former Oil House Area, including wells ME-6, ME-3, GM-22, EAST, GM-21 and GM-2, are potentially hydraulically downgradient of GM-23. In addition, historical flow could have had a southwesterly trend under the influence of County pumping (i.e., at Miami Shores), which may make impacts to HR-1, W-1-S and HR-17 from the Former Oil House Area possible.

Of the wells identified as downgradient from the Former Oil House Area in the southerly direction toward the property boundary, the total VOC concentrations have decreased, as discussed below.

- ME-6, total VOCs were 944.9 ug/L in 1999 baseline, then decreasing to 86.56 ug/L in 2003.

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- ME-3, total VOCs were 159.7 ug/L in 1999 baseline, decreasing to 27.37 ug/L in 2003.
- EAST, total VOCs were 152.6 ug/L in 1999 baseline, decreasing to 95.7 ug/L in 2003.
- GM-33, total VOCs were 292.1 ug/L in 2001 (this well was installed after the baseline sampling event), decreasing to 162.12 ug/L in 2003.
- GM-35, total VOCs were 732.8 ug/L in 2001 (this well was installed after the baseline sampling event), slightly decreasing to 729 ug/L in 2003.
- GM-8, total VOCs were 150.3 ug/L in 1999 baseline, decreasing to 68.8 ug/L in 2003.
- GM-2, total VOCs were 82.9 ug/L in 1999 baseline, decreasing to 25.98 ug/L in 2003.

These data indicate that VOC concentrations in monitor wells hydraulically downgradient of the Former Oil House Area and RZ-1 decreased from the 1999 baseline to 2003. Wells GM-21 and GM-22, located south of and sidegradient to the Former Oil House Area, both exhibited increases in total VOC concentrations. In well GM-22, total VOCs were 7.6 ug/L in 1999 baseline and increased to 13.15 ug/L in 2003. In well GM-21, total VOCs were 168.9 ug/L in 1999 baseline and increased to 342.8 ug/L in 2003 (primarily due to TCE). The significance of these concentrations is further discussed in Sections 3.2 and 4.0.

The following total VOC concentrations are noted in monitor wells hydraulically downgradient of the Former Oil House Area to the southwest and upgradient of the closed South Settling Lagoon:

- HR-1, total VOCs were 114 ug/L in the 1999 baseline event, decreasing to 92.1 ug/L in 2003.
- HR-17, total VOCs were 29.1 ug/L in the 1999 baseline event, increasing to 77.65 ug/L in 2003.

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The following total VOC concentrations are noted in monitor wells hydraulically side-gradient of the Former Oil House Area to the west and east of the closed North Settling Lagoon:

- HR-2, total VOC concentrations were 15 ug/L in the 1999 baseline event, 13.06 ug/L in 2003.
- HR-3, total VOC concentrations were 12.3 ug/L in the 1999 baseline event, 25.6 ug/L in 2003.
- HR-4, total VOC concentrations were 2.6 ug/L in the 1999 baseline event, 1.26 ug/L in 2003.

Wells downgradient of the closed North (W-2-N, W-3-N, W-4-N) and South (W-2-S, W-3-S, W-4-S) Settling Lagoons (closed through in-situ solidification in 2001, after the 1999 baseline sampling event) were sampled for both the site-wide groundwater monitoring and post-closure monitoring programs. Total VOC concentrations in wells downgradient of the closed North Settling Lagoon, ranged from 3.3 ug/L to 308.9 ug/L in the 1999 baseline event and 1.3 ug/L to 115 ug/L in 2003. The detected VOCs included DCA, DCE compounds, TCE, PCE, 1,1,1-TCA, and vinyl chloride. Total VOC concentrations in wells downgradient of the closed South Settling Lagoon, ranged from 6.5 ug/L to 52.9 ug/L in the 1999 baseline event and 4.95 ug/L to 44.55 ug/L in 2003. The detected VOCs included DCA, DCE compounds, toluene, TCE, PCE, and 1,1,1-TCA. The significance of these concentrations is further discussed in Section 4.0.

As discussed in the Draft Site-Wide Groundwater Monitoring Report for 2001/2002 (ARCADIS G&M, Inc. 2003), select upper aquifer, on-site wells were sampled for arsenic and barium to confirm previous sampling data and to evaluate groundwater quality downgradient of the RZs. During the May 2003 sampling, wells HR-17, GM-28, and GM-32 were sampled for arsenic and barium. During the September 2003 sampling, wells downgradient of the RZs (GM-28, ME-3, GM-32, GM-21) and wells at the property boundary (GM-6, TW-2, 4S, GM-2) were sampled for arsenic and barium. These results are presented on Table 18. The arsenic and barium 2003 concentrations have a limited spatial extent which is consistent with the discussion presented in the Site-Wide Groundwater Monitoring Report for 2001/2002. This data is further evaluated in Appendix E.

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2.2.3.1.3 Downgradient Groundwater Quality

On-site downgradient wells (GM-6, TW-2, 4S, GM-2) and off-site downgradient wells (GM-16, GM-17, GM-18, WSU-24, GM-10) in the upper aquifer exhibited concentrations of PCE, TCE, 1,1,1-TCA and their associated daughter products. In the 1999 baseline event, total VOC concentrations in these wells ranged from 16.5 ug/L to 266.3 ug/L. In 2003, total VOC concentrations in these wells ranged from 9.57 ug/L to 178.6 ug/L. The off-site downgradient well GM-26, serves as the short-/intermediate-term goal, point of compliance well for the upper aquifer. In 1999 no VOCs were detected, while in 2003, PCE (0.85 ug/L, an estimated concentration below the laboratory reporting limit) was detected in GM-26. The decreasing concentrations in the wells downgradient of the site, compared to the RFI data (ARCADIS Geraghty & Miller, Inc. 2000a) and the 1999 baseline conditions, is likely attributable to the effects of corrective measures pumping at TW-2 which began in January 1996, pumping at DN-13, the effects of the RZs and on-going natural attenuation of the VOCs.

2.2.3.2 Lower Aquifer Groundwater Quality

This section includes a discussion of the groundwater quality in lower aquifer monitoring wells shown on Figure 4 that are part of the site-wide program. In 1999 and 2003, the upgradient lower aquifer monitor well HR-12 exhibited the presence of VOCs (total VOCs of 7.4 ug/L and 4.7 ug/L, respectively). The detected VOCs included DCA, cis-DCE, and vinyl chloride, suggesting that degradation of the chlorinated VOCs from the upgradient releases has occurred. The detected VOCs in HR-12 are consistent with historical values for upgradient groundwater quality as indicated in the DOCC (Geraghty & Miller, Inc. 1991 and 1997b) and RFI Reports (ARCADIS Geraghty & Miller, Inc. 2000a and 2000b) for the GM Moraine facilities. This confirms that upgradient sources of VOCs, not related to GM operations, do exist in the lower aquifer in the local area. Additionally, the types of VOCs detected upgradient are similar to those detected further downgradient beneath the site, indicating that total VOC concentrations detected beneath the site may be affected by both upgradient (off-site) and on-site contributions. VOCs were not detected in upgradient lower aquifer well HR-10 in 2003.

On-site lower-aquifer monitor wells that were part of the site-wide evaluation in September 2003 included HR-15, HR-13, 39, and GM-19D. Detected VOCs included PCE, TCE, 1,1,1-TCA and their associated daughter products. In 1999 (baseline conditions) the total VOC concentrations in these wells ranged from 13.5 ug/L to 70.3 ug/L. In 2003, total VOC concentrations in these wells ranged from 2.18 ug/L to 54.7 ug/L.

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In November 2003, four new lower aquifer, on-site monitoring wells were installed. These wells were installed to replace production wells 28, 31, 32, and 42 in the site-wide monitoring program. Figure 4 shows the locations of the wells in relation to the production wells and the lower aquifer monitoring well network. The boring logs and well construction logs for wells GM-39 through GM-42 are presented in Appendix B.

- GM-39 was installed to replace production well 31 (or 39), downgradient of the Former Oil House Area (AOI 7) in proximity to upper aquifer monitoring well GM-28. This well will be used to monitor groundwater quality in the northern part of the site.
- GM-40 was installed to replace production well 42, west of former Delphi Thermal Building 14 and east of Dryden Road to monitor groundwater quality in the central portion of the site.
- GM-41 was installed to replace production well 28, south of the paint building and east of Springboro Road to monitor groundwater quality in the central portion of the site.
- GM-42 was installed to replace production well 32, upgradient of the Waste Pile/Staging Area and south of former Delphi Thermal Building 14. This well will be used to monitor groundwater quality in the southern portion of the site.

Wells GM-39 through GM-42 were sampled in December 2003. Total VOC concentrations were as follows: 1.48 ug/L in GM-39, 3.1 ug/L in GM-40, 330 ug/L (predominantly TCE) in GM-41, and 13.44 ug/L in GM-42. Concentrations detected in wells GM-39, GM-40, GM-41 and GM-42 should not be compared to the production well data due to the difference in the construction of these wells. These new lower aquifer wells will be sampled on an annual basis during future site-wide sampling events and GM will continue to evaluate that data in accordance with the methodology defined for this long-term monitoring program.

On-site downgradient wells (GM-3, GM-1) and off-site downgradient wells (GM-15, GM-11, GM-20D, DN-13, GM-9) exhibited similar concentrations of total VOCs when compared to the on-site groundwater quality. In 1999 (baseline conditions) the total VOC concentrations in these wells ranged from non-detect to 115 ug/L. In 2003, total VOC concentrations in these wells decreased (total VOCs ranged from 9.2 ug/L to 37.2 ug/L). VOCs were not detected in off-site, downgradient well MT-69 in 1999 and

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2003**

General Motors Corporation
Moraine, Ohio

2003. The off-site downgradient wells GM-15, GM-11, and GM-20D, serve as the short-/intermediate-term goal, point of compliance wells for the lower aquifer.

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3. Corrective Measures Implementation and Performance

To address the source of VOCs in groundwater (AOI 7 Source Area) and the downgradient plume, GM continued to operate the corrective measures systems in 2003. This involved operation of the RZs and capture zones, as presented in Section 3.1. To meet the objectives defined in Section 4.0 of the Site-Wide Groundwater Monitoring Plan, the data collected in 2003 (described in Section 2.0 of this report) are evaluated in Sections 3.2 and 4.0 to assess the ongoing effectiveness of and the need for continuation of these corrective measures. The corrective measures performance is summarized in Section 3.2 and presented in more detail in Appendix E.

3.1 Corrective Measures Implementation

3.1.1 In-Situ Reactive Zones

The reductive dechlorination of chlorinated VOCs can be enhanced by the introduction of a carbon source that stimulates activity of indigenous microorganisms. The high carbon loading triggers a succession of microbial species. Initially, aerobic electron acceptors such as oxygen and nitrate are consumed. Then, the microbial succession leads to a consortium of species that survive by sulfate reduction, methanogenesis and other similar metabolic pathways, supporting the highly reducing conditions necessary for the dechlorination of PCE, TCE, cis-DCE, and vinyl chloride. This enhanced reductive dechlorination process has been developed at the GM Moraine site through the use of RZs for introduction of a degradable carbon source necessary to develop the desired reducing conditions.

Enhanced reductive dechlorination was implemented as a component of the Former Oil House Area corrective measures at three zones: 1) at the southern boundary of the Former Oil House Area (RZ-1); 2) at an intermediate downgradient location south of the Former Oil House Area in the ME well series area (RZ-2); and 3) at a downgradient location south of former Delphi Thermal Moraine (RZ-3 west) and the former Moraine Engine plant (RZ-3 east). The RZ locations are shown on Figure 2. The actual layouts of each RZ are shown on Figures 10, 11, and 12, and discussed below:

- At RZ-1, the molasses solution was introduced into the upper aquifer, above the upper clay till. The carbon injection level was set by screening the injection wells in the lower 10 ft of the upper aquifer, which is 4 ft to 12 ft thick. RZ-1 has 21

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introduction wells, of which 12 wells were added in 2002 to the original 9 wells, to expand RZ-1.

- RZ-2 consists of four existing monitoring wells, located along the western edge of the former Moraine Engine Plant 3 building. The RZ-2 wells were screened within the upper 3 ft of the upper aquifer.
- RZ-3 consists of 42 introduction wells, 30 wells in RZ-3 West and 12 in RZ-3 East. At RZ-3, the upper clay till is not present, and the carbon injection wells were screened from the aquifer surface to a depth of 46 ft to 68 ft, allowing carbon introduction through the entire thickness of the upper aquifer.

To sustain dechlorinating conditions within the RZs, a readily degradable carbon source solution (molasses) was periodically introduced during a 6-month period from December 1999 to May 2000. The molasses solution consisted of either a 10 to 1 or 20 to 1 mixture of potable water to feed-grade molasses that was pumped into each RZ well. The initial event, conducted in December 1999, consisted of two consecutive rounds of carbon source introductions in each RZ well. After the initial introduction event, the carbon source solution introductions were scheduled twice per month through May 2000. Due to the success during the first six months of implementing this technology, carbon source introduction activities (using a 10 to 1 mixture) continued in October, November, and December 2000, and subsequently from June 2001 through December 2001, from June 2002 through January 2003, and May 2003 through December 2003. Introductions in RZ-1 were modified in the fall of 2003 after review of the site-wide groundwater results. Due to the success of RZ-1, GM is implementing an every other month introduction routine and will periodically monitor GM-28 to ensure reducing conditions are sustaining the dechlorination process. Carbon source introductions in RZ-2 were suspended in 2003 due to the build up of carbon in the ME wells. Carbon source introductions in RZ-3 east were suspended in the summer of 2003 while the evaluation of this area is being completed. Additional discussion is presented in Appendix E.

The carbon introduction contractor, Monarch Water Systems, Inc. of Xenia, Ohio, maintained dedicated mix tanks at their Xenia facility and transported the pre-mixed solution in a dedicated tanker truck to the GM site. Details regarding the frequency and strength of carbon source introductions are provided in Table 19 for 2003.

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3.1.2 Capture Zones

The capture zone corrective measure for the upper aquifer consists of groundwater extraction at the property boundary using well TW-2; treatment through an air stripper tower; and discharge through GM's NPDES permitted outfall to the Great Miami River. Groundwater recovery from TW-2 began on January 31, 1996. During the eight years of operation (January 31, 1996 through December 31, 2003), the system has recovered and treated a total of 576,464,998 gallons of groundwater at an average flow rate of approximately 143 gallons per minute (gpm). Annual total gallons recovered and average flow rate during 2003 were 69,894,490 gallons and approximately 139.5 gpm, respectively. The location of recovery well TW-2 is shown on Figure 2.

From November 1996 through the end of this reporting period, GM has monitored the water level in TW-2 and adjusted the TW-2 flow rate as recommended in the October 1996 Monthly Technical Progress Report (Geraghty & Miller, Inc. 1996) and approved by U.S. EPA (Personal Communication, 1996). This procedure was implemented to avoid excessive drawdown within the well, which could cause damage to the well screen and/or the pump. The flow rate from TW-2 is adjusted as necessary to maintain the water level in TW-2 at least 0.5 feet above the top of the well screen. Due to higher water level elevations noted in 2003, adjustments to the flow rate were not necessary (discussed further in Section 3.2.2).

Between January 1, 2003 and December 31, 2003, the TW-2 component of the remediation system was in operation except for a period of 14 days between January 16th and 29th when the packing was replaced; a period of 10 days between February 10th and 19th when the recovery pump was pulled, cleaned, tested and reinstalled; a period of 15 minutes on March 11th to replace the blower discharge hose; a period of 1.4 hours on March 25th to replace the flow control valve; a period of 2 hours on April 21st to clean the distribution tray; a period of 25 minutes on May 5th and May 12th to replace the pressure transducer; a period of 1.8 hours on June 25th to clean the distribution tray; a period of 3.8 hours on July 25th to replace the top 10 feet of packing; a period of 3 hours on October 20th to clean the distribution tray; and a period of 7.8 hours on December 3rd to replace the tower packing.

Well DN-13 is a lower aquifer well that Montgomery County has been using in a Pump-to-Waste Program since March 1990. The capture zone corrective measure for the lower aquifer consists of continued pumping of DN-13 at a rate of 2.7 million gallons per day. Well DN-13 was operational throughout 2003 except for temporary shut downs in March (5 minutes to 15 hours), August (1 day and 12 hours), and

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October (4 days and 16 hours). As further discussed in Section 3.2.2, these temporary shut downs did not have long-term effects on the capture zone around well DN-13. The location of well DN-13 is shown on Figure 2.

3.2 Corrective Measures Performance

3.2.1 In-Situ Reactive Zones Performance Results

As described earlier in Section 3.1.1, the carbon solution delivery network consists of three reactive zones, RZ-1, RZ-2, and RZ-3 (West and East). Molasses was introduced in 2003 into the groundwater through introduction points shown on Figures 10 and 12 for RZ-1 and RZ-3, respectively. Operation of the RZs was monitored through the collection of field parameter measurements, and laboratory analyses of biogeochemical indicator parameters and VOCs, according to the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002). A detailed assessment of the effectiveness of the In-situ Reactive Zones and the results of this monitoring are presented in Appendix E and summarized below.

- Existing aquifer conditions have been converted to more reducing conditions through the introduction of a carbon source, as evidenced by the changes in field and bioattenuation parameters.
- The target compounds (PCE and TCE) have been effectively reduced to daughter products (cis-DCE and vinyl chloride) and ultimately to ethene and ethane based on a review of the VOC results.
- Levels of vinyl chloride were consistently low to non-detect in all downgradient wells, indicating degradation of cis-DCE to ethene and ethane, without production of significant vinyl chloride peaks.
- VOC concentrations at RZ-3 East may not have responded to molasses injections, in contrast to the other three reaction zone segments. TOC levels, as well as other primary and secondary operational monitoring data, indicate that the effects of molasses injections are not yet reaching MW-21, the presumed downgradient monitoring location. This is further discussed in Appendix E.

Overall, the process of enhanced reductive dechlorination at this site has been successful in achieving the desired reduction of VOC concentrations. Additional

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investigation is being conducted so that suitable corrective actions can be undertaken in RZ-3 East to achieve the desired reduction in VOCs.

3.2.2 Capture Zone Performance Results

Figures 6 and 7 and figures in Appendix D indicate that the capture zone corrective measures continue to be effective at maintaining hydraulic control at the southern end of the former Delphi Thermal Moraine site. Additionally, it should be noted that these flow maps are consistent with the flow conditions predicted by the capture zone modeling, presented on Figures 2 and 3 of the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995). A comparison of the actual groundwater flow contours in the upper and lower aquifers to the predicted flow lines from the particle tracking analysis in the upper aquifer and the predicted zones of capture for DN-13 in the upper and lower aquifers indicates that the predicted influence within each aquifer at the southern end of the former Delphi Thermal Moraine site is being achieved by the corrective measures pumping.

Seasonal weather conditions vary throughout the year and this variation will have an impact on the groundwater elevations observed at the site (Table 7). The observed elevation differences in 2003 are a result of the above average precipitation in 2003. Water-level elevations in TW-2 are regularly monitored to ensure the water level does not fall below the well screen. If the water level approaches the well screen, the pumping rate is reduced for protection of the pump. Due to higher groundwater elevation in 2003, pumping rate adjustments were not necessary as discussed previously in Section 3.1. The pumping rate for DN-13 was not adjusted; therefore, only seasonal variations influence water level elevations at DN-13. Effective capture has been maintained in spite of seasonal variations in both the upper and lower aquifers.

Figure 5 presents a graph of the influent concentration of total chlorinated VOCs and benzene, toluene, ethylbenzene, and xylene (BTEX) compounds in TW-2 since start up of the recovery and treatment system in January 1996. The data shows a steady decline in total chlorinated VOCs and a significant decrease in BTEX concentrations. The data indicates that the remediation at the site is continuing to provide VOC mass reduction downgradient of RZ-3 West.

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4. Corrective Action Completion Strategy

4.1 Effectiveness of Corrective Measures Activities

4.1.1 Background and Objectives

The goal of the corrective measures at this Site is to reduce existing site-related groundwater concentrations to levels that are protective of reasonably expected future uses of groundwater. GM's approach for achieving this goal is being met through a combination of interim and corrective measures that achieve plume migration control, reduce existing plume concentrations, and monitor performance of these measures. Once on-site groundwater concentrations are reduced sufficiently by active corrective measures to ensure continued protection of reasonably expected groundwater uses, some or all of the active measures will be terminated. Groundwater monitoring as described in the Site-Wide Groundwater Monitoring Plan will continue to verify that groundwater conditions remain acceptable, and that ultimately, groundwater concentrations at the downgradient property boundary decline below appropriately protective levels (i.e., appropriate for the protection of the groundwater resource and its reasonably expected future uses). Data have been acquired during the implementation of the site-wide groundwater monitoring program to evaluate progress towards achieving this goal.

The need for continued operation of the remedial measures described in Section 2 will be determined based on achieving and maintaining the following conditions:

1. Upper aquifer: consistent with the criterion stated in the approved RCRA Corrective Action Environmental Indicator Determination – Migration of Contaminated Groundwater Under Control (CA 750), the condition to be met in the upper aquifer is no migration of VOCs at concentrations exceeding appropriately protective levels (i.e., appropriate for the protection of the groundwater resource and its reasonably expected future uses as characterized in the RFI) beyond the existing area of contaminated groundwater. Based on the groundwater conditions established during the September 1999 baseline sampling event, the short-/intermediate-term goal is to use existing well GM-26 as the monitoring point or point of compliance (POC) for ensuring that this condition is maintained.
2. Lower aquifer: consistent with the goal to maintain a usable aquifer, including off-site drinking water use, the condition to be met in the lower aquifer is no VOC

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concentrations exceeding MCLs or equivalent risk-based drinking water concentrations in the lower aquifer beyond the existing area of contaminated groundwater. Based on the groundwater conditions established during the September 1999 baseline sampling event, the short-/intermediate-term goal is to use existing wells GM-15, GM-11, and GM-20D as the monitoring points or POCs for ensuring that this condition is maintained.

Once on-site groundwater concentrations are reduced sufficiently by active measures to be protective of reasonably expected future uses, some or all of these active measures will be terminated. Following termination of any active measures, GM will continue its groundwater monitoring program to confirm that the conditions in the upper and lower aquifer continue to be met without these active measures. GM's long-term goal is to reduce the off-site groundwater concentrations to below appropriately protective levels so that the monitoring points can be shifted to the downgradient facility boundary.

4.1.2 Methodology

In accordance with the Site-Wide Groundwater Monitoring Plan, groundwater data are compared to remediation target levels (RTLs) developed to ensure compliance with the above-stated conditions without active corrective measures. As defined in the Site-Wide Groundwater Monitoring Plan, these RTLs have been calculated using the groundwater assessment methods developed in the Baseline and Supplemental Baseline Risk Assessments (ENVIRON 2000a, b) taking into consideration the current pumping conditions at and in the vicinity of the facility. Specifically, the MODFLOW groundwater flow model (Geraghty & Miller, Inc. 1994) developed for Delphi Thermal Moraine and the surrounding region (including former Moraine Engine and Moraine Assembly) is used to support estimation of RTLs equal to concentrations in on-site groundwater at locations downgradient of AOI 7 that would not be expected to result in exceedances of the MCL at the designated monitoring points. Using this approach and considering the scope of the annual groundwater monitoring program, GM developed RTLs for the following remediation monitoring zones in both the upper and lower aquifer at and downgradient of AOI 7:

- Upper Aquifer

- AOI 7, Shallow: the AOI 7 source area (wells GM-23, GM-29 and GM-30),
- Zone S1: the monitoring zone immediately downgradient of RZ-1 (well GM-28),

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- Zone S1 to Zone S2: the monitoring zone between RZ-1 and RZ-2 (wells GM-28, ME-6),
- Zone S2: the monitoring zone immediately downgradient of RZ-2 (wells ME-6, ME-3, GM-31),
- Zone S2 to Zone S3: the monitoring zone between RZ-2 and RZ-3 (wells ME-6, ME-3, GM-31, GM-22, GM-19S, EAST, GM-33, GM-35),
- Zone S3: the monitoring zone immediately downgradient of RZ-3 (wells GM-32, GM-21),
- Zone S3 to GM-10: the monitoring zone between RZ-3 and GM-10 (wells GM-32, GM-21, GM-8, GM-6, 4S, GM-2, GM-16, GM-18, WSU-24, and GM-10),
- GM-10: the monitoring zone downgradient of RZ-3 (well GM-10), and
- POC Shallow: monitoring at well GM-26.

■ Lower Aquifer

- AOI 7, Deep: the AOI 7 source area (wells GM-23, GM-29, and GM-30),
- Zone D1: the monitoring zone encompassing GM-19D,
- Zone GM-40/41: the monitoring zone encompassing GM-40 and GM-41,
- Zone GM-42: the monitoring zone encompassing GM-42,
- Zone D2: the monitoring zone encompassing wells GM-1 and GM-3, and
- POC Deep: monitoring at wells GM-11, GM-15 and GM-20D.

The following steps were conducted to assess the site-wide monitoring data for the purpose of determining the extent to which each remedial measure is contributing to achievement of the conditions outlined above for the upper and lower aquifers:

- Groundwater pumping conditions at the facility and surrounding area were reviewed to confirm that the basis for the RTLs remain valid. As discussed in Section 3, groundwater flow patterns remain the same as those evaluated during the RFI, thus indicating that RTLs developed based on the RFI flow conditions remain valid. Additional RTLs were calculated for new lower aquifer wells GM-40, GM-41, and GM-42.

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- Mean constituent concentrations in each remediation monitoring zone were calculated based on data collected during the 2003 monitoring period. One-half sample quantitation limits were used for non-detect results.
- Minimum, mean and maximum constituent concentrations were compared against the RTLs developed for each remediation monitoring zone.

4.1.3 Results

The results for groundwater quality data collected in 2003 in each remediation monitoring zone wells are discussed in Section 2.2.3. A comparison of the site-specific parameter minimum, mean and maximum concentrations in each remediation monitoring zone to the RTLs is presented on Table 20. These results and relative change in these results in comparison with the 2002 monitoring period are discussed below. For reference, Table 20 also presents a comparison with the results from the 1999 baseline sampling event.

The comparison of the 2003 shallow zone monitoring data with the RTLs indicates the following:

AOI 7, Shallow (wells GM-23, GM-29 and GM-30):

- As compared to 2002, the maximum concentrations of PCE and vinyl chloride in the source area have increased and remain above the RTLs.
- As compared to 2002, the maximum concentration of TCE in the source area has decreased and is now below the RTL.
- As compared to 2002, the average concentrations of PCE, TCE and vinyl chloride have increased, however, only the average concentration of PCE exceeds the RTL.

Zone S1 (well GM-28):

- As compared to 2002, all concentrations remain below the RTLs.

Zone S1 to S2 (wells GM-28, ME-6):

- As compared to 2002, all concentrations remain below RTLs.

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Zone S2 (wells ME-6, ME-3, GM-31):

- As compared to 2002, all concentrations remain below the RTLs.

Zone S2 to S3 (wells ME-6, ME-3, GM-31, GM-22, GM-19S, EAST, GM-33, GM-35):

- As compared to 2002, the maximum concentrations of TCE and vinyl chloride have increased. Similar to 2002, the maximum TCE concentration remains above the RTL. Unlike 2002, the maximum concentration of vinyl chloride now exceeds the RTL.
- As compared to 2002, the average concentrations of TCE and vinyl chloride have increased but remain below the RTLs.

Zone S3 (wells GM-32, GM-21):

- As compared to 2002, the maximum concentration of TCE did not significantly increase and remains above the RTL.
- As compared to 2002, the average concentration of TCE in this zone has increased to a concentration in which it now is greater than the RTL.

Zone S3 to GM-10 (wells GM-32, GM-21, GM-8, GM-6, W-4-S, 4S, GM-2, GM-16, GM-18, WSU-24, and GM-10):

- As compared to 2002, the maximum concentration of PCE has decreased but remains at a level greater than the RTL.
- As compared to 2002, the maximum concentration of TCE has increased and remains at a level greater than the RTL.
- As compared to 2002, the average PCE concentration has increased but remains at a level below the RTL.
- As compared to 2002, the average TCE concentration has increased and is now at a level greater than the RTL.

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GM-10:

- As compared to 2002, the detected concentration of TCE has decreased but remains at a level above the RTL.

POC Shallow (GM-26):

- Consistent with 2002, all concentrations remain below the RTLs.

The comparison of the 2003 deep zone monitoring data with the RTLs indicates the following:

AOI 7, Deep (wells GM-23, GM-29, and GM-30):

- As compared to 2002, the maximum concentration of cis-1,2-DCE has decreased to a level below the RTL.
- As compared to 2002, the maximum concentrations of PCE and vinyl chloride have increased and remain above the RTLs.
- As compared to 2002, the maximum concentration of TCE has decreased but remains above the RTL.
- As compared to 2002, the average PCE and vinyl chloride concentrations have increased to levels above the RTLs.

GM-19D:

- As compared to 2002, the maximum and average concentrations for TCE have increased to levels now exceeding RTLs.
- As compared to 2002, the maximum concentration for vinyl chloride has increased to a level now exceeding RTL.

Zone GM-40/41:

- The maximum and average concentrations for TCE exceed the RTL. (These wells were installed in November 2003, and as such, there is not a point of comparison to prior sampling events).

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Zone GM-42:

- All concentrations are below RTLs. (This well was installed in November 2003, and as such, there is not a point of comparison to prior sampling events).

Zone D2 (Well GM-1 and GM-3):

- As compared to 2002, the maximum concentration for TCE has decreased but remains at a level above the RTL.
- As compared to 2002, the average concentration for TCE exceeds the RTL.

POC Deep (GM-11, GM-15 and GM-20D):

- As compared to 2002, the maximum concentration for TCE has decreased but remains at a level exceeding the RTL.
- As compared to 2002, the average concentration for TCE has increased to a level which now exceeds the RTL.

As indicated by the comparison of groundwater monitoring data with RTLs, concentrations at the upper aquifer POC well remain below RTLs. However, concentrations in the monitoring zone immediately upgradient of the upper aquifer POC, as well as concentrations at the lower aquifer POC wells are above the RTLs. Therefore, active corrective measures are still required to maintain the short-term objective in the upper aquifer, and to achieve the short-term corrective action objective in the lower aquifer.

Concentrations in the AOI 7 area remain above levels necessary to achieve the RTLs at the downgradient upper and lower aquifer POCs. However, concentrations downgradient of RZ-1 are below the RTLs, thus indicating that RZ-1 has been effective at remediating groundwater impacts from AOI 7 in the upper aquifer. Continued corrective measures are also required downgradient of RZ-1 (i.e., at RZ-3) to address residual impacts in the downgradient upper aquifer plume area.

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4.2 Monitoring of Land-Based Waste Management Units

4.2.1 Background and Objectives

One component of the site-wide groundwater monitoring program is monitoring of other specific units (i.e., the closed lagoons). Although the RFI and Supplemental RFI determined that the wastes at these units do not contribute constituents to groundwater at levels that would have a significant effect on current and reasonably expected future groundwater uses, the monitoring program includes monitoring wells that are used to confirm these findings. In addition, the Site-Wide Groundwater Monitoring Plan was developed to meet the objectives of post-closure monitoring for the closed North and South Settling Lagoons.

4.2.2 Methodology

As indicated above, this site-wide monitoring program was developed to meet the objectives of RCRA corrective action and the post-closure groundwater monitoring requirements for the closed lagoons. The site-wide program will monitor potentially significant contributions of hazardous waste constituents to existing groundwater quality from the closed lagoons. To determine if the closed lagoons may be significant contributors of hazardous waste constituents to existing groundwater concentrations, monitoring data collected from the designated post-closure monitoring wells located downgradient of each of the closed lagoons are to be evaluated for temporal trends. The approach proposed in the Site-Wide Groundwater Monitoring Plan for this assessment includes, as an initial approach, the application of straight line regression to determine if the data suggests a strong positive correlation.

In addition, in accordance with the Site-Wide Groundwater Monitoring Plan, the monitoring wells located immediately downgradient of the in-place waste management units are evaluated to determine whether these units are significantly affecting groundwater quality. Specifically, the potential health significance of constituents detected in monitoring wells immediately downgradient of these units to current and reasonably expected groundwater uses on-site and off-site are evaluated using the groundwater assessment methods developed in the Supplemental RFI Baseline Risk Assessment (ENVIRON 2000b). If this evaluation identifies detected concentrations that indicate one of these units may be having a potentially significant impact on downgradient groundwater quality, then a review of groundwater quality from monitoring wells upgradient and downgradient of the particular unit will be conducted to identify whether this unit is affecting groundwater quality. The monitoring wells

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identified in the Site-Wide Groundwater Monitoring Plan for monitoring each of the waste management units are:

- Closed North Settling Lagoon: HR-5, W-2-N, W-3-N, and W-4-N.
- Closed South Settling Lagoon: W-2-S, W-3-S, and W-4-S.
- Landfill L1: TW-2, GM-6, and 4S.
- Landfill L2: W-4-N and HR-2.
- Landfill L3: W-4-N, HR-2, and HR-4.

Consistent with the groundwater exposure evaluation conducted for the Supplemental Baseline Risk Assessment, groundwater concentrations reported for each set of downgradient monitoring wells are assumed to represent source concentrations associated with each unit. These source concentrations are combined with source reduction factors developed for the base case exposure scenario (i.e., current groundwater use conditions without corrective measures pumping) to estimate exposure concentrations at the points of groundwater use (e.g., downgradient municipal well fields and on-site industrial wells). For the current evaluation, the maximum concentrations detected during the 2003 sampling events in each set of monitoring wells are used as the source concentration. The estimated exposure concentrations are then compared with MCLs or risk-based equivalent drinking water levels (EDWLs).

4.2.3 Results

As proposed in the Site-Wide Groundwater Monitoring Plan, post-closure monitoring data collected from those wells assigned to the closed North and South Settling Lagoons are to be evaluated for temporal trends. Data considered in the evaluation included results from the September 2003 monitoring event and data ranging back to the initial post-closure monitoring event conducted in November 2001. Currently, the data set collected since the lagoons were closed includes only three data points for any monitoring well/constituent pair, and therefore, no regression analysis was performed. Using the methodology developed in the RFI baseline risk assessment for assessing potential impacts to groundwater receptors from releases at the Moraine facilities, GM determined that the data from the wells downgradient of the closed North and South

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Settling Lagoons do not indicate that these units are significantly affecting groundwater quality.

The potential significance of concentrations detected during the 2003 sampling event in each set of downgradient monitoring wells for the lagoons and landfills were assessed. Based on the maximum concentrations detected during the 2003 sampling event at each of these units, exposure concentrations at water supply wells representing current pumping conditions were estimated. The estimated combined groundwater concentrations at each of the receptor wells are presented on Table 21 in comparison with MCLs or EDWLs. As shown on Table 21, the maximum concentrations detected downgradient of each of the land-based waste disposal units do not contribute significantly to concentrations at these points of potential exposure. Therefore, the data from the wells downgradient of the waste management units indicate that these units are not significantly affecting groundwater quality. Supporting calculations for this assessment are provided in Appendix F.

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5. Conclusions and Recommendations

This summary report presents the groundwater monitoring activities completed in 2003 at the GM Moraine Facilities located in Moraine, Ohio. This sampling was conducted to meet the five objectives presented in Section 1.2. Compliance with these objectives is presented for the waste management units, interim/corrective measures, and on-going site-wide groundwater monitoring in the following sections.

5.1 Land-Based Waste Management Units

As proposed in the Site-Wide Ground Water Monitoring Plan (ARCADIS G&M, Inc. 2002), monitoring data collected immediately downgradient of the closed North and South Settling Lagoons, and Landfills L1, L2 and L3 were evaluated to determine if these units may be contributing constituents to groundwater at levels that would have a significant effect on current and reasonably expected future groundwater uses. Using the methodology developed in the RFI baseline risk assessment for assessing potential impacts to groundwater receptors from releases at the Moraine facilities, the potential significance of observed groundwater concentrations downgradient of these units was evaluated. This evaluation determined that data from the wells downgradient of the in-place waste management units indicate that these units are not significantly affecting groundwater quality.

Based on the results from the 2003 monitoring, no changes in the monitoring program for the waste management units are proposed.

5.2 Corrective Measures Performance

GM's approach for achieving its corrective action goals for the Moraine facilities is through a combination of corrective measures (in-situ treatment and hydraulic control) designed to reduce existing plume concentrations thereby achieving plume reduction and migration control.

5.2.1 In-Situ Treatment

Groundwater quality monitoring at and downgradient of the reductive dechlorination treatment zones indicates that this in-situ treatment program has been effective at reducing VOC concentrations in groundwater. As observed during the 2003 monitoring, the upper aquifer conditions in the areas downgradient of the in-situ reactive zones have been converted to more reducing conditions through the

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introduction of a carbon source, as evidenced by the changes in field and bioattenuation indicator parameters. Further, the VOC results indicate that the target compounds (PCE and TCE) have been effectively reduced to daughter products (cis-DCE and vinyl chloride) and ultimately to ethene and ethane.

Overall, the process of enhanced reductive dechlorination at this site has been successful in achieving the desired reduction of VOC concentrations. However, GM is conducting additional investigations so that suitable modifications can be undertaken in RZ-3 East to achieve the desired reduction in VOCs downgradient of this area.

5.2.2 Hydraulic Control

Groundwater elevation monitoring indicates that the capture zone corrective measures continue to be effective at maintaining hydraulic control in both the upper and lower aquifers at the southern end of the former Delphi Thermal Moraine. Additionally, the observed flow conditions are consistent with the conditions predicted by the capture zone modeling performed in developing the interim measures pumping plan, confirming the continued utility of the previously developed groundwater flow model as a predictive tool.

Based on the effective performance of the pumping program during the 2003 monitoring and exceedences of RTLs at AOI 7 and in Zones S2 to S3, S3, S3 to GM-10, D1, D2, and monitoring points in the deep aquifer (GM-11, GM-15, GM-20D), no changes to the hydraulic control component of the ongoing corrective measures are proposed at this time.

GM's ongoing groundwater monitoring program includes the assessment of changes in site-specific VOCs in both the upper and lower aquifer at locations upgradient of the GM Moraine facilities, as well as on-site and downgradient of the facilities. Data collected from upper and lower aquifer wells located upgradient of the facilities confirms that upgradient sources of VOCs, not related to GM operations, do exist in the local area. Notwithstanding these upgradient contributions of VOCs to on-site groundwater, the monitoring data indicate a site-wide decrease in VOC concentrations since the baseline sampling event conducted in 1999. In addition, VOC concentrations at the off-site downgradient upper aquifer well GM-26 (the short-/intermediate-term goal point of compliance well for the upper aquifer) remained below MCLs. Concentrations of VOCs (TCE) remained above MCLs in downgradient lower aquifer wells GM-11, GM-15 and GM-20D (the short-/intermediate-term goal point of compliance wells for the lower aquifer).

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The decreasing concentrations in the wells downgradient of the site, compared to the RFI data, is likely attributable to the effects of corrective measures pumping at TW-2 which began in January 1996, pumping at DN-13, and on-going enhanced natural attenuation of the VOCs. However, concentrations in the monitoring zone immediately upgradient of the upper aquifer POC, as well as concentrations at the lower aquifer POC wells are above the RTLs. Therefore, active corrective measures are still required to maintain the short-term objective in the upper aquifer, and to achieve the short-term corrective action objective in the lower aquifer.

Based on the evaluation of the site-wide groundwater quality, both the in-situ treatment and hydraulic control components of the corrective action program will be continued.

5.3 Reassessment of Site-Wide Groundwater Monitoring Program

In accordance with the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002), groundwater monitoring was conducted in 2003 to evaluate groundwater quality upgradient and downgradient of the closed lagoons and landfills, performance of the in-situ reactive zones, and performance of the capture zones. Based on the data collected during the 2003 monitoring period, GM believes that the monitoring program defined for the upper aquifer, in terms of the monitoring locations, the constituents monitored and the frequency of monitoring, continue to provide sufficient data for a comprehensive evaluation of these corrective action goals. As discussed on the Site-Wide Groundwater Monitoring Report for 2001/2002, GM will continue monitoring arsenic and barium downgradient of the reactive zones (upper aquifer wells GM-28, ME-3, GM-32, and GM-21) and at the property boundary wells (upper aquifer wells GM-6, TW-2, 4S, and GM-2). These constituents will be included in the site-wide monitoring program for the 2004 sampling events to continue demonstrating that the random detection of these two metals does not pose a concern at this site.

Based on the data collected during the 2003 monitoring period, GM believes that the monitoring program defined for the lower aquifer, in terms of the monitoring locations, the constituents monitored and the frequency of monitoring, continue to provide sufficient data for a comprehensive evaluation of these corrective action goals in regard to evaluating the downgradient point of compliance performance goals. The replacement wells GM-39, GM-40, GM-41 and GM-42 will be sampled during future site-wide monitoring events. The updated site-wide groundwater monitoring program summary is presented in Table 22.

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Table 1. Site-Wide Groundwater Monitoring Events in 2003, General Motors Corporation, Moraine, Ohio.

May 2003 Semi-Annual Groundwater Sampling

Site-specific list of VOCs⁽¹⁾, field parameters⁽²⁾, and biogeochemical parameters⁽³⁾ were analyzed during this sampling event from the following upper aquifer monitoring wells:

GM-30	ME-6	EAST
GM-23	ME-3	GM-32
GM-29	GM-22	GM-21
GM-28	GM-19S	HR-17

Notes:

Samples from wells GM-28 and GM-32 were also analyzed for arsenic and barium. The sample from well HR-17 was only analyzed for arsenic and barium.

September 2003 Site-Wide Annual Groundwater Sampling

Site-specific list of VOCs⁽¹⁾ and field parameters⁽²⁾ were analyzed during these sampling events from the following upper aquifer monitoring wells. Biogeochemical parameters⁽³⁾ were analyzed at wells denoted with an asterisk(*):

W-2-N	HR-11	GM-16	GM-22*
W-3-N	HR-17	GM-17	GM-23*
W-4-N	W-2-S	GM-18	GM-26
HR-1	W-3-S	GM-19S*	GM-27
HR-2	W-4-S	EAST*	GM-28*
HR-3	GM-2	WSU-24	GM-29*
HR-4	TW-2	ME-3*	GM-30*
HR-5	GM-6*	ME-6*	GM-31
HR-8	GM-8*	GM-21*	GM-32*
HR-9	GM-10		

Notes:

Samples from wells GM-28, ME-3, GM-21, GM-32, GM-6, TW-2, 4S, and GM-2 were also analyzed for arsenic and barium.

Site-specific list of VOCs⁽¹⁾ were analyzed during this sampling event from the following list of lower aquifer monitoring wells:

HR-10	GM-19D	GM-15	GM-9
HR-12	GM-3	GM-11	MT69
HR-13	GM-1	GM-20D	
HR-15	39	DN-13	

December 2003 Deep Well Groundwater Sampling

Appendix IX VOCs and cis-1,2-DCE were analyzed during this sampling event from the following list of lower aquifer monitoring wells installed in November 2003:

GM-39	GM-40	GM-41	GM-42
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DN-13 Monthly Groundwater Sampling

Appendix IX VOCs and cis-1,2-DCE were analyzed during these sampling events from DN-13.

Table 1. Site-Wide Groundwater Monitoring Events in 2003, General Motors Corporation, Moraine, Ohio.

Air Stripper Tower Influent and Effluent Monthly Groundwater Sampling

Benzene, chloroethane, 1,1-dichloroethane, trans-1,2-dichloroethene, ethylbenzene, tetrachloroethene, toluene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride, and xylenes were analyzed during the influent sampling events from the air stripper tower. The stripping tower effluent sample was analyzed for oil and grease and the following list of VOCs: benzene, chloroethane, 1,1-dichloroethane, cis-1,2-dichloroethene, trans-1,2-dichloroethene, ethylbenzene, tetrachloroethene, toluene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride, and xylenes.

1. Site-specific list of VOCs includes: benzene, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, ethylbenzene, tetrachloroethene, toluene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride, and xylenes.
2. Field parameters include: pH, specific conductivity, dissolved oxygen, oxidation reduction potential, and temperature.
3. Biogeochemical parameters include: manganese (total and dissolved), iron (total and dissolved), sulfate, sulfide, total organic carbon, chlorides, ethane, ethene, and methane.

<u>Parameter</u>	<u>Analytical Method</u>
Site-specific list of VOCs	EPA Method 8260B
Manganese, total and dissolved	EPA Method 6010B
Iron, total and dissolved	EPA Method 6010B
Sulfate	SM 375.4
Sulfide	SM 376.1
Total Organic Carbon	SM 415.1
Chlorides	SM 325.2
Ethane, Ethene, Methane	Method AM18G

Table 2. Air Permit Influent Monitoring of the Air Stripper Tower for 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compound ¹	Units	1/06/03	2/06/03	3/04/03	4/02/03	5/05/03	6/03/03	7/02/03	8/04/03	9/02/03	10/01/03	11/03/03	12/04/03
Benzene	ug/L	1.4	2.1	1.7	<2.0	1.6	1.5	1.6	1.2	1.6	1.4	1.4	1.4
Chloroethane	ug/L	5.2	8.9	5.8	5.1	6.2	6.2	8.4	6.1	8.5	6.2	6.9	5.2
1,1-Dichloroethane	ug/L	26	28	22	20	18	15	15	13	16	13	11	14
trans-1,2-Dichloroethene	ug/L	2.3	2.3	2.0	1.7	1.6	1.4	1.5	0.99	1.3	<0.50	1.1	1.2
Ethylbenzene	ug/L	2.4	2.3	3.2	2.6	3.3	3.2	3.9	1.8	1.4	1.2	2.0	2.4
Tetrachloroethene	ug/L	8.4	8.7	9.6	9.3	8.2	8.5	9.7	8.8	8.6	7.3	7.5	9.8
Toluene	ug/L	<1.2	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/L	<1.2	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/L	35	31	30	33	26	26	25	31	26	21	18	23
Vinyl chloride	ug/L	3.1	3.5	4.0	2.2	1.8	1.8	2.0	2.3	1.9	1.4	1.4	1.8
Xylenes	ug/L	<1.2	<1.0	1.1	<2.0	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	1.4
Total VOCs²	ug/L	83.8	86.8	79.4	73.9	68.8	63.6	67.1	65.2	65.3	51.5	50.4	60.2

1 Analytical method for VOC analysis is SW-846 Method 8260B.

2 Permit Limit 850 ug/L.

All concentrations in micrograms per liter (ug/L) as reported by the laboratory. As of June 20, 2003, the air permit is a registration status permit.

Table 3. NPDES Permit Effluent Monitoring of the Air Stripper Tower for 2003, General Motors Corporation, Moraine, Ohio.

Draft

Constituent	Units	Permit Limit ⁴	1/06/03	2/06/03	3/04/03	4/02/03	5/05/03	6/03/03	7/02/03	8/04/03	9/02/03	10/01/03	11/0/03	12/04/03
Oil & Grease ¹	mg/L	10 mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	19.3/≤5.0 ⁵	<5.0	<5.0	<5.0	<5.0	<5.0
pH ²	S.U.	6.5 - 9.0 S.U.	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.2	8.2	8.3	7.8	8.0
VOCs³														
Benzene	ug/L	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/L	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	1.9	<1.0
1,1-Dichloroethane	ug/L	10	7.7	<1.0	1.2	2.0	<1.0	1.4	4.6	<1.0	<1.0	<1.0	4.6	<1.0
cis-1,2-Dichloroethene	ug/L	10	7.4	<0.50	1.4	1.9	<0.50	1.2	4.0	<0.50	<0.50	0.83	4.5	<0.50
trans-1,2-Dichloroethene	ug/L	10	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.5	<0.5	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/L	10	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	1.8	<1.0	<1.0	<1.0	1.9	<1.0
Toluene	ug/L	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/L	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/L	10	7.7	<1.0	1.5	2.8	<1.0	1.9	5.9	<1.0	<1.0	1.1	6.1	<1.0
Vinyl Chloride	ug/L	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/L	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

mg/L Milligrams per Liter.

S.U. Standard Units.

ug/L Micrograms per Liter.

1 Analytical method for oil & grease is EPA 1664A.

2 Analytical method for pH is EPA 150.1.

3 Analytical method for VOC analysis is SW-846 Method 8260B.

4 Final permit limit of 10 ug/L for VOCs effective February 2003. Permit limit of 5 ug/l for benzene, toluene, and ethylbenzene effective in January 2003.

5 The effluent was resampled on July 25, 2003 and the result was <5.0.

Table 4. DN-13 Monthly Monitoring for 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compound ¹	Units	1/06/03	2/06/03	3/04/03	4/14/03	5/05/03	6/03/03	7/02/03	8/04/03	9/02/03	10/01/03	11/03/03	12/04/03
Acetone	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acetonitrile	ug/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Acrolein	ug/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Acrylonitrile	ug/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Allyl chloride	ug/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Benzene	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Butanone	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroprene	ug/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Dibromochloromethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromomethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dichlorodifluoromethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dibromo-3-chloropropane	ug/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
1,2-Dibromoethane (EDB)	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,4-Dichloro-2-butene	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	ug/L	2.5	2.6	2.1	2.4	2.5	2.5	2.3	2.2	2.5	2.4	2.0	2.2
1,2-Dichloroethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis-1,2-Dichloroethene	ug/L	6.7	7.3	6.1	6.5	6.7	6.9	6.9	6.1	6.7	6.9	6.0	6.6
trans-1,2-Dichloroethene	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Table 4. DN-13 Monthly Monitoring for 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compound ¹	Units	1/06/03	2/06/03	3/04/03	4/14/03	5/05/03	6/03/03	7/02/03	8/04/03	9/02/03	10/01/03	11/03/03	12/04/03
trans-1,3-Dichloropropene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dioxane	ug/L	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Ethyl methacrylate	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Iodomethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Isobutyl alcohol	ug/L	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Methacrylonitrile	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methylene chloride	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-pentanone	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methyl methacrylate	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Propionitrile	ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Styrene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1,2-Tetrachloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/L	1.1	1.2	<1.0	1.1	1.1	1.2	1.2	<1.0	1.1	<1.0	<1.0	1.1
1,1,2-Trichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/L	6.2	7.1	5.4	6.3	6.1	6.3	6.6	5.6	6.3	5.3	5.6	5.9
Trichlorofluoromethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichloropropane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl acetate	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Vinyl chloride	ug/L	1.6	1.7	1.3	1.4	1.2	1.2	1.5	<1.0	1.5	1.1	1.4	1.2
Xylenes (total)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs	ug/L	18.1	19.9	14.9	17.7	17.6	18.1	18.5	13.9	18.1	15.7	15.0	17.0

1 Analytical method for VOC analysis is SW-846 Method 8260B.
All concentrations in micrograms per liter (ug/L) as reported by the laboratory.
< - Value below laboratory reporting limits.

Table 5. Monitoring Well Construction Details, General Motors Corporation, Moraine, Ohio.

Well ID #	Surface Elevation ft msl	TOC Elevation ft msl	Well Diameter Inches	Screened Interval ft bls	Total Well Depth ft bls	Northing y	Easting x
<u>Shallow Aquifer Wells</u>							
W-1-N	737.61	739.02	4	36-71	71	6618	5037
W-2-N	729.68	731.68	4	35-60	60	5264	4744
W-3-N	731.98	733.66	4	34-58	58	5157	5032
W-4-N	729.88	731.63	4	41-66	66	5157	5224
HR-1	730.10	732.71	2	49-59	59	3420	5205
HR-2	732.62	734.75	2	47-57	58	5209	5455
HR-3	734.31	736.75	2	51-61	61	5211	5648
HR-4	740.61	742.60	2	55-65	67	6111	5214
HR-5	730.95	734.27	2	52-57	58	4760	4985
HR-6	730.18	732.66	2	45-55	55	4009	4985
HR-7	731.00	731.73	2	47-57	57	4743	4678
HR-8	740.84	743.42	2	56-66	66	6819	5626
HR-9	741.00	743.51	2	60-70	70	7669	5508
HR-11	740.90	743.33	2	59-69	69	7313	6207
HR-16	724.60	727.01	4	42-62	65	2354	4198
HR-17	725.40	726.43	4	27-47	48	2457	4776
W-1-S	728.23	729.29	4	25-60	60	2777	4958
W-2-S	725.01	726.64	4	30-65	67	1786	4207
W-3-S	731.47	733.42	4	36-76	78	1678	4386
W-4-S	726.66	727.68	4	30-70	71	1671	4783
GM-2	NM	735.81	2	47-57	57	1102	5803
4S	NM	731.36	4	30-65	65	1071	5564
GM-6	NM	730.27	2	37-47	47	1042	5306
GM-8	NM	735.17	2	42-52	52	1283	5285
GM-10	NM	723.90	2	40-50	50	162	5258
GM-16	NM	725.30	2	48-58	58	652	4566
GM-17	NM	723.84	2	40-50	50	672	5174
GM-18	NM	723.80	2	45-55	55	583	4993
GM-19S	NM	730.85	2	49-59	59	1767	5274
EAST	NM	730.98	2	NA	71	2120	5818
WEST	NM	731.08	2	NA	52	2004	5463
WSU-24	NM	725.10	2	NA	66	574	5663
WS-17	NM	726.18	2	NA	66	970	5279

Table 5. Monitoring Well Construction Details, General Motors Corporation, Moraine, Ohio.

Well ID #	Surface Elevation ft msl	TOC Elevation ft msl	Well Diameter Inches	Screened Interval ft bls	Total Well Depth ft bls	Northing y	Easting x
<u>Shallow Aquifer Wells</u>							
WS-18	NM	733.52	2	NA	61	1004	5458
WS-19	NM	726.62	2	NA	62	1182	5212
TW-2	NM	733.38	10	35-45	45	1027	5337
RW-10	729.29	728.53	4	22-32	35	2147	5751
RW-11	730.02	729.74	4	22-32	37	2121	5773
GM-21	723.79	723.50	2	22-32	54	1449	6079
GM-22	731.84	731.63	2	44-54	60	2531	6285
GM-23	NM	731.00	2	47-57	35	5393	6018
GM-24	747.61	747.29	2	24-34	70	8122	7812
GM-25	747.05	746.17	2	58-68	58	4930	8170
GM-26	722.29	722.29	2	48-58	60	-988	4961
GM-27	731.03	730.57	2	50-60	58	5393	6029
GM-28	NM	738.02	2	40-50	41	5041	5916
GM-29	731.31	730.78	2	31-41	38	5209	5974
GM-30	NM	734.73	2	28-38	40	5559	5970
GM-31	NM	735.23	2	30-40	68	2939	5913
GM-32	732.47	732.08	2	58-68	61	3486	6070
GM-33	730.30	729.77	2	51-61	58	2278	5762
GM-34	731.06	730.56	2	48-58	36	2278	5770
GM-35	731.56	731.27	2	26-36	67	1750	5510
GM-36	731.44	731.11	2	57-67	35	1755	5551
GM-37	730.36	730.05	2	25-35	56	1857	5696
GM-38	730.31	729.88	2	46-56	34	1858	5686
ME-2	732.38	732.08	2	24-34	33	2945	5973
ME-3	NM	732.59	2	23-33	35	2897	5938
ME-4	NM	732.74	2	25-35	34	2925	5913
ME-6	NM	735.91	2	22-32	35	3325	5927
<u>Deep Aquifer Wells</u>							
GM-1	NM	735.74	2	92-102	103	1087	5803
GM-3	NM	730.44	2	91-101	101	1023	5309
GM-4	NM	731.46	2	140-150	150	1010	5322
GM-5	NM	731.29	2	92-101	102	1037	5512
GM-7R	NM	735.61	2	80-90	91	1247	5295

Table 5. Monitoring Well Construction Details, General Motors Corporation, Moraine, Ohio.

Well ID #	Surface Elevation ft msl	TOC Elevation ft msl	Well Diameter Inches	Screened Interval ft bls	Total Well Depth ft bls	Northing y	Easting x
Deep Aquifer Wells							
GM-9	NM	724.07	2	90-100	100	146	5247
GM-11	NM	723.71	2	90-100	100	679	5164
GM-13	NM	723.82	2	90-100	100	566	4990
GM-14	NM	723.50	2	140-150	150	611	5030
GM-15	NM	725.23	2	90-100	101	664	4581
GM-19D	NM	730.25	4	145-150	150	1775	5298
GM-20D	NM	727.26	4	90-95	100	619	5699
GM-39 ⁽¹⁾	731.15	730.95	2	106-116	116	5396	6006
GM-40 ⁽¹⁾	727.28	727.04	2	140-150	150	3089	4984
GM-41 ⁽¹⁾	731.22	733.65	2	104-114	114	3430	6684
GM-42 ⁽¹⁾	729.48	729.16	2	140-150	150	2338	5651
HR-10	740.90	742.81	4	118-128	131	7686	5492
HR-12	741.00	742.64	4	122-132	132	7333	6194
HR-13	733.20	735.03	4	76-86	86	5221	5665
HR-14	729.90	731.63	4	78-88	89	5178	5209
HR-15	732.10	733.74	4	88-98	102	5161	5020
M73C	NM	716.55	NA	NA	NA	180	4539
MT68	743.68	746.45	5	NA	135	2163	8847
MT69	719.84	722.71	8	NA	158	-988	5020
MT576M	750.00	751.46	5	NA	114	4804	9620
MT596M*	759.18	757.73	5	NA	89	6438	10644
DN-13	NM	NM	NA	NA	NA	NM	NM
28	NM	733.67	14	150-161, 177-207	214	NM	NM
31	NM	734.05	20	90-120	120	NM	NM
32	NM	732.10	20	94-109, 139-149	149	2394	5791
42	NM	731.62	20	135-185	193	3710	5070

ft bls - Feet Below Land Surface.

ft msl - Feet Above Mean Sea Level.

TOC - Top of Casing.

*Measuring point is top of cement housing.

NM - Not Measured.

NA - Not Available.

(1) - Installed in November 2003.

Table 6. Water-Level Measurements Collected During September 2003, General Motors Corporation, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
Shallow Aquifer Wells			
W-1-N	739.02	28.00	711.02
W-2-N	731.68	21.01	710.67
W-3-N	733.66	23.08	710.58
W-4-N	731.63	21.02	710.61
HR-1	732.71	23.06	709.65
HR-2	734.75	24.18	710.57
HR-3	736.75	26.19	710.56
HR-4	742.60	31.61	710.99
HR-5	734.27	23.93	710.34
HR-6	732.66	22.74	709.92
HR-7	731.73	21.35	710.38
HR-8	743.42	33.28	710.14
HR-9	743.51	33.06	710.45
HR-11	743.33	32.81	710.52
HR-16	727.01	17.91	709.1
HR-17	726.43	17.09	709.34
W-1-S	729.29	19.81	709.48
W-2-S	726.64	18.16	708.48
W-3-S	733.42	20.65	712.77
W-4-S	727.68	19.11	708.57
GM-2	735.81	26.92	708.89
4S	731.36	23.45	707.91
GM-6	730.27	22.07	708.2
GM-8	735.17	26.84	708.33
GM-10	723.90	17.90	706.00
GM-16	725.30	18.21	707.09
GM-17	723.84	15.74	708.1
GM-18	723.80	15.74	708.06
GM-19S	730.85	21.77	709.08
EAST	730.98	21.46	709.52
WEST	731.08	21.72	709.36
WSU-24	725.10	16.26	708.84
WS-17	726.18	17.89	708.29
WS-18	733.52	25.07	708.45
WS-19	726.62	18.34	708.28
TW-2	733.38	29.63	703.75
RW-10	728.53	NM	NM
RW-11	729.74	NM	NM
GM-21	724.20	15.77	708.43
GM-22	731.63	21.91	709.72
GM-23	731	21.60	709.4
GM-24	747.29	36.16	711.13
GM-25	746.17	35.33	710.84
GM-26	722.29	15.74	706.55

Table 6. Water-Level Measurements Collected During September 2003, General Motors Corporation, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
<u>Shallow Aquifer Wells</u>			
GM-27	730.57	20.77	709.8
GM-28	738.02	26.87	711.15
GM-29	730.78	20.81	709.97
GM-30	734.73	24.91	709.82
GM-31	735.23	23.50	711.73
GM-32	732.08	23.23	708.85
GM-33	729.77	20.21	709.56
GM-34	730.56	21.02	709.54
GM-35	731.27	22.21	709.06
GM-36	731.11	21.95	709.16
GM-37	730.05	20.73	709.32
GM-38	729.88	20.58	709.3
ME-2	732.08	22.31	709.77
ME-3	732.59	23.10	709.49
ME-4	732.74	23.65	709.09
ME-6	735.91	24.15	711.76
<u>Deep Aquifer Wells</u>			
GM-1	735.74	27.21	708.53
GM-3	730.44	22.41	708.03
GM-4	731.46	23.65	707.81
GM-5	731.29	23.08	708.21
GM-7R	735.61	27.14	708.47
GM-9	724.07	16.35	707.72
GM-11	723.71	16.08	707.63
GM-13	723.82	16.58	707.24
GM-14	723.50	16.35	707.15
GM-15	725.23	19.11	706.12
GM-19D	730.25	21.72	708.53
GM-20D	727.26	18.58	708.68
HR-10	742.81	32.48	710.33
HR-12	742.64	32.12	710.52
HR-13	735.03	24.53	710.5
HR-14	731.63	21.17	710.46
HR-15	733.74	23.40	710.34
M73C	716.55	9.32	707.23
MT68	746.45	36.71	709.74
MT69	722.71	16.31	706.4
MT576M	751.46	40.88	710.58
MT596M*	757.73	46.04	711.69

Table 6. Water-Level Measurements Collected During September 2003, General Motors Corporation, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
Production and Fire Wells			
11B	NS	ON	NM
12A	742.35	ON	NM
31	734.05	24.99 (OFF)	709.06
32	732.10	24.50 (OFF)	707.60
35	733.96	25.90 (OFF)	708.06
39	732.07	OFF	NM
42	731.62	24.06 (OFF)	707.56
44	734.62	25.21 (OFF)	709.41
45	731.03	22.55	708.48
46	733.34	24.7	708.64
A	739.00	27.57	711.43
FW-1A	739.89	30.82	709.07
FW-2	737.48	29.43	708.05
FW-3	739.26	30.82	708.44
FW-4	731.62	24.05	707.57

Measuring point is to top of the PVC Casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on September 15 and 16, 2003 using an electronic water level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

NS - Not Surveyed.

NM - Not measured.

*Measuring point is top of cement housing.

Table 7. Summary of Precipitation Measurements Recorded by the National Weather Service, During 2003 - Dayton, Ohio.

Date	Actual Precipitation	Average Precipitation	Departure from Average
January 2003	1.07	2.60	1.53 below average
February 2003	2.23	2.29	0.06 below average
March 2003	2.65	3.29	0.64 below average
April 2003	1.49	4.03	2.54 below average
May 2003	6.62	4.17	2.45 above average
June 2003	4.56	4.21	0.35 above average
July 2003	6.32	3.75	2.57 above average
August 2003	3.84	3.49	0.35 above average
September 2003	5.40	2.65	2.75 above average
October 2003	3.03	2.72	0.31 above average
November 2003	3.88	3.30	0.58 above average
December 2003	2.44	3.08	0.64 below average
2003 Total	43.53	39.58	3.95 above average

All precipitation measurements are reported in inches.

Table 8. Vertical Gradients For Shallow/Deep Well Pairs During 2003, General Motors Corporation, Moraine, Ohio.

Shallow/Deep Wells	Vertical Gradient in September 2003 ⁽¹⁾	
	Direction	Difference (feet)
<u>Ugradient</u>		
HR-9/HR-10	D	-0.12
HR-11/HR-12	None	0.00
<u>On-Site</u>		
W-3-N/HR-15	D	-0.24
W-4-N/HR-14	U	-0.15
HR-3/HR-13	U	-0.06
GM-8/GM-7R	U	0.14
GM-16/GM-15	D	-0.97
GM-2/GM-1	D	-0.36
GM-18/GM-13	D	-0.82
GM-17/GM-11	D	-0.47
GM-6/GM-3	D	-0.17
<u>AOI 7</u>		
GM-23/GM-27	U	0.40
<u>Downgradient</u>		
GM-10/GM-9	ME	ME
GM-26/MT-69	D	-0.15

D - Downward gradient (-).

U - Upward gradient (+).

⁽¹⁾ - Water-level measurements collected on September 15-16, 2003.

ME - Measurement error.

Table 9. Summary of Groundwater Analytical Results from Reactive Zone 1 Wells, General Motors Corporation, Moraine, Ohio.

Draft

RZ-1		Upgradient Well GM-29											
Constituents	Units	9/1/99	2/22/00	5/26/00	9/21/00	3/20/01	6/26/01	11/13/01	12/12/01	6/13/02	9/25/02	5/22/03	9/24/03
Volatile Organic Compounds													
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0UJ	<50	<50	<50	<40	< 50	<33
1,1-Dichloroethane	ug/L	4.3	4.1	6.3	16.6	10.8	6.3J	<50	<50	<50	<40	< 50	<33
1,1-Dichloroethene	ug/L	1.3	1.1	1.6	3.1	3.5	3.0J	<50	<50	<50	<40	< 50	<33
cis-1,2-Dichloroethene	ug/L	320	223	1,190J	2,871	2,170	2050J	1,800	1,800	1600	1300	950	1200
trans-1,2-Dichloroethene	ug/L	11.1	9.1	8.9	14.4	20.4	25.6J	26	24J	21	21	< 25	20
Ethylbenzene	ug/L	<1.0	1.4	<1.0	<1.0	<1.0	<1.0UJ	21J	<50	<50	<40	< 50	<33
Tetrachloroethene	ug/L	<20	38.7	24.6	20.0	24.4	24.8J	17J	22J	22	18J	47J	18J
Toluene	ug/L	<1.0	<1.0	<1.0	2.2	<1.0	<1.0UJ	<50	<50	<50	<40	< 50	<33
1,1,1-Trichloroethane	ug/L	37.8	36.0	32.5	24.5	27.0	23.8J	<50	19J	17	16J	< 50	18J
Trichloroethene	ug/L	878	758	649J	289	354	437J	270	320	380	310	280	390
Vinyl chloride	ug/L	3.8	1.0	1.7	788	362	276J	230	280	140	140	99	150
Xylenes	ug/L	<1.0	6.0	<1.0	<1.0	<1.0	<1.0UJ	52	<50	<50	<40	< 50	<33
Total VOCs	ug/L	1,256.3	1,078.4	1,914.6	4,028.8	2,972.1	2,846.5	2,416	2,465	2,180	1,805	1,376	1,796

ug/L - Micrograms per liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 9. Summary of Groundwater Analytical Results from Reactive Zone 1 Wells, General Motors Corporation, Moraine, Ohio.

Draft

RZ-1		Downgradient Well											
		GM-28											
Constituents	Units	9/1/99	2/23/00	5/26/00	9/21/00	3/20/01	6/26/01	11/15/01	12/12/01	7/21/02	9/24/02	5/23/03	10/1/03
Volatile Organic Compounds													
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<5.0UJ	<4.0	<1	< 1	<1
1,1-Dichloroethane	ug/L	3.3	4.2	11.8	9.9	<1.0	<1.0	<10	<5.0UJ	<4.0	2.7	4.2	3.3
1,1-Dichloroethene	ug/L	<1.0	<1.0	3.8	<1.0	<1.0	<1.0	<10	<5.0UJ	<4.0	<1	< 1	<1
cis-1,2-Dichloroethene	ug/L	175	503	2,700	37.0	7.7	352	<5.0	2.2UJ	<2.0	1.1	0.66	0.58
trans-1,2-Dichloroethene	ug/L	9.2	9.7	36.5	22.3	17.6	<1.0	11	11J	8.6	11	9.2	4
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<5.0UJ	<4.0	<1	< 1	<1
Tetrachloroethene	ug/L	316	88.4	30.2	2.3	2.8	<1.0	<10	<5.0UJ	<4.0	<1	0.95J	<1
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	< 1.8UJ	<4.0	<1.3	1	<1
1,1,1-Trichloroethane	ug/L	17.7	23.2	18.1	5.0	<1.0	<1.0	<10	<5.0UJ	<4.0	<1	< 1	<1
Trichloroethene	ug/L	768	833	14.8	1.6	1.8	<1.0	<10	<5.0UJ	<4.0	0.86J	3.1	1.6
Vinyl chloride	ug/L	3.2	<1.0	1.9	12.4	2.6	<1.0	<10	<5.0UJ	<4.0	<1	< 1	0.53J
Xylenes	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<5.0UJ	<4.0	<1.2	0.87J	<1
Total VOCs	ug/L	1,292.4	1,461.5	2,817.1	90.5	32.5	352	11	11	8.6	15.66	19.98	10.01

ug/L - Micrograms per liter.
J - Value is estimated.
JJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 10. Summary of Groundwater Analytical Results from Reactive Zone 2 Wells, General Motors Corporation, Moraine, Ohio.

Draft

RZ-2		Introduction Well ME-6											Introduction Well ME-1		
Constituents	Units	8/31/99	2/22/00	5/25/00	9/21/00	03/20/01	6/26/01	11/15/01	12/12/01	9/25/02	5/22/03	10/1/03	8/31/99	2/22/00	5/25/00
Volatile Organic Compounds															
Benzene	ug/L	<1.0	<10	<5.0	<1.0	<1.0	<1.0	<2.0	<3.3	<10	<1	0.46J	<1.0	<10	<5.0
1,1-Dichloroethane	ug/L	<1.0	<10	1.4J	<1.0	1.6	1.8	2.7	4.8	<10	1.7	7.2	2.4	<10	<5.0
1,1-Dichloroethene	ug/L	<1.0	<10	<5.0	<1.0	<1.0	<1.0	<2.0	<3.3	<10	<1	<2	<1.0	<10	<5.0
cis-1,2-Dichloroethene	ug/L	255	541	712	98.8	171	67.0	65	86	5.2	3.3	20	38.2	459	537
trans-1,2-Dichloroethene	ug/L	<1.0	<10	6.1	2.5	4.3	1.8	1.8	2.0	<5	<0.5	<1	1.5	<10	4.2J
Ethylbenzene	ug/L	<1.0	<10	<5.0	<1.0	<1.0	<1.0	<2.0	<3.3	<10	<1	<2	<1.0	<10	1.5J
Tetrachloroethene	ug/L	213	18.3	16.2	6.7	34.0	<1.0	8.2	6.1	<10	<1	12	83.6	<10	1.8J
Toluene	ug/L	<1.0	<10	<5.0	1.9	<1.0	2.1	0.42J	1.5J	6.6J	1.8	<2	<1.0	<10	1.4J
1,1,1-Trichloroethane	ug/L	2.9	<10	<5.0	<1.0	1.3	1.2	2.2	2.9J	<10	0.83J	13	13.5	<10	<5.0
Trichloroethene	ug/L	474	39.0	28.0	19.0	66.0	4.8	23	19	<10	0.69J	31	292	<10	5.8
Vinyl chloride	ug/L	<1.0	<10	10.8	6.1	27.7	13.3	13	22	<10	1.8	2.9	36	<10	9.1
Xylenes	ug/L	<1.0	<10	<5.0	<1.0	<1.0	2.9	<2.0	<3.3	<10	0.93J	<2	<1.0	<10	<5.0
Total VOCs	ug/L	944.9	598.3	774.5	135	305.9	94.9	116.32	144.3	11.8	11.05	86.56	467.2	459	560.8

ug/L - Micrograms per liter.

J - Value is estimated.

UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.

< - Constituent not detected above laboratory reporting limit shown.

U - Constituent not detected.

Samples collected in September and October 1999 represent baseline conditions.

Carbon source introductions began in December 1999.

Table 10. Summary of Groundwater Analytical Results from Reactive Zone 2 Wells, General Motors Corporation, Moraine, Ohio.

Draft

RZ-2		Introduction Well ME-3										Introduction Well ME-5
Constituents	Units	8/31/99	2/22/00	5/25/00	9/21/00	11/15/01	12/12/01	7/21/02	9/24/02	5/21/03	10/1/03	6/26/01
Volatile Organic Compounds												
Benzene	ug/L	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<40	<2.5	< 1	0.6J	<1.0
1,1-Dichloroethane	ug/L	6.1	12.4	4.7	3.4	5.9	5.6	<40	<2.5	19	24	<1.0
1,1-Dichloroethene	ug/L	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<40	<2.5	< 1	<1	<1.0
cis-1,2-Dichloroethene	ug/L	5.7	105	100	2.9	16	22	<20	<1.2	1.3	0.96	1.8
trans-1,2-Dichloroethene	ug/L	<1.0	<10	7.5	2.9	2.7	2.8	<20	<1.2	< 0.5	<0.5	<1.0
Ethylbenzene	ug/L	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<40	<2.5	< 1	<1	<1.0
Tetrachloroethene	ug/L	57.9	<10	<1.0	<1.0	1.3	3.4	<40	<2.5	< 1	<1	<1.0
Toluene	ug/L	<1.0	<10	<1.0	1.4	0.34J	0.19J	<40	<2.5	< 1	<1	3.8
1,1,1-Trichloroethane	ug/L	42.5	16.0	4.8	6.4	1.6	1.9	<40	<2.5	< 1	0.31J	<1.0
Trichloroethene	ug/L	47.5	<10	4.3	<1.0	3.8	9.7	<40	<2.5	1.2	1.5	<1.0
Vinyl chloride	ug/L	<1.0	<10	54.7	2.1	7.3	11	<40	<2.5	0.36J	<1	<1.0
Xylenes	ug/L	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<40	<2.5	< 1	<1	4.3
Total VOCs	ug/L	159.7	133.4	176	19.1	38.94	56.59	0	0	21.86	27.37	9.9

ug/L - Micrograms per liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 10. Summary of Groundwater Analytical Results from Reactive Zone 2 Wells, General Motors Corporation, Moraine, Ohio.

Draft

RZ-2		Below Introduction Zone						
		GM-31						
Constituents	Units	9/1/99	2/23/00	5/31/00	9/21/00	11/15/01	9/24/02	10/1/03
Volatile Organic Compounds								
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	<4.0	<6	<5
1,1-Dichloroethane	ug/L	1.3	1.4	1.8	1.1	3.1J	5.9J	6
1,1-Dichloroethene	ug/L	<1.0	<1.0	<1.0	<1.0	<4.0	<6	<5
cis-1,2-Dichloroethene	ug/L	7.80	27.8	48.1	40.2	120	200	170
trans-1,2-Dichloroethene	ug/L	<1.0	<1.0	<1.0	<1.0	1.8J	3.5	3.5
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<4.0	<6	<5
Tetrachloroethene	ug/L	1.3	<1.0	<1.0	<1.0	<4.0	<6	<5
Toluene	ug/L	<1.0	<1.0	1.5	<1.0	<4.0	<6	<5
1,1,1-Trichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<4.0	<6	<5
Trichloroethene	ug/L	27.2	13.6	8.4	8.5	11	10	28
Vinyl chloride	ug/L	<1.0	<1.0	<1.0	<1.0	7.4	19	10
Xylenes	ug/L	<1.0	1.1	1.6	<1.0	<4.0	<6	<5
Total VOCs	ug/L	37.6	43.9	61.4	49.8	143.3	238.4	217.5

ug/L - Micrograms per liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 11. Summary of Groundwater Analytical Results from Reactive Zone 3 West Wells, General Motors Corporation, Moraine, Ohio.

RZ-3 West		Upgradient Well EAST												Upgradient Well WEST		
Constituents	Units	09/21/99	02/23/00	05/25/00	09/22/00	03/19/01	6/25/01	11/12/01	12/11/01	6/12/02	9/23/02	5/21/03	9/25/03	09/21/99	02/23/00	05/25/00
Volatile Organic Compounds																
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<3.3	<2.5	<2	<1.4	<2	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/L	5.4	7.3	7.7	7.7	5.9	5.5	6.2	5.3	6.0	3.9	1.9	2.3	25.6	24.5	32.5
1,1-Dichloroethene	ug/L	<1.0	<1.0	1.02J	1.2	1.2	<1.0	0.90J	<3.3	1.3	0.82J	<1.4	<2	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/L	9.1	24.0	32.0	77.3	117	80.1	51	51	33	25.8	4.5	4.3	125	34.5	29.0
trans-1,2-Dichloroethene	ug/L	<1.0	2.0	1.5	1.8	5.8	3.3	2.7	2.4	1.3	<1	<0.72	<1	<1.0	1.7	1.3
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<3.3	<2.5	<2	<1.4	<2	<1.0	<1.0	<1.0
Tetrachloroethene	ug/L	61.0	77.1	54.6	55.8	49.9	59.3	56	49	37	47	49	47	41.3	53.9	37.7
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<3.3	<2.5	<2	<1.4	<2	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/L	21.0	20.6	20.5	22.2	19.3	16.7	13	12	14	10	6.2	7.1	24.8	25.1	27.4
Trichloroethene	ug/L	56.1	90.1	81.3	97.2	105	117	92	94	75	44	46	35	37.3	108	103.0
Vinyl chloride	ug/L	<1.0	5.3	1.2	3.0	4.8	<1.0	1.5J	0.66J	0.48	<2	<1.4	<2	<1.0	<1.0	<1.0
Xylenes	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<3.3	<2.5	<2	<1.4	<2	<1.0	<1.0	<1.0
Total VOCs	ug/L	152.6	226.4	199.82	266.2	308.9	281.9	223.3	214.36	168.08	115.22	83.6	95.7	254	247.7	230.9

ug/L - Micrograms per liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.



Table 11. Summary of Groundwater Analytical Results from Reactive Zone 3 West Wells, General Motors Corporation, Moraine, Ohio.

RZ-3 West		Upgradient Well GM-19S											
Constituents	Units	09/20/99	02/23/00	05/24/00	09/22/00	03/19/01	06/25/01	11/12/01	12/11/01	06/12/02	09/26/02	05/21/03	09/25/03
Volatile Organic Compounds													
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<3.3	0.62	<4	< 4	<5
1,1-Dichloroethane	ug/L	7.7	7.3	7.0	4.4	4.1	2.9	2.9J	2.8J	3.7	6.3	8.5	8.3
1,1-Dichloroethene	ug/L	1.0	1.0	1.1	<1.0	<1.0	<1.0	<3.3	<3.3	0.98	<4	< 4	1.6J
cis-1,2-Dichloroethene	ug/L	34.6	38.8	42.9	37.6	38.2	31.5	26	27	28	39	81	89
trans-1,2-Dichloroethene	ug/L	2.3	2.3	2.7	2.6	3.0	2.4	2.0	2.0	2.3	2.7	3	2.9
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<3.3	<3.3	<4	< 4	<5
Tetrachloroethene	ug/L	46.0	71.3	57.1	68.0	67.6	71.7	64	64	60	52	62	62
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<3.3	<3.3	<4	< 4	<5
1,1,1-Trichloroethane	ug/L	16.0	16.9	17.9	14.5	11.9	9.6	7.6	7.5	7.2	6.3	12	13
Trichloroethene	ug/L	71.1	101	104	104	107	121	97	110	110	110	120	140
Vinyl chloride	ug/L	<1.0	1.7	1.4	<1.0	<1.0	<1.0	<3.3	0.66J	0.70	5.2	< 4	<5
Xylenes	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<3.3	<3.3	<4	< 4	<5
Total VOCs	ug/L	178.7	240.3	234.1	231.1	231.8	239.1	199.5	213.96	213.5	221.5	286.5	316.8



ug/L - Micrograms per liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 11. Summary of Groundwater Analytical Results from Reactive Zone 3 West Wells, General Motors Corporation, Moraine, Ohio.

RZ-3 West		Downgradient Well GM-32												Downgradient Well GM-8					
Constituents	Units	09/22/99	02/28/00	05/30/00	09/25/00	03/19/01	06/25/01	11/12/01	12/11/01	6/12/02	9/20/02	5/23/03	10/1/03	3/6/98	9/20/99	9/26/00	11/9/01	9/20/02	10/1/03
Volatile Organic Compounds																			
Benzene	ug/L	<1.0	<10	<100	<1.0	<50	<1.0	4.3J	<100	4.0	<10	1.6	1.5J	2.3	3.4	1.1	0.78J	5.5	5.4
1,1-Dichloroethane	ug/L	3.3	101	46.0J	35.9	<50	3.1	6.2	<100	12	9.7J	5.3	5.5	49.3	30.2	36.5	40	63	48
1,1-Dichloroethene	ug/L	<1.0	<10	<100	<1.0	<50	<1.0	<5.0	<100	<20	<10	< 1 U	<2	1.0	<1.0	<1.0	< 1.0	<2.0	<2
cis-1,2-Dichloroethene	ug/L	2.6	<10	<100	<1.0	<50	32.0	<2.5	<50	<10	<5	0.59	<1	56.1	26.2	1.5	2.0	5.5	<1
trans-1,2-Dichloroethene	ug/L	4.2	111	41.0J	20.3	<50	2.5	2.9	<50	3.0	<5	1.8	1	10.1	12.0	5.4	3.6	9	4.4
Ethylbenzene	ug/L	<1.0	<10	<100	<1.0	<50	<1.0	0.79J	<100	<20	<10	0.65J	<2	28.9	20.7	12.5	0.40J	7.5	11
Tetrachloroethene	ug/L	1.2	<10	<100	<1.0	<50	37.6	<5.0	<100	<20	<10	< 1 U	<2	20.0	14.8	<1.0	< 1.0	<2.0	<2
Toluene	ug/L	1.0	20.6	<100	10.4	<50	<1.0	12	<100	4.9	<10	2.2	<2	<1.0	<1.0	<1.0	< 1.0	1.8J	<2
1,1,1-Trichloroethane	ug/L	<1.0	<10	<100	<1.0	<50	9.2	<5.0	<100	<20	<10	< 1 U	<2	6.7	1.9	<1.0	0.40J	<2.0	<2
Trichloroethene	ug/L	3.2	<10	<100	<1.0	<50	107	<5.0	<100	<20	<10	< 1 U	<2	95.2	30.4	6.6	4.4	<2.0	<2
Vinyl chloride	ug/L	3.0	<10	<100	<1.0	<50	<1.0	1.1J	<100	3.0	<10	< 1 U	<2	10.1	8.4	2.4	1.9	5.8	<2
Xylenes	ug/L	<1.0	<10	<100	<1.0	<50	<1.0	3.0J	<100	<20	<10	2.2	<2	10.3	2.3	1.9	0.39J	1.5J	<2
Total VOCs	ug/L	18.5	232.6	87	66.6	0	191.4	30.29	0	26.9	9.7	14.34	8	290	150.3	67.9	53.87	99.6	68.8

ug/L - Micrograms per liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 11. Summary of Groundwater Analytical Results from Reactive Zone 3 West Wells, General Motors Corporation, Moraine, Ohio.

RZ-3 West		Downgradient Well GM-6					
Constituents	Units	3/6/98	9/20/99	9/26/00	11/9/01	9/20/02	10/2/03
Volatile Organic Compounds							
Benzene	ug/L	<1.0	<1.0	<1.0	< 2.0	2.2	1
1,1-Dichloroethane	ug/L	35.3	33.2	13.0	14	60	20
1,1-Dichloroethene	ug/L	<1.0	1.2	<1.0	< 2.0	<2.0	<1
cis-1,2-Dichloroethene	ug/L	82.4	52.9	41.0	8.2	43	13
trans-1,2-Dichloroethene	ug/L	2.4	2.0	2.2	1.8	8.6	2.5
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	< 2.0	<2.0	0.22J
Tetrachloroethene	ug/L	94.0	81.4	51.5	14	14	11
Toluene	ug/L	<1.0	<1.0	<1.0	< 2.0	<2.0	<1
1,1,1-Trichloroethane	ug/L	36.2	24.6	12.1	3.9	1.4J	0.19J
Trichloroethene	ug/L	119	78.2	56.6	48	33	23
Vinyl chloride	ug/L	2.3	1.6	3.7	1.9J	12	3.3
Xylenes	ug/L	<1.0	<10	<1.0	< 2.0	< 2.0	<1
Total VOCs	ug/L	371.6	275.1	180.1	91.8	174.2	74.21

ug/L - Micrograms per liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 12. Summary of Groundwater Analytical Results from Reactive Zone 3 East Wells, General Motors Corporation, Moraine, Ohio.

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RZ-3 East		Upgradient Well GM-22											
Constituents	Units	09/01/99	02/23/00	05/25/00	09/21/00	03/20/01	06/26/01	11/13/01	12/12/01	6/13/02	9/25/02	5/22/03	9/24/03
Volatile Organic Compounds													
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2	<1	<1
1,1-Dichloroethane	ug/L	<1.0	2.2	2.8	2.4	3.8	4.7	6.8	6.6	4.1	<2	1.2	1
1,1-Dichloroethene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.58J	0.32J	<1.0	<2	<1	<1
cis-1,2-Dichloroethene	ug/L	<1.0	3.1	4.0	1.9	3.5	5.1	8.5	7.8	3.6	<1	0.46J	0.45J
trans-1,2-Dichloroethene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.17J	<0.50	<0.50	<1	<0.5	<0.5
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2	<1	<1
Tetrachloroethene	ug/L	3.6	2.8	3.0	1.6	2.2	3.2	4.9	2.9	1.9	2.3	2.5	2.9
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	0.32J	<1.0	<2	0.49J	<1
1,1,1-Trichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.4	0.63J	0.47	0.93J	0.61J	1.2
Trichloroethene	ug/L	4.0	2.5	3.6	<1.0	1.6	2.8	7.5	2.3	2.1	7.6	6	7.6
Vinyl chloride	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.60J	0.85J	0.38	<2	<1	<1
Xylenes	ug/L	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2	<1	<1
Total VOCs	ug/L	7.6	11.8	13.4	5.9	11.1	16.9	33.45	21.72	12.55	10.83	11.26	13.15

ug/L - Micrograms per liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 12. Summary of Groundwater Analytical Results from Reactive Zone 3 East Wells, General Motors Corporation, Moraine, Ohio.

RZ-3 East		Downgradient Well GM-21											
Constituents	Units	09/22/99	02/23/00	05/26/00	09/22/00	03/19/01	06/25/01	11/13/01	12/11/01	6/12/02	9/25/02	5/22/03	9/24/03
Volatile Organic Compounds													
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<6.0	<6.7	<6.7	<8
1,1-Dichloroethane	ug/L	9.0	5.8	6.8	5.6	5.1	4.1	3.8J	0.71J	5.4	5J	4.1J	6.9J
1,1-Dichloroethene	ug/L	3.9	1.6	2.4	1.6	1.2	<1.0	<5.0	<1.0	3.6	2.6J	<6.7	2J
cis-1,2-Dichloroethene	ug/L	66.4	35.9	47.8	38.7	39.5	37.8	39	6.5	48	43	130	100
trans-1,2-Dichloroethene	ug/L	7.8	9.3	7.4	12.9	16.4	15.7	15	2.8	8.3	5.1	2.2J	2.9J
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<6.0	<6.7	<6.7	<8
Tetrachloroethene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<6.0	<6.7	<6.7	<8
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<6.0	<6.7	<6.7	<8
1,1,1-Trichloroethane	ug/L	53.1	15.4	27.9	15.7	7.0	7.7	6.9	1.2	23	31	18	31
Trichloroethene	ug/L	28.7	283	311	189	169	158	160	28	210	230	79	200
Vinyl chloride	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<6.0	<6.7	<6.7	<8
Xylenes	ug/L	<1.0	2.3	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<6.0	<6.7	<6.7	<8
Total VOCs	ug/L	168.9	353.3	403.3	263.5	238.2	223.3	224.7	39.21	298.3	316.7	233.3	342.8

ug/L - Micrograms per liter.
J - Value is estimated.
JJ - Constituent not detected above laboratory reporting limit. Reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 13. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 1, General Motors Corporation, Moraine, Ohio.

RZ-1		Upgradient Well GM-29											
Constituents	Units	9/1/99	2/22/00	5/26/00	9/21/00	3/20/01	6/26/01	11/13/01	12/12/01	6/13/02	9/25/02	5/22/03	9/24/03
Inorganics & TOC													
Nitrate	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	<0.30	<0.30	<0.30	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	0.552	0.136	0.35	0.248	0.203	0.136	0.17B	0.17	1.5B	0.18B	0.67J	0.20J
Manganese (Dissolved)	mg/l	0.13	0.101	0.177	0.125	0.116	0.128	0.17B	0.15	0.13B	0.16B	0.15J	0.21J
Iron (Total)	mg/l	18	1.43	10.1	8.48	5.84	2.52	3.4	3.8	47.8B	3.8	28.6	4.9
Iron (Dissolved)	mg/l	0.24	0.13	2.78	3.09	<0.10	2.03	3.3	2.9	2.2B	2.8	2.4	3.6
Iron (Ferrous)	mg/l	0.02	0	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	90	126	31	29	31	37	65	48	63	76	91J	52
Sulfide	mg/l	<4	<1	<1	<1	<1.0	<1	1.3	<1.0	<1.0	<1.0	0.54B	1.6
Total Organic Carbon	mg/l	18	11	22	<1	7.57	7.3	10	10	8	8	7	9
Chloride	mg/l	254	426	508	373	337	262	600B	460	490	490	490	560J
Permanent Gases													
Carbon Dioxide	mg/l	46.52	49.87	44.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	1.02	0.66	1.41	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	20.29	18.7	15.61	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	0.01152	0.007699	0.00017	1.62	1.30	1.5	0.610	1.2	0.56	1.1	0.6	1.5
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA
Light Hydrocarbon Scan													
Ethane	ug/l	5.641	1.861	0.751	0.639	0.46	17	20	28	14	16	7.4	9.9
Ethene	ug/l	9.769	1.275	12.098	441.796	160	130	230	180	48	140	150	200
Ethane + Ethene	ug/l	15.4	3.1	12.8	442.4	160.5	147.0	250.0	208.0	62.0	156.0	157.4	209.9
Field Parameters													
pH	S.U.	6.99	7.02	6.86	7.24	7.31	7.20	7.47	7.57	7.14	7.22	6.32	6.88
Specific Conductivity	uS/cm	1502	3044	2388	1942	1733	1291	2703	2860	1977	2354	2303	2278
Dissolved Oxygen	mg/l	0.35	0.51	0.45	3.44	8.20	0.40	0.22	0.01	3.57	1.40	1.38	0.13
Redox Potential	mV	-526.6	19.6	-105.4	-35.0	-158.2	-166.4	-129.7	-168	-122.9	-91.3	-157.8	-118.6
Temperature	°C	17.8	16.9	17.97	17.64	20.04	20.47	16.42	17.13	19.33	17.63	18.23	16.81

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 13. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 1, General Motors Corporation, Moraine, Ohio.

RZ-1		Downgradient Well GM-28											
Constituents	Units	9/1/99	2/23/00	5/26/00	9/21/00	3/20/01	6/26/01	11/15/01	12/12/01	7/21/02	9/24/02	5/23/03	10/1/03
Inorganics & TOC													
Nitrate	mg/l	0.08	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0.06	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	<0.30	<0.30	0.68	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	3.2	1.15	6.26	4.1	0.594	2.24	0.58	0.47	1.1	0.48B	0.69J	0.42J
Manganese (Dissolved)	mg/l	0.068	0.449	6.71	3.94	0.477	1.76	0.61	0.49	1.1	0.41B	0.29J	0.40J
Iron (Total)	mg/l	106	25.3	22.7	58.9	29.6	59	23.6	23.5	36.2	28.7	47.9	23.4J
Iron (Dissolved)	mg/l	<0.10	0.59	23.3	48.3	2.65	49.8	23.3	23.7	34.7	23.4	16.7	22.4J
Iron (Ferrous)	mg/l	0	0.03	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	89	43	<5	<5	9	106	<5	<5	<5	18	65J	31J
Sulfide	mg/l	<4	<1	<1	<1	<1	<1	1.5	<1.0	2.0	4.3	2.5	<1.0
Total Organic Carbon	mg/l	15	24	742	571	90.0	360	74	68B	140	23	15	17
Chloride	mg/l	208	664	805	782	1030	508	730B	560	370	450	350	270J
Permanent Gases													
Carbon Dioxide	mg/l	41.52	63.57	16.51	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	2.32	0.59	0.64	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	19.42	16.39	19.82	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	0.002487	0.001832	0.21	1.70	13.0	13.0	13	20	19	14	8.9	11
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA
Light Hydrocarbon Scan													
Ethane	ug/l	0.75	0.493	0.865	1.198	42	39	91	98	420	300	310	230
Ethene	ug/l	0.048	0.098	0.646	1794.606	57	5	1.1	1.4	8.8	12	74	0.43
Ethane + Ethene	ug/l	0.8	0.6	1.5	1,795.8	99.0	44.0	92.1	99.4	428.8	312.0	384.0	230.4
Field Parameters													
pH	S.U.	7.02	6.92	7.01	7.18	7.10	6.64	6.50	7.45	6.84	7.24	6.86	6.80
Specific Conductivity	uS/cm	1359	3124	4402	4538	3724	3216	3136	3700	2187	2195	2132	1501
Dissolved Oxygen	mg/l	0.95	1.45	2.52	6.78	4.36	0.41	0.83	0.20	0.68	0.35	1.41	0.34
Redox Potential	mV	90.5	56.0	-93.7	-200.1	-70.6	-177.8	-148.2	-203	-153.3	-135.3	-93.1	-146.9
Temperature	°C	16.4	18.48	19.24	20.21	18.93	19.04	19.24	18.92	20.44	18.68	16.88	17.97

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 14. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 2, General Motors Corporation, Moraine, Ohio.

RZ-2		Introduction Well ME-6										
Constituents	Units	8/31/99	2/22/00	5/25/00	9/21/00	3/20/01	6/26/01	11/15/01	12/12/01	9/25/02	5/22/03	10/1/03
<u>Inorganics & TOC</u>												
Nitrate	mg/l	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	<0.30	10.9	23.4	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	0.502	4.19	1.44	0.46	0.276	0.245	0.33	0.34	1.9B	0.77J	0.42J
Manganese (Dissolved)	mg/l	<0.010	3.60	1.34	0.456	0.277	0.222	0.30	0.32	1.6B	0.63J	0.40J
Iron (Total)	mg/l	8.17	67.1	46.3	6.4	1.25	3.52	5.5	4.6	37.2	30.3	6.7J
Iron (Dissolved)	mg/l	<0.10	46.5	42.8	6.66	0.63	1.74	3.9	2.8	7.3	6.5	6.1J
Iron (Ferrous)	mg/l	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	139	111	34	91	128	165	400	220	<5	<5	91J
Sulfide	mg/l	<2	2.00	1.11	1.58	<1.0	<1	<1.0	<1.0	1.7	0.86B	6.7
Total Organic Carbon	mg/l	9	1,560	374	35	21.5	38	41	34	1500	250	56
Chloride	mg/l	182	350	302	196	261	289	390B	320	430	370	220J
<u>Permanent Gases</u>												
Carbon Dioxide	mg/l	51.08	173.39	156.4	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	0.84	0.45	0.52	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	18.57	12.44	9.03	NA	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	0.002063	0.56	12.2	0.33	8.30	0.25	0.160	0.65	1.6	12	5.1
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA	NA
<u>Light Hydrocarbon Scan</u>												
Ethane	ug/l	0.134	0.097	<0.005	0.134	4.9	3.6	4.6	16	0.026	2.6	2
Ethene	ug/l	0.134	0.164	3.508	3.316	7.6	1.9	4	20	0.34	0.81	1.4
Ethane + Ethene	ug/l	0.268	0.261	3.508	3.45	12.5	5.5	8.6	36	0.366	3.41	3.4
<u>Field Parameters</u>												
pH	S.U.	7.02	6.64	6.58	7.00	7.06	6.82	6.92	7.50	6.78	6.73	6.90
Specific Conductivity	uS/cm	1424	4645	3118	1864	1922	2630	3004	3000	6309	3428	1735
Dissolved Oxygen	mg/l	0.66	7.12	0.84	1.19	4.83	0.33	0.67	0.48	0.59	2.49	0.35
Redox Potential	mV	109.1	-85.8	-133.8	-200.6	-294.0	43.5	-80.4	-129	-107.2	-101.4	-133.4
Temperature	°C	27.51	18.59	22.60	18.98	21.68	19.42	20.01	19.74	22.17	19.1	17.58

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 14. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 2, General Motors Corporation, Moraine, Ohio.

RZ-2		Introduction Well									
		ME-3									
Constituents	Units	8/31/99	2/22/00	5/25/00	9/21/00	11/15/01	12/12/01	7/21/02	9/24/02	5/21/03	10/1/03
Inorganics & TOC											
Nitrate	mg/l	22	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0.1665	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	<0.30	3.10	12.6	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	0.016	0.870	1.16	0.556	0.580	0.60	3.0	0.67B	0.21J	0.28J
Manganese (Dissolved)	mg/l	<0.010	0.702	0.436	0.543	0.620	0.610	3.4	0.69B	0.23J	0.28J
Iron (Total)	mg/l	<0.10	20.5	38.2	4.9	3.9	3.6	162	41.1	5.9	1.9J
Iron (Dissolved)	mg/l	<0.10	15.3	10.3	4.45	4.10	3.40	133	36.2	4.7	1.7J
Iron (Ferrous)	mg/l	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	152	60	34	87	160	150	71B	<5	45J	79J
Sulfide	mg/l	<1	1.39	1.32	<1	<1	<1.0	0.32J	<1.0	1.70	0.98B
Total Organic Carbon	mg/l	1	162	69	4	<1	6	1100	340	15	9
Chloride	mg/l	336	208	235	184	260B	330	370	380	290	340J
Permanent Gases											
Carbon Dioxide	mg/l	57.26	183.76	85.52	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	1.72	0.47	0.78	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	16.44	13.39	13.0	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	0.000129	0.01088	9.68	0.001226	0.0430	0.0160	1.6	7	1.8	1.2
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA
Light Hydrocarbon Scan											
Ethane	ug/l	0.01	0.073	0.138	0.047	0.52	0.47	0.37	0.21	0.83	0.54
Ethene	ug/l	<0.005	0.109	96.276	0.218	23	38	1.5	0.2	0.12	0.073
Ethane + Ethene	ug/l	0.01	0.182	96.414	0.265	23.52	38.47	1.87	0.41	0.95	0.613
Field Parameters											
pH	S.U.	6.96	6.75	6.89	7.15	6.52	7.40	5.77	6.96	6.70	6.97
Specific Conductivity	uS/cm	1889	2305	1752	1509	1477	2280	4081	3454	1662	1413
Dissolved Oxygen	mg/l	2.01	4.06	0.59	1.11	1.70	0.19	1.60	2.41	2.92	2.93
Redox Potential	mV	80.9	-96.8	-136.7	-193.2	-36.1	-127.0	-103.4	-59.7	-30.6	-89.7
Temperature	°C	22.86	19.28	20.00	21.09	18.63	20.05	20.82	21.65	17.18	17.74

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 14. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 2, General Motors Corporation, Moraine, Ohio.

RZ-2		Below Introduction Zone						
		GM-31						
Constituents	Units	9/1/99	2/23/00	5/31/00	9/21/00	11/15/01	9/24/02	10/1/03
Inorganics & TOC								
Nitrate	mg/l	0	0	0	NA	NA	NA	NA
Nitrite	mg/l	0	0	0	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	0.41	<0.3	<0.30	NA	NA	NA	NA
Manganese (Total)	mg/l	7.45	0.53	0.899	0.605	0.470	0.97B	1.6J
Manganese (Dissolved)	mg/l	0.293	0.208	0.189	0.163	0.19	0.27B	0.24J
Iron (Total)	mg/l	288	17.4	34.9	18.7	16.3	33.4	35.9J
Iron (Dissolved)	mg/l	0.27	1.87	2.37	2.51	3.2	2.8	0.79J
Iron (Ferrous)	mg/l	0	1.6	1.6	NA	NA	NA	NA
Sulfate	mg/l	118	105	131	105	120	130	140J
Sulfide	mg/l	<4	<1	1.06	<1	<1	<1.0	7.5
Total Organic Carbon	mg/l	176	4	12	<1	3B	3	2
Chloride	mg/l	240	249	259	221	190B	240	290J
Permanent Gases								
Carbon Dioxide	mg/l	32.12	49.58	38.89	NA	NA	NA	NA
Oxygen	mg/l	0.60	0.61	0.66	NA	NA	NA	NA
Nitrogen	mg/l	16.05	19.79	23.03	NA	NA	NA	NA
Methane	mg/l	0.0124	0.03339	0.08616	0.04758	0.034	0.11	0.075
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA
Light Hydrocarbon Scan								
Ethane	ug/l	2.472	4.55	9.895	2.507	1.9	1.3	0.74
Ethene	ug/l	2.295	1.283	2.439	0.413	0.5	2	0.26
Ethane + Ethene	ug/l	4.767	5.833	12.334	2.92	2.4	3.3	1
Field Parameters								
pH	S.U.	7.25	7.19	7.03	7.30	6.70	6.80	6.99
Specific Conductivity	uS/cm	1514	1786	1538	1580	1275	1635	1321
Dissolved Oxygen	mg/l	1.61	0.39	0.81	1.71	ME	0.31	0.25
Redox Potential	mV	-328.2	-61.9	-73.7	-188.5	-82.1	-66.2	-69.7
Temperature	°C	28.93	20.75	21.91	21.11	19.45	20.87	18.74

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 15. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 West, General Motors Corporation, Moraine, Ohio.

RZ-3 West		Upgradient Well EAST										
Constituents	Units	9/21/99	2/23/00	5/25/00	9/22/00	3/19/01	11/12/01	12/11/01	6/12/02	9/23/02	5/21/03	9/25/03
Inorganics & TOC												
Nitrate	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	<0.30	<0.30	<0.30	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	0.627	0.474	0.361	0.227	0.182	0.20B	0.21B	0.56B	0.28B	0.12J	0.23J
Manganese (Dissolved)	mg/l	0.098	0.157	0.116	0.136	0.129	0.18B	0.17B	0.20B	0.16B	0.041J	0.096
Iron (Total)	mg/l	4.82	5.55	5.3	2.26	1.17	0.21	0.29	7.9	0.89	0.16	0.64
Iron (Dissolved)	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<0.10
Iron (Ferrous)	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	75	130	117	96	101	130	120	170	95	63J	110
Sulfide	mg/l	<1	<1	<1	<1	<1.0	1.2	1.6	<1.0	<1.0	<1	2.1
Total Organic Carbon	mg/l	3	10	4	<1	<1.0	3B	2	4	2	<1	1
Chloride	mg/l	283	254	194	196	198	190B	180	270	310	250	310J
Permanent Gases												
Carbon Dioxide	mg/l	34.69	58.08	52.02	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	1.88	0.97	1.26	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	17.88	17.50	19.1	NA	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	0.000571	0.003269	0.01158	1.08	1.100	0.310	0.15	0.0042	0.0027	0.00055	0.0013
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA	NA
Light Hydrocarbon Scan												
Ethane	ug/l	0.032	0.039	0.118	0.126	2.6	2	1.8	0.44	0.05	0.013	0.014
Ethene	ug/l	0.018	0.107	0.057	0.073	0.19	0.15	0.056	0.17	0.037	0.034	0.021
Ethane + Ethene	ug/l	0.05	0.146	0.175	0.199	2.79	2.15	1.856	0.61	0.087	0.047	0.035
Field Parameters												
pH	S.U.	6.99	7.04	7.00	7.11	7.34	7.15	7.32	7.02	7.18	6.69	6.94
Specific Conductivity	uS/cm	1777	1955	1503	1133	1189	1363	1480	1439	1467	1506	1548
Dissolved Oxygen	mg/l	0.30	0.37	2.76	1.68	1.00	1.73	0.05	1.05	1.82	1.79	1.04
Redox Potential	mV	14.9	122.9	144.5	143.7	468.4	177.1	86	306.5	215.6	201	147.6
Temperature	°C	21.21	19.38	19.32	20.30	19.60	18.68	18.69	19.61	19.62	19.45	18.47

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 15. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 West, General Motors Corporation, Moraine, Ohio.

RZ-3 West		Upgradient Well GM-19S										
Constituents	Units	9/20/99	2/23/00	5/24/00	9/22/00	3/19/01	11/20/01	12/11/01	6/12/02	9/26/02	5/21/03	9/25/03
Inorganics & TOC												
Nitrate	mg/l	11	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	<0.30	<0.30	<0.30	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	0.726	1.09	0.247	0.238	0.191	0.20	0.21B	0.25B	0.39B	0.3J	0.23J
Manganese (Dissolved)	mg/l	0.185	0.205	0.200	0.187	0.155	0.19	0.18B	0.18B	0.19B	0.2J	0.21J
Iron (Total)	mg/l	16.9	39.4	1.19	0.40	0.90	0.091	0.18	0.26	0.44	0.17	0.96
Iron (Dissolved)	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10
Iron (Ferrous)	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	127	131	131	118	113	100	90	110	110	150J	150
Sulfide	mg/l	<1	<1	<1	<1	<1	<1	0.96J	<1.0	<1.0	<1	1.3
Total Organic Carbon	mg/l	2	7	5	<1	<1	2B	1	1	3	2	2
Chloride	mg/l	247	197	168	165	158	130B	150	140	210	270	300J
Permanent Gases												
Carbon Dioxide	mg/l	41.85	57.12	50.12	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	4.43	1.01	1.24	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	20.87	17.07	17.13	NA	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	0.009863	0.002712	0.003325	0.003706	0.039	0.005	0.0088	0.002	0.46	0.0021	0.0022
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA	NA
Light Hydrocarbon Scan												
Ethane	ug/l	0.071	0.104	0.139	0.184	0.21	0.3	0.35	0.41	0.73	0.17	0.08
Ethene	ug/l	0.055	0.045	0.043	0.036	0.061	0.034	0.027	0.13	0.77	0.078	0.045
Ethane + Ethene	ug/l	0.126	0.149	0.182	0.22	0.271	0.334	0.377	0.54	1.5	0.248	0.125
Field Parameters												
pH	S.U.	7.05	7.05	7.00	7.19	7.14	7.28	7.31	7.09	7.02	6.71	6.93
Specific Conductivity	uS/cm	1500	1784	1548	1235	1097	1190	1350	1052	1474	1706	1726
Dissolved Oxygen	mg/l	0.92	0.30	1.94	1.36	0.96	1.75	0.06	0.90	0.47	2.01	1.87
Redox Potential	mV	31.3	149.6	200.1	187.7	320.8	195.6	13	446.3	259.6	178.3	135
Temperature	°C	20.85	18.69	20.80	20.09	20.14	19.24	19.10	20.39	20.36	20.22	19.57

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 15. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 West, General Motors Corporation, Moraine, Ohio.

RZ-3 West		Downgradient Well GM-32										
Constituents	Units	9/22/99	2/28/00	5/30/00	9/25/00	3/19/01	11/12/01	12/11/01	6/12/02	9/20/02	5/23/03	10/1/03
Inorganics & TOC												
Nitrate	mg/l	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	2.29	2.00	19.3	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	0.147	0.516	0.051	0.30	0.17	0.16B	0.087B	0.043B	0.053B	0.1J	0.13J
Manganese (Dissolved)	mg/l	0.052	0.061	0.048	0.31	<0.050	0.020B	0.024B	0.042B	0.028B	0.077J	0.11J
Iron (Total)	mg/l	8.14	42.4	18.4	81.0	13.0	16.5	10.5	7.5	8.4B	21.3	31.4J
Iron (Dissolved)	mg/l	3.53	0.59	17.1	81.6	3.17	5.2	6.5	8.1	6.8B	18.7	30.5J
Iron (Ferrous)	mg/l	1.8	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	30	<5	<10	<10	<20	5	4J	1J	<5	<5	<5
Sulfide	mg/l	<1	<10	<1	<1	1.60	<1	<1.0	0.50J	1.3	0.86B	7.3
Total Organic Carbon	mg/l	68	1200	2020	2720	1120	320B	250	240	160	150	170
Chloride	mg/l	317	638	740	740	798	700B	630	470	510	390	510J
Permanent Gases												
Carbon Dioxide	mg/l	39.79	8.94	24.32	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	1.67	0.85	<0.15	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	14.93	15.23	2.40	NA	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	2.73	7.06	14.91	16.84	29	29	38	24	32	24	19
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA	NA
Light Hydrocarbon Scan												
Ethane	ug/l	1.649	9.965	1.029	0.189	7.9	42	72	84	94	74	46
Ethene	ug/l	86.509	163.855	472.312	510.593	150	130	90	93	49	9.9	3.4
Ethane + Ethene	ug/l	88.158	173.82	473.341	510.782	157.9	172	162	177	143	83.9	49.4
Field Parameters												
pH	S.U.	7.54	8.59	7.64	7.73	8.36	8.42	8.13	8.55	8.13	6.41	6.81
Specific Conductivity	uS/cm	2750	9030	9195	9225	7483	6874	6200	5432	4289	3908	3192
Dissolved Oxygen	mg/l	0.09	0.23	10.82	2.55	0.36	0.07	0.03	1.14	0.22	1.93	0.31
Redox Potential	mV	-226.4	-279.1	-213.6	-353.8	-152.5	-222.8	-279	-220.5	-227.1	-204.6	-154.4
Temperature	°C	19.27	19.72	23.48	19.27	19.30	18.84	18.62	20.83	19.81	19.31	18.47

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 15. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 West, General Motors Corporation, Moraine, Ohio.

RZ-3 West		Downgradient Well GM-8				Downgradient Well GM-6			
Constituents	Units	3/6/98	9/20/99	9/20/02	12/9/03	3/6/98	9/20/99	9/20/02	12/9/03
Inorganics & TOC									
Nitrate	mg/l	<4.4	0	NA	NA	<4.4	0	NA	NA
Nitrite	mg/l	<0.033	0	NA	NA	<0.033	0	NA	NA
Nitrogen, Ammonia	mg/l	1.69	1.95	NA	NA	<0.300	<0.30	NA	NA
Manganese (Total)	mg/l	0.204	0.125	0.085B	0.21	1.07	1.11	0.27B	0.57
Manganese (Dissolved)	mg/l	0.229	0.125	0.084B	0.21	1	0.958	0.24B	0.53
Iron (Total)	mg/l	1.01	0.27	0.55B	1.9	1.32	0.27	0.40B	5.7
Iron (Dissolved)	mg/l	1.22	0.26	0.52B	1.9	<0.1	<0.10	0.30B	1.9
Iron (Ferrous)	mg/l	<0.2	0	NA	NA	<0.2	NA	NA	NA
Sulfate	mg/l	59	54	59	<5	93	83	43	27
Sulfide	mg/l	<1	<1	<1.0	<1.0	<1	<1	<1.0	<1.0
Total Organic Carbon	mg/l	7	8	16	20	3	4	17	12
Chloride	mg/l	248	216	180	180J	227	247	170	190J
Permanent Gases									
Carbon Dioxide	mg/l	15.8	9.91	NA	NA	47.4	48.44	NA	NA
Oxygen	mg/l	1.1	0.92	NA	NA	1.57	2.23	NA	NA
Nitrogen	mg/l	19.7	25.42	NA	NA	20.5	21.77	NA	NA
Methane	mg/l	1.48	2.47	8.5	14	0.008337	0.006916	7.8	7.8
Carbon Monoxide	mg/l	<0.4	<0.40	NA	NA	<0.4	<0.40	NA	NA
Light Hydrocarbon Scan									
Ethane	ug/l	0.37	1.134	13	12	0.047	0.067	10	2.4
Ethene	ug/l	12.233	39.617	3.7	0.44	0.091	0.097	4.9	0.75
Ethane + Ethene	ug/l	12.603	40.751	16.7	12.44	0.138	0.164	14.9	3.15
Field Parameters									
pH	S.U.	7.7	7.98	8.18	7.2	7	7.05	7.46	7.76
Specific Conductivity	uS/cm	1539	1584	1734	1870	1422	1493	1658	2080
Dissolved Oxygen	mg/l	0.16	0.28	0.37	0.04	0.88	0.48	0.34	0.03
Redox Potential	mV	-145	-49.8	-150.6	-137	57.6	26.5	-27.7	-223
Temperature	°C	17.53	19.09	19.20	18.17	18.49	21.07	19.07	17.71

mg/l - milligrams per liter.
S.U. - Standard Units.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank contamination.
NA - Not Analyzed.
uS/cm - Microsiemens/centimeter.
ug/l - micrograms per liter.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

Table 16. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 East, General Motors Corporation, Moraine, Ohio.

Draft

RZ-3 East		Upgradient Well GM-22										
Constituents	Units	9/1/99	2/23/00	5/25/00	9/21/00	3/20/01	11/13/01	12/12/01	6/13/02	9/25/02	5/22/03	9/24/03
Inorganics & TOC												
Nitrate	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	<0.30	<0.30	<0.30	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	0.089	0.273	0.355	0.422	0.458	0.74B	0.63	0.38B	0.029B	0.031J	0.027J
Manganese (Dissolved)	mg/l	0.096	0.263	0.328	0.403	0.413	0.73B	0.62	0.40B	0.093B	0.023J	0.020J
Iron (Total)	mg/l	<0.10	0.16	0.96	0.94	0.28	<0.10	<0.10	0.11B	0.18	0.22	0.23
Iron (Dissolved)	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10
Iron (Ferrous)	mg/l	0.6	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	49	125	120	117	99	300	150	120	70	72J	77
Sulfide	mg/l	<1	<1	<1	<1	<1.0	<1	<1.0	<1.0	0.40J	0.54B	1.6
Total Organic Carbon	mg/l	6	4	4	<1	<1.0	16B	6B	3	2	<1	1
Chloride	mg/l	246	270	279	248	326	220B	280	290	370	350	350J
Permanent Gases												
Carbon Dioxide	mg/l	40.15	43.99	40.20	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	1.05	0.86	1.28	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	23.38	19.43	21.3	NA	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	0.05818	0.23	0.18	0.000967	0.280	0.067	0.16	0.039	0.014	0.00039	1.2
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA	NA
Light Hydrocarbon Scan												
Ethane	ug/l	0.042	0.091	0.069	0.029	0.083	0.13	0.12	0.14	0.27	0.013	0.0084
Ethene	ug/l	0.067	0.032	0.064	0.111	0.039	0.21	0.012	0.054	0.062	0.027	0.011
Ethane + Ethene	ug/l	0.109	0.123	0.133	0.14	0.122	0.34	0.132	0.194	0.332	0.04	0.0194
Field Parameters												
pH	S.U.	7.12	7.15	7.08	7.17	7.00	7.33	7.39	7.21	7.02	6.89	7.04
Specific Conductivity	uS/cm	1373	1975	1671	1684	1610	1753	2020	1415	1720	1730	1597
Dissolved Oxygen	mg/l	0.32	0.46	0.49	1.73	0.82	0.01	0.15	0.94	2.14	1.04	1.2
Redox Potential	mV	62.2	70.2	26.1	-80.8	175.1	54.8	-110	105.2	181.2	116.6	74.6
Temperature	°C	19.41	18.87	20.87	22.28	20.79	19.45	18.99	20.29	19.49	18.62	18.45

mg/l - milligrams per liter.

S.U. - Standard Units.

mV - Millivolts.

°C - Degrees Celsius.

J - Value is estimated.

B - Blank contamination.

NA - Not Analyzed.

uS/cm - Microsiemens/centimeter.

ug/l - micrograms per liter.

Samples collected in September 1999 represent baseline conditions.

Carbon source introductions began in December 1999.

Table 16. Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 East, General Motors Corporation, Moraine, Ohio.

RZ-3 East		Downgradient Well GM-21										
Constituents	Units	9/22/99	2/23/00	5/26/00	9/22/00	3/19/01	11/13/01	12/11/01	6/12/02	9/25/02	5/22/03	9/24/03
Inorganics & TOC												
Nitrate	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/l	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Ammonia	mg/l	<0.30	<0.3	<0.30	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Total)	mg/l	0.321	0.233	0.215	0.336	0.298	0.30B	0.30B	0.31B	0.29B	0.32J	0.37J
Manganese (Dissolved)	mg/l	0.273	0.225	0.212	0.312	0.291	0.32B	0.29B	0.29B	0.25B	0.26J	0.38J
Iron (Total)	mg/l	2.58	0.30	0.83	0.63	0.11	<0.10	0.16	0.65	0.56	12.6	0.27
Iron (Dissolved)	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	1.4	0.47
Iron (Ferrous)	mg/l	0.4	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/l	103	102	80	102	118	120	100	76	76	55J	82
Sulfide	mg/l	<1	<1	<1	<1	<1	<1	1.9	0.50J	0.40J	0.54B	1.5
Total Organic Carbon	mg/l	1	3	2	<1	<1	2B	1	0.9J	2	2	2
Chloride	mg/l	136	145	126	129	165	140	150	170	180	160	190J
Permanent Gases												
Carbon Dioxide	mg/l	37.04	37.40	18.70	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	mg/l	1.41	0.99	1.89	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen	mg/l	23.40	21.67	23.64	NA	NA	NA	NA	NA	NA	NA	NA
Methane	mg/l	0.03744	0.01769	0.01370	0.04218	0.048	0.049	0.035	0.022	0.03	0.031	1.5
Carbon Monoxide	mg/l	<0.40	<0.40	<0.40	NA	NA	NA	NA	NA	NA	NA	NA
Light Hydrocarbon Scan												
Ethane	ug/l	0.072	0.067	0.084	0.072	0.082	0.076	0.12	0.15	0.12	0.13	0.03
Ethene	ug/l	0.169	0.038	0.07	0.069	0.046	0.046	0.1	0.12	0.064	0.57	0.52
Ethane + Ethene	ug/l	0.241	0.105	0.154	0.141	0.128	0.122	0.22	0.27	0.184	0.7	0.55
Field Parameters												
pH	S.U.	6.99	7.22	7.06	7.21	7.85	7.50	7.45	7.22	7.09	6.76	7.05
Specific Conductivity	uS/cm	1188	1299	1048	1096	1067	1190	1360	1045	1245	968	1181
Dissolved Oxygen	mg/l	0.66	0.60	0.40	0.99	0.57	0.04	0.04	0.63	0.41	0.83	0.75
Redox Potential	mV	-26.9	113.3	167.1	153.9	218.5	168.8	-25	373.8	238.1	77.1	-26.7
Temperature	°C	20.43	18.43	17.92	19.03	17.59	16.73	15.82	18.67	18.67	17.54	18.39

mg/l - milligrams per liter.

S.U. - Standard Units.

mV - Millivolts.

°C - Degrees Celsius.

J - Value is estimated.

B - Blank contamination.

NA - Not Analyzed.

uS/cm - Microsiemens/centimeter.

ug/l - micrograms per liter.

† Samples collected in September 1999 represent baseline conditions.

‡ Carbon source introductions began in December 1999.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	Upgradient of the Site		On-Site			
		HR-9 9/17/03 Upper Aquifer	HR-11 9/18/03 Upper Aquifer	HR-8 9/17/03 Upper Aquifer	HR-4 9/18/03 Upper Aquifer	W-2-N 9/18/03 Upper Aquifer	W-3-N 9/17/03 Upper Aquifer
<u>Volatile Organic Compounds</u>							
Benzene	ug/l	< 1.2 U	< 1 U	< 1 U	< 1 U	< 1 U	< 4 U
1,1-Dichloroethane	ug/l	35	10	13	< 1 U	< 1 U	< 4 U
1,1-Dichloroethene	ug/l	< 1.2 U	< 1 U	< 1 U	< 1 U	< 1 U	< 4 U
cis-1,2-Dichloroethene	ug/l	11	1.7	2.8	< 0.5 U	1.3	100
trans-1,2-Dichloroethene	ug/l	1.5	< 0.5 U	0.63	< 0.5 U	< 0.5 U	1.6 J
Ethylbenzene	ug/l	< 1.2 U	< 1 U	< 1 U	< 1 U	< 1 U	< 4 U
Tetrachloroethene	ug/l	< 1.2 U	< 1 U	< 1 U	0.55 J	< 1 U	5.1
Toluene	ug/l	< 1.2 U	< 1 U	< 1 U	< 1 U	< 1 U	< 4 U
1,1,1-Trichloroethane	ug/l	12	< 1 U	7.8	< 1 U	< 1 U	< 4 U
Trichloroethene	ug/l	11	< 1 U	1.3	0.71 J	< 1 U	1.7 J
Vinyl chloride	ug/l	< 1.2 U	< 1 U	< 1 U	< 1 U	< 1 U	6.6
Xylene (total)	ug/l	< 1.2 U	< 1 U	< 1 U	< 1 U	< 1 U	< 4 U
Total VOCs	ug/l	70.5	11.7	25.53	1.26	1.3	115

ug/l - Micrograms per liter.

All QA/QC results for 2003 data are shown in Appendix C.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	On-Site					
		W-4-N 9/17/03 Upper Aquifer	HR-2 9/16/03 Upper Aquifer	HR-5 9/18/03 Upper Aquifer	HR-3 9/16/03 Upper Aquifer	HR-1 9/18/03 Upper Aquifer	GM-30 9/23/03 Upper Aquifer
<u>Volatile Organic Compounds</u>							
Benzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	< 120 U
1,1-Dichloroethane	ug/l	0.94 J	4.5	0.42 J	13	2.6	< 120 U
1,1-Dichloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	< 120 U
cis-1,2-Dichloroethene	ug/l	1.7	7.2	5	9.9	2.3	< 62 U
trans-1,2-Dichloroethene	ug/l	< 0.5 U	0.96	0.46 J	1.1	3.2	< 62 U
Ethylbenzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	1000
Tetrachloroethene	ug/l	1.1	< 1 U	< 1 U	< 1 U	27	< 120 U
Toluene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	240
1,1,1-Trichloroethane	ug/l	0.26 J	< 1 U	< 1 U	< 1 U	1 J	< 120 U
Trichloroethene	ug/l	8.1	0.4 J	11	1.6	56	< 120 U
Vinyl chloride	ug/l	0.48 J	< 1 U	< 1 U	< 1 U	< 2 U	< 120 U
Xylene (total)	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	7000
Total VOCs	ug/l	12.58	13.06	16.88	25.6	92.1	8,240

ug/l - Micrograms per liter.
 All QA/QC results for 2003 data are shown in Appendix C.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	On-Site						
		GM-23 9/23/03 Upper Aquifer	GM-27 9/23/03 Upper Aquifer	GM-29 9/24/03 Upper Aquifer	GM-28 10/1/03 Upper Aquifer	ME-6 10/1/03 Upper Aquifer	GM-31 10/1/03 Upper Aquifer	
<u>Volatile Organic Compounds</u>								
Benzene	ug/l	< 500 U	< 5 U	< 33 U	< 1 U	0.46 J	< 5 U	
1,1-Dichloroethane	ug/l	< 500 U	1.9 J	< 33 U	3.3	7.2	6	
1,1-Dichloroethene	ug/l	< 500 U	< 5 U	< 33 U	< 1 U	< 2 U	< 5 U	
cis-1,2-Dichloroethene	ug/l	5800	12	1200	0.58	20	170	
trans-1,2-Dichloroethene	ug/l	< 250 U	< 2.5 U	20	4	< 1 U	3.5	
Ethylbenzene	ug/l	< 500 U	< 5 U	< 33 U	< 1 U	< 2 U	< 5 U	
Tetrachloroethene	ug/l	12000	2.1 J	18 J	< 1 U	12	< 5 U	
Toluene	ug/l	< 500 U	< 5 U	< 33 U	< 1 U	< 2 U	< 5 U	
1,1,1-Trichloroethane	ug/l	< 500 U	< 5 U	18 J	< 1 U	13	< 5 U	
Trichloroethene	ug/l	1600	100	390	1.6	31	28	
Vinyl chloride	ug/l	690	< 5 U	150	0.53 J	2.9	10	
Xylene (total)	ug/l	< 500 U	< 5 U	< 33 U	< 1 U	< 2 U	< 5 U	
Total VOCs	ug/l	20,090	116	1,796	10.01	86.56	217.5	

ug/l - Micrograms per liter.
All QA/QC results for 2003 data are shown in Appendix C.
< - Constituent not detected above laboratory reporting limit shown.
J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	On-Site				
		ME-3 10/1/03 Upper Aquifer	GM-22 9/24/03 Upper Aquifer	GM-19S 9/25/03 Upper Aquifer	EAST 09/25/03 Upper Aquifer	GM-33 09/25/03 Upper Aquifer
Volatile Organic Compounds						
Benzene	ug/l	0.6 J	< 1 U	< 5 U	< 2 U	< 8 U
1,1-Dichloroethane	ug/l	24	1	8.3	2.3	46
1,1-Dichloroethene	ug/l	< 1 U	< 1 U	1.6 J	< 2 U	4 J
cis-1,2-Dichloroethene	ug/l	0.96	0.45 J	89	4.3	300
trans-1,2-Dichloroethene	ug/l	< 0.5 U	< 0.5 U	2.9	< 1 U	12
Ethylbenzene	ug/l	< 1 U	< 1 U	< 5 U	< 2 U	< 8 U
Tetrachloroethene	ug/l	< 1 U	2.9	62	47	21
Toluene	ug/l	< 1 U	< 1 U	< 5 U	< 2 U	< 8 U
1,1,1-Trichloroethane	ug/l	0.31 J	1.2	13	7.1	17
Trichloroethene	ug/l	1.5	7.6	140	35	270
Vinyl chloride	ug/l	< 1 U	< 1 U	< 5 U	< 2 U	59
Xylene (total)	ug/l	< 1 U	< 1 U	< 5 U	< 2 U	< 8 U
Total VOCs	ug/l	27.37	13.15	316.8	95.7	729

ug/l - Micrograms per liter.
 All QA/QC results for 2003 data are shown in Appendix C.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	On-Site				
		GM-32 10/1/03 Upper Aquifer	GM-21 9/24/03 Upper Aquifer	HR-17 9/25/03 Upper Aquifer	W-2-S 9/26/03 Upper Aquifer	W-4-S 9/26/03 Upper Aquifer
Volatile Organic Compounds						
Benzene	ug/l	1.5 J	< 8 U	< 2 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	5.5	6.9 J	0.75 J	0.99 J	0.92 J
1,1-Dichloroethene	ug/l	< 2 U	2 J	< 2 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	< 1 U	100	2.2	0.74	3.6
trans-1,2-Dichloroethene	ug/l	1	2.9 J	0.7 J	< 0.5 U	0.78
Ethylbenzene	ug/l	< 2 U	< 8 U	< 2 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	< 2 U	< 8 U	64	< 1 U	24
Toluene	ug/l	< 2 U	< 8 U	< 2 U	0.25 J	0.25 J
1,1,1-Trichloroethane	ug/l	< 2 U	31	< 2 U	1.4	2
Trichloroethene	ug/l	< 2 U	200	10	5.5	13
Vinyl chloride	ug/l	< 2 U	< 8 U	< 2 U	< 1 U	< 1 U
Xylene (total)	ug/l	< 2 U	< 8 U	< 2 U	< 1 U	< 1 U
Total VOCs	ug/l	8	342.8	77.65	8.88	44.55

ug/l - Micrograms per liter.
 All QA/QC results for 2003 data are shown in Appendix C.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	Downgradient of the Site 4S			
		GM-8 10/1/03 Upper Aquifer	GM-6 10/2/03 Upper Aquifer	TW-2 10/2/03 Upper Aquifer	GM-2 10/2/03 Upper Aquifer
Volatile Organic Compounds					
Benzene	ug/l	5.4	1	1.5	< 1 U
1,1-Dichloroethane	ug/l	48	20	5.7	1.7
1,1-Dichloroethene	ug/l	< 2 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	< 1 U	13	8.3	4.7
trans-1,2-Dichloroethene	ug/l	4.4	2.5	0.59	< 0.5 U
Ethylbenzene	ug/l	11	0.22 J	0.86 J	0.21 J
Tetrachloroethene	ug/l	< 2 U	11	4.7	5.7
Toluene	ug/l	< 2 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	< 2 U	0.19 J	0.66 J	0.21 J
Trichloroethene	ug/l	< 2 U	23	24	13
Vinyl chloride	ug/l	< 2 U	3.3	1.4	0.46 J
Xylene (total)	ug/l	< 2 U	< 1 U	< 1 U	< 1 U
Total VOCs	ug/l	68.8	74.21	47.71	25.98
				12	178.6

ug/l - Micrograms per liter.
 All QA/QC results for 2003 data are shown in Appendix C.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	Downgradient of the Site				
		GM-17 9/24/03 Upper Aquifer	GM-18 9/22/03 Upper Aquifer	WSU-24 9/22/03 Upper Aquifer	GM-10 9/24/03 Upper Aquifer	GM-26 10/1/03 Upper Aquifer
<u>Volatile Organic Compounds</u>						
Benzene	ug/l	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	1.2	3.7	< 1 U	< 1 U	< 1 U
1,1-Dichloroethene	ug/l	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	2.9	8.8	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	ug/l	< 0.5 U	< 1 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	ug/l	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	12	24	1	2.2	0.85 J
Toluene	ug/l	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	1.3	10	0.67 J	0.96 J	< 1 U
Trichloroethene	ug/l	24	77	7.9	33	< 1 U
Vinyl chloride	ug/l	< 1 U	0.75 J	< 1 U	< 1 U	< 1 U
Xylene (total)	ug/l	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U
Total VOCs	ug/l	41.4	124.25	9.57	36.16	0.85

ug/l - Micrograms per liter.
 All QA/QC results for 2003 data are shown in Appendix C.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	Upgradient of the Site		On-Site		
		HR-10 9/17/03	HR-12 9/18/03	HR-15 9/17/03	HR-13 9/16/03	39 9/24/03
		Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
<u>Volatile Organic Compounds</u>						
Benzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	< 1 U	1.7	< 1 U	33	< 1 U
1,1-Dichloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	< 0.5 U	1.4	2.2	12	0.71
trans-1,2-Dichloroethene	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	1.8	< 0.5 U
Ethylbenzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	< 1 U	< 1 U	< 1 U	2.2	0.18 J
Trichloroethene	ug/l	< 1 U	< 1 U	< 1 U	5.7	< 1 U
Vinyl chloride	ug/l	< 1 U	1.6	0.29 J	14	0.89 J
Xylene (total)	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Total VOCs	ug/l	ND	4.7	16.49	54.7	2.18
						1.48

ug/l - Micrograms per liter.
 All QA/QC results for 2003 data are shown in Appendix C.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

	Units	On-Site				Downgradient of the Site	
		GM-40 12/10/03 Lower Aquifer	GM-41 12/10/03 Lower Aquifer	GM-42 12/9/03 Lower Aquifer	GM-19D 9/25/03 Lower Aquifer	GM-3 10/2/03 Lower Aquifer	GM-1 10/2/03 Lower Aquifer
Volatile Organic Compounds							
Benzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	< 1 U	< 11 U	0.46 J	< 1 U	1.6	< 1 U
1,1-Dichloroethene	ug/l	< 1 U	< 11 U	< 1 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	< 0.5 U	10	11	1.8	5.5	< 0.5 U
trans-1,2-Dichloroethene	ug/l	< 0.5 U	< 5.6 U	0.34 J	< 0.5 U	0.77	< 0.5 U
Ethylbenzene	ug/l	< 1 U	< 11 U	< 1 U	< 1 U	0.26 J	< 1 U
Tetrachloroethene	ug/l	< 1 U	< 11 U	0.27 J	< 1 U	1.7	2
Toluene	ug/l	< 1 U	< 11 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	< 1 U	< 11 U	< 1 U	< 1 U	0.96 J	1.2
Trichloroethene	ug/l	< 1 U	320	< 1 U	< 1 U	12	34
Vinyl chloride	ug/l	< 1 U	< 11 U	0.37 J	0.24 J	< 1 U	< 1 U
Xylene (total)	ug/l	3.1	< 11 U	1	17	< 1 U	< 1 U
Total VOCs	ug/l	3.1	330	13.44	19.04	22.79	37.2

ug/l - Micrograms per liter.
 All QA/QC results for 2003 data are shown in Appendix C.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table 17. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2003, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compounds	Units	Downgradient of the Site					
		GM-15 9/22/03	GM-11 9/24/03	GM-20D 9/22/03	DN-13 9/22/03	GM-9 9/24/03	MT-69 10/1/03
		Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
Benzene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1-Dichloroethane	ug/l	1.7	<1 U	<1 U	2.4	0.45 J	<1 U
1,1-Dichloroethene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
cis-1,2-Dichloroethene	ug/l	1.6	<0.5 U	<0.5 U	6.8	0.56	<0.5 U
trans-1,2-Dichloroethene	ug/l	<0.5 U	<0.5 U	<0.5 U	0.4 J	<0.5 U	<0.5 U
Ethylbenzene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Tetrachloroethene	ug/l	<1 U	2.2	3.6	0.31 J	<1 U	<1 U
Toluene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1,1-Trichloroethane	ug/l	<1 U	0.96 J	0.89 J	1.1	1.3	<1 U
Trichloroethene	ug/l	5.9	33	12	6.4	20	<1 U
Vinyl chloride	ug/l	<1 U	<1 U	<1 U	1.1	<1 U	<1 U
Xylene (total)	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Total VOCs	ug/l	9.2	36.16	16.49	18.51	22.31	ND

ug/l - Micrograms per liter.
 All QA/QC results for 2003 data are shown in Appendix C.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table 18. Summary of Arsenic and Barium Analytical Results from Upper Aquifer Monitoring Wells in 2003, General Motors Corporation, Moraine, Ohio.

	Units	GM-28		GM-28		ME-3		GM-32		GM-32		GM-21		HR-17	
		Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer
Metals															
Arsenic	mg/l	0.12	0.086	0.018	0.099	0.11						< 0.01 U		< 0.01 U	
Arsenic, dissolved	mg/l	NA	0.081	0.017	NA	0.12						< 0.01 U		NA	
Barium	mg/l	2	2 J	0.081 BJ	1.5	1.9 J						0.21		0.14 B	
Barium, dissolved	mg/l	NA	2 J	0.081 BJ	NA	2.1 J						0.21		NA	

Table 18. Summary of Arsenic and Barium Analytical Results from Upper Aquifer Monitoring Wells in 2003, General Motors Corporation, Moraine, Ohio.

	Units	GM-6		TW-2		4S		GM-2	
		10/2/03		10/2/03		10/2/03		10/2/03	
Metals		Upper Aquifer		Upper Aquifer		Upper Aquifer		Upper Aquifer	
Arsenic	mg/l	0.013		0.0077 B		0.036		< 0.01 U	
Arsenic, dissolved	mg/l	0.0071 B		0.0066 B		0.029		< 0.01 U	
Barium	mg/l	0.33		0.24		0.52		0.12 B	
Barium, dissolved	mg/l	0.3		0.22		0.52		0.12 B	

mg/l - Milligrams per liter.

All QA/QC results for 2003 data are shown in Appendix C.

< - Constituent not detected above laboratory reporting limit shown.

B - Value is estimated.

J - Method blank contamination.

NA - Not analyzed.

ARCADIS

Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

Draft

Location	Injection Well	January		May		June		July	
		Injection Event #36 ⁽¹⁾	Flow Rate (gpm)	Injection Event #37 ⁽²⁾	Flow Rate (gpm)	Injection Event #38 ⁽³⁾	Flow Rate (gpm)	Injection Event #39 ⁽⁴⁾	Flow Rate (gpm)
Reactive Zone 1	RZ-1A	500	26	500	25	500	37	500	34
	RZ-1B	500	31	500	36	500	30	500	36
	RZ-1C	500	25	500	31	500	32	500	33
	RZ-1D	500	35	500	40	500	35	500	31
	RZ-1E	500	35	500	35	500	33	500	34
	RZ-1F	500	49	500	49	500	36	500	38
	RZ-1G	500	31	500	34	500	34	500	34
	RZ-1H	500	36	500	33	500	35	500	33
	RZ-1I	500	52	500	44	500	35	500	35
	RZ-1J	500	44	500	34	500	35	500	35
	RZ-1K	500	47	500	44	500	34	500	33
	RZ-1L	500	24	500	45	500	35	500	36
	RZ-1M	500	23	500	35	500	35	500	33
	RZ-1N	500	47	500	21	500	30	500	34
	RZ-1O	500	46	500	26	500	34	500	33
	RZ-1P	500	51	500	24	380	30	380	35
	RZ-1Q	500	53	500	34	500	35	500	29
Reactive Zone 2	RZ-1R	500	51	500	36	500	35	500	34
	RZ-1S	500	50	500	24	500	34	500	34
	RZ-1T	500	51	500	32	500	36	500	36
	RZ-1U	296	50	500	28	500	--	500	35
	ME-2	--	--	--	--	--	--	--	--
	ME-4	--	--	--	--	--	--	--	--

Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

Draft

Location	Injection Well	January		May		June		July	
		Injection Event #36 ⁽¹⁾	Injection Event #37 ⁽²⁾	Injection Event #38 ⁽³⁾	Injection Event #39 ⁽⁴⁾	Volume (gal.)	Flow Rate (gpm)	Volume (gal.)	Flow Rate (gpm)
Reactive Zone 3	RZ-3A	750	37	750	33	750	31	750	40
	RZ-3B	750	52	750	44	750	35	750	37
	RZ-3C	750	45	750	32	750	33	750	35
	RZ-3D	750	22	750	58	750	35	750	37
	RZ-3E	750	45	750	47	750	36	750	37
	RZ-3F	750	35	750	50	750	37	750	36
	RZ-3G	750	49	750	50	750	37	750	36
	RZ-3H	750	32	750	30	750	36	750	36
	RZ-3I	750	39	750	46	750	36	750	35
	RZ-3J	750	42	750	24	750	35	750	34
	RZ-3K	750	43	750	40	750	34	750	34
	RZ-3L	750	48	750	45	750	34	750	35
	RZ-3M	750	33	750	38	750	35	750	35
	RZ-3N	750	51	750	33	750	35	750	35
	RZ-3O	750	48	750	36	750	34	750	35
	RZ-3P	750	57	750	45	750	35	750	35
	RZ-3Q	750	62	750	23	750	35	750	36
	RZ-3R	750	38	750	48	750	35	750	37
	RZ-3S	750	36	750	32	750	35	750	36
	RZ-3T	750	49	750	45	750	34	750	35
	RZ-3U	795	56	795	33	750	35	750	35
	RZ-3V	750	43	750	47	750	35	750	36
	RZ-3W	750	46	750	49	750	47	750	35
	RZ-3X	750	49	750	31	750	35	750	36
	RZ-3Y	750	46	750	33	750	35	750	35
	RZ-3Z	750	49	750	44	750	35	750	35
	RZ-3AA	750	51	750	29	750	35	750	35
	RZ-3BB	750	34	750	44	750	36	750	35

Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

Draft

Location	Injection Well	January		May		June		July	
		Injection Event #36 ⁽¹⁾	Injection Event #37 ⁽²⁾	Injection Event #38 ⁽³⁾	Injection Event #39 ⁽⁴⁾	Volume (gal.)	Flow Rate (gpm)	Volume (gal.)	Flow Rate (gpm)
Reactive Zone 3	RZ-3CC	750	49	750	37	750	36	750	34
	RZ-3DD	750	44	750	37	750	36	750	35
	RZ-3FF	750	58	750	36	750	34	--	--
	RZ-3GG	750	54	750	35	750	34	--	--
	RZ-3HH	750	47	750	48	750	34	--	--
	RZ-3II	750	47	750	32	750	35	--	--
	RZ-3JJ	750	36	750	39	750	34	--	--
	RZ-3KK	750	50	750	44	750	36	--	--
	RZ-3MM	750	54	750	37	750	35	--	--
	RZ-3NN	750	53	750	36	750	37	--	--
	RZ-3OO	750	58	750	10	750	36	--	--
	RZ-3PP	750	37	750	36	750	36	--	--
	RZ-3QQ	750	53	750	35	750	34	--	--
Site-Wide Total		41,091		41,295		41,130		32,880	

Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

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Location	Injection Well	August		September		October		November	
		Injection Event #40 ⁽⁵⁾	Flow Rate (gpm)	Injection Event #41 ⁽⁶⁾	Flow Rate (gpm)	Injection Event #42 ⁽⁷⁾	Flow Rate (gpm)	Injection Event #43 ⁽⁸⁾	Flow Rate (gpm)
Reactive Zone 1	RZ-1A	500	33	500	38	--	--	500	36
	RZ-1B	500	36	500	36	--	--	500	33
	RZ-1C	500	34	500	30	--	--	--	--
	RZ-1D	500	33	500	33	--	--	500	33
	RZ-1E	500	36	500	36	--	--	500	35
	RZ-1F	500	36	500	36	--	--	500	33
	RZ-1G	500	36	500	35	--	--	500	33
	RZ-1H	500	34	500	35	--	--	500	28
	RZ-1I	500	36	500	35	--	--	500	33
	RZ-1J	500	36	500	38	--	--	500	33
	RZ-1K	500	34	500	35	--	--	500	33
	RZ-1L	500	35	500	37	--	--	500	34
	RZ-1M	500	35	500	33	--	--	500	32
	RZ-1N	500	33	500	37	--	--	500	31
	RZ-1O	500	34	500	33	--	--	500	31
	RZ-1P	500	33	500	32	--	--	500	31
	RZ-1Q	500	32	500	32	--	--	415	31
	RZ-1R	500	34	500	36	--	--	500	34
	RZ-1S	500	34	500	35	--	--	300	33
	RZ-1T	500	34	500	33	--	--	500	33
	RZ-1U	500	38	500	36	--	--	500	34
Reactive Zone 2	ME-2	--	--	--	--	--	--	--	--
	ME-4	--	--	--	--	--	--	--	--

Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

Draft

Location	Injection Well	August		September		October		November	
		Injection Event #40 ⁽⁵⁾	Flow Rate (gpm)	Injection Event #41 ⁽⁶⁾	Flow Rate (gpm)	Injection Event #42 ⁽⁷⁾	Flow Rate (gpm)	Injection Event #43 ⁽⁸⁾	Flow Rate (gpm)
Reactive Zone 3	RZ-3A	750	35	750	37	750	36	750	32
	RZ-3B	750	36	750	36	750	36	750	32
	RZ-3C	750	36	750	37	750	35	750	32
	RZ-3D	750	35	750	36	750	35	750	30
	RZ-3E	750	36	750	36	750	35	750	34
	RZ-3F	750	36	750	35	750	35	750	36
	RZ-3G	750	37	750	35	750	36	750	34
	RZ-3H	750	35	750	35	750	35	750	34
	RZ-3I	750	35	750	35	750	34	750	34
	RZ-3J	750	35	750	34	750	34	750	33
	RZ-3K	750	35	750	34	750	33	750	34
	RZ-3L	750	36	750	35	750	35	750	35
	RZ-3M	750	36	750	35	750	35	750	35
	RZ-3N	750	36	750	36	750	37	750	37
	RZ-3O	750	35	750	33	750	35	750	36
	RZ-3P	750	36	750	35	790	35	790	36
	RZ-3Q	750	36	750	35	750	36	750	34
	RZ-3R	750	35	750	35	750	36	750	36
	RZ-3S	750	34	750	35	750	36	750	34
	RZ-3T	750	36	750	35	750	35	750	35
	RZ-3U	750	35	750	34	750	35	750	34
	RZ-3V	750	36	750	35	750	34	750	35
	RZ-3W	750	35	750	35	750	36	750	35
	RZ-3X	750	36	750	36	750	34	750	34
	RZ-3Y	750	35	750	34	750	32	750	33
	RZ-3Z	750	37	750	35	750	34	750	34
	RZ-3AA	750	36	750	35	750	34	750	35
	RZ-3BB	750	34	500	35	750	33	750	34

Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

Location	Injection Well	August		September		October		November	
		Injection Event #40 ⁽⁵⁾	Flow Rate (gpm)	Injection Event #41 ⁽⁶⁾	Flow Rate (gpm)	Injection Event #42 ⁽⁷⁾	Flow Rate (gpm)	Injection Event #43 ⁽⁸⁾	Flow Rate (gpm)
Reactive Zone 3	RZ-3CC	750	36	750	35	750	31	750	34
	RZ-3DD	360	37	750	35	750	34	750	36
	RZ-3FF	--	--	--	--	--	--	--	--
	RZ-3GG	--	--	--	--	--	--	--	--
	RZ-3HH	--	--	--	--	--	--	--	--
	RZ-3II	--	--	--	--	--	--	--	--
	RZ-3JJ	--	--	--	--	--	--	--	--
	RZ-3KK	--	--	--	--	--	--	--	--
	RZ-3MM	--	--	--	--	--	--	--	--
	RZ-3NN	--	--	--	--	--	--	--	--
	RZ-3OO	--	--	--	--	--	--	--	--
	RZ-3PP	--	--	--	--	--	--	--	--
	RZ-3QQ	--	--	--	--	--	--	--	--
Site-Wide Total		32,610		32,750		22,540		32,255	

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Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

Location	Injection Well	December	
		Injection Event #44 ⁽⁹⁾	Volume (gal.) Flow Rate (gpm)
Reactive Zone 1	RZ-1A	--	--
	RZ-1B	--	--
	RZ-1C	--	--
	RZ-1D	--	--
	RZ-1E	--	--
	RZ-1F	--	--
	RZ-1G	--	--
	RZ-1H	--	--
	RZ-1I	--	--
	RZ-1J	--	--
	RZ-1K	--	--
	RZ-1L	--	--
	RZ-1M	--	--
	RZ-1N	--	--
	RZ-1O	--	--
	RZ-1P	--	--
	RZ-1Q	--	--
	RZ-1R	--	--
	RZ-1S	--	--
	RZ-1T	--	--
	RZ-1U	--	--
Reactive Zone 2	ME-2	--	--
	ME-4	--	--

Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

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Location	Injection Well	December	
		Injection Event #44 ⁽⁹⁾	Flow Rate (gpm)
Reactive Zone 3	RZ-3A	750	36
	RZ-3B	750	36
	RZ-3C	750	35
	RZ-3D	750	34
	RZ-3E	750	35
	RZ-3F	750	35
	RZ-3G	750	35
	RZ-3H	750	35
	RZ-3I	750	35
	RZ-3J	750	34
	RZ-3K	750	33
	RZ-3L	750	34
	RZ-3M	750	36
	RZ-3N	750	36
	RZ-3O	750	36
	RZ-3P	580	35
	RZ-3Q	750	35
	RZ-3R	750	35
	RZ-3S	750	35
	RZ-3T	750	34
	RZ-3U	750	35
	RZ-3V	750	34
	RZ-3W	750	35
	RZ-3X	750	35
	RZ-3Y	750	36
	RZ-3Z	750	35
	RZ-3AA	750	34
	RZ-3BB	750	34

Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

Location	Injection Well	December	
		Injection Event #44 ⁽⁹⁾	Flow Rate (gpm)
Reactive Zone 3	RZ-3CC	750	34
	RZ-3DD	750	34
	RZ-3FF	--	--
	RZ-3GG	--	--
	RZ-3HH	--	--
	RZ-3II	--	--
	RZ-3JJ	--	--
	RZ-3KK	--	--
	RZ-3MM	--	--
	RZ-3NN	--	--
	RZ-3OO	--	--
	RZ-3PP	--	--
	RZ-3QQ	--	--
Site-Wide Total		22,330	

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Table 19. Carbon Source Solution Introduction Volumes for 2003, General Motors Corporation, Moraine, Ohio.

Notes:

Carbon source introduced into each well is a 10 to 1 solution (potable water to molasses).

NA - Not accessible.

-- - Not injected.

(1) Injection Event #36 was completed from January 15, 2003 to January 29, 2003.

(2) Injection Event #37 was completed from May 13, 2003 to May 28, 2003.

(3) Injection Event #38 was completed from June 5, 2003 to June 24, 2003.

(4) Injection Event #39 was completed from July 7, 2003 to July 15, 2003.

(5) Injection Event #40 was completed from August 4, 2003 to August 18, 2003.

(6) Injection Event #41 was completed from August 28, 2003 to September 5, 2003.

(7) Injection Event #42 was completed from October 3, 2003 to October 8, 2003.

(8) Injection Event #43 was completed from November 3, 2003 to November 11, 2003.

(9) Injection Event #44 was completed from December 1, 2003 to December 5, 2003.

Table 20: Corrective Action Monitoring Results for Comparison to Remediation Target Levels (RTLs)
General Motors Corporation - Moraine, Ohio

Aquifer	Remediation Zone	Chemical	Num of Analyses	Num of Detects	Min of 2003 Value ¹ (mg/l)	Mean 2003 Value ¹ (mg/L)	Max of 2003 Value ¹ (mg/l)	Max of 1999 Value ¹ (mg/l)	RTL (mg/L)	Ratio: Min 2003 Value to RTL	Ratio: Mean 2003 Value to RTL	Ratio: Max 2003 Value to RTL	Ratio: Max 1999 Value to RTL
SHALLOW	AOI 7 SHALLOW	1,1-Dichloroethene	6	4	3.65E-03	3.08E-02	9.50E-02	5.00E-02	2.33E+00	1.6E-03	1.3E-02	4.1E-02	2.1E-02
SHALLOW	AOI 7 SHALLOW	cis-1,2-Dichloroethene	6	4	9.00E-03	2.46E+00	6.80E+00	9.73E+00	2.33E+01	3.9E-04	1.1E-01	2.9E-01	4.2E-01
SHALLOW	AOI 7 SHALLOW	Tetrachloroethene	6	4	7.50E-02	4.01E+01	1.20E+01	7.12E+00	1.67E+00	4.5E-03	2.4E+00	7.2E+00	4.3E+00
SHALLOW	AOI 7 SHALLOW	Trichloroethene	6	4	1.05E-02	6.32E-01	1.60E+00	1.46E+00	1.67E+00	6.3E-03	3.8E-01	9.6E-01	8.8E-01
SHALLOW	AOI 7 SHALLOW	Vinyl Chloride	6	4	9.00E-03	4.44E-01	1.70E+00	2.60E+00	6.67E-01	1.3E-02	6.7E-01	2.5E+00	3.3E+00
SHALLOW	ZONE S1	1,1-Dichloroethene	2	1	1.10E-04	1.33E-04	1.55E-04	5.00E-04	2.10E+00	5.2E-05	6.3E-05	7.4E-05	2.4E-04
SHALLOW	ZONE S1	cis-1,2-Dichloroethene	2	2	5.80E-04	6.20E-04	6.60E-04	1.75E-01	2.10E+01	2.8E-05	3.0E-05	3.1E-05	8.3E-03
SHALLOW	ZONE S1	Tetrachloroethene	2	2	6.00E-05	5.05E-04	9.50E-04	3.16E-01	1.50E+00	4.0E-05	3.4E-04	6.3E-04	2.1E-01
SHALLOW	ZONE S1	Trichloroethene	2	2	1.60E-03	2.35E-03	3.10E-03	7.68E-01	1.50E+00	1.1E-03	1.6E-03	2.1E-03	5.1E-01
SHALLOW	ZONE S1	Vinyl Chloride	2	1	1.80E-04	3.55E-04	5.30E-04	3.20E-03	6.00E-01	3.0E-04	5.9E-04	8.8E-04	5.3E-03
SHALLOW	ZONE S1 TO ZONE S2	1,1-Dichloroethene	4	1	1.10E-04	1.60E-04	2.20E-04	5.00E-04	1.63E+00	6.7E-05	9.8E-05	1.3E-04	3.1E-04
SHALLOW	ZONE S1 TO ZONE S2	cis-1,2-Dichloroethene	4	4	5.80E-04	6.14E-03	2.00E-02	2.55E-01	1.63E+01	3.6E-05	3.8E-04	1.2E-03	1.6E-02
SHALLOW	ZONE S1 TO ZONE S2	Tetrachloroethene	4	3	6.00E-05	3.31E-03	1.20E-02	3.16E-01	1.17E+00	5.1E-05	2.8E-03	1.0E-02	2.7E-01
SHALLOW	ZONE S1 TO ZONE S2	Trichloroethene	4	4	6.90E-04	9.10E-03	3.10E-02	7.68E-01	1.17E+00	5.9E-04	7.8E-03	2.7E-02	6.8E-01
SHALLOW	ZONE S1 TO ZONE S2	Vinyl Chloride	4	3	1.80E-04	1.35E-03	2.90E-03	3.20E-03	4.67E-01	3.9E-04	2.9E-03	6.2E-03	6.9E-03
SHALLOW	ZONE S2	1,1-Dichloroethene	5	1	1.10E-04	2.38E-04	5.50E-04	5.00E-04	2.33E-01	4.7E-04	1.0E-03	2.4E-03	2.1E-03
SHALLOW	ZONE S2	cis-1,2-Dichloroethene	5	5	9.60E-04	3.91E-02	1.70E-01	2.55E-01	2.33E+00	4.1E-04	1.7E-02	7.3E-02	1.1E-01
SHALLOW	ZONE S2	Tetrachloroethene	5	1	6.00E-05	2.56E-03	1.20E-02	2.13E-01	1.67E-01	3.6E-04	1.5E-02	7.2E-02	1.3E+00
SHALLOW	ZONE S2	Trichloroethene	5	5	6.90E-04	1.25E-02	3.10E-02	4.74E-01	1.67E-01	4.1E-03	7.5E-02	1.9E-01	2.8E+00
SHALLOW	ZONE S2	Vinyl Chloride	5	4	1.30E-04	3.04E-03	1.00E-02	5.00E-04	6.70E-02	1.9E-03	4.5E-02	1.5E-01	7.5E-03
SHALLOW	ZONE S2 TO ZONE S3	1,1-Dichloroethene	13	3	1.10E-04	7.00E-04	4.00E-03	1.00E-03	9.30E-02	1.2E-03	7.5E-03	4.3E-02	1.1E-02
SHALLOW	ZONE S2 TO ZONE S3	cis-1,2-Dichloroethene	13	13	4.50E-04	5.34E-02	3.00E-01	2.55E-01	9.33E-01	4.8E-04	5.7E-02	3.2E-01	2.7E-01
SHALLOW	ZONE S2 TO ZONE S3	Tetrachloroethene	13	9	6.00E-05	2.22E-02	6.20E-02	2.13E-01	6.70E-02	9.0E-04	3.3E-01	9.3E-01	3.2E+00
SHALLOW	ZONE S2 TO ZONE S3	Trichloroethene	13	13	6.90E-04	5.73E-02	2.70E-01	4.74E-01	6.70E-02	1.0E-02	8.6E-01	4.0E+00	7.1E+00
SHALLOW	ZONE S2 TO ZONE S3	Vinyl Chloride	13	5	1.30E-04	5.90E-03	5.90E-02	5.00E-04	2.70E-02	4.8E-03	2.2E-01	2.2E+00	1.9E-02
SHALLOW	ZONE S3	1,1-Dichloroethene	4	1	1.55E-04	8.56E-04	2.00E-03	3.90E-03	7.00E-02	2.2E-03	1.2E-02	2.9E-02	5.6E-02
SHALLOW	ZONE S3	cis-1,2-Dichloroethene	4	3	2.50E-04	5.77E-02	1.30E-01	6.64E-02	7.00E-01	3.6E-04	8.2E-02	1.9E-01	9.5E-02
SHALLOW	ZONE S3	Tetrachloroethene	4	1	1.20E-04	5.53E-04	1.40E-03	1.20E-03	5.00E-02	2.4E-03	1.1E-02	2.8E-02	2.4E-02
SHALLOW	ZONE S3	Trichloroethene	4	2	2.10E-04	6.99E-02	2.00E-01	2.87E-02	5.00E-02	4.2E-03	1.4E+00	4.0E+00	5.7E-01
SHALLOW	ZONE S3	Vinyl Chloride	4	1	1.80E-04	6.73E-04	1.20E-03	3.00E-03	2.00E-02	9.0E-03	3.4E-02	6.0E-02	1.5E-01
SHALLOW	ZONE S3 TO GM-10	1,1-Dichloroethene	13	1	1.10E-04	3.82E-04	2.00E-03	3.90E-03	4.70E-02	2.3E-03	8.1E-03	4.3E-02	8.3E-02
SHALLOW	ZONE S3 TO GM-10	cis-1,2-Dichloroethene	13	10	1.25E-04	2.08E-02	1.30E-01	6.64E-02	4.67E-01	2.7E-04	4.5E-02	2.8E-01	1.4E-01
SHALLOW	ZONE S3 TO GM-10	Tetrachloroethene	13	8	1.20E-04	1.47E-02	1.10E-01	8.14E-02	3.30E-02	3.6E-03	4.5E-01	3.3E+00	2.5E+00
SHALLOW	ZONE S3 TO GM-10	Trichloroethene	13	10	2.10E-04	3.93E-02	2.00E-01	1.31E-01	3.30E-02	6.4E-03	1.2E+00	6.1E+00	4.0E+00
SHALLOW	ZONE S3 TO GM-10	Vinyl Chloride	13	3	1.30E-04	6.52E-04	3.30E-03	8.40E-03	1.30E-02	1.0E-02	5.0E-02	2.5E-01	6.5E-01
SHALLOW	GM-10	1,1-Dichloroethene	1	1	1.10E-04	1.10E-04	1.10E-04	5.00E-04	1.90E-02	5.8E-03	5.8E-03	5.8E-03	2.6E-02
SHALLOW	GM-10	cis-1,2-Dichloroethene	1	1	5.00E-04	5.00E-04	5.00E-04	5.00E-04	1.87E-01	2.7E-03	2.7E-03	2.7E-03	2.6E-02
SHALLOW	GM-10	Tetrachloroethene	1	1	1.30E-03	1.30E-03	1.30E-03	5.00E-04	1.30E-02	1.0E-01	1.0E-01	1.0E-01	3.8E-02
SHALLOW	GM-10	Trichloroethene	1	1	1.60E-02	1.60E-02	1.60E-02	1.48E-02	1.30E-02	1.2E+00	1.2E+00	1.2E+00	1.1E+00
SHALLOW	GM-10	Vinyl Chloride	1	1	1.30E-04	1.30E-04	1.30E-04	5.00E-04	5.00E-03	2.6E-02	2.6E-02	2.6E-02	1.0E-01
SHALLOW	POC SHALLOW	1,1-Dichloroethene	1	1	1.10E-04	1.10E-04	1.10E-04	5.00E-04	7.00E-03	1.6E-02	1.6E-02	1.6E-02	7.1E-02
SHALLOW	POC SHALLOW	cis-1,2-Dichloroethene	1	1	1.25E-04	1.25E-04	1.25E-04	5.00E-04	7.00E-02	1.8E-03	1.8E-03	1.8E-03	7.1E-03
SHALLOW	POC SHALLOW	Tetrachloroethene	1	1	8.50E-04	8.50E-04	8.50E-04	5.00E-04	5.00E-03	1.7E-01	1.7E-01	1.7E-01	1.0E-01
SHALLOW	POC SHALLOW	Trichloroethene	1	1	1.10E-04	1.10E-04	1.10E-04	5.00E-04	5.00E-03	2.2E-02	2.2E-02	2.2E-02	1.0E-01
SHALLOW	POC SHALLOW	Vinyl Chloride	1	1	1.30E-04	1.30E-04	1.30E-04	5.00E-04	2.00E-03	6.5E-02	6.5E-02	6.5E-02	2.5E-01

Table 20: Corrective Action Monitoring Results for Comparison to Remediation Target Levels (RTLs)
General Motors Corporation - Moraine, Ohio

Aquifer	Remediation Zone	Chemical	Num of Analyses	Num of Detects	Min of 2003 Value ¹ (mg/l)	Mean 2003 Value ¹ (mg/L)	Max of 2003 Value ¹ (mg/l)	Max of 1999 Value ¹ (mg/l)	RTL (mg/L)	Ratio: Min 2003 Value to RTL	Ratio: Mean 2003 Value to RTL	Ratio: Max 2003 Value to RTL	Ratio: Max 1999 Value to RTL
DEEP	AOI 7 DEEP	1,1-Dichloroethene	6	6	3.65E-03	3.08E-02	9.50E-02	5.00E-02	7.78E-01	4.7E-03	3.9E-02	1.2E-01	6.4E-02
DEEP	AOI 7 DEEP	cis-1,2-Dichloroethene	6	4	9.00E-03	2.46E+00	6.80E+00	9.73E+00	7.78E+00	1.2E-03	3.2E-01	8.7E-01	1.3E+00
DEEP	AOI 7 DEEP	Tetrachloroethene	6	4	7.50E-03	4.01E+00	1.20E+01	7.12E+00	5.56E-01	1.3E-02	7.2E+00	2.2E+01	1.3E+01
DEEP	AOI 7 DEEP	Trichloroethene	6	4	1.05E-02	6.32E-01	1.60E+00	1.46E+00	5.56E-01	1.9E-02	1.1E+00	2.9E+00	2.8E+00
DEEP	AOI 7 DEEP	Vinyl Chloride	6	4	9.00E-03	4.44E-01	1.70E+00	2.60E+00	2.22E-01	4.1E-02	2.0E+00	7.7E+00	1.2E+01
DEEP	GM-40/41	1,1-Dichloroethene	2	1	1.10E-04	6.55E-04	1.20E-03		6.20E-02	1.8E-03	1.1E-02	1.9E-02	
DEEP	GM-40/41	cis-1,2-Dichloroethene	2	1	1.25E-04	5.06E-03	1.00E-02		6.22E-01	2.0E-04	8.1E-03	1.6E-02	
DEEP	GM-40/41	Tetrachloroethene	2	1	6.00E-05	3.55E-04	6.50E-04		4.40E-02	1.4E-03	8.1E-03	1.5E-02	
DEEP	GM-40/41	Trichloroethene	2	1	1.10E-04	1.60E-01	3.20E-01		4.40E-02	2.5E-03	3.6E+00	7.3E+00	
DEEP	GM-40/41	Vinyl Chloride	2	1	1.45E-03	2.28E-03	3.10E-03		1.80E-02	8.1E-02	1.3E-01	1.7E-01	
DEEP	GM-42	1,1-Dichloroethene	1	1	1.10E-04	1.10E-04	1.10E-04		3.10E-02	3.5E-03	3.5E-03	3.5E-03	
DEEP	GM-42	cis-1,2-Dichloroethene	1	1	1.10E-02	1.10E-02	1.10E-02		3.11E-01	3.5E-02	3.5E-02	3.5E-02	
DEEP	GM-42	Tetrachloroethene	1	1	2.70E-04	2.70E-04	2.70E-04		2.20E-02	1.2E-02	1.2E-02	1.2E-02	
DEEP	GM-42	Trichloroethene	1	1	3.70E-04	3.70E-04	3.70E-04		2.20E-02	1.7E-02	1.7E-02	1.7E-02	
DEEP	GM-42	Vinyl Chloride	1	1	1.00E-03	1.00E-03	1.00E-03		9.00E-03	1.1E-01	1.1E-01	1.1E-01	
DEEP	GM-19D	1,1-Dichloroethene	1	1	1.10E-04	1.10E-04	1.10E-04	5.00E-04	2.30E-02	4.8E-03	4.8E-03	4.8E-03	2.2E-02
DEEP	GM-19D	cis-1,2-Dichloroethene	1	1	1.80E-03	1.80E-03	1.80E-03	1.20E-03	2.33E-01	7.7E-03	7.7E-03	7.7E-03	5.2E-03
DEEP	GM-19D	Tetrachloroethene	1	1	6.00E-05	6.00E-05	6.00E-05	5.00E-04	1.70E-02	3.5E-03	3.5E-03	3.5E-03	2.9E-03
DEEP	GM-19D	Trichloroethene	1	1	2.40E-04	2.40E-04	2.40E-04	1.35E-02	1.70E-02	1.4E-02	1.4E-02	1.4E-02	7.9E-01
DEEP	GM-19D	Vinyl Chloride	1	1	1.70E-02	1.70E-02	1.70E-02	1.50E-03	7.00E-03	2.4E+00	2.4E+00	2.4E+00	2.1E-01
DEEP	ZONE D2	1,1-Dichloroethene	2	2	1.10E-04	1.10E-04	1.10E-04	5.00E-04	1.60E-02	6.9E-03	6.9E-03	6.9E-03	3.1E-02
DEEP	ZONE D2	cis-1,2-Dichloroethene	2	1	1.25E-04	2.81E-03	5.50E-03	1.10E-03	1.56E-01	8.0E-04	1.8E-02	3.5E-02	7.1E-03
DEEP	ZONE D2	Tetrachloroethene	2	2	1.70E-03	1.85E-03	2.00E-03	2.00E-03	1.10E-02	1.5E-01	1.7E-01	1.8E-01	1.8E-01
DEEP	ZONE D2	Trichloroethene	2	2	1.20E-02	2.30E-02	3.40E-02	3.06E-02	1.10E-02	1.1E+00	2.1E+00	3.1E+00	2.8E+00
DEEP	ZONE D2	Vinyl Chloride	2	2	1.30E-04	1.30E-04	1.30E-04	5.00E-04	4.00E-03	3.3E-02	3.3E-02	3.3E-02	1.3E-01
DEEP	POC DEEP	1,1-Dichloroethene	3	1	1.10E-04	1.10E-04	1.10E-04	5.00E-04	7.00E-03	1.6E-02	1.6E-02	1.6E-02	7.1E-02
DEEP	POC DEEP	cis-1,2-Dichloroethene	3	1	1.25E-04	6.17E-04	1.60E-03	4.30E-03	7.00E-02	1.8E-03	8.8E-03	2.3E-02	6.1E-02
DEEP	POC DEEP	Tetrachloroethene	3	2	6.00E-05	1.95E-03	3.60E-03	1.50E-03	5.00E-03	1.2E-02	3.9E-01	7.2E-01	3.0E-01
DEEP	POC DEEP	Trichloroethene	3	3	5.90E-03	1.70E-02	3.30E-02	1.45E-02	5.00E-03	1.2E+00	3.4E+00	6.6E+00	2.9E+00
DEEP	POC DEEP	Vinyl Chloride	3	3	1.30E-04	1.30E-04	1.30E-04	5.00E-04	2.00E-03	6.5E-02	6.5E-02	6.5E-02	2.5E-01

Notes:

1 - Value is calculated either from detected concentrations or 1/2 the sample quantitation limit for non-detects.

TCL/TAL Group	Constituent	CASRN	Moraine Assembly	Moraine Engine	West Carrollton	Criteria	Flag
VOC	1,1,1-Trichloroethane	71-55-6	0.	0.	0.	0.2	
VOC	1,1-Dichloroethane	75-34-3	0.	0.	0.	3.65	
VOC	1,1-Dichloroethene	75-35-4	0.	0.	0.	0.007	
VOC	1,2-Dichloroethene (total)	540-59-0	0.	0.	0.	0.07	
VOC	2-Butanone	78-93-3	0.	0.	0.	21.9	
VOC	Acetone	67-64-1	0.	0.	0.	3.65	
VOC	Benzene	71-43-2	0.	0.	0.	0.005	
VOC	Carbon Disulfide	75-15-0	0.	0.	0.	3.65	
VOC	Chlorobenzene	108-90-7	0.	0.	0.	0.1	
VOC	Chloroethane	75-00-3	0.	0.	0.	0.01	
VOC	Chloroform	67-66-3	0.	0.	0.	0.1	
VOC	cis-1,2-Dichloroethene	156-59-2	0.0001	0.0001	0.	0.07	
VOC	Ethyl Benzene	100-41-4	0.	0.	0.	0.7	
VOC	Styrene	100-42-5	0.	0.	0.	0.1	
VOC	Tetrachloroethene	127-18-4	0.	0.	0.0001	0.005	
VOC	Toluene	108-88-3	0.	0.	0.	1.	
VOC	trans-1,2-Dichloroethene	156-60-5	0.	0.	0.	0.1	
VOC	Trichloroethene	79-01-6	0.0001	0.0001	0.0001	0.005	
VOC	Trichlorofluoromethane	75-69-4	0.	0.	0.	10.95	
VOC	Vinyl Chloride	75-01-4	0.	0.	0.	0.002	
VOC	Xylenes (total)	1330-20-7	0.	0.	0.	10.	
SVOC	1,2-Dichlorobenzene	95-50-1	0.	0.	0.	0.6	
SVOC	2-Methylnaphthalene	91-57-6	0.	0.	0.	0.73	
SVOC	Benzo(a)anthracene	56-55-3	0.	0.	0.	0.01	
SVOC	Benzo(a)pyrene	50-32-8	0.	0.	0.	0.0002	
SVOC	Benzo(b)fluoranthene	205-99-2	0.	0.	0.	0.01	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	0.	0.	0.	0.006	
SVOC	Butylbenzylphthalate	85-68-7	0.	0.	0.	7.3	
SVOC	Chrysene	218-01-9	0.	0.	0.	0.0117	
SVOC	Di-n-butylphthalate	84-74-2	0.	0.	0.	3.65	
SVOC	Fluoranthene	206-44-0	0.	0.	0.	1.46	
SVOC	Fluorene	86-73-7	0.	0.	0.	1.46	
SVOC	Naphthalene	91-20-3	0.	0.	0.	0.73	
SVOC	Phenanthrene	85-01-8	0.	0.	0.	1.095	
SVOC	Pyrene	129-00-0	0.	0.	0.	1.095	
P/PCB	Aroclor-1242	53469-21-9	0.	0.	0.	0.0005	
P/PCB	Aroclor-1254	11097-69-1	0.	0.	0.	0.0005	
P/PCB	Aroclor-1260	11096-82-5	0.	0.	0.	0.0005	
INORG	Antimony	7440-36-0	0.	0.	0.	0.006	
INORG	Arsenic	7440-38-2	0.	0.	0.	0.05	
INORG	Barium	7440-39-3	0.	0.	0.0002	2.	
INORG	Beryllium	7440-41-7	0.	0.	0.	0.004	
INORG	Cadmium	7440-43-9	0.	0.	0.	0.005	
INORG	Chromium (total)	7440-47-3	0.	0.	0.	0.1	
INORG	Cobalt	7440-48-4	0.	0.	0.	2.19	
INORG	Copper	7440-50-8	0.	0.	0.	1.3	
INORG	Cyanide (total)	57-12-5	0.	0.	0.	0.2	
INORG	Lead	7439-92-1	0.	0.	0.	0.015	
INORG	Manganese	7439-96-5	0.	0.	0.0002	5.11	
INORG	Mercury	7439-97-6	0.	0.	0.	0.002	
INORG	Nickel	7440-02-0	0.	0.	0.	0.1	
INORG	Selenium	7782-49-2	0.	0.	0.	0.05	
INORG	Silver	7440-22-4	0.	0.	0.	0.1825	
INORG	Thallium	7440-28-0	0.	0.	0.	0.002	
INORG	Vanadium	7440-62-2	0.	0.	0.	0.2555	
INORG	Zinc	7440-66-6	0.	0.	0.	10.95	
Note:							
1 Supplemental Baseline Risk Assessment (ENVIRON 2001b). Groundwater Exposure Scenario 1 - Baseline wells (West Carrollton municipal well field, Moraine Assembly industrial wells (11A, 12A) and Moraine Engine industrial wells (31, 39).							

Table 22. Summary of Site-Wide Groundwater Monitoring Plan, General Motors Corporation, Moraine, Ohio.

Monitoring Wells	Reason for Monitoring	Monitoring Frequency	Parameter List
Upper Aquifer Wells			
HR-9	Monitoring groundwater quality upgradient of the site.	Annual	VOCs ⁽¹⁾
HR-11	Monitoring groundwater quality upgradient of the site.	Annual	VOCs ⁽¹⁾
HR-8	Monitoring of groundwater quality upgradient of the North Settling Lagoon and Landfills L2 and L3.	Annual	VOCs ⁽¹⁾
HR-4	Monitoring of groundwater quality upgradient of the North Settling Lagoon and downgradient of Landfill L3.	Annual	VOCs ⁽¹⁾
W-2-N	Monitoring of groundwater quality downgradient of the North Settling Lagoon.	Annual	VOCs ⁽¹⁾
W-3-N	Monitoring of groundwater quality downgradient of the North Settling Lagoon.	Annual	VOCs ⁽¹⁾
W-4-N	Monitoring of groundwater quality downgradient of the North Settling Lagoon and Landfills L2 and L3.	Annual	VOCs ⁽¹⁾
HR-2	Monitoring groundwater quality downgradient of Landfills L2 and L3.	Annual	VOCs ⁽¹⁾
HR-5	Monitoring of groundwater quality downgradient of the North Settling Lagoon.	Annual	VOCs ⁽¹⁾
HR-3	Monitoring groundwater quality in the central portion of the site.	Annual	VOCs ⁽¹⁾
HR-1	Monitoring groundwater quality in the central portion of the site.	Annual	VOCs ⁽¹⁾
GM-30	Monitoring effectiveness of interim measures at AOI 7.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾

Table 22. Summary of Site-Wide Groundwater Monitoring Plan, General Motors Corporation, Moraine, Ohio.

Monitoring Wells	Reason for Monitoring	Monitoring Frequency	Parameter List
<u>Upper Aquifer Wells</u> GM-23	Monitoring effectiveness of interim measures at AOI 7.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾
GM-27	Monitoring effectiveness of interim measures at AOI 7 in lower portion of the upper aquifer.	Annual	VOCs ⁽¹⁾
GM-29	Monitoring effectiveness of interim measures upgradient of RZ-1.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾
GM-28	Monitoring effectiveness of interim measures downgradient of RZ-1.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾ arsenic, barium
ME-6	Monitoring effectiveness of interim measures at the upgradient boundary of RZ-2.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾
GM-31	Monitoring effectiveness of interim measures within RZ-2.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾
ME-3	Monitoring effectiveness of interim measures at the downgradient boundary of RZ-2.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾ arsenic, barium
GM-22	Monitoring effectiveness of interim measures upgradient of RZ-3.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽¹⁾
GM-19S	Monitoring effectiveness of interim measures upgradient of RZ-3 and groundwater quality upgradient of Landfill L1.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾

Table 22. Summary of Site-Wide Groundwater Monitoring Plan, General Motors Corporation, Moraine, Ohio.

Monitoring Wells	Reason for Monitoring	Monitoring Frequency	Parameter List
Upper Aquifer Wells EAST	Monitoring effectiveness of interim measures upgradient of RZ-3 and groundwater quality upgradient of Landfill L1.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾
GM-33	Monitoring effectiveness of interim measures upgradient of RZ-3 and groundwater quality upgradient of Landfill L1.	Annual	VOCs ⁽¹⁾
GM-35	Monitoring effectiveness of interim measures upgradient of RZ-3 and groundwater quality upgradient of Landfill L1.	Annual	VOCs ⁽¹⁾
GM-32	Monitoring effectiveness of interim measures downgradient of RZ-3 and groundwater quality upgradient of Landfill L1.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾ arsenic, barium
GM-21	Monitoring effectiveness of interim measures downgradient of RZ-3.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾ arsenic, barium
HR-17	Monitoring of groundwater quality upgradient of the South Settling Lagoon.	Annual	VOCs ⁽¹⁾
W-2-S	Monitoring of groundwater quality downgradient of the South Settling Lagoon.	Annual	VOCs ⁽¹⁾
W-3-S	Monitoring of groundwater quality downgradient of the South Settling Lagoon.	Annual	VOCs ⁽¹⁾
W-4-S	Monitoring of groundwater quality downgradient of the South Settling Lagoon.	Annual	VOCs ⁽¹⁾

Table 22. Summary of Site-Wide Groundwater Monitoring Plan, General Motors Corporation, Moraine, Ohio.

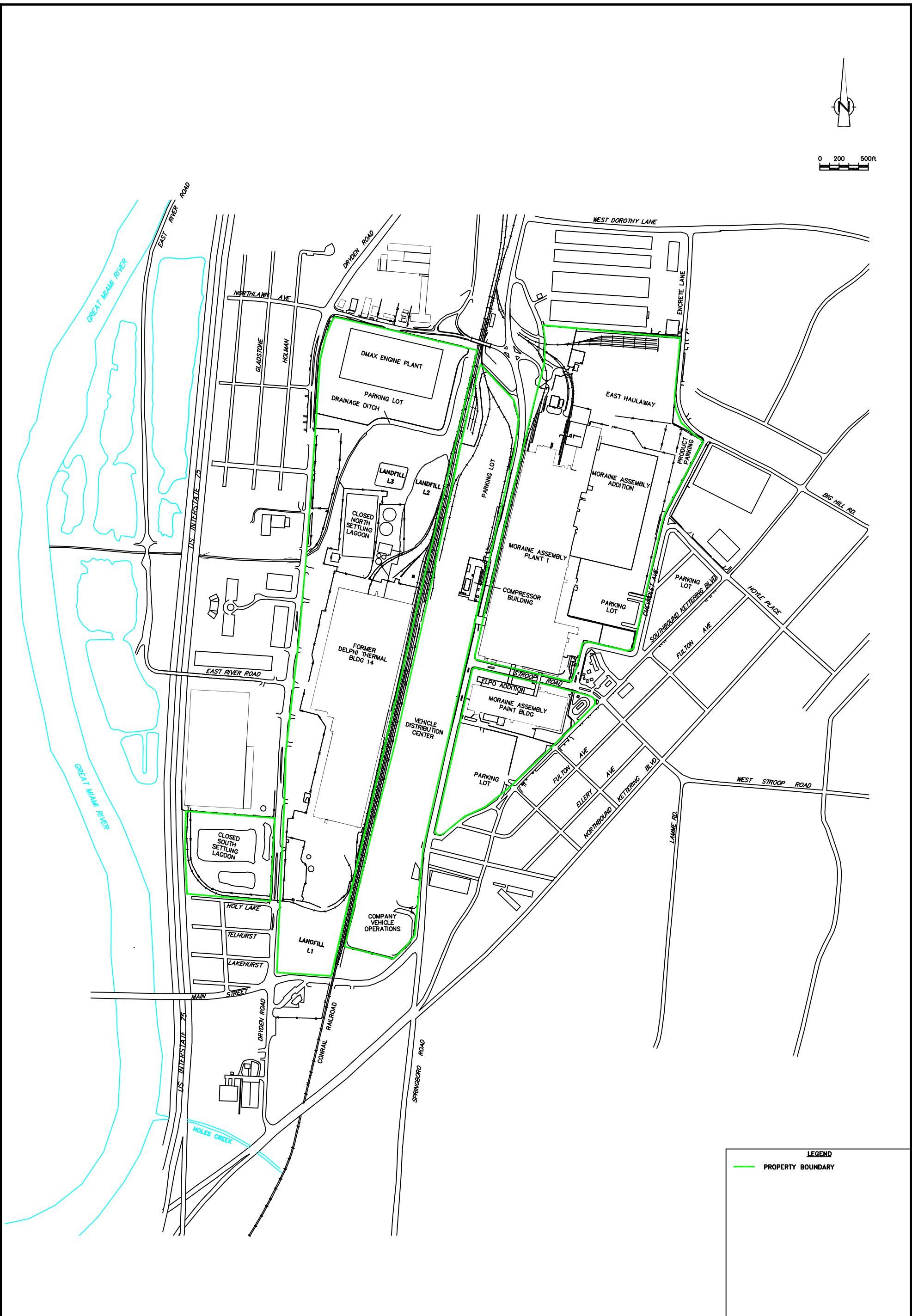
Monitoring Wells	Reason for Monitoring	Monitoring Frequency	Parameter List
<u>Upper Aquifer Wells</u> GM-8	Monitoring groundwater quality downgradient of the site and within Landfill L1.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾
GM-6	Monitoring groundwater quality downgradient of the site and Landfill L1.	Annual	VOCs ⁽¹⁾ Biogeochemical ⁽²⁾ arsenic, barium
TW-2	Monitoring groundwater quality downgradient of the site and Landfill L1.	Annual	VOCs ⁽¹⁾ arsenic, barium
4S	Monitoring groundwater quality downgradient of the site and Landfill L1.	Annual	VOCs ⁽¹⁾ arsenic, barium
GM-2	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾ arsenic, barium
GM-16	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-17	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-18	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
WSU-24	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-10	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-26	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
<u>Lower Aquifer Wells</u> HR-10	Monitoring groundwater quality upgradient of the site.	Annual	VOCs ⁽¹⁾
HR-12	Monitoring groundwater quality upgradient of the site.	Annual	VOCs ⁽¹⁾

Table 22. Summary of Site-Wide Groundwater Monitoring Plan, General Motors Corporation, Moraine, Ohio.

Monitoring Wells	Reason for Monitoring	Monitoring Frequency	Parameter List
<u>Lower Aquifer Wells</u>			
HR-15	Monitoring groundwater quality in the central portion of the site.	Annual	VOCs ⁽¹⁾
HR-13	Monitoring groundwater quality in the central portion of the site.	Annual	VOCs ⁽¹⁾
GM-39	Monitoring groundwater quality in the central portion of the site.	Annual	VOCs ⁽¹⁾
GM-40	Monitoring groundwater quality in the central portion of the site.	Annual	VOCs ⁽¹⁾
GM-41	Monitoring groundwater quality in the central portion of the site.	Annual	VOCs ⁽¹⁾
GM-42	Monitoring groundwater quality in the central portion of the site.	Annual	VOCs ⁽¹⁾
GM-19D	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-3	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-1	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-15	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-11	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-20D	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
DN-13	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
GM-9	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾
MT-69	Monitoring groundwater quality downgradient of the site.	Annual	VOCs ⁽¹⁾

VOCs - Volatile organic compounds.

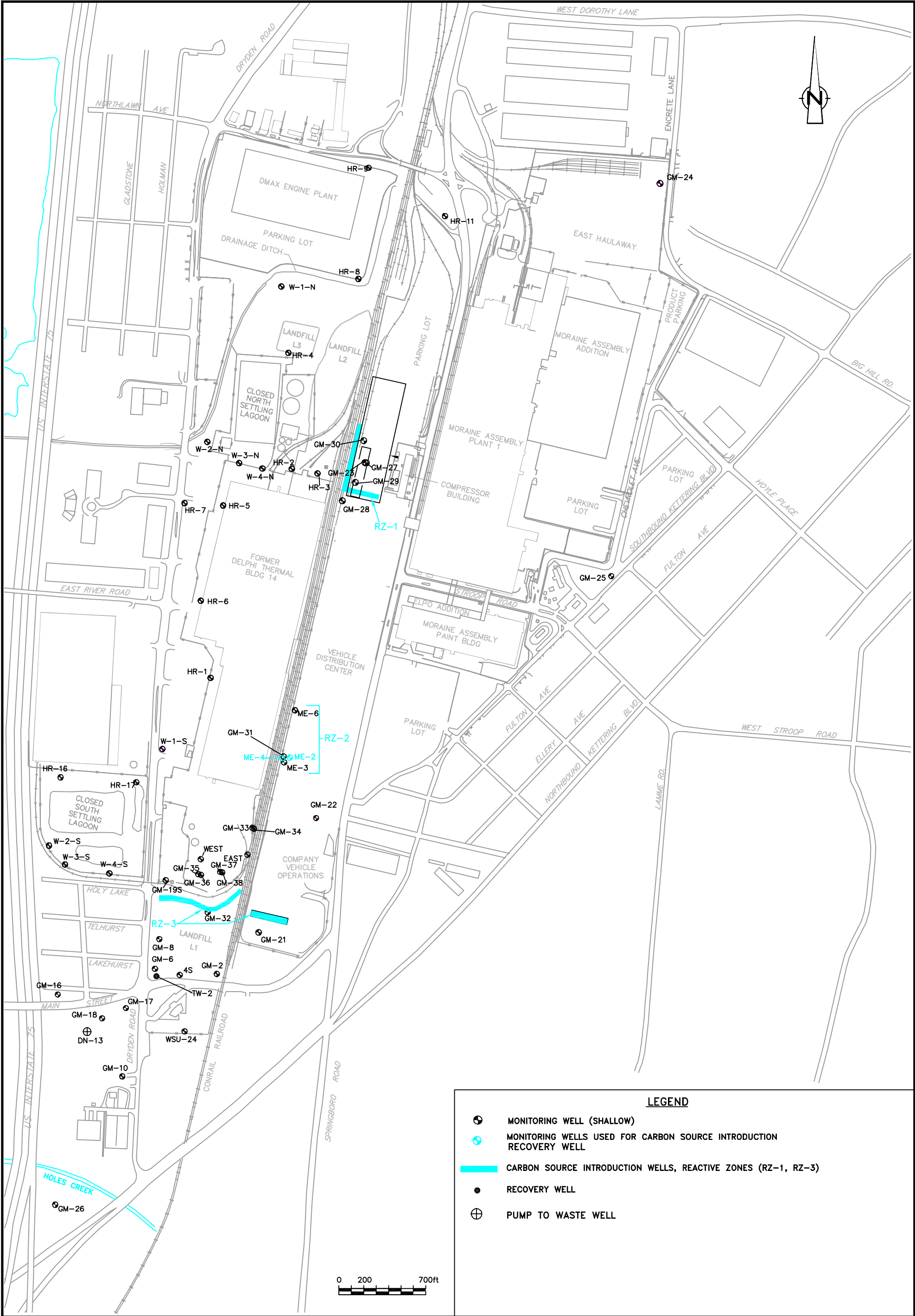
- (1) The parameters for the remaining annual sampling events will include the site-specific list of VOCs: benzene, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, ethylbenzene, tetrachloroethane, toluene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride, and xylenes.
- (2) The biogeochemical list includes the field and laboratory parameters presented on Table 1.

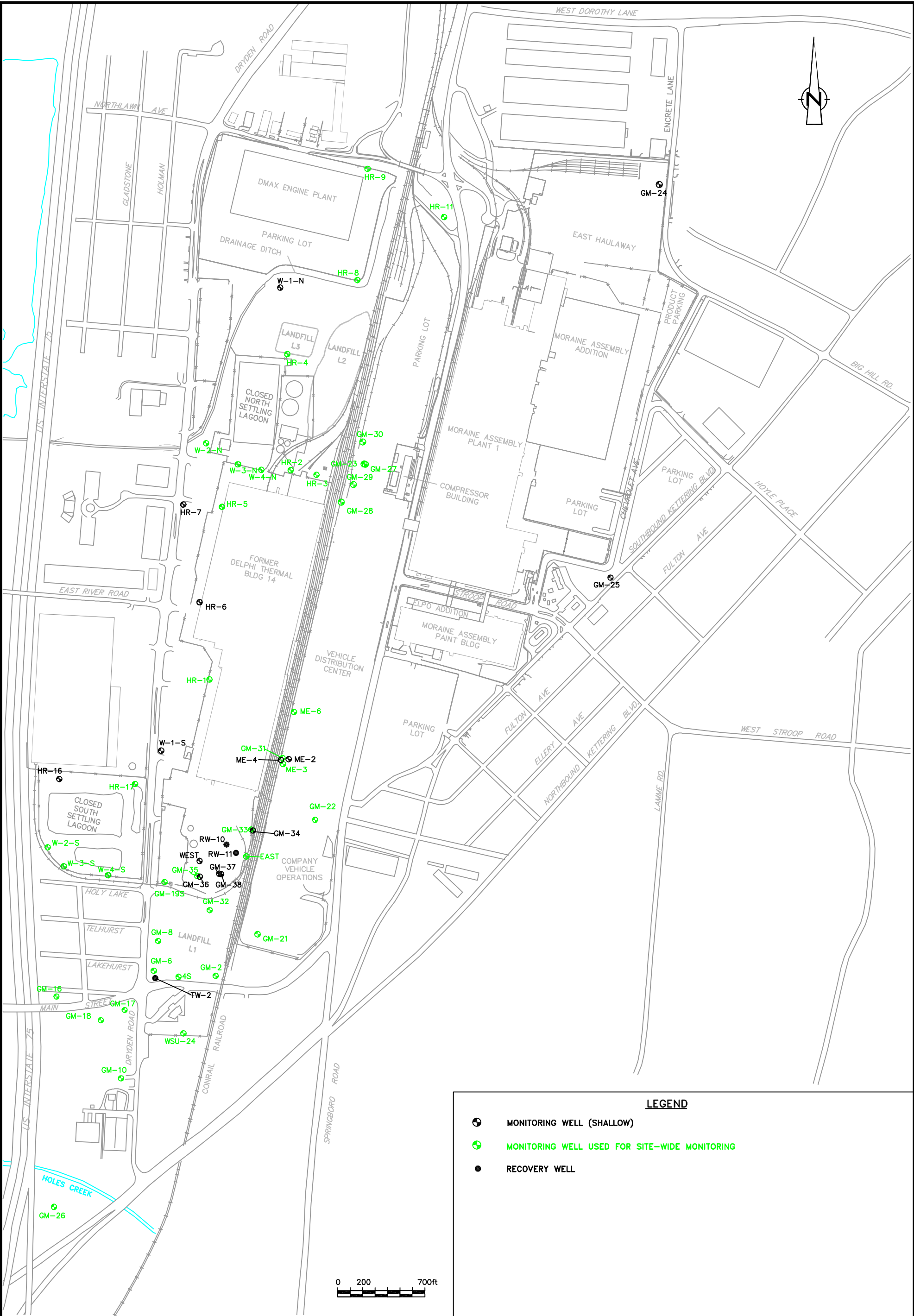


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Tel: 614/764-2310 Fax: 614/764-1270

SITE LAYOUT
GENERAL MOTORS CORPORATION
MORaine, OHIO

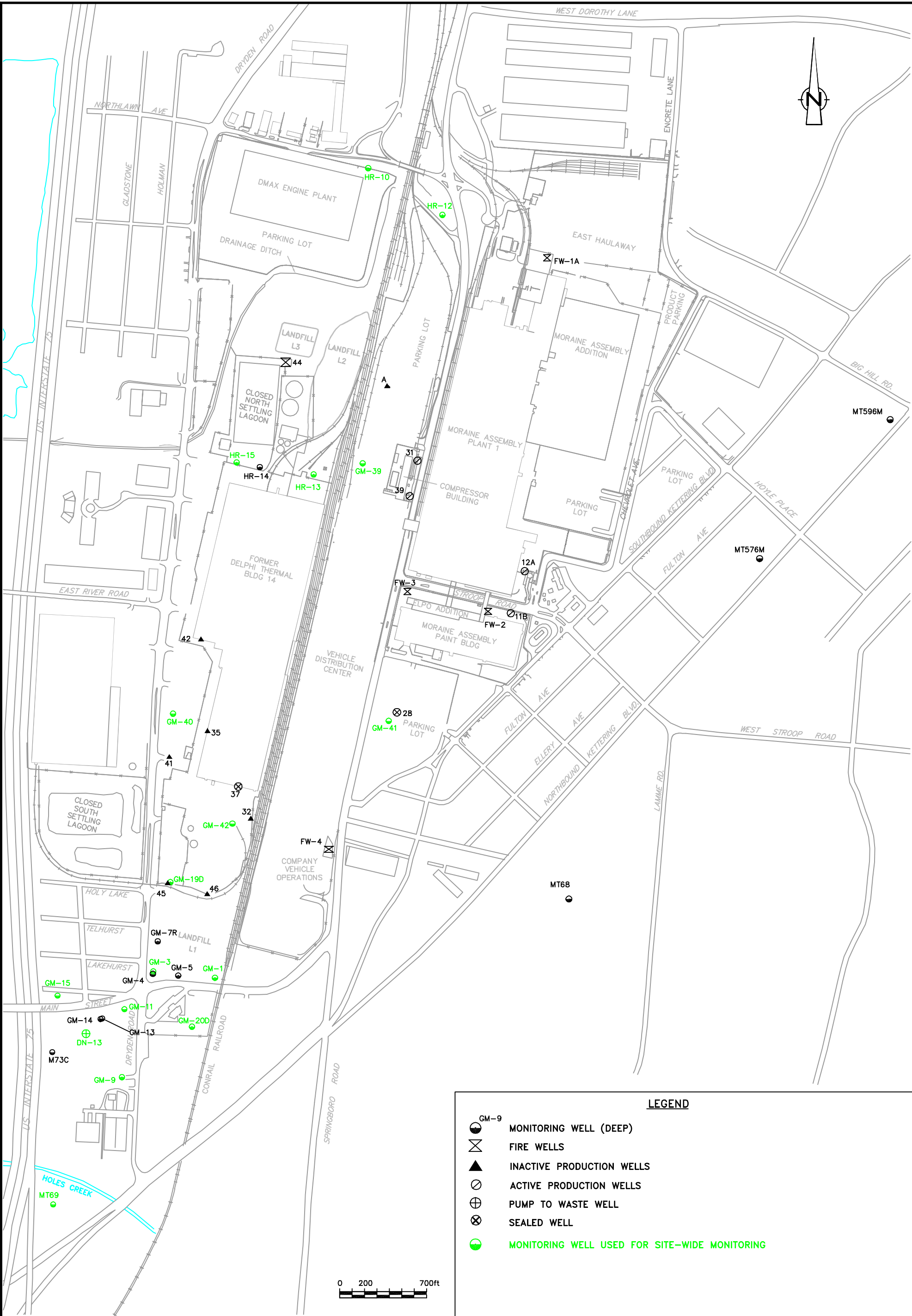
DATE 2/24/2004	PROJECT MANAGER N. GILLOTTI	DRAWING NAME CRA\SITE\SWGW00
DRAWN R. SMITH	LEAD DESIGN PROF. J. REID	CHECKED N. GILLOTTI
PROJECT NUMBER OH000294.0006.0003	DRAWING NUMBER 1	

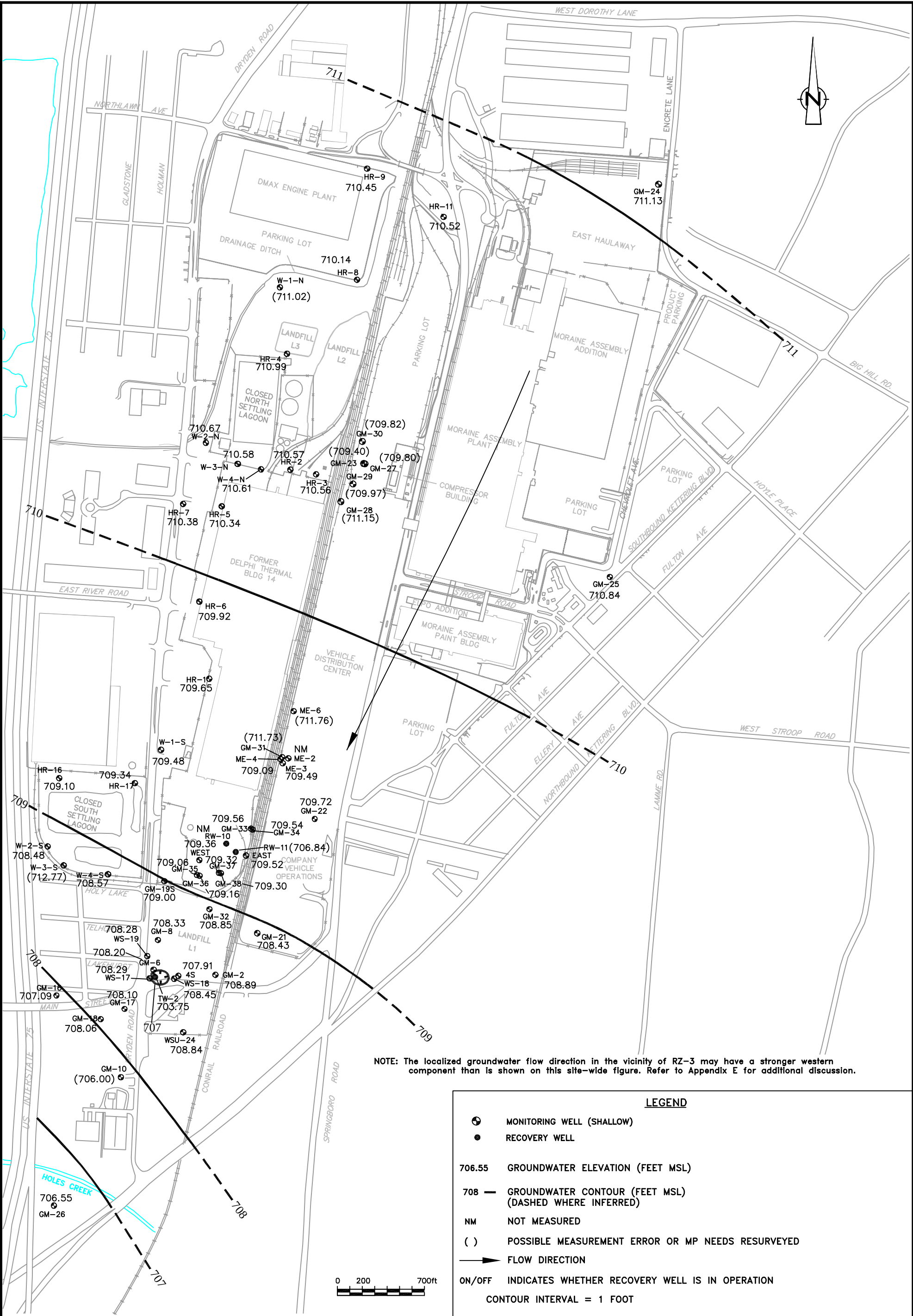


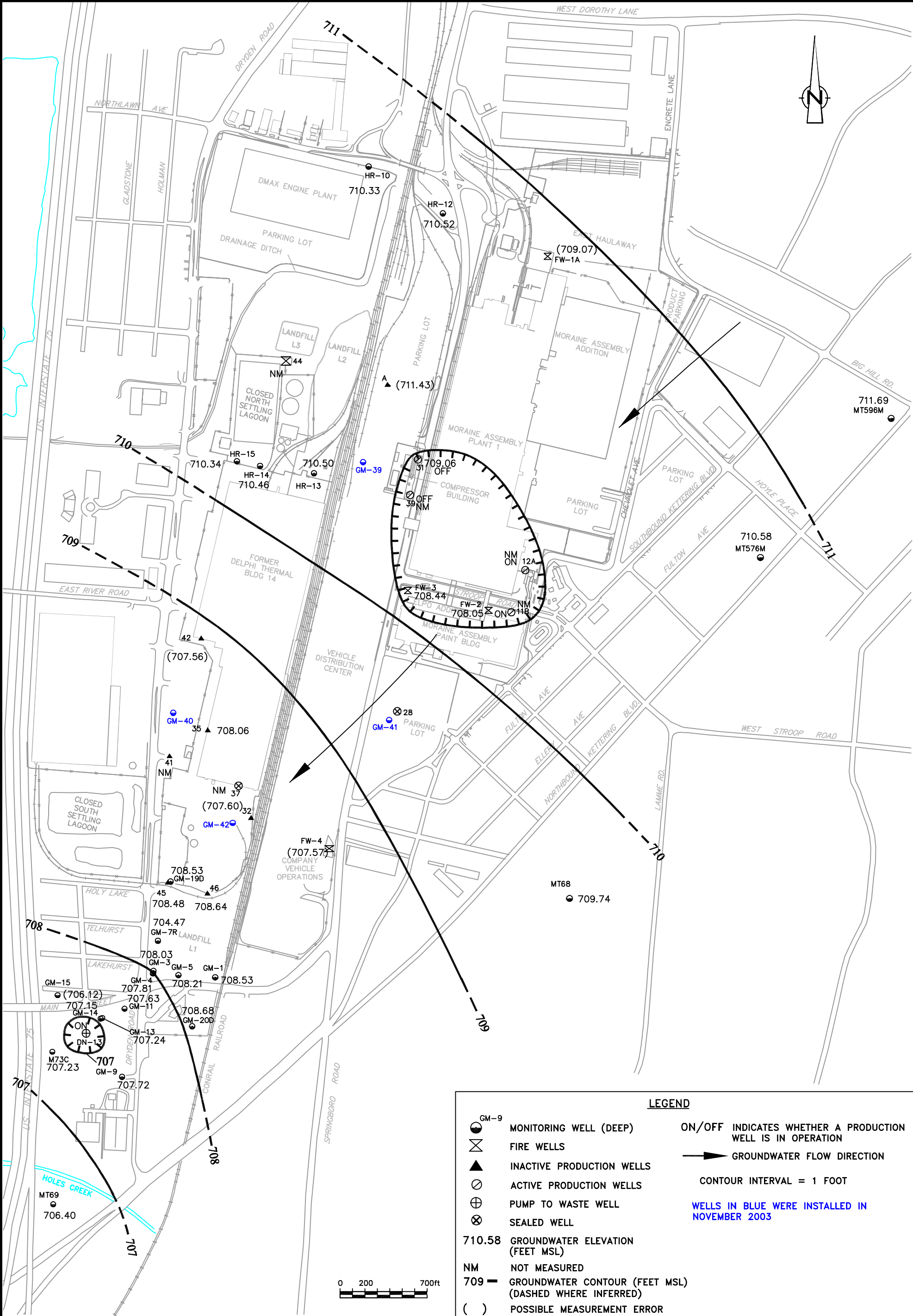


LEGEND

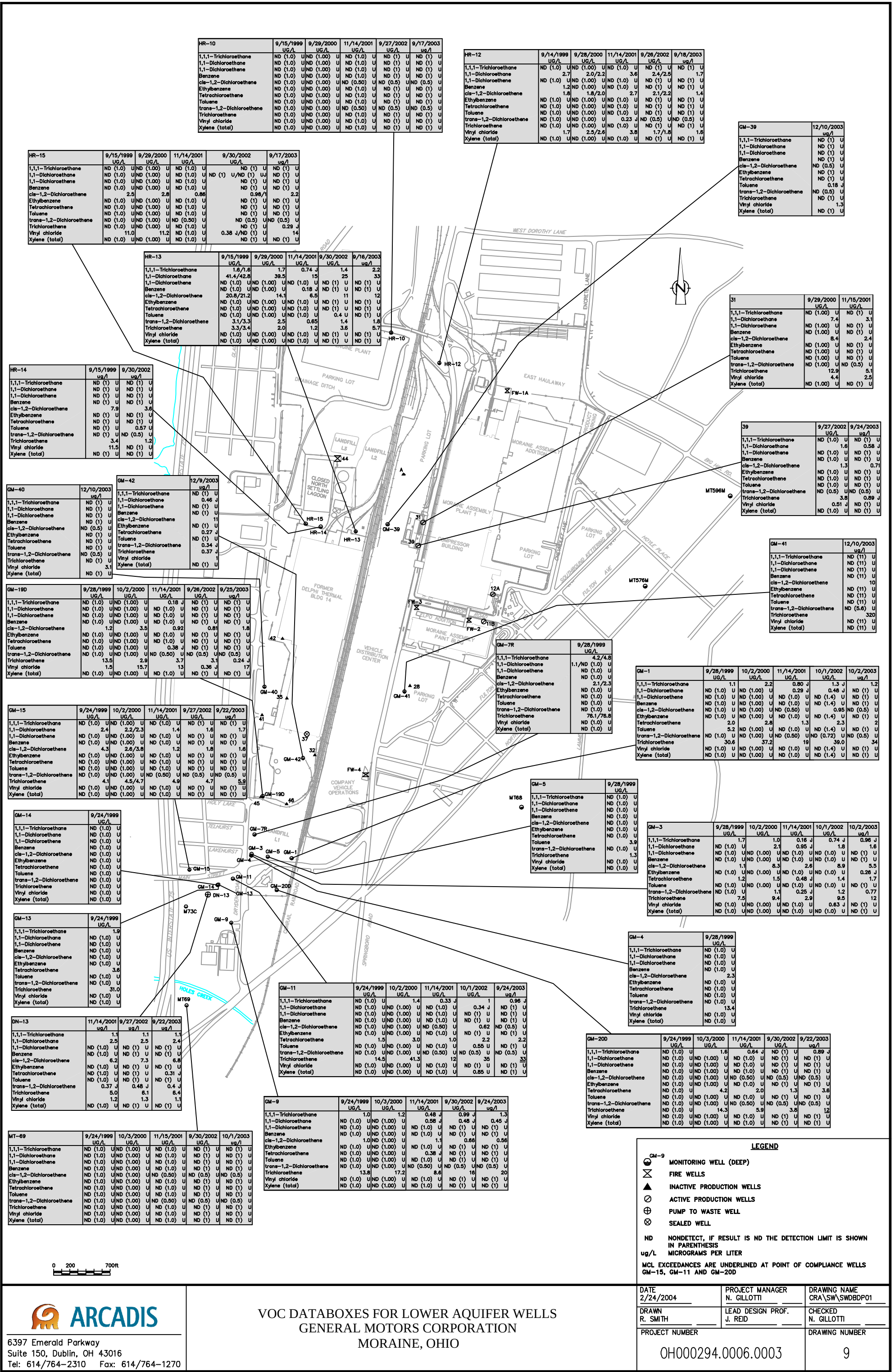
- MONITORING WELL (SHALLOW)
- MONITORING WELL USED FOR SITE-WIDE MONITORING
- RECOVERY WELL

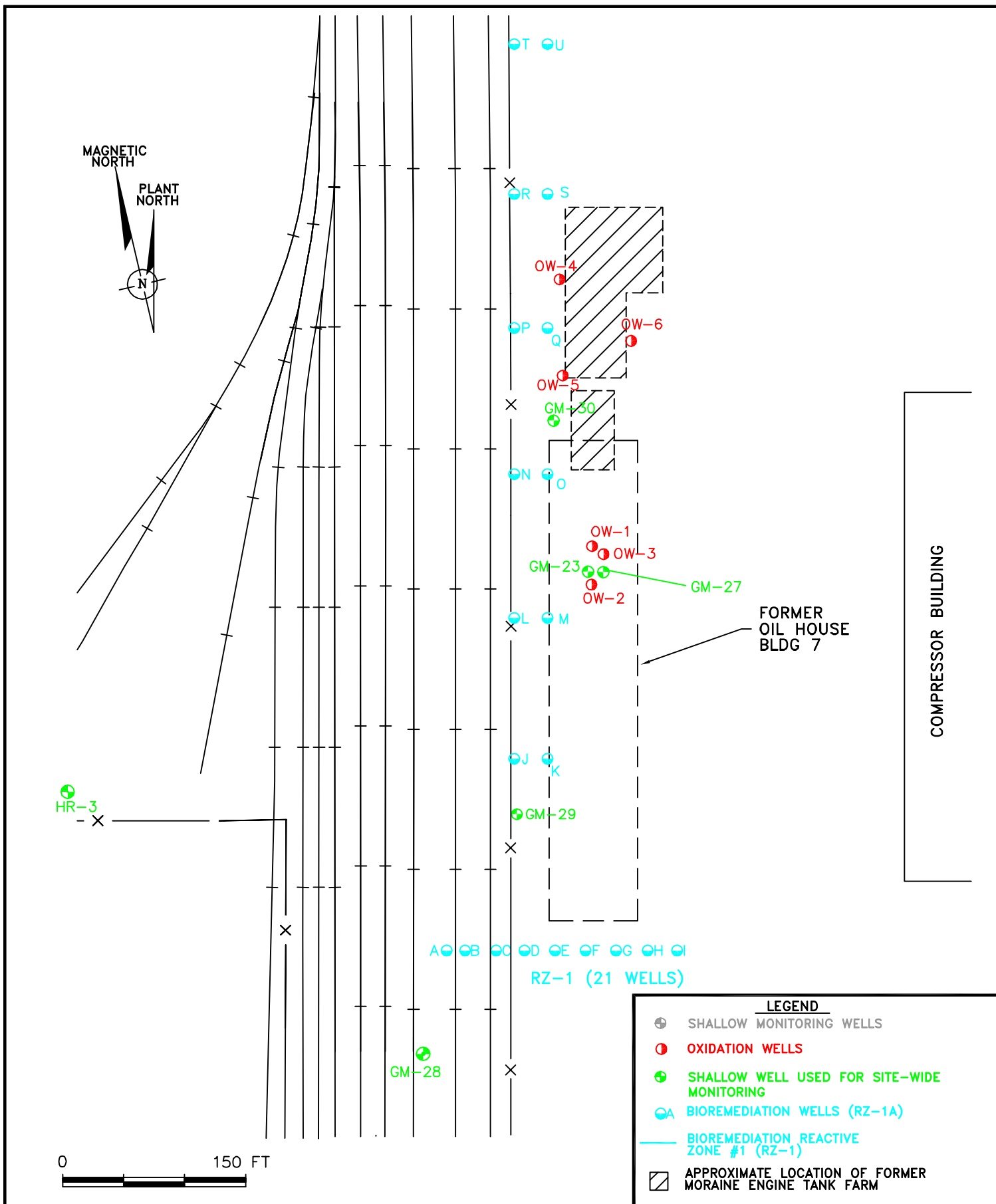


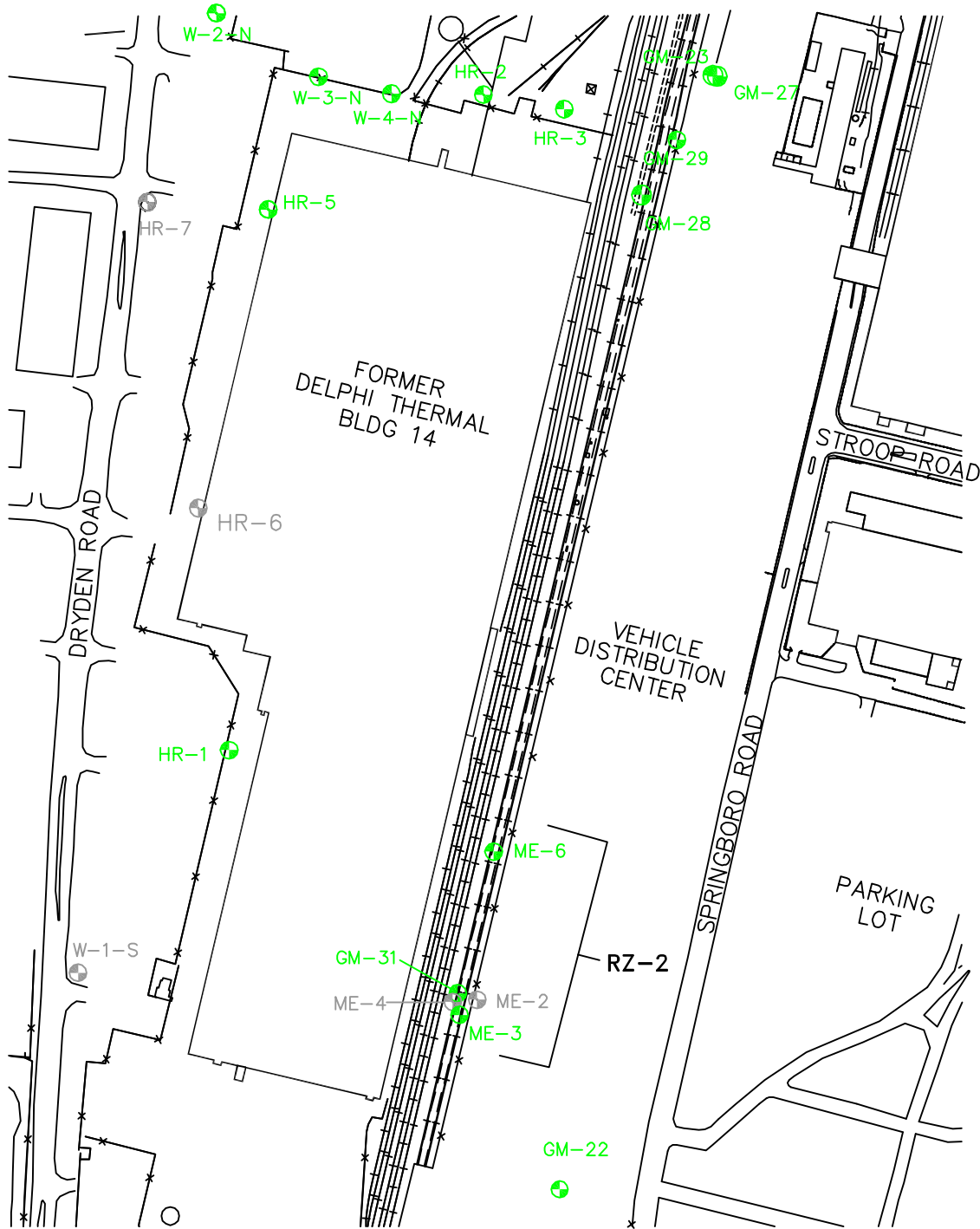












LEGEND

- MONITORING WELL (SHALLOW)
- MONITORING WELL USED FOR SITE-WIDE MONITORING



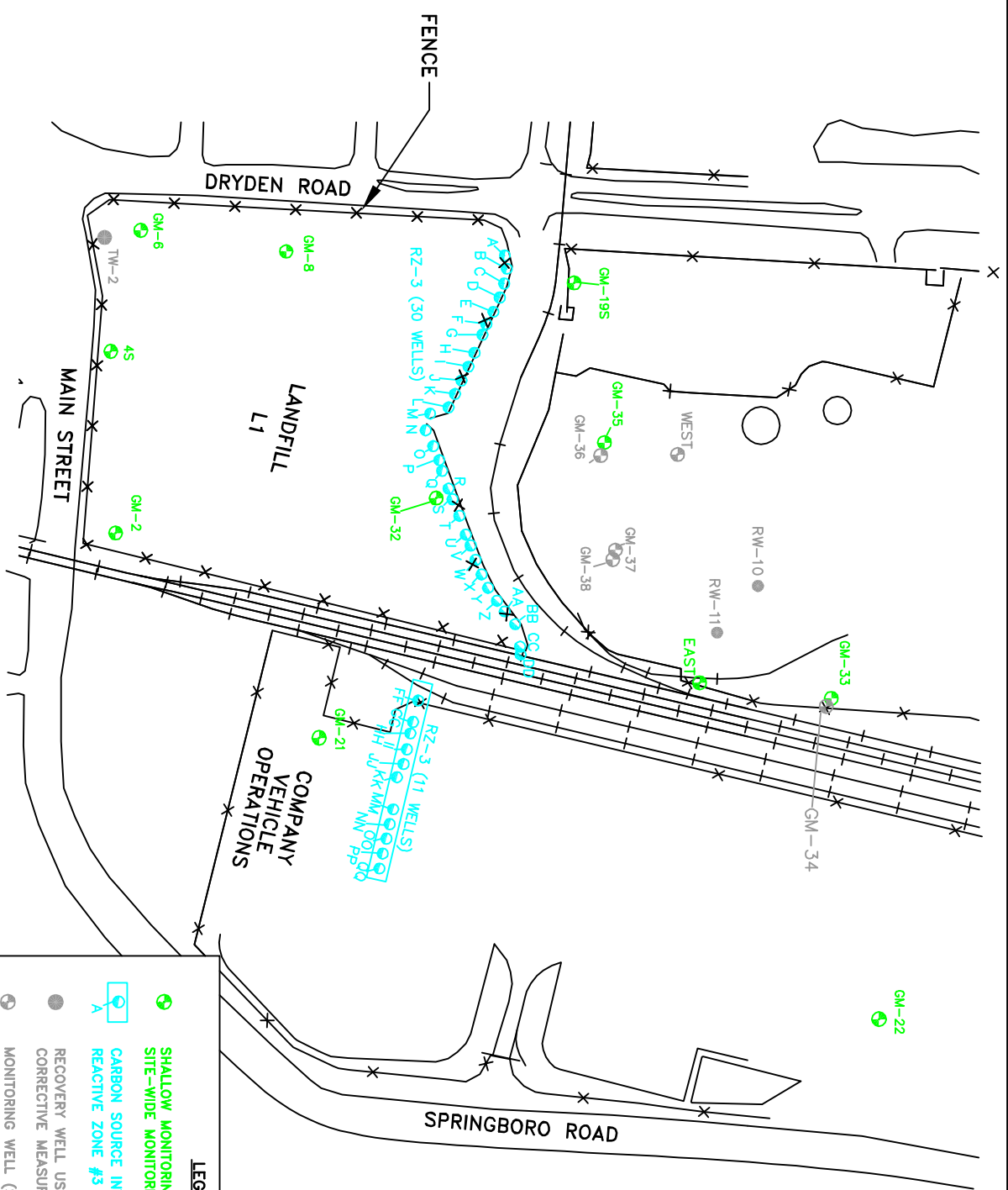
6307 Emerald Parkway
 Suite 150, Dublin, OH 43016
 Tel: 614/764-2310 Fax: 614/764-1270

**REACTIVE ZONE #2
 GENERAL MOTORS CORPORATION
 MORaine, OHIO**

DATE 2/24/2004	PROJECT MANAGER N. GILLOTTI	DRAWING NAME CRA SITEWIDE SWGW10
DRAWN R. SMITH	LEAD DESIGN PROF. J. REID	CHECKED N. GILLOTTI
PROJECT NUMBER OH000294.0006.0003		FIGURE NUMBER 11



NOTE: INTRODUCTION WELL RZ-3LL WAS NOT INSTALLED DUE TO PRESENCE OF UNDERGROUND UTILITIES.



LEGEND

- SHALLOW MONITORING WELL USED FOR SITE-WIDE MONITORING
- CARBON SOURCE INTRODUCTION WELLS
- REACTIVE ZONE #3 (RZ-3A)
- RECOVERY WELL USED FOR THE CAPTURE ZONE
- CORRECTIVE MEASURES
- MONITORING WELL (SHALLOW)



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REACTIVE ZONES #3 WEST AND #3 EAST
GENERAL MOTORS CORPORATION
MORaine, OHIO

DATE	2/24/2004	PROJECT MANAGER	N. GILLOTTI	DRAWING NAME	CRA SITEWIDE (SNGW11)
DRAWN	R. SMITH	LEAD DESIGN PROF.	J. REID	CHECKED	N. GILLOTTI
PROJECT NUMBER	0H000294.0006.0003				FIGURE NUMBER
					12



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Appendix A

Site-Wide Groundwater Analytical
Results from 1999 to 2002 Sampling
Events



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Table A-1. Groundwater Analytical Results for the Upper Aquifer Wells in 1999, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	HR-9 09/16/99	HR-11 09/14/99	GM-24 09/23/99	HR-8 09/16/99	W-1-N 09/17/99	HR-4 09/14/99	W-2-N 09/14/99	W-3-N 09/17/99	W-4-N 09/17/99	HR-2 09/16/99	HR-3 09/16/99
<u>Volatiles Organic Compounds</u>												
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	52.2	13.5	<1.0	26.4	<1.0	<1.0	<1.0	<1.0	1.3	3.9	6.2
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	20.3	3.3	<1.0	4.4	<1.0	<1.0	1.6	2.9	2.2	9.6	6.1
trans-1,2-Dichloroethene	ug/l	3.2	<1.0	<1.0	1.5	<1.0	<1.0	<1.0	2.6	<1.0	1.5	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	2.5	2.1	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	20.3	<1.0	2.7	10.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	18.1	<1.0	<1.0	1.6	<1.0	1.4	1.7	<1.0	9.8	<1.0	<1.0
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	12.8	<1.0	<1.0	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

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Table A-1. Groundwater Analytical Results for the Upper Aquifer Wells in 1999, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	GM-30 09/02/99	GM-23 09/02/99	GM-27 09/01/99	GM-29 09/01/99	GM-28 09/01/99	GM-25 09/22/99	HR-7 09/17/99	HR-5 09/16/99	HR-6 09/16/99	HR-1 09/16/99	DUP-75 09/16/99
<u>Volatile Organic Compounds</u>												
Benzene	ug/l	<10	1.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	53.8J	32.5	2.4	4.3	3.3	<1.0	<1.0	<1.0	<1.0	2.4	2.5
1,1-Dichloroethene	ug/l	<10	17.2	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	7.5J	7530	20.6	320	175	<1.0	<1.0	10.5	<1.0	5.8	6.1
trans-1,2-Dichloroethene	ug/l	<10	54.5	<1.0	11.1	9.2	<1.0	<1.0	1.1	<1.0	3.9	4.0
Ethylbenzene	ug/l	7030J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	9.5J	6250	1.7	<20	316	<1.0	<1.0	<1.0	<1.0	44.3	40.5
Toluene	ug/l	6950J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<10	7.2	<1.0	37.8	17.7	<1.0	<1.0	<1.0	<1.0	1.6	1.5
Trichloroethene	ug/l	<10	1460	121	878	768	<1.0	9.8	12.0	2.0	56.0	53.5
Vinyl Chloride	ug/l	<10	2500	<1.0	3.8	3.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	23300J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

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Table A-1. Groundwater Analytical Results for the Upper Aquifer Wells in 1999, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	W-1-S 09/22/99	DUP-77 09/22/99	ME-6 08/31/99	ME-1 08/31/99	GM-31 09/01/99	ME-3 08/31/99	DUP-72 08/31/99	HR-16 09/23/99	HR-17 09/23/99	W-2-S 09/23/99	W-3-S 09/23/99
<u>Volatiles Organic Compounds</u>												
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	<1.0	<1.0	2.4	1.3	6.1	6.1	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	8.0	7.8	255	38.2	7.8	5.7	5.6	<1.0	6.2	<1.0	<1.0
trans-1,2-Dichloroethene	ug/l	1.1	1.1	<1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	30.9	28.4	213	83.6	1.3	57.9	60.4	<1.0	15.5	<1.0	1.1
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	2.9	13.5	<1.0	42.5	38.3	<1.0	<1.0	1.9J	3.9
Trichloroethene	ug/l	11.6	11.6	474	292	27.2	47.5	45.0	2.7	7.4	6.1	2.6
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	36	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

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Table A-1. Groundwater Analytical Results for the Upper Aquifer Wells in 1999, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	W-4-S 09/23/99	DUP-78 09/23/99	GM-19S 09/20/99	EAST 09/21/99	WEST 09/21/99	GM-32 09/22/99	GM-22 09/01/99	GM-21 09/22/99	GM-8 09/20/99	GM-6 09/20/99
<u>Volatile Organic Compounds</u>											
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.4	<1.0
1,1-Dichloroethane	ug/l	1.2	1.2	7.7	5.4	25.6	3.3	<1.0	9.0	30.2	33.2
1,1-Dichloroethene	ug/l	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	3.9	<1.0	1.2
cis-1,2-Dichloroethene	ug/l	4.4	4.3	34.6	9.1	125	2.6	<1.0	66.4	26.2	52.9
trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	2.3	<1.0	<1.0	4.2	<1.0	7.8	12.0	2.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	20.7	<1.0
Tetrachloroethene	ug/l	30.5J	29.6	46.0	61.0	41.3	1.2	3.6	<1.0	14.8	81.4
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	3.3	3.4	16.0	21.0	24.8	<1.0	<1.0	53.1	1.9	24.6
Trichloroethene	ug/l	14.7J	14.6	71.1	56.1	37.3	3.2	4.0	28.7	30.4	78.2
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	3.0	<1.0	<1.0	8.4	1.6
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.3	<1.0

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Table A-1. Groundwater Analytical Results for the Upper Aquifer Wells in 1999, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	45	GM-2	GM-16	GM-17	GM-18	GM-10	DUP-76	WSU-24	GM-26
<u>Volatile Organic Compounds</u>										
Benzene	ug/l	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	1.6	1.4	<1.0	26.4	22.6	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	<1.0	8.4	1.7	30.0	35.3	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	2.6	2.2	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	<1.0	6.0	44.1	<1.0	4.9	<1.0	<1.0	1.9	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	5.5	2.2	6.4	42.6	1.7	1.6	2.4	<1.0
Trichloroethene	ug/l	<1.0	61.6	8.5	28.7	131	14.8	13.8	17.0	<1.0
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

ug/l - Micrograms per liter.

DUP-72 - Duplicate of ME-3.

DUP-75 - Duplicate of HR-1.

DUP-76 - Duplicate of GM-10.

DUP-77 - Duplicate of W-1-S.

DUP-78 - Duplicate of W-4-S.

R - Value is unusable.

UJ - Constituent not detected above the reporting limit. Detection limit estimated.

< - Constituent not detected above laboratory detection limit shown.

J - Value is estimated.

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Table A-2. Groundwater Analytical Results for Lower Aquifer Wells in 1999, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	HR-10 09/15/99	HR-12 09/14/99	HR-15 09/15/99	HR-14 09/15/99	HR-13 09/15/99	DUP-74 09/15/99	GM-19D 09/28/99	GM-7R 09/28/99
<u>Volatile Organic Compounds</u>									
Benzene	ug/l	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	2.7	<1.0	<1.0	41.4	42.8	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	<1.0	1.8	2.5	7.9	20.8	21.2	1.2	2.1
trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	3.1	3.3	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	1.6	1.6	<1.0	4.2
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	3.4	3.4	3.3	13.5	76.1
Xylenes	ug/l	<1.0	1.7	11.0	11.5	<1.0	<1.0	1.5	<1.0
	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

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Table A-2. Groundwater Analytical Results for Lower Aquifer Wells in 1999, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	DUP-79 09/28/99	GM-3 09/28/99	GM-4 09/28/99	GM-5 09/28/99	GM-1 09/28/99	GM-15 09/24/99	GM-14 09/24/99	GM-13 09/24/99
<u>Volatile Organic Compounds</u>									
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	1.1	<1.0	<1.0	<1.0	<1.0	2.4	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	2.3	1.1	2.3	<1.0	<1.0	4.3	<1.0	<1.0
trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	3.9	5.2	<1.0	<1.0	3.6
1,1,1-Trichloroethane	ug/l	4.8	1.7	<1.0	<1.0	1.1	<1.0	<1.0	<1.0
Trichloroethene	ug/l	76.8	7.5	13.4	1.3	30.6	4.1	<1.0	1.9
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	31.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

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Table A-2. Groundwater Analytical Results for Lower Aquifer Wells in 1999, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	GM-11 09/24/99	GM-20D 09/24/99	GM-9 09/24/99	MT-69 09/24/99
<u>Volatile Organic Compounds</u>					
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	<1.0	<1.0	1.0	<1.0
trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	1.5	<1.0	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	1.0	<1.0
Trichloroethene	ug/l	14.5	<1.0	13.8	<1.0
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0

ug/l - Micrograms per liter.

DUP-74 - Duplicate of HR-13.

DUP-79 - Duplicate of GM-7R.

R - Value is unusable.

UJ - Constituent not detected above the reporting limit. Detection limit estimated.

< - Constituent not detected above laboratory detection limit shown

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Table A-3. Groundwater Analytical Results for Upper Aquifer Wells in 2000, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	HR-9 9/18/2000	HR-11 9/18/2000	DUP-89 9/18/2000	HR-8 9/18/2000	HR-4 9/20/2000	W-2-N 9/19/2000	W-3-N 9/19/2000	W-4-N 9/19/2000	HR-2 9/19/2000
Volatle Organic Compounds										
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	51.0	32.9	36.8	29.0	<1.0	<1.0	<1.0	<1.0	4.6
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	16.3	18.5	20.9	5.6	<1.0	1.2	282	2.0	8.6
trans-1,2-Dichloroethene	ug/l	2.6	2.6	2.8	1.8	<1.0	<1.0	3.9	<1.0	1.1
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	20.5	<1.0	<1.0	9.9	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	16.9	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.3	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	24.0	<1.0	<1.0
								<1.0	<1.0	<1.0

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Table A-3. Groundwater Analytical Results for Upper Aquifer Wells in 2000, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	HR-3 9/19/2000	GM-30 9/20/2000	GM-23 9/20/2000	GM-27 9/20/2000	DUP-90 9/20/2000	GM-29 9/21/2000	GM-28 9/21/2000	HR-5 9/19/2000	HR-1 9/25/2000
Volatile Organic Compounds										
Benzene	ug/l	<1.0	2.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	5.1	50.6	16.3	2.2	2.1	16.6	9.9	<1.0	2.4
1,1-Dichloroethene	ug/l	<1.0	<1.0	5.1	<1.0	<1.0	3.1	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	4.6	<1.0	5620	13.9	13.5	2871	37.0	5.6	8.5
trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	33.2	<1.0	<1.0	14.4	22.3	<1.0	3.2
Ethylbenzene	ug/l	<1.0	2290	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	<1.0	<1.0	3470	1.2	1.2	20.0	2.3	<1.0	32.6
Toluene	ug/l	<1.0	98.9	<1.0	<1.0	<1.0	2.2	<1.0	3.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	2.0	<1.0	<1.0	24.5	5.0	<1.0	1.3
Trichloroethene	ug/l	<1.0	<1.0	609	112	117	289	1.6	8.1	56.4
Vinyl Chloride	ug/l	<1.0	<1.0	801	<1.0	<1.0	788	12.4	<1.0	<1.0
Xylenes	ug/l	<1.0	6770	<1.0	<1.0	<1.0	<1.0	<1.0	2.0	<1.0

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Table A-3. Groundwater Analytical Results for Upper Aquifer Wells in 2000, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	ME-6 9/21/2000	GM-31 9/21/2000	ME-3 9/21/2000	HR-17 9/28/2000	W-2-S 9/27/2000	DUP-92 9/27/2000	W-3-S 9/28/2000	W-4-S 9/28/2000	GM-19S 9/22/2000
<u>Volatile Organic Compounds</u>										
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	1.1	3.4	<1.0	<1.0	<1.0	<1.0	1.0	4.4
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	98.8	40.2	2.9	<1.0	<1.0	<1.0	<1.0	4.0	37.6
trans-1,2-Dichloroethene	ug/l	2.5	<1.0	2.9	<1.0	<1.0	<1.0	<1.0	<1.0	2.6
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	6.7	<1.0	<1.0	3.7	<1.0	<1.0	<1.0	15.4	68.0
Toluene	ug/l	1.9	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	6.4	1.9	1.6	1.7	2.8	3.0	14.5
Trichloroethene	ug/l	19.0	8.5	<1.0	4.4	5.0	5.0	2.5	11.3	104
Vinyl Chloride	ug/l	6.1	<1.0	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

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Table A-3. Groundwater Analytical Results for Upper Aquifer Wells in 2000, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	EAST 9/22/2000	GM-32 9/25/2000	GM-22 9/21/2000	GM-21 9/22/2000	DUP-91 9/22/2000	GM-8 9/26/2000	GM-6 9/26/2000	TW-2 9/26/2000
Volatile Organic Compounds									
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0
1,1-Dichloroethane	ug/l	7.7	35.9	2.4	5.6	6.3	36.5	13.0	27.8
1,1-Dichloroethene	ug/l	1.2	<1.0	<1.0	1.6	1.8	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	77.3	<1.0	1.9	38.7	42.8	1.5	41.0	22.5
trans-1,2-Dichloroethene	ug/l	1.8	20.3	<1.0	12.9	13.2	5.4	2.2	2.9
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	12.5	<1.0	10.4
Tetrachloroethene	ug/l	55.8	<1.0	1.6	<1.0	<1.0	<1.0	51.5	5.0
Toluene	ug/l	<1.0	10.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	22.2	<1.0	<1.0	15.7	18.7	<1.0	12.1	4.5
Trichloroethene	ug/l	97.2	<1.0	<1.0	189	206	6.6	56.6	43.1
Vinyl Chloride	ug/l	3.0	<1.0	<1.0	<1.0	<1.0	2.4	3.7	5.9
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	1.9	<1.0	3.2

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Table A-3. Groundwater Analytical Results for Upper Aquifer Wells in 2000, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	GM-2 9/25/2000	GM-16 9/26/2000	GM-17 9/27/2000	GM-18 9/27/2000	WSU-24 9/26/2000	GM-10 9/27/2000	GM-26 9/27/2000
<u>Volatile Organic Compounds</u>								
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	3.7	<1.0	23.9	10.4	<1.0	1.4	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	39.2	<1.0	41.6	23.9	2.7	5.7	<1.0
trans-1,2-Dichloroethene	ug/l	1.3	<1.0	2.5	1.8	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	7.7	16.2	24.6	7.8	1.2	1.4	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	5.7	2.5	6.7	31.8	2.1	2.5	<1.0
Trichloroethene	ug/l	82.8	3.5	48.4	115	16.8	23.2	<1.0
Vinyl Chloride	ug/l	1.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

ug/l - Micrograms per liter.

DUP-89 - Duplicate of HR-11.

DUP-90 - Duplicate of GM-27.

DUP-91 - Duplicate of GM-21.

DUP-92 - Duplicate of W-2-5.

< - Constituent not detected above laboratory detection limit shown.

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Table A-4. Groundwater Analytical Results for Lower Aquifer Wells in 2000, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	HR-10 9/29/2000	HR-12 9/28/2000	DUP-93 9/28/2000	HR-13 9/29/2000	HR-15 9/29/2000	31 9/29/2000	GM-19D 10/2/2000	GM-1 10/2/2000	GM-3 10/2/2000	GM-11 10/2/2000
Volatile Organic Compounds											
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	2.2	2.0	39.5	<1.0	7.4	<1.0	<1.0	2.1	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	<1.0	2.0	1.8	14.1	2.8	8.4	3.5	<1.0	8.3	<1.0
trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	2.5	<1.0	<1.0	<1.0	<1.0	1.1	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.5	3.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	<1.0	1.7	<1.0	<1.0	<1.0	<1.0	1.0	1.4
Trichloroethene	ug/l	<1.0	<1.0	<1.0	2.0	<1.0	12.9	2.9	37.2	9.4	41.3
Vinyl Chloride	ug/l	<1.0	2.5	2.6	<1.0	11.2	4.4	15.7	<1.0	<1.0	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

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Table A-4. Groundwater Analytical Results for Lower Aquifer Wells in 2000, General Motors Corporation, Moraine, Ohio.

COMPOUND	UNITS	GM-15 10/2/2000	DUP-94 10/2/2000	GM-20D 10/3/2000	GM-9 10/3/2000	MT69 10/3/2000
<u>Volatile Organic Compounds</u>						
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	2.3	2.2	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/l	2.6	3.8	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	ug/l	<1.0	<1.0	4.2	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	1.6	1.2	<1.0
Trichloroethene	ug/l	4.7	4.5	14.3	17.2	<1.0
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0

ug/l - Micrograms per liter.

DUP-89 - Duplicate of HR-11.

DUP-90 - Duplicate of GM-27.

DUP-91 - Duplicate of GM-21.

DUP-92 - Duplicate of W-2-S.

DUP-93 - Duplicate of HR-12.

DUP-94 - Duplicate of GM-15.

< - Constituent not detected above laboratory detection limit shown.

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Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compound	Unit	Upgradient of the Site		On-Site			
		HR-9 11/6/01 Upper Aquifer	HR-11 11/6/01 Upper Aquifer	HR-8 11/6/01 Upper Aquifer	HR-4 11/6/01 Upper Aquifer	W-2-N 11/6/01 Upper Aquifer	W-3-N 11/7/01 Upper Aquifer
Benzene	ug/l	< 1.4	< 1.0	< 1.0	< 1.0	< 1.0	< 5.6
1,1-Dichloroethane	ug/l	38	32	26	< 1.0	0.33J	< 5.6
1,1-Dichloroethene	ug/l	0.95J	< 1.0	< 1.0	< 1.0	< 1.0	< 5.6
cis-1,2-Dichloroethene	ug/l	12	18	5.4	0.28J	1.1	160
trans-1,2-Dichloroethene	ug/l	1.7	2.3	1.3	< 0.50	< 0.50	2.2J
Ethylbenzene	ug/l	< 1.4	< 1.0	< 1.0	< 1.0	< 1.0	< 5.6
Tetrachloroethene	ug/l	< 1.4	< 1.0	< 1.0	0.88J	< 1.0	9.0
Toluene	ug/l	< 1.4	< 1.0	< 1.0	< 1.0	< 1.0	< 5.6
1,1,1-Trichloroethane	ug/l	17	0.36J	10	0.17J	0.48J	< 5.6
Trichloroethene	ug/l	14	< 1.0	1.4	1.0	1.3	2.1J
Vinyl chloride	ug/l	< 1.4	0.35J	< 1.0	< 1.0	< 1.0	7.6
Xylene (total)	ug/l	< 1.4	< 1.0	< 1.0	< 1.0	< 1.0	< 5.6
Total VOCs	ug/l	83.65	53.01	44.1	2.33	3.21	180.9

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 B - Blank contamination.

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Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

	Unit	On-Site					GM-30 11/13/01 Upper Aquifer
		W-4-N 11/7/01 Upper Aquifer	HR-2 11/7/01 Upper Aquifer	HR-5 11/7/01 Upper Aquifer	HR-3 11/7/01 Upper Aquifer	HR-1 11/8/01 Upper Aquifer	
<u>Volatile Organic Compound</u>							
Benzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 25
1,1-Dichloroethane	ug/l	0.89J	4.2	0.55J	6.9	2.8J	31
1,1-Dichloroethene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 25
Cis-1,2-Dichloroethene	ug/l	1.6	8.3	7.8	5.1	9.9	< 12
trans-1,2-Dichloroethene	ug/l	< 0.50	1.1	0.74	0.60	2.8	< 12
Ethylbenzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	840
Tetrachloroethene	ug/l	0.92J	< 1.0	< 1.0	< 1.0	36	< 25
Toluene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	5.0J
1,1,1-Trichloroethane	ug/l	0.33J	< 1.0	0.17J	< 1.0	2.2J	< 25
Trichloroethene	ug/l	7.1	0.56J	11	0.66J	86B	12J
Vinyl chloride	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 25
Xylene (total)	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	2000
Total VOCs	ug/l	10.84	14.16	20.26	13.26	139.7	2,888

ug/l - Micrograms per liter.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

B - Blank contamination.

Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

	Unit	On-Site				
		GM-23 11/12/01 Upper Aquifer	GM-27 11/13/01 Upper Aquifer	GM-29 11/13/01 Upper Aquifer	GM-28 11/15/01 Upper Aquifer	GM-6 11/15/01 Upper Aquifer
Volatile Organic Compound						
Benzene	ug/l	< 420	< 3.3	< 50	< 10	< 2.0
1,1-Dichloroethane	ug/l	< 420	1.8J	< 50	< 10	2.7
1,1-Dichloroethene	ug/l	< 420	< 3.3	< 50	< 10	< 2.0
cis-1,2-Dichloroethene	ug/l	8400	13	1800	< 5.0	65
trans-1,2-Dichloroethene	ug/l	< 210	< 1.7	26	11	1.8
Ethylbenzene	ug/l	< 420	< 3.3	21J	< 10	< 2.0
Tetrachloroethene	ug/l	15000	6.8	17J	< 10	8.2
Toluene	ug/l	< 420	< 3.3	< 50	< 10	0.42J
1,1,1-Trichloroethane	ug/l	< 420	< 3.3	< 50	< 10	2.2
Trichloroethene	ug/l	2200	110	270	< 10	23
Vinyl chloride	ug/l	1200	< 3.3	230	< 10	13
Xylene (total)	ug/l	< 420	< 3.3	52	< 10	< 2.0
Total VOCs	ug/l	26,800	131.6	2,416	11	116.32
						143.3

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 B - Blank contamination.

Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

	Unit	On-Site				
		ME-3 11/15/01 Upper Aquifer	GM-22 11/13/01 Upper Aquifer	GM-19S 11/12/01 Upper Aquifer	EAST 11/12/01 Upper Aquifer	GM-32 11/12/01 Upper Aquifer
<u>Volatile Organic Compound</u>						
Benzene	ug/l	< 1.0	< 1.0	< 3.3	< 3.3	< 5.0
1,1-Dichloroethane	ug/l	5.9	6.8	2.9J	6.2	3.8J
1,1-Dichloroethene	ug/l	< 1.0	0.58J	< 3.3	0.90J	< 5.0
cis-1,2-Dichloroethene	ug/l	16	8.5	26	51	39
trans-1,2-Dichloroethene	ug/l	2.7	0.17J	2.0	2.7	15
Ethylbenzene	ug/l	< 1.0	< 1.0	< 3.3	< 3.3	< 5.0
Tetrachloroethene	ug/l	1.3	4.9	64	56	< 5.0
Toluene	ug/l	0.34J	< 1.0	< 3.3	< 3.3	< 5.0
1,1,1-Trichloroethane	ug/l	1.6	4.4	7.6	13	6.9
Trichloroethene	ug/l	3.8	7.5	97	92	160
Vinyl chloride	ug/l	7.3	0.60J	< 3.3	1.5J	< 5.0
Xylene (total)	ug/l	< 1.0	< 1.0	< 3.3	< 3.3	< 5.0
Total VOCs	ug/l	38.94	33.45	199.5	223.3	224.7

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 B - Blank contamination.

Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

	Unit	On-Site				
		HR-17 11/8/01	W-2-S 11/8/01	W-3-S 11/8/01	W-4-S 11/8/01	GM-6 11/9/01
		Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer
Volatile Organic Compound						
Benzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
1,1-Dichloroethane	ug/l	< 1.0	0.58J	< 1.0	1.1	40
1,1-Dichloroethene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
cis-1,2-Dichloroethene	ug/l	< 0.50	0.49J	< 0.50	3.3	2.0
trans-1,2-Dichloroethene	ug/l	< 0.50	< 0.50	< 0.50	0.43J	3.6
Ethylbenzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	0.40J
Tetrachloroethene	ug/l	3.3	< 1.0	0.44J	13	< 1.0
Toluene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
1,1,1-Trichloroethane	ug/l	1.4	1.7	1.6	2.9	3.9
Trichloroethene	ug/l	4.28	5.28	1.58	8.98	48
Vinyl chloride	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	1.9J
Xylene (total)	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
Total VOCs	ug/l	8.9	7.97	3.54	29.63	53.87
						91.8

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 B - Blank contamination.

Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

	Unit	Downgradient of the Site					
		TW-2 11/9/01 Upper Aquifer	GM-2 11/9/01 Upper Aquifer	GM-16 11/8/01 Upper Aquifer	GM-17 11/8/01 Upper Aquifer	GM-18 11/8/01 Upper Aquifer	WSU-24 11/9/01 Upper Aquifer
Volatile Organic Compound							
Benzene	ug/l	< 2.0	< 3.3	< 1.0	< 3.3	< 3.3	< 1.0
1,1-Dichloroethane	ug/l	20	6.1	0.31J	7.3	3.3	0.81J
1,1-Dichloroethene	ug/l	< 2.0	< 3.3	< 1.0	< 3.3	1.3J	< 1.0
cis-1,2-Dichloroethene	ug/l	8.8	26	0.39J	16	14	4.0
trans-1,2-Dichloroethene	ug/l	2.4	1.1J	< 0.50	1.8	1.6J	< 0.50
Ethylbenzene	ug/l	0.38J	< 3.3	< 1.0	< 3.3	< 3.3	< 1.0
Tetrachloroethene	ug/l	8.5	8.4	17	48	12	1.6
Toluene	ug/l	< 2.0	< 3.3	< 1.0	< 3.3	< 3.3	< 1.0
1,1,1-Trichloroethane	ug/l	3.9	6.1	2.2	6.8	23	2.4
Trichloroethene	ug/l	488	658	3.6	79	93	188
Vinyl chloride	ug/l	2.7	< 3.3	< 1.0	< 3.3	< 3.3	< 1.0
Xylene (total)	ug/l	< 2.0	< 3.3	< 1.0	< 3.3	< 3.3	< 1.0
Total VOCs	ug/l	94.68	112.7	23.5	158.9	148.2	26.81

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 B - Blank contamination.

Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compound	Unit	Downgradient of the Site		Upgradient of the Site		On-Site	
		GM-10 11/8/01	GM-26 11/12/01	HR-10 11/14/01	HR-12 11/14/01	HR-15 11/14/01	HR-13 11/14/01
		Upper Aquifer	Upper Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
Benzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.18J
1,1-Dichloroethane	ug/l	3.4	< 1.0	< 1.0	3.6	< 1.0	15
1,1-Dichloroethene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	ug/l	16	< 0.50	< 0.50	2.7	0.86	6.5
trans-1,2-Dichloroethene	ug/l	0.93	< 0.50	< 0.50	0.23	< 0.50	0.65
Ethylbenzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	ug/l	1.9	1.1	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	ug/l	2.7	0.19J	< 1.0	< 1.0	< 1.0	0.74J
Trichloroethene	ug/l	27	< 1.0	< 1.0	< 1.0	< 1.0	1.2
Vinyl chloride	ug/l	1.2	< 1.0	< 1.0	3.8	< 1.0	< 1.0
Xylene (total)	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total VOCs	ug/l	53.13	1.29	ND	10.33	0.86	24.27

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 B - Blank contamination.

Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compound	Unit	On-Site		Downgradient of the Site		GM-11 11/14/01 Lower Aquifer
		31 11/15/01 Lower Aquifer	GM-19D 11/14/01 Lower Aquifer	GM-3 11/14/01 Lower Aquifer	GM-1 11/14/01 Lower Aquifer	GM-15 11/14/01 Lower Aquifer
Benzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	ug/l	3.1	< 1.0	0.95J	0.29J	1.4
1,1-Dichloroethene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	ug/l	2.4	0.92	2.6	< 0.50	1.2
trans-1,2-Dichloroethene	ug/l	< 0.50	< 0.50	0.25J	< 0.50	< 0.50
Ethylbenzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	ug/l	< 1.0	< 1.0	0.48J	1.3	1.0
Toluene	ug/l	< 1.0	0.38J	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	ug/l	< 1.0	0.18J	0.16J	0.80J	0.33J
Trichloroethene	ug/l	5.1	3.7	2.9	19	12
Vinyl chloride	ug/l	2.5	13	< 1.0	< 1.0	< 1.0
Xylene (total)	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total VOCs	ug/l	13.1	18.18	7.34	21.39	7.5
						13.33

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 B - Blank contamination.

Table A-5. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in November 2001, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compound	Unit	Downgradient of the Site			
		GM-20D 11/14/01 Lower Aquifer	DN-13 11/14/01 Lower Aquifer	GM-9 11/14/01 Lower Aquifer	MT-69 11/15/01 Lower Aquifer
Benzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	ug/l	< 1.0	2.5	0.58J	< 1.0
1,1-Dichloroethene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	ug/l	< 0.50	6.2	1.1	< 0.50
trans-1,2-Dichloroethene	ug/l	< 0.50	0.37J	< 0.50	< 0.50
Ethylbenzene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	ug/l	2.0	< 1.0	0.38J	< 1.0
Toluene	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	ug/l	0.64J	1.1	0.48J	< 1.0
Trichloroethene	ug/l	5.9	5.0	8.6	< 1.0
Vinyl chloride	ug/l	< 1.0	1.2	< 1.0	< 1.0
Xylene (total)	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Total VOCs	ug/l	8.54	16.37	11.14	ND

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 B - Blank contamination.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

	Units	Upgradient of the Site		On-Site			
		HR-9 9/19/02 Upper Aquifer	HR-11 9/26/02 Upper Aquifer	HR-8 9/19/02 Upper Aquifer	W-1-N 9/19/02 Upper Aquifer	HR-4 9/27/02 Upper Aquifer	W-2-N 9/19/02 Upper Aquifer
<u>Volatile Organic Compounds</u>							
Benzene	ug/l	< 1.7	< 1	< 1.0	< 1.0	< 1	< 1.0
1,1-Dichloroethane	ug/l	46	18	18	0.36J	< 1	0.31J
1,1-Dichloroethene	ug/l	1.1J	< 1	0.44J	< 1.0	< 1	< 1.0
cis-1,2-Dichloroethene	ug/l	17	6.1	4.8	< 0.50	< 0.5	1.6
trans-1,2-Dichloroethene	ug/l	2.5	0.72	0.85	< 0.50	< 0.5	< 0.50
Ethylbenzene	ug/l	< 1.7	< 1	< 1.0	< 1.0	< 1	< 1.0
Tetrachloroethene	ug/l	< 1.7	< 1	< 1.0	< 1.0	0.59J	< 1.0
Toluene	ug/l	< 1.7	< 1	< 1.0	< 1.0	< 1	< 1.0
1,1,1-Trichloroethane	ug/l	13	< 1	11	< 1.0	< 1	< 1.0
Trichloroethene	ug/l	15	< 1	1.8	< 1.0	< 1	< 1.0
Vinyl chloride	ug/l	< 1.7	< 1	< 1.0	< 1.0	0.71J	1.4
Xylene (total)	ug/l	< 1.7	< 1	< 1.0	< 1.0	< 1	< 1.0
Total VOCs	ug/l	94.6	24.82	36.89	0.36	1.3	3.31

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

	Units	On-Site					
		W-3-N 9/23/02 Upper Aquifer	W-4-N 9/24/02 Upper Aquifer	HR-2 9/24/02 Upper Aquifer	HR-5 9/23/02 Upper Aquifer	HR-7 9/19/02 Upper Aquifer	HR-6 9/23/02 Upper Aquifer
<u>Volatile Organic Compounds</u>							
Benzene	ug/l	< 6.7	< 1	< 1	< 1	< 1.0	< 1
1,1-Dichloroethane	ug/l	< 6.7	1.7	4.9	0.55J	< 1.0	< 1
1,1-Dichloroethene	ug/l	< 6.7	< 1	< 1	< 1	< 1.0	< 1
cis-1,2-Dichloroethene	ug/l	150	5.2	8.8	7.5	0.65	< 0.5
trans-1,2-Dichloroethene	ug/l	< 3.3	0.33J	1.2	0.58	< 0.50	< 0.5
Ethylbenzene	ug/l	< 6.7	< 1	< 1	< 1	< 1.0	< 1
Tetrachloroethene	ug/l	< 6.7	0.94J	< 1	< 1	< 1.0	< 1
Toluene	ug/l	< 6.7	< 1	< 1	< 1	< 1.0	< 1
1,1,1-Trichloroethane	ug/l	< 6.7	0.44J	< 1	< 1	< 1.0	< 1
Trichloroethene	ug/l	< 6.7	8.5	0.46J	13	9.4	1.5
Vinyl chloride	ug/l	6.5J	0.77J	< 1	< 1	< 1.0	< 1
Xylene (total)	ug/l	< 6.7	< 1	< 1	< 1	< 1.0	< 1
Total VOCs	ug/l	156.5	17.88	15.36	21.63	10.05	1.5

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

	Units	On-Site					
		HR-3 9/24/02 Upper Aquifer	HR-1 9/23/02 Upper Aquifer	GM-30 9/27/02 Upper Aquifer	GM-23 9/26/02 Upper Aquifer	GM-27 9/26/02 Upper Aquifer	GM-29 9/25/02 Upper Aquifer
Volatile Organic Compounds							
Benzene	ug/l	< 1	< 2	< 33	< 400	< 3.3	< 40
1,1-Dichloroethane	ug/l	15	2.8	34	< 400	1.7J	< 40
1,1-Dichloroethene	ug/l	< 1	< 2	< 33	< 400	< 3.3	< 40
cis-1,2-Dichloroethene	ug/l	9.9	4.5	< 17	7700	14	1300
trans-1,2-Dichloroethene	ug/l	1	3.2	< 17	< 200	< 1.7	21
Ethylbenzene	ug/l	< 1	< 2	350	< 400	< 3.3	< 40
Tetrachloroethene	ug/l	< 1	33	< 33	10000	< 3.3	18J
Toluene	ug/l	< 1	< 2	< 33	< 400	< 3.3	< 40
1,1,1-Trichloroethane	ug/l	< 1	< 2	< 33	< 400	< 3.3	16J
Trichloroethene	ug/l	1.4	33	< 33	1700	100	310
Vinyl chloride	ug/l	< 1	< 2	< 33	540	< 3.3	140
Xylene (total)	ug/l	< 1	< 2	1400	< 400	< 3.3	< 40
Total VOCs	ug/l	27.3	76.5	1,784	19,940	115.7	1,805

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compounds	Units	On-Site					
		GM-28 9/24/02 Upper Aquifer	ME-6 9/25/02 Upper Aquifer	GM-31 9/24/02 Upper Aquifer	ME-3 9/24/02 Upper Aquifer	GM-22 9/25/02 Upper Aquifer	GM-195 9/26/02 Upper Aquifer
Benzene	ug/l	< 1	< 10	< 6	< 2.5	< 2	< 4
1,1-Dichloroethane	ug/l	2.7	< 10	5.9J	< 2.5	< 2	6.3
1,1-Dichloroethene	ug/l	< 1	< 10	< 6	< 2.5	< 2	< 4
cis-1,2-Dichloroethene	ug/l	1.1	5.2	200	< 1.2	< 1	39
trans-1,2-Dichloroethene	ug/l	11	< 5	3.5	< 1.2	< 1	2.7
Ethylbenzene	ug/l	< 1	< 10	< 6	< 2.5	< 2	< 4
Tetrachloroethene	ug/l	< 1	< 10	< 6	< 2.5	2.3	52
Toluene	ug/l	< 1.3 U	6.6J	< 6	< 2.5	< 2	< 4
1,1,1-Trichloroethane	ug/l	< 1	< 10	< 6	< 2.5	0.93J	6.3
Trichloroethene	ug/l	0.86J	< 10	10	< 2.5	7.6	110
Vinyl chloride	ug/l	< 1	< 10	19	< 2.5	< 2	5.2
Xylene (total)	ug/l	< 1.2 U	< 10	< 6	< 2.5	< 2	< 4
Total VOCs	ug/l	15.66	11.8	238.4	ND	10.83	221.5

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

	Units	On-Site					HR-16 9/18/02 Upper Aquifer	HR-17 9/18/02 Upper Aquifer
		EAST 9/23/2002 Upper Aquifer	GM-32 9/20/02 Upper Aquifer	GM-21 9/25/02 Upper Aquifer	W-1-S 9/19/02 Upper Aquifer			
<u>Volatile Organic Compounds</u>								
Benzene	ug/l	< 2	< 10	< 6.7	< 2.0		< 1.0	< 1.0
1,1-Dichloroethane	ug/l	3.9	9.7J	5J	0.97J		< 1.0	1.5
1,1-Dichloroethene	ug/l	0.73J	< 10	2.6J	< 2.0		< 1.0	< 1.0
cis-1,2-Dichloroethene	ug/l	8.8	< 5	43	6.0		0.46J	5.1
trans-1,2-Dichloroethene	ug/l	< 1	< 5	5.1	1.3		< 0.50	1.4
Ethylbenzene	ug/l	< 2	< 10	< 6.7	< 2.0		< 1.0	< 1.0
Tetrachloroethene	ug/l	49	< 10	< 6.7	62		< 1.0	22
Toluene	ug/l	< 2	< 10	< 6.7	< 2.0		< 1.0	< 1.0
1,1,1-Trichloroethane	ug/l	10	< 10	31	< 2.0		< 1.0	0.39J
Trichloroethene	ug/l	46	< 10	230	16		1.5	12
Vinyl chloride	ug/l	< 2	< 10	< 6.7	< 2.0		< 1.0	< 1.0
Xylene (total)	ug/l	< 2	< 10	< 6.7	< 2.0		< 1.0	< 1.0
Total VOCs	ug/l	118.43	9.7	316.7	86.27		1.96	42.39

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compounds	Units	W-2-S		W-3-S		On-Site		GM-8		GM-6	
		9/18/02		9/18/02		9/18/02		9/20/02		9/20/02	
		Upper Aquifer		Upper Aquifer		Upper Aquifer		Upper Aquifer		Upper Aquifer	
Benzene	ug/l	< 1.0		< 1.0		< 1.0		5.5		2.2	
1,1-Dichloroethane	ug/l	0.98J		< 1.0		0.87J		63		60	
1,1-Dichloroethene	ug/l	< 1.0		< 1.0		< 1.0		< 2		< 2	
cis-1,2-Dichloroethene	ug/l	0.90		< 0.50		3.6		5.5		43	
trans-1,2-Dichloroethene	ug/l	< 0.50		< 0.50		0.60		9		8.6	
Ethylbenzene	ug/l	< 1.0		< 1.0		< 1.0		7.5		< 2	
Tetrachloroethene	ug/l	< 1.0		0.61J		17		< 2		14	
Toluene	ug/l	< 1.0		< 1.0		< 1.0		1.8J		< 2	
1,1,1-Trichloroethane	ug/l	1.5		2.1		2.3		< 2		1.4J	
Trichloroethene	ug/l	4.9		2.4		9.8		< 2		33	
Vinyl chloride	ug/l	< 1.0		< 1.0		< 1.0		5.8		12	
Xylene (total)	ug/l	< 1.0		< 1.0		< 1.0		1.5J		< 2	
Total VOCs	ug/l	8.28		5.11		34.17		99.6		174.2	

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compounds	Units	Downgradient of the Site					
		TW-2 9/20/02 Upper Aquifer	GM-2 9/20/02 Upper Aquifer	GM-16 9/24/02 Upper Aquifer	GM-17 9/19/02 Upper Aquifer	GM-18 9/19/02 Upper Aquifer	WSU-24 9/24/02 Upper Aquifer
Benzene	ug/l	< 2	< 1	< 2	< 1.2	< 3.3	< 1
1,1-Dichloroethane	ug/l	9	3.4	4.1	6.0	6.0	< 1
1,1-Dichloroethene	ug/l	< 2	< 1	< 2	< 1.2	< 3.3	< 1
cis-1,2-Dichloroethene	ug/l	26	7.6	6.2	13	15	< 0.5
trans-1,2-Dichloroethene	ug/l	1.4	0.37J	1.6	0.67	1.6J	< 0.5
Ethylbenzene	ug/l	< 2	< 1	< 2	< 1.2	< 3.3	< 1
Tetrachloroethene	ug/l	5.9	8.7	63	22	28	1.2
Toluene	ug/l	< 2	< 1	< 2	< 1.2	< 3.3	< 1
1,1,1-Trichloroethane	ug/l	2.2	0.75J	1.4J	2.3	18	1.4
Trichloroethene	ug/l	70	26	28	39	98	13
Vinyl chloride	ug/l	2.5	< 1	< 2	0.79J	< 3.3	< 1
Xylene (total)	ug/l	< 2	< 1	< 2	< 1.2	< 3.3	< 1
Total VOCs	ug/l	117	46.82	104.3	83.76	166.6	15.6

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compounds	Units	Downgradient of the Site GM-10 9/18/02		Upgradient of the Site GM-26 9/25/02		Upgradient of the Site HR-10 9/27/02		On-Site HR-14 9/30/02		On-Site HR-15 9/30/02	
		Upper Aquifer	Lower Aquifer	Upper Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
Benzene	ug/l	< 1.0	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	ug/l	0.61J	< 1		2.4	< 1	< 1	< 1	< 1UJ	< 1	< 1
1,1-Dichloroethene	ug/l	< 1.0	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	ug/l	2.3	< 0.5		2.1	< 0.5	< 0.5	3.6	1	< 0.5	< 0.5
trans-1,2-Dichloroethene	ug/l	< 0.50	< 0.5		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	ug/l	< 1.0	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	ug/l	1.1	0.92J		< 1	< 1	< 1	< 1	< 1	< 1	< 1
Toluene	ug/l	< 1.0	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,1-Trichloroethane	ug/l	1.8	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	ug/l	19	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1
Vinyl chloride	ug/l	< 1.0	< 1		< 1	< 1	< 1	1.2	< 1	< 1	< 1
Xylene (total)	ug/l	< 1.0	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total VOCs	ug/l	24.81	0.92	ND	6.2	ND	4.8	1	1	1	1

ug/l - Micrograms per liter.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compounds	Units	HR-13 9/30/02		On-Site 39 9/27/02		GM-19D 9/26/02		Downgradient of the Site GM-3 10/1/02		GM-1 10/1/02	
		Lower Aquifer		Lower Aquifer		Lower Aquifer		Lower Aquifer		Lower Aquifer	
Benzene	ug/l	<1		<1		<1		<1		<1.4 U	
1,1-Dichloroethane	ug/l	25		1.6		<1		1.8		0.48 J	
1,1-Dichloroethene	ug/l	<1		<1		<1		<1		<1.4 U	
cis-1,2-Dichloroethene	ug/l	11		1.3		0.81		8.9		0.95	
trans-1,2-Dichloroethene	ug/l	1.4		<0.5		<0.5		1.2		<0.72 U	
Ethylbenzene	ug/l	<1		<1		<1		<1		<1.4 U	
Tetrachloroethene	ug/l	<1		<1		<1		1.4		2.3	
Toluene	ug/l	<1		<1		<1		<1		<1.4 U	
1,1,1-Trichloroethane	ug/l	1.4		<1		<1		0.74J		1.3 J	
Trichloroethene	ug/l	3.6		3.8		3.1		9.5		39	
Vinyl chloride	ug/l	<1		0.51J		0.36J		0.63J		<1.4 U	
Xylene (total)	ug/l	<1		<1		<1		<1		<1.4 U	
Total VOCs	ug/l	42.4		7.21		4.27		24.17		44.03	

ug/l - Micrograms per liter.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

Table A-6. Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in September 2002, General Motors Corporation, Moraine, Ohio.

Volatile Organic Compounds	Units	Downgradient of the Site					
		GM-15 9/27/02	GM-11 10/1/02	GM-20D 9/30/02	DN-13 9/27/02	GM-9 9/30/02	MT-69 9/30/02
		Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
Benzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	ug/l	1.6	0.34J	< 1	2.5	0.48J	< 1
1,1-Dichloroethene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	ug/l	1.8	0.62	< 0.5	7.3	0.66	< 0.5
trans-1,2-Dichloroethene	ug/l	< 0.5	< 0.5	< 0.5	0.48J	< 0.5	< 0.5
Ethylbenzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	ug/l	< 1	2.2	1.3	< 1	< 1	< 1
Toluene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1
1,1,1-Trichloroethane	ug/l	< 1	1	< 1	1.1	< 1	< 1
Trichloroethene	ug/l	4.7	35	3.8	6.1	0.99J	< 1
Vinyl chloride	ug/l	< 1	< 1	< 1	1.3	16	< 1
Xylene (total)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1
Total VOCs	ug/l	8.1	39.16	5.1	18.78	18.13	ND

ug/l - Micrograms per liter.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.

DRAFT

Appendix B

Groundwater Sampling Logs and
Boring Logs for 2003



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Groundwater Sampling Logs

May 2003



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Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/21/2003</u>
Site/Well No.	<u>ME-3</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Clear, 50s</u>	Sampling Time:	Begin <u>11:00</u> End <u>11:51</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>730.40</u>
Land Surface Elevation (ft)	<u>728.31</u>
Sounded Well Depth (ft bmp)	<u>36.5</u>
Depth to Water (ft bmp)	<u>24.76</u>
Water-Level Elevation (ft)	<u>706.65</u>
Water Column in Well (ft)	<u>11.74</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>1.87</u>
Gallons Pumped/Bailed Prior to Sampling	<u>2.5 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	begin <u>11:14</u> end <u>11:32</u>
Pumping Rate (gpm)	<u>0.13</u>
Evacuation Method	<u>peristaltic pump</u>

Field Parameters

Color	<u>Gray w/black specks</u>
Odor	<u>Yes</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.70</u>
Conductivity (mS/cm)	<u>N/A</u>
(µS/cm)	<u>1662</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>17.18</u>
Dissolved Oxygen (mg/L)	<u>2.92</u>
ORP (mV)	<u>-30.6</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 11:34</u>
	<u>DTW final = 24.78</u>

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. ME-3 Time Pump Started 11:14

Depth of Sampling Midpoint of Screen Date 5/21/2003

Parameters	Time									
	11:17	11:20	11:23	11:26	11:29	11:32				
Redox Potential (millivolts)	-43.1	-38.0	-34.9	-32.5	-30.8	-30.6				
Dissolved Oxygen (mg/L)	4.69	4.36	4.00	3.53	3.09	2.92				
pH (s.u.)	6.57	6.62	6.64	6.66	6.67	6.70				
Specific Conductance (uS/cm)	1,669	1,672	1,666	1,662	1,660	1,662				
Temperature (C)	17.04	17.11	17.14	17.18	17.17	17.18				

Flow Rate 500 ml/min Total Depth of Well: 36.5

Time Sampled 11:34 Depth to Water Before Purging: 24.76

Total Water Pumped 2.5 gal Depth to Water After Purging: 24.78

Comments

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Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/21/2003</u>
Site/Well No.	<u>GM-19S</u>	Replicate No.	<u>DUP-124A</u>	Code No.	<u></u>
Weather	<u>Sunny 60s</u>	Sampling Time:	Begin <u>1305</u> End <u>1435</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>730.85</u>
Land Surface Elevation (ft)	<u>NR</u>
Sounded Well Depth (ft bmp)	<u>55.04</u>
Depth to Water (ft bmp)	<u>24.47</u>
Water-Level Elevation (ft)	<u>706.38</u>
Water Column in Well (ft)	<u>30.57</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>5</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	<u>begin 1335 end 1353</u>
Pumping Rate (gpm)	<u>800 ml/min</u>
Evacuation Method	<u>2" Submersible pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.71</u>
Conductivity (mS/cm)	<u>N/A</u>
(µS/cm)	<u>1706</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>20.22</u>
Dissolved Oxygen (mg/L)	<u>2.01</u>
ORP (mV)	<u>178.3</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 1355</u>
	<u>DTW final = 24.45</u>
	<u>DUP-124A</u>
	<u>MS/MSD on this well.</u>

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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GROUNDWATER FIELD PARAMETER LOG

Project Number	OH000294.0006.00002												
Site Location	Moraine, Ohio												
Monitoring Well No.	GM-19S					Time Pump Started					13:35		
Depth of Sampling	Midpoint of Screen										Date		5/21/2003
Parameters		1338	1341	1344	1347	1350	1353						
Redox Potential (millivolts)		180.6	183.5	181.8	181.2	181.7	178.3						
Dissolved Oxygen (mg/L)		3.20	2.61	2.34	2.10	2.02	2.01						
pH (s.u.)		6.77	6.71	6.66	6.63	6.62	6.71						
Specific Conductance (uS/cm)		1,668	1,670	1,685	1,698	1,700	1,706						
Temperature (C)		18.67	19.11	19.60	19.83	19.90	20.22						
Flow Rate	800 ml/min					Total Depth of Well:					55.04		
Time Sampled	1355					Depth to Water Before Purging:					24.47		
Total Water Pumped	5 gallons					Depth to Water After Purging:					24.45		
Comments													

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Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/21/2003</u>
Site/Well No.	<u>EAST</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Sunny 60s</u>	Sampling Time:	Begin <u>1450</u> End <u>1630</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>730.98</u>
Land Surface Elevation (ft)	<u>NR</u>
Sounded Well Depth (ft bmp)	<u>71.64</u>
Depth to Water (ft bmp)	<u>24.18</u>
Water-Level Elevation (ft)	<u>706.80</u>
Water Column in Well (ft)	<u>47.46</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>7.6</u>
Gallons Pumped/Bailed Prior to Sampling	<u>3 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	begin <u>1512</u> end <u>1527</u>
Pumping Rate (gpm)	<u>0.2</u>
Evacuation Method	<u>2" Submersible pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.69</u>
Conductivity (mS/cm)	<u>N/A</u>
(µS/cm)	<u>1506</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>19.45</u>
Dissolved Oxygen (mg/L)	<u>1.79</u>
ORP (mV)	<u>201</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 1530</u>
	<u>DTW final = 24.16</u>
	<u>RB-101A @ 1620</u>

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. EAST Time Pump Started 1512

Depth of Sampling Midpoint of Screen Date 5/21/2003

Parameters	Time									
	1515	1518	1521	1524	1527					
Redox Potential (millivolts)	199.7	206.5	200.0	199.5	201.0					
Dissolved Oxygen (mg/L)	2.87	2.43	1.99	1.87	1.79					
pH (s.u.)	6.85	6.81	6.78	6.74	6.69					
Specific Conductance (uS/cm)	1,481	1,486	1,503	1,508	1,506					
Temperature (C)	18.49	18.90	19.24	19.35	19.45					

Flow Rate 800 ml/min Total Depth of Well: 71.64

Time Sampled 1530 Depth to Water Before Purging: 24.18

Total Water Pumped 3 gal Depth to Water After Purging: 24.16

Comments _____

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Water Sampling Log

Project	GM Site-Wide Monitoring	Project No.	OH000294.06.03	Page	1 of 1
Site Location	Moraine, Ohio			Date	5/22/2003
Site/Well No.	GM-21	Replicate No.		Code No.	
Weather	Cloudy 50s	Sampling Time: Begin	8:20	End	9:28

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	725.01
Land Surface Elevation (ft)	N/A
Sounded Well Depth (ft bmp)	53.70
Depth to Water (ft bmp)	18.52
Water-Level Elevation (ft)	706.49
Water Column in Well (ft)	35.18
Casing Diameter/Type	2"
Gallons in Well	5.6
Gallons Pumped/Bailed Prior to Sampling	4.5 pumped
Sample Pump Intake Setting (ft bmp)	Midpoint of screen
Purge Time	begin 8:49 end 9:10
Pumping Rate (gpm)	600 ml/min
Evacuation Method	2" Submersible pump

Field Parameters

Color	Light gray and black specks
Odor	Slight
Appearance	Clear
pH (s.u.)	6.76
Conductivity (mS/cm)	N/A
(µS/cm)	968
Turbidity (NTU)	NR
Temperature (°C)	17.54
Dissolved Oxygen (mg/L)	0.83
ORP (mV)	77.1
Sampling Method	Low flow
Remarks	Sample time @ 9:12
	DTW final = 18.51

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml VOA	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes					
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47	

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. GM-21 Time Pump Started 8:49

Depth of Sampling Midpoint of Screen Date 5/22/2003

Parameters	Time									
	8:52	8:55	8:58	9:01	9:04	9:07	9:10			
Redox Potential (millivolts)	115.0	95.7	89.0	84.3	81.3	78.7	77.1			
Dissolved Oxygen (mg/L)	1.43	1.11	1.03	0.95	0.89	0.85	0.83			
pH (s.u.)	6.12	6.26	6.37	6.52	6.61	6.71	6.76			
Specific Conductance (uS/cm)	509	694	782	854	905	943	968			
Temperature (C)	16.22	16.80	17.05	17.22	17.31	17.46	17.54			

Flow Rate 600 ml/min Total Depth of Well: 53.70

Time Sampled 9:12 Depth to Water Before Purging: 18.52

Total Water Pumped 4.5 gallons Depth to Water After Purging: 18.51

Comments _____

ARCADIS

Water Sampling Log

Project GM Site-Wide Monitoring Project No. OH000294.06.03 Page 1 of 1
 Site Location Moraine, Ohio Date 5/22/2003
 Site/Well No. GM-22 Replicate No. _____ Code No. _____
 Weather Cloudy 50s Sampling Time: Begin 9:35 End 10:17

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 728.28
 Land Surface Elevation (ft) NR
 Sounded Well Depth (ft bmp) 53.10
 Depth to Water (ft bmp) 24.63
 Water-Level Elevation (ft) 703.65
 Water Column in Well (ft) 28.47
 Casing Diameter/Type 2"
 Gallons in Well 4.5
 Gallons Pumped/Bailed Prior to Sampling 5 pumped
 Sample Pump Intake Setting (ft bmp) Midpoint of screen
 Purge Time begin 9:43 end 10:01
 Pumping Rate (gpm) 0.2
 Evacuation Method 2" Submersible pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 6.89
 Conductivity (mS/cm) N/A
 (µS/cm) 1730
 Turbidity (NTU) NR
 Temperature (°C) 18.62
 Dissolved Oxygen (mg/L) 1.04
 ORP (mV) 116.6
 Sampling Method Low flow
 Remarks Sample time @ 10:03
DTW final = 24.65

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¾" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. GM-22 Time Pump Started 9:43

Depth of Sampling Midpoint of Screen Date 5/22/2003

Parameters	Time									
	9:46	9:49	9:52	9:55	9:58	10:01				
Redox Potential (millivolts)	134.1	123.7	118.3	115.8	115.5	116.6				
Dissolved Oxygen (mg/L)	1.70	1.32	1.21	1.12	1.07	1.04				
pH (s.u.)	6.80	6.84	6.89	6.88	6.89	6.89				
Specific Conductance (uS/cm)	1,435	1,591	1,706	1,719	1,723	1,730				
Temperature (C)	17.64	17.94	18.17	18.39	18.57	18.62				

Flow Rate 800 ml/min Total Depth of Well: 53.10

Time Sampled 10:03 Depth to Water Before Purging: 24.63

Total Water Pumped 5 gallons Depth to Water After Purging: 24.65

Comments

ARCADIS

Water Sampling Log

Project	GM Site-Wide Monitoring	Project No.	OH000294.06.03	Page	1 of 1
Site Location	Moraine, Ohio			Date	5/22/2003
Site/Well No.	GM-30	Replicate No.		Code No.	
Weather	Sunny 60s	Sampling Time: Begin	10:35	End	11:40

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	734.66
Land Surface Elevation (ft)	735.46
Sounded Well Depth (ft bmp)	36.73
Depth to Water (ft bmp)	26.20
Water-Level Elevation (ft)	708.46
Water Column in Well (ft)	10.53
Casing Diameter/Type	2"
Gallons in Well	1.68
Gallons Pumped/Bailed Prior to Sampling	2.5 pumped
Sample Pump Intake Setting (ft bmp)	Midpoint of screen
Purge Time	begin 11:07 end 11:22
Pumping Rate (gpm)	0.2
Evacuation Method	2" Submersible pump

Field Parameters

Color	Gray
Odor	Yes
Appearance	Slightly turbid
pH (s.u.)	5.61
Conductivity (mS/cm)	N/A
(µS/cm)	1917
Turbidity (NTU)	NR
Temperature (°C)	18.17
Dissolved Oxygen (mg/L)	1.91
ORP (mV)	210.8
Sampling Method	Low flow
Remarks	Sample time @ 11:30
	DTW final = 26.28
	Well under pressure. Well dry at 11:22, allowed to recharge.

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

GROUNDWATER FIELD PARAMETER LOG

Project Number	OH000294.0006.00002										
Site Location	Moraine, Ohio										
Monitoring Well No.	GM-30					Time Pump Started					11:07
Depth of Sampling	Midpoint of Screen					Date					5/22/2003

Parameters	11:10	11:13	11:16	11:19	11:22						
Redox Potential (millivolts)	239.1	229.0	218.0	214.4	210.8						
Dissolved Oxygen (mg/L)	1.88	1.87	1.91	1.90	1.91						
pH (s.u.)	5.46	5.52	5.57	5.59	5.61						
Specific Conductance (uS/cm)	1,965	1,933	1,918	1,917	1,917						
Temperature (C)	17.31	17.78	18.02	18.12	18.17						

Flow Rate	800 ml/min	Total Depth of Well:	36.73
Time Sampled	11:30	Depth to Water Before Purging:	26.20
Total Water Pumped	2.5 gallons	Depth to Water After Purging:	26.28
Comments	11:22 well dry. Purged 2 gallons, allowed to recharge before sampling.		

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Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/22/2003</u>
Site/Well No.	<u>ME-6</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Sunny 60s</u>	Sampling Time:	Begin <u>12:16</u> End <u>13:50</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>736.24</u>
Land Surface Elevation (ft)	<u>736.68</u>
Sounded Well Depth (ft bmp)	<u>32.45</u>
Depth to Water (ft bmp)	<u>25.78</u>
Water-Level Elevation (ft)	<u>710.46</u>
Water Column in Well (ft)	<u>6.67</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>1.06</u>
Gallons Pumped/Bailed Prior to Sampling	<u>1 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	begin <u>1242</u> end <u>1300</u>
Pumping Rate (gpm)	<u>0.1</u>
Evacuation Method	<u>High performance pump</u>

Field Parameters

Color	<u>Greenish brown</u>
Odor	<u>Yes</u>
Appearance	<u>Thick</u>
pH (s.u.)	<u>6.73</u>
Conductivity (mS/cm)	<u>N/A</u>
(µS/cm)	<u>3428</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>19.10</u>
Dissolved Oxygen (mg/L)	<u>2.49</u>
ORP (mV)	<u>-101.4</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 1302 for VOCs</u>
	<u>DTW final = 25.79</u>
	<u>Bugs on H2O level. Remaining samples collected at 1330.</u>

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (826B)	<u>40 ml glass vial</u>	<u>3</u>	<u>Cool, HCl</u>
Iron & Manganese Tot. (6010B)	<u>1 liter plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Iron & Manganese Diss. (6010B)	<u>1 liter plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Chlorides (SM325.2)	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
Sulfide (SM376.1)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, NaOH/ZnAc</u>
TOC (SM415.1)	<u>40 ml glass vial</u>	<u>2</u>	<u>Cool, H₂SO₄</u>
Sulfate (SM375.4)	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
Light Hydrocarbons (AM18G)	<u>40 ml amber glass vials</u>	<u>2</u>	<u>Cool</u>

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. ME-6 Time Pump Started 12:42

Depth of Sampling Midpoint of Screen Date 5/22/2003

Parameters	Time									
	12:45	12:48	12:51	12:54	12:57	13:00				
Redox Potential (millivolts)	-142.0	-141.6	-122.8	-111.4	-107.1	-101.4				
Dissolved Oxygen (mg/L)	2.94	2.28	2.17	2.33	2.39	2.49				
pH (s.u.)	7.02	6.88	6.76	6.74	6.74	6.73				
Specific Conductance (uS/cm)	3,911	3,810	3,627	3,548	3,481	3,428				
Temperature (C)	21.72	20.31	19.54	19.17	19.07	19.10				

Flow Rate 250 ml/min Total Depth of Well: 32.45

Time Sampled 13:02/13:30 Depth to Water Before Purging: 25.78

Total Water Pumped 1 gallon Depth to Water After Purging: 25.79

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/22/2003</u>
Site/Well No.	<u>GM-23</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Sunny 60s</u>	Sampling Time: Begin	<u>1445</u>	End	<u>1555</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>730.99</u>
Land Surface Elevation (ft)	<u>NR</u>
Sounded Well Depth (ft bmp)	<u>34.00</u>
Depth to Water (ft bmp)	<u>26.02</u>
Water-Level Elevation (ft)	<u>704.97</u>
Water Column in Well (ft)	<u>7.98</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>1.3</u>
Gallons Pumped/Bailed Prior to Sampling	<u>2.2 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	<u>begin 1513 end 1525</u>
Pumping Rate (gpm)	<u>0.24</u>
Evacuation Method	<u>Peristaltic pump</u>

Field Parameters

Color	<u>Light yellow</u>
Odor	<u>Yes</u>
Appearance	<u>Oily</u>
pH (s.u.)	<u>5.59</u>
Conductivity (mS/cm)	<u>N/A</u>
(µS/cm)	<u>1683</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>17.91</u>
Dissolved Oxygen (mg/L)	<u>1.76</u>
ORP (mV)	<u>247.9</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 1527</u>
	<u>DTW final = 26.02</u>
	<u>Oily substance in well, not measurable.</u>

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. GM-23 Time Pump Started 1510

Depth of Sampling Midpoint of Screen Date 5/22/2003

Parameters	Time						
	15:13	15:16	15:19	15:22	15:25		
Redox Potential (millivolts)	225.3	261.3	254.5	251.7	247.9		
Dissolved Oxygen (mg/L)	2.48	2.12	1.87	1.80	1.76		
pH (s.u.)	4.99	5.25	5.44	5.46	5.59		
Specific Conductance (uS/cm)	1,670	1,658	1,667	1,676	1,683		
Temperature (C)	16.47	17.00	17.35	17.46	17.91		

Flow Rate 900 ml/min Total Depth of Well: 34.00

Time Sampled 15:27 Depth to Water Before Purging: 26.02

Total Water Pumped 2.2 gallons Depth to Water After Purging: 26.02

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/22/2003</u>
Site/Well No.	<u>GM-29</u>	Replicate No.	<u>NA</u>	Code No.	
Weather	<u>Sunny 60s</u>	Sampling Time:	Begin <u>1600</u> End <u>1635</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>731.37</u>
Land Surface Elevation (ft)	<u>731.86</u>
Sounded Well Depth (ft bmp)	<u>33.61</u>
Depth to Water (ft bmp)	<u>22.97</u>
Water-Level Elevation (ft)	<u>708.89</u>
Water Column in Well (ft)	<u>10.64</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>1.70</u>
Gallons Pumped/Bailed Prior to Sampling	<u>1.5 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	<u>begin 1609 end 1624</u>
Pumping Rate (gpm)	<u>0.16</u>
Evacuation Method	<u>2" Submersible pump</u>

Field Parameters

Color	<u>Light brown</u>
Odor	<u>No</u>
Appearance	<u>Slightly turbid</u>
pH (s.u.)	<u>6.32</u>
Conductivity (mS/cm)	<u>NA</u>
(µS/cm)	<u>2303</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>18.23</u>
Dissolved Oxygen (mg/L)	<u>1.38</u>
ORP (mV)	<u>-157.8</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 1625</u>
	<u>DTW final = 23.03</u>

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. GM-29 Time Pump Started 1609

Depth of Sampling Midpoint of Screen Date 5/22/2003

Parameters	Time									
	1612	1615	1618	1621	1624					
Redox Potential (millivolts)	-179.0	-174.4	-168.1	-162.8	-157.8					
Dissolved Oxygen (mg/L)	2.00	1.54	1.41	1.40	1.38					
pH (s.u.)	6.21	6.22	6.24	6.28	6.32					
Specific Conductance (uS/cm)	2,237	2,268	2,295	2,302	2,303					
Temperature (C)	16.84	17.49	17.96	18.08	18.23					

Flow Rate 600 ml/min Total Depth of Well: 33.61

Time Sampled 1625 Depth to Water Before Purging: 22.97

Total Water Pumped 1.5 gallons Depth to Water After Purging: 23.03

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/22/2003</u>
Site/Well No.	<u>HR-17</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Sunny 60s</u>	Sampling Time: Begin	<u>1728</u>	End	<u>1753</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>726.43</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>48.11</u>
Depth to Water (ft bmp)	<u>19.71</u>
Water-Level Elevation (ft)	<u>706.72</u>
Water Column in Well (ft)	<u>28.40</u>
Casing Diameter/Type	<u>3" PVC</u>
Gallons in Well	<u>10.5</u>
Gallons Pumped/Bailed Prior to Sampling	<u>2 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	begin <u>1723</u> end <u>1739</u>
Pumping Rate (gpm)	<u>0.2</u>
Evacuation Method	<u>Submersible pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.60</u>
Conductivity (mS/cm)	<u>N/A</u>
(µS/cm)	<u>1164</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>18.36</u>
Dissolved Oxygen (mg/L)	<u>2.28</u>
ORP (mV)	<u>168.6</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 1744</u>
	<u>DTW final = 19.71</u>

Constituents Sampled	Container Description	Number	Preservative
Arsenic and Barium (6010B)	1 liter plastic	1	Cool, HNO ₃

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. HR-17 Time Pump Started 1723

Depth of Sampling Midpoint of Screen Date 5/22/2003

Parameters	Time									
	1726	1730	1733	1736	1739					
Redox Potential (millivolts)	159.2	165.9	166.7	174.8	168.6					
Dissolved Oxygen (mg/L)	2.29	1.86	2.04	2.28	2.28					
pH (s.u.)	6.75	6.66	6.64	6.54	6.60					
Specific Conductance (uS/cm)	1,166	1,165	1,160	1,160	1,164					
Temperature (C)	17.31	18.03	18.19	18.40	18.36					

Flow Rate 800 ml/min Total Depth of Well: 48.11

Time Sampled 1744 Depth to Water Before Purging: 19.71

Total Water Pumped 2 gallons Depth to Water After Purging: 19.71

Comments

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Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/23/2003</u>
Site/Well No.	<u>GM-28</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Clear 50s</u>	Sampling Time:	Begin <u>9:15</u>	End	<u>10:30</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>736.67</u>
Land Surface Elevation (ft)	<u>NA</u>
Sounded Well Depth (ft bmp)	<u>36.50</u>
Depth to Water (ft bmp)	<u>28.29</u>
Water-Level Elevation (ft)	<u>708.38</u>
Water Column in Well (ft)	<u>8.21</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>1.31</u>
Gallons Pumped/Bailed Prior to Sampling	<u>1 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	<u>begin 9:40 end 9:58</u>
Pumping Rate (gpm)	<u>0.11</u>
Evacuation Method	<u>2" Submersible pump</u>

Field Parameters

Color	<u>Grayish black</u>
Odor	<u>Yes</u>
Appearance	<u>Slightly turbid</u>
pH (s.u.)	<u>6.86</u>
Conductivity (mS/cm)	<u>NA</u>
(µS/cm)	<u>2132</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.88</u>
Dissolved Oxygen (mg/L)	<u>1.41</u>
ORP (mV)	<u>-93.1</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 10:02</u>
	<u>DTW final = 28.26</u>
	<u>Dry at 9:55, allow to recharge before sampling.</u>

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Fe, Mn, As, Ba Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. GM-28 Time Pump Started 9:40

Depth of Sampling Midpoint of Screen Date 5/23/2003

Parameters	Time									
	9:43	9:46	9:49	9:52	9:55					
Redox Potential (millivolts)	-160.4	-126.8	-116.5	-103.0	-93.1					
Dissolved Oxygen (mg/L)	1.98	1.45	1.48	1.40	1.41					
pH (s.u.)	6.68	6.74	6.78	6.86	6.86					
Specific Conductance (uS/cm)	2,374	2,229	2,180	2,162	2,132					
Temperature (C)	16.35	16.63	16.68	16.96	16.88					

Flow Rate 400 ml/min Total Depth of Well: 36.50

Time Sampled 10:02 Depth to Water Before Purging: 28.29

Total Water Pumped 1 gallon Depth to Water After Purging: 28.3

Comments Dry at 9:55, allow for recharge before sampling.

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Water Sampling Log

Project	<u>GM Site-Wide Monitoring</u>	Project No.	<u>OH000294.06.03</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>5/23/2003</u>
Site/Well No.	<u>GM-32</u>	Replicate No.	<u>DUP-125A</u>	Code No.	<u></u>
Weather	<u>Sunny 60s</u>	Sampling Time: Begin	<u>11:10</u>	End	<u>11:56</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>732.08</u>
Land Surface Elevation (ft)	<u>732.47</u>
Sounded Well Depth (ft bmp)	<u>60.21</u>
Depth to Water (ft bmp)	<u>25.68</u>
Water-Level Elevation (ft)	<u>706.40</u>
Water Column in Well (ft)	<u>34.53</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>5</u>
Gallons Pumped/Bailed Prior to Sampling	<u>3 pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>
Purge Time	<u>begin 11:12 end 11:30</u>
Pumping Rate (gpm)	<u>0.18</u>
Evacuation Method	<u>2" Submersible pump</u>

Field Parameters

Color	<u>Yellow</u>
Odor	<u>Slight</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.41</u>
Conductivity (mS/cm)	<u>N/A</u>
(µS/cm)	<u>3908</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>19.31</u>
Dissolved Oxygen (mg/L)	<u>1.93</u>
ORP (mV)	<u>-204.6</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 11:32</u>
	<u>DTW final = 25.98</u>
	<u>RB-102A collected at 11:00. DUP-125A</u>

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260B)	40 ml glass vial	3	Cool, HCl
Fe, Mn, As, Ba Tot. (6010B)	1 liter plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010B)	1 liter plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel T. Trommer/J. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. GM-32 Time Pump Started 11:12

Depth of Sampling Midpoint of Screen Date 5/23/2003

Parameters		Time									
		11:15	11:18	11:21	11:24	11:27	11:30				
Redox Potential (millivolts)		-341.8	-350.3	-328.2	-289.2	-232.7	-204.6				
Dissolved Oxygen (mg/L)		1.99	2.09	2.20	2.09	1.77	1.93				
pH (s.u.)		5.87	5.89	6.13	6.32	6.34	6.41				
Specific Conductance (uS/cm)		3,200	6,217	3,891	3,953	3,918	3,908				
Temperature (C)		18.27	18.58	18.83	18.96	19.22	19.31				

Flow Rate 700 ml/min Total Depth of Well: 60.21

Time Sampled 11:32 Depth to Water Before Purging: 25.68

Total Water Pumped 3 gal Depth to Water After Purging: 25.98

Comments



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Groundwater Sampling Logs

September 2003



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Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.0006.00002	Page	1	of	1
Site Location	Moraine, Ohio	Date	9/16/2003				
Site/Well No.	HR-2	Replicate No.		Code No.			
Weather	Warm; 80's	Sampling Time:	Begin	1415	End	1510	

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	734.75
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	57.60
Depth to Water (ft bmp)	24.18
Water-Level Elevation (ft)	710.57
Water Column in Well (ft)	33.42
Casing Diameter/Type	2"
Gallons in Well	5.347
Gallons Pumped/Bailed Prior to Sampling	3.5 Pumped
Sample Pump Intake Setting (ft bmp)	53'
Purge Time	begin 1415 end 1443
Pumping Rate	500 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.54
Conductivity (mS/cm)	
(µS/cm)	1,104
Turbidity (NTU)	NR
Temperature (°C)	17.34
Dissolved Oxygen (mg/L)	0.88
ORP (mV)	346.9
Sampling Method	Low Flow

Remarks	Sample time @ 1444
	FDTW: 24.18

Constituents Sampled

Container Description

Number

Preservative

Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel	S. Clouse/D. Manzo
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Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-2 Time Pump Started 1415

Depth of Sampling 53' Date 9/16/2003

Parameters	Time									
	1422	1425	1428	1431	1434	1437	1440	1443		
Redox Potential (millivolts)	153.7	180.9	202.8	227.9	264.4	304.5	321.4	346.9		
Dissolved Oxygen (mg/L)	1.48	1.19	0.95	0.99	0.94	0.95	0.89	0.88		
pH (s.u.)	6.83	6.78	6.72	6.66	6.62	6.58	6.57	6.54		
Specific Conductance (uS/cm)	1,125	1,121	1,118	1,115	1,112	1,108	1,105	1,104		
Temperature (C)	16.83	17.07	17.20	17.20	17.27	17.43	17.42	17.34		

Flow Rate 500 mL/min Total Depth of Well (ft) 57.6

Time Sampled 1444 Depth to Water Before Purging (ft) 24.18

Total Water Pumped (Gal) 3.5 Depth to Water After Purging (ft) 24.18

Comments

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Water Sampling Log

Project	<u>GM Annual site-wide GWS 2003</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/16/2003</u>		
Site/Well No.	<u>HR-13</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Warm; 85°</u>	Sampling Time:	Begin <u>1528</u>	End	<u>1610</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>735.03</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>86.30</u>
Depth to Water (ft bmp)	<u>24.53</u>
Water-Level Elevation (ft)	<u>710.50</u>
Water Column in Well (ft)	<u>61.77</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>40.15</u>
Gallons Pumped/Bailed Prior to Sampling	<u>6.5</u>
Sample Pump Intake Setting (ft bmp)	<u>81'</u>
Purge Time	begin <u>1535</u> end <u>1553</u>
Pumping Rate	<u>600 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.60</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>1,287</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>15.28</u>
Dissolved Oxygen (mg/L)	<u>0.66</u>
ORP (mV)	<u>371.8</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 15.22</u>
	<u>FDTW: 24.49</u>

Constituents Sampled	Container Description	Number	Preservative
<u>Site specific VOCs (8260)</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-13 Time Pump Started 1528

Depth of Sampling 81' Date 9/16/2003

Parameters	Time									
	1535	1538	1541	1544	1547	1550	1553			
Redox Potential (millivolts)	203.9	251.5	290.5	331.6	343.8	353.9	371.8			
Dissolved Oxygen (mg/L)	1.27	0.91	0.85	0.79	0.69	0.68	0.66			
pH (s.u.)	6.61	6.55	6.49	6.52	6.57	6.58	6.60			
Specific Conductance (uS/cm)	1,306	1,306	1,303	1,298	1,294	1,290	1,257			
Temperature (C)	15.18	15.20	15.25	14.99	15.18	15.24	15.28			

Flow Rate 600 mL/min Total Depth of Well (ft) 86.3

Time Sampled 1522 Depth to Water Before Purging (ft): 24.53

Total Water Pumped (Gal) 6.5 Depth to Water After Purging (ft): 24.49

Comments

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Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.0006.00002	Page	1	of	1
Site Location	Moraine, Ohio			Date	9/16/2003		
Site/Well No.	HR-3	Replicate No.		Code No.			
Weather	Warm; 80's	Sampling Time:	Begin 1620	End	1730		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	736.75
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	61.02
Depth to Water (ft bmp)	26.19
Water-Level Elevation (ft)	710.56
Water Column in Well (ft)	34.83
Casing Diameter/Type	2"
Gallons in Well	5.57
Gallons Pumped/Bailed Prior to Sampling	10 Pumped
Sample Pump Intake Setting (ft bmp)	57'
Purge Time	begin 1630 end 1702
Pumping Rate	700 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.55
Conductivity (mS/cm)	
(µS/cm)	1,102
Turbidity (NTU)	NR
Temperature (°C)	14.97
Dissolved Oxygen (mg/L)	NR
ORP (mV)	420.3
Sampling Method	Low Flow

Remarks Sample time @ 1703

FDTW: 26.19

Constituents Sampled

Container Description

Number

Preservative

Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-3 Time Pump Started 1630

Depth of Sampling 57' Date 9/16/2003

Parameters	Time									
	1633	1638	1641	1644	1647	1652	1654	1656	1658	1700
Redox Potential (millivolts)	318.4	371.9	384.0	398.3	409.3	410.5	409.3	409.3	413.5	415.8
Dissolved Oxygen (mg/L)	5.52	5.26	5.14	4.94	4.23	1.58	1.09	0.88	0.71	0.66
pH (s.u.)	6.96	6.90	6.87	6.85	6.84	6.58	6.56	6.55	6.56	6.55
Specific Conductance (uS/cm)	1,049	1,048	1,040	1,049	1,047	1,122	1,121	1,119	1,117	1,109
Temperature (C)	16.69	17.07	17.18	17.19	17.90	15.19	15.08	15.01	14.99	14.99

Flow Rate 700 mL/min Total Depth of Well (ft): 61.02

Time Sampled 1703 Depth to Water Before Purging (ft): 26.19

Total Water Pumped (Gal) 10 Depth to Water After Purging (ft): 26.19

Comments Pump trouble @ 1652.

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Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.0006.00002	Page	1	of	1
Site Location	Moraine, Ohio			Date	9/17/2003		
Site/Well No.	HR-8	Replicate No.		Code No.			
Weather	Sunny; 70's	Sampling Time:	Begin 0832	End	0944		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	743.42
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	66.47
Depth to Water (ft bmp)	33.37
Water-Level Elevation (ft)	710.05
Water Column in Well (ft)	33.1
Casing Diameter/Type	2"
Gallons in Well	5.296
Gallons Pumped/Bailed Prior to Sampling	8 Pumped
Sample Pump Intake Setting (ft bmp)	61'
Purge Time	begin 0856 end 0920
Pumping Rate	1200 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.99
Conductivity (mS/cm)	
(µS/cm)	1,144
Turbidity (NTU)	NR
Temperature (°C)	16.82
Dissolved Oxygen (mg/L)	2.33
ORP (mV)	83.1
Sampling Method	Low Flow
Remarks	Sample time @ 0921

FDTW: 33.39

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-8 Time Pump Started 0856

Depth of Sampling 61' Date 9/17/2003

Parameters	Time									
	0902	0905	0908	0911	0914	0917	0920			
Redox Potential (millivolts)	203.3	189.7	144.4	117.7	104.1	91.6	83.1			
Dissolved Oxygen (mg/L)	4.68	2.46	2.40	2.37	2.36	2.34	2.33			
pH (s.u.)	6.98	6.98	6.98	6.98	6.99	6.99	6.99			
Specific Conductance (uS/cm)	1,152	1,151	1,150	1,149	1,147	1,146	1,144			
Temperature (C)	16.43	16.61	16.78	16.79	16.80	16.80	16.82			

Flow Rate 1200 mL/min Total Depth of Well (ft) 66.47

Time Sampled 0921 Depth to Water Before Purging (ft): 33.37

Total Water Pumped (Gal) 8 Depth to Water After Purging (ft): 33.39

Comments

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Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/17/2003</u>				
Site/Well No.	<u>HR-10</u>	Replicate No.	<u></u>				
Weather	<u>Sunny/Windy; 70's</u>	Sampling Time: Begin	<u>0946</u>	End	<u>1040</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>742.81</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>126.33</u>
Depth to Water (ft bmp)	<u>32.49</u>
Water-Level Elevation (ft)	<u>710.32</u>
Water Column in Well (ft)	<u>93.84</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>61</u>
Gallons Pumped/Bailed Prior to Sampling	<u>6 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>121'</u>
Purge Time	<u>begin 1002 end 1021</u>
Pumping Rate	<u>1200 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.72</u>
Conductivity (mS/cm)	<u></u>
(µS/cm)	<u>1,113</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>15.67</u>
Dissolved Oxygen (mg/L)	<u>0.67</u>
ORP (mV)	<u>-64.8</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1022</u>
	<u>FDTW: 32.49</u>

Constituents Sampled	Container Description	Number	Preservative
<u>Site specific VOCs (8260)</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

HR-10

Time Pump Started

1002

Depth of Sampling

121'

Date

9/17/2003

Parameters

Time

	1006	1009	1012	1015	1018	1021			
Redox Potential (millivolts)	-87.3	-86.0	-73.3	-67.7	-71.6	-64.8			
Dissolved Oxygen (mg/L)	1.16	0.90	0.79	0.74	0.70	0.67			
pH (s.u.)	6.99	6.94	6.89	6.82	6.76	6.72			
Specific Conductance (uS/cm)	1,149	1,142	1,133	1,127	1,119	1,113			
Temperature (C)	16.10	15.29	15.49	15.53	15.59	15.67			

Flow Rate

1200 mL/min

Total Depth of Well (ft):

126.33

Time Sampled

1022

Depth to Water Before Purging (ft):

32.49

Total Water Pumped (Gal)

6

Depth to Water After Purging (ft):

32.49

Comments

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/17/2003
 Site/Well No. HR-9 Replicate No. _____ Code No. _____
 Weather Sunny/Windy; 70's Sampling Time: Begin 1040 End 1128

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 743.51
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 69.81
 Depth to Water (ft bmp) 33.17
 Water-Level Elevation (ft) 710.34
 Water Column in Well (ft) 36.64
 Casing Diameter/Type 2"
 Gallons in Well 5.86
 Gallons Pumped/Bailed
 Prior to Sampling 5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 64'
 Purge Time begin 1051 end 1110
 Pumping Rate 900 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.97
 Conductivity
 (mS/cm) _____
 (µS/cm) 975
 Turbidity (NTU) NR
 Temperature (°C) 17.80
 Dissolved Oxygen (mg/L) 2.84
 ORP (mV) 182.2
 Sampling Method Low Flow
 Remarks Sample time @ 1111
FDTW: 33.17

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-9 Time Pump Started 1051

Depth of Sampling 64' Date 9/17/2003

Parameters	Time									
	1055	1058	1101	1104	1107	1110				
Redox Potential (millivolts)	134.2	156.7	175.3	184.5	187	182.2				
Dissolved Oxygen (mg/L)	6.66	6.41	5.28	3.28	2.99	2.84				
pH (s.u.)	7.28	7.25	7.17	7.01	7.00	6.97				
Specific Conductance (uS/cm)	859	861	897	944	940	975				
Temperature (C)	16.19	16.52	16.69	17.57	17.79	17.80				

Flow Rate 900 mL/min Total Depth of Well (ft): 69.81

Time Sampled 1111 Depth to Water Before Purging (ft): 33.17

Total Water Pumped (Gal) 5 Depth to Water After Purging (ft): 33.17

Comments Pump problems @ 1104

ARCADIS

Water Sampling Log

Project Gm Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/17/2003
 Site/Well No. HR-15 Replicate No. _____ Code No. _____
 Weather Sunny/Windy; 70's Sampling Time: Begin 1330 End 1425

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 733.74
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 102
 Depth to Water (ft bmp) 24.58
 Water-Level Elevation (ft) 709.16
 Water Column in Well (ft) 77.42
 Casing Diameter/Type 4"
 Gallons in Well 50.32
 Gallons Pumped/Bailed
 Prior to Sampling 10 Pumped
 Sample Pump Intake
 Setting (ft bmp) 97'
 Purge Time begin 1352 end 1411
 Pumping Rate 1300 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.67
 Conductivity
 (mS/cm) _____
 (µS/cm) 920
 Turbidity (NTU) NR
 Temperature (°C) 15.20
 Dissolved Oxygen (mg/L) 5.90
 ORP (mV) -58.2
 Sampling Method Low Flow
 Remarks Sample time @ 1412
FDTW: 24.57

Constituents Sampled

Container Description

Number

Preservative

Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-15 Time Pump Started 1352

Depth of Sampling 97' Date 9/17/2003

Parameters	Time									
	1356	1359	1402	1405	1408	1411				
Redox Potential (millivolts)	-55.5	-59.1	-60.8	-59.9	-59.1	-58.2				
Dissolved Oxygen (mg/L)	8.16	6.72	6.33	6.06	5.91	5.90				
pH (s.u.)	6.72	6.69	6.68	6.68	6.66	6.67				
Specific Conductance (uS/cm)	951	943	937	931	925	920				
Temperature (C)	15.05	15.15	15.18	15.19	15.20	15.20				

Flow Rate 1300 mL/min Total Depth of Well (ft): 102.00

Time Sampled 1412 Depth to Water Before Purging (ft): 24.58

Total Water Pumped (Gall) 10 Depth to Water After Purging (ft): 24.57

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/17/2003</u>				
Site/Well No.	<u>W-3-N</u>	Replicate No.	<u></u>				
Weather	<u>Sunny/Windy; 85°</u>	Sampling Time: Begin	<u>1425</u>	End	<u>1540</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>733.66</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>56.40</u>
Depth to Water (ft bmp)	<u>24.23</u>
Water-Level Elevation (ft)	<u>709.43</u>
Water Column in Well (ft)	<u>32.17</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>5.1</u>
Gallons Pumped/Bailed Prior to Sampling	<u>8 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>52'</u>
Purge Time	<u>begin 1436 end 1506</u>
Pumping Rate	<u>1000 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Light Yellow</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.87</u>
Conductivity (mS/cm)	<u></u>
(µS/cm)	<u>927</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.18</u>
Dissolved Oxygen (mg/L)	<u>0.86</u>
ORP (mV)	<u>-87.8</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1507</u>

FDTW: 24.21

RB-103A @ 1530

Constituents Sampled

Container Description

Number

Preservative

<u>Site specific VOCs (8260)</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-3-N

Time Pump Started

1436

Depth of Sampling 52'

Date

9/17/2003

Parameters

	1439	1445	1448	1451	1454	1457	1500	1503	1506	
Redox Potential (millivolts)	-86.6	-89.9	-89.0	-89.0	-89.6	-88.3	-86.7	-87.4	-87.8	
Dissolved Oxygen (mg/L)	3.15	2.00	1.66	1.44	1.28	1.11	0.99	0.91	0.86	
pH (s.u.)	7.07	6.98	6.93	6.91	6.89	6.88	6.87	6.87	6.87	
Specific Conductance (uS/cm)	998	982	974	964	956	947	937	930	927	
Temperature (C)	15.96	16.15	16.17	16.20	16.20	16.17	16.22	16.23	16.18	

Flow Rate

1000 mL/min

Total Depth of Well (ft):

56.40

Time Sampled

1507

Depth to Water Before Purging (ft):

24.23

Total Water Pumped (Gal)

8

Depth to Water After Purging (ft):

24.21

Comments

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1

Site Location Moraine, Ohio Date 9/17/2003

Site/Well No. W-4-N Replicate No. _____ Code No. _____

Weather Sunny/Windy; 80's Sampling Time: Begin 1630 End 1730

Evacuation Data

Measuring Point Top of PVC Casing

MP Elevation (ft) 731.63

Land Surface Elevation (ft) NM

Sounded Well Depth (ft bmp) 66.47

Depth to Water (ft bmp) 22.15

Water-Level Elevation (ft) 709.48

Water Column in Well (ft) 44.32

Casing Diameter/Type 4"

Gallons in Well 26.59

Gallons Pumped/Bailed
Prior to Sampling 9.5 Pumped

Sample Pump Intake
Setting (ft bmp) 62'

Purge Time begin 1637 end 1701

Pumping Rate 1300 mL/min

Evacuation Method Submersible Pump

Field Parameters

Color Colorless

Odor None

Appearance Clear

pH (s.u.) 6.92

Conductivity (mS/cm) _____

(µS/cm) 909

Turbidity (NTU) NR

Temperature (°C) 16.46

Dissolved Oxygen (mg/L) NR

ORP (mV) -9.7

Sampling Method Low Flow

Remarks Sample time @ 1702

FDTW: 22.15

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65

1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

W-4-N

Depth of Sampling

62'

Time Pump Started

1637

Date

9/17/2003

Parameters

	1640	1643	1646	1649	1652	1655	1658	1701		
Redox Potential (millivolts)	-2.6	-5.6	-6.6	-8.0	-8.7	-9.0	-9.7	-9.7		
Dissolved Oxygen (mg/L)	1.77	1.27	1.00	0.83	0.70	0.63	0.56	0.54		
pH (s.u.)	7.03	6.95	6.93	6.93	6.90	6.92	6.91	6.92		
Specific Conductance (uS/cm)	918	916	915	912	912	910	910	909		
Temperature (C)	16.21	16.44	16.52	16.56	16.44	16.47	16.38	16.46		

Flow Rate

1300 mL/min

Total Depth of Well (ft):

66.47

Time Sampled

1702

Depth to Water Before Purging (ft):

22.15

Total Water Pumped (Gal)

9.5

Depth to Water After Purging (ft):

22.15

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/18/2003</u>		
Site/Well No.	<u>HR-5</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Sunny, Clear; 65°</u>	Sampling Time: Begin	<u>0735</u>	End	<u>0845</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>734.27</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>56.81</u>
Depth to Water (ft bmp)	<u>25.12</u>
Water-Level Elevation (ft)	<u>709.15</u>
Water Column in Well (ft)	<u>31.61</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>5.06</u>
Gallons Pumped/Bailed Prior to Sampling	<u>4.5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>52'</u>
Purge Time	<u>begin 0808 end 0832</u>
Pumping Rate	<u>900 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Light Yellow</u>
Odor	<u>Odor</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>7.10</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>950</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.55</u>
Dissolved Oxygen (mg/L)	<u>5.45</u>
ORP (mV)	<u>-6.9</u>
Sampling Method	<u>Low Flow</u>

Remarks	<u>Sample time @ 0833</u>
	<u>FDTW: 25.13</u>

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel	<u>S. Clouse/D. Manzo</u>
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Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

Water Sampling Log

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Site Location Moraine, Ohio Date 9/18/2003

Site/Well No. HR-1 Replicate No. Code No.

Weather Sunny, Clear; 75° Sampling Time: Begin 0931 End 1022

Evacuation Data

Measuring Point Top of PVC Casing

MP Elevation (ft) 732.71

Land Surface Elevation (ft) NM

Sounded Well Depth (ft bmp) 58.21

Depth to Water (ft bmp) 24.31

Water-Level Elevation (ft) 708.40

Water Column in Well (ft) 33.9

Casing Diameter/Type 2"

Gallons in Well 5.42

Gallons Pumped/Bailed
Prior to Sampling 3.5 Pumped

Sample Pump Intake
Setting (ft bmp) 55'

Purge Time begin 0941 end 0954

Pumping Rate 1000 mL/min

Evacuation Method Submersible Pump

Field Parameters

Color Colorless

Odor None

Appearance Clear

pH (s.u.) 7.09

Conductivity (mS/cm)

(µS/cm) 1,038

Turbidity (NTU) NR

Temperature (°C) 19.77

Dissolved Oxygen (mg/L) 6.63

ORP (mV) 141.9

Sampling Method Low Flow

Remarks Sample time @ 0955

FDTW: 24.31

DUP-127A

RB-104A collected after HR-1

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65

1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp below measuring point ml milliliter NTU Nephelometric Turbidity Units

°C Degrees Celsius mS/cm Millisiemens per centimeter PVC Polyvinyl chloride

ft feet msl mean sea-level s.u. Standard units

gpm Gallons per minute N/A Not Applicable µS/cm Microsiemens per centimeter

mg/L Milligrams per liter NR Not Recorded VOC Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-1 Time Pump Started 0941

Depth of Sampling 55' Date 9/18/2003

Parameters	Time						
	0945	0948	0951	0954			
Redox Potential (millivolts)	158.6	150.8	143.9	141.9			
Dissolved Oxygen (mg/L)	7.50	7.15	6.89	6.63			
pH (s.u.)	7.14	7.12	7.10	7.09			
Specific Conductance (uS/cm)	1,029	1,032	1,037	1,038			
Temperature (C)	19.17	19.52	19.68	19.77			

Flow Rate 1,000 mL/min Total Depth of Well (ft): 58.21

Time Sampled 0955 Depth to Water Before Purging (ft): 24.31

Total Water Pumped (Gal) 3.5 Depth to Water After Purging (ft): 24.31

Comments _____

ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.0006.00002	Page	1	of	1
Site Location	Moraine, Ohio	Date	9/18/2003				
Site/Well No.	W-2-N	Replicate No.		Code No.			
Weather	Sunny, Warm; 80°	Sampling Time:	Begin	1040	End	1118	

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	731.68
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	58.60
Depth to Water (ft bmp)	21.16
Water-Level Elevation (ft)	710.52
Water Column in Well (ft)	37.44
Casing Diameter/Type	4"
Gallons in Well	24.34
Gallons Pumped/Bailed Prior to Sampling	4.5 Pumped
Sample Pump Intake Setting (ft bmp)	47'
Purge Time	begin 1051 end 1106
Pumping Rate	1000 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Light Yellow
Odor	None
Appearance	Clear
pH (s.u.)	7.09
Conductivity (mS/cm)	
(µS/cm)	997
Turbidity (NTU)	NR
Temperature (°C)	15.97
Dissolved Oxygen (mg/L)	2.86
ORP (mV)	-61.2
Sampling Method	Low Flow
Remarks	Sample time @ 1107
	FDTW: 21.17

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel	S. Clouse/D. Manzo
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Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-2-N

Depth of Sampling 54'

Time Pump Started 1051

Date 9/18/2003

Parameters		Time						
		1054	1057	1100	1103	1106		
Redox Potential (millivolts)		-55.3	-62	-62.5	-61.8	-61.2		
Dissolved Oxygen (mg/L)		4.70	3.99	3.42	3.14	2.86		
pH (s.u.)		7.20	7.14	7.12	7.10	7.09		
Specific Conductance (uS/cm)		1,009	1,004	1,002	999	997		
Temperature (C)		15.53	15.77	15.87	15.95	15.97		

Flow Rate 1,000 mL/min

Time Sampled 1107

Total Water Pumped (Gal) 4.5

Comments

Total Depth of Well (ft): 58.60

Depth to Water Before Purging (ft): 21.16

Depth to Water After Purging (ft): 21.17

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/18/2003
 Site/Well No. HR-4 Replicate No. _____ Code No. _____
 Weather Sunny, Warm; 80's Sampling Time: Begin 1121 End 1200

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 742.60
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 65.85
 Depth to Water (ft bmp) 31.74
 Water-Level Elevation (ft) 710.86
 Water Column in Well (ft) 34.11
 Casing Diameter/Type 2"
 Gallons in Well 5.46
 Gallons Pumped/Bailed
 Prior to Sampling 7 Pumped
 Sample Pump Intake
 Setting (ft bmp) 62'
 Purge Time begin 1135 end 1150
 Pumping Rate 1300 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Light Gray
 Odor None
 Appearance Clear
 pH (s.u.) 7.11
 Conductivity
 (mS/cm) _____
 (µS/cm) 844
 Turbidity (NTU) NR
 Temperature (°C) 16.28
 Dissolved Oxygen (mg/L) 0.55
 ORP (mV) 181.9
 Sampling Method Low Flow
 Remarks Sample time @ 1151
FDTW: 31.73

Constituents Sampled

Container Description

Number

Preservative

Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

9/18/2003

Parameters		Time									
		1138	1141	1144	1147	1150					
Redox Potential (millivolts)		150.1	158.9	169.9	175.7	181.9					
Dissolved Oxygen (mg/L)		1.00	0.73	0.63	0.58	0.55					
pH (s.u.)		7.22	7.16	7.13	7.12	7.11					
Specific Conductance (uS/cm)		837	844	847	846	844					
Temperature (C)		16.17	16.33	16.37	16.32	16.28					

65.85

31.74

31.73

Comments

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Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/18/2003
 Site/Well No. HR-12 Replicate No. Code No.
 Weather Sunny, Hazy; 85° Sampling Time: Begin 1250 End 1340

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 742.64
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 131.50
 Depth to Water (ft bmp) 31.22
 Water-Level Elevation (ft) 711.42
 Water Column in Well (ft) 100.28
 Casing Diameter/Type 4"
 Gallons in Well 65.18
 Gallons Pumped/Bailed
 Prior to Sampling 7 Pumped
 Sample Pump Intake
 Setting (ft bmp) 125'
 Purge Time begin 1304 end 1326
 Pumping Rate 1100 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Light Gray
 Odor None
 Appearance Cloudy
 pH (s.u.) 6.90
 Conductivity
 (mS/cm)
 (µS/cm) 1,217
 Turbidity (NTU) NR
 Temperature (°C) 16.11
 Dissolved Oxygen (mg/L) 0.56
 ORP (mV) -51.1
 Sampling Method Low Flow
 Remarks Sample time @ 1327
FDTW: 31.20

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp below measuring point ml milliliter NTU Nephelometric Turbidity Units
 °C Degrees Celsius mS/cm Millisiemens per centimeter PVC Polyvinyl chloride
 ft feet msl mean sea-level s.u. Standard units
 gpm Gallons per minute N/A Not Applicable µS/cm Microsiemens per centimeter
 mg/L Milligrams per liter NR Not Recorded VOC Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. HR-12

Depth of Sampling 125'

Time Pump Started 1304

Date 9/18/2003

Parameters	1308	1311	1314	1317	1320	1323	1326		
Redox Potential (millivolts)	-35.8	-45.2	-47.2	-49.4	-49.6	-50.6	-51.1		
Dissolved Oxygen (mg/L)	1.01	0.84	0.74	0.67	0.59	0.57	0.56		
pH (s.u.)	7.03	6.96	6.93	6.91	6.90	6.90	6.90		
Specific Conductance (uS/cm)	1,222	1,221	1,223	1,221	1,220	1,217	1,217		
Temperature (C)	15.73	15.96	16.02	16.07	16.09	16.11	16.11		

Flow Rate 1100 mL/min

Time Sampled 1327

Total Water Pumped (Gal) 7

Comments

Total Depth of Well (ft): 131.50

Depth to Water Before Purging (ft): 31.22

Depth to Water After Purging (ft): 31.20

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Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.0006.00002	Page	1	of	1
Site Location	Moraine, Ohio			Date	9/18/2003		
Site/Well No.	HR-11	Replicate No.		Code No.			
Weather	Sunny, Hazy; 85°	Sampling Time:	Begin 1340	End	1435		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	743.33
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	69.92
Depth to Water (ft bmp)	31.88
Water-Level Elevation (ft)	711.45
Water Column in Well (ft)	38.04
Casing Diameter/Type	2"
Gallons in Well	6.09
Gallons Pumped/Bailed Prior to Sampling	4 Pumped
Sample Pump Intake Setting (ft bmp)	64'
Purge Time	begin 1349 end 1413
Pumping Rate	700 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Slightly Gray
Odor	None
Appearance	Slightly Cloudy
pH (s.u.)	6.80
Conductivity (mS/cm)	
(µS/cm)	1,181
Turbidity (NTU)	NR
Temperature (°C)	18.19
Dissolved Oxygen (mg/L)	0.70
ORP (mV)	64.0
Sampling Method	Low Flow
Remarks	Sample time @ 1414
	FDTW: 31.89

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-11 Time Pump Started 1349

Depth of Sampling 64' Date 9/18/2003

Parameters	Time									
	1352	1355	1358	1401	1404	1407	1410	1413		
Redox Potential (millivolts)	103.8	103.9	97.4	87.9	79.0	70.2	65.3	64.0		
Dissolved Oxygen (mg/L)	1.36	1.05	1.03	0.87	0.82	0.76	0.72	0.70		
pH (s.u.)	6.78	6.74	6.74	6.75	6.77	6.79	6.79	6.80		
Specific Conductance (uS/cm)	1,224	1,208	1,205	1,196	1,193	1,192	1,184	1,181		
Temperature (C)	16.66	17.21	17.52	17.81	17.87	18.04	18.05	18.19		

Flow Rate 700 mL/min Total Depth of Well (ft): 69.92

Time Sampled 1414 Depth to Water Before Purging (ft): 31.88

Total Water Pumped (Gal) 4 Depth to Water After Purging (ft): 31.89

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/22/2003</u>				
Site/Well No.	<u>GM-15</u>	Replicate No.	<u> </u>	Code No.	<u> </u>		
Weather	<u>Rainy; 60's</u>	Sampling Time: Begin	<u>1000</u>	End	<u>1100</u>		

Evacuation Data

Measuring Point	<u>Top of Casing</u>
MP Elevation (ft)	<u>725.23</u>
Land Surface Elevation (ft)	<u> </u>
Sounded Well Depth (ft bmp)	<u>98.77</u>
Depth to Water (ft bmp)	<u>18.45</u>
Water-Level Elevation (ft)	<u>706.78</u>
Water Column in Well (ft)	<u>80.32</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>12.85</u>
Gallons Pumped/Bailed Prior to Sampling	<u>70 Gallons</u>
Sample Pump Intake Setting (ft bmp)	<u>95'</u>
Purge Time	<u>begin 1114 end 1140</u>
Pumping Rate	<u>1000 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Light Gray</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>7.03</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>1,440</u>
Turbidity (NTU)	<u>N/A</u>
Temperature (°C)	<u>17.31</u>
Dissolved Oxygen (mg/L)	<u>0.70</u>
ORP (mV)	<u>-19.1</u>
Sampling Method	<u>Disposable Bailer</u>
Remarks	<u>Sample time @ 1141</u>

DTW final = 18.45

MS/MSD's collected

Constituents Sampled

Container Description

Number

Preservative

<u>Site specific VOCs (8260)</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

Sampling Personnel S. Clouse/D. Yoder

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-15 Time Pump Started 1114

Depth of Sampling Midpoint of Screen Date 9/22/2003

Parameters	1122	1125	1128	1131	1134	1137	1140	Time				
Redox Potential (millivolts)	-4.4	-12.3	-14.4	-17.0	-19.5	-20.0	-19.1					
Dissolved Oxygen (mg/L)	0.89	0.82	0.80	0.77	0.74	0.72	0.70					
pH (s.u.)	7.00	7.01	7.02	7.02	7.03	7.03	7.03					
Specific Conductance (uS/cm)	1,409	1,405	1,405	1,403	1,403	1,408	1,440					
Temperature (C)	17.26	17.26	17.27	17.27	17.29	17.30	17.31					

Flow Rate 1000 mL/min Total Depth of Well: 98.77

Time Sampled 1141 Depth to Water Before Purging: 18.45

Total Water Pumped 7 Gallons Depth to Water After Purging: 18.45

Comments MS/MSD collected

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/22/2003
 Site/Well No. GM-16 Replicate No. _____ Code No. _____
 Weather Rainy; 60's Sampling Time: Begin 1100 End 1230

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 725.30
 Land Surface Elevation (ft) _____
 Sounded Well Depth (ft bmp) 57.05
 Depth to Water (ft bmp) 17.70
 Water-Level Elevation (ft) 707.6
 Water Column in Well (ft) 39.35
 Casing Diameter/Type 2"
 Gallons in Well 6.29
 Gallons Pumped/Bailed
 Prior to Sampling 8 Gallons
 Sample Pump Intake
 Setting (ft bmp) 53'
 Purge Time begin 1157 end 1218
 Pumping Rate 1300 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 7.02
 Conductivity
 (mS/cm) _____
 (µS/cm) 1514
 Turbidity (NTU) N/A
 Temperature (°C) 18.12
 Dissolved Oxygen (mg/L) 1.80
 ORP (mV) 105.7
 Sampling Method Low Flow

Remarks Sample time @ 1219
DTW final = 17.7

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Yoder

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

GM-16

Time Pump Started

1157

Depth of Sampling

Midpoint of Screen

Date

9/22/2003

Parameters

	1203	1206	1209	1212	1215	1218	Time					
Redox Potential (millivolts)	107.1	105.1	104.2	104.4	104.7	105.7						
Dissolved Oxygen (mg/L)	2.92	2.68	2.13	1.96	1.90	1.80						
pH (s.u.)	7.03	7.03	7.03	7.02	7.01	7.02						
Specific Conductance (uS/cm)	1,513	1,515	1,514	1,515	1,513	1,514						
Temperature (C)	17.93	18.04	18.08	18.09	18.10	18.12						

Flow Rate

1300 mL/min

Total Depth of Well:

57.05

Time Sampled

1219

Depth to Water Before Purging:

17.7

Total Water Pumped

8 Gallons

Depth to Water After Purging:

17.7

Comments

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1

Site Location Moraine, Ohio Date 9/22/2003

Site/Well No. GM-20D Replicate No. Code No.

Weather Overcast; 70's Sampling Time: Begin 1315 End 1414

Evacuation Data

Measuring Point Top of Casing

MP Elevation (ft) 727.26

Land Surface Elevation (ft) NA

Sounded Well Depth (ft bmp) 100.00

Depth to Water (ft bmp) 18.90

Water-Level Elevation (ft) 708.56

Water Column in Well (ft) 81.10

Casing Diameter/Type 4"

Gallons in Well 52.7

Gallons Pumped/Bailed
Prior to Sampling 7 Gallons

Sample Pump Intake
Setting (ft bmp) 95'

Purge Time begin 1342 end 1355

Pumping Rate 850 mL/min

Evacuation Method Submersible Pump

Field Parameters

Color Colorless

Odor None

Appearance Clear

pH (s.u.) 7.13

Conductivity
(mS/cm)
(µS/cm) 1,050

Turbidity (NTU) N/A

Temperature (°C) 15.20

Dissolved Oxygen (mg/L) 0.75

ORP (mV) 137.2

Sampling Method Disposable Bailer

Remarks Sample time @ 1356
DTW final = 18.89

Constituents Sampled

Container Description

Number

Preservative

Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Yoder

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

**LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG**

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-20D Time Pump Started 1342

Depth of Sampling Midpoint of Screen Date 9/22/2003

Parameters	1346	1349	1352	1355	Time			
Redox Potential (millivolts)	140.2	138.4	137.3	137.2				
Dissolved Oxygen (mg/L)	1.11	0.87	0.81	0.75				
pH (s.u.)	7.19	7.16	7.15	7.13				
Specific Conductance (uS/cm)	1,048	1,049	1,050	1,050				
Temperature (C)	15.07	15.15	15.19	15.20				

Flow Rate 850 mL/min Total Depth of Well: 99.82

Time Sampled 1356 Depth to Water Before Purging: 18.90

Total Water Pumped 7 Gallons Depth to Water After Purging: 18.89

Comments _____

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1

Site Location Moraine, Ohio Date 9/22/2003

Site/Well No. WSU-24 Replicate No. Code No.

Weather Overcast, Raining; 75 Degrees Sampling Time: Begin 1414 End 1500

Evacuation Data

Measuring Point Top of PVC Casing

MP Elevation (ft) 725.10

Land Surface Elevation (ft) NR

Sounded Well Depth (ft bmp) 64.50

Depth to Water (ft bmp) 16.60

Water-Level Elevation (ft) 708.5

Water Column in Well (ft) 47.90

Casing Diameter/Type 2"

Gallons in Well 7.67

Gallons Pumped/Bailed
Prior to Sampling 7 Gallons

Sample Pump Intake
Setting (ft bmp) ~59

Purge Time begin 1414 end 1428

Pumping Rate 1,000 mL/min

Evacuation Method Submersible Pump

Field Parameters

Color Light Gray

Odor None

Appearance Colorless

pH (s.u.) 7.12

Conductivity
(mS/cm)
(µS/cm) 1,270

Turbidity (NTU) N/A

Temperature (°C) 15.38

Dissolved Oxygen (mg/L) 5.64

ORP (mV) 162.0

Sampling Method Low Flow

Remarks Sample time @ 1429
DTW final = 16.61

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel S. Clouse/D. Yoder

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

9/22/2003

Flow Rate	1,000 mL/min	Total Depth of Well (ft):	64.50
Time Sampled	1429	Depth to Water Before Purging (ft):	16.60
Total Water Pumped (Gal)	7 gal	Depth to Water After Purging (ft):	16.61
Comments			

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/22/2003</u>		
Site/Well No.	<u>DN-13</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Overcast, Wet; 70 Degrees</u>	Sampling Time:	Begin <u>1442</u>	End	<u>1456</u>

Evacuation Data

Measuring Point	<u>N/A</u>
MP Elevation (ft)	<u>N/A</u>
Land Surface Elevation (ft)	<u>N/A</u>
Sounded Well Depth (ft bmp)	<u>N/A</u>
Depth to Water (ft bmp)	<u>N/A</u>
Water-Level Elevation (ft)	<u>N/A</u>
Water Column in Well (ft)	<u>N/A</u>
Casing Diameter/Type	<u>N/A</u>
Gallons in Well	<u>N/A</u>
Gallons Pumped/Bailed Prior to Sampling	<u>N/A</u>
Sample Pump Intake Setting (ft bmp)	<u>N/A</u>
Purge Time	begin <u>1442</u> end <u>1452</u>
Pumping Rate	<u>NM</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>N/A</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>N/A</u>
Turbidity (NTU)	<u>N/A</u>
Temperature (°C)	<u>N/A</u>
Dissolved Oxygen (mg/L)	<u>N/A</u>
ORP (mV)	<u>N/A</u>
Sampling Method	<u>Grab</u>
Remarks	<u>Sample time @ 1453</u>
	<u>DTW final = N/A</u>
	<u>Well is running.</u>

Constituents Sampled

Container Description

Number

Preservative

<u>Site-Specific VOCs (8260)</u>	<u>40 ml glass vial</u>	<u>3</u>	<u>Cool, HCl</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

Sampling Personnel S. Clouse/D. Yoder

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.0006.00002	Page	1	of	1
Site Location	Moraine, Ohio	Date	9/22/2003				
Site/Well No.	GM-18	Replicate No.		Code No.			
Weather	Overcast; 70's	Sampling Time: Begin	1500	End	1615		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	723.80
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	53.01
Depth to Water (ft bmp)	16.08
Water-Level Elevation (ft)	707.72
Water Column in Well (ft)	36.93
Casing Diameter/Type	2"
Gallons in Well	5.91
Gallons Pumped/Bailed Prior to Sampling	7 Gallons
Sample Pump Intake Setting (ft bmp)	48'
Purge Time	begin 1513 end 1527
Pumping Rate	1050 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Light Gray
Odor	None
Appearance	Sl. Cloudy
pH (s.u.)	7.17
Conductivity (mS/cm)	
(µS/cm)	1,473
Turbidity (NTU)	N/A
Temperature (°C)	16.41
Dissolved Oxygen (mg/L)	5.85
ORP (mV)	15.7
Sampling Method	Low Flow
Remarks	Sample time @ 1533
	DTW final = 16.07

Constituents Sampled

Container Description

Number

Preservative

Site specific VOCs (8260)	40 ml glass	3	HCl, Cool

Sampling Personnel	S. Clouse/D. Yoder
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Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-18 Time Pump Started 1513

Depth of Sampling Midpoint of Screen Date 9/22/2003

Parameters	Time									
	1518	1521	1524	1527						
Redox Potential (millivolts)	-15.2	-5.6	4.3	15.7						
Dissolved Oxygen (mg/L)	7.90	7.43	6.97	5.85						
pH (s.u.)	7.21	7.19	7.17	7.17						
Specific Conductance (uS/cm)	1,460	1,468	1,472	1,473						
Temperature (C)	16.39	16.41	16.42	16.41						

Flow Rate 1050 mL/min Total Depth of Well: 53.01

Time Sampled 1533 Depth to Water Before Purging: 16.08

Total Water Pumped 7 Gallons Depth to Water After Purging: 16.07

Comments Have YSI problems. Will sample because most parameters have stabilized.

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/23/2003
 Site/Well No. GM-30 Replicate No. Code No.
 Weather Warm, Clear Sampling Time: Begin 0910 End 1242

Evacuation Data

Field Parameters

Measuring Point	<u>Top of PVC Casing</u>	Color	<u>Yellow gray</u>
MP Elevation (ft)	<u>732.33</u>	Odor	<u>Strong</u>
Land Surface Elevation (ft)	<u> </u>	Appearance	<u>Cloudy</u>
Sounded Well Depth (ft bmp)	<u>40.00</u>	pH (s.u.)	<u>6.92</u>
Depth to Water (ft bmp)	<u>25.50</u>	Conductivity	<u> </u>
		(mS/cm)	<u> </u>
Water-Level Elevation (ft)	<u>706.83</u>	(µS/cm)	<u>2,217</u>
Water Column in Well (ft)	<u>14.9</u>	Turbidity (NTU)	<u>N/A</u>
Casing Diameter/Type	<u>2"</u>	Temperature (°C)	<u>17.13</u>
Gallons in Well	<u>2.32</u>	Dissolved Oxygen (mg/L)	<u>2.67</u>
Gallons Pumped/Bailed Prior to Sampling	<u>10 Gallons</u>	ORP (mV)	<u>-68.9</u>
Sample Pump Intake Setting (ft bmp)	<u>35'</u>	Sampling Method	<u>Bailer</u>
Purge Time	begin <u>N/A</u> end <u>N/A</u>	Remarks	<u>Sample time @ 1145</u>
Pumping Rate	<u>N/A</u>		<u>DTW final = 25.50</u>
Evacuation Method	<u>Submersible Pump</u>		<u> </u>

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	<u>40 ml glass</u>	<u>3</u>	<u>Cool, HCL</u>
Iron & Manganese Tot. (6010A)	<u>1 L plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Iron & Manganese Diss. (6010A)	<u>1 L plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Chlorides (SM325.2)/Sulfate	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
Sulfide (SM376.1)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, NaOH/ZnAc</u>
TOC (SM415.1)	<u>40 ml glass vials</u>	<u>2</u>	<u>Cool, H₂SO₄</u>
Light Hydrocarbons (AM18G)	<u>40 ml amber glass vials</u>	<u>2</u>	<u>Cool</u>

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1

Site Location Moraine, Ohio Date 9/23/2003

Site/Well No. GM-27 Replicate No. Code No.

Weather Sunny; 70's Sampling Time: Begin 1415 End 1550

Evacuation Data

Measuring Point TOC

MP Elevation (ft) 730.57

Land Surface Elevation (ft) NM

Sounded Well Depth (ft bmp) 50.00

Depth to Water (ft bmp) 20.77

Water-Level Elevation (ft) 709.80

Water Column in Well (ft) 28.3

Casing Diameter/Type 2"

Gallons in Well 4.528

Gallons Pumped/Bailed
Prior to Sampling 5 Gallons

Sample Pump Intake
Setting (ft bmp) 45'

Purge Time begin 1517 end 1540

Pumping Rate 650 ml/min

Evacuation Method Submersible Pump

Field Parameters

Color Light Gray

Odor An odor

Appearance Clear

pH (s.u.) 6.89

Conductivity
(mS/cm)
(µS/cm) 1,366

Turbidity (NTU) NM

Temperature (°C) 17.64

Dissolved Oxygen (mg/L) 2.18

ORP (mV) 133.4

Sampling Method Low Flow

Remarks Sample time @ 1541
DTW final = 21.70

Constituents Sampled	Container Description	Number	Preservative
Site specific VOCs (8260)	40 ml glass	3	Cool, HCl

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

GM-27

Time Pump Started

1517

Depth of Sampling

Midpoint of Screen

Date

9/23/2003

Parameters

Time

	1525	1528	1531	1534	1537	1540				
Redox Potential (millivolts)	155.5	143.5	139.3	135.2	134.3	133.4				
Dissolved Oxygen (mg/L)	3.64	3.00	2.73	2.48	2.39	2.18				
pH (s.u.)	6.79	6.87	6.86	6.88	6.86	6.89				
Specific Conductance (uS/cm)	1,309	1,342	1,348	1,355	1,368	1,366				
Temperature (C)	17.68	17.78	17.81	17.86	17.90	17.64				

Flow Rate

650 mL/min

Total Depth of Well:

50

Time Sampled

1541

Depth to Water Before Purging:

21.70

Total Water Pumped

4.5 Gallons

Depth to Water After Purging:

21.70

Comments

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Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/23/2003
 Site/Well No. GM-23 Replicate No. Code No.
 Weather Warm, Sunny; Hi 70's Sampling Time: Begin 1600 End 1745

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 730.99
 Land Surface Elevation (ft)
 Sounded Well Depth (ft bmp) 34
 Depth to Water (ft bmp) 22.05
 Water-Level Elevation (ft) 708.94
 Water Column in Well (ft) 11.95
 Casing Diameter/Type 2"
 Gallons in Well 1.912
 Gallons Pumped/Bailed
 Prior to Sampling 8 Gallons Pumped
 Sample Pump Intake
 Setting (ft bmp) 29'
 Purge Time begin 1616 end 1640
 Pumping Rate 1000 mL/48 sec
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor An odor
 Appearance Clear
 pH (s.u.) 6.73
 Conductivity
 (mS/cm)
 (µS/cm) 2,258
 Turbidity (NTU) N/A
 Temperature (°C) 17.38
 Dissolved Oxygen (mg/L) 0.85
 ORP (mV) 198.8
 Sampling Method Low Flow
 Remarks Sample time @ 1642
DTW final = 22.05

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass	3	Cool, HCL
Iron & Manganese Tot. (6010A)	500 ml plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010A)	500 ml plastic	1	Cool, HNO ₃
Chlorides (SM325.2)/Sulfate	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vials	2	Cool, H ₂ SO ₄
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s. u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location GM- Moraine, Ohio

Monitoring Well No. GM-23

Depth of Sampling 29'

Time Pump Started 1616

Date 9/23/2003

Parameters	Time									
	1619	1622	1625	1628	Not Recorded	1634	1637	1640		
Redox Potential (millivolts)	160.1	163.9	169.3	175.2		186.8	191.5	198.8		
Dissolved Oxygen (mg/L)	1.88	1.45	1.15	0.96		0.84	0.83	0.85		
pH (s.u.)	6.81	6.78	6.75	6.75		6.73	6.73	6.73		
Specific Conductance (uS/cm)	2,420	2,389	2,355	2,325		2,283	2,274	2,258		
Temperature (C)	17.32	17.36	17.39	17.42		17.41	17.40	17.38		

Flow Rate 1000 mL/48 sec

Time Sampled 1642

Total Water Pumped 8 Gallons

Comments

Total Depth of Well: 34

Depth to Water Before Purging: 22.05

Depth to Water After Purging: 22.05

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Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/24/2003</u>		
Site/Well No.	<u>GM-29</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Sunny, 60's</u>	Sampling Time:	Begin <u>0745</u> End <u>0930</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>730.78</u>
Land Surface Elevation (ft)	<u></u>
Sounded Well Depth (ft bmp)	<u>32.51</u>
Depth to Water (ft bmp)	<u>24.93</u>
Water-Level Elevation (ft)	<u>705.85</u>
Water Column in Well (ft)	<u>7.58</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>1.21</u>
Gallons Pumped/Bailed Prior to Sampling	<u>9 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>28'</u>
Purge Time	begin <u>0825</u> end <u>0845</u>
Pumping Rate (gpm)	<u>1500 mL/min</u>
Evacuation Method	<u>Peristaltic pump</u>

Field Parameters

Color	<u>Brown</u>
Odor	<u>None</u>
Appearance	<u>Cloudy (silty)</u>
pH (s.u.)	<u>6.88</u>
Conductivity (mS/cm)	<u></u>
(µS/cm)	<u>2,278</u>
Turbidity (NTU)	<u>N/A</u>
Temperature (°C)	<u>16.81</u>
Dissolved Oxygen (mg/L)	<u>0.13</u>
ORP (mV)	<u>-118.6</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 0846</u>

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010A)	500 ml plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010A)	500 ml plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number	OH000294.0006.00002		
Site Location	General Motors Corporation, Moraine, Ohio		
Monitoring Well No.	GM-29	Time Pump Started	0825
Depth of Sampling	Midpoint of Screen	Date	9/24/2003

Parameters	Time				
	0833	0836	0839	0842	0845
Redox Potential (millivolts)	-105.4	-112.3	-115.3	-117.0	-118.6
Dissolved Oxygen (mg/L)	0.23	0.17	0.16	0.14	0.13
pH (s.u.)	6.83	6.86	6.86	6.87	6.88
Specific Conductance (uS/cm)	2,283	2,442	2,242	2,279	2,278
Temperature (C)	16.89	16.83	16.81	16.82	16.81

Flow Rate	1500 mL/min	Total Depth of Well (ft):	32.51
Time Sampled	0846	Depth to Water Before Purging (ft)	24.93
Total Water Pumped (Gal)	9	Depth to Water After Purging (ft):	24.93
Comments			

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Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>9/24/2003</u>
Site/Well No.	<u>GM-22</u>	Replicate No.	<u>DUP-128A @ 1052</u>	Code No.	<u></u>
Weather	<u>Cloudy; 70's</u>	Sampling Time:	Begin <u>1010</u> End <u>1145</u>		

Evacuation Data

Field Parameters

Measuring Point	<u>Top of PVC Casing</u>	Color	<u>Light brown</u>
MP Elevation (ft)	<u>728.28</u>	Odor	<u>None</u>
Land Surface Elevation (ft)	<u></u>	Appearance	<u>Slightly cloudy</u>
Sounded Well Depth (ft bmp)	<u>55.69</u>	pH (s.u.)	<u>7.04</u>
Depth to Water (ft bmp)	<u>22.35</u>	Conductivity (mS/cm)	<u></u>
		(µS/cm)	<u>1,597</u>
Water-Level Elevation (ft)	<u>705.93</u>	Turbidity (NTU)	<u>N/A</u>
Water Column in Well (ft)	<u>33.34</u>	Temperature (°C)	<u>18.45</u>
Casing Diameter/Type	<u>2"</u>	Dissolved Oxygen (mg/L)	<u>1.20</u>
Gallons in Well	<u>5.33</u>	ORP (mV)	<u>74.6</u>
Gallons Pumped/Bailed Prior to Sampling	<u>10 Pumped</u>	Sampling Method	<u>Low flow</u>
Sample Pump Intake Setting (ft bmp)	<u>50</u>	Remarks	<u>Sample time @ 1042</u>
Purge Time	begin <u>1022</u> end <u>1041</u>		
Pumping Rate (gpm)	<u>1150 mL/min</u>		<u>DTW final = 22.30</u>
Evacuation Method	<u>Peristaltic pump</u>		

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	<u>40 ml glass vial</u>	<u>3</u>	<u>Cool, HCl</u>
Iron & Manganese Tot. (6010A)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Iron & Manganese Diss. (6010A)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Chlorides (SM325.2)	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
Sulfide (SM376.1)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, NaOH/ZnAc</u>
TOC (SM415.1)	<u>40 ml glass vial</u>	<u>2</u>	<u>Cool, H₂SO₄</u>
Sulfate (SM375.4)	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
Light Hydrocarbons (AM18G)	<u>40 ml amber glass vials</u>	<u>2</u>	<u>Cool</u>

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-22 Time Pump Started 1023

Depth of Sampling 50' Date 9/24/2003

Parameters	Time									
	1029	1032	1035	1038	1041					
Redox Potential (millivolts)	87.5	82.6	79.1	76.0	74.6					
Dissolved Oxygen (mg/L)	1.28	1.51	1.27	1.18	1.20					
pH (s.u.)	7.09	7.07	7.05	7.04	7.04					
Specific Conductance (uS/cm)	1,575	1,581	1,590	1,597	1,597					
Temperature (C)	18.11	18.24	18.32	18.37	18.45					

Flow Rate 1150 mL/min Total Depth of Well (ft): 55.69

Time Sampled 1042 Depth to Water Before Purging (ft) 22.35

Total Water Pumped (Gal) 8 Depth to Water After Purging (ft): 22.30

Comments

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Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 9/24/2003
 Site/Well No. GM-21 Replicate No. Code No.
 Weather Sunny, wind; 80° Sampling Time: Begin 1315 End 1430

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 723.50
 Land Surface Elevation (ft)
 Sounded Well Depth (ft bmp) 54.76
 Depth to Water (ft bmp) 16.26
 Water-Level Elevation (ft) 707.24
 Water Column in Well (ft) 38.5
 Casing Diameter/Type 2"
 Gallons in Well 6.16
 Gallons Pumped/Bailed
 Prior to Sampling 6 Pumped
 Sample Pump Intake
 Setting (ft bmp) 49'
 Purge Time begin 1332 end 1354
 Pumping Rate (gpm) 1000 mL/min
 Evacuation Method Submersible pump

Field Parameters

Color Light gray
 Odor None
 Appearance clear
 pH (s.u.) 7.05
 Conductivity (mS/cm)
 (µS/cm) 1,181
 Turbidity (NTU) N/A
 Temperature (°C) 18.39
 Dissolved Oxygen (mg/L) 0.75
 ORP (mV) -26.7
 Sampling Method Low flow
 Remarks Sample time @ 1355
DTW final = 16.26
RB-105A @ 1420

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
As, Ba, Fe, Mn Tot. (6010A)	500 ml plastic	1	Cool, HNO ₃
As, Ba, Fe, Mn Diss. (6010A)	500 ml plastic	1	Cool, HNO ₃
Chlorides (SM325.2)/Sulfate	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml VOA	2	Cool, H ₂ SO ₄
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-21 Time Pump Started 1332

Depth of Sampling 49' Date 9/24/2003

Parameters	Time									
	1336	1339	1342	1345	1348	1351	1354			
Redox Potential (millivolts)	-17.1	-16.9	-21.1	-23.1	-25.9	-26.9	-26.7			
Dissolved Oxygen (mg/L)	1.16	1.04	0.85	0.88	0.73	0.71	0.75			
pH (s.u.)	7.13	7.11	7.06	7.07	7.07	7.06	7.05			
Specific Conductance (uS/cm)	1,275	1,170	1,192	1,191	1,186	1,182	1,181			
Temperature (C)	18.19	18.25	18.35	18.40	18.35	18.37	18.39			

Flow Rate 1000 mL/min Total Depth of Well (ft): 54.76

Time Sampled 1355 Depth to Water Before Purging (ft): 16.26

Total Water Pumped (Gal) 6 Depth to Water After Purging (ft): 16.26

Comments

ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.06.02	Page	1	of	1
Site Location	Moraine, Ohio			Date	9/24/2003		
Site/Well No.	39	Replicate No.		Code No.			
Weather	Sunny, windy; 70's	Sampling Time:	Begin 1450	End	1510		

Evacuation Data

Measuring Point	N/A	
MP Elevation (ft)	N/A	
Land Surface Elevation (ft)	N/A	
Sounded Well Depth (ft bmp)	N/A	
Depth to Water (ft bmp)	N/A	
Water-Level Elevation (ft)	N/A	
Water Column in Well (ft)	N/A	
Casing Diameter/Type	N/A	
Gallons in Well	N/A	
Gallons Pumped/Bailed Prior to Sampling	N/A	
Sample Pump Intake Setting (ft bmp)	N/A	
Purge Time	begin 1455	end 1508
Pumping Rate (gpm)	N/A	
Evacuation Method	N/A	

Field Parameters

Color	Yellow
Odor	No
Appearance	Slightly Cloudy
pH (s.u.)	N/A
Conductivity (mS/cm)	
(μ S/cm)	N/A
Turbidity (NTU)	N/A
Temperature ($^{\circ}$ F)	N/A
Dissolved Oxygen (mg/L)	N/A
ORP (mV)	N/A
Sampling Method	Grab

Remarks Sample time @ 1505

DTW final = N/A

31-off line; therefore, sampled 39

Constituents Sampled

[illegible]

Sampling Personnel

S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	Well Casing Volumes			
	1-1/2" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-3/4" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s. u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.06.02	Page	1	of	1
Site Location	Moraine, Ohio			Date	9/24/2003		
Site/Well No.	GM-11	Replicate No.		Code No.			
Weather	Sunny, warm; 80's	Sampling Time:	Begin 1520	End	1600		

Evacuation Data

Measuring Point	Top of Casing
MP Elevation (ft)	723.71
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	98.40
Depth to Water (ft bmp)	16.40
Water-Level Elevation (ft)	707.31
Water Column in Well (ft)	82
Casing Diameter/Type	2"
Gallons in Well	13.12
Gallons Pumped/Bailed Prior to Sampling	6 Pumped
Sample Pump Intake Setting (ft bmp)	93'
Purge Time	begin 1538 end 1552
Pumping Rate (gpm)	1300 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Light yellow
Odor	None
Appearance	Clear
pH (s.u.)	6.77
Conductivity (mS/cm)	
(μ S/cm)	979
Turbidity (NTU)	N/A
Temperature ($^{\circ}$ C)	16.18
Dissolved Oxygen (mg/L)	1.24
ORP (mV)	161.7
Sampling Method	Low Flow

Remarks Sample time @ 1553

DTW final = 16.35

Constituents Sampled

Container Description

Number

Preservative

[illegible]

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Well Casing Volumes				
Gal./Ft.	1-1/4"	2"	3"	4"
	0.06	0.16	0.37	0.65
	0.09	0.26	0.50	1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	S.U.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

	Time									
	1543	1546	1549	1552						
Redox Potential (millivolts)	133.5	145.9	155.7	161.7						
Dissolved Oxygen (mg/L)	1.15	1.23	1.34	1.24						
pH (s.u.)	6.87	6.79	6.78	6.77						
Specific Conductance (uS/cm)	977	980	977	979						
Temperature (C)	16.10	16.16	16.19	16.18						

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 9/24/2003
 Site/Well No. GM-17 Replicate No. _____ Code No. _____
 Weather Sunny, warm; 80's Sampling Time: Begin 1600 End 1650

Evacuation Data

Field Parameters

Measuring Point	<u>Top of PVC Casing</u>	Color	<u>Colorless</u>
MP Elevation (ft)	<u>723.84</u>	Odor	<u>None</u>
Land Surface Elevation (ft)	_____	Appearance	<u>Clear</u>
Sounded Well Depth (ft bmp)	<u>48.60</u>	pH (s.u.)	<u>6.91</u>
Depth to Water (ft bmp)	<u>16.10</u>	Conductivity (mS/cm)	_____
Water-Level Elevation (ft)	<u>707.74</u>	(µS/cm)	<u>1,242</u>
Water Column in Well (ft)	<u>32.5</u>	Turbidity (NTU)	<u>N/A</u>
Casing Diameter/Type	<u>2"</u>	Temperature (°C)	<u>18.56</u>
Gallons in Well	<u>5.2</u>	Dissolved Oxygen (mg/L)	<u>0.72</u>
Gallons Pumped/Bailed Prior to Sampling	<u>3 Pumped</u>	ORP (mV)	<u>184.9</u>
Sample Pump Intake Setting (ft bmp)	<u>52'</u>	Sampling Method	<u>Low flow</u>
Purge Time	begin <u>1618</u> end <u>1634</u>	Remarks	<u>Sample time @ 1635</u>
Pumping Rate (gpm)	<u>600 mL/min</u>		<u>DTW final = 16.10</u>
Evacuation Method	<u>Submersible pump</u>		_____

Constituents Sampled

Container Description

Number

Preservative

<u>Site-Specific VOCs (8260)</u>	<u>40 ml glass vial</u>	<u>3</u>	<u>Cool, HCl</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-17 Time Pump Started 1618

Depth of Sampling 52' Date 9/24/2003

Parameters	Time									
	1622	1625	1628	1631	1634					
Redox Potential (millivolts)	93.6	126.9	146.7	163.4	184.9					
Dissolved Oxygen (mg/L)	0.84	0.78	0.77	0.77	0.72					
pH (s.u.)	6.99	6.97	6.92	6.92	6.91					
Specific Conductance (uS/cm)	1,232	1,239	1,240	1,241	1,242					
Temperature (C)	17.45	18.23	18.42	18.55	18.56					

Flow Rate 600 mL/min Total Depth of Well (ft): 48.60

Time Sampled 1635 Depth to Water Before Purging (ft): 16.10

Total Water Pumped (Gal) 3 Depth to Water After Purging (ft): 16.10

Comments _____

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 9/24/2003
 Site/Well No. GM-9 Replicate No. _____ Code No. _____
 Weather Sunny, windy, 80's Sampling Time: Begin 1700 End 1735

Evacuation Data

Measuring Point Top of Casing
 MP Elevation (ft) 724.07
 Land Surface Elevation (ft) _____
 Sounded Well Depth (ft bmp) 99.5
 Depth to Water (ft bmp) 16.67
 Water-Level Elevation (ft) 707.40
 Water Column in Well (ft) 82.83
 Casing Diameter/Type 2"
 Gallons in Well 13.25
 Gallons Pumped/Bailed
 Prior to Sampling 5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 90' (Wouldn't go deeper)
 Purge Time begin 1711 end 1725
 Pumping Rate (gpm) 800 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 7.05
 Conductivity (mS/cm) _____
 (µS/cm) 989
 Turbidity (NTU) N/A
 Temperature (°C) 17.05
 Dissolved Oxygen (mg/L) 2.65
 ORP (mV) 174.9
 Sampling Method Low Flow
 Remarks Sample time @ 1726

DTW final = 16.67

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)

40 ml glass vial

3

Cool, HCl

Sampling Personnel

S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft. 1-1/4" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-1/2" = 0.09 2-1/2" = 0.26 3-1/2" = 0.50 6" = 1.47

bmp below measuring point ml milliliter NTU Nephelometric Turbidity Units
 °C Degrees Celsius mS/cm Millisiemens per centimeter PVC Polyvinyl chloride
 ft feet msl mean sea-level s.u. Standard units
 gpm Gallons per minute N/A Not Applicable µS/cm Microsiemens per centimeter
 mg/L Milligrams per liter NR Not Recorded VOC Volatile Organic Compounds

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

011000294.0006.00002

General Motors Corporation, Moraine, Ohio

GM-9

Midpoint of Screen

171

9/24/2003

Time

	Time									
	1716	1719	1722	1725						
Redox Potential (millivolts)	138.8	151.5	166.2	174.9						
Dissolved Oxygen (mg/L)	3.37	2.76	2.79	2.65						
pH (s.u.)	7.11	7.07	7.04	7.05						
Specific Conductance (uS/cm)	975	983	989	989						
Temperature (C)	16.89	16.97	17.03	17.05						

800 mL/min

99.50

1726

16.67

6.67

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>9/24/2003</u>
Site/Well No.	<u>GM-10</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Sunny, windy; Hi 70's</u>	Sampling Time:	Begin <u>1735</u>	End	<u>1845</u>

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	723.46
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	48.55
Depth to Water (ft bmp)	13.70
Water-Level Elevation (ft)	674.91
Water Column in Well (ft)	34.85
Casing Diameter/Type	2"
Gallons in Well	5.576
Gallons Pumped/Bailed Prior to Sampling	4 Pumped
Sample Pump Intake Setting (ft bmp)	43'
Purge Time	begin 1750 end 1803
Pumping Rate (gpm)	800 mL/min
Evacuation Method	Submersible pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.96
Conductivity (mS/cm)	
(μ Ss/cm)	1.102
Turbidity (NTU)	N/A
Temperature (°C)	17.25
Dissolved Oxygen (mg/L)	1.86
ORP (mV)	234.7
Sampling Method	Low flow
Remarks	Sample time @ 1804

Remarks Sample time @ 1804

DTW final = 16.38

Constituents Sampled

Container Description

Number

Preservative

[illegible]

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2 1/2" = 0.26	3 1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

OH000294,0006.00002

General Motors Corporation, Moraine, Ohio

GM-10

43

1750

9/24/2003

	Time					
	1754	1757	1800	1803		
Redox Potential (millivolts)	205.4	217.3	227.9	234.7		
Dissolved Oxygen (mg/L)	2.27	2.04	1.93	1.86		
pH (s.u.)	7.03	6.99	6.95	6.96		
Specific Conductance (uS/cm)	1,110	1,106	1,102	1,102		
Temperature (C)	16.89	17.13	17.20	17.25		

800 mL/min

48.55

1804

५

13.70

16.38

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>9/25/2003</u>
Site/Well No.	<u>GM-19D</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Cloudy; 70°</u>	Sampling Time:	Begin <u>0820</u>	End	<u>1040</u>

Evacuation Data

Measuring Point	Top of Casing
MP Elevation (ft)	730.25
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	149.00
Depth to Water (ft bmp)	22.24
Water-Level Elevation (ft)	708.01
Water Column in Well (ft)	126.22
Casing Diameter/Type	4"
Gallons in Well	82
Gallons Pumped/Bailed Prior to Sampling	246 Pumped
Sample Pump Intake Setting (ft bmp)	75'
Purge Time	begin 0850 end 0943
Pumping Rate (gpm)	1 gal/13sec
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	N/A
Conductivity (mS/cm)	
(μ S/cm)	N/A
Turbidity (NTU)	N/A
Temperature ($^{\circ}$ C)	N/A
Dissolved Oxygen (mg/L)	N/A
ORP (mV)	N/A
Sampling Method	Disposable bailer
Remarks	Sample time @ 0944

Remarks Sample time @ 0944

DTW final = 22.23

DUP - 129A @ 0944

Constituents Sampled

Container Description

Number

Preservative

[illegible]

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	Well Casing Volumes			
1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 9/25/2003
 Site/Well No. GM-19S Replicate No. Code No.
 Weather Sunny; 70's Sampling Time: Begin 1041 End 1135

Evacuation Data

Field Parameters

Measuring Point	<u>Top of PVC Casing</u>	Color	<u>Light brown</u>
MP Elevation (ft)	<u>730.85</u>	Odor	<u>None</u>
Land Surface Elevation (ft)	<u> </u>	Appearance	<u>Slightly cloudy</u>
Sounded Well Depth (ft bmp)	<u>54.70</u>	pH (s.u.)	<u>6.93</u>
Depth to Water (ft bmp)	<u>22.37</u>	Conductivity (mS/cm)	<u> </u>
Water-Level Elevation (ft)	<u>708.48</u>	(µS/cm)	<u>1726</u>
Water Column in Well (ft)	<u>32.33</u>	Turbidity (NTU)	<u>N/A</u>
Casing Diameter/Type	<u>2"</u>	Temperature (°C)	<u>19.57</u>
Gallons in Well	<u>5.17</u>	Dissolved Oxygen (mg/L)	<u>1.87</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>	ORP (mV)	<u>135.0</u>
Sample Pump Intake Setting (ft bmp)	<u>Midpoint of screen</u>	Sampling Method	<u>Low flow</u>
Purge Time	begin <u>1100</u> end <u>1115</u>	Remarks	<u>Sample time @ 1116</u>
Pumping Rate (gpm)	<u>1000 mL/min</u>		<u>DTW final = 22.27</u>
Evacuation Method	<u>Submersible pump</u>		<u> </u>

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	<u>40 ml glass vial</u>	<u>3</u>	<u>Cool, HCl</u>
Iron & Manganese Tot. (6010A)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Iron & Manganese Diss. (6010A)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Chlorides (SM325.2)/Sulfates	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
Sulfide (SM376.1)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, NaOH/ZnAc</u>
TOC (SM415.1)	<u>40 ml glass vial</u>	<u>2</u>	<u>Cool, H₂SO₄</u>
Light Hydrocarbons (AM18G)	<u>40 ml amber glass vials</u>	<u>2</u>	<u>Cool</u>

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

OH000294.0006.00002

General Motors Corporation, Moraine, Ohio

GM-19S

49

1100

9/25/2003

Time

Total Depth of Well (ft): 54.70

9
10
11
12

5

Depth to Water After Purging (ft): 22.27

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 9/25/2003
 Site/Well No. GM-35 Replicate No. _____ Code No. _____
 Weather Sunny; 80° Sampling Time: Begin 1250 End 1404

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 731.27
 Land Surface Elevation (ft) _____
 Sounded Well Depth (ft bmp) 64.90
 Depth to Water (ft bmp) 22.80
 Water-Level Elevation (ft) 708.47
 Water Column in Well (ft) 42.1
 Casing Diameter/Type 2"
 Gallons in Well 6.736
 Gallons Pumped/Bailed
 Prior to Sampling 10+ Pumped
 Sample Pump Intake
 Setting (ft bmp) 49'
 Purge Time begin 1320 end 1400
 Pumping Rate (gpm) 1200 mL/min
 Evacuation Method Submersible pump

Field Parameters

Color Very yellow, Amber, not oily
 Odor None
 Appearance Clear
 pH (s.u.) 8.40
 Conductivity (mS/cm) _____
 (µS/cm) 5906
 Turbidity (NTU) N/A
 Temperature (°C) 20.05
 Dissolved Oxygen (mg/L) 0.03
 ORP (mV) -37.1
 Sampling Method Low flow
 Remarks Sample time @ 1401

DTW final = 22.78

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)

40 ml glass vial

3

Cool, HCl

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp below measuring point
 °C Degrees Celsius
 ft feet
 gpm Gallons per minute
 mg/L Milligrams per liter

ml milliliter
 mS/cm Millisiemens per centimeter
 msl mean sea-level
 N/A Not Applicable
 NR Not Recorded

NTU Nephelometric Turbidity Units
 PVC Polyvinyl chloride
 s.u. Standard units
 µS/cm Microsiemens per centimeter
 VOC Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

GM-35

Depth of Sampling

59'

Time Pump Started

1320

Date

9/25/2003

Parameters

	1325	1328	1331	1334	1337	1340	1344	1350	1354	1357	1400
Redox Potential (millivolts)	-18.5	-34.7	-42.5	-28.7	-28.9	-18.0	-16.5	-33.7	-17.4	-41.4	-37.1
Dissolved Oxygen (mg/L)	0.18	0.14	0.11	0.08	0.06	0.06	0.04	0.03	0.04	0.03	0.03
pH (s.u.)	8.45	8.44	8.44	8.45	8.46	8.47	8.42	8.39	8.39	8.39	8.40
Specific Conductance (uS/cm)	6,277	6,222	6,244	6,274	6,422	6,390	5,611	5,820	5,877	5,999	5,906
Temperature (C)	19.44	19.67	19.86	20.15	20.45	20.71	19.30	19.49	19.80	19.99	20.05

Flow Rate

1200 mL

Total Depth of Well (ft):

64.90

Time Sampled

1401

Depth to Water Before Purging (ft):

22.80

Total Water Pumped (Gal)

10+

Depth to Water After Purging (ft):

22.78

Comments

Very recalibrated SPC - (1.055 calib)

SPC - very High - start @ 1304; recalibrated - still very high.

Water Sampling Log

Evacuation Data		Field Parameters	
Measuring Point	Top of PVC Casing	Color	Slightly yellow tinge
MP Elevation (ft)	729.77	Odor	Slight
Land Surface Elevation (ft)		Appearance	Clear or slightly cloudy
Sounded Well Depth (ft bmp)	53.52	pH (s.u.)	6.92
Depth to Water (ft bmp)	20.70	Conductivity (mS/cm)	
Water-Level Elevation (ft)	709.7	(µS/cm)	1663
Water Column in Well (ft)	32.82	Turbidity (NTU)	N/A
Casing Diameter/Type	2"	Temperature (°C)	19.04
Gallons in Well	5.25	Dissolved Oxygen (mg/L)	0.17
Gallons Pumped/Bailed Prior to Sampling	8.5 Pumped	ORP (mV)	141.2
Sample Pump Intake Setting (ft bmp)	48'	Sampling Method	Low flow
Purge Time	begin 1441 end 1459	Remarks	Sample time @ 1500
Pumping Rate (gpm)	1280 mL/min		DTW final = 20.70
Evacuation Method	Submersible pump		

Sampling Personnel S. Clouse/M. Adkins

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

9/25/2003

Parameters

	1444	1447	1450	1453	1456	1459	Time
Redox Potential (millivolts)	117.7	122.5	126.2	131.7	136.8	141.2	
Dissolved Oxygen (mg/L)	0.47	0.35	0.26	0.20	0.18	0.17	
pH (s.u.)	6.98	6.94	6.93	6.92	6.92	6.92	
Specific Conductance (uS/cm)	1,662	1,664	1,665	1,665	1,664	1,663	
Temperature (C)	18.49	18.87	18.99	19.02	19.05	19.04	

53.52

1500

8.5

Comments

ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.06.02	Page	1 of 1
Site Location	Moraine, Ohio	Date	9/25/2003		
Site/Well No.	EAST	Replicate No.		Code No.	
Weather	Sunny, 80°	Sampling Time: Begin	1525	End	1614

Evacuation Data

Field Parameters

Measuring Point	Top of PVC Casing	Color	Brown
MP Elevation (ft)	730.98	Odor	None
Land Surface Elevation (ft)		Appearance	Turbid
Sounded Well Depth (ft bmp)	70.15	pH (s.u.)	6.94
Depth to Water (ft bmp)	22.03	Conductivity (mS/cm)	
Water-Level Elevation (ft)	708.95	(µS/cm)	1548
Water Column in Well (ft)	48.12	Turbidity (NTU)	N/A
Casing Diameter/Type	2"	Temperature (°C)	18.47
Gallons in Well	7.6992	Dissolved Oxygen (mg/L)	1.04
Gallons Pumped/Bailed Prior to Sampling	8 Pumped	ORP (mV)	147.6
Sample Pump Intake Setting (ft bmp)	65'	Sampling Method	Low flow
Purge Time	begin 1528 end 1551	Remarks	Sample time @ 1552
Pumping Rate (gpm)	1480 mL/min		DTW final = 22.00
Evacuation Method	Submersible pump		

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010A)	500 ml plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010A)	500 ml plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

EAST

Time Pump Started

1528

Depth of Sampling

65'

Date

9/25/2003

Parameters

	Time									
	1532	1535	1538	1541	1544	1548	1551			
Redox Potential (millivolts)	97.4	102.5	112.0	115.8	127.3	138.2	147.6			
Dissolved Oxygen (mg/L)	2.46	2.13	2.04	1.48	1.19	1.09	1.04			
pH (s.u.)	7.09	7.01	6.97	6.96	6.95	6.95	6.94			
Specific Conductance (uS/cm)	1,551	1,550	1,546	1,547	1,554	1,558	1,547			
Temperature (C)	18.09	18.22	18.39	18.45	18.51	18.47	18.47			

Flow Rate

1480 mL/min

Total Depth of Well (ft):

70.15

Time Sampled

1552

Depth to Water Before Purging (ft):

22.03

Total Water Pumped (Gal)

8

Depth to Water After Purging (ft):

22.00

Comments

Water Sampling Log

Evacuation Data

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number	OH000294.0006.00002		
Site Location	Moraine, Ohio		
Monitoring Well No.	HR-17	Time Pump Started	1631
Depth of Sampling	42'	Date	9/25/2003

Parameters	Time						
	1634	1637	1640	1643			
Redox Potential (millivolts)	118.3	119.5	120.4	121.1			
Dissolved Oxygen (mg/L)	1.65	1.52	1.46	1.43			
pH (s.u.)	7.10	7.07	7.06	7.06			
Specific Conductance (uS/cm)	1,064	1,064	1,060	1,057			
Temperature (C)	18.03	18.11	18.14	18.18			

Flow Rate	1200 mL/min	Total Depth of Well (ft):	47.05
Time Sampled	1644	Depth to Water Before Purging (ft):	17.64
Total Water Pumped (Gal)	5	Depth to Water After Purging (ft):	17.65
Comments			

Water Sampling Log

Evacuation Data			Field Parameters	
Measuring Point	Top of PVC Casing		Color	Colorless
MP Elevation (ft)	726.64		Odor	None
Land Surface Elevation (ft)			Appearance	Clear
Sounded Well Depth (ft bmp)	66.40		pH (s.u.)	7.17
Depth to Water (ft bmp)	18.70		Conductivity (mS/cm)	
Water-Level Elevation (ft)	707.86		(µS/cm)	1148
Water Column in Well (ft)	47.62		Turbidity (NTU)	N/A
Casing Diameter/Type	4"		Temperature (°C)	15.80
Gallons in Well	30.95		Dissolved Oxygen (mg/L)	0.68
Gallons Pumped/Bailed Prior to Sampling	5 Pumped		ORP (mV)	183.0
Sample Pump Intake Setting (ft bmp)	62'		Sampling Method	Low flow
Purge Time	begin	0820	end	0837
Pumping Rate (gpm)	1480 mL/min		Remarks	Sample time @
Evacuation Method	Submersible pump			DTW final = 19.00

Sampling Personnel _____ S. Clouse/M. Adkins

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	ms/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-2-S Time Pump Started 0820

Depth of Sampling 62' Date 9/26/2003

Parameters	Time									
	0825	0828	0831	0834	0837					
Redox Potential (millivolts)	194.3	189.2	185.9	183.8	183.0					
Dissolved Oxygen (mg/L)	0.95	0.79	0.61	0.63	0.68					
pH (s.u.)	7.15	7.16	7.16	7.17	7.17					
Specific Conductance (uS/cm)	1,159	1,150	1,143	1,141	1,148					
Temperature (C)	15.39	15.63	15.73	15.79	15.80					

Flow Rate 1480 mL/min Total Depth of Well (ft): 66.40

Time Sampled 0838 Depth to Water Before Purging (ft): 18.78

Total Water Pumped (Gal) 5 Depth to Water After Purging (ft): 19.00

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>9/26/2003</u>		
Site/Well No.	<u>W-3-S</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Sunny; 60°</u>	Sampling Time:	Begin <u>0855</u>	End	<u>0940</u>		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	733.42
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	73.00
Depth to Water (ft bmp)	21.26

Water-Level Elevation (ft)	712.16
----------------------------	--------

Water Column in Well (ft)	51.74
---------------------------	-------

Casing Diameter/Type 4"

Gallons in Well	33.63
-----------------	-------

Gallons Pumped/Bailed Prior to Sampling	6
--	---

Sample Pump Intake	
Setting (ft bmp)	70'

Purge Time	begin	0908	end	0923
------------	-------	------	-----	------

Pumping Rate (gpm) 1400 mL/min

Evacuation Method	Submersible pump
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Field Parameters

Color Colorless

Odor None

Appearance	Clear
------------	-------

pH (s.u.) 7.19

Conductivity (mS/cm)

($\mu\text{S}/\text{cm}$) 1090

Turbidity (NTU)	N/A
-----------------	-----

Temperature (°C) 15.98

Dissolved Oxygen (mg/L)	1.73
-------------------------	------

ORP (mV) 153.8

Sampling Method	Low flow
-----------------	----------

Remarks Sample time @ 0924

DTW final = 21.24

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
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[illegible]

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[illegible]

Figure S1

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

brp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-3-S Time Pump Started 0908

Depth of Sampling 70' Date 9/26/2003

Parameters	Time						
	0911	0914	0917	0920	0923		
Redox Potential (millivolts)	148.0	145.5	147.6	150.8	153.8		
Dissolved Oxygen (mg/L)	2.06	1.84	1.79	1.75	1.73		
pH (s.u.)	7.32	7.25	7.22	7.20	7.19		
Specific Conductance (uS/cm)	1,107	1,083	1,100	1,088	1,090		
Temperature (C)	15.48	15.83	15.91	15.94	15.98		

Flow Rate 1400 mL/min Total Depth of Well (ft): 73.00

Time Sampled 0924 Depth to Water Before Purging (ft): 21.26

Total Water Pumped (Gal) 6 Depth to Water After Purging (ft): 21.24

Comments

ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.06.02	Page	1	of	1
Site Location	Moraine, Ohio			Date	9/26/2003		
Site/Well No.	W-4-S	Replicate No.		Code No.			
Weather	Sunny; 70°	Sampling Time:	Begin 0942	End	1100		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	727.68
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	69.90
Depth to Water (ft bmp)	19.70

Water-Level Elevation (ft)	707.98
----------------------------	--------

Water Column in Well (ft)	50.2
---------------------------	------

Casing Diameter/Type 4"

Gallons in Well	32.63
-----------------	-------

Gallons Pumped/Bailed Prior to Sampling	11.5 Pumped
--	-------------

Sample Pump Intake	
Setting (ft bmp)	65'

Purge Time	begin	0955	end	1030
------------	-------	------	-----	------

Pumping Rate (gpm) 1100 mL/min

Evacuation Method	Submersible pump
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Field Parameters

Color Colorless

Odor None

Appearance	Clear
------------	-------

pH (s.u.) 7.05

Conductivity
(mS/cm)

(45/cm) 1321

Turbidity (NTU)	N/A
-----------------	-----

Temperature (°C) 18.25

Dissolved Oxygen (mg/L)	0.34
-------------------------	------

ORP (mV) 156.4

Sampling Method	Low flow
-----------------	----------

Remarks Sample time @ 1031

DTW final = 19.70

Constituents Sampled

Container Description

Number

Preservative

[illegible]

Sampling Personnel S. Clouse/M. Adkins

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-4-S

Time Pump Started 0955

Depth of Sampling 65' Date 9/26/2003

Parameters

	Time											
	0958	1001	1004	1007	1010	1013	1016	1019	1023	1025	1027	1030
Redox Potential (millivolts)	150.7	150.8	151.2	151.8	152.3	152.9	153.8	154.5	155.3	155.5	156.1	156.4
Dissolved Oxygen (mg/L)	3.02	2.28	1.65	1.24	1.05	0.89	0.76	0.62	0.47	0.40	0.38	0.34
pH (s.u.)	7.16	7.09	7.06	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05
Specific Conductance (uS/cm)	1,315	1,321	1,324	1,317	1,316	1,313	1,314	1,320	1,316	1,318	1,318	1,321
Temperature (C)	17.51	17.87	18.00	18.05	18.12	18.15	18.16	18.18	18.22	18.23	18.25	18.25

Flow Rate 1100 mL/min

Total Depth of Well (ft): 69.90

Time Sampled 1031

Depth to Water Before Purging (ft): 19.70

Total Water Pumped (Gal) 11.5

Depth to Water After Purging (ft): 19.70

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>10/1/2003</u>		
Site/Well No.	<u>ME-6</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Sunny; ~50°</u>	Sampling Time: Begin	<u>0820</u>	End	<u>0945</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>734.84</u>
Land Surface Elevation (ft)	<u> </u>
Sounded Well Depth (ft bmp)	<u>36.59</u>
Depth to Water (ft bmp)	<u>24.69</u>
Water-Level Elevation (ft)	<u>710.15</u>
Water Column in Well (ft)	<u>11.9</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>1.904</u>
Gallons Pumped/Bailed Prior to Sampling	<u>8 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>34.00</u>
Purge Time	begin <u>0903</u> end <u>0928</u>
Pumping Rate (gpm)	<u>1050 mL/min</u>
Evacuation Method	<u>High performance pump</u>

Field Parameters

Color	<u>Amber</u>
Odor	<u>Slight rotten smell</u>
Appearance	<u>Very turbid</u>
pH (s.u.)	<u>6.90</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>1,735</u>
Turbidity (NTU)	<u>N/A</u>
Temperature (°C)	<u>17.58</u>
Dissolved Oxygen (mg/L)	<u>0.35</u>
ORP (mV)	<u>-133.4</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 0928</u>
	<u>DTW final = 24.69</u>

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010A)	500 ml plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010A)	500 ml plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel S. Clouse/C. Capell

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. ME-6 Time Pump Started 0903

Depth of Sampling 34.00' Date 10/1/2003

Parameters	Time									
	0907	0912	0915	0918	0921	0924	0927			
Redox Potential (millivolts)	-116.3	-120.2	-127.0	-129.0	-128.1	-130.0	-133.4			
Dissolved Oxygen (mg/L)	3.58	1.22	0.52	0.48	0.42	0.38	0.35			
pH (s.u.)	6.90	6.87	6.88	6.89	6.90	6.89	6.90			
Specific Conductance (uS/cm)	2,227	1,982	1,884	1,842	1,809	1,770	1,735			
Temperature (C)	17.55	17.55	17.55	17.54	17.57	17.57	17.58			

Flow Rate 1050 mL/min Total Depth of Well (ft): 36.59

Time Sampled 0928 Depth to Water Before Purging (ft): 24.69

Total Water Pumped (Gal) 8 Depth to Water After Purging (ft): 24.69

Comments

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>10/1/2003</u>
Site/Well No.	<u>ME-3</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Sunny; ~ 50°</u>	Sampling Time:	Begin <u>0950</u>	End	<u>1040</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>730.40</u>
Land Surface Elevation (ft)	<u></u>
Sounded Well Depth (ft bmp)	<u>35.55</u>
Depth to Water (ft bmp)	<u>23.75</u>
Water-Level Elevation (ft)	<u>706.65</u>
Water Column in Well (ft)	<u>11.8</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>1.888</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>33'</u>
Purge Time	begin <u>1003</u> end <u>1018</u>
Pumping Rate (gpm)	<u>850 ml/min</u>
Evacuation Method	<u>High performance pump</u>

Field Parameters

Color	<u>Dark amber</u>
Odor	<u>Bad, rotten</u>
Appearance	<u>Turbid</u>
pH (s.u.)	<u>6.99</u>
Conductivity (mS/cm)	<u></u>
(µS/cm)	<u>1,413</u>
Turbidity (NTU)	<u>N/A</u>
Temperature (°C)	<u>17.74</u>
Dissolved Oxygen (mg/L)	<u>2.93</u>
ORP (mV)	<u>-89.7</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>DTW final = 23.65</u>
	<u>Sample time @ 1019</u>
	<u></u>
	<u></u>

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
As, Ba, Fe, Mn Total (6010A)	500 ml plastic	1	Cool, HNO ₃
As, Ba, Fe, Mn Diss. (6010A)	500 ml plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel	<u>S. Clouse/C. Capell</u>
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Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. ME-3

Depth of Sampling 33'

Time Pump Started 1003

Date 10/1/2003

Parameters	1006	1009	1012	1015	1018	Time
Redox Potential (millivolts)	-79.6	-85.5	-89.1	-89.8	-89.7	
Dissolved Oxygen (mg/L)	6.00	3.49	3.06	3.09	2.93	
pH (s.u.)	7.06	7.03	7.01	7.00	6.99	
Specific Conductance (uS/cm)	1,413	1,417	1,411	1,413	1,413	
Temperature (C)	17.72	17.75	17.71	17.71	17.74	

Flow Rate 850 mL/min

Time Sampled 1019

Total Water Pumped (Gal) 5

Comments

Total Depth of Well (ft): 35.55

Depth to Water Before Purging (ft): 23.78

Depth to Water After Purging (ft): 23.65

ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.06.02	Page	1 of 1
Site Location	Moraine, Ohio	Date	10/1/2003		
Site/Well No.	GM-28	Replicate No.		Code No.	
Weather	Sunny, 60°	Sampling Time: Begin	1055	End	1155

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	735.32
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	36.53
Depth to Water (ft bmp)	27.37
Water-Level Elevation (ft)	707.98
Water Column in Well (ft)	9.16
Casing Diameter/Type	2"
Gallons in Well	1.47
Gallons Pumped/Bailed Prior to Sampling	8 Pumped
Sample Pump Intake Setting (ft bmp)	33'
Purge Time	begin 1004 end 1141
Pumping Rate (gpm)	1000 mL/min
Evacuation Method	Submersible pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.80
Conductivity (mS/cm)	
(µS/cm)	1501
Turbidity (NTU)	N/A
Temperature (°C)	17.97
Dissolved Oxygen (mg/L)	0.34
ORP (mV)	-146.9
Sampling Method	Low flow
Remarks	Sample time @ 1142
	DTW final = 27.37

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
As, Ba, Fe, Mn Tot. (6010A)	500 ml plastic	1	Cool, HNO ₃
As, Ba, Fe, Mn Diss. (6010A)	500 ml plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel	S. Clouse/C. Capell
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Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-28 Time Pump Started 1104

Depth of Sampling 33' Date 10/1/2003

Parameters	Time											
	1108	1111	1114	1117	1120	1123	1126	1129	1132	1135	1138	1141
Redox Potential (millivolts)	-138.8	-144.4	-144.4	-142.7	-146.4	-144.5	-145.5	-146.3	-147.0	-146.9	-146.0	-146.9
Dissolved Oxygen (mg/L)	4.98	4.40	4.02	3.63	3.09	2.77	2.55	0.56	0.47	0.38	0.36	0.34
pH (s.u.)	6.99	6.96	6.93	6.91	6.88	6.86	6.85	6.83	6.83	6.82	6.81	6.80
Specific Conductance (uS/cm)	1,595	1,583	1,570	1,557	1,546	1,537	1,529	1,522	1,516	1,512	1,505	1,501
Temperature (C)	17.06	17.22	17.34	17.45	17.64	17.71	17.73	17.83	17.84	17.86	17.95	17.97

Flow Rate 1000 mL/min Total Depth of Well (ft): 36.53

Time Sampled 1142 Depth to Water Before Purging (ft): 27.37

Total Water Pumped (Gal) 8 Depth to Water After Purging (ft): 27.37

Comments

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 10/1/2003
 Site/Well No. GM-31 Replicate No. _____ Code No. _____
 Weather Sunny; 60° Sampling Time: Begin 1200 End 1300

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 736.71
 Land Surface Elevation (ft) _____
 Sounded Well Depth (ft bmp) 63.28
 Depth to Water (ft bmp) 24.67
 Water-Level Elevation (ft) 712.04
 Water Column in Well (ft) 38.58
 Casing Diameter/Type 2"
 Gallons in Well 6.17
 Gallons Pumped/Bailed Prior to Sampling 6 Pumped
 Sample Pump Intake Setting (ft bmp) 59'
 Purge Time begin 1212 end 1235
 Pumping Rate (gpm) 600 mL/min
 Evacuation Method Submersible pump

Field Parameters

Color Brown
 Odor None
 Appearance Turbid
 pH (s.u.) 6.99
 Conductivity (mS/cm) _____
 (µS/cm) 1,321
 Turbidity (NTU) N/A
 Temperature (°C) 18.74
 Dissolved Oxygen (mg/L) 0.25
 ORP (mV) -69.7
 Sampling Method Low flow

Remarks Sample time @ 1236
DTW final = 24.67

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
Iron & Manganese Tot. (6010A)	500 ml plastic	1	Cool, HNO ₃
Iron & Manganese Diss. (6010A)	500 ml plastic	1	Cool, HNO ₃
Chlorides (SM325.2)	250 ml plastic	1	Cool
Sulfide (SM376.1)	500 ml plastic	1	Cool, NaOH/ZnAc
TOC (SM415.1)	40 ml glass vial	2	Cool, H ₂ SO ₄
Sulfate (SM375.4)	250 ml plastic	1	Cool
Light Hydrocarbons (AM18G)	40 ml amber glass vials	2	Cool

Sampling Personnel S. Clouse/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. GM-31

Depth of Sampling 59'

Time Pump Started 1212

Date 10/1/2003

Parameters

	1217	1220	1224	1226	1229	1232	1235	
Redox Potential (millivolts)	8.2	-14.5	-44.2	-52.5	-60.3	-64.4	-69.7	
Dissolved Oxygen (mg/L)	0.46	0.29	0.22	0.20	0.22	0.24	0.25	
pH (s.u.)	7.02	7.01	7.01	7.00	6.99	6.99	6.99	
Specific Conductance (uS/cm)	1,383	1,372	1,360	1,351	1,341	1,332	1,321	
Temperature (C)	17.79	18.18	18.35	18.39	18.60	18.78	18.74	

Flow Rate

600 mL/min

Total Depth of Well (ft): 63.25

Time Sampled

1236

Depth to Water Before Purging (ft): 24.67

Total Water Pumped (Gal)

6

Depth to Water After Purging (ft): 24.67

Comments

Water Sampling Log

Evacuation Data

Remarks Sample time @ 14.55

[illegible]

Sampling Personnel S. Clouse/C. Capell

Well Casing Volumes				
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

MT-69

Depth of Sampling

110'

Time Pump Started

1430

Date

10/1/2003

Parameters

	Time									
	1436	1439	1442	1445	1448	1451	1454			
Redox Potential (millivolts)	-219.1	-233.4	-239.3	-252.5	-250.9	-254.5	-257.6			
Dissolved Oxygen (mg/L)	0.48	0.34	0.29	0.24	0.21	0.19	0.19			
pH (s.u.)	7.72	7.73	7.75	7.75	7.76	7.76	7.79			
Specific Conductance (uS/cm)	487	486	486	486	486	487	486			
Temperature (C)	16.76	16.97	17.10	17.11	17.09	17.21	17.14			

Flow Rate

1200mL/min

Total Depth of Well (ft):

116.80

Time Sampled

1455

Depth to Water Before Purging (ft):

16.71

Total Water Pumped (Gal)

8

Depth to Water After Purging (ft):

16.71

Comments

ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.06.02	Page	1 of 1
Site Location	Moraine, Ohio			Date	10/1/2003
Site/Well No.	GM-26	Replicate No.	DUP-130A	Code No.	
Weather	Cloudy, windy; 60's	Sampling Time:	Begin 1500	End	1600

Evacuation Data

Field Parameters

Measuring Point	Top of PVC Casing	Color	Light brown
MP Elevation (ft)	722.29	Odor	None
Land Surface Elevation (ft)		Appearance	Slightly turbid
Sounded Well Depth (ft bmp)	58.62	pH (s.u.)	7.00
Depth to Water (ft bmp)	15.26	Conductivity (mS/cm)	
Water-Level Elevation (ft)	707.03	(µS/cm)	863
Water Column in Well (ft)	43.36	Turbidity (NTU)	N/A
Casing Diameter/Type	2"	Temperature (°C)	17.96
Gallons in Well	6.94	Dissolved Oxygen (mg/L)	5.28
Gallons Pumped/Bailed Prior to Sampling	7 Pumped	ORP (mV)	53.4
Sample Pump Intake Setting (ft bmp)	53'	Sampling Method	Low flow
Purge Time	begin 1516 end 1530	Remarks	Sample time @ 1531
Pumping Rate (gpm)	700 mL/min		RB-107A @ 1545
Evacuation Method	Submersible pump		DTW final = 15.27
			MS/MSD

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl

Sampling Personnel S. Clouse/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

01000294.0006.00002

General Motors Corporation, Moraine, Ohio

GM-26

33

1516

01/2003

	1521	1524	1527	1530					Time
Redox Potential (millivolts)	47.7	50.5	52.9	53.4					
Dissolved Oxygen (mg/L)	5.66	5.50	5.39	5.28					
pH (s.u.)	7.04	7.01	6.99	7.00					
Specific Conductance (uS/cm)	857	862	863	863					
Temperature (C)	18.26	17.87	17.86	17.96					

700 mL/min

58.62

1531

15.27

7

15.27

[illegible]

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Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>10/1/2003</u>		
Site/Well No.	<u>GM-32</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Cloudy; 60's</u>	Sampling Time: Begin	<u>1610</u>	End	<u>1705</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>732.10</u>
Land Surface Elevation (ft)	<u></u>
Sounded Well Depth (ft bmp)	<u>59.40</u>
Depth to Water (ft bmp)	<u>23.47</u>
Water-Level Elevation (ft)	<u>708.63</u>
Water Column in Well (ft)	<u>35.93</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>3.756</u>
Gallons Pumped/Bailed Prior to Sampling	<u>4 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>54'</u>
Purge Time	begin <u>1622</u> end <u>1641</u>
Pumping Rate (gpm)	<u>700 mL/min</u>
Evacuation Method	<u>Submersible pump</u>

Field Parameters

Color	<u>Light amber</u>
Odor	<u>Odor</u>
Appearance	<u>Slightly cloudy</u>
pH (s.u.)	<u>6.81</u>
Conductivity (mS/cm)	<u></u>
(µS/cm)	<u>3,192</u>
Turbidity (NTU)	<u>N/A</u>
Temperature (°C)	<u>18.47</u>
Dissolved Oxygen (mg/L)	<u>0.31</u>
ORP (mV)	<u>-154.4</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 1642</u>
	<u>DTW final = 23.47</u>
	<u>(samples effervesced)</u>

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	<u>40 ml glass vial</u>	<u>3</u>	<u>Cool, HCl</u>
As, Be, Fe, Mn Tot. (6010A)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
As, Be, Fe, Mn Diss. (6010A)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, HNO₃</u>
Chlorides (SM325.2)	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
Sulfide (SM376.1)	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, NaOH/ZnAc</u>
TOC (SM415.1)	<u>40 ml glass vial</u>	<u>2</u>	<u>Cool, H₂SO₄</u>
Sulfate (SM375.4)	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
Light Hydrocarbons (AM18G)	<u>40 ml amber glass vials</u>	<u>2</u>	<u>Cool</u>

Sampling Personnel	<u>S. Clouse/C. Capell</u>
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Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number	OH000294.0006.00002		
Site Location	General Motors Corporation, Moraine, Ohio		
Monitoring Well No.	GM-32	Time Pump Started	1622
Depth of Sampling	54'	Date	10/1/2003

Parameters	1626	1629	1632	1635	1638	1641	Time
Redox Potential (millivolts)	-153.7	-156.5	-156.9	-155.2	-154.7	-154.4	
Dissolved Oxygen (mg/L)	0.56	0.42	0.37	0.33	0.31	0.31	
pH (s.u.)	7.01	6.97	6.90	6.85	6.82	6.81	
Specific Conductance (uS/cm)	3,339	3,348	3,303	3,247	3,213	3,192	
Temperature (C)	17.55	17.86	18.11	18.28	18.37	18.47	

Flow Rate	700 mL/min	Total Depth of Well (ft):	59.40
Time Sampled	1642	Depth to Water Before Purging (ft):	23.47
Total Water Pumped (Gal)	4	Depth to Water After Purging (ft):	23.47
Comments			

ARCADIS

Water Sampling Log

Project	<u>GM Annual Site-wide GWS 2003</u>	Project No.	<u>OH000294.06.02</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>10/1/2003</u>
Site/Well No.	<u>GM-8</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Sunny; 60's</u>	Sampling Time: Begin	<u>1710</u>	End	<u>1800</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>735.17</u>
Land Surface Elevation (ft)	<u> </u>
Sounded Well Depth (ft bmp)	<u>50.44</u>
Depth to Water (ft bmp)	<u>26.27</u>
Water-Level Elevation (ft)	<u>708.9</u>
Water Column in Well (ft)	<u>24.17</u>
Casing Diameter/Type	<u>2" PVC</u>
Gallons in Well	<u>3.87</u>
Gallons Pumped/Bailed Prior to Sampling	<u>4.5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>45.44'</u>
Purge Time	<u>begin 1716 end 1733</u>
Pumping Rate (gpm)	<u>1100 mL/min</u>
Evacuation Method	<u>Submersible pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>7.63</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>1,662</u>
Turbidity (NTU)	<u>N/A</u>
Temperature (°C)	<u>17.81</u>
Dissolved Oxygen (mg/L)	<u>0.20</u>
ORP (mV)	<u>-172.9</u>
Sampling Method	<u>Low flow</u>
Remarks	<u>Sample time @ 1735</u>
	<u>DTW final = 27.38</u>

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl

Sampling Personnel

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-8 Time Pump Started 1716

Depth of Sampling 45.44' Date 10/1/2003

Parameters	Time						
	1719	1721	1724	1727	1730	1733	
Redox Potential (millivolts)	-94.8	-140.7	-153.3	-165.1	-170.1	-172.9	
Dissolved Oxygen (mg/L)	0.38	0.27	0.25	0.22	0.21	0.20	
pH (s.u.)	7.53	7.58	7.61	7.61	7.62	7.63	
Specific Conductance (uS/cm)	1,594	1,644	1,652	1,661	1,663	1,662	
Temperature (C)	16.93	17.52	17.63	17.70	17.77	17.81	

Flow Rate 1100 mL/min Total Depth of Well (ft): 50.44

Time Sampled 1735 Depth to Water Before Purging (ft): 26.27

Total Water Pumped (Gai) 4.5 Depth to Water After Purging (ft): 27.38

Comments

Water Sampling Log

Evacuation Data

Evacuation Method	Submersible Pump
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[illegible]

Well Casing Volumes

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ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

GM-3

Depth of Sampling

95'

Time Pump Started

1038

Date

10/2/2003

Parameters

	1041	1044	1047	1050	1053	Time				
Redox Potential (millivolts)	158.4	153.7	149.3	146.1	143.4					
Dissolved Oxygen (mg/L)	0.51	0.49	0.44	0.40	0.38					
pH (s.u.)	6.88	6.89	6.91	6.92	6.87					
Specific Conductance (uS/cm)	1,197	1,190	1,201	1,205	1,201					
Temperature (C)	16.38	16.43	16.74	16.76	16.79					

Flow Rate

1000 mL/min

Total Depth of Well (ft):

101.00

Time Sampled

1054

Depth to Water Before Purging (ft):

22.87

Total Water Pumped (Gal)

6

Depth to Water After Purging (ft):

22.89

Comments

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 10/2/2003
 Site/Well No. GM-6 Replicate No. _____ Code No. _____
 Weather Sunny; 60° Sampling Time: Begin 1100 End 1140

Evacuation Data

Field Parameters

Measuring Point	<u>Top of PVC Casing</u>	Color	<u>Colorless</u>
MP Elevation (ft)	<u>730.27</u>	Odor	<u>None</u>
Land Surface Elevation (ft)	_____	Appearance	<u>Clear</u>
Sounded Well Depth (ft bmp)	<u>45.18</u>	pH (s.u.)	<u>6.98</u>
Depth to Water (ft bmp)	<u>22.68</u>	Conductivity (mS/cm)	_____
Water-Level Elevation (ft)	<u>707.59</u>	(µS/cm)	<u>1,610</u>
Water Column in Well (ft)	<u>22.50</u>	Turbidity (NTU)	<u>N/A</u>
Casing Diameter/Type	<u>2"</u>	Temperature (°C)	<u>18.15</u>
Gallons in Well	<u>3.6</u>	Dissolved Oxygen (mg/L)	<u>0.42</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>	ORP (mV)	<u>-81.2</u>
Sample Pump Intake Setting (ft bmp)	<u>40'</u>	Sampling Method	<u>Low flow</u>
Purge Time	begin <u>1110</u> end <u>1127</u>	Remarks	<u>Sample time @ 1128</u>
Pumping Rate (gpm)	<u>1100 mL/min</u>		<u>DTW final = 22.67</u>
Evacuation Method	<u>Submersible pump</u>		

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	<u>40 ml glass vial</u>	<u>3</u>	<u>Cool, HCl</u>
As and Ba, total	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, HN03</u>
As and Ba, dissolved	<u>500 ml plastic</u>	<u>1</u>	<u>Cool, HN03</u>

Sampling Personnel S. Clouse/C. Capell

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-6 Time Pump Started 1110

Depth of Sampling 40' Date 10/2/2003

Parameters	Time						
	1115	1118	1121	1124	1127		
Redox Potential (millivolts)	-37.9	-60.9	-70.4	-77.1	-81.2		
Dissolved Oxygen (mg/L)	0.49	0.46	0.43	0.43	0.42		
pH (s.u.)	6.95	6.95	6.97	6.97	6.98		
Specific Conductance (uS/cm)	1,606	1,610	1,611	1,611	1,610		
Temperature (C)	17.72	18.00	18.04	18.13	18.15		

Flow Rate 1100 mL/min Total Depth of Well (ft): 45.18

Time Sampled 1128 Depth to Water Before Purging (ft): 22.68

Total Water Pumped (Gal) 5 Depth to Water After Purging (ft): 22.67

Comments

ARCADIS

Water Sampling Log

Project	GM Annual Site-wide GWS 2003	Project No.	OH000294.06.02	Page	1 of 1
Site Location	Moraine, Ohio	Date	10/2/2003		
Site/Well No.	TW2	Replicate No.	DUP-109 @ 11:29	Code No.	
Weather	Windy, clear; 60's	Sampling Time:	Begin 1140	End	1240

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	733.38
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	42.05
Depth to Water (ft bmp)	30.66
Water-Level Elevation (ft)	702.72
Water Column in Well (ft)	11.39
Casing Diameter/Type	10"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	7 Pumped
Sample Pump Intake Setting (ft bmp)	37'
Purge Time	begin 1146 end 1225
Pumping Rate (gpm)	900 mL/min
Evacuation Method	Submersible pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	7.21
Conductivity (mS/cm)	
(µS/cm)	1,548
Turbidity (NTU)	N/A
Temperature (°C)	16.8
Dissolved Oxygen (mg/L)	0.91
ORP (mV)	-32.8
Sampling Method	Low flow
Remarks	Sample time @ 1225
	DTW final = 30.73

Constituents Sampled

Container Description

Number

Preservative

Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
As and Ba, total	500 ml plastic	1	Cool, HNO3
As and Ba, dissolved	500 ml plastic	1	Cool, HNO3

Sampling Personnel	S. Clouse/C. Capell
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Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. TW2

Time Pump Started

1146

Depth of Sampling 37'

Date

10/2/2003

Parameters

	Time											
	1150	1153	1156	1159	1202	1205	1208	1211	1214	1217	1220	1224
Redox Potential (millivolts)	33.7	24.9	13.6	2.2	-6.1	-12.0	-16.1	-19.1	-22.7	-25.1	-28.5	-32.8
Dissolved Oxygen (mg/L)	1.31	1.23	1.16	1.08	1.07	1.05	1.04	0.98	0.96	0.94	0.91	0.89
pH (s.u.)	7.19	7.17	7.19	7.19	7.19	7.19	7.20	7.20	7.20	7.21	7.21	7.21
Specific Conductance (uS/cm)	1,524	1,526	1,526	1,535	1,534	1,534	1,536	1,537	1,541	1,545	1,545	1,545
Temperature (C)	16.60	16.67	16.76	16.71	16.80	16.74	16.72	16.69	16.76	16.68	16.69	16.79

Flow Rate

900 mL/min

Total Depth of Well (ft):

42.05

Time Sampled

1225

Depth to Water Before Purging (ft):

30.66

Total Water Pumped (Gal)

7

Depth to Water After Purging (ft):

30.73

Comments

recovery well - pump on

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 10/2/2003
 Site/Well No. 45 Replicate No. Code No.
 Weather Sunny, windy; 60's Sampling Time: Begin 1330 End 1430

Evacuation Data

Field Parameters

Measuring Point Top of PVC Casing
 MP Elevation (ft) 731.36
 Land Surface Elevation (ft)
 Sounded Well Depth (ft bmp) 65.00
 Depth to Water (ft bmp) 24.02
 Water-Level Elevation (ft) 707.34
 Water Column in Well (ft) 40.98
 Casing Diameter/Type 4"
 Gallons in Well 26.64
 Gallons Pumped/Bailed
 Prior to Sampling 4 pumped
 Sample Pump Intake
 Setting (ft bmp) 5'
 Purge Time begin 1343 end 1357
 Pumping Rate (gpm) 600 mL/min
 Evacuation Method Submersible pump

Color Amber
 Odor None
 Appearance Turbid
 pH (s.u.) 8.25
 Conductivity (mS/cm)
 (µS/cm) 3009
 Turbidity (NTU) N/A
 Temperature (°C) 17.39
 Dissolved Oxygen (mg/L) 1.01
 ORP (mV) -210.6
 Sampling Method Low flow
 Remarks Sample time @ 1358
DTW final = 24.03

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
As and Ba, total	500 ml plastic	1	Cool, HN03
As and Ba, dissolved	500 ml plastic	1	Cool, HN03

Sampling Personnel S. Clouse/C. Capell

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp below measuring point
 °C Degrees Celsius
 ft feet
 gpm Gallons per minute
 mg/L Milligrams per liter
 ml milliliter
 mS/cm Millisiemens per centimeter
 msl mean sea-level
 N/A Not Applicable
 NR Not Recorded
 NTU Nephelometric Turbidity Units
 PVC Polyvinyl chloride
 s.u. Standard units
 µS/cm Microsiemens per centimeter
 VOC Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0006.00002

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

4S

Depth of Sampling

55'

Time Pump Started

1343

Date

10/2/2003

Parameters

	1348	1351	1354	1357	Time
Redox Potential (millivolts)	-196.4	-201.4	-206.5	-210.6	
Dissolved Oxygen (mg/L)	1.33	1.00	0.93	1.01	
pH (s.u.)	8.29	8.28	8.26	8.25	
Specific Conductance (uS/cm)	3,210	3,132	3,084	3,009	
Temperature (C)	17.01	17.17	17.29	17.39	

Flow Rate

600 mL/min

Total Depth of Well (ft):

65.00

Time Sampled

1358

Depth to Water Before Purging (ft):

24.02

Total Water Pumped (Gal)

4

Depth to Water After Purging (ft):

24.03

Comments

Water Sampling Log

Evacuation Data		Field Parameters	
Measuring Point	Top of Casing	Color	Colorless
MP Elevation (ft)	735.74	Odor	None
Land Surface Elevation (ft)		Appearance	Clear
Sounded Well Depth (ft bmp)	100.82	pH (s.u.)	7.00
Depth to Water (ft bmp)	27.68	Conductivity (mS/cm)	
Water-Level Elevation (ft)	708.06	(µS/cm)	10.32
Water Column in Well (ft)	73.14	Turbidity (NTU)	N/A
Casing Diameter/Type	2"	Temperature (°C)	16.49
Gallons in Well	11.70	Dissolved Oxygen (mg/L)	1.64
Gallons Pumped/Bailed Prior to Sampling	4 Pumped	ORP (mV)	38.1
Sample Pump Intake Setting (ft bmp)	94'	Sampling Method	Low Flow
Purge Time	begin 1342 end 1453	Remarks	Sample time @ 1453
Pumping Rate (gpm)	800 mL/min		RB - 108A @ 1505
Evacuation Method	Submersible Pump		DTW final = 27.67

Sampling Personnel S. Clouse/C. Capell

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-1

Depth of Sampling 94'

Time Pump Started 1442

Date 10/2/03

Parameters	Time									
	1448	1451	1554							
Redox Potential (millivolts)	40.1	38.6	38.1							
Dissolved Oxygen (mg/L)	1.72	1.66	1.64							
pH (s.u.)	7.03	7.01	7.00							
Specific Conductance (uS/cm)	1,030	1,031	1,032							
Temperature (C)	16.13	16.41	16.49							

Flow Rate 800 mL/min

Total Depth of Well (ft): 100.82

Time Sampled 1455

Depth to Water Before Purging (ft): 27.68

Total Water Pumped (Gal) 4

Depth to Water After Purging (ft): 27.67

Comments

ARCADIS

Water Sampling Log

Project GM Annual Site-wide GWS 2003 Project No. OH000294.06.02 Page 1 of 1
 Site Location Moraine, Ohio Date 10/2/2003
 Site/Well No. GM-2 Replicate No. _____ Code No. _____
 Weather Sunny; 60° Sampling Time: Begin 1515 End 1550

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 735.81
 Land Surface Elevation (ft) _____
 Sounded Well Depth (ft bmp) 55.30
 Depth to Water (ft bmp) 27.48
 Water-Level Elevation (ft) 708.33
 Water Column in Well (ft) 27.82
 Casing Diameter/Type 2"
 Gallons in Well 4.5
 Gallons Pumped/Bailed
 Prior to Sampling 6 Pumped
 Sample Pump Intake
 Setting (ft bmp) 50'
 Purge Time begin 1520 end 1536
 Pumping Rate (gpm) 700 mL/min
 Evacuation Method Submersible pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.9
 Conductivity (mS/cm) _____
 (µS/cm) 1176
 Turbidity (NTU) N/A
 Temperature (°C) 17.19
 Dissolved Oxygen (mg/L) 0.32
 ORP (mV) 64.9
 Sampling Method Low flow
 Remarks Sample time @ 1537

DTW final = 27.70

Constituents Sampled	Container Description	Number	Preservative
Site-Specific VOCs (8260)	40 ml glass vial	3	Cool, HCl
As and Ba, Total	500 ml plastic	1	Cool, HN03
As and Ba, Dissolved	500 ml plastic	1	Cool, HN03

Sampling Personnel S. Clouse/C. Capell

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-2 Time Pump Started 1520

Depth of Sampling 50' Date 10/2/2003

Parameters	Time							
	1524	1527	1530	1533	1536			
Redox Potential (millivolts)	65.3	65.9	66.1	65.7	64.9			
Dissolved Oxygen (mg/L)	0.59	0.46	0.37	0.34	0.32			
pH (s.u.)	6.94	6.91	6.91	6.90	6.90			
Specific Conductance (uS/cm)	1,173	1,176	1,177	1,176	1,176			
Temperature (C)	16.62	17.05	17.12	17.18	17.19			

Flow Rate 700 mL/min Total Depth of Well (ft): 55.30

Time Sampled 1537 Depth to Water Before Purging (ft): 27.48

Total Water Pumped (Gal) 6 Depth to Water After Purging (ft): 27.70

Comments



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DRAFT

Groundwater Sampling Logs

December 2003



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Water Sampling Log

Project GM Site-Wide Project No. OH0294.05.08 Page 1 of 1
 Site Location Moraine, Ohio Date 12/10/2003
 Site/Well No. GM-39 Replicate No. Code No.
 Weather Rain, 30s Sampling Time: Begin 1110 End 1210

Evacuation Data

Measuring Point TOC
 MP Elevation (ft) 730.95
 Land Surface Elevation (ft) 731.15
 Sounded Well Depth (ft bmp) 116.65
 Depth to Water (ft bmp) 21.91
 Water-Level Elevation (ft) 709.04
 Water Column in Well (ft) 94.74
 Casing Diameter/Type 2" PVC
 Gallons in Well 15.16
 Gallons Pumped/Bailed
 Prior to Sampling 6 pumped
 Sample Pump Intake
 Setting (ft bmp) 112'
 Purge Time begin 1129 end 1146
 Pumping Rate (gpm) 1200 mL/min
 Evacuation Method Submersible pump

Field Parameters

Color Brown
 Odor No
 Appearance Turbid
 pH (s.u.) 7.17
 Conductivity
 (mS/cm) 1.63
 (µmhos/cm) NR
 Turbidity (NTU) NR
 Temperature (°C) 15.51
 Dissolved Oxygen (mg/L) 0.05
 ORP (mV) -156
 Sampling Method Low flow
 Remarks Sampled @ 1147

Constituents Sampled

Container Description

Number

Preservative

Constituents Sampled	Container Description	Number	Preservative
VOCs (App IX+cis-1,2-DCE)	40 ml VOA	3	HCl, cool

Sampling Personnel D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	NR	Not Recorded	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0005.00008

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

GM-39

Time Pump Started

1129

Depth of Sampling

112'

Date

12/10/03

Parameters

Time

	1131	1134	1137	1140	1143	1146				
Redox Potential (millivolts)	-131	-155	-158	-156	-156	-156				
Dissolved Oxygen (mg/L)	2.04	0.37	0.20	0.09	0.06	0.05				
pH (s.u.)	7.28	7.20	7.18	7.17	7.17	7.17				
Specific Conductance (mS/cm)	0.550	1.59	1.61	1.62	1.63	1.63				
Temperature (C)	15.13	15.15	15.33	15.49	15.51	15.51				

Flow Rate

1200 mL/min

Time Sampled

1147

Total Water Pumped (Gal)

6 gallons

Comments

ARCADIS

Water Sampling Log

Project GM Site-Wide Project No. OH0294.05.08 Page 1 of 1
 Site Location Moraine, Ohio Date 12/10/2003
 Site/Well No. GM-40 Replicate No. Code No.
 Weather Rain, 40s Sampling Time: Begin 0848 End 0950

Evacuation Data

Measuring Point TOC
 MP Elevation (ft) 727.04
 Land Surface Elevation (ft) 727.28
 Sounded Well Depth (ft bmp) 149.61
 Depth to Water (ft bmp) 19.82
 Water-Level Elevation (ft) 707.22
 Water Column in Well (ft) 129.79
 Casing Diameter/Type 2" PVC
 Gallons in Well 20.77
 Gallons Pumped/Bailed Prior to Sampling 3 pumped
 Sample Pump Intake Setting (ft bmp) 145'
 Purge Time begin 0909 end 0924
 Pumping Rate (gpm) 1000 mL/min
 Evacuation Method Submersible pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 7.22
 Conductivity (mS/cm) 1.20
 (µmhos/cm) NR
 Turbidity (NTU) NR
 Temperature (°C) 16.33
 Dissolved Oxygen (mg/L) 0.09
 ORP (mV) -152
 Sampling Method Low flow
 Remarks Sampled @ 0925

Constituents Sampled	Container Description	Number	Preservative
VOCs (App IX+cis-1,2-DCE)	40 ml VOA	3	HCl, cool

Sampling Personnel D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	NR	Not Recorded	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0005.00008

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

GM-40

Time Pump Started

909

Depth of Sampling

145'

Date

12/10/03

Parameters

Time

	911	915	918	921	924					
Redox Potential (millivolts)	78	-140	-148	-149	-152					
Dissolved Oxygen (mg/L)	0.93	0.20	0.14	0.10	0.09					
pH (s.u.)	7.99	7.27	7.26	7.26	7.26					
Specific Conductance (mS/cm)	0.532	1.15	1.20	1.20	1.20					
Temperature (C)	16.55	16.31	16.14	16.33	16.33					

Flow Rate

1000 mL/min

Time Sampled

0925

Total Water Pumped (Gal)

3 gallons

Comments

ARCADIS

Water Sampling Log

Project GM Site-Wide Project No. OH0294.05.08 Page 1 of 1
 Site Location Moraine, Ohio Date 12/10/2003
 Site/Well No. GM-41 Replicate No. Code No.
 Weather Rain, 30s Sampling Time: Begin 0955 End 1106

Evacuation Data

Measuring Point TOC
 MP Elevation (ft) 733.65
 Land Surface Elevation (ft) 731.22
 Sounded Well Depth (ft bmp) 116.05
 Depth to Water (ft bmp) 25.69
 Water-Level Elevation (ft) 707.96
 Water Column in Well (ft) 90.36
 Casing Diameter/Type 2" PVC
 Gallons in Well 14.46
 Gallons Pumped/Bailed Prior to Sampling 6 pumped
 Sample Pump Intake Setting (ft bmp) 112'
 Purge Time begin 1017 end 1036
 Pumping Rate (gpm) 1000 mL/min
 Evacuation Method Submersible pump

Field Parameters

Color Brown
 Odor No
 Appearance Turbid
 pH (s.u.) 7.12
 Conductivity (mS/cm) 1.46
 (µmhos/cm) NR
 Turbidity (NTU) NR
 Temperature (°C) 16.54
 Dissolved Oxygen (mg/L) 0.06
 ORP (mV) -163
 Sampling Method Low flow
 Remarks Sampled @ 1037

Constituents Sampled

Container Description

Number

Preservative

VOCs (App IX+cis-1,2-DCE)	40 ml VOA	3	HCl, cool

Sampling Personnel D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	NR	Not Recorded	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00008

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-41 Time Pump Started 1017

Depth of Sampling 112' Date 12/10/03

Parameters	Time									
	1020	1023	1026	1029	1033	1036				
Redox Potential (millivolts)	-124	-150	-155	-159	-162	-163				
Dissolved Oxygen (mg/L)	3.09	1.52	0.36	0.16	0.10	0.06				
pH (s.u.)	7.73	7.17	7.13	7.12	7.12	7.12				
Specific Conductance (mS/cm)	0.529	1.38	1.42	1.45	1.47	1.46				
Temperature (C)	16.79	16.33	16.52	16.53	16.60	16.54				

Flow Rate 1000 mL/min

Time Sampled 1037

Total Water Pumped (Gal) 6 gallons

Comments

ARCADIS

Water Sampling Log

Project GM Site-Wide Project No. OH0294.05.08 Page 1 of 1
 Site Location Moraine, Ohio Date 12/9/2003
 Site/Well No. GM-42 Replicate No. DUP-133 Code No.
 Weather Light rain, 50s Sampling Time: Begin 1400 End 1510

Evacuation Data

Measuring Point TOC
 MP Elevation (ft) 729.16
 Land Surface Elevation (ft) 729.48
 Sounded Well Depth (ft bmp) 150.09
 Depth to Water (ft bmp) 22.20
 Water-Level Elevation (ft) 706.96
 Water Column in Well (ft) 127.89
 Casing Diameter/Type 2" PVC
 Gallons in Well 20.46
 Gallons Pumped/Bailed Prior to Sampling 5 pumped
 Sample Pump Intake Setting (ft bmp) 145'
 Purge Time begin 1409 end 1426
 Pumping Rate (gpm) 1000 mL/min
 Evacuation Method Submersible pump

Field Parameters

Color Light brown
 Odor No
 Appearance Slightly turbid
 pH (s.u.) 7.25
 Conductivity (mS/cm) 1.22
 (µmhos/cm) NR
 Turbidity (NTU) NR
 Temperature (°C) 17.17
 Dissolved Oxygen (mg/L) 0.05
 ORP (mV) -122
 Sampling Method Low flow
 Remarks Sampled @ 1427. RB-110 taken
after GM-42, MS/MSD taken. RB-110 at
1445; DUP-133 at 1427.

Constituents Sampled	Container Description	Number	Preservative
VOCs (App IX+cis-1,2-DCE)	40 ml VOA	3	HCl, cool

Sampling Personnel D. Manzo

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	NR	Not Recorded	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00008

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. GM-42 Time Pump Started 1409

Depth of Sampling 145' Date 12/9/03

Parameters	1411	1414	1417	1420	1423	1426			
Redox Potential (millivolts)	-104	-107	-114	-118	-120	-122			
Dissolved Oxygen (mg/L)	2.60	0.53	0.57	0.09	0.06	0.05			
pH (s.u.)	7.29	7.23	7.24	7.24	7.25	7.25			
Specific Conductance (mS/cm)	1.17	1.19	1.21	1.23	1.19	1.22			
Temperature (C)	17.49	17.04	17.15	17.18	17.17	17.17			

Flow Rate 1000 mL/min

Time Sampled 1427

Total Water Pumped (Gal) 5 gallons

Comments Rediflow setting = 1115.3

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
0	N/A	96	0.9					CONCRETE first 1' concrete	
							GW	GRAVEL sandy gravel, damp with fines (25%), gravel (35%), sand (40%), well graded, fill	
2	N/A		2.9				SW	SAND light brown, dry, gravely-sand with fines (10%), gravel (20%), sand (70%), well graded, fill, pieces of limestone aggregate visible	
4	N/A		6.3				SW	SAND light brown, dry, gravely-sand with fines (10%), gravel (20%), sand (70%), well graded, fill	
6	N/A		3.4				SW	SAND light brown, dry, gravely-sand with fines (10%), gravel (20%), sand (70%) well graded, fill	
								Second layer of concrete is visible at 7'	
8	N/A	132	2.9				SW	SAND light brown, dry, gravely-sand with fines (10%), gravel (20%), sand (70%), well graded	
10	N/A		3.4				SW	SAND light brown, dry, gravely-sand with fines (10%), gravel (20%), sand (70%), well graded	
12									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 1 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotosonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
12	N/A		2.9				SW	SAND light brown, dry, gravely-sand with fines (10%), gravel (20%), sand (70%), well graded	
14	N/A		3.4				SW	SAND light brown, dry, gravely-sand with fines (10%), gravel (20%), sand (70%), well graded	
16	N/A		3.8				SW	SAND light brown, dry, gravely-sand with fines (10%), gravel (20%), sand (70%), well graded	
18	N/A	144	12.6				SW	SAND sand (60%), gravel (40%), wet, cobbles, visible, well graded	▼
20	N/A		12.6				SW	SAND sand (60%), gravel (40%), wet, cobbles, visible, well graded	
22	N/A		36.9				SP	SAND fine to medium grained sand, gravel (10%), poorly graded, wet, cobbles visible	
24									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 2 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotosonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
24	N/A		36.9				SP	SAND fine to medium grained sand, gravel (10%), poorly graded, wet, cobbles visible	
26	N/A		36.9				SP	SAND fine to medium grained sand, gravel (10%), poorly graded, wet, cobbles visible	
28	N/A	144	18.4				SP	SAND fine to medium grained sand, gravel (10%), poorly graded, wet, cobbles visible	
30	N/A		18.4				SP	SAND fine to medium grained sand, gravel (10%), poorly graded, wet, cobbles visible	
32	N/A		18.4				SP	SAND fine to medium grained sand, gravel (10%), poorly graded, wet, cobbles visible	
34	N/A		1.9				CL	CLAY silty clay with gravel (10%), low plasticity, hard, dry, light gray	
36									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 3 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotasonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

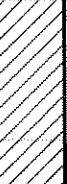
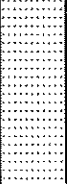
Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (6 in.)	Recovery (inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
36	N/A		0.9				CL	CLAY silty clay with gravel (10%), low plasticity, hard, dry, light gray	
38	N/A	150	0.9				CL	CLAY silty clay with gravel (10%), low plasticity, hard, dry, light gray	
40	N/A		1.4				SW	SAND coarse grained sand (70%) and gravel (30%), well graded, wet, cobbles visible	
42	N/A		1.4				SW	SAND coarse grained sand (70%) and gravel (30%), well graded, wet, cobbles visible	
44	N/A		0.9				SW	SAND coarse grained sand (70%) and gravel (30%), well graded, wet, cobbles visible	
46	N/A		0.9				GW	GRAVEL gravel (75%) mostly cobbles, and coarse grained sand (25%), well graded, wet	
48	N/A						GW	GRAVEL gravel (75%) mostly cobbles, and coarse grained sand (25%), well graded, wet	

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 4 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotosonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
48	N/A	132	0.9				GW	GRAVEL gravel (60%) and coarse grained sand (40%), cobbles visible, well graded, wet	
50	N/A		0.9				GW	GRAVEL gravel (60%) and coarse grained sand (40%), cobbles visible, well graded, wet	
52	N/A		0.9				GW	GRAVEL gravel (60%) and coarse grained sand (40%), cobbles visible, well graded, wet	
54	N/A		0.9				CL	CLAY light gray, silty clay, with gravel (10-25%), low plasticity, hard, dry	
56	N/A		0.9				CL	CLAY light gray, silty clay, with gravel (10-25%), low plasticity, hard, dry	
58	N/A	132	0.9				SW	SAND coarse-grained sand (60%), gravel (40%), wet, cobbles visible, well graded	
60									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 5 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotosonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
60	N/A		0.9				SW	SAND coarse-grained sand (60%), gravel (40%), wet, cobbles visible, well graded	
62	N/A		0.9				SW	SAND coarse-grained sand (60%), gravel (40%), wet, cobbles visible, well graded	
64	N/A		0.9				SW	SAND coarse-grained sand (60%), gravel (40%), wet, cobbles visible, well graded	
66	N/A		1.4				SW	SAND medium grained to coarse grained sand (80%) and gravel (20%), well graded, damp	
68	N/A	144	1.4				SW	SAND medium grained to coarse grained sand (80%) and gravel (20%), well graded, damp	
70	N/A		0.0				SP	SAND fine to medium grained sand, damp, fines (10%), gravel (<10%), damp, well graded	
72									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 6 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotasonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
72	N/A		0.0				SP	SAND fine to medium grained sand, damp, fines (10%), gravel (<10%), damp, well graded	
74	N/A		0.0				SM	SILTY SAND fine grained sand, silts and clays (25%), wet, poorly graded	
76	N/A		1.4				SW	SAND medium to coarse grained sand (75%) and gravel (25%), well graded, wet	
78	N/A	108	0.9				SW	SAND medium to coarse grained sand (75%) and gravel (25%), well graded, wet	
80	N/A		0.9				SW	SAND medium to coarse grained sand (75%) and gravel (25%), well graded, wet	
82	N/A		0.9				SW	SAND coarse grained sand (60%) and gravel (40%), wet, well graded	
84									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 7 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotosonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
84	N/A		0.9				GP	GRAVEL gravel (90%) cobble sized, with coarse grained sand (10%), poorly graded, wet	
86	N/A		0.4				SW	SAND coarse grained sand (60%) and gravel (40%), wet, well graded, cobbles visible	
88	N/A	96	0.4				SW	SAND coarse grained sand (60%) and gravel (40%), wet, well graded, cobbles visible	
90	N/A		0.4				SW	SAND coarse grained sand (60%) and gravel (40%), wet, well graded, cobbles visible	
92	N/A		0.4				SW	SAND coarse grained sand (60%) and gravel (40%), wet, well graded, cobbles visible	
94	N/A		0.4				SW	SAND coarse grained sand (60%) and gravel (40%), wet, well graded, cobbles visible	
96									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 8 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotosonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
96	N/A		0.4				SW	SAND coarse grained sand (60%) and gravel (40%), wet, well graded, cobbles visible	
98	N/A	96	0.4				SW	SAND coarse grained sand (60%) and gravel (40%), wet, well graded, cobbles visible	
100	N/A		0.4				GW	GRAVEL gravel (60%) and coarse grained sand (40%), well graded, wet	
102	N/A		0.9				GW	GRAVEL gravel (60%) and coarse grained sand (40%), well graded, wet	
104	N/A		0.9				GW	GRAVEL gravel (60%) and coarse grained sand (40%), well graded, wet	
106	N/A		0.9				SW	SAND medium to coarse grained sand (80%) and gravel (20%), well graded, wet	
108									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 9 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotosonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
108	N/A	120	1.4				SW	SAND medium to coarse grained sand (80%) and gravel (20%), well graded, wet	
110	N/A		1.4				SW	SAND medium to coarse grained sand (80%) and gravel (20%), well graded, wet	
112	N/A		1.4				SW	SAND medium to coarse grained sand (80%) and gravel (20%), well graded, wet	
114	N/A		1.4				SW	SAND medium to coarse grained sand (80%) and gravel (20%), well graded, wet	
116	N/A		0.0				CL	CLAY dark gray, silty clay, gravel (10-25%), low plasticity, hard, dry	
118								End of Boring	
120									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 10 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1140

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/12/03 @ 1612

Drilling Method: Rotosonic

Surface Elev.: 731.15

Converted to Well: Y Well I.D.: GM-39

Drilling Fluid: Water

North Coord.: 5396.416

East Coord.: 6006.197

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

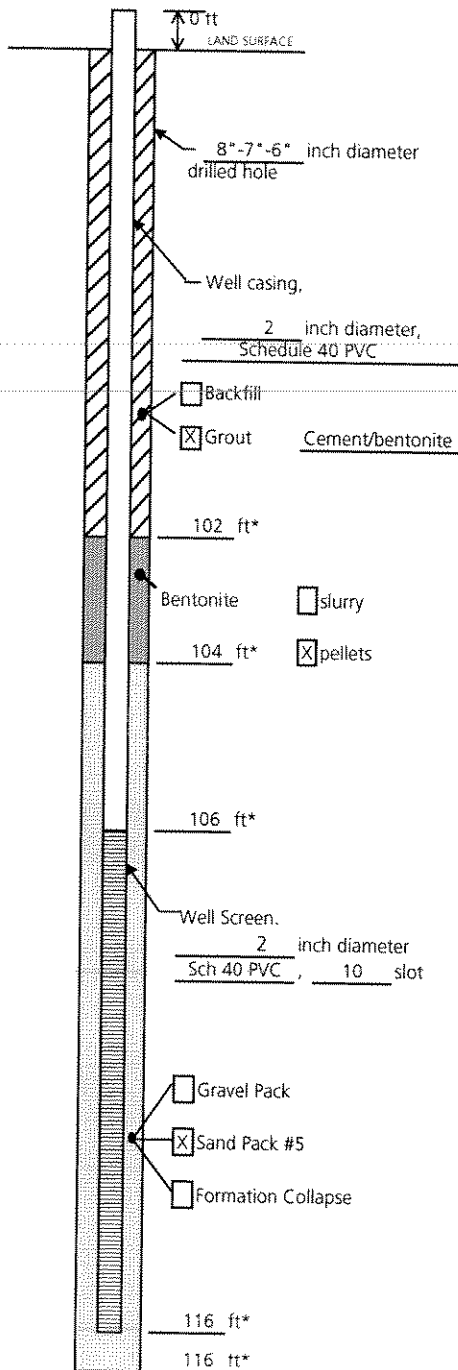
Datum: N/A

Filename: November 2003

ARCADIS

Well Construction Log

(Unconsolidated)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

* Depth Below Land Surface

Project General Motors Corporation Well GM-39

Town/City Moraine

County Montgomery State Ohio

Permit No. N/A

Land-Surface (LS) Elevation and Datum:

731.15 feet ☒ Surveyed

☐ Estimated

Installation Date(s) 11/17/03 - 11/18/03

Drilling Method Rotosonic

Drilling Contractor Prosonic

Drilling Fluid Water (800 gallons)

Development Technique(s) and Date(s)

Submersible 4" pump 11/17-11/18/03. 800 gallons

Fluid Loss During Drilling N/A gallons

Water Removed During Development 900 gallons

Static Depth to Water N/A feet below M.P.

Pumping Depth to Water N/A feet below M.P.

Pumping Duration 3 hours

Yield N/A gpm Date 11/17/03

Specific Capacity N/A gpm/ft 11/20/03

Well Purpose Deep monitoring well for north

portion of property replaces production wells 31/39.

Remarks 8" casing driven to 38'

7" casing driven to 58'

6" casing driven to 116'

Prepared by D. Manzo



ARCADIS

DRAFT

Monitoring Well Boring Log

GM-40



General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
0	N/A	96	1.4					ASPHALT	
							CL	CLAY light brown silty clay, dry, hard, low plasticity, sand and gravel (25%)	
2	N/A		1.4				CL	CLAY light brown silty clay, dry, hard, low plasticity, sand and gravel (25%)	
4	N/A		1.4				CL	CLAY light brown silty clay, medium hardness, medium plasticity, sand and gravel (10%)	
6	N/A		0.9				CL	CLAY light brown silty clay, medium hardness, medium plasticity, sand and gravel (10%)	
8	N/A	72	0.9				CL	CLAY light brown silty clay, medium hardness, medium plasticity, sand and gravel (10%)	
10	N/A		0.9				CL	CLAY light brown silty clay, medium hardness, medium plasticity, sand and gravel (10%)	
12									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 1 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
12	N/A		0.9				ML	SILT light brown clayey silt, low plasticity, hard, dry, sand and gravel (25%)	
14	N/A		0.9				ML	SILT light brown clayey silt, low plasticity, hard, dry, sand and gravel (25%)	
16	N/A		0.9				SW	SAND gravely sand with fines (25%), sand (50%), gravel (25%), dry, well graded	
18	N/A	102	0.9				SW	SAND gravely sand with fines (25%), sand (50%), gravel (25%), dry, well graded	
20	N/A		0.9				GW	GRAVEL gravel (60%), sand (40%), cobbles visible, well graded	
22	N/A		0.9				SW	SAND sand (80%) and gravel (20%), damp, well graded	
24									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 2 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
24	N/A		0.9				SW	SAND sand (80%) and gravel (20%), damp, well graded	
26	N/A		0.9				GW	GRAVEL gravel (70%) and sand (30%), cobbles visible, wet, well graded	
28	N/A	120	0.9				GW	GRAVEL gravel (70%) and sand (30%), cobbles visible, wet, well graded	
30	N/A		0.9				GW	GRAVEL gravel (70%) and sand (30%), cobbles visible, wet, well graded	
32	N/A		1.4				GW	GRAVEL gravel (70%) and sand (30%), cobbles visible, wet, well graded	
							CL	CLAY silty clay with sand (25%) and gravel, damp, low plasticity, hard, cobbles visible	
34	N/A		2.9				CL	CLAY silty clay with sand (25%) and gravel, damp, low plasticity, hard, cobbles visible	
							GW	GRAVEL gravel (60%) and sand (30%), fines (10%) , well graded, wet (saturated)	
36									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 3 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
36	N/A		1.4				GW	GRAVEL gravel (60%) and sand (30%), fines (10%) , well graded, wet (saturated)	
38	N/A	84	1.4				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet (saturated), well graded, cobbles visible	
40	N/A		0.9				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet (saturated), well graded, cobbles visible	
42	N/A		1.4				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet (saturated), well graded, cobbles visible	
44	N/A		0.9				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet (saturated), well graded, cobbles visible	
46	N/A		0.9				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet (saturated), well graded, cobbles visible	
48									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 4 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
48	N/A	84	0.9				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet (saturated), well graded, cobbles visible	
50	N/A		0.9				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet (saturated), well graded, cobbles visible	
52	N/A		1.4				CL	CLAY light gray, silty clay, gravel (10-25%), low plasticity, hard, dry	
54	N/A		1.4				CL	CLAY light gray, silty clay, gravel (10-25%), low plasticity, hard, dry	
56	N/A		1.4				CL	CLAY light gray, silty clay, gravel (10-25%), low plasticity, hard, dry	
58	N/A	96	1.4				CL	CLAY light gray, silty clay, gravel (10-25%), low plasticity, hard, dry	
60									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 5 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
60	N/A		1.4				CL	CLAY light gray, silty clay, gravel (10-25%), low plasticity, hard, dry	
62	N/A		1.4				CL	CLAY light gray, silty clay, gravel (10-25%), low plasticity, hard, dry	
64	N/A		0.9				SW	SAND sand (75%) and gravel (25%), wet, well graded, cobbles visible	
66	N/A		0.9				SW	SAND sand (75%) and gravel (25%), wet, well graded, cobbles visible	
68	N/A	96	0.9				SW	SAND sand (75%) and gravel (25%), wet, well graded, cobbles visible	
70	N/A		0.9				SW	SAND sand (75%) and gravel (25%), wet, well graded, cobbles visible	
72							SP	SAND fine grained sand (80%) with silts and clays (20%), wet (saturated), poorly graded	

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 6 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
72	N/A		0.9				SP	SAND fine grained sand (80%) with silts and clays (20%), wet (saturated), poorly graded	
							CL	CLAY silty clay, damp, low plasticity, hard, light gray, no sand or gravel	
74	N/A		1.4				CL	CLAY silty clay, damp, low plasticity, hard, light gray, no sand or gravel	
							CL	CLAY silty clay, damp, low plasticity, hard, light gray, no sand or gravel	
76	N/A		1.4				CL	CLAY silty clay, damp, low plasticity, hard, light gray, no sand or gravel	
							SW	SAND sand (75%) and gravel (25%), well graded, cobbles visible	
78	N/A	90	0.9				SW	SAND sand (75%) and gravel (25%), well graded, cobbles visible	
							SW	SAND coarse grained sand (70%) and gravel (30%), wet (saturated), well graded, large cobbles visible	
80	N/A		0.9				SW	SAND coarse grained sand (70%) and gravel (30%), wet (saturated), well graded, large cobbles visible	
							SW	SAND coarse grained sand (70%) and gravel (30%), wet (saturated), well graded, large cobbles visible	
82	N/A		0.9				SW	SAND coarse grained sand (70%) and gravel (30%), wet (saturated), well graded, large cobbles visible	
							SW	SAND coarse grained sand (70%) and gravel (30%), wet (saturated), well graded, large cobbles visible	
84									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 7 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
84	N/A		0.9				SP	SAND fine grained to medium grained sand, gravel (10%), poorly graded, wet (saturated)	
86	N/A		0.9				SP	SAND fine grained to medium grained sand, gravel (10%), poorly graded, wet (saturated)	
88	N/A	84	0.9				SW	SAND sand (60%), gravel (40%), sand is fine to coarse-grained, well graded, cobbles visible	
90	N/A		0.9				SW	SAND sand (60%), gravel (40%), sand is fine to coarse-grained, well graded, cobbles visible	
92	N/A		0.9				SW	SAND sand (60%), gravel (40%), sand is fine to coarse-grained, well graded, cobbles visible	
94	N/A		0.9				SW	SAND sand (60%), gravel (40%), sand is fine to coarse-grained, well graded, cobbles visible	
96									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 8 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
96	N/A		0.9				SW	SAND sand (60%), gravel (40%), sand is fine to coarse-grained, well graded, cobbles visible	
98	N/A	90	0.9				SW	SAND sand (60%), gravel (40%), sand is fine to coarse-grained, well graded, cobbles visible	
100	N/A		0.9				SW	SAND sand (60%), gravel (40%), sand is fine to coarse-grained, well graded, cobbles visible	
102	N/A		0.9				GP	GRAVEL gravel (80%), coarse grained sand (20%), wet, poorly graded	
104	N/A		0.9				SW	SAND sand (70%), gravel (30%), medium to coarse grained sand, wet, cobbles visible, well graded	
106	N/A		0.9				SW	SAND sand (70%), gravel (30%), medium to coarse grained sand, wet, cobbles visible, well graded	
108									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 9 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
108	N/A	72	0.9				SW	SAND sand (70%), gravel (30%), medium to coarse grained sand, wet, cobbles visible, well graded	
110	N/A		0.9				SW	SAND sand (70%), gravel (30%), medium to coarse grained sand, wet, cobbles visible, well graded	
112	N/A		0.9				SW	SAND sand (70%), gravel (30%), medium to coarse grained sand, wet, cobbles visible, well graded	
114	N/A		0.9				SW	SAND sand (70%), gravel (30%), medium to coarse grained sand, wet, cobbles visible, well graded	
116	N/A		0.9				SW	SAND sand (70%), gravel (30%), medium to coarse grained sand, wet, cobbles visible, well graded	
118	N/A	78	0.9				SW	SAND medium to coarse grained sand, wet, well graded, gravel (10%)	
120									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 10 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
120	N/A		0.9				SW	SAND medium to coarse grained sand, wet, well graded, gravel (10%)	
122	N/A		0.9				SW	SAND medium to coarse grained sand, wet, well graded, gravel (10%)	
124	N/A		0.9				SW	SAND medium to coarse grained sand, wet, well graded, gravel (10%)	
126	N/A		0.9				SW	SAND medium to coarse grained sand, wet, well graded, gravel (10%)	
128	N/A	102	0.9				SW	SAND medium to coarse grained sand, wet, well graded, gravel (10%)	
130	N/A		0.9				SW	SAND medium to coarse grained sand, wet, well graded, gravel (10%)	
132									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 11 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

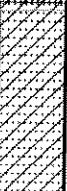
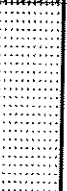
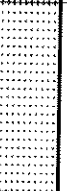
Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (6 in.)	Recovery (inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
132	N/A		1.4				SC	CLAYEY SAND fine to coarse grained sand (50%), gravel (25%), silts and clays (25%), wet, well graded	
134	N/A		1.4				SC	CLAYEY SAND fine to coarse grained sand (50%), gravel (25%), silts and clays (25%), wet, well graded	
136	N/A		0.9				SW	SAND medium to coarse grained sand (75%), gravel (25%), wet, well graded	
138	N/A	90	0.9				SW	SAND medium to coarse grained sand (75%), gravel (25%), wet, well graded	
140	N/A		0.9				SW	SAND medium to coarse grained sand (75%), gravel (25%), wet, well graded	
142	N/A		1.4				GW	GRAVEL gravel (75%), medium to coarse grained sand (25%), wet, well graded, predominately large cobbles	
144									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 12 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
144	N/A		0.9				GW	GRAVEL gravel (75%), medium to coarse grained sand (25%), wet, well graded, predominately large cobbles	
146	N/A		0.9				GW	GRAVEL gravel (60%), medium to coarse grained sand, wet, well graded	
148								Not sampled	
150								End of Boring	
152									
154									
156									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 13 of 13

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/12/03 @ 1641

Driller: J. Sigler

Total Depth: 150 feet

End Drilling: 11/13/03 @ 1342

Drilling Method: Rotosonic

Surface Elev.: 727.28

Converted to Well: Y Well I.D.: GM-40

Drilling Fluid: Water

North Coord.: 3088.907

East Coord.: 4983.552

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

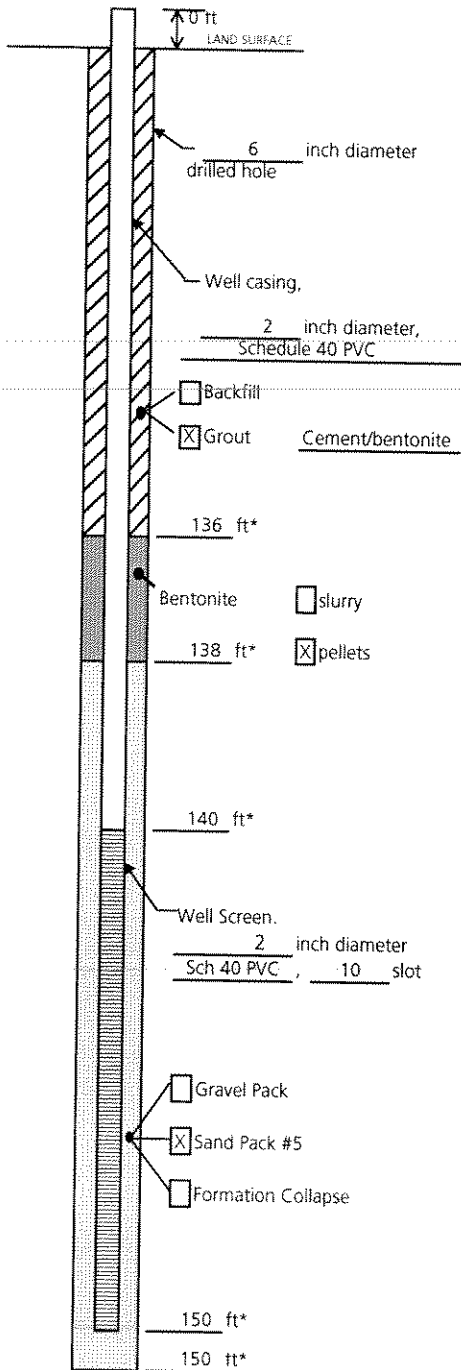
Datum: N/A

Filename: November 2003

ARCADIS

Well Construction Log

(Unconsolidated)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

* Depth Below Land Surface

Project General Motors Corporation Well GM-40

Town/City Moraine

County Montgomery State Ohio

Permit No. N/A

Land-Surface (LS) Elevation and Datum:

727.28 feet ☒ Surveyed

☐ Estimated

Installation Date(s) 11/12/03 - 11/14/03

Drilling Method Rotosonic

Drilling Contractor Prosonic

Drilling Fluid Water (765 gallons)

Development Technique(s) and Date(s)

Submersible 4" pump 11/13/03

Fluid Loss During Drilling N/A gallons

Water Removed During Development 900 gallons

Static Depth to Water N/A feet below M.P.

Pumping Depth to Water N/A feet below M.P.

Pumping Duration 3.5 hours

Yield N/A gpm Date 11/13/03

Specific Capacity N/A gpm/ft 11/20/03

Well Purpose Deep monitoring well for west side

of property replaces production well 42.

Remarks

Prepared by D. Manzo



ARCADIS

DRAFT

Monitoring Well Boring Log

GM-41



General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
0	N/A	72	0.4				CL	CLAY dark brown, silty clay, low plasticity, hard, gravel (10%), dry, roots visible, fill	
2	N/A		0.4				CL	CLAY dark brown, silty clay, low plasticity, hard, gravel (10%), dry, fill	
4	N/A		0.4				CL	CLAY dark brown, silty clay, low plasticity, hard, gravel (10%), fill	
6	N/A		0.4				CL	CLAY dark brown, silty clay, low plasticity, hard, gravel (10%), fill	
8	N/A	54	0.4				CL	CLAY dark brown, silty clay, low plasticity, hard, gravel (10%), fill	
10	N/A		0.4				GC	CLAYEY GRAVEL clayey gravel, clay (40%), gravel (50%), sand and silt (10%), low plasticity, hard, dry	
12									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 1 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
12	N/A		0.4				SP	SAND fine to medium grained sand, dry, poorly graded	
14	N/A		0.4				SP	SAND fine to medium grained sand, dry, poorly graded	
16	N/A		0.4				SP	SAND fine to medium grained sand, dry, poorly graded	
18	N/A	54	0.4				SP	SAND fine to medium grained sand, dry, poorly graded	
20	N/A		0.4				SP	SAND fine to medium grained sand, dry, poorly graded	
22	N/A		0.4				GP	GRAVEL gravel, poorly graded, sand (<10%), damp	
24									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 2 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
24	N/A		0.4				SW	SAND gravely sand, gravel (30%), sand (50%), silts and clays (20%), well graded, damp	
26	N/A		0.4				SW	SAND gravely sand, gravel (30%), sand (50%), silts and clays (20%), well graded, damp	
28	N/A	54	0.4				SP	SAND fine to medium grained sand, wet (saturated), poorly graded	
30	N/A		0.4				SP	SAND fine to medium grained sand, wet (saturated), poorly graded	
32	N/A		0.4				SP	SAND fine to medium grained sand, wet (saturated), poorly graded	
34	N/A		0.9				SW	SAND gravely sand, gravel (30%), sand (60%), fines (10%), wet, well graded	
36									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 3 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotasonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
36	N/A		0.4				CL	CLAY light gray silty clay, gravel (10-25%), low plasticity, hard, large cobbles visible	
38	N/A	90	0.4				SM	SILTY SAND silt and fine grained sand (60%), clay (40%), wet, poorly graded	
40	N/A		0.4				SM	SILTY SAND silt and fine grained sand (60%), clay (40%), wet, poorly graded	
42	N/A		0.4				SM	SILTY SAND silt and fine grained sand (60%), clay (40%), wet, poorly graded	
44	N/A		0.4				CL	CLAY light gray silty clay with gravel (10-25%), low plasticity, dry to damp, hard	
46	N/A		0.4				CL	CLAY light gray silty clay with gravel (10-25%), low plasticity, dry to damp, hard	
48									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 4 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
48	N/A	120	0.4				CL	CLAY light gray silty clay with gravel (10-25%), low plasticity, dry to damp, hard	
50	N/A		0.4				CL	CLAY light gray silty clay with gravel (10-25%), low plasticity, dry to damp, hard	
52	N/A		0.4				SP	SAND fine to medium grained sand, damp, poorly graded	
54	N/A		0.4				SP	SAND fine to medium grained sand, damp, poorly graded	
56	N/A		0.4				SP	SAND fine to medium grained sand, damp, poorly graded	
58	N/A	96	0.4				SP	SAND fine to medium grained sand, damp, poorly graded	
60									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 5 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
60	N/A		0.4				SP	SAND fine to medium grained sand, damp, poorly graded	
62	N/A		0.4				SP	SAND fine to medium grained sand, damp, poorly graded	
							CL	CLAY silty clay, dry, light gray, low plasticity, hard, gravel (10%)	
64	N/A		0.4				SW	SAND medium to coarse grained sand (75%), pea sized gravel (25%), wet (saturated), well graded	
66	N/A		0.4				SW	SAND medium to coarse grained sand (75%), pea sized gravel (25%), wet (saturated), well graded	
68	N/A	96	0.4				SW	SAND medium to coarse grained sand (75%), pea sized gravel (25%), wet (saturated), well graded	
70	N/A		0.4				SP	SAND fine grained sand, wet, poorly graded	
72									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 6 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
72	N/A		0.9				SM	SILTY SAND silt, fine grained sand (25%), wet, poorly graded	
74	N/A		0.9				SM	SILTY SAND silt, fine grained sand (25%), wet, poorly graded	
76	N/A		0.9				SM	SILTY SAND silt and fine grained sand (25%), wet, poorly graded	
78	N/A	204	0.4				SP	SAND fine to medium grained sand, wet, poorly graded	
80	N/A		0.4				SP	SAND fine to medium grained sand, wet, poorly graded	
82	N/A		0.4				SP	SAND fine to medium grained sand, wet, poorly graded	
84									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 7 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
84	N/A		0.4				SP	SAND fine to medium grained sand, wet, poorly graded	
86	N/A		0.4				SP	SAND fine to medium grained sand, wet, poorly graded	
88	N/A		0.4				SP	SAND fine to medium grained sand, wet, poorly graded	
90	N/A		0.4				GW	GRAVEL gravel (75%) and coarse grained sand (25%), well graded, wet (saturated), very large cobbles visible (10%)	
92	N/A		0.4				GW	GRAVEL gravel (75%) and coarse grained sand (25%), well graded, wet (saturated), very large cobbles visible (10%)	
94	N/A		0.4				GW	GRAVEL gravel (75%) and coarse grained sand (25%), well graded, wet (saturated), very large cobbles visible (10%)	
96									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 8 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
96	N/A		0.4				GW	GRAVEL gravel (75%) and coarse grained sand (25%), well graded, wet (saturated), very large cobbles visible (10%)	
98	N/A	108	0.4				GW	GRAVEL gravel (75%) and coarse grained sand (25%), well graded, wet (saturated), very large cobbles visible (10%)	
100	N/A		0.4				SW	SAND medium to coarse grained sand (75%) and gravel, well graded, wet	
102	N/A		0.4				SW	SAND medium to coarse grained sand (75%) and gravel, well graded, wet	
104	N/A		0.4				SW	SAND medium to coarse grained sand (75%) and gravel, well graded, wet	
106	N/A		0.4				SW	SAND medium to coarse grained sand (75%) and gravel, well graded, wet	
108									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 9 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
108	N/A	108	0.4				SW	SAND medium to coarse grained sand (75%) and gravel, well graded, wet	
110	N/A		0.4				SW	SAND medium to coarse grained sand (75%) and gravel, well graded, wet	
112	N/A		0.4				SW	SAND medium to coarse grained sand (75%) and gravel, well graded, wet	
114	N/A		0.4				CL	CLAY blue-gray clay with gravel (10%), hard, high plasticity, dry	
116	N/A		0.4				CL	CLAY blue-gray clay with gravel (10%), hard, high plasticity, dry	
118								End of Boring	
120									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 10 of 10

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/19/03 @ 0809

Driller: J. Sigler

Total Depth: 118 feet

End Drilling: 11/19/03 @ 1033

Drilling Method: Rotosonic

Surface Elev.: 733.78

Converted to Well: Y Well I.D.: GM-41

Drilling Fluid: Water

North Coord.: 3429.721

East Coord.: 6684.301

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

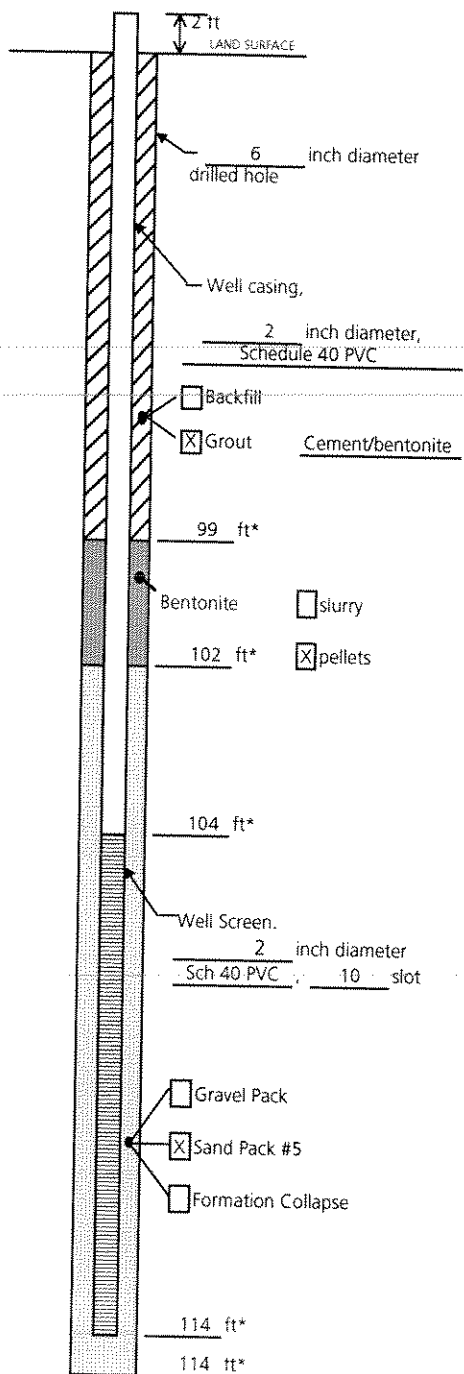
Datum: N/A

Filename: November 2003

ARCADIS

Well Construction Log

(Unconsolidated)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

* Depth Below Land Surface

Project General Motors Corporation Well GM-41

Town/City Moraine

County Montgomery State Ohio

Permit No. N/A

Land-Surface (LS) Elevation and Datum:

733.78 feet ☒ Surveyed

☐ Estimated

Installation Date(s) 11/19/2003

Drilling Method Rotosonic

Drilling Contractor Prosonic

Drilling Fluid Water (600 gallons)

Development Technique(s) and Date(s)

Submersible 4" pump 11/19/03 (600 gallons)

Fluid Loss During Drilling 150 gallons

Water Removed During Development 700 gallons

Static Depth to Water N/A feet below M.P.

Pumping Depth to Water N/A feet below M.P.

Pumping Duration 3 hours

Yield N/A gpm Date 11/19/03

Specific Capacity N/A gpm/ft 11/20/03

Well Purpose Deep monitoring well for east

portion of property replaces production well 28.

Remarks Set well at 114' due to the clay from
from 114-118'.

Prepared by D. Manzo



ARCADIS

DRAFT

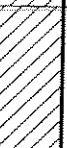
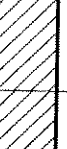
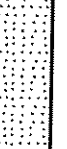
Monitoring Well Boring Log

GM-42



General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
0	N/A	96	1.4					ASPHALT	
							CL	CLAY brown silty clay, gravel (10-20%), dry, low plasticity, medium hardness	
2	N/A		0.9				CL	CLAY brown silty clay, gravel (10-20%), dry, low plasticity, medium hardness	
4	N/A		0.9				CL	CLAY brown silty clay, gravel (10-20%), dry, low plasticity, medium hardness	
6	N/A		0.9				CL	CLAY brown silty clay, gravel (10-20%), dry, low plasticity, medium hardness	
8	N/A	150	1.4				SP	SAND medium grained sand (80%), gravel (20%), dry, light brown, poorly graded	
10	N/A		1.4				SP	SAND medium grained sand (80%), gravel (20%), dry, light brown, poorly graded	
12							SW	SAND fine to coarse grained sand (60%), gravel (40%), dry, light brown, well graded	

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 1 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
12	N/A		0.9				SW	SAND fine to coarse grained sand (60%), gravel (40%), dry, light brown, well graded	
14	N/A		1.4				SW	SAND fine to coarse grained sand (60%), gravel (40%), dry, light brown, well graded	
16	N/A		0.9				SW	SAND fine to coarse grained sand (60%), gravel (40%), dry, light brown, well graded	
18	N/A	132	1.4				SP	SAND fine grained sand (90%), gravel (10%), damp, light brown, poorly graded	
20	N/A		0.9				SP	SAND fine grained sand (90%), gravel (10%), damp, light brown, poorly graded	
22	N/A		1.4				GW	GRAVEL coarse grained sand (25%), gravel (75%), wet (saturated), well graded	
24									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 2 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
24	N/A		0.9				GW	GRAVEL coarse grained sand (25%), gravel (75%), wet (saturated), well graded	
26	N/A		0.9				GW	GRAVEL coarse grained sand (25%), gravel (75%), wet (saturated), well graded	
28	N/A	96	0.9				GW	GRAVEL coarse grained sand (25%), gravel (75%), wet (saturated), well graded	
30	N/A		0.9				GW	GRAVEL coarse grained sand (25%), gravel (75%), wet (saturated), well graded	
32	N/A		0.9				GW	GRAVEL coarse grained sand (25%), gravel (75%), wet (saturated), well graded	
34	N/A		0.9				GW	GRAVEL coarse grained sand (25%), gravel (75%), wet (saturated), well graded	
36									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 3 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
36	N/A		1.4				GW	GRAVEL coarse grained sand (25%), gravel (75%), wet (saturated), well graded	
							SW	SAND fine to coarse grained sand (60%), gravel (40%), well graded, wet (saturated)	
38	N/A	156	0.9				SW	SAND coarse grained sand (50%), gravel (50%), saturated (wet), well graded	
40	N/A		1.4				SW	SAND coarse grained sand (50%), gravel (50%), saturated (wet), well graded	
42	N/A		1.9				SW	SAND coarse grained sand (50%), gravel (50%), saturated (wet), well graded	
44	N/A		1.4				SW	SAND coarse grained sand (50%), gravel (50%), saturated (wet), well graded	
46	N/A		2.4				SW	SAND fine grained sand, coarse grained sand (50%), gravel (50%), saturated (wet), well graded	
48							SP	SAND fine grained sand, damp to wet with 10% coarse sand and gravel, light brown, poorly graded	

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 4 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
48	N/A		2.4				SP	SAND fine grained sand, damp to wet with 10% coarse sand and gravel, light brown, poorly graded	
50	N/A	126	2.4				SP	SAND fine grained sand, damp to wet with 10% coarse sand and gravel, light brown, poorly graded	
52	N/A		2.4				SP	SAND fine grained sand, damp to wet with 10% coarse sand and gravel, light brown, poorly graded	
54	N/A		0.9				CL	CLAY light gray, damp, silty clay, low plasticity, medium hardness, gravel (10%)	
56	N/A		0.4				CL	CLAY light gray, damp, silty clay, low plasticity, medium hardness, gravel (10%)	
58	N/A	144	0.9				CL	CLAY light gray, damp, silty clay, low plasticity, medium hardness, gravel (10%)	
60									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 5 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
60	N/A		0.4				SW	SAND fine grained sand, light gray, wet (saturated), poorly graded, coarse grained sand and gravel (10%)	
62	N/A		0.4				CL	CLAY light gray silty clay, damp, coarse grained sand and gravel (10%), low plasticity, hard, 1-3" stringers of fine grained, wet sand	
64	N/A		0.4				CL	CLAY light gray silty clay, damp, coarse grained sand and gravel (10%), low plasticity, hard, 1-3" stringers of fine grained, wet sand	
66	N/A		3.4				SW	SAND light brown sand (75%), gravel (25%), well graded, damp	
68	N/A	138	0.4				SW	SAND damp, coarse grained sand (50%), gravel (50%), well graded, no fines	
70	N/A		0.4				SW	SAND damp, coarse grained sand (50%), gravel (50%), well graded, no fines	
72									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 6 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
72	N/A		0.4				SW	SAND damp, coarse grained sand (50%), gravel (50%), well graded, no fines	
74	N/A		0.0				SM	SILTY SAND fine grained sand (60%), silts and clay (40%), low plasticity, hard, light gray, damp	
76	N/A		0.0				SM	SILTY SAND fine grained sand (60%), silts and clay (40%), low plasticity, hard, light gray, damp	
78	N/A	90	0.4				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
80	N/A		0.4				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
82	N/A		0.4				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
84									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 7 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
84	N/A		0.4				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
86	N/A		0.4				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
88	N/A	120	0.9				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
90	N/A		0.9				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
92	N/A		0.9				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
94	N/A		0.9				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
96									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 8 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
96	N/A		0.9				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
98	N/A	120	0.0				SP	SAND fine to medium grained sand (90%), gravel (10%), poorly graded, damp	
100	N/A		0.0				GW	GRAVEL gravel (75%), coarse grained sand (25%), wet, well graded, no fines	
102	N/A		0.0				GW	GRAVEL gravel (75%), coarse grained sand (25%), wet, well graded, no fines	
104	N/A		0.0				GW	GRAVEL gravel (75%), coarse grained sand (25%), wet, well graded, no fines	
106	N/A		0.0				GW	GRAVEL gravel (75%), coarse grained sand (25%), wet, well graded, no fines	
108							CL	CLAY silty clay with coarse grained sand and gravel (25%), low plasticity, hard, light gray, damp	

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 9 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
108	N/A	162	0.0				SW	SAND sand (75%), gravel (25%), well graded, wet	
110	N/A		0.0				SP	SAND fine grained sand (80%), coarse grained sand and gravel (20%), poorly graded, wet	
112	N/A		0.0				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet, well graded, no fines	
114	N/A		0.0				GW	GRAVEL gravel (60%), coarse grained sand (40%), wet, well graded, no fines	
116	N/A		0.0				CL	CLAY light gray silty clay, gravel (25%), low plasticity, hard, damp	
118	N/A	120	0.0				CL	CLAY light gray silty clay, gravel (25%), low plasticity, hard, damp	
120	N/A		0.0				SW	SAND sand, wet, gravel (10%), well graded	

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 10 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
120	N/A		0.0				SW	SAND sand, wet, gravel (10%), well graded	
122	N/A		0.0				SW	SAND sand, wet, gravel (10%), well graded	
124	N/A		0.0				CL	CLAY light gray silty clay, damp, very hard, high plasticity	
126	N/A		0.0				CL	CLAY light gray silty clay, damp, very hard, high plasticity	
128	N/A	120	0.0				CL	CLAY light gray silty clay, damp, very hard, high plasticity	
130	N/A		0.0				GW	GRAVEL gravel (60%), fine to coarse grained sand (40%), wet, well graded	
132									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 11 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
132	N/A		0.0				GW	GRAVEL gravel (60%), fine to coarse grained sand (40%), wet, well graded	
134	N/A		0.0				GW	GRAVEL gravel (60%), fine to coarse grained sand (40%), wet, well graded	
136	N/A		0.0				GW	GRAVEL gravel (60%), fine to coarse grained sand (40%), wet, well graded	
138	N/A	96	0.0				GW	GRAVEL gravel (60%), fine to coarse grained sand (40%), wet, well graded	
140	N/A		0.0				GW	GRAVEL gravel (80%), sand (20%), cobbles visible, wet, well graded	
142	N/A		0.0				GW	GRAVEL gravel (80%), sand (20%), cobbles visible, wet, well graded	
144									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 12 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

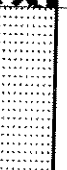
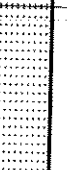
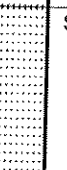
Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
144	N/A		0.0				GW	GRAVEL gravel (80%), sand (20%), cobbles visible, wet, well graded	
146	N/A		0.0				GW	GRAVEL gravel (80%), sand (20%), cobbles visible, wet, well graded	
148	N/A	120	0.0				GW	GRAVEL gravel (80%), sand (20%), cobbles visible, wet, well graded	
150	N/A		0.0				SW	SAND sand (75%), gravel (25%), wet, well graded, some cobbles visible	
152	N/A		0.0				SW	SAND sand (75%), gravel (25%), wet, well graded, some cobbles visible	
154	N/A		0.0				SW	SAND sand (75%), gravel (25%), wet, well graded, some cobbles visible	
156									

☒ Composite Sample to Lab

☒ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 13 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

Datum: N/A

Filename: November 2003

General Motors Corporation

Moraine, Ohio

Depth (feet)	Blows (/6 in.)	Recovery (Inches)	OVA (PPM)	Sample Analysis	Sample Type	Graphic Log	Soil Class.	Description	Depth to Water
156	N/A		0.0				SW	SAND sand (75%), gravel (25%), wet, well graded, some cobbles visible	
158								End of Boring	
160									
162									
164									
166									
168									

☒ Composite Sample to Lab

☐ Grab Sample to Lab

☐ Split-Spoon Not Analyzed

Page 14 of 14

Drilling Co.: Prosonic

Geologist: D. Manzo

Begin Drilling: 11/11/03 @ 0915

Driller: J. Sigler

Total Depth: 158 feet

End Drilling: 11/12/03 @ 1614

Drilling Method: Rotosonic

Surface Elev.: 729.48

Converted to Well: Y Well I.D.: GM-42

Drilling Fluid: Water

North Coord.: 2338.296

East Coord.: 5651.056

Remarks: 4 inch core barrel.

Project No.: OH000294.0005.00008

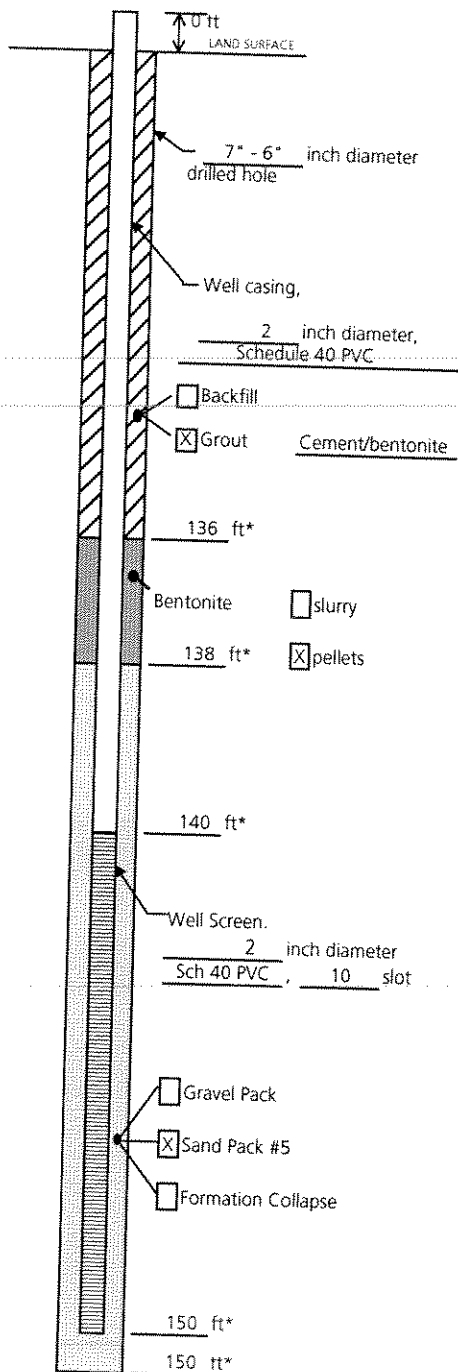
Datum: N/A

Filename: November 2003

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Well Construction Log

(Unconsolidated)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

* Depth Below Land Surface

Project General Motors Corporation Well GM-42

Town/City Moraine

County Montgomery State Ohio

Permit No. N/A

Land-Surface (LS) Elevation and Datum:

729.48 feet ☒ Surveyed

☐ Estimated

Installation Date(s) 11/11/03 - 11/12/03

Drilling Method Rotosonic

Drilling Contractor Prosonic

Drilling Fluid Water (765 gallons)

Development Technique(s) and Date(s)

Submersible pump 11/19/03

Fluid Loss During Drilling N/A gallons

Water Removed During Development 1100 gallons

Static Depth to Water N/A feet below M.P.

Pumping Depth to Water N/A feet below M.P.

Pumping Duration 7.5 hours

Yield N/A gpm Date 11/19/03

Specific Capacity N/A gpm/ft 11/20/03

Well Purpose Deep monitoring well for south

portion of property replaces production well 32.

Remarks 7" casing driven to 58'.

6" casing driven to 150'.

Prepared by D. Manzo



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DRAFT

Appendix C

Groundwater Analytical Database
for 2003



Table C-1. Groundwater Analytical Results for May 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compounds	Units	GM-30	GM-23	GM-29	GM-28	ME-3	ME-6
		5/22/03 Upper Aquifer	5/22/03 Upper Aquifer	5/22/03 Upper Aquifer	5/23/03 Upper Aquifer	5/21/03 Upper Aquifer	5/22/03 Upper Aquifer
Benzene	ug/l	< 50 U	< 620 U	< 50 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	45 J	< 620 U	< 50 U	4.2	19	1.7
1,1-Dichloroethene	ug/l	< 50 U	< 620 U	< 50 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	< 25 U	6800	950	0.66	1.3	3.3
trans-1,2-Dichloroethene	ug/l	< 25 U	< 310 U	< 25 U	9.2	< 0.5 U	< 0.5 U
Ethylbenzene	ug/l	480	< 620 U	< 50 U	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	< 50 U	12000	47 J	0.95 J	< 1 U	< 1 U
Toluene	ug/l	< 50 U	< 620 U	< 50 U	1	< 1 U	1.8
1,1,1-Trichloroethane	ug/l	< 50 U	< 620 U	< 50 U	< 1 U	< 1 U	0.83 J
Trichloroethene	ug/l	< 50 U	1500	280	3.1	1.2	0.69 J
Vinyl chloride	ug/l	< 50 U	1700	99	< 1 U	0.36 J	1.8
Xylene (total)	ug/l	3300	< 620 U	< 50 U	0.87 J	< 1 U	0.93 J

ug/l - Micrograms per liter.

DUP 124 - Duplicate of GM-195.

DUP 125 - Duplicate of GM-32.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB- Rinseate blank.

Table C-1. Groundwater Analytical Results for May 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compounds	Units	GM-195 5/21/03		DUP-124 5/21/03		EAST 5/21/03		GM-32 5/23/03		DUP-125 5/23/03		GM-22 5/22/03	
		Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer
Benzene	ug/l	< 4 U	< 4 U	< 4 U	< 1.4 U	< 1.4 U	1.6	1.6	< 1 U	1.6	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	8.5	8.4	8.4	1.9	1.9	5.3	5.5	1.2	5.5	1.2	1.2	1.2
1,1-Dichloroethene	ug/l	< 4 U	< 4 U	< 4 U	< 1.4 U	< 1.4 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	81	81	81	4.5	4.5	0.59	0.66	0.46 J	0.66	0.46 J	0.46 J	0.46 J
trans-1,2-Dichloroethene	ug/l	3	2.5	2.5	< 0.72 U	< 0.72 U	1.8	1.6	< 0.5 U	1.6	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	ug/l	< 4 U	< 4 U	< 4 U	< 1.4 U	< 1.4 U	0.65 J	0.65 J	< 1 U	0.65 J	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	62	62	62	42	42	< 1 U	< 1 U	2.5	< 1 U	2.5	2.5	2.5
Toluene	ug/l	< 4 U	< 4 U	< 4 U	< 1.4 U	< 1.4 U	2.2	2.2	0.49 J	2.2	0.49 J	0.49 J	0.49 J
1,1,1-Trichloroethane	ug/l	12	12	12	6.2	6.2	< 1 U	< 1 U	0.61 J	< 1 U	0.61 J	0.61 J	0.61 J
Trichloroethene	ug/l	120 J	120	120	29	29	< 1 U	< 1 U	6	< 1 U	6	6	6
Vinyl chloride	ug/l	< 4 U	< 4 U	< 4 U	< 1.4 U	< 1.4 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Xylene (total)	ug/l	< 4 U	< 4 U	< 4 U	< 1.4 U	< 1.4 U	2.2	2.1	< 1 U	2.1	< 1 U	< 1 U	< 1 U

ug/l - Micrograms per liter.

DUP 124 - Duplicate of GM-195.

DUP 125 - Duplicate of GM-32.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB- Rinseate blank.

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Table C-1. Groundwater Analytical Results for May 2003, General Motors Corporation, Moraine, Ohio.

Draft

	Units	GM-21 5/22/03 Upper Aquifer	TB-156 5/21/03	TB-157 5/22/03	TB-158 5/23/03	RB-101 5/21/03	RB-102 5/23/03
<u>Volatile Organic Compounds</u>							
Benzene	ug/l	< 6.7 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	4.1 J	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethene	ug/l	< 6.7 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	130	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	ug/l	2.2 J	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	ug/l	< 6.7 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	< 6.7 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	ug/l	< 6.7 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	< 6.7 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Trichloroethene	ug/l	18	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Vinyl chloride	ug/l	79	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Xylene (total)	ug/l	< 6.7 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U

ug/l - Micrograms per liter.
 DUP 124 - Duplicate of GM-195.
 DUP 125 - Duplicate of GM-32.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 TB - Trip blank.
 RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compounds	Units	HR-9		HR-11		HR-8		HR-4		W-2-N		W-3-N	
		9/17/03		9/18/03		9/17/03		9/18/03		9/18/03		9/17/03	
		Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer
Benzene	ug/l	< 1.2 U		< 1 U		< 1 U		< 1 U		< 1 U		< 4 U	
1,1-Dichloroethane	ug/l	35		10		13		< 1 U		< 1 U		< 4 U	
1,1-Dichloroethene	ug/l	< 1.2 U		< 1 U		< 1 U		< 1 U		< 1 U		< 4 U	
cis-1,2-Dichloroethene	ug/l	11		1.7		2.8		< 0.5 U		1.3		100	
trans-1,2-Dichloroethene	ug/l	1.5		< 0.5 U		0.63		< 0.5 U		< 0.5 U		1.6 J	
Ethylbenzene	ug/l	< 1.2 U		< 1 U		< 1 U		< 1 U		< 1 U		< 4 U	
Tetrachloroethene	ug/l	< 1.2 U		< 1 U		< 1 U		0.55 J		< 1 U		5.1	
Toluene	ug/l	< 1.2 U		< 1 U		< 1 U		< 1 U		< 1 U		< 4 U	
1,1,1-Trichloroethane	ug/l	12		< 1 U		7.8		< 1 U		< 1 U		< 4 U	
Trichloroethene	ug/l	11		< 1 U		1.3		0.71 J		< 1 U		1.7 J	
Vinyl chloride	ug/l	< 1.2 U		< 1 U		< 1 U		< 1 U		< 1 U		6.6	
Xylene (total)	ug/l	< 1.2 U		< 1 U		< 1 U		< 1 U		< 1 U		< 4 U	

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compounds	Units	DUP-126 9/17/03	W-4-N 9/17/03	HR-2 9/16/03	HR-5 9/18/03	HR-3 9/16/03	HR-1 9/18/03	DUP-127 9/18/03
		Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer
Benzene	ug/l	< 4 U	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	< 2 U
1,1-Dichloroethane	ug/l	< 4 U	0.94 J	4.5	0.42 J	13	2.6	2.4
1,1-Dichloroethene	ug/l	< 4 U	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	< 2 U
cis-1,2-Dichloroethene	ug/l	97	1.7	7.2	5	9.9	2.3	2.1
trans-1,2-Dichloroethene	ug/l	1.5 J	< 0.5 U	0.96	0.46 J	1.1	3.2	3.2
Ethylbenzene	ug/l	< 4 U	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	< 2 U
Tetrachloroethene	ug/l	5.7	1.1	< 1 U	< 1 U	< 1 U	27	25
Toluene	ug/l	< 4 U	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	< 2 U
1,1,1-Trichloroethane	ug/l	< 4 U	0.26 J	< 1 U	< 1 U	< 1 U	1 J	0.9 J
Trichloroethene	ug/l	1.8 J	8.1	0.4 J	11	1.6	56	53
Vinyl chloride	ug/l	6	0.48 J	< 1 U	< 1 U	< 1 U	< 2 U	< 2 U
Xylene (total)	ug/l	< 4 U	< 1 U	< 1 U	< 1 U	< 1 U	< 2 U	< 2 U

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compounds	Units	GM-30	GM-23	GM-27	GM-29	GM-28	ME-6
		9/23/03 Upper Aquifer	9/23/03 Upper Aquifer	9/23/03 Upper Aquifer	9/24/03 Upper Aquifer	10/1/03 Upper Aquifer	10/1/03 Upper Aquifer
Benzene	ug/l	< 120 U	< 500 U	< 5 U	< 33 U	< 1 U	0.46 J
1,1-Dichloroethane	ug/l	< 120 U	< 500 U	1.9 J	< 33 U	3.3	7.2
1,1-Dichloroethene	ug/l	< 120 U	< 500 U	< 5 U	< 33 U	< 1 U	< 2 U
cis-1,2-Dichloroethene	ug/l	< 62 U	5800	12	1200	0.58	20
trans-1,2-Dichloroethene	ug/l	< 62 U	< 250 U	< 2.5 U	20	4	< 1 U
Ethylbenzene	ug/l	1000	< 500 U	< 5 U	< 33 U	< 1 U	< 2 U
Tetrachloroethene	ug/l	< 120 U	12000	2.1 J	18 J	< 1 U	12
Toluene	ug/l	240	< 500 U	< 5 U	< 33 U	< 1 U	< 2 U
1,1,1-Trichloroethane	ug/l	< 120 U	< 500 U	< 5 U	18 J	< 1 U	13
Trichloroethene	ug/l	< 120 U	1600	100	390	1.6	31
Vinyl chloride	ug/l	< 120 U	690	< 5 U	150	0.53 J	2.9
Xylene (total)	ug/l	7000	< 500 U	< 5 U	< 33 U	< 1 U	< 2 U

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compounds	Units	GM-31 10/1/03		ME-3 10/1/03		GM-22 9/24/03		DUP-128 9/24/03		GM-19S 9/25/03		EAST 09/25/03	
		Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer
Benzene	ug/l	< 5 U		0.6 J	< 1 U	< 1 U	< 1 U	< 1 U	< 5 U	< 2 U			
1,1-Dichloroethane	ug/l	6		24	1	1	1	1	8.3	2.3			
1,1-Dichloroethene	ug/l	< 5 U		< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	1.6 J	< 2 U			
cis-1,2-Dichloroethene	ug/l	170		0.96	0.45 J	0.46 J	0.46 J	0.46 J	89	4.3			
trans-1,2-Dichloroethene	ug/l	3.5		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	2.9	< 1 U			
Ethylbenzene	ug/l	< 5 U		< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 5 U	< 2 U			
Tetrachloroethene	ug/l	< 5 U		< 1 U	2.9	2.8	2.8	2.8	62	47			
Toluene	ug/l	< 5 U		< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 5 U	< 2 U			
1,1,1-Trichloroethane	ug/l	< 5 U		0.31 J	1.2	1.3	1.3	1.3	13	7.1			
Trichloroethene	ug/l	28		1.5	7.6	8.1	8.1	8.1	140	35			
Vinyl chloride	ug/l	10		< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 5 U	< 2 U			
Xylene (total)	ug/l	< 5 U		< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 5 U	< 2 U			

ug/l - Micrograms per liter.
 DUP 126 - Duplicate of W-3-N.
 DUP 127 - Duplicate of HR-1.
 DUP 128 - Duplicate of GM-22.
 DUP 129 - Duplicate of GM-19D.
 DUP 130 - Duplicate of GM-26.
 DUP 131 - Duplicate of GM-1.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 TB - Trip blank.
 RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

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Volatile Organic Compounds	Units	GM-33 09/25/03		GM-35 09/25/03		GM-32 10/1/03		GM-21 9/24/03		HR-17 9/25/03		W-2-S 9/26/03	
		Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer
Benzene	ug/l	< 2.5 U		< 8 U		1.5 J		< 8 U		< 2 U		< 1 U	
1,1-Dichloroethane	ug/l	8.4		46		5.5		6.9 J		0.75 J		0.99 J	
1,1-Dichloroethene	ug/l	1 J		4 J		< 2 U		2 J		< 2 U		< 1 U	
cis-1,2-Dichloroethene	ug/l	19		300		< 1 U		100		2.2		0.74	
trans-1,2-Dichloroethene	ug/l	0.72 J		12		1		2.9 J		0.7 J		< 0.5 U	
Ethylbenzene	ug/l	< 2.5 U		< 8 U		< 2 U		< 8 U		< 2 U		< 1 U	
Tetrachloroethene	ug/l	37		21		< 2 U		< 8 U		64		< 1 U	
Toluene	ug/l	< 2.5 U		< 8 U		< 2 U		< 8 U		< 2 U		0.25 J	
1,1,1-Trichloroethane	ug/l	21		17		< 2 U		31		< 2 U		1.4	
Trichloroethene	ug/l	75		270		< 2 U		200		10		5.5	
Vinyl chloride	ug/l	< 2.5 U		59		< 2 U		< 8 U		< 2 U		< 1 U	
Xylene (total)	ug/l	< 2.5 U		< 8 U		< 2 U		< 8 U		< 2 U		< 1 U	

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

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Volatile Organic Compounds	Units	W-3-S		W-4-S		GM-8		GM-6		TW-2		4S
		Upper Aquifer	9/26/03	Upper Aquifer	9/26/03	Upper Aquifer	10/1/03	Upper Aquifer	10/2/03	Upper Aquifer	10/2/03	
Benzene	ug/l	< 1 U		< 1 U				1		1.5		1.6 J
1,1-Dichloroethane	ug/l	< 1 U		0.92 J		5.4		20		5.7		7
1,1-Dichloroethene	ug/l	< 1 U		< 1 U		< 2 U		< 1 U		< 1 U		< 2 U
cis-1,2-Dichloroethene	ug/l	0.34 J		3.6		< 1 U		13		8.3		< 1 U
trans-1,2-Dichloroethene	ug/l	< 0.5 U		0.78		4.4		2.5		0.59		1.7
Ethylbenzene	ug/l	< 1 U		< 1 U		11		0.22 J		0.86 J		1.7 J
Tetrachloroethene	ug/l	0.81 J		24		< 2 U		11		4.7		< 2 U
Toluene	ug/l	< 1 U		0.25 J		< 2 U		< 1 U		< 1 U		< 2 U
1,1,1-Trichloroethane	ug/l	1.8		2		< 2 U		0.19 J		0.66 J		< 2 U
Trichloroethene	ug/l	2		13		< 2 U		23		24		< 2 U
Vinyl chloride	ug/l	< 1 U		< 1 U		< 2 U		3.3		1.4		< 2 U
Xylene (total)	ug/l	< 1 U		< 1 U		< 2 U		< 1 U		< 1 U		< 2 U

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compounds	Units	GM-2		GM-16		GM-17		GM-18		WSU-24		GM-10	
		10/2/03		9/22/03		9/24/03		9/22/03		9/22/03		9/24/03	
		Upper Aquifer		Upper Aquifer		Upper Aquifer		Upper Aquifer		Upper Aquifer		Upper Aquifer	
Benzene	ug/l	< 1 U		< 4 U		< 1 U		< 2 U		< 1 U		< 1 U	
1,1-Dichloroethane	ug/l	1.7		2.8 J		1.2		3.7		< 1 U		< 1 U	
1,1-Dichloroethene	ug/l	< 1 U		< 4 U		< 1 U		< 2 U		< 1 U		< 1 U	
cis-1,2-Dichloroethene	ug/l	4.7		5.8		2.9		8.8		< 0.5 U		< 0.5 U	
trans-1,2-Dichloroethene	ug/l	< 0.5 U		1.1 J		< 0.5 U		< 1 U		< 0.5 U		0.5	
Ethylbenzene	ug/l	0.21 J		< 4 U		< 1 U		< 2 U		< 0.5 U		< 0.5 U	
Tetrachloroethene	ug/l	5.7		110		12		24		< 1 U		< 1 U	
Toluene	ug/l	< 1 U		< 4 U		< 1 U		< 2 U		1		1.3	
1,1,1-Trichloroethane	ug/l	0.21 J		1.9 J		1.3		10		< 1 U		< 1 U	
Trichloroethene	ug/l	13		57		24		77		0.67 J		1.5	
Vinyl chloride	ug/l	0.46 J		< 4 U		< 1 U		0.75 J		7.9		16	
Xylene (total)	ug/l	< 1 U		< 4 U		< 1 U		< 2 U		< 1 U		< 1 U	

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

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Volatile Organic Compounds	Units	GM-26	DUP-130	HR-10	HR-12	HR-15	HR-13
		10/1/03 Upper Aquifer	10/1/03	9/17/03 Lower Aquifer	9/18/03 Lower Aquifer	9/17/03 Lower Aquifer	9/16/03 Lower Aquifer
Benzene	ug/l	< 1 U	0.2 J	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	< 1 U	< 1 U	< 1 U	1.7	< 1 U	33
1,1-Dichloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	1.4	2.2	12
trans-1,2-Dichloroethene	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	1.8
Ethylbenzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	0.85 J	0.73 J	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Trichloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	2.2
Vinyl chloride	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	0.29 J	5.7
Xylene (total)	ug/l	< 1 U	< 1 U	< 1 U	1.6	14	< 1 U
				< 1 U	< 1 U	< 1 U	< 1 U

ug/l - Micrograms per liter.
 DUP 126 - Duplicate of W-3-N.
 DUP 127 - Duplicate of HR-1.
 DUP 128 - Duplicate of GM-22.
 DUP 129 - Duplicate of GM-19D.
 DUP 130 - Duplicate of GM-26.
 DUP 131 - Duplicate of GM-1.
 < - Constituent not detected above laboratory reporting limit shown.
 J - Value is estimated.
 TB - Trip blank.
 RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

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Volatile Organic Compounds	Units	39		GM-39		GM-40		GM-41		GM-42		GM-19D	
		Lower Aquifer	9/24/03	Lower Aquifer	12/10/03	Lower Aquifer	12/10/03	Lower Aquifer	12/10/03	Lower Aquifer	12/9/03	Lower Aquifer	9/25/03
Benzene	ug/l	< 1 U		< 1 U		< 1 U		< 1 U		< 1 U		< 1 U	
1,1-Dichloroethane	ug/l	0.58 J		< 1 U		< 1 U		< 11 U		0.46 J		< 1 U	
1,1-Dichloroethene	ug/l	< 1 U		< 1 U		< 1 U		< 11 U		< 1 U		< 1 U	
cis-1,2-Dichloroethene	ug/l	0.71		< 0.5 U		< 0.5 U		10		11		1.8	
trans-1,2-Dichloroethene	ug/l	< 0.5 U		< 0.5 U		< 0.5 U		< 5.6 U		0.34 J		< 0.5 U	
Ethylbenzene	ug/l	< 1 U		< 1 U		< 1 U		< 11 U		< 1 U		< 1 U	
Tetrachloroethene	ug/l	< 1 U		< 1 U		< 1 U		< 11 U		0.27 J		< 1 U	
Toluene	ug/l	< 1 U		0.18 J		< 1 U		< 11 U		< 1 U		< 1 U	
1,1,1-Trichloroethane	ug/l	< 1 U		< 1 U		< 1 U		< 11 U		< 1 U		< 1 U	
Trichloroethene	ug/l	0.89 J		< 1 U		< 1 U		320		< 1 U		< 1 U	
Vinyl chloride	ug/l	< 1 U		1.3		< 1 U		< 11 U		0.37 J		0.24 J	
Xylene (total)	ug/l	< 1 U		< 1 U		< 1 U		< 11 U		1		17	

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

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	Units	DUP-129 9/25/03	GM-3 10/2/03 Lower Aquifer	GM-1 10/2/03 Lower Aquifer	DUP-131 10/2/03	GM-15 9/22/03 Lower Aquifer	GM-11 9/24/03 Lower Aquifer
Volatile Organic Compounds							
Benzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	< 1 U	1.6	< 1 U	< 1 U	1.7	< 1 U
1,1-Dichloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	1.6	5.5	< 0.5 U	< 0.5 U	1.6	< 0.5 U
trans-1,2-Dichloroethene	ug/l	< 0.5 U	0.77	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	ug/l	< 1 U	0.26 J	< 1 U	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	< 1 U	1.7	2	2.1	< 1 U	2.2
Toluene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	< 1 U	0.96 J	1.2	1.1	< 1 U	0.96 J
Trichloroethene	ug/l	0.34 J	12	34	35	5.9	33
Vinyl chloride	ug/l	15	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Xylene (total)	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

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Volatile Organic Compounds	Units	GM-20D 9/22/03		DN-13 9/22/03		GM-9 9/24/03		MT-69 10/1/03		TB-159 9/16/03		TB-160 9/17/03	
		Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
Benzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	< 1 U	< 1 U	2.4	< 1 U	0.45 J	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	< 0.5 U	< 0.5 U	6.8	< 0.5 U	0.56	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	0.41 J	< 0.5 U
trans-1,2-Dichloroethene	ug/l	< 0.5 U	< 0.5 U	0.4 J	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	3.6	0.31 J	0.31 J	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	0.89 J	1.1	1.1	< 1 U	1.3	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	0.78 J	< 1 U
Trichloroethene	ug/l	12	6.4	6.4	< 1 U	20	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Vinyl chloride	ug/l	< 1 U	1.1	1.1	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Xylene (total)	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	0.46 J

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

Draft

	Units	TB-161 9/18/03	TB-162 9/22/03	TB-163 9/23/03	TB-164 9/24/03	TB-165 9/25/03	TB-166 9/26/03	TB-167 10/1/03	TB-168 10/2/03
<u>Volatile Organic Compounds</u>									
Benzene	ug/l	0.25 J	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethane	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1-Dichloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
cis-1,2-Dichloroethene	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Tetrachloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	ug/l	1.4	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
1,1,1-Trichloroethane	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	0.52 J	0.63 J
Trichloroethene	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Vinyl chloride	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Xylene (total)	ug/l	0.8 J	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-2. Groundwater Analytical Results for September 2003, General Motors Corporation, Moraine, Ohio.

Draft

	Units	RB-103 9/17/03	RB-104 9/18/03	RB-105 9/24/03	RB-106 9/25/03	RB-107 10/1/03	RB-108 10/2/03
<u>Volatile Organic Compounds</u>							
Benzene	ug/l	2.1	2.5	<1 U	<1 U	<1 U	<1 U
1,1-Dichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1-Dichloroethene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
cis-1,2-Dichloroethene	ug/l	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trans-1,2-Dichloroethene	ug/l	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Ethylbenzene	ug/l	3	3.1	<1 U	<1 U	0.29 J	<1 U
Tetrachloroethene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Toluene	ug/l	17	18	<1 U	<1 U	0.83 J	0.61 J
1,1,1-Trichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Trichloroethene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Vinyl chloride	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Xylene (total)	ug/l	16	13	<1 U	<1 U	<1 U	<1 U
				<1 U	<1 U	1.7	0.67 J

ug/l - Micrograms per liter.

DUP 126 - Duplicate of W-3-N.

DUP 127 - Duplicate of HR-1.

DUP 128 - Duplicate of GM-22.

DUP 129 - Duplicate of GM-19D.

DUP 130 - Duplicate of GM-26.

DUP 131 - Duplicate of GM-1.

< - Constituent not detected above laboratory reporting limit shown.

J - Value is estimated.

TB - Trip blank.

RB - Rinseate blank.

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Table C-3. Groundwater Analytical Results for December 2003, General Motors Corporation, Moraine, Ohio.

Draft

Volatile Organic Compound	Units	GM-39				GM-40		GM-41		GM-42		DUP-133		TB-169		TB-170		RB-110	
		12/10/03		12/10/03		12/10/03		12/10/03		12/9/03		12/9/03		12/9/03		12/10/03		12/9/03	
		Lower Aquifer		Lower Aquifer		Lower Aquifer		Lower Aquifer		Lower Aquifer		Lower Aquifer		Lower Aquifer		Lower Aquifer		Lower Aquifer	
1,1,1,2-Tetrachloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1,1-Trichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1,2,2-Tetrachloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1,2-Trichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1-Dichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1-Dichloroethene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	0.46 J	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,2,3-Trichloropropane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,2-Dibromo-3-chloropropane (DBCP)	ug/l	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<22 UJ	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U
1,2-Dibromoethane (Ethylene Dibromide)	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,2-Dichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,2-Dichloropropane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
2-Butanone	ug/l	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<11 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ
2-Hexanone	ug/l	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<110 UJ	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
4-Methyl-2-pentanone	ug/l	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<110 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Acetone	ug/l	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	19 J	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ
Acrolein	ug/l	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Acrylonitrile	ug/l	<20 U	<20 U	<20 U	<20 U	<20 U	<20 U	<220 U	<20 U	<20 U	<20 U	<20 U	<20 U	<20 U	<20 U	<20 U	<20 U	<20 U	<20 U
Allyl chloride	ug/l	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<22 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U
Benzene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Bromodichloromethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Bromoform	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Bromomethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Carbon disulfide	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Carbon tetrachloride	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chlorobenzene	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chloroform (Trichloromethane)	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chloromethane	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chloroprene	ug/l	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<11 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U
cis-1,2-Dichloroethene	ug/l	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	10	<0.5 U	11	<0.5 U	11	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

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Table C-3. Groundwater Analytical Results for December 2003, General Motors Corporation, Moraine, Ohio.

Draft

		GM-39 12/10/03		GM-40 12/10/03		GM-41 12/10/03		GM-42 12/9/03		DUP-133 12/9/03		TB-169 12/9/03		TB-170 12/10/03		RB-110 12/9/03	
	Units	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
<u>Volatile Organic Compound</u>																	
cis-1,3-Dichloropropene	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Dibromochloromethane	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Dibromomethane	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Dichlorodifluoromethane (CFC-12)	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Ethyl methacrylate	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Ethylbenzene	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Iodomethane	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Methyl acrylonitrile	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Methyl methacrylate	ug/l	<2 U	<2 U	<2 U	<2 U	<22 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U
Methylene chloride	ug/l	<2 U	<2 U	<2 U	<2 U	<22 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U
Propionitrile (Ethyl cyanide)	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Styrene	ug/l	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Tetrachloroethene	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Toluene	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
trans-1,2-Dichloroethene	ug/l	0.18 J	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
trans-1,3-Dichloropropene	ug/l	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5.6 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trans-1,4-Dichloro-2-butene	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Trichloroethene	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Trichlorofluoromethane (CFC-11)	ug/l	<1 U	<1 U	<1 U	<1 U	320	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Vinyl acetate	ug/l	<1 U	<1 U	<1 U	<1 U	<11 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Vinyl chloride	ug/l	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<22 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ
Xylene (total)	ug/l	1.3	3.1	3.1	3.1	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U
ug/l - Micrograms per liter.																	

< - Constituent not detected above laboratory reporting limit shown.
R - Value is rejected.
J - Value is estimated.
TB - Trip blank.
RB - Rinseate blank.

DRAFT

Appendix D

Closed North and South Settling
Lagoon Data for 2003



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Closed North Settling Lagoon

1st Quarter March 2003



ARCADIS Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0005.00010</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>3/25/2003</u>		
Site/Well No.	<u>W-1-N</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Cloudy, 60's</u>	Sampling Time:	Begin <u>1600</u>	End	<u>1646</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>739.02</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>71.50</u>
Depth to Water (ft bmp)	<u>30.38</u>
Water-Level Elevation (ft)	<u>708.64</u>
Water Column in Well (ft)	<u>41.12</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>26.73</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>65'</u>
Purge Time	begin <u>1607</u> end <u>0:00</u>
Pumping Rate	<u>800 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.97</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1140</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>17.14</u>
Dissolved Oxygen (mg/L)	<u>0.26</u>
ORP (mV)	<u>142</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1630</u>
	<u>Final DTW: 30.38</u>

Constituents Sampled	Container Description	Number	Preservative
<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>4</u>	<u>Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
Sampling Personnel	<u>T. Trommer, C. Capell</u>		

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-1-N Time Pump Started 1607

Depth of Sampling 65' Date 3/25/2003

Parameters	Time									
	1610	1613	1616	1619	1622	1625				
Redox Potential (millivolts)	243	186	166	156	148	142				
Dissolved Oxygen (mg/L)	0.31	0.18	0.16	0.30	0.28	0.26				
pH (s.u.)	6.80	6.83	6.88	6.92	6.95	6.97				
Specific Conductance (uS/cm)	1,210	1,190	1,180	1,170	1,150	1,140				
Temperature (C)	16.59	16.96	17.03	17.11	17.10	17.14				

Flow Rate 800 mL/min Total Depth of Well: 71.50'

Time Sampled 1630 Depth to Water Before Purging: 30.38'

Total Water Pumped 5 gallons Depth to Water After Purging: 30.38'

Comments

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/25/2003
 Site/Well No. HR-4 Replicate No. Code No.
 Weather Rain, 50's Sampling Time: Begin 1646 End 1730

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 742.60
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 67.16
 Depth to Water (ft bmp) 34.09
 Water-Level Elevation (ft) 708.51
 Water Column in Well (ft) 33.07
 Casing Diameter/Type 2"
 Gallons in Well 5.3
 Gallons Pumped/Bailed
 Prior to Sampling 5 pumped
 Sample Pump Intake
 Setting (ft bmp) 62
 Purge Time begin 1703 end 1721
 Pumping Rate 650 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 7.06
 Conductivity
 (mS/cm)
 (µmhos/cm) 990
 Turbidity (NTU) NR
 Temperature (°C) 16.38
 Dissolved Oxygen (mg/L) 0
 ORP (mV) 101
 Sampling Method Low Flow

Remarks Sample time @ 1725
Final DTW: 34.09

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location GM- Moraine, Ohio

Monitoring Well No. HR-4 Time Pump Started 1700

Depth of Sampling 62' Date 3/25/2003

Parameters	Time									
	1703	1706	1709	1712	1715	1718	1721			
Redox Potential (millivolts)	216	199	NR	148	122	107	101			
Dissolved Oxygen (mg/L)	0.00	0.00	NR	0.00	0.00	0.00	0.00			
pH (s.u.)	7.03	7.03	NR	7.05	7.05	7.06	7.06			
Specific Conductance (uS/cm)	980	980	NR	980	980	980	990			
Temperature (C)	16.05	16.41	NR	15.88	16.02	16.39	16.38			

Flow Rate 650 ml/min Total Depth of Well: 67.16'

Time Sampled 1725 Depth to Water Before Purging: 34.09'

Total Water Pumped 5 Gallons Depth to Water After Purging: 34.09'

Comments 1709 storm hit- unable to obtain reading NR - not recorded

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Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0005.00010</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>3/26/2003</u>		
Site/Well No.	<u>W-2-N</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Clear, 50's</u>	Sampling Time:	Begin <u>0810</u>	End	<u>0913</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>731.68</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>59.55</u>
Depth to Water (ft bmp)	<u>23.60</u>
Water-Level Elevation (ft)	<u>708.08</u>
Water Column in Well (ft)	<u>35.95</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>23.4</u>
Gallons Pumped/Bailed Prior to Sampling	<u>3 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>54'</u>
Purge Time	begin <u>0836</u> end <u>0854</u>
Pumping Rate	<u>400 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.94</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1250</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>15.63</u>
Dissolved Oxygen (mg/L)	<u>0.01</u>
ORP (mV)	<u>-67</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 0856</u>
	<u>Final DTW: 23.59</u>

Constituents Sampled	Container Description	Number	Preservative
<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-2-N

Depth of Sampling 54'

Time Pump Started 0836

Date 3/25/2003

Parameters	Time									
	0839	0842	0845	0848	0851	0854				
Redox Potential (millivolts)	-16	-45	-57	-62	-64	-67				
Dissolved Oxygen (mg/L)	4.11	1.97	1.31	0.81	0.33	0.01				
pH (s.u.)	6.82	6.88	6.91	6.92	6.94	6.94				
Specific Conductance (uS/cm)	1,310	1,300	1,290	1,270	1,260	1,250				
Temperature (C)	13.25	15.48	15.77	15.92	15.75	15.63				

Flow Rate 400 mL/min

Time Sampled 0856

Total Water Pumped 3 Gallons

Comments

Total Depth of Well: 59.55'

Depth to Water Before Purging: 23.60'

Depth to Water After Purging: 23.59'

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Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0005.00010</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>3/26/2003</u>
Site/Well No.	<u>HR-1</u>	Replicate No.	<u>HR-1C @ 1006</u>	Code No.	
Weather	<u>Clear, 50's</u>	Sampling Time: Begin	<u>0916</u>	End	<u>1024</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>732.71</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>59.52</u>
Depth to Water (ft bmp)	<u>25.97</u>
Water-Level Elevation (ft)	<u>706.74</u>
Water Column in Well (ft)	<u>33.55</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>5.3</u>
Gallons Pumped/Bailed Prior to Sampling	<u>3 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>55'</u>
Purge Time	<u>begin 0930 end 1004</u>
Pumping Rate	<u>300 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.87</u>
Conductivity (mS/cm)	
(umhos/cm)	<u>1410</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>18.91</u>
Dissolved Oxygen (mg/L)	<u>0</u>
ORP (mV)	<u>54</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1006</u>
	<u>Final DTW 25.95</u>

Constituents Sampled	Container Description	Number	Preservative
<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	<u>below measuring point</u>	ml	<u>milliliter</u>	NTU	<u>Nephelometric Turbidity Units</u>
°C	<u>Degrees Celsius</u>	mS/cm	<u>Millisiemens per centimeter</u>	PVC	<u>Polyvinyl chloride</u>
ft	<u>feet</u>	msl	<u>mean sea-level</u>	s.u.	<u>Standard units</u>
gpm	<u>Gallons per minute</u>	N/A	<u>Not Applicable</u>	umhos/cm	<u>Micromhos per centimeter</u>
mg/L	<u>Milligrams per liter</u>	NR	<u>Not Recorded</u>	VOC	<u>Volatile Organic Compounds</u>

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-1

Time Pump Started 0930

Depth of Sampling 55' Date 3/26/2003

Parameters

	0933	0936	0939	0952	0955	0958	1001	1004		
Redox Potential (millivolts)	147	122	Shut	154	107	72	62	54		
Dissolved Oxygen (mg/L)	0.29	0.00	Down	3.31	0.00	0.00	0.00	0.00		
pH (s.u.)	6.90	6.90	Pump	6.97	6.91	6.90	6.88	6.87		
Specific Conductance (uS/cm)	1,520	1,420		1,410	1,400	1,410	1,410	1,410		
Temperature (C)	17.99	18.16		17.33	18.21	18.26	18.66	18.91		

Flow Rate 300 mL/min

Total Depth of Well: 59.52'

Time Sampled 1006

Depth to Water Before Purging: 25.97'

Total Water Pumped 3 Gallons

Depth to Water After Purging: 25.95'

Comments 0939 shut pump down due to equipment problems. Restarted pump at 0949.

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/26/2003
 Site/Well No. HR-6 Replicate No. Code No.
 Weather Clear, 50's Sampling Time: Begin 1025 End 1110

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 732.66
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 55.17
 Depth to Water (ft bmp) 25.63
 Water-Level Elevation (ft) 29.54
 Water Column in Well (ft) 707.03
 Casing Diameter/Type 2"
 Gallons in Well 4.7
 Gallons Pumped/Bailed
 Prior to Sampling 4.5 pumped
 Sample Pump Intake
 Setting (ft bmp) 50
 Purge Time begin 1044 end 1059
 Pumping Rate 800 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 6.89
 Conductivity
 (mS/cm)
 (µmhos/cm) 1280
 Turbidity (NTU) NR
 Temperature (°C) 16.92
 Dissolved Oxygen (mg/L) 0.70
 ORP (mV) 167
 Sampling Method Low Flow
 Remarks Sample time @ 1100
Final DTW: 25.68

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number

OH000294.0005.00010

Site Location

General Motors Corporation, Moraine, Ohio

Monitoring Well No.

HR-6

Time Pump Started

1044

Depth of Sampling

50'

Date

3/26/2003

Parameters

Time

	1047	1050	1053	1056	1059							
Redox Potential (millivolts)	219	189	174	168	167							
Dissolved Oxygen (mg/L)	0.99	0.73	0.69	0.70	0.70							
pH (s.u.)	6.89	6.89	6.89	6.89	6.89							
Specific Conductance (uS/cm)	1,280	1,280	1,280	1,280	1,280							
Temperature (C)	15.71	16.47	16.79	16.90	16.92							

Flow Rate

800 mL/min

Total Depth of Well: 55.17'

Time Sampled

1100

Depth to Water Before Purging:

25.63'

Total Water Pumped

4.5 Gallons

Depth to Water After Purging:

25.68'

Comments

ARCADIS

Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0005.00010</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>3/26/2003</u>		
Site/Well No.	<u>HR-5</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Clear, 50's</u>	Sampling Time: Begin	<u>1113</u>	End	<u>1148</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>734.27</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>57.86</u>
Depth to Water (ft bmp)	<u>26.68</u>
Water-Level Elevation (ft)	<u>31.18</u>
Water Column in Well (ft)	<u>707.59</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>4.9</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>52</u>
Purge Time	<u>begin 1121 end 1136</u>
Pumping Rate	<u>950 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.88</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1210</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.24</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>-57</u>
Sampling Method	<u>Low Flow</u>

Remarks	<u>Sample time @ 1138</u>
	<u>Final DTW = 26.68</u>

Constituents Sampled	Container Description	Number	Preservative
<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-5 Time Pump Started 1121

Depth of Sampling 52' Date 3/26/2003

Parameters	Time									
	1124	1127	1130	1133	1136					
Redox Potential (millivolts)	-31	-47	-53	-56	-57					
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR					
pH (s.u.)	6.89	6.88	6.89	6.88	6.88					
Specific Conductance (uS/cm)	1,190	1,200	1,200	1,210	1,210					
Temperature (C)	15.48	15.95	16.14	16.19	16.24					

Flow Rate 950 mL/min Total Depth of Well: 57.86'

Time Sampled 1138 Depth to Water Before Purging: 26.68'

Total Water Pumped 5 Gallons Depth to Water After Purging: 26.68'

Comments NR - not recorded, DO probe not working

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/26/2003
 Site/Well No. HR-8 Replicate No. _____ Code No. _____
 Weather Clear, 50's Sampling Time: Begin 1245 End 1325

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 743.42
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 66.39
 Depth to Water (ft bmp) 34.66
 Water-Level Elevation (ft) 708.76
 Water Column in Well (ft) 31.73
 Casing Diameter/Type 2"
 Gallons in Well 5.1
 Gallons Pumped/Bailed Prior to Sampling 6 Gallons
 Sample Pump Intake Setting (ft bmp) 61
 Purge Time begin 1255 end 1313
 Pumping Rate 1200 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 6.90
 Conductivity (mS/cm) _____
 (µmhos/cm) 1320
 Turbidity (NTU) NR
 Temperature (°C) 16.31
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 121
 Sampling Method Low Flow
 Remarks Sample time @ 1315
Final DTW: 34.66

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capeli

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-8 Time Pump Started 1255

Depth of Sampling 61' Date 3/26/2003

Parameters	Time									
	1258	1301	1304	1307	1310	1313				
Redox Potential (millivolts)	193	166	146	132	123	121				
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR				
pH (s.u.)	6.89	6.89	6.90	6.91	6.90	6.90				
Specific Conductance (uS/cm)	1,320	1,320	1,320	1,320	1,310	1,320				
Temperature (C)	16.19	16.29	16.29	16.28	16.32	16.31				

Flow Rate 1200 mL/min Total Depth of Well: 66.39'

Time Sampled 1315 Depth to Water Before Purging: 34.66'

Total Water Pumped 6 Gallons Depth to Water After Purging: 34.66'

Comments NR - not recorded, DO probe not working

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/26/2003
 Site/Well No. HR-9 Replicate No. _____ Code No. _____
 Weather Sunny, 50's Sampling Time: Begin 1340 End 1430

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 743.51
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 69.75
 Depth to Water (ft bmp) 34.26
 Water-Level Elevation (ft) 709.25
 Water Column in Well (ft) 35.49
 Casing Diameter/Type 2"
 Gallons in Well 5.67
 Gallons Pumped/Bailed
 Prior to Sampling 4 Gallons
 Sample Pump Intake
 Setting (ft bmp) 64'
 Purge Time begin 1354 end 1416
 Pumping Rate 500 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 6.88
 Conductivity
 (mS/cm) _____
 (umhos/cm) 1160
 Turbidity (NTU) NR
 Temperature (°C) 17.01
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 80
 Sampling Method Low Flow
 Remarks Sample time @ 1418
Final DTW: 34.26

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-9 Time Pump Started 1354

Depth of Sampling 64' Date 3/26/2003

Parameters		Time									
		1357	1400	1403	1406	1409	1412	1416			
Redox Potential (millivolts)	269	236	142	172	101	80					
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR	NR	NR			
pH (s.u.)	6.72	6.78	6.84	6.86	6.87	6.88	6.88	6.88			
Specific Conductance (uS/cm)	1,200	1,190	1,180	1,180	1,180	1,170	1,160	1,160			
Temperature (C)	15.40	15.94	16.78	16.93	16.99	17.02	17.01	17.01			

Flow Rate 500 mL/min Total Depth of Well: 69.75'

Time Sampled 1418 Depth to Water Before Purging: 34.26'

Total Water Pumped 4 gallons Depth to Water After Purging: 34.26'

Comments NR - not recorded, DO probe not working

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-10 Time Pump Started 1436

Depth of Sampling 121' Date 3/26/2003

Parameters	Time									
	1438	1441	1444	1447	1450	1453				
Redox Potential (millivolts)	-112	-113	-118	-121	-125	-127				
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR				
pH (s.u.)	6.86	6.75	6.77	6.81	6.86	6.84				
Specific Conductance (uS/cm)	1,410	1,380	1,360	1,350	1,340	1,340				
Temperature (C)	14.91	15.11	15.31	15.46	15.37	15.40				

Flow Rate 700 mL/min Total Depth of Well: 126.74'

Time Sampled 1455 Depth to Water Before Purging: 33.56'

Total Water Pumped 4 Gallons Depth to Water After Purging: 33.56'

Comments NR - not recorded, DO probe not working

ARCADIS Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0005.00010</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>3/26/2003</u>		
Site/Well No.	<u>HR-7</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Clear, 60's</u>	Sampling Time: Begin	<u>1525</u>	End	<u>1615</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>731.73</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>57.36</u>
Depth to Water (ft bmp)	<u>24.03</u>
Water-Level Elevation (ft)	<u>707.70</u>
Water Column in Well (ft)	<u>33.33</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>5.3</u>
Gallons Pumped/Bailed Prior to Sampling	<u>4.5</u>
Sample Pump Intake Setting (ft bmp)	<u>52</u>
Purge Time	<u>begin 1536 end 1554</u>
Pumping Rate	<u>750 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.86</u>
Conductivity	<u></u>
(mS/cm)	<u></u>
(µmhos/cm)	<u>1310</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>17.62</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>38</u>
Sampling Method	<u>Low Flow</u>

Remarks	<u>Sample time @ 1556</u>
	<u>Final DTW: 24.03</u>
	<u></u>
	<u></u>

Constituents Sampled	Container Description	Number	Preservative
<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>

Sampling Personnel	<u>T. Trommer, C. Capell</u>
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Well Casing Volumes				
Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-7 Time Pump Started 1536

Depth of Sampling 52' Date 3/26/2003

Parameters		Time									
		1539	1542	1545	1548	1551	1554				
Redox Potential (millivolts)		148	111	76	53	44	38				
Dissolved Oxygen (mg/L)		NR	NR	NR	NR	NR	NR				
pH (s.u.)		6.89	6.76	6.79	6.83	6.85	6.86				
Specific Conductance (uS/cm)		1,380	1,350	1,340	1,320	1,320	1,310				
Temperature (C)		16.36	17.07	17.42	17.57	17.62	17.62				

Flow Rate 750 mL/min Total Depth of Well: 57.36'

Time Sampled 1556 Depth to Water Before Purging: 24.03'

Total Water Pumped 4.5 Gallons Depth to Water After Purging: 24.03'

Comments NR - not recorded, DO probe not working

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/27/2003
 Site/Well No. W-4-N Replicate No. _____ Code No. _____
 Weather P. Cloudy, 50's Sampling Time: Begin 0855 End 0958

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 731.63
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 67.07
 Depth to Water (ft bmp) 23.61
 Water-Level Elevation (ft) 708.02
 Water Column in Well (ft) 43.46
 Casing Diameter/Type 4"
 Gallons in Well 28
 Gallons Pumped/Bailed
 Prior to Sampling 6
 Sample Pump Intake
 Setting (ft bmp) 62'
 Purge Time begin 0930 end 0948
 Pumping Rate 1300 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Cloudy
 pH (s.u.) 7.05
 Conductivity
 (mS/cm) _____
 (µmhos/cm) 1004
 Turbidity (NTU) NR
 Temperature (°C) 16.31
 Dissolved Oxygen (mg/L) 0.38
 ORP (mV) 3.1
 Sampling Method Low Flow
 Remarks Sample time @ 0950
Final DTW: 23.61

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	4	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-4-N Time Pump Started 0930

Depth of Sampling 62' Date 3/27/2003

Parameters	Time									
	0933	0936	0939	0942	0945	0948				
Redox Potential (millivolts)	36.6	39.8	8.6	7.1	3.4	3.1				
Dissolved Oxygen (mg/L)	0.93	0.65	0.49	0.44	0.40	0.38				
pH (s.u.)	6.95	6.98	7.01	7.02	7.02	7.05				
Specific Conductance (uS/cm)	997	999	999	999	999	1,004				
Temperature (C)	15.27	15.77	16.06	16.17	16.27	16.31				

Flow Rate 1300 mL/min Total Depth of Well: 67.07'

Time Sampled 0950 Depth to Water Before Purging: 23.61'

Total Water Pumped 6 Gallons Depth to Water After Purging: 23.61'

Comments _____

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/27/2003
 Site/Well No. HR-14 Replicate No. Code No.
 Weather P. Cloudy, 60's Sampling Time: Begin 1000 End 1034

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 731.63
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 89.55
 Depth to Water (ft bmp) 23.61
 Water-Level Elevation (ft) 708.0
 Water Column in Well (ft) 65.92
 Casing Diameter/Type 4"
 Gallons in Well 42.8
 Gallons Pumped/Bailed
 Prior to Sampling 6 Pumped
 Sample Pump Intake
 Setting (ft bmp) 85'
 Purge Time begin 1003 end 1018
 Pumping Rate 1200 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 7.05
 Conductivity
 (mS/cm)
 (µmhos/cm) 1034
 Turbidity (NTU) NR
 Temperature (°C) 15.81
 Dissolved Oxygen (mg/L) 0.34
 ORP (mV) -53.2
 Sampling Method Low Flow
 Remarks Sample time @ 1020
Final DTW: 23.61

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	4	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-14

Depth of Sampling 85'

Time Pump Started 1003

Date 3/27/2003

Parameters	1006	1009	1012	1015	1018	Time	
Redox Potential (millivolts)	-29.2	-38	-48.1	-50.5	-53.2		
Dissolved Oxygen (mg/L)	0.66	0.50	0.42	0.38	0.34		
pH (s.u.)	7.08	7.04	7.04	7.05	7.05		
Specific Conductance (uS/cm)	1,039	1,039	1,038	1,037	1,034		
Temperature (C)	15.36	15.70	15.80	15.79	15.81		

Flow Rate 1200 mL/min

Time Sampled 1020

Total Water Pumped 6 Gallons

Comments

Total Depth of Well: 89.55'

Depth to Water Before Purging: 23.61'

Depth to Water After Purging: 23.61'

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/27/2003
 Site/Well No. W-3-N Replicate No. W-3-E @ 1116 Code No.
 Weather P. Cloudy, 60's Sampling Time: Begin 1048 End 1125

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 733.66
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 57.85
 Depth to Water (ft bmp) 25.66
 Water-Level Elevation (ft) 708.0
 Water Column in Well (ft) 32.19
 Casing Diameter/Type 4"
 Gallons in Well 20.9
 Gallons Pumped/Bailed
 Prior to Sampling 6
 Sample Pump Intake
 Setting (ft bmp) 52'
 Purge Time begin 1050 end 1114
 Pumping Rate 900 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 7.08
 Conductivity
 (mS/cm)
 (µmhos/cm) 1084
 Turbidity (NTU) NR
 Temperature (°C) 15.85
 Dissolved Oxygen (mg/L) 0.22
 ORP (mV) -94.3
 Sampling Method Low Flow
 Remarks Sample time @ 1116
BB-1 @ 1130
Final DTW: 25.66

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-3-N Time Pump Started 1056

Depth of Sampling 52' Date 3/27/2003

Parameters	1059	1102	1105	1108	1111	1114	Time
Redox Potential (millivolts)	-81.3	-91	-94.1	-92.5	-92.1	-94.3	
Dissolved Oxygen (mg/L)	0.65	0.44	0.47	0.31	0.26	0.22	
pH (s.u.)	7.14	7.08	7.09	7.08	7.09	7.08	
Specific Conductance (uS/cm)	1,119	1,116	1,118	1,101	1,096	1,084	
Temperature (C)	15.44	15.79	16.33	16.08	15.91	15.85	

Flow Rate 900 mL/min Total Depth of Well: 57.85'

Time Sampled 1116 Depth to Water Before Purging: 25.66'

Total Water Pumped 6 Gallons Depth to Water After Purging: 25.66'

Comments

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/27/2003
 Site/Well No. HR-15 Replicate No. _____ Code No. _____
 Weather P. Cloudy, 60's Sampling Time: Begin 1137 End _____

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 733.74
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 102.45
 Depth to Water (ft bmp) 25.86
 Water-Level Elevation (ft) 707.88
 Water Column in Well (ft) 76.59
 Casing Diameter/Type 4"
 Gallons in Well 49.7
 Gallons Pumped/Bailed
 Prior to Sampling 5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 97'
 Purge Time begin 1142 end 1159
 Pumping Rate 1100 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 7.03
 Conductivity
 (mS/cm) _____
 (µmhos/cm) 991
 Turbidity (NTU) NR
 Temperature (°C) 15.48
 Dissolved Oxygen (mg/L) 0.22
 ORP (mV) -81.3
 Sampling Method Low Flow
 Remarks Sample time @ 1201
Final DTW: 25.86

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-15 Time Pump Started 1142

Depth of Sampling 97' Date 3/27/2003

Parameters	Time									
	1147	1150	1153	1156	1159					
Redox Potential (millivolts)	-81.7	-80.1	-79.2	-79.7	-81.3					
Dissolved Oxygen (mg/L)	0.41	0.28	0.26	0.23	0.22					
pH (s.u.)	7.10	7.06	7.03	7.02	7.03					
Specific Conductance (uS/cm)	992	1,004	1,001	996	991					
Temperature (C)	15.14	15.46	15.48	15.43	15.48					

Flow Rate 1100 mL/min Total Depth of Well: 102.45'

Time Sampled 1201 Depth to Water Before Purging: 25.86'

Total Water Pumped 5 Gallons Depth to Water After Purging: 25.86'

Comments

ARCADIS Water Sampling Log

Project	GM-Lagoon Monitoring	Project No.	OH000294.0005.00010	Page	1	of	1
Site Location	Moraine, Ohio			Date	3/27/2003		
Site/Well No.	HR-2	Replicate No.		Code No.			
Weather	P. Cloudy, 60's	Sampling Time:	Begin 1305	End	1422		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	734.75
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	58.54
Depth to Water (ft bmp)	26.71
Water-Level Elevation (ft)	708.04
Water Column in Well (ft)	31.83
Casing Diameter/Type	2"
Gallons in Well	5.09
Gallons Pumped/Bailed Prior to Sampling	5 Pumped
Sample Pump Intake Setting (ft bmp)	53'
Purge Time	begin 1356 end 1411
Pumping Rate	950 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	No
Appearance	Clear
pH (s.u.)	6.78
Conductivity (mS/cm)	
(µmhos/cm)	1081
Turbidity (NTU)	NR
Temperature (°C)	16.40
Dissolved Oxygen (mg/L)	0.31
ORP (mV)	140
Sampling Method	Low Flow
Remarks	Sample time @ 1413
	Final DTW: 26.71

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-2 Time Pump Started 1356

Depth of Sampling 53' Date 3/27/2003

Parameters	Time									
	1359	1402	1405	1408	1411					
Redox Potential (millivolts)	130.9	140.3	139	139.3	140					
Dissolved Oxygen (mg/L)	1.08	0.49	0.39	0.33	0.31					
pH (s.u.)	6.79	6.77	6.81	6.80	6.78					
Specific Conductance (uS/cm)	1,073	1,078	1,080	1,081	1,081					
Temperature (C)	15.62	16.10	16.22	16.29	16.40					

Flow Rate 950 mL/min Total Depth of Well: 58.54'

Time Sampled 1413 Depth to Water Before Purging: 26.71'

Total Water Pumped 5 Gallons Depth to Water After Purging: 26.71'

Comments

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/27/2003
 Site/Well No. HR-13 Replicate No. _____ Code No. _____
 Weather Cloudy, 60's Sampling Time: Begin 1413 End 1510

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 735.03
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 86.05
 Depth to Water (ft bmp) 27.07
 Water-Level Elevation (ft) 707.96
 Water Column in Well (ft) 58.98
 Casing Diameter/Type 4"
 Gallons in Well 38
 Gallons Pumped/Bailed
 Prior to Sampling 5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 81'
 Purge Time begin 1445 end 1503
 Pumping Rate 1000 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 6.77
 Conductivity (mS/cm) _____
 (µmhos/cm) 1288
 Turbidity (NTU) NR
 Temperature (°C) 15.90
 Dissolved Oxygen (mg/L) 0.27
 ORP (mV) 119.7
 Sampling Method Low Flow
 Remarks Sample time @ 1505
Final DTW: 27.07

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-13 Time Pump Started 1445

Depth of Sampling 81' Date 3/27/2003

Parameters	Time									
	1448	1451	1454	1457	1500	1503				
Redox Potential (millivolts)	20.4	70.3	88	103.8	115.9	119.7				
Dissolved Oxygen (mg/L)	0.76	0.41	0.36	0.31	0.28	0.27				
pH (s.u.)	6.80	6.76	6.78	6.76	6.71	6.77				
Specific Conductance (uS/cm)	1,279	1,289	1,290	1,288	1,285	1,288				
Temperature (C)	15.07	15.61	15.71	15.83	15.95	15.90				

Flow Rate 1000 mL/min Total Depth of Well: 86.05'

Time Sampled 1505 Depth to Water Before Purging: 27.07'

Total Water Pumped 5 Gallons Depth to Water After Purging: 27.07'

Comments _____

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/27/2003
 Site/Well No. HR-3 Replicate No. _____ Code No. _____
 Weather Clear, 60's Sampling Time: Begin 1513 End 1555

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 736.75
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 61.98
 Depth to Water (ft bmp) 28.70
 Water-Level Elevation (ft) 708.05
 Water Column in Well (ft) 33.28
 Casing Diameter/Type 2"
 Gallons in Well 5.3
 Gallons Pumped/Bailed Prior to Sampling 4.5 Pumped
 Sample Pump Intake Setting (ft bmp) 57'
 Purge Time begin 1522 end 1534
 Pumping Rate 800 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 6.73
 Conductivity (mS/cm) _____
 (µmhos/cm) 1148
 Turbidity (NTU) NR
 Temperature (°C) 16.66
 Dissolved Oxygen (mg/L) 0.31
 ORP (mV) 128.5
 Sampling Method Low Flow
 Remarks Sample time @ 1539
Final DTW: 28.70

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-3 Time Pump Started 1522

Depth of Sampling 57' Date 3/27/2003

Parameters	Time									
	1525	1528	1531	1534	1537					
Redox Potential (millivolts)	34.2	100.1	119.3	124.5	128.5					
Dissolved Oxygen (mg/L)	1.00	0.37	0.27	0.29	0.31					
pH (s.u.)	6.90	6.80	6.80	6.74	6.73					
Specific Conductance (uS/cm)	1,156	1,149	1,151	1,149	1,148					
Temperature (C)	15.69	16.36	16.56	16.64	16.66					

Flow Rate 800 mL/min Total Depth of Well: 61.98'

Time Sampled 1539 Depth to Water Before Purging: 28.70'

Total Water Pumped 4.5 Gallons Depth to Water After Purging: 28.70'

Comments _____

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0005.00010 Page 1 of 1
 Site Location Moraine, Ohio Date 3/28/2003
 Site/Well No. HR-11 Replicate No. _____ Code No. _____
 Weather Cloudy, 60's Sampling Time: Begin 0900 End 0949

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 743.33
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 69.00
 Depth to Water (ft bmp) 34.12
 Water-Level Elevation (ft) 709.21
 Water Column in Well (ft) 34.80
 Casing Diameter/Type 2"
 Gallons in Well 5.6
 Gallons Pumped/Bailed
 Prior to Sampling 5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 64'
 Purge Time begin 0921 end 0939
 Pumping Rate 800 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor No
 Appearance Clear
 pH (s.u.) 6.75
 Conductivity (mS/cm) _____
 (µmhos/cm) 1355
 Turbidity (NTU) NR
 Temperature (°C) 17.06
 Dissolved Oxygen (mg/L) 0.32
 ORP (mV) 137.1
 Sampling Method Low Flow
 Remarks Sample time @ 941
Final DTW: 34.12

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-11

Depth of Sampling 64'

Time Pump Started 0921

Date 3/28/2003

Parameters	Time									
	0924	0927	0930	0933	0936	0939				
Redox Potential (millivolts)	225.3	187.3	160.1	146.6	139	137.1				
Dissolved Oxygen (mg/L)	0.85	0.50	0.40	0.36	0.33	0.32				
pH (s.u.)	6.65	6.69	6.73	6.74	6.75	6.75				
Specific Conductance (uS/cm)	1,367	1,352	1,353	1,361	1,357	1,355				
Temperature (C)	15.63	16.53	16.94	17.14	17.06	17.06				

Flow Rate 800 mL/min

Time Sampled 941

Total Water Pumped 5 Gallons

Comments

Total Depth of Well: 69.00'

Depth to Water Before Purging: 34.12'

Depth to Water After Purging: 34.12'

ARCADIS Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0005.00010</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>3/28/2003</u>
Site/Well No.	<u>HR-12</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Cloudy, 60's</u>	Sampling Time: Begin	<u>0955</u>	End	<u>1040</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>742.64</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>130.10</u>
Depth to Water (ft bmp)	<u>33.43</u>
Water-Level Elevation (ft)	<u>709.21</u>
Water Column in Well (ft)	<u>96.67</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>62.8</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>125'</u>
Purge Time	<u>begin 0958 end 1013</u>
Pumping Rate	<u>1300 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.81</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1502</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>15.94</u>
Dissolved Oxygen (mg/L)	<u>0.34</u>
ORP (mV)	<u>-51.7</u>
Sampling Method	<u>Low Flow</u>

Remarks Sample time @ 1015
Final DTW: 33.43

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel T. Trommer, C. Capell

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0005.00010

Site Location Moraine, Ohio

Monitoring Well No. HR-12

Depth of Sampling 125'

Time Pump Started 0958

Date 3/28/2003

Parameters	Time									
	1001	1004	1007	1010	1013					
Redox Potential (millivolts)	-54	-52.9	-52.9	-52.3	-51.7					
Dissolved Oxygen (mg/L)	0.43	0.32	0.34	0.34	0.34					
pH (s.u.)	6.86	6.80	6.81	6.81	6.81					
Specific Conductance (uS/cm)	1,505	1,505	1,505	1,504	1,502					
Temperature (C)	15.53	15.86	15.91	15.92	15.94					

Flow Rate 1300 mL/min

Time Sampled 1015

Total Water Pumped 5 Gallons

Comments

Total Depth of Well: 130.10'

Depth to Water Before Purging: 33.43'

Depth to Water After Purging: 33.43'



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Groundwater Analytical Results



Table 7. Appendix IX Organic Analyses from Shallow Monitoring Wells during the First Quarter 2003 Monitoring of the Closed North Settling Lagoon, General Motors Corporation, Moraine, Ohio.

Appendix IX Constituent	Upgradient of Lagoon				Downgradient of Lagoon					Downgradient Some Distance from Lagoon			
	HR-9	HR-11	HR-8	HR-4	W-2-N	W-3-N	W-4-N	HR-2	HR-3	HR-5	HR-7	HR-6	HR-1
Laboratory pH	8.1	7.8	8.1	8.0	8.1	8.0	7.9	7.9	7.9	8.1	8.1	8.1	8.0
Laboratory SpC	1100	1,200	1200	1100	908	1100	1100	998	1025	1100	1200	1200	1300
Total Volatile Organics	89.42	14.4	28.64	1.00	1.89	3.04	136.9	13.94	15.43	36.59	18.98	2.3	75.69
Acetone	--	--	1.2J	--	--	--	--	--	--	--	--	--	--
Carbon disulfide	--	--	--	--	--	--	1.2J	--	0.48J	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	0.86J
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	2.0
1,1,1-Trichloroethane	11	--	9.1	--	--	--	--	--	--	--	--	--	0.60J
1,1-Dichloroethane	45	11	13	--	--	--	--	1.1	4.7	18	--	--	3.0
1,2-Dichloroethane	1.8	--	--	--	--	--	--	--	--	0.48J	--	--	--
1,1-Dichloroethene	0.52J	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	16	2.3	3.1	--	--	1.6	130	2.2	8.0	15	6.4	0.82	--
Tetrachloroethene	--	--	--	--	0.51J	--	--	1.1	--	--	--	--	3.6
Toluene	--	1.1	--	0.53J	0.66J	0.85J	--	0.41J	0.77J	0.40J	--	--	29
trans-1,2-Dichloroethene	2.1	--	0.54	--	--	--	--	--	1.0	1.2	0.51J	1.3	0.83J
Trichloroethene	13	--	1.7	0.47J	0.72J	0.59J	--	--	0.48J	1.7	0.59	--	3.8
Vinyl chloride	--	--	--	--	--	--	5.7	0.53J	--	--	11	8.5	32

All VOC concentrations in micrograms per liter (ug/L) as reported by the laboratory. Specific conductance is reported in umhos/cm and pH is reported in standard units.
 -- Not detected.

Shaded analytical results represent data from wells not directly downgradient of the North Settling Lagoon based on groundwater flow. J - Estimated result; result is less than reporting limit.

Table 8. Appendix IX Organic Analyses from Deep Monitoring Wells during the First Quarter 2003 Monitoring of the Closed North Settling Lagoon, General Motors Corporation, Moraine, Ohio.

Appendix IX Constituent	Upgradient of Lagoon		Downgradient of Lagoon			
	HR-10	HR-12	HR-15	HR-14	HR-13	
Field pH*	8.1	7.8	7.9	7.9	8.0	
Laboratory SpC*	1200	1400	1000	1050	1275	
Total Volatile Organics	--	5.8	16.32	26.5	55.7	
Carbon disulfide	--	--	0.32J	4.4	--	
1,1-Dichloroethane	--	2.2	--	--	32	
Chloroethane	--	0.30J	--	--	--	
cis-1,2-Dichloroethene	--	1.7	2.0	5.9	13	
trans-1,2-Dichloroethene	--	--	--	--	1.7	
1,1,1-Trichloroethane	--	--	--	--	1.9	
Trichloroethene	--	--	--	4.2	7.1	
Vinyl chloride	--	1.6	14	12	--	

All VOC concentrations in micrograms per liter (ug/L) as reported by the laboratory. Specific conductance is reported in umhos/cm and pH is reported in standard units.
 -- Not detected.

Shaded analytical results represent data from wells not directly downgradient of the North Settling Lagoon based on groundwater flow.
 J - Estimated result, result is less than reporting limit.

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Hydraulic Monitoring Data

Table 2. Water-Level Measurements during the First Quarter 2003 from Shallow Monitoring Wells at Delphi Harrison Thermal Systems, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
W-1-N	739.02	30.38	708.64
W-2-N	731.68	23.60	708.08
W-3-N	733.66	25.73	707.93
W-4-N	731.63	23.66	707.97
HR-1	732.71	26.02	706.69
HR-2	734.75	26.80	707.95
HR-3	736.75	28.78	707.97
HR-4	742.60	34.09	708.51
HR-5	734.27	26.72	707.55
HR-6	732.66	25.70	706.96
HR-7	731.73	24.07	707.66
HR-8	743.42	34.66	708.76
HR-9	743.51	34.30	709.21
HR-11	743.33	34.15	709.18
HR-16	727.01	20.65	706.36
HR-17	726.43	19.91	706.52
W-1-S	729.29	22.70	706.59
W-2-S	726.64	20.77	705.87
W-3-S	733.42	23.26	710.16
W-4-S	727.68	21.77	705.91
GM-2	735.81	29.78	706.03
4S	731.36	NA	NA
GM-6	730.27	24.77	705.50
GM-8	735.17	29.54	705.63
GM-10	723.90	18.55	705.35
GM-16	725.30	19.86	705.44
GM-17	723.84	18.38	705.46
GM-18	723.80	18.33	705.47
GM-19S	730.85	24.65	706.20
GM-26	722.29	17.31	704.98
GM-32	732.08	25.89	706.19
GM-33	729.77	23.22	706.55
GM-34	730.56	24.03	706.53
GM-35	731.27	25.15	706.12
GM-36	731.11	24.88	706.23
GM-37	730.05	23.71	706.34
G-38	729.88	23.57	706.31
EAST	730.98	24.49	706.49
WEST	731.08	24.64	706.44
WSU-24	725.10	19.02	706.08
WS-17	726.18	20.58	705.60
WS-18	733.52	27.80	705.72
WS-19	726.62	21.01	705.61
TW-2	733.38	31.27	702.11
RW-10	728.53	NM	NM
RW-11	729.74	23.25	706.49

Measuring point is to top of the PVC casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured March 24-25, 2003 using an electronic water-level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

NA – Not accessible because 4S still contains a submersible pump.

NM – Not measured because RW-10 was not accessible.

Table 3. Water-Level Measurements during the First Quarter 2003 from Shallow Monitoring Wells at the Moraine Assembly and Former Moraine Engine Plants, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
GM-21	723.50	18.71	704.79
GM-22	731.63	24.96	706.67
GM-23	731.00	23.14	707.86
GM-24	747.29	37.60	709.69
GM-25	746.17	38.42	707.75
GM-27	730.57	22.43	708.14
GM-28	738.02	28.75	709.27
GM-29	730.78	23.36	707.42
GM-30	734.73	708.21	708.21
GM-31	735.23	25.47	709.76
ME-2	732.08	NA	NA
ME-3	732.59	25.05	707.54
ME-4	732.74	25.61	707.13
ME-6	735.91	26.12	709.79

Measuring point is top of the PVC casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured March 24-25, 2003 using an electronic water-level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

NA – Not accessible.

Table 5. Water-Level Measurements during the First Quarter 2003 from Deep Monitoring Wells at Delphi Harrison Thermal Systems, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
GM-1	735.74	29.92	705.82
GM-3	730.44	25.05	705.39
GM-4	731.46	26.07	705.39
GM-5	731.29	25.72	705.57
GM-7R	735.61	29.78	705.83
GM-9	724.07	18.96	705.11
GM-11	723.71	18.69	705.02
GM-13	723.82	19.24	704.58
GM-14	723.50	18.95	704.55
GM-15	725.23	20.71	704.52
GM-19D	730.25	24.11	706.14
GM-20D	727.26	21.27	705.99
HR-10	742.81	33.58	709.23
HR-12	742.64	33.46	709.18
HR-13	735.03	27.00	708.03
HR-14	731.63	23.61	708.02
HR-15	733.74	25.85	707.89
M73C	716.55	NA	NA
MT68	746.45	NA	NA
MT69	722.71	NA	NA
MT576M	751.46	42.59	708.87
MT596M*	757.73	47.85	709.88

Measuring point is to top of the PVC casing.

*Measuring point is the top of cement housing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured March 24-25, 2003 using an electronic water-level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

NA – Not accessible.

Table 6. Water-Level Measurements during the First Quarter 2003 from Production and Fire Wells, General Motors Corporation, Moraine, Ohio.

Well	Measuring Point (Top of)	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
28	Port Hole	733.67	NM	NM
31	Steel	734.05	Off	NM
32	Port Hole	732.10	24.65	707.45
35	Rim	733.96	27.28	706.68
37	W. Port Hole	731.24	NM	NM
39	Port Hole	732.07	On	NM
42	Rim	731.62	NM	NM
44	Port Hole	734.62	NM	NM
45	Steel	731.03	NM	NM
46	Steel	733.34	27.14	706.20
"A"	Port Hole	739.00	NM	NM
11B	Steel	NS	On	NM
12A	Steel	742.35	On	NM
FW-1A	Air Line Hole	739.89	25.46	714.43
FW-2	Air Line Hole	737.48	30.09	707.39
FW-3	Air Line Hole	739.26	31.94	707.32
FW-4	Hole to West of Air Line	731.62	31.95	699.67

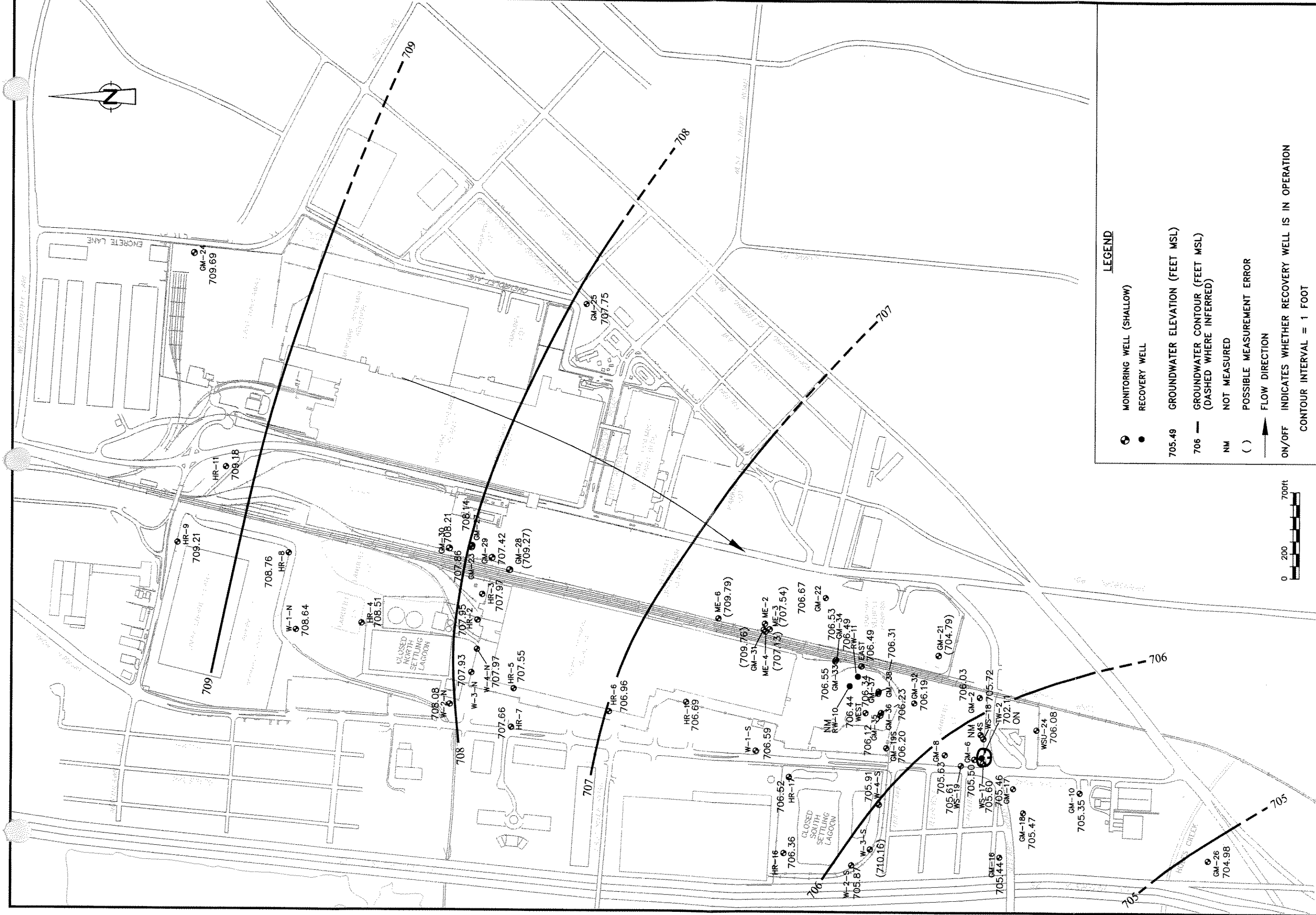
NM - Not Measured.

NS - Not Surveyed.

Water-level elevations are reported in feet above mean sea level (msl).

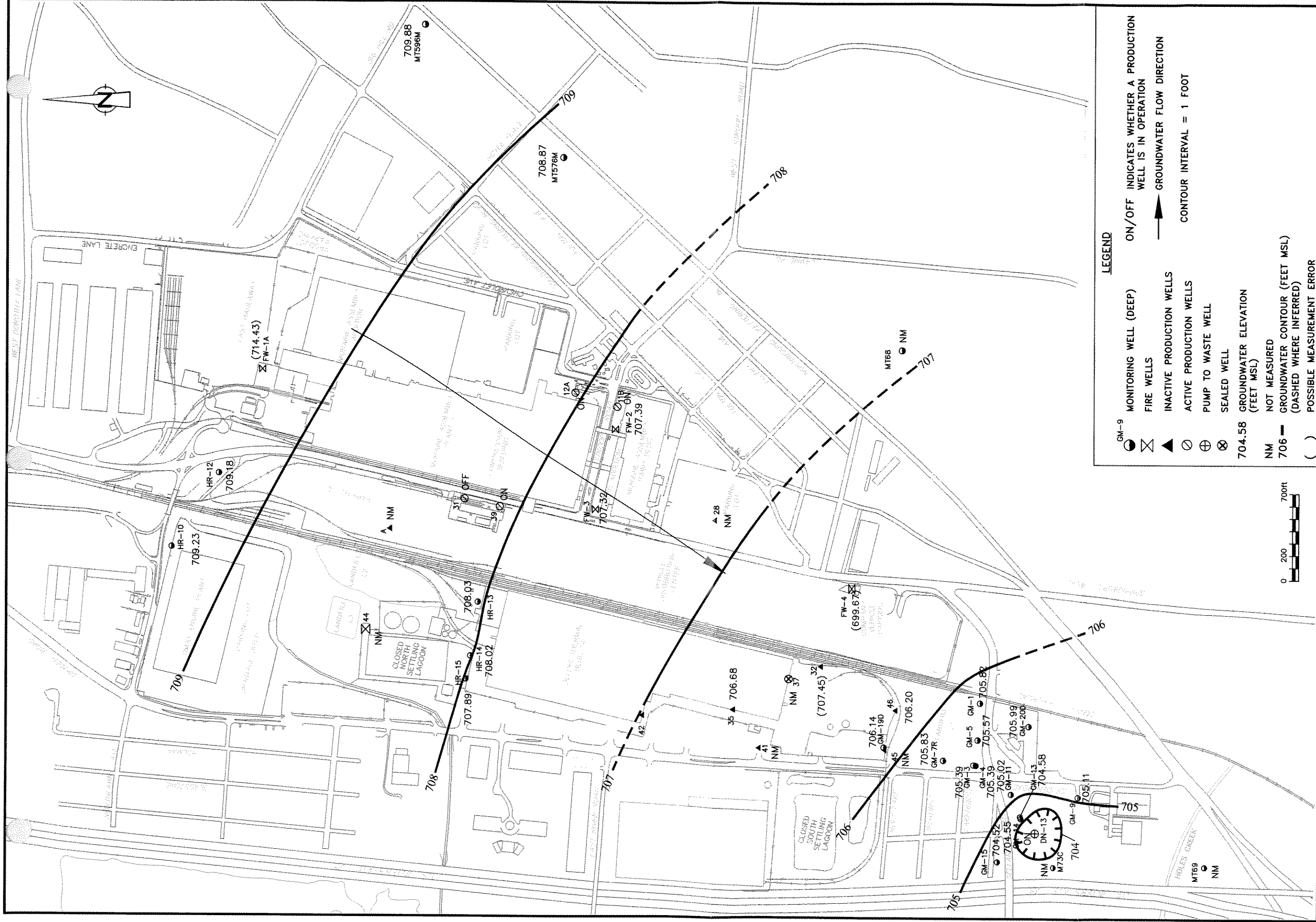
Depth-to-water elevations were measured March 24-25, 2003 using an electronic water-level indicator.

Depth-to-water measurements are reported in feet below the measuring point.



WATER TABLE SURFACE (UPPER AQUIFER)
ON MARCH 24-25, 2003
GENERAL MOTORS CORPORATION
MORAIN, OHIO

DATE	5/12/2003	PROJECT MANAGER	N. GILLOTTI	DRAWING NAME	DRA\0103\SHAL03
DRAWN	R. SMITH	LEAD DESIGN PROF.	J. REID	CHECKED	N. GILLOTTI
PROJECT NUMBER	OH000294.0006.0003	DRAWING NUMBER			3



LEGEND

GM-9	MONITORING WELL (DEEP)	ON/OFF	INDICATES WHETHER A PRODUCTION WELL IS IN OPERATION
⊗	FIRE WELLS	→	GROUNDWATER FLOW DIRECTION
▲	INACTIVE PRODUCTION WELLS		CONTOUR INTERVAL = 1 FOOT
○	ACTIVE PRODUCTION WELLS		
⊕	PUMP TO WASTE WELL		
⊗	SEALED WELL		
704.58	GROUNDWATER ELEVATION (FEET MSL)		
NM	NOT MEASURED		
706	GROUNDWATER CONTOUR (FEET MSL) (DASHED WHERE INFERRED)		
()	POSSIBLE MEASUREMENT ERROR		



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Closed North Settling Lagoon

2nd Quarter June 2003



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Groundwater Sampling Logs



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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/24/2003
 Site/Well No. HR-2 Replicate No. Code No.
 Weather Sun/80's Sampling Time: Begin 1450 End 1550

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 734.75
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 58.54
 Depth to Water (ft bmp) 26.25
 Water-Level Elevation (ft) 708.50
 Water Column in Well (ft) 32.29
 Casing Diameter/Type 2"
 Gallons in Well 5.17
 Gallons Pumped/Bailed
 Prior to Sampling 5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 53'
 Purge Time begin 1505 end 1535
 Pumping Rate 600 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.85
 Conductivity
 (mS/cm)
 (umhos/cm) 1110
 Turbidity (NTU) NR
 Temperature (°C) 16.77
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 54
 Sampling Method Low Flow

Remarks Sample time @ 1538
Final DTW: 26.27

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/ C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-2

Depth of Sampling 53'

Time Pump Started 1505

Date 6/24/2003

Parameters	Time									
	1508	1511	1514	1517	1520	1523	1526	1529	1532	1535
Redox Potential (millivolts)	160	149	123	104	86	76	58	52	56	54
Dissolved Oxygen (mg/L)	4.70	3.22	1.59	0.88	0.56	0.33	0.12	NR	NR	NR
pH (s.u.)	6.69	6.56	6.49	6.51	6.57	6.64	6.79	6.88	6.86	6.85
Specific Conductance (uS/cm)	1,120	1,130	1,130	1,120	1,120	1,120	1,110	1,110	1,110	1,110
Temperature (C)	16.51	16.70	16.92	17.27	17.28	17.41	17.45	17.06	16.70	16.77

Flow Rate 600 ml/min

Total Depth of Well: 58.54'

Time Sampled 1538

Depth to Water Before Purging: 26.25'

Total Water Pumped 5 Gallons

Depth to Water After Purging: 26.27'

Comments NR - not recorded, DO probe quit working at 1529

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Water Sampling Log

Project	GM-Lagoon Monitoring	Project No.	OH00294.006.002	Page	1	of	1
Site Location	Moraine, Ohio			Date	6/24/2003		
Site/Well No.	HR-3	Replicate No.		Code No.			
Weather	Sun, 90's	Sampling Time:	Begin 1600	End	1650		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	736.75
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	61.98
Depth to Water (ft bmp)	28.37
Water-Level Elevation (ft)	708.38
Water Column in Well (ft)	33.61
Casing Diameter/Type	2"
Gallons in Well	5.38
Gallons Pumped/Bailed Prior to Sampling	5
Sample Pump Intake Setting (ft bmp)	57'
Purge Time	begin 1614 end 1642
Pumping Rate	600 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.71
Conductivity (mS/cm)	
(µmhos/cm)	1190
Turbidity (NTU)	NR
Temperature (°C)	16.81
Dissolved Oxygen (mg/L)	NR
ORP (mV)	34
Sampling Method	Low Flow

Remarks	Sample time @ 1643
	Final DTW: 28.36

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-3 Time Pump Started 1614

Depth of Sampling 57' Date 6/24/2003

Parameters	Time									
	1617	1620	1623	1626	1629	1632	1635	1638	1641	
Redox Potential (millivolts)	137	98	80	65	59	50	43	38	34	
Dissolved Oxygen (mg/L)	4.43	1.93	1.23	0.67	0.38	0.16	NR	NR	NR	
pH (s.u.)	6.59	6.35	6.41	6.50	6.54	6.59	6.63	6.67	6.71	
Specific Conductance (uS/cm)	1,230	1,230	1,290	1,210	1,210	1,210	1,200	1,190	1,190	
Temperature (C)	16.33	16.27	16.43	16.50	16.72	16.62	16.84	16.91	16.81	

Flow Rate 600 ml/min Total Depth of Well: 61.98'

Time Sampled 1643 Depth to Water Before Purging: 28.37'

Total Water Pumped 5 Gallons Depth to Water After Purging: 28.36'

Comments NR - not recorded, DO probe quit working at 1635

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Water Sampling Log

Project	GM-Lagoon Monitoring	Project No.	OH00294.006.002	Page	1	of	1
Site Location	Moraine, Ohio			Date	6/24/2003		
Site/Well No.	HR-13	Replicate No.		Code No.			
Weather	Sun, 90's	Sampling Time: Begin	1653	End	1740		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	735.03
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	86.05
Depth to Water (ft bmp)	26.53
Water-Level Elevation (ft)	708.50
Water Column in Well (ft)	59.52
Casing Diameter/Type	4"
Gallons in Well	38.69
Gallons Pumped/Bailed Prior to Sampling	6.5 Pumped
Sample Pump Intake Setting (ft bmp)	80'
Purge Time	begin 1704 end 1723
Pumping Rate	800 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.55
Conductivity (mS/cm)	
(µmhos/cm)	1370
Turbidity (NTU)	NR
Temperature (°C)	17.37
Dissolved Oxygen (mg/L)	NR
ORP (mV)	9
Sampling Method	Low Flow
Remarks	Sample time @ 1725
	Final DTW: 26.53

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-13

Depth of Sampling 80'

Time Pump Started 1704

Date 6/24/2003

Parameters

	1707	1710	1713	1716	1719	1722			
Redox Potential (millivolts)	-60	-12	-1	5	9	9			
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR			
pH (s.u.)	6.70	6.48	6.47	6.47	6.52	6.55			
Specific Conductance (uS/cm)	1,350	1,390	1,380	1,380	1,370	1,370			
Temperature (C)	17.75	17.48	17.21	17.18	17.47	17.37			

Flow Rate 800 ml/min

Time Sampled 1725

Total Water Pumped 6.5 Gallons

Comments NR - not recorded, DO probe not working

Total Depth of Well: 86.05

Depth to Water Before Purging: 26.53

Depth to Water After Purging: 26.53

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/25/2003
 Site/Well No. HR-7 Replicate No. Code No.
 Weather Sun, 70's Sampling Time: Begin 0820 End 0915

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 731.73
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 57.36
 Depth to Water (ft bmp) 23.67
 Water-Level Elevation (ft) 708.06
 Water Column in Well (ft) 33.69
 Casing Diameter/Type 2"
 Gallons in Well 5.39
 Gallons Pumped/Bailed
 Prior to Sampling 3 Pumped
 Sample Pump Intake
 Setting (ft bmp) 52'
 Purge Time begin 0837 end 0902
 Pumping Rate 400 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.72
 Conductivity
 (mS/cm)
 (µmhos/cm) 1230
 Turbidity (NTU) NR
 Temperature (°C) 18.03
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 102
 Sampling Method Low Flow

Remarks Sample time @ 0905
Final DTW: 23.76

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/ C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-7 Time Pump Started 0837

Depth of Sampling 52' Date 6/25/2003

Parameters	Time									
	0840	0843	0846	0849	0852	0855	0858	901		
Redox Potential (millivolts)	207	194	177	157	142	124	111	102		
Dissolved Oxygen (mg/L)	3.10	1.57	0.94	0.51	0.28	0.10	NR	NR		
pH (s.u.)	6.32	6.38	6.46	6.55	6.61	6.65	6.69	6.72		
Specific Conductance (uS/cm)	1270	1270	1260	1250	1240	1230	1230	1230		
Temperature (C)	16.88	17.32	17.56	17.72	17.81	17.89	18.01	18.03		

Flow Rate 400 ml/min Total Depth of Well: 57.36'

Time Sampled 0905 Depth to Water Before Purging: 23.67'

Total Water Pumped 3 Gallons Depth to Water After Purging: 23.76'

Comments NR - not recorded, DO probe not working

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/25/2003
 Site/Well No. HR-11 Replicate No. Code No.
 Weather Sun, 70's Sampling Time: Begin 0918 End 1000

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 743.33
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 69.00
 Depth to Water (ft bmp) 33.65
 Water-Level Elevation (ft) 709.68
 Water Column in Well (ft) 35.35
 Casing Diameter/Type 2"
 Gallons in Well 5.66
 Gallons Pumped/Bailed
 Prior to Sampling 7 Pumped
 Sample Pump Intake
 Setting (ft bmp) 64'
 Purge Time begin 0928 end 0949
 Pumping Rate 1000 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.52
 Conductivity (mS/cm)
 (µmhos/cm) 1350
 Turbidity (NTU) NR
 Temperature (°C) 16.99
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 56
 Sampling Method Low Flow
 Remarks Sample time @ 950
Final DTW: 33.66

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-11 Time Pump Started 9:28

Depth of Sampling 64' Date 6/25/2003

Parameters	Time									
	0931	0934	0937	0940	0943	0946	0949			
Redox Potential (millivolts)	136	108	86	71	66	60	56			
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR	NR			
pH (s.u.)	6.58	6.35	6.31	6.38	6.42	6.47	6.52			
Specific Conductance (uS/cm)	1,410	1,410	1,400	1,380	1,380	1,360	1,350			
Temperature (C)	16.98	16.92	17.00	17.05	16.98	17.02	16.99			

Flow Rate 1000 ml/min Total Depth of Well: 69.00'

Time Sampled 950 Depth to Water Before Purging: 33.65

Total Water Pumped 7 Gallons Depth to Water After Purging: 33.66

Comments NR - not recorded, DO probe not working

ARCADIS

Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH00294.006.002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>6/25/2003</u>		
Site/Well No.	<u>HR-12</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Sun, 70's</u>	Sampling Time: Begin	<u>1000</u>	End	<u>1100</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>742.64</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>130.10</u>
Depth to Water (ft bmp)	<u>32.98</u>
Water-Level Elevation (ft)	<u>709.66</u>
Water Column in Well (ft)	<u>97.12</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>63.13</u>
Gallons Pumped/Bailed Prior to Sampling	<u>7.5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>125'</u>
Purge Time	begin <u>1020</u> end <u>1039</u>
Pumping Rate	<u>1100 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.61</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1340</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.23</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>-124</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1040</u>
	<u>Final DTW: 32.98</u>

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location Moraine, Ohio

Monitoring Well No. HR-12

Depth of Sampling 125'

Time Pump Started 1021

Date 6/25/2003

Parameters	1024	1027	1030	1033	1036	1039	Time					
Redox Potential (millivolts)	-109	-107	-112	-118	-123	-124						
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR						
pH (s.u.)	6.52	6.41	6.47	6.54	6.58	6.61						
Specific Conductance (uS/cm)	1,510	1,450	1,420	1,380	1,330	1,340						
Temperature (C)	16.07	16.12	16.10	16.25	16.24	16.23						

Flow Rate 1100 ml/min

Time Sampled 1040

Total Water Pumped 7.5 Gallons

Comments NR - not recorded, DO probe not working

Total Depth of Well: 130.1

Depth to Water Before Purging: 32.98

Depth to Water After Purging: 32.98

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Water Sampling Log

Project	GM-Lagoon Monitoring	Project No.	OH00294.006.002	Page	1	of	1
Site Location	Moraine, Ohio			Date	6/25/2003		
Site/Well No.	W-1-N	Replicate No.		Code No.			
Weather	Sun, 80's	Sampling Time:	Begin 1353	End	1445		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	739.02
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	71.50
Depth to Water (ft bmp)	29.93
Water-Level Elevation (ft)	709.09
Water Column in Well (ft)	41.57
Casing Diameter/Type	4"
Gallons in Well	27.0
Gallons Pumped/Bailed Prior to Sampling	5 Pumped
Sample Pump Intake Setting (ft bmp)	60
Purge Time	begin 1407 end 1429
Pumping Rate	800 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.83
Conductivity (mS/cm)	
(µmhos/cm)	920
Turbidity (NTU)	NR
Temperature (°C)	16.79
Dissolved Oxygen (mg/L)	NR
ORP (mV)	58
Sampling Method	Low Flow
Remarks	Sample time @ 1430
	Final DTW: 29.93

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis-1,2-DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/ C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-1-N Time Pump Started 1407

Depth of Sampling 60' Date 6/25/2003

Parameters	Time									
	1410	1413	1416	1419	1422	1425	1428			
Redox Potential (millivolts)	97	86	78	70	63	61	58			
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR	NR			
pH (s.u.)	6.63	6.58	6.60	6.62	6.73	6.77	6.83			
Specific Conductance (uS/cm)	1,030	1,020	1,000	970	950	950	920			
Temperature (C)	16.54	16.67	16.85	16.92	16.87	16.86	16.79			

Flow Rate 800 ml/min Total Depth of Well: 71.50'

Time Sampled 1430 Depth to Water Before Purging: 29.93'

Total Water Pumped 5 gallons Depth to Water After Purging: 29.93'

Comments NR - not recorded, DO probe not working

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Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH00294.006.002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>6/25/2003</u>		
Site/Well No.	<u>W-2-N</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Sun, 80's</u>	Sampling Time: Begin	<u>1300</u>	End	<u>1350</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>731.68</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>59.55</u>
Depth to Water (ft bmp)	<u>23.16</u>
Water-Level Elevation (ft)	<u>708.52</u>
Water Column in Well (ft)	<u>36.39</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>23.65</u>
Gallons Pumped/Bailed Prior to Sampling	<u>4 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>50</u>
Purge Time	begin <u>1319</u> end <u>1338</u>
Pumping Rate	<u>600 ml/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.74</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1170</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>17.76</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>-94</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1340</u>
	<u>Final DTW: 23.30</u>

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis-1,2-DCE	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
SpC, pH	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>

Sampling Personnel J. Manzo/ C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-2-N Time Pump Started 1319

Depth of Sampling 54' Date 6/25/2003

Parameters

	Time										
	1322	1325	1328	1331	1334	1337					
Redox Potential (millivolts)	-104	-95	-93	-96	-95	-94					
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR					
pH (s.u.)	6.77	6.54	6.59	6.64	6.70	6.74					
Specific Conductance (uS/cm)	1,240	1,230	1,190	1,180	1,170	1,170					
Temperature (C)	17.00	16.88	17.05	17.28	17.65	17.76					

Flow Rate 600 ml/min Total Depth of Well: 59.55'

Time Sampled 1340 Depth to Water Before Purging: 23.16'

Total Water Pumped 4 Gallons Depth to Water After Purging: 23.30'

Comments NR - not recorded, DO probe not working

ARCADIS

Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH00294.006.002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>6/25/2003</u>		
Site/Well No.	<u>HR-4</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Sun/80's</u>	Sampling Time: Begin	<u>1443</u>	End	<u>1528</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>742.60</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>67.16</u>
Depth to Water (ft bmp)	<u>33.60</u>
Water-Level Elevation (ft)	<u>709.00</u>
Water Column in Well (ft)	<u>33.56</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>5.37</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>62</u>
Purge Time	<u>begin 1450 end 1518</u>
Pumping Rate	<u>700 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.92</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>950</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>18.39</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>61</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1520</u>
	<u>Final DTW: 33.60</u>

Constituents Sampled	Container Description	Number	Preservative
<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location GM- Moraine, Ohio

Monitoring Well No. HR-4

Time Pump Started 1450

Depth of Sampling 62' Date 6/25/2003

Parameters

	1453	1456	1459	1502	1505	1508	1511	1514	1517	
Redox Potential (millivolts)	139	126	114	105	97	85	73	66	61	
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR	NR	NR	NR	
pH (s.u.)	6.91	6.76	6.72	6.72	6.74	6.79	6.85	6.89	6.92	
Specific Conductance (uS/cm)	980	980	980	970	970	960	950	950	950	
Temperature (C)	17.51	17.52	17.57	17.76	17.92	18.07	18.41	18.42	18.39	

Flow Rate 700 ml/min

Total Depth of Well: 67.16'

Time Sampled 1520

Depth to Water Before Purging: 33.60'

Total Water Pumped 5 Gallons

Depth to Water After Purging: 33.60'

Comments NR - not recorded, DO probe not working

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/25/2003
 Site/Well No. W-3-N Replicate No. W-3-E @ 1610 Code No.
 Weather Sun, 90's Sampling Time: Begin 1542 End 1620

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 733.66
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 57.85
 Depth to Water (ft bmp) 25.29
 Water-Level Elevation (ft) 708.37
 Water Column in Well (ft) 32.56
 Casing Diameter/Type 4"
 Gallons in Well 5.21
 Gallons Pumped/Bailed
 Prior to Sampling 7 Pumped
 Sample Pump Intake
 Setting (ft bmp) 50
 Purge Time begin 1550 end 1609
 Pumping Rate 1100 ml/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.71
 Conductivity
 (mS/cm)
 (µmhos/cm) 1100
 Turbidity (NTU) NR
 Temperature (°C) 15.55
 Dissolved Oxygen (mg/L) NR
 ORP (mV) -138
 Sampling Method Low Flow
 Remarks Sample time @ 1610
BB @ 1620
Final DTW: 25.36

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis-1,2-DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-3-N Time Pump Started 1550

Depth of Sampling 50' Date 6/25/2003

Parameters	Time									
	1553	1556	1559	1602	1606	1609				
Redox Potential (millivolts)	-126	-123	-132	-136	-136	-138				
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR				
pH (s.u.)	6.69	6.55	6.73	6.73	6.69	6.71				
Specific Conductance (uS/cm)	1,210	1,210	1,150	1,080	1,050	1,100				
Temperature (C)	16.37	17.07	16.50	15.99	15.61	15.55				

Flow Rate 1100 ml/min Total Depth of Well: 57.85'

Time Sampled 1610 Depth to Water Before Purging: 25.29'

Total Water Pumped 7 Gallons Depth to Water After Purging: 25.36'

Comments NR - not recorded, DO probe not working

ARCADIS

Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH00294.006.002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>6/25/2003</u>		
Site/Well No.	<u>HR-15</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Sun, 90's</u>	Sampling Time: Begin	<u>1625</u>	End	<u>1710</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>733.74</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>102.45</u>
Depth to Water (ft bmp)	<u>25.54</u>
Water-Level Elevation (ft)	<u>708.20</u>
Water Column in Well (ft)	<u>76.91</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>49.99</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>97'</u>
Purge Time	begin <u>1631</u> end <u>1649</u>
Pumping Rate	<u>1000 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.75</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>990</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.18</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>-130</u>
Sampling Method	<u>Low Flow</u>

Remarks Sample time @ 1650
Final DTW: 25.63

Constituents Sampled

Container Description

Number

Preservative

<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	misl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-15

Time Pump Started 1631

Depth of Sampling 97' Date 6/25/2003

Parameters

	Time									
	1634	1637	1640	1643	1646	1649				
Redox Potential (millivolts)	-123	-120	-121	-124	-128	-130				
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR				
pH (s.u.)	6.85	6.71	6.66	6.68	6.72	6.75				
Specific Conductance (uS/cm)	1,080	1,060	1,030	1,000	990	990				
Temperature (C)	15.93	16.06	16.07	16.10	16.13	16.18				

Flow Rate 1000 ml/min

Total Depth of Well: 102.45'

Time Sampled

1650

Depth to Water Before Purging: 25.54'

Total Water Pumped

5 Gallons

Depth to Water After Purging: 25.63'

Comments

NR - not recorded, DO probe not working

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/26/2003
 Site/Well No. HR-16 Replicate No. _____ Code No. _____
 Weather Sun, 70s Sampling Time: Begin 0828 End 0920

Evacuation Data

Measuring Point Top of PVC
 MP Elevation (ft) 727.01
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 64.60
 Depth to Water (ft bmp) 20.52
 Water-Level Elevation (ft) 706.49
 Water Column in Well (ft) 44.08
 Casing Diameter/Type 4"
 Gallons in Well 28.65
 Gallons Pumped/Bailed Prior to Sampling 3.5
 Sample Pump Intake Setting (ft bmp) 59'
 Purge Time begin 0843 end 0908
 Pumping Rate 400 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.80
 Conductivity (mS/cm) _____
 (µmhos/cm) 1230
 Turbidity (NTU) NR
 Temperature (°C) 17.57
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 3
 Sampling Method Low Flow
 Remarks Sample time @ 0910
Final DTW: 20.59

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
SpC, pH	1 liter plastic	1	Cool
TOC	500 ml amber glass	2	H ₂ SO ₄ , Cool
TOX	1 liter amber glass	2	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-16

Time Pump Started 0843

Depth of Sampling 59' Date 6/26/2003

Parameters

	0846	0849	0852	0855	0858	0901	0904	0907		
Redox Potential (millivolts)	188	113	67	42	23	12	7	3		
Dissolved Oxygen (mg/L)	4.28	2.05	1.13	NR	NR	NR	NR	NR		
pH (s.u.)	6.49	6.50	6.54	6.60	6.67	6.73	6.77	6.80		
Specific Conductance (uS/cm)	1,230	1,230	1,230	1,230	1,230	1,220	1,230	1,230		
Temperature (C)	17.10	17.20	17.35	17.43	17.51	17.51	17.56	17.57		

Flow Rate 400 ml/min

Total Depth of Well: 64.60'

Time Sampled 0910

Depth to Water Before Purging: 20.52'

Total Water Pumped 3.5 Gallons

Depth to Water After Purging: 20.59'

Comments NR - not recorded, DO probe not working properly

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/26/2003
 Site/Well No. W-2-S Replicate No. _____ Code No. _____
 Weather Sun, 80's Sampling Time: Begin 0922 End 1007

Evacuation Data

Measuring Point Top of PVC
 MP Elevation (ft) 726.64
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 67.12
 Depth to Water (ft bmp) 20.71
 Water-Level Elevation (ft) 705.93
 Water Column in Well (ft) 46.95
 Casing Diameter/Type 4"
 Gallons in Well 7.51
 Gallons Pumped/Bailed
 Prior to Sampling 8 Pumped
 Sample Pump Intake
 Setting (ft bmp) 50
 Purge Time begin 0929 end 0952
 Pumping Rate 1100 ml/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.92
 Conductivity
 (mS/cm) _____
 (µmhos/cm) 1230
 Turbidity (NTU) NR
 Temperature (°C) 16.40
 Dissolved Oxygen (mg/L) NR
 ORP (mV) -16
 Sampling Method Low Flow

Remarks Sample time @ 0953
Final DTW: 20.78

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
SpC, pH	1 liter plastic	1	Cool
TOC	500 ml amber glass	2	H ₂ SO ₄ , Cool
TOX	1 liter amber glass	2	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes				
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-2-S

Time Pump Started 0929

Depth of Sampling 50' Date 6/26/2003

Parameters

	0932	0935	0938	0941	0945	0948	0951		
Redox Potential (millivolts)	-2	-9	-11	-12	-14	-16	-16		
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR	NR		
pH (s.u.)	6.87	6.78	6.76	6.81	6.86	6.89	6.92		
Specific Conductance (uS/cm)	1,250	1,250	1,250	1,250	1,240	1,230	1,230		
Temperature (C)	15.99	16.15	16.21	16.26	16.30	16.34	16.40		

Flow Rate 1100 ml/min

Total Depth of Well: 67.12'

Time Sampled 0953

Depth to Water Before Purging: 20.71'

Total Water Pumped 8 Gallons

Depth to Water After Purging: 20.78

Comments NR - not recorded, DO probe not working

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/26/2003
 Site/Well No. W-3-S Replicate No. _____ Code No. _____
 Weather Sun/humid, 83 degrees Sampling Time: Begin 1008 End 1043

Evacuation Data

Measuring Point Top of PVC
 MP Elevation (ft) 733.42
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 77.84
 Depth to Water (ft bmp) 23.15
 Water-Level Elevation (ft) 710.27
 Water Column in Well (ft) 54.69
 Casing Diameter/Type 4"
 Gallons in Well 35.55
 Gallons Pumped/Bailed
 Prior to Sampling 6 pumped
 Sample Pump Intake
 Setting (ft bmp) 60
 Purge Time begin 1012 end 1027
 Pumping Rate 900 ml/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.86
 Conductivity
 (mS/cm) _____
 (µmhos/cm) 1190
 Turbidity (NTU) NR
 Temperature (°C) 16.95
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 32
 Sampling Method Low Flow

Remarks Sample time @ 1030
Final DTW: 23.15

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
SpC, pH	1 liter plastic	1	Cool
TOC	500 ml amber glass	2	H ₂ SO ₄ , Cool
TOX	1 liter amber glass	2	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/26/2003
 Site/Well No. W-4-S Replicate No. W-4-E @ 1110 Code No. _____
 Weather Sun/humid, 83 degrees Sampling Time: Begin 1043 End 1130

Evacuation Data

Measuring Point Top of PVC
 MP Elevation (ft) 727.68
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 50.95
 Depth to Water (ft bmp) 21.65
 Water-Level Elevation (ft) 706.03
 Water Column in Well (ft) 29.30
 Casing Diameter/Type 4"
 Gallons in Well 19.05
 Gallons Pumped/Bailed Prior to Sampling 5 Pumped
 Sample Pump Intake Setting (ft bmp) 40
 Purge Time begin 1050 end 1109
 Pumping Rate 1100 ml/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Cloudy
 pH (s.u.) 6.72
 Conductivity (mS/cm) _____
 (µmhos/cm) 1460
 Turbidity (NTU) NR
 Temperature (°C) 18.51
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 28
 Sampling Method Low Flow
 Remarks Sample time @ 1110
BB-2 Sample time @ 1125
Final DTW: 21.65

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
SpC, pH	1 liter plastic	1	Cool
TOC	500 ml amber glass	2	H ₂ SO ₄ , Cool
TOX	1 liter amber glass	2	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-4-S

Depth of Sampling 40' Time Pump Started 1050

Parameters Date 6/26/2003

	1053	1056	1059	1102	1105	1108	Time					
Redox Potential (millivolts)	85	49	35	31	29	28						
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR						
pH (s.u.)	6.73	6.70	6.69	6.71	6.71	6.72						
Specific Conductance (uS/cm)	1,470	1,470	1,470	1,470	1,470	1,460						
Temperature (C)	18.17	18.34	18.41	18.45	18.47	18.51						

Flow Rate 1100 ml/min

Total Depth of Well: 50.95'

Time Sampled 1110

Total Water Pumped 5 Gallons Depth to Water Before Purging: 21.65'

Comments NR - not recorded, DO probe not working Depth to Water After Purging: 21.65'

ARCADIS Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/26/2003
 Site/Well No. HR-17 Replicate No. Code No.
 Weather Sun/humid, 84 degrees Sampling Time: Begin 1137 End 1215

Evacuation Data

Measuring Point Top of PVC
 MP Elevation (ft) 726.43
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 48.05
 Depth to Water (ft bmp) 19.67
 Water-Level Elevation (ft) 706.76
 Water Column in Well (ft) 28.38
 Casing Diameter/Type 4"
 Gallons in Well 18.45
 Gallons Pumped/Bailed Prior to Sampling 4.5
 Sample Pump Intake Setting (ft bmp) 40
 Purge Time begin 1144 end 1159
 Pumping Rate 900 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.73
 Conductivity (mS/cm)
 (µmhos/cm) 1300
 Turbidity (NTU) NR
 Temperature (°C) 18.29
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 55
 Sampling Method Low Flow
 Remarks Sample time @ 1200
Final DTW: 19.75

Constituents Sampled	Container Description	Number	Preservative
SpC, pH	1 liter plastic	1	Cool
TOC	500 ml amber glass	2	H ₂ SO ₄ Cool
TOX	1 liter amber glass	2	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft. 1-1/4" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-1/2" = 0.09 2-1/2" = 0.26 3-1/2" = 0.50 6" = 1.47

bmp below measuring point ml milliliter NTU Nephelometric Turbidity Units
 °C Degrees Celsius mS/cm Millisiemens per centimeter PVC Polyvinyl chloride
 ft feet msl mean sea-level s.u. Standard units
 gpm Gallons per minute N/A Not Applicable umhos/cm Micromhos per centimeter
 mg/L Milligrams per liter NR Not Recorded VOC Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-17

Time Pump Started 1144

Depth of Sampling 40' Date 6/26/2003

Parameters

	Time									
	1147	1150	1153	1156	1159					
Redox Potential (millivolts)	87	72	64	58	55					
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR					
pH (s.u.)	6.74	6.72	6.72	6.72	6.73					
Specific Conductance (uS/cm)	1,310	1,310	1,310	1,300	1,300					
Temperature (C)	18.17	18.31	18.31	18.32	18.29					

Flow Rate 900 ml/min

Total Depth of Well: 48.05'

Time Sampled 1200

Depth to Water Before Purging: 19.67'

Total Water Pumped 4.5 Gallons

Depth to Water After Purging: 19.75'

Comments NR - not recorded, DO probe not working

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/26/2003
 Site/Well No. HR-8 Replicate No. Code No.
 Weather Sun/humid, 80's Sampling Time: Begin 1300 End 1345

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 743.42
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 66.39
 Depth to Water (ft bmp) 34.24
 Water-Level Elevation (ft) 709.18
 Water Column in Well (ft) 32.15
 Casing Diameter/Type 2"
 Gallons in Well 5.14
 Gallons Pumped/Bailed
 Prior to Sampling 8 Pumped
 Sample Pump Intake
 Setting (ft bmp) 61'
 Purge Time begin 1307 end 1323
 Pumping Rate 1100 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.59
 Conductivity
 (mS/cm)
 (µmhos/cm) 1420
 Turbidity (NTU) NR
 Temperature (°C) 16.98
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 94
 Sampling Method Low Flow
 Remarks Sample time @ 1325
Final DTW: 34.26

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/ C. Capell

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-8

Time Pump Started 1307

Depth of Sampling 61' Date 6/26/2003

Parameters

	1310	1313	1316	1319	1322	Time				
Redox Potential (millivolts)	109	109	104	100	94					
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR					
pH (s.u.)	6.49	6.40	6.45	6.52	6.59					
Specific Conductance (uS/cm)	1,430	1,430	1,430	1,430	1,420					
Temperature (C)	16.95	16.99	16.94	17.01	16.98					

Flow Rate 1100 ml/min

Total Depth of Well: 66.39'

Time Sampled 1325

Depth to Water Before Purging: 34.24'

Total Water Pumped 8 Gallons

Depth to Water After Purging: 34.26'

Comments NR - not recorded, DO probe not working

ARCADIS Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH00294.006.002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>6/26/2003</u>		
Site/Well No.	<u>HR-9</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Sun/humid, 90's</u>	Sampling Time: Begin	<u>1344</u>	End	<u>1445</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>743.51</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>69.75</u>
Depth to Water (ft bmp)	<u>33.86</u>
Water-Level Elevation (ft)	<u>709.65</u>
Water Column in Well (ft)	<u>35.89</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>5.74</u>
Gallons Pumped/Bailed Prior to Sampling	<u>3.5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>64'</u>
Purge Time	begin <u>1400</u> end <u>1431</u>
Pumping Rate	<u>400 mL/mn</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.69</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1150</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>18.37</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>32</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1432</u>
	<u>Final DTW: 33.90</u>

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/ C. Capell

Well Casing Volumes					
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	
bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-9

Time Pump Started 1400

Depth of Sampling 64' Date 6/26/2003

Parameters

	1403	1406	1409	1412	1415	1418	1421	1424	1427	1430	
Redox Potential (millivolts)	124	106	93	78	66	56	45	36	33	32	
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
pH (s.u.)	6.72	6.53	6.48	6.47	6.51	6.56	6.61	6.66	6.67	6.69	
Specific Conductance (uS/cm)	1,190	1,190	1,190	1,180	1,180	1,170	1,170	1,160	1,160	1,150	
Temperature (C)	17.81	18.00	18.14	18.47	18.42	18.90	19.20	18.49	18.79	18.37	

Flow Rate 400 ml/min

Total Depth of Well: 69.75'

Time Sampled 1432

Depth to Water Before Purging: 33.86'

Total Water Pumped 3.5 Gallons

Depth to Water After Purging: 33.9'

Comments NR - not recorded, DO probe not working

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/26/2003
 Site/Well No. HR-10 Replicate No. _____ Code No. _____
 Weather Clouds/humid, 80's Sampling Time: Begin 1435 End 1515

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 742.81
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 126.74
 Depth to Water (ft bmp) 33.15
 Water-Level Elevation (ft) 709.66
 Water Column in Well (ft) 93.59
 Casing Diameter/Type 4"
 Gallons in Well 60.83
 Gallons Pumped/Bailed
 Prior to Sampling 4.5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 120'
 Purge Time begin 1441 end 1457
 Pumping Rate 1100 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.65
 Conductivity
 (mS/cm) _____
 (µmhos/cm) 1300
 Turbidity (NTU) NR
 Temperature (°C) 15.86
 Dissolved Oxygen (mg/L) NR
 ORP (mV) -131
 Sampling Method Low Flow

Remarks Sample time @ 1458
Final DTW: 33.20

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-10

Depth of Sampling 120'

Time Pump Started 1441

Date 6/26/2003

Parameters	Time									
	1444	1447	1450	1453	1456					
Redox Potential (millivolts)	-127	-123	-123	-128	-131					
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR					
pH (s.u.)	6.78	6.60	6.55	6.60	6.65					
Specific Conductance (uS/cm)	1,360	1,350	1,340	1,320	1,300					
Temperature (C)	15.61	15.69	15.75	15.84	15.86					

Flow Rate 1100 ml/min

Time Sampled 1458

Total Water Pumped 4.5 Gallons

Comments NR - not recorded, DO probe not working

Total Depth of Well: 126.74'

Depth to Water Before Purging: 33.15'

Depth to Water After Purging: 33.20'

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Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH00294.006.002</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>6/26/2003</u>
Site/Well No.	<u>HR-14</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Clouds/Humid, 80's</u>	Sampling Time:	Begin <u>1518</u>	End	<u>1550</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>731.63</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>89.55</u>
Depth to Water (ft bmp)	<u>23.39</u>
Water-Level Elevation (ft)	<u>708.24</u>
Water Column in Well (ft)	<u>66.16</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>43.0</u>
Gallons Pumped/Bailed Prior to Sampling	<u>3 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>84'</u>
Purge Time	begin <u>1529</u> end <u>1544</u>
Pumping Rate	<u>700 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.59</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1170</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.29</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>-110</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1545</u>
	<u>Final DTW: 23.39</u>

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	4	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-14

Time Pump Started 1529

Depth of Sampling 84'

Date 6/26/2003

Parameters

	1532	1535	1538	1541	1544	Time			
Redox Potential (millivolts)	-111	-106	-105	-107	-110				
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR				
pH (s.u.)	6.77	6.60	6.56	6.56	6.59				
Specific Conductance (uS/cm)	1,190	1,180	1,180	1,170	1,170				
Temperature (C)	16.14	16.22	16.23	16.26	16.29				

Flow Rate 700 ml/min

Total Depth of Well: 89.55'

Time Sampled 1545

Depth to Water Before Purging: 23.39'

Total Water Pumped 3 Gallons

Depth to Water After Purging: 23.39'

Comments NR - not recorded, DO probe not working

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/26/2003
 Site/Well No. W-4-N Replicate No. Code No.
 Weather Clouds, 80's Sampling Time: Begin 1550 End 1630

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 731.63
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 67.07
 Depth to Water (ft bmp) 23.16
 Water-Level Elevation (ft) 708.47
 Water Column in Well (ft) 43.91
 Casing Diameter/Type 4"
 Gallons in Well 28.54
 Gallons Pumped/Bailed
 Prior to Sampling 6 Gallons pumped
 Sample Pump Intake
 Setting (ft bmp) 60
 Purge Time begin 1556 end 1617
 Pumping Rate 1000 ml/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.75
 Conductivity
 (mS/cm)
 (µmhos/cm) 1050
 Turbidity (NTU) NR
 Temperature (°C) 16.5
 Dissolved Oxygen (mg/L) NR
 ORP (mV) -29
 Sampling Method Low Flow
 Remarks Sample time @ 1620
Final DTW: 23.16

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis-1,2-DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-4-N

Time Pump Started 1556

Depth of Sampling 60' Date 6/26/2003

Parameters

	1559	1602	1605	1608	1611	1614	1617			
Redox Potential (millivolts)	-63	-54	-43	-36	-34	-32	-29			
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR	NR			
pH (s.u.)	6.77	6.72	6.72	6.73	6.74	6.74	6.75			
Specific Conductance (uS/cm)	1,090	1,080	1,070	1,060	1,060	1,050	1,050			
Temperature (C)	16.07	16.23	16.40	16.51	16.48	16.52	16.50			

Flow Rate 1000 ml/min

Total Depth of Well: 67.07'

Time Sampled 1620

Depth to Water Before Purging: 23.16'

Total Water Pumped 6 Gallons

Depth to Water After Purging: 23.16'

Comments NR - not recorded, DO probe not working

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/27/2003
 Site/Well No. HR-1 Replicate No. HR-1C @ 0938 Code No.
 Weather Sun, 60's Sampling Time: Begin 0858 End 0950

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 732.71
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 59.52
 Depth to Water (ft bmp) 25.63
 Water-Level Elevation (ft) 707.08
 Water Column in Well (ft) 33.89
 Casing Diameter/Type 2"
 Gallons in Well 5.42
 Gallons Pumped/Bailed
 Prior to Sampling 8 pumped
 Sample Pump Intake
 Setting (ft bmp) 54
 Purge Time begin 0918 end 0937
 Pumping Rate 1100 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.82
 Conductivity (mS/cm)
 (umhos/cm) 1290
 Turbidity (NTU) NR
 Temperature (°C) 19.8
 Dissolved Oxygen (mg/L) NR
 ORP (mV) 112
 Sampling Method Low Flow

Remarks Sample time @ 0938
Final DTW: 25.70

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-1

Time Pump Started 0918

Depth of Sampling 54'

Date 6/27/2003

Parameters

	Time									
	0921	0924	0927	0930	0933	0936				
Redox Potential (millivolts)	176	152	133	125	116	112				
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR	NR				
pH (s.u.)	6.72	6.78	6.81	6.82	6.82	6.82				
Specific Conductance (uS/cm)	1,300	1,300	1,290	1,290	1,290	1,290				
Temperature (C)	19.44	19.57	19.81	19.81	19.74	19.80				

Flow Rate 1100 ml/min

Total Depth of Well: 59.52'

Time Sampled 0938

Depth to Water Before Purging: 25.63'

Total Water Pumped 8 Gallons

Depth to Water After Purging: 25.70'

Comments NR - not recorded, DO probe not working

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Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH00294.006.002</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>6/27/2003</u>
Site/Well No.	<u>HR-6</u>	Replicate No.	<u></u>	Code No.	<u></u>
Weather	<u>Sun/ 60's</u>	Sampling Time: Begin	<u>0950</u>	End	<u>1027</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>732.66</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>55.17</u>
Depth to Water (ft bmp)	<u>25.23</u>
Water-Level Elevation (ft)	<u>707.43</u>
Water Column in Well (ft)	<u>29.94</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>4.79</u>
Gallons Pumped/Bailed Prior to Sampling	<u>7 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>50'</u>
Purge Time	begin <u>956</u> end <u>1012</u>
Pumping Rate	<u>1100 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.73</u>
Conductivity (mS/cm)	<u></u>
(µmhos/cm)	<u>1410</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>17.25</u>
Dissolved Oxygen (mg/L)	<u>NR</u>
ORP (mV)	<u>108</u>
Sampling Method	<u>Low Flow</u>

Remarks	<u>Sample time @ 1013</u>
	<u>Final DTW: 25.23</u>

Constituents Sampled	Container Description	Number	Preservative
<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>

Sampling Personnel	<u>J. Manzo/C. Capell</u>
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Well Casing Volumes					
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47	

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-6

Time Pump Started 0956

Depth of Sampling 50'

Date 6/27/2003

Parameters

	0959	1002	1005	1008	1011						
Redox Potential (millivolts)	129	121	116	111	108						
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR						
pH (s.u.)	6.76	6.69	6.70	6.71	6.73						
Specific Conductance (uS/cm)	1,420	1,420	1,420	1,410	1,410						
Temperature (C)	17.09	17.17	17.22	17.25	17.25						

Flow Rate 1100 ml/min

Total Depth of Well: 55.17'

Time Sampled 1013

Depth to Water Before Purging: 25.23'

Total Water Pumped 7 Gallons

Depth to Water After Purging: 25.23'

Comments NR - not recorded, DO probe not working

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH00294.006.002 Page 1 of 1
 Site Location Moraine, Ohio Date 6/27/2003
 Site/Well No. HR-5 Replicate No. Code No.
 Weather Sun/ 70's Sampling Time: Begin 1029 End 1115

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 734.27
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 57.86
 Depth to Water (ft bmp) 26.30
 Water-Level Elevation (ft) 707.97
 Water Column in Well (ft) 31.56
 Casing Diameter/Type 2"
 Gallons in Well 5.05
 Gallons Pumped/Bailed
 Prior to Sampling 6 Pumped
 Sample Pump Intake
 Setting (ft bmp) 52'
 Purge Time begin 1034 end 1049
 Pumping Rate 800 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.76
 Conductivity
 (mS/cm)
 (µmhos/cm) 1250
 Turbidity (NTU) NR
 Temperature (°C) 16.44
 Dissolved Oxygen (mg/L) NR
 ORP (mV) -73
 Sampling Method Low Flow

Remarks Sample time @ 1050
Final DTW: 26.35

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel J. Manzo/C. Capell

Well Casing Volumes					
Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47	

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH00294.006.002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-5

Time Pump Started 1034

Depth of Sampling 52' Date 6/27/2003

Parameters

	1037	1040	1043	1046	1049	Time				
Redox Potential (millivolts)	-42	-59	-66	-70	-73					
Dissolved Oxygen (mg/L)	NR	NR	NR	NR	NR					
pH (s.u.)	6.82	6.75	6.75	6.75	6.76					
Specific Conductance (uS/cm)	1,250	1,260	1,260	1,250	1,250					
Temperature (C)	15.96	16.19	16.31	16.38	16.44					

Flow Rate 800 ml/min

Total Depth of Well: 57.86'

Time Sampled 1050

Depth to Water Before Purging: 26.30'

Total Water Pumped 6 Gallons

Depth to Water After Purging: 26.35'

Comments NR - not recorded, DO probe not working



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DRAFT

Groundwater Analytical Results



Table 7. Appendix IX Organic Analyses from Shallow Monitoring Wells during the Second Quarter 2003 Monitoring of the Closed North Settling Lagoon, General Motors Corporation, Moraine, Ohio.

Appendix IX Constituent	Upgradient of Lagoon				Downgradient of Lagoon						Downgradient Some Distance from Lagoon			
	HR-9	HR-11	HR-8	W-1-N	HR-4	W-2-N	W-3-N	W-4-N	HR-2	HR-3	HR-5	HR-6	HR-7	HR-1
Laboratory pH*	8.15	8.08	8.1	8.2	8.2	8.2	8.2	8.18	7.0	7.0	8.0	8.0	8.2	8.0
Laboratory SpC*	1000	1275	1200	995	893	1100	1100	950	1000	1100	1100	1100	1150	1200
Total Volatile Organics*	79.45	20.1	27.85	5.05	4.8	5.74	168.2	15.89	12.37	30.86	22.52	35.11	4.75	86.49
Acetone	--	3.2 J	--	3.4 J	3.0 J	2.5 J	7.0 J	1.3 J	--	1.3 J	2.6 J	2.9 J	3.1 J	3.2 J
Benzene	--	--	--	--	--	--	--	--	--	--	--	1.0	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.44 J
Methylene chloride	0.65 J	--	0.58 J	--	--	--	--	0.58 J	--	--	--	1.7	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	11	--	8.3	--	--	--	--	--	--	--	--	--	--	2.3
1,1-Dichloroethane	38	11	13	--	--	--	--	--	--	--	--	--	--	0.74 J
1,2-Dichloroethane	1.7	--	--	--	--	--	--	1.2	4.0	13	0.48 J	--	--	2.9
cis-1,2-Dichloroethene	14	2.0	3.8	--	--	1.5	150	3.6	7.4	13	--	--	--	--
Tetrachloroethene	--	--	--	--	0.56 J	--	--	0.88 J	--	--	6.4	0.91	--	3.0
Toluene	--	1.8	--	0.91 J	--	0.42 J	--	--	--	--	--	--	--	30
trans-1,2-Dichloroethene	2.1	--	0.67	--	--	--	1.9 J	--	0.97	1.2	0.44 J	10	0.55 J	0.41 J
Trichloroethene	12	--	1.5	--	0.68 J	0.78 J	--	7.8	--	1.8	0.60	--	--	3.5
Vinyl chloride	--	--	--	--	--	--	9.3	0.53 J	--	1.8	12	8.7	1.1	40
Xylenes (total)	--	2.1	--	0.74 J	0.56 J	0.54 J	--	--	--	0.56 J	--	--	--	--

* All VOC concentrations in micrograms per liter (ug/L) as reported by the laboratory. Specific conductance is reported in umhos/cm and pH is reported in standard units.
 -- Not detected.

Shaded analytical results represent data from wells not directly downgradient of the North Settling Lagoon based on groundwater flow.
 J - Estimated result, result is less than reporting limit.

Table 8. Appendix IX Organic Analyses from Deep Monitoring Wells during the Second Quarter 2003 Monitoring of the Closed North Settling Lagoon, General Motors Corporation, Moraine, Ohio.

Appendix IX Constituent	Upgradient of Lagoon		Downgradient of Lagoon		
	HR-10	HR-12	HR-15	HR-14	HR-13
Laboratory pH*	8.1	8.08	8.2	8.2	6.95
Laboratory SpC*	1200	1350	983	1000	1225
Total Volatile Organics*	0.55	11.34	19.94	21.79	50
Acetone	--	2.9 J	1.8 J	--	--
Carbon disulfide	--	--	0.54 J	--	--
1,1-Dichloroethane	--	2.2	--	--	27
Chloroethane	--	0.34 J	--	--	--
cis-1,2-Dichloroethene	--	1.8	2.6	5.1	12
Methylene chloride	0.55 J	--	--	0.59 J	--
trans-1,2-Dichloroethene	--	--	--	--	--
1,1,1-Trichloroethane	--	--	--	--	1.6
Toluene	--	1.1	--	--	1.8 J
Trichloroethene	--	--	--	--	--
Vinyl chloride	--	1.6	--	4.1	7.6
Xylenes (total)	--	1.4	15	12	--

* All VOC concentrations in micrograms per liter (ug/L) as reported by the laboratory. Specific conductance is reported in umhos/cm and pH is reported in standard units.

-- Not detected.

Shaded analytical results represent data from wells not directly downgradient of the North Settling Lagoon based on groundwater flow.
J - Estimated result, result is less than reporting limit.

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Hydraulic Monitoring Data

Table 2. Water-Level Measurements Collected During Second Quarter 2003 from Shallow Monitoring Wells at Delphi Harrison Thermal Systems, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
Shallow Aquifer Wells			
W-1-N	739.02	29.93	709.09
W-2-N	731.68	23.16	708.52
W-3-N	733.66	25.29	708.37
W-4-N	731.63	23.16	708.47
HR-1	732.71	25.63	707.08
HR-2	734.75	26.25	708.5
HR-3	736.75	28.37	708.38
HR-4	742.60	33.60	709
HR-5	734.27	26.30	707.97
HR-6	732.66	25.23	707.43
HR-7	731.73	23.67	708.06
HR-8	743.42	34.24	709.18
HR-9	743.51	33.86	709.65
HR-11	743.33	33.65	709.68
HR-16	727.01	20.52	706.49
HR-17	726.43	19.67	706.76
W-1-S	729.29	22.33	706.96
W-2-S	726.64	20.71	705.93
W-3-S	733.42	23.15	710.27
W-4-S	727.68	21.65	706.03
GM-2	735.81	29.45	706.36
4S	731.36	25.97	705.39
GM-6	730.27	24.63	705.64
GM-8	735.17	29.38	705.79
GM-10	723.90	18.29	705.61
GM-16	725.30	20.55	704.75
GM-17	723.84	18.20	705.64
GM-18	723.80	18.25	705.55
GM-19S	730.85	24.32	706.53
EAST	730.98	24.00	706.98
WEST	731.08	24.29	706.79
WSU-24	725.10	18.71	706.39
WS-17	726.18	20.44	705.74
WS-18	733.52	27.58	705.94
WS-19	726.62	20.64	705.98
TW-2	733.38	31.99	701.39
RW-10	728.53	NM	NM
RW-11	729.74	22.90	706.84
GM-32	732.08	25.57	706.51
GM-33	729.77	22.78	706.99
GM-34	730.56	23.57	706.99
GM-35	731.27	24.78	706.49
GM-36	731.11	24.49	706.62
GM-37	730.05	23.37	706.68
GM-38	729.88	23.25	706.63

Measuring point is to top of the PVC Casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on June 23 and 24, 2003 using an electronic water level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

Table 3. Water-Level Measurements During Second Quarter 2003 from Shallow Monitoring Wells at the Moraine Assembly and Former Moraine Engine Plants, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
GM-21	723.50	18.41	705.09
GM-22	731.63	24.54	707.09
GM-23	731	22.80	708.2
GM-24	747.29	37.00	710.29
GM-25	746.17	37.49	708.68
GM-26	722.29	17.23	705.06
GM-27	730.57	22.01	708.56
GM-28	738.02	28.21	709.81
GM-29	730.78	22.86	707.92
GM-30	734.73	26.30	708.43
GM-31	735.23	25.11	710.12
ME-2	732.08	NM	NM
ME-3	732.59	24.68	707.91
ME-4	732.74	24.73	708.01
ME-6	735.91	25.74	710.17

Measuring point is to top of the PVC Casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on June 23 and 24, 2003 using an electronic water level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

NM - Not measured.

Table 5. Water-Level Measurements during the Second Quarter 2003 from Deep Monitoring Wells at Delphi Harrison Thermal Systems, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
GM-1	735.74	29.64	706.1
GM-3	730.44	24.82	705.62
GM-4	731.46	25.86	705.6
GM-5	731.29	25.51	705.78
GM-7R	735.61	29.56	706.05
GM-9	724.07	18.74	705.33
GM-11	723.71	18.45	705.26
GM-13	723.82	19.03	704.79
GM-14	723.50	18.80	704.7
GM-15	725.23	19.70	705.53
GM-19D	730.25	24.12	706.13
GM-20D	727.26	20.95	706.31
HR-10	742.81	33.15	709.66
HR-12	742.64	32.98	709.66
HR-13	735.03	26.53	708.5
HR-14	731.63	19.70	711.93
HR-15	733.74	25.54	708.2
M73C	716.55	11.80	704.75
MT68	746.45	38.03	708.42
MT69	722.71	17.86	704.85
MT576M	751.46	41.86	709.6
MT596M*	757.73	46.96	710.77

Measuring point is to top of the PVC Casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on June 23 and 24, 2003 using an electronic water level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

* Measuring Point is top pf cement housing.

Table 6. Water-Level Measurements during the Second Quarter 2003 from Production and Fire Wells, General Motors Corporation, Moraine, Ohio.

Well	Measuring Point (Top of)	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
31	Steel	734.05	Off	NM
32	Port Hole	732.10	25.24	706.86
35	Rim	733.96	26.76	707.2
39	Port Hole	732.07	On	NM
42	Rim	731.62	25	706.62
44	Port Hole	734.62	25.6	709.02
45	Steel	731.03	24.94	706.09
46	Steel	733.34	27.2	706.14
A	Port Hole	739.00	28.75	710.25
11B	Steel	NS	On	NM
12A	Steel	742.35	On	NM
FW-1A	Air Line Hole	739.89	30.9	708.99
FW-2	Air Line Hole	737.48	30.28	707.2
FW-3	Air line Hole	739.26	31.35	707.91
FW-4	Hole to West of Air Line	731.62	24.59	707.03

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on June 23 and 24, 2003 using an electronic water level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

NS - Not Surveyed.

NM - Not measured.

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Closed North Settling Lagoon

3rd Quarter September 2003



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Groundwater Sampling Logs



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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/16/2003
 Site/Well No. HR-2 Replicate No. Code No.
 Weather Warm; 80's Sampling Time: Begin 1415 End 1510

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 734.75
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 57.60
 Depth to Water (ft bmp) 24.18
 Water-Level Elevation (ft) 710.57
 Water Column in Well (ft) 33.42
 Casing Diameter/Type 2"
 Gallons in Well 5.347
 Gallons Pumped/Bailed
 Prior to Sampling 3.5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 53'
 Purge Time begin 1415 end 1443
 Pumping Rate 500 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.54
 Conductivity
 (mS/cm)
 (µS/cm) 1,104
 Turbidity (NTU) NR
 Temperature (°C) 17.34
 Dissolved Oxygen (mg/L) 0.88
 ORP (mV) 346.9
 Sampling Method Low Flow
 Remarks Sample time @ 1444
FDTW: 24.18

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-2 Time Pump Started 1415

Depth of Sampling 53' Date 9/16/2003

Parameters	Time									
	1422	1425	1428	1431	1434	1437	1440	1443		
Redox Potential (millivolts)	153.7	180.9	202.8	227.9	264.4	304.5	321.4	346.9		
Dissolved Oxygen (mg/L)	1.48	1.19	0.95	0.99	0.94	0.95	0.89	0.88		
pH (s.u.)	6.83	6.78	6.72	6.66	6.62	6.58	6.57	6.54		
Specific Conductance (uS/cm)	1,125	1,121	1,118	1,115	1,112	1,108	1,105	1,104		
Temperature (C)	16.83	17.07	17.20	17.20	17.27	17.43	17.42	17.34		

Flow Rate 500 mL/min Total Depth of Well (ft): 57.6

Time Sampled 1444 Depth to Water Before Purging (ft): 24.18

Total Water Pumped (Gal) 3.5 Depth to Water After Purging (ft): 24.18

Comments

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/16/2003
 Site/Well No. HR-13 Replicate No. Code No.
 Weather Warm; 85° Sampling Time: Begin 1528 End 1610

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 735.03
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 86.30
 Depth to Water (ft bmp) 24.53
 Water-Level Elevation (ft) 710.50
 Water Column in Well (ft) 61.77
 Casing Diameter/Type 4"
 Gallons in Well 40.15
 Gallons Pumped/Bailed Prior to Sampling 6.5
 Sample Pump Intake Setting (ft bmp) 81'
 Purge Time begin 1535 end 1553
 Pumping Rate 600 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.60
 Conductivity (mS/cm)
 (µS/cm) 1,287
 Turbidity (NTU) NR
 Temperature (°C) 15.28
 Dissolved Oxygen (mg/L) 0.66
 ORP (mV) 371.8
 Sampling Method Low Flow

Remarks Sample time @ 15.22
FDTW: 24.49

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-13 Time Pump Started 1528

Depth of Sampling 81' Date 9/16/2003

Parameters	Time									
	1535	1538	1541	1544	1547	1550	1553			
Redox Potential (millivolts)	203.9	251.5	290.5	331.6	343.8	353.9	371.8			
Dissolved Oxygen (mg/L)	1.27	0.91	0.85	0.79	0.69	0.68	0.66			
pH (s.u.)	6.61	6.55	6.49	6.52	6.57	6.58	6.60			
Specific Conductance (uS/cm)	1,306	1,306	1,303	1,298	1,294	1,290	1,287			
Temperature (C)	15.18	15.20	15.25	14.99	15.18	15.24	15.28			

Flow Rate 600 mL/min Total Depth of Well (ft): 86.3

Time Sampled 1522 Depth to Water Before Purging (ft): 24.53

Total Water Pumped (Gal) 6.5 Depth to Water After Purging (ft): 24.49

Comments

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/16/2003
 Site/Well No. HR-3 Replicate No. Code No.
 Weather Warm; 85 Sampling Time: Begin 1620 End 1730

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 736.75
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 61.02
 Depth to Water (ft bmp) 26.19
 Water-Level Elevation (ft) 710.56
 Water Column in Well (ft) 34.83
 Casing Diameter/Type 2"
 Gallons in Well 5.57
 Gallons Pumped/Bailed
 Prior to Sampling 10 Pumped
 Sample Pump Intake
 Setting (ft bmp) 57'
 Purge Time begin 1630 end 1702
 Pumping Rate 700 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.55
 Conductivity
 (mS/cm)
 (µS/cm) 1,102
 Turbidity (NTU) NR
 Temperature (°C) 14.97
 Dissolved Oxygen (mg/L) 0.62
 ORP (mV) 420.3
 Sampling Method Low Flow

Remarks Sample time @ 1703
FDTW: 26.19

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-3 Time Pump Started 1630

Depth of Sampling 57' Date 9/16/2003

Parameters	Time											
	1633	1638	1641	1644	1647	1654	1654	1656	1658	1700	1702	
Redox Potential (millivolts)	318.4	371.9	384.0	398.3	409.3	410.5	409.3	409.3	413.5	415.8	420.3	
Dissolved Oxygen (mg/L)	5.52	5.26	5.14	4.94	4.23	1.58	1.09	0.88	0.71	0.66	0.62	
pH (s.u.)	6.96	6.90	6.87	6.85	6.84	6.58	6.56	6.55	6.56	6.55	6.55	
Specific Conductance (uS/cm)	1,049	1,048	1,040	1,049	1,047	1,122	1,121	1,119	1,117	1,109	1,102	
Temperature (C)	16.69	17.07	17.18	17.19	17.90	15.19	15.08	15.01	14.99	14.99	14.97	

Flow Rate 700 mL/min Total Depth of Well (ft): 61.02

Time Sampled 1703 Depth to Water Before Purging (ft): 26.19

Total Water Pumped (Gall) 10 Depth to Water After Purging (ft): 26.19

Comments Trouble with pump @ 1652

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/17/2003
 Site/Well No. HR-8 Replicate No. Code No.
 Weather Sunny; 70's Sampling Time: Begin 0832 End 0944

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 743.42
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 66.47
 Depth to Water (ft bmp) 33.37
 Water-Level Elevation (ft) 710.05
 Water Column in Well (ft) 33.1
 Casing Diameter/Type 2"
 Gallons in Well 5.296
 Gallons Pumped/Bailed
 Prior to Sampling 8 Pumped
 Sample Pump Intake
 Setting (ft bmp) 61'
 Purge Time begin 0856 end 0920
 Pumping Rate 1200 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.99
 Conductivity
 (mS/cm)
 (µS/cm) 1,144
 Turbidity (NTU) NR
 Temperature (°C) 16.82
 Dissolved Oxygen (mg/L) 2.33
 ORP (mV) 83.1
 Sampling Method Low Flow
 Remarks Sample time @ 0921
FDTW: 33.39

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-8

Time Pump Started 0856

Depth of Sampling 61'

Date 9/17/2003

Parameters

	0902	0905	0908	0911	0914	0917	0920			
Redox Potential (millivolts)	203.3	189.7	144.4	117.7	104.1	91.6	83.1			
Dissolved Oxygen (mg/L)	4.68	2.46	2.40	2.37	2.36	2.34	2.33			
pH (s.u.)	6.98	6.98	6.98	6.98	6.99	6.99	6.99			
Specific Conductance (uS/cm)	1,152	1,151	1,150	1,149	1,147	1,146	1,144			
Temperature (C)	16.43	16.61	16.78	16.79	16.80	16.80	16.82			

Flow Rate 1200 mL/min

Total Depth of Well (ft): 66.47

Time Sampled 0921

Depth to Water Before Purging (ft): 33.37

Total Water Pumped (Gal) 8

Depth to Water After Purging (ft): 33.39

Comments

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Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/17/2003</u>		
Site/Well No.	<u>HR-10</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Sunny/Windy; 70's</u>	Sampling Time:	Begin <u>0946</u>	End	<u>1040</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>742.81</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>126.33</u>
Depth to Water (ft bmp)	<u>32.49</u>
Water-Level Elevation (ft)	<u>710.32</u>
Water Column in Well (ft)	<u>93.84</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>61</u>
Gallons Pumped/Bailed Prior to Sampling	<u>6 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>121'</u>
Purge Time	begin <u>1002</u> end <u>1021</u>
Pumping Rate	<u>1200 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.72</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>1,113</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>15.67</u>
Dissolved Oxygen (mg/L)	<u>0.67</u>
ORP (mV)	<u>-64.8</u>
Sampling Method	<u>Low Flow</u>

Remarks	<u>Sample time @ 1022</u>
	<u>FDTW: 32.49</u>
	<u> </u>
	<u> </u>

Constituents Sampled

Container Description

Number

Preservative

<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

Sampling Personnel	<u>S. Clouse/D. Manzo</u>
--------------------	---------------------------

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-10 Time Pump Started 1002

Depth of Sampling 121' Date 9/17/2003

Parameters	Time	1006	1009	1012	1015	1018	1021			
Redox Potential (millivolts)		-87.3	-86.0	-73.3	-67.7	-71.6	-64.8			
Dissolved Oxygen (mg/L)		1.16	0.90	0.79	0.74	0.70	0.67			
pH (s.u.)		6.99	6.94	6.89	6.82	6.76	6.72			
Specific Conductance (uS/cm)		1,149	1,142	1,133	1,127	1,119	1,113			
Temperature (C)		16.10	15.29	15.49	15.53	15.59	15.67			

Flow Rate 1200 mL/min Total Depth of Well (ft): 126.33

Time Sampled 1022 Depth to Water Before Purging (ft): 32.49

Total Water Pumped (Gal) 6 Depth to Water After Purging (ft): 32.49

Comments

ARCADIS

Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>9/17/2003</u>		
Site/Well No.	<u>HR-9</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Sunny/Windy; 70's</u>	Sampling Time:	Begin <u>1040</u>	End	<u>1128</u>		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	743.51
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	69.81
Depth to Water (ft bmp)	33.17
Water-Level Elevation (ft)	710.34
Water Column in Well (ft)	36.64
Casing Diameter/Type	2"
Gallons in Well	5.86
Gallons Pumped/Bailed Prior to Sampling	5 Pumped
Sample Pump Intake Setting (ft bmp)	64'
Purge Time	begin 1051 end 1110
Pumping Rate	900 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Colorless
Odor	None
Appearance	Clear
pH (s.u.)	6.97
Conductivity (mS/cm)	
(μ S/cm)	975
Turbidity (NTU)	NR
Temperature ($^{\circ}$ C)	17.80
Dissolved Oxygen (mg/L)	2.84
ORP (mV)	182.2
Sampling Method	Low Flow

Remarks	Sample time @ 1111
	FDTW: 33.17

Constituents Sampled

Container Description

Number

Preservative

VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

brmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-9 Time Pump Started 1051

Depth of Sampling 64' Date 9/17/2003

Parameters	Time									
	1055	1058	1101	1104	1107	1110				
Redox Potential (millivolts)	134.2	156.7	175.3	184.5	187	182.2				
Dissolved Oxygen (mg/L)	6.66	6.41	5.28	3.28	2.99	2.84				
pH (s.u.)	7.28	7.25	7.17	7.01	7.00	6.97				
Specific Conductance (uS/cm)	859	861	897	944	940	975				
Temperature (C)	16.19	16.52	16.69	17.57	17.79	17.80				

Flow Rate 900 mL/min Total Depth of Well (ft): 69.81

Time Sampled 1111 Depth to Water Before Purging (ft): 33.17

Total Water Pumped (Gal) 5 Depth to Water After Purging (ft): 33.17

Comments Pump problems @ 1104

ARCADIS

Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/17/2003</u>		
Site/Well No.	<u>HR-7</u>	Replicate No.	<u> </u>	Code No.	<u> </u>
Weather	<u>Sunny/Windy; 70's</u>	Sampling Time:	Begin <u>1145</u>	End	<u>1240</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>731.73</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>56.33</u>
Depth to Water (ft bmp)	<u>22.51</u>
Water-Level Elevation (ft)	<u>709.22</u>
Water Column in Well (ft)	<u>33.82</u>
Casing Diameter/Type	<u>2"</u>
Gallons in Well	<u>5.41</u>
Gallons Pumped/Bailed Prior to Sampling	<u>9.5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>52'</u>
Purge Time	<u>begin 1155 end 1226</u>
Pumping Rate	<u>1200 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>V. Light Gray</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.99</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>1,024</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.97</u>
Dissolved Oxygen (mg/L)	<u>0.90</u>
ORP (mV)	<u>169.3</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1227</u>
	<u>FDTW: 22.52</u>

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-7

Depth of Sampling 52'

Time Pump Started 1155

Date 9/17/2003

Parameters

	Time											
	1159	1202	1205	1208	1211	1214	1217	1220	1223	1226		
Redox Potential (millivolts)	156.2	160.4	162.9	163.6	165.3	166.9	167.5	168.6	169.1	169.3		
Dissolved Oxygen (mg/L)	4.23	3.34	2.62	2.32	1.74	1.54	1.27	1.08	0.99	0.90		
pH (s.u.)	7.15	7.06	7.01	7.00	6.99	6.99	6.99	6.99	6.99	6.99		
Specific Conductance (uS/cm)	7,065	1,066	1,063	1,059	1,053	1,078	1,039	1,032	1,028	1,024		
Temperature (C)	16.87	16.99	16.94	17.00	16.96	16.97	16.97	16.93	16.95	16.97		

Flow Rate 1200 mL/min

Time Sampled 1227

Total Water Pumped (Gal) 9.5

Comments

Total Depth of Well (ft): 56.33

Depth to Water Before Purging (ft): 22.51

Depth to Water After Purging (ft): 22.52

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/17/2003
 Site/Well No. HR-15 Replicate No. Code No.
 Weather Sunny/Windy; 80's Sampling Time: Begin 1330 End 1425

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 733.74
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 102
 Depth to Water (ft bmp) 24.58
 Water-Level Elevation (ft) 709.16
 Water Column in Well (ft) 77.42
 Casing Diameter/Type 4"
 Gallons in Well 50.32
 Gallons Pumped/Bailed
 Prior to Sampling 10 Pumped
 Sample Pump Intake
 Setting (ft bmp) 97'
 Purge Time begin 1352 end 1411
 Pumping Rate 1300 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.67
 Conductivity
 (mS/cm)
 (µS/cm) 920
 Turbidity (NTU) NR
 Temperature (°C) 15.20
 Dissolved Oxygen (mg/L) 5.90
 ORP (mV) -58.2
 Sampling Method Low Flow

Remarks Sample time @ 1412
FDTW: 24.57

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-15

Time Pump Started 1352

Depth of Sampling 97' Date 9/17/2003

Parameters

	1356	1359	1402	1405	1408	1411			
Redox Potential (millivolts)	-55.5	-59.1	-60.8	-59.9	-59.1	-58.2			
Dissolved Oxygen (mg/L)	8.16	6.72	6.33	6.06	5.91	5.90			
pH (s.u.)	6.72	6.69	6.68	6.68	6.66	6.67			
Specific Conductance (uS/cm)	951	943	937	931	925	920			
Temperature (C)	15.05	15.15	15.18	15.19	15.20	15.20			

Flow Rate 1300 mL/min

Total Depth of Well (ft): 102.00

Time Sampled 1412

Depth to Water Before Purging (ft): 24.58

Total Water Pumped (Gal) 10

Depth to Water After Purging (ft): 24.57

Comments

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Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u> of <u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/17/2003</u>		
Site/Well No.	<u>W-3-N</u>	Replicate No.	<u>W-3-E @ 1507</u>	Code No.	<u></u>
Weather	<u>Sunny/Windy, 85°</u>	Sampling Time:	Begin <u>1425</u>	End	<u>1540</u>

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>733.66</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>56.40</u>
Depth to Water (ft bmp)	<u>24.23</u>
Water-Level Elevation (ft)	<u>709.43</u>
Water Column in Well (ft)	<u>32.17</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>20.91</u>
Gallons Pumped/Bailed Prior to Sampling	<u>8 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>52'</u>
Purge Time	begin <u>1436</u> end <u>1506</u>
Pumping Rate	<u>1000 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Light Yellow</u>
Odor	<u>No</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.87</u>
Conductivity	<u></u>
(mS/cm)	<u></u>
(µS/cm)	<u>927</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.10</u>
Dissolved Oxygen (mg/L)	<u>0.86</u>
ORP (mV)	<u>-87.8</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1507</u>
	<u>FDTW: 24.21</u>
	<u>BB-1 @ 1530</u>

Constituents Sampled	Container Description	Number	Preservative
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<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-3-N Time Pump Started 1436

Depth of Sampling 52' Date 9/17/2003

Parameters	Time									
	1439	1445	1448	1451	1454	1457	1500	1503	1506	
Redox Potential (millivolts)	-86.6	-89.9	-89.0	-89.0	-89.6	-88.3	-86.7	-87.4	-87.8	
Dissolved Oxygen (mg/L)	3.15	2.00	1.66	1.44	1.28	1.11	0.99	0.91	0.86	
pH (s.u.)	7.07	6.98	6.93	6.91	6.89	6.88	6.87	6.87	6.87	
Specific Conductance (uS/cm)	998	982	974	964	956	947	937	930	927	
Temperature (C)	15.96	16.15	16.17	16.20	16.20	16.17	16.22	16.23	16.18	

Flow Rate 1000 mL/min Total Depth of Well (ft): 56.40

Time Sampled 1507 Depth to Water Before Purging (ft): 24.23

Total Water Pumped (Gal) 8 Depth to Water After Purging (ft): 24.21

Comments _____

ARCADIS

Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>	Date	<u>9/17/2003</u>				
Site/Well No.	<u>HR-14</u>	Replicate No.	<u> </u>	Code No.	<u> </u>		
Weather	<u>Sunny/Windy; 85°</u>	Sampling Time:	Begin <u>1545</u>	End	<u>1630</u>		

Evacuation Data

Measuring Point	<u>Top of PVC Casing</u>
MP Elevation (ft)	<u>731.63</u>
Land Surface Elevation (ft)	<u>NM</u>
Sounded Well Depth (ft bmp)	<u>88.27</u>
Depth to Water (ft bmp)	<u>22.32</u>
Water-Level Elevation (ft)	<u>708.31</u>
Water Column in Well (ft)	<u>54.95</u>
Casing Diameter/Type	<u>4"</u>
Gallons in Well	<u>42.22</u>
Gallons Pumped/Bailed Prior to Sampling	<u>5 Pumped</u>
Sample Pump Intake Setting (ft bmp)	<u>85'</u>
Purge Time	begin <u>1559</u> end <u>1617</u>
Pumping Rate	<u>1100 mL/min</u>
Evacuation Method	<u>Submersible Pump</u>

Field Parameters

Color	<u>Colorless</u>
Odor	<u>None</u>
Appearance	<u>Clear</u>
pH (s.u.)	<u>6.88</u>
Conductivity (mS/cm)	<u> </u>
(µS/cm)	<u>938</u>
Turbidity (NTU)	<u>NR</u>
Temperature (°C)	<u>16.31</u>
Dissolved Oxygen (mg/L)	<u>0.57</u>
ORP (mV)	<u>-62.1</u>
Sampling Method	<u>Low Flow</u>
Remarks	<u>Sample time @ 1618</u>
	<u>FDTW: 22.31</u>

Constituents Sampled	Container Description	Number	Preservative
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<u>VOCs + cis -1, 2 - DCE</u>	<u>40 ml glass</u>	<u>3</u>	<u>HCl, Cool</u>
<u>SpC, pH</u>	<u>250 ml plastic</u>	<u>1</u>	<u>Cool</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	<u>1-¼" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-½" = 0.09</u>	<u>2-½" = 0.26</u>	<u>3-½" = 0.50</u>	<u>6" = 1.47</u>

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-14 Time Pump Started 1559

Depth of Sampling 85' Date 9/17/2003

Parameters	Time									
	1602	1605	1608	1611	1614	1617				
Redox Potential (millivolts)	-59.9	-60.5	-60.8	-61.1	-61.9	-62.1				
Dissolved Oxygen (mg/L)	1.21	0.82	0.71	0.67	0.62	0.57				
pH (s.u.)	7.03	6.96	6.91	6.89	6.90	6.88				
Specific Conductance (uS/cm)	946	947	944	943	942	938				
Temperature (C)	16.04	16.09	16.20	16.32	16.32	16.31				

Flow Rate 1100 mL/min Total Depth of Well (ft): 88.27

Time Sampled 1618 Depth to Water Before Purging (ft): 22.32

Total Water Pumped (Gal) 5 Depth to Water After Purging (ft): 22.31

Comments _____

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/17/2003
 Site/Well No. W-4-N Replicate No. _____ Code No. _____
 Weather Sunny/Windy; 80's Sampling Time: Begin 1630 End 1730

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 731.63
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 66.47
 Depth to Water (ft bmp) 22.15
 Water-Level Elevation (ft) 709.48
 Water Column in Well (ft) 44.32
 Casing Diameter/Type 4"
 Gallons in Well 26.59
 Gallons Pumped/Bailed
 Prior to Sampling 9.5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 62'
 Purge Time begin 1637 end 1701
 Pumping Rate 1300 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 6.92
 Conductivity
 (mS/cm) _____
 (µS/cm) 909
 Turbidity (NTU) NR
 Temperature (°C) 16.46
 Dissolved Oxygen (mg/L) 0.54
 ORP (mV) -9.7
 Sampling Method Low Flow

Remarks Sample time @ 1702
FDTW: 22.15

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-4-N

Time Pump Started 1637

Depth of Sampling 62' Date 9/17/2003

Parameters

	1640	1643	1646	1649	1652	1655	1658	1701		
Redox Potential (millivolts)	-2.6	-5.6	-6.6	-8.0	-8.7	-9.0	-9.7	-9.7		
Dissolved Oxygen (mg/L)	1.77	1.27	1.00	0.83	0.70	0.63	0.56	0.54		
pH (s.u.)	7.03	6.95	6.93	6.93	6.90	6.92	6.91	6.92		
Specific Conductance (uS/cm)	918	916	915	912	912	910	910	909		
Temperature (C)	16.21	16.44	16.52	16.56	16.44	16.47	16.38	16.46		

Flow Rate 1300 mL/min

Total Depth of Well (ft): 66.47

Time Sampled 1702

Depth to Water Before Purging (ft): 22.15

Total Water Pumped (Gal) 9.5

Depth to Water After Purging (ft): 22.15

Comments

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/17/2003
 Site/Well No. W-1-N Replicate No. _____ Code No. _____
 Weather Sunny/Windy; 80's Sampling Time: Begin 1735 End 1815

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 739.02
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 72.00
 Depth to Water (ft bmp) 29.15
 Water-Level Elevation (ft) 709.87
 Water Column in Well (ft) 42.85
 Casing Diameter/Type 4"
 Gallons in Well 27.85
 Gallons Pumped/Bailed
 Prior to Sampling 5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 53'
 Purge Time begin 1747 end 1803
 Pumping Rate 1200 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 7.17
 Conductivity
 (mS/cm) _____
 (µS/cm) 828
 Turbidity (NTU) NR
 Temperature (°C) 15.82
 Dissolved Oxygen (mg/L) 1.53
 ORP (mV) 182.4
 Sampling Method Low Flow

Remarks Sample time @ 1804
FDTW: 29.15

Constituents Sampled

Container Description

Number

Preservative

VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-1-N

Time Pump Started 1747

Depth of Sampling 65' Date 9/17/2003

Parameters

	1751	1754	1757	1800	1803					
Redox Potential (millivolts)	182.5	183.7	183.9	183.3	182.4					
Dissolved Oxygen (mg/L)	2.01	1.77	1.61	1.56	1.53					
pH (s.u.)	7.26	7.21	7.18	7.18	7.17					
Specific Conductance (uS/cm)	833	832	833	831	828					
Temperature (C)	15.33	15.59	15.75	15.77	15.82					

Flow Rate 1200 mL/min Total Depth of Well (ft): 72.00

Time Sampled 1804

Total Water Pumped (Gal) 5 Depth to Water Before Purging (ft): 29.15

Comments Depth to Water After Purging (ft): 29.15

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/18/2003
 Site/Well No. HR-5 Replicate No. Code No.
 Weather Sunny, Clear; 65° Sampling Time: Begin 0735 End 0845

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 734.27
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 56.81
 Depth to Water (ft bmp) 25.12
 Water-Level Elevation (ft) 709.15
 Water Column in Well (ft) 31.61
 Casing Diameter/Type 2"
 Gallons in Well 5.06
 Gallons Pumped/Bailed Prior to Sampling 4.5 Pumped
 Sample Pump Intake Setting (ft bmp) 52'
 Purge Time begin 0808 end 0832
 Pumping Rate 900 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Light Yellow
 Odor Odor
 Appearance Clear
 pH (s.u.) 7.10
 Conductivity (mS/cm)
 (µS/cm) 950
 Turbidity (NTU) NR
 Temperature (°C) 15.55
 Dissolved Oxygen (mg/L) 5.45
 ORP (mV) -6.9
 Sampling Method Low Flow

Remarks Sample time @ 0833
FDTW: 25.13

Constituents Sampled

VOCs + cis -1, 2 - DCE
SpC, pH

Container Description

40 ml glass
250 ml plastic

Number

3
1

Preservative

HCl, Cool
Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-5

Time Pump Started 0808

Depth of Sampling 52' Date 9/18/2003

Parameters

	0811	0814	0817	0820	0823	0826	0829	0832	
Redox Potential (millivolts)	49.5	12.0	-1.0	-4.8	-5.7	-6.0	-6.7	-6.9	
Dissolved Oxygen (mg/L)	7.72	7.34	6.68	6.33	6.15	5.84	5.64	5.45	
pH (s.u.)	7.43	7.26	7.16	7.13	7.12	7.11	7.10	7.10	
Specific Conductance (uS/cm)	948	946	950	951	951	951	952	950	
Temperature (C)	15.45	15.89	16.34	16.38	16.40	16.45	16.46	15.55	

Flow Rate 900 mL/min

Total Depth of Well (ft): 56.81

Time Sampled 0833

Depth to Water Before Purging (ft): 25.12

Total Water Pumped (Gal) 4.5

Depth to Water After Purging (ft): 25.13

Comments

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/18/2003
 Site/Well No. HR-6 Replicate No. Code No.
 Weather Sunny, Clear, 70° Sampling Time: Begin 0847 End 0930

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 732.66
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 54.22
 Depth to Water (ft bmp) 23.91
 Water-Level Elevation (ft) 708.75
 Water Column in Well (ft) 30.31
 Casing Diameter/Type 2"
 Gallons in Well 4.85
 Gallons Pumped/Bailed
 Prior to Sampling 5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 50'
 Purge Time begin 0904 end 0918
 Pumping Rate 1200 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 7.09
 Conductivity
 (mS/cm)
 (µS/cm) 1,172
 Turbidity (NTU) NR
 Temperature (°C) 16.95
 Dissolved Oxygen (mg/L) 2.67
 ORP (mV) 136.0
 Sampling Method Low Flow
 Remarks Sample time @ 0919
FDTW: 23.97

Constituents Sampled

Container Description

Number

Preservative

VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

01H000294.0006.00002

General Motors Corporation, Moraine, Ohio

HR-6

501

0904

9/18/2003

Time

Flow Rate

54.22

0919

5

23.97

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Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/18/2003
 Site/Well No. HR-1 Replicate No. HR-1C @ 0955 Code No.
 Weather Sunny, Clear; 75° Sampling Time: Begin 0931 End 1022

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 732.71
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 58.21
 Depth to Water (ft bmp) 24.31
 Water-Level Elevation (ft) 708.40
 Water Column in Well (ft) 33.9
 Casing Diameter/Type 2"
 Gallons in Well 5.42
 Gallons Pumped/Bailed
 Prior to Sampling 3.5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 55'
 Purge Time begin 0941 end 0954
 Pumping Rate 1000 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Colorless
 Odor None
 Appearance Clear
 pH (s.u.) 7.09
 Conductivity
 (mS/cm)
 (µS/cm) 1,038
 Turbidity (NTU) NR
 Temperature (°C) 19.77
 Dissolved Oxygen (mg/L) 6.63
 ORP (mV) 141.9
 Sampling Method Low Flow

Remarks Sample time @ 0955
FDTW: 24.31

Constituents Sampled

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-1

Time Pump Started 0941

Depth of Sampling 55' Date 9/18/2003

Parameters

	0945	0948	0951	0954	Time			
Redox Potential (millivolts)	158.6	150.8	143.9	141.9				
Dissolved Oxygen (mg/L)	7.50	7.15	6.89	6.63				
pH (s.u.)	7.14	7.12	7.10	7.09				
Specific Conductance (uS/cm)	1,029	1,032	1,037	1,038				
Temperature (C)	19.17	19.52	19.68	19.77				

Flow Rate 1,000 mL/min

Total Depth of Well (ft): 58.21

Time Sampled 0955

Depth to Water Before Purging (ft): 24.31

Total Water Pumped (Gal) 3.5

Depth to Water After Purging (ft): 24.31

Comments

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/18/2003
 Site/Well No. W-2-N Replicate No. _____ Code No. _____
 Weather Sunny, Warm; 80° Sampling Time: Begin 1040 End 1118

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 731.68
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 58.60
 Depth to Water (ft bmp) 21.16
 Water-Level Elevation (ft) 710.52
 Water Column in Well (ft) 37.44
 Casing Diameter/Type 4"
 Gallons in Well 24.34
 Gallons Pumped/Bailed
 Prior to Sampling 4.5 Pumped
 Sample Pump Intake
 Setting (ft bmp) 47'
 Purge Time begin 1051 end 1106
 Pumping Rate 1000 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Light Yellow
 Odor None
 Appearance Clear
 pH (s.u.) 7.09
 Conductivity
 (mS/cm) _____
 (µS/cm) 997
 Turbidity (NTU) NR
 Temperature (°C) 15.97
 Dissolved Oxygen (mg/L) 2.86
 ORP (mV) -61.2
 Sampling Method Low Flow
 Remarks Sample time @ 1107
FDTW: 21.17

Constituents Sampled

Container Description

Number

Preservative

VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. W-2-N

Time Pump Started 1051

Depth of Sampling 54'

Date 9/18/2003

Parameters

	1054	1057	1100	1103	1106						
Redox Potential (millivolts)	-55.3	-62	-62.5	-61.8	-61.2						
Dissolved Oxygen (mg/L)	4.70	3.99	3.42	3.14	2.86						
pH (s.u.)	7.20	7.14	7.12	7.10	7.09						
Specific Conductance (uS/cm)	1,009	1,004	1,002	999	997						
Temperature (C)	15.53	15.77	15.87	15.95	15.97						

Flow Rate 1,000 mL/min

Total Depth of Well (ft): 58.60

Time Sampled 1107

Depth to Water Before Purging (ft): 21.16

Total Water Pumped (Gal) 4.5

Depth to Water After Purging (ft): 21.17

Comments

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/18/2003
 Site/Well No. HR-4 Replicate No. Code No.
 Weather Sunny, Warm; 80's Sampling Time: Begin 1121 End 1200

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 742.60
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 65.85
 Depth to Water (ft bmp) 31.74
 Water-Level Elevation (ft) 710.86
 Water Column in Well (ft) 34.11
 Casing Diameter/Type 2"
 Gallons in Well 5.46
 Gallons Pumped/Bailed
 Prior to Sampling 7 Pumped
 Sample Pump Intake
 Setting (ft bmp) 62'
 Purge Time begin 1135 end 1150
 Pumping Rate 1300 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Light Gray
 Odor None
 Appearance Clear
 pH (s.u.) 7.11
 Conductivity
 (mS/cm)
 (µS/cm) 844
 Turbidity (NTU) NR
 Temperature (°C) 16.28
 Dissolved Oxygen (mg/L) 0.55
 ORP (mV) 181.9
 Sampling Method Low Flow

Remarks Sample time @ 1151
FDTW: 31.73

Constituents Sampled	Container Description	Number	Preservative
VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING
GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location GM- Moraine, Ohio

Monitoring Well No. HR-4

Depth of Sampling 62'

Time Pump Started

1135

Date

9/18/2003

Parameters

	1138	1141	1144	1147	1150					
Redox Potential (millivolts)	150.1	158.9	169.9	175.7	181.9					
Dissolved Oxygen (mg/L)	1.00	0.73	0.63	0.58	0.55					
pH (s.u.)	7.22	7.16	7.13	7.12	7.11					
Specific Conductance (uS/cm)	837	844	847	846	844					
Temperature (C)	16.17	16.33	16.37	16.32	16.28					

Flow Rate

1,300 mL/min

Total Depth of Well (ft):

65.85

Time Sampled

1151

Depth to Water Before Purging (ft):

31.74

Total Water Pumped (Gal)

7

Depth to Water After Purging (ft):

31.73

Comments

ARCADIS

Water Sampling Log

Project GM-Lagoon Monitoring Project No. OH000294.0006.00002 Page 1 of 1
 Site Location Moraine, Ohio Date 9/18/2003
 Site/Well No. HR-12 Replicate No. Code No.
 Weather Sunny, Hazy; 85° Sampling Time: Begin 1250 End 1340

Evacuation Data

Measuring Point Top of PVC Casing
 MP Elevation (ft) 742.64
 Land Surface Elevation (ft) NM
 Sounded Well Depth (ft bmp) 131.50
 Depth to Water (ft bmp) 31.22
 Water-Level Elevation (ft) 711.42
 Water Column in Well (ft) 100.28
 Casing Diameter/Type 4"
 Gallons in Well 65.18
 Gallons Pumped/Bailed Prior to Sampling 7 Pumped
 Sample Pump Intake Setting (ft bmp) 125'
 Purge Time begin 1304 end 1326
 Pumping Rate 1100 mL/min
 Evacuation Method Submersible Pump

Field Parameters

Color Light Gray
 Odor None
 Appearance Cloudy
 pH (s.u.) 6.90
 Conductivity (mS/cm)
 (µS/cm) 1,217
 Turbidity (NTU) NR
 Temperature (°C) 16.11
 Dissolved Oxygen (mg/L) 0.56
 ORP (mV) -51.1
 Sampling Method Low Flow
 Remarks Sample time @ 1327
FDTW: 31.20

Constituents Sampled

Container Description

Number

Preservative

VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location Moraine, Ohio

Monitoring Well No. HR-12

Depth of Sampling 125'

Time Pump Started 1304

Date 9/18/2003

Parameters	1308	1311	1314	1317	1320	1323	1326		
Redox Potential (millivolts)	-35.8	-45.2	-47.2	-49.4	-49.6	-50.6	-51.1		
Dissolved Oxygen (mg/L)	1.01	0.84	0.74	0.67	0.59	0.57	0.56		
pH (s.u.)	7.03	6.96	6.93	6.91	6.90	6.90	6.90		
Specific Conductance (uS/cm)	1,222	1,221	1,223	1,221	1,220	1,217	1,217		
Temperature (C)	15.73	15.96	16.02	16.07	16.09	16.11	16.11		

Flow Rate 1100 mL/min

Time Sampled 1327

Total Water Pumped (Gal) 7

Comments

Total Depth of Well (ft): 131.50

Depth to Water Before Purging (ft): 31.22

Depth to Water After Purging (ft): 31.20

ARCADIS
Water Sampling Log

Project	<u>GM-Lagoon Monitoring</u>	Project No.	<u>OH000294.0006.00002</u>	Page	<u>1</u>	of	<u>1</u>
Site Location	<u>Moraine, Ohio</u>			Date	<u>9/18/2003</u>		
Site/Well No.	<u>HR-11</u>	Replicate No.	<u></u>	Code No.	<u></u>		
Weather	<u>Sunny, Hazy; 85°</u>	Sampling Time:	Begin <u>1340</u>	End	<u>1435</u>		

Evacuation Data

Measuring Point	Top of PVC Casing
MP Elevation (ft)	743.33
Land Surface Elevation (ft)	NM
Sounded Well Depth (ft bmp)	69.92
Depth to Water (ft bmp)	31.88
Water-Level Elevation (ft)	711.45
Water Column in Well (ft)	38.04
Casing Diameter/Type	2"
Gallons in Well	6.09
Gallons Pumped/Bailed Prior to Sampling	4 Pumped
Sample Pump Intake Setting (ft bmp)	64'
Purge Time	begin 1349 end 1413
Pumping Rate	700 mL/min
Evacuation Method	Submersible Pump

Field Parameters

Color	Slightly Gray
Odor	None
Appearance	Slightly Cloudy
pH (s.u.)	6.80
Conductivity (mS/cm)	
(μ S/cm)	1,181
Turbidity (NTU)	NR
Temperature ($^{\circ}$ C)	18.19
Dissolved Oxygen (mg/L)	0.70
ORP (mV)	64.0
Sampling Method	Low Flow
Remarks	Sample time @ 1414
	FDTW: 31.89

Remarks	Sample time @ 1414
	FDTW: 31.89

Constituents Sampled

Container Description

Number

Preservative

VOCs + cis -1, 2 - DCE	40 ml glass	3	HCl, Cool
SpC, pH	250 ml plastic	1	Cool

Sampling Personnel S. Clouse/D. Manzo

Well Casing Volumes

Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	µS/cm	Microsiemens per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

LOW FLOWS SAMPLING GROUNDWATER FIELD PARAMETER LOG

Project Number OH000294.0006.00002

Site Location General Motors Corporation, Moraine, Ohio

Monitoring Well No. HR-11

Time Pump Started 1349

Depth of Sampling 64' Date 9/18/2003

Parameters

	1352	1355	1358	1401	1404	1407	1410	1413	
Redox Potential (millivolts)	103.8	103.9	97.4	87.9	79.0	70.2	65.3	64.0	
Dissolved Oxygen (mg/L)	1.36	1.05	1.03	0.87	0.82	0.76	0.72	0.70	
pH (s.u.)	6.78	6.74	6.74	6.75	6.77	6.79	6.79	6.80	
Specific Conductance (uS/cm)	1,224	1,208	1,205	1,196	1,193	1,192	1,184	1,181	
Temperature (C)	16.66	17.21	17.52	17.81	17.87	18.04	18.05	18.19	

Flow Rate 700 mL/min

Total Depth of Well (ft): 69.92

Time Sampled 1414

Depth to Water Before Purging (ft): 31.88

Total Water Pumped (Gal) 4

Depth to Water After Purging (ft): 31.89

Comments



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Groundwater Analytical Results



Table 7. Appendix IX Organic Analyses from Shallow Monitoring Wells during the Third Quarter 2003 Monitoring of the Closed North Settling Lagoon, General Motors Corporation, Moraine, Ohio.

Appendix IX Constituent	Upgradient of Lagoon				Downgradient of Lagoon				Downgradient Some Distance from Lagoon					
	HR-9	HR-11	HR-8	W-1-N	HR-4	W-2-N	W-3-N	W-4-N	HR-2	HR-3	HR-5	HR-6	HR-7	HR-1
Laboratory pH*	7.1	7.0	7.0	7.3	7.2	7.1	7.0	7.1	7.9	7.9	7.0	7.0	7.0	7.0
Laboratory SpC *	1000	1325	1100	918	940	1100	1000	1000	1000	1100	1025	1100	1300	1100
Total Volatile Organics*	75.74	14.09	27.04	0.93	1.56	1.93	124.1	13.19	12.78	25.96	20.62	9.79	2.59	105.31
Acetone	--	1.7 J	--	--	--	--	--	--	--	--	--	--	1.2 J	--
Chloroform	--	--	0.25 J	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	0.29 J	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	12	--	8.2	--	--	--	--	0.26 J	--	--	--	--	--	3.1
1,1-Dichloroethane	36	10	13	--	--	--	--	1.0	4.5	13	0.48 J	--	--	0.97 J
1,2-Dichloroethane	1.3 J	--	--	--	--	--	--	--	--	--	--	--	--	2.6
1,1-Dichloroethene	0.42 J	--	--	--	--	--	--	--	--	0.27 J	--	--	--	--
cis-1,2-Dichloroethene	12	1.8	3.4	--	--	1.4	110	1.9	6.9	9.8	6.0	0.79	--	--
Tetrachloroethene	--	--	--	--	0.56 J	--	5.4	1.2	--	--	0.16 J	--	--	2.0
Toluene	0.42 J	0.59 J	--	--	0.28 J	0.25 J	--	--	--	--	0.43 J	--	0.29 J	32
trans-1,2-Dichloroethene	1.6	--	0.69	--	--	--	1.5 J	--	0.97	1.0	0.55	--	--	0.44 J
Trichloroethene	12	--	1.5	0.93 J	0.72 J	0.28 J	1.8 J	8.4	0.41 J	1.6	13	9.0	1.1	3.2
Vinyl chloride	--	--	--	--	--	--	5.4	0.43 J	--	--	--	--	--	61

* All VOC concentrations in micrograms per liter (ug/L) as reported by the laboratory. Specific conductance is reported in umhos/cm and pH is reported in standard units.
 -- Not detected.

Shaded analytical results represent data from wells not directly downgradient of the North Settling Lagoon based on groundwater flow.
 J - Estimated result, result is less than reporting limit.

Table 8. Appendix IX Organic Analyses from Deep Monitoring Wells during the Third Quarter 2003 Monitoring of the Closed North Settling Lagoon, General Motors Corporation, Moraine, Ohio.

Appendix IX Constituent	Upgradient of Lagoon		Downgradient of Lagoon		
	HR-10	HR-12	HR-15	HR-14	HR-13
Laboratory pH*	7.0	7.0	7.0	7.1	7.9
Laboratory SpC*	1200	1325	990	1000	1200
Total Volatile Organics*	0.31	5.51	13.92	21.3	50.1
1,1-Dichloroethane	--	1.8	--	0.30 J	30
Chloroethane	--	0.35 J	--	--	--
cis-1,2-Dichloroethene	--	1.4	2.4	6.0	11
trans-1,2-Dichloroethene	--	--	--	--	1.6
1,1,1-Trichloroethane	--	--	--	--	2.1
Toluene	0.31 J	.46 J	0.18 J	--	--
Trichloroethene	--	--	0.34 J	5.0	5.4
Vinyl chloride	--	1.5	11	10	--

* All VOC concentrations in micrograms per liter (ug/L) as reported by the laboratory. Specific conductance is reported in umhos/cm and pH is reported in standard units.

-- Not detected.

Shaded analytical results represent data from wells not directly downgradient of the North Settling Lagoon based on groundwater flow.
J - Estimated result, result is less than reporting limit.



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Hydraulic Monitoring Data



Table 2. Water-Level Measurements Collected During Third Quarter 2003 from Shallow Monitoring Wells at Delphi Harrison Thermal Systems, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
<u>Shallow Aquifer Wells</u>			
W-1-N	739.02	28.00	711.02
W-2-N	731.68	21.01	710.67
W-3-N	733.66	23.08	710.58
W-4-N	731.63	21.02	710.61
HR-1	732.71	23.06	709.65
HR-2	734.75	24.18	710.57
HR-3	736.75	26.19	710.56
HR-4	742.60	31.61	710.99
HR-5	734.27	23.93	710.34
HR-6	732.66	22.74	709.92
HR-7	731.73	21.35	710.38
HR-8	743.42	33.28	710.14
HR-9	743.51	33.06	710.45
HR-11	743.33	32.81	710.52
HR-16	727.01	17.91	709.1
HR-17	726.43	17.09	709.34
W-1-S	729.29	19.81	709.48
W-2-S	726.64	18.16	708.48
W-3-S	733.42	20.65	712.77
W-4-S	727.68	19.11	708.57
GM-2	735.81	26.92	708.89
4S	731.36	23.45	707.91
GM-6	730.27	22.07	708.2
GM-8	735.17	26.84	708.33
GM-10	723.90	17.90	706.00
GM-16	725.30	18.21	707.09
GM-17	723.84	15.74	708.1
GM-18	723.80	15.74	708.06
GM-19S	730.85	21.77	709.08
EAST	730.98	21.46	709.52
WEST	731.08	21.72	709.36
WSU-24	725.10	16.26	708.84
WS-17	726.18	17.89	708.29
WS-18	733.52	25.07	708.45
WS-19	726.62	18.34	708.28
TW-2	733.38	29.63	703.75
RW-10	728.53	NM	NM
RW-11	729.74	NM	NM
GM-32	732.08	23.23	708.85
GM-33	729.77	20.21	709.56
GM-34	730.56	21.02	709.54
GM-35	731.27	22.21	709.06
GM-36	731.11	21.95	709.16
GM-37	730.05	20.73	709.32
GM-38	729.88	20.58	709.3

Measuring point is to top of the PVC Casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on September 15 and 16, 2003 using an electronic water level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

NM - Not measured.

Table 3. Water-Level Measurements During Third Quarter 2003 from Shallow Monitoring Wells at the Moraine Assembly and Former Moraine Engine Plants, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
GM-21	724.20	15.77	708.43
GM-22	731.63	21.91	709.72
GM-23	731.00	21.60	709.4
GM-24	747.29	36.16	711.13
GM-25	746.17	35.33	710.84
GM-26	722.29	15.74	706.55
GM-27	730.57	20.77	709.8
GM-28	738.02	26.87	711.15
GM-29	730.78	20.81	709.97
GM-30	734.73	24.91	709.82
GM-31	735.23	23.50	711.73
ME-2	732.08	22.31	709.77
ME-3	732.59	23.10	709.49
ME-4	732.74	23.65	709.09
ME-6	735.91	24.15	711.76

Measuring point is to top of the PVC Casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on September 15 and 16, 2003 using an electronic water level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

Table 5. Water-Level Measurements during the Third Quarter 2003 from Deep Monitoring Wells at Delphi Harrison Thermal Systems, Moraine, Ohio.

Well	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
GM-1	735.74	27.21	708.53
GM-3	730.44	22.41	708.03
GM-4	731.46	23.65	707.81
GM-5	731.29	23.08	708.21
GM-7R	735.61	27.14	708.47
GM-9	724.07	16.35	707.72
GM-11	723.71	16.08	707.63
GM-13	723.82	16.58	707.24
GM-14	723.50	16.35	707.15
GM-15	725.23	19.11	706.12
GM-19D	730.25	21.72	708.53
GM-20D	727.26	18.58	708.68
HR-10	742.81	32.48	710.33
HR-12	742.64	32.12	710.52
HR-13	735.03	24.53	710.5
HR-14	731.63	21.17	710.46
HR-15	733.74	23.40	710.34
M73C	716.55	9.32	707.23
MT68	746.45	36.71	709.74
MT69	722.71	16.31	706.4
MT576M	751.46	40.88	710.58
MT596M*	757.73	46.04	711.69

Measuring point is to top of the PVC Casing.

Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on September 15 and 16, 2003 using an electronic water level indicator.

Depth-to-water measurements are reported in feet below the measuring point.

* Measuring Point is top pf cement housing.

Table 6. Water-Level Measurements during the Third Quarter 2003 from Production and Fire Wells, General Motors Corporation, Moraine, Ohio.

Well	Measuring Point (Top of)	Measuring Point Elevation	Depth-to-Water (feet)	Water-Level Elevation
31	Steel	734.05	24.99 (OFF)	709.06
32	Port Hole	732.10	24.50 (OFF)	707.60
35	Rim	733.96	25.90 (OFF)	708.06
39	Port Hole	732.07	OFF	NM
42	Rim	731.62	24.06 (OFF)	707.56
44	Port Hole	734.62	25.21 (OFF)	709.41
45	Steel	731.03	22.55	708.48
46	Steel	733.34	24.7	708.64
A	Port Hole	739.00	27.57	711.43
11B	Steel	NS	ON	NM
12A	Steel	742.35	ON	NM
FW-1A	Air Line Hole	739.89	30.82	709.07
FW-2	Air Line Hole	737.48	29.43	708.05
FW-3	Air line Hole	739.26	30.82	708.44
FW-4	Hole to West of Air Line	731.62	24.05	707.57

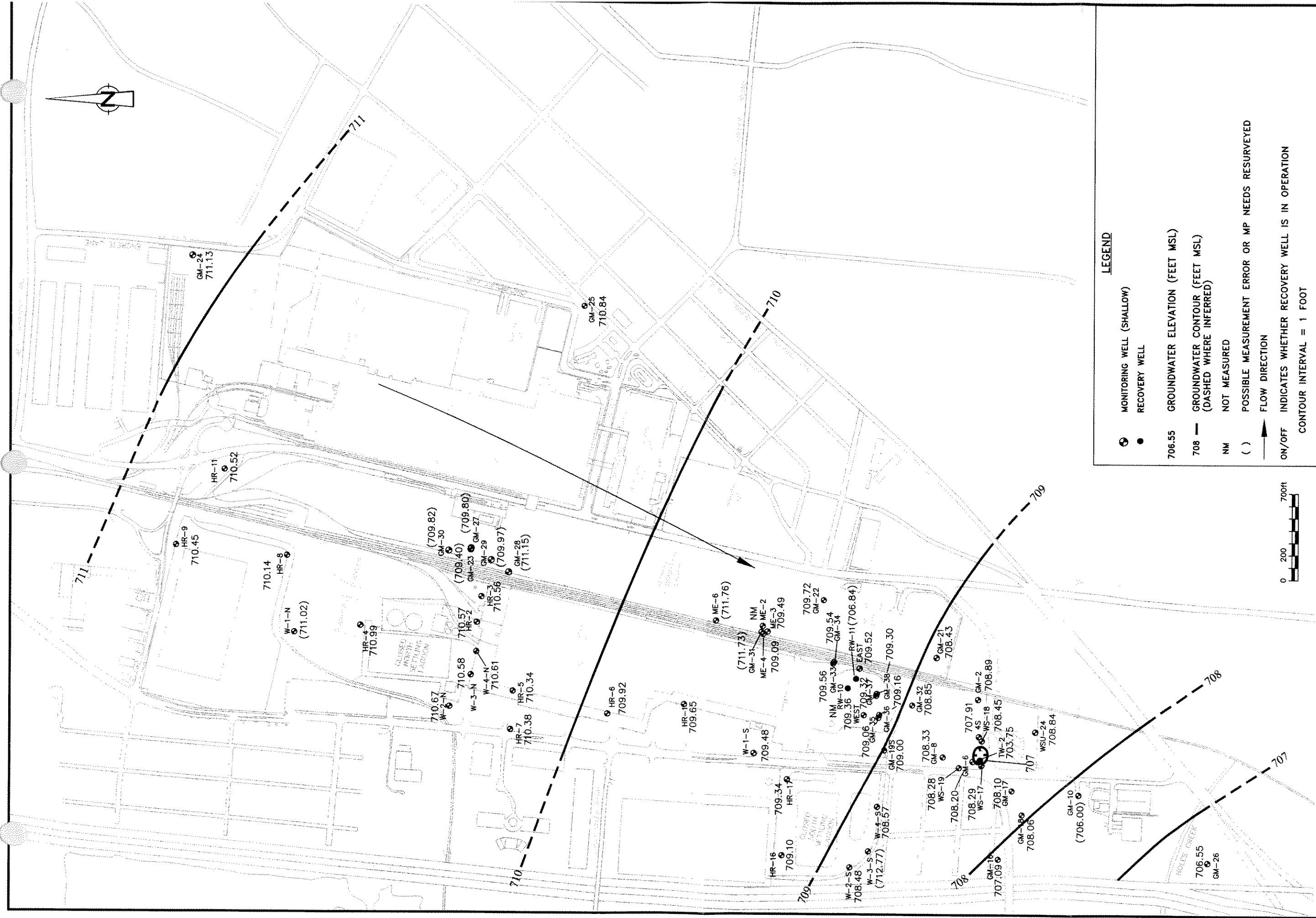
Water-level elevations are reported in feet above mean sea level (msl).

Depth-to-water elevations were measured on September 15 and 16, 2003 using an electronic water level

Depth-to-water measurements are reported in feet below the measuring point.

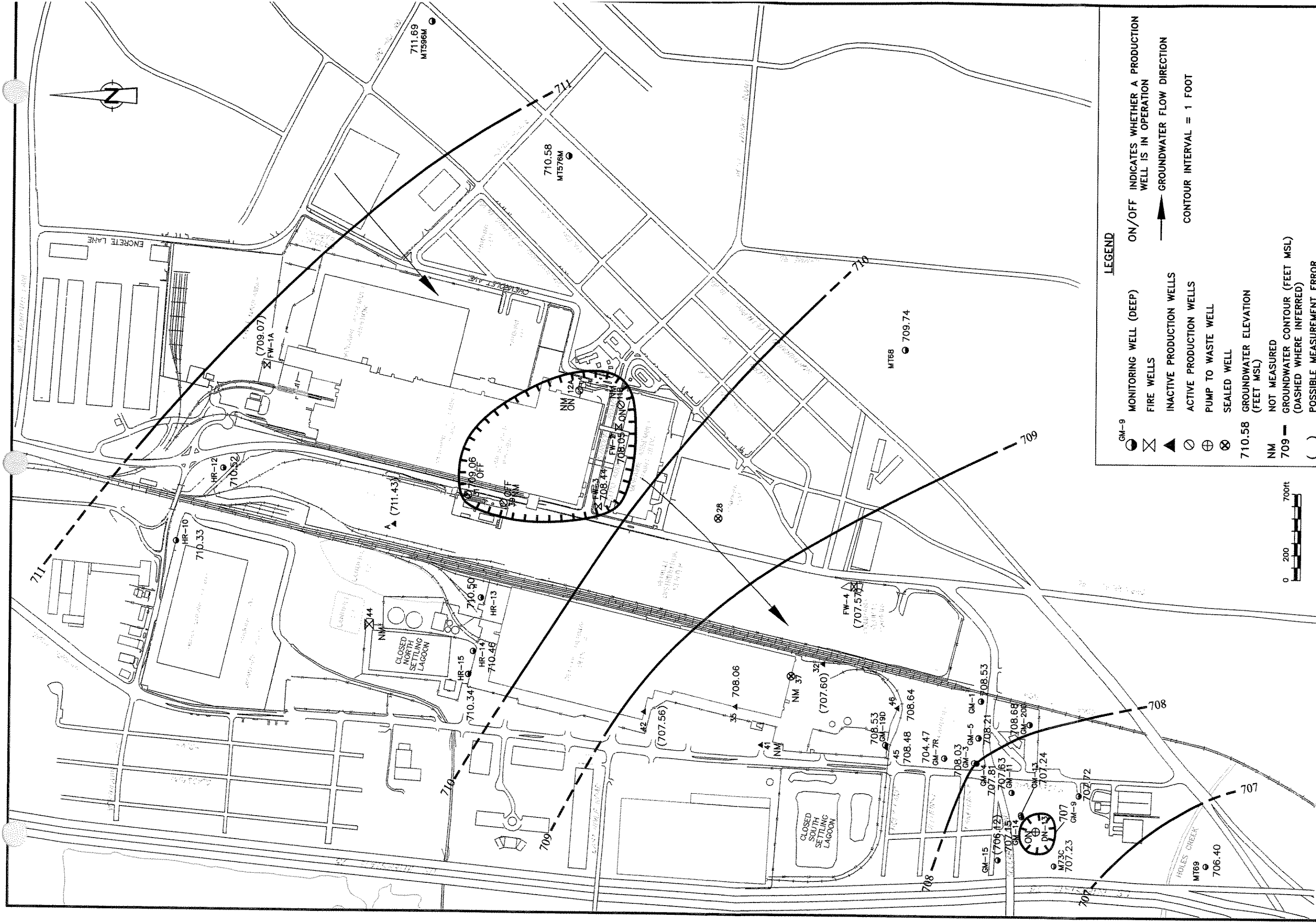
NS - Not Surveyed.

NM - Not measured.



**WATER TABLE SURFACE (UPPER AQUIFER)
ON SEPTEMBER 15 AND 16, 2003
GENERAL MOTORS CORPORATION
MORaine, OHIO**

DATE	5/12/2003	PROJECT MANAGER	N. GILLOTTI	DRAWING NAME	CRA\OTR03\SHAL03
DRAWN	R. SMITH	LEAD DESIGN PROF.	J. REID	CHECKED	N. GILLOTTI
PROJECT NUMBER	OH000294.0006.0003	DRAWING NUMBER	3		



LEGEND

- GM-9 MONITORING WELL (DEEP)
- Fire Wells
- INACTIVE PRODUCTION WELLS
- ACTIVE PRODUCTION WELLS
- PUMP TO WASTE WELL
- SEALED WELL
- 710.58 GROUNDWATER ELEVATION (FEET MSL)
- NM NOT MEASURED
- 709 GROUNDWATER CONTOUR (FEET MSL) (DASHED WHERE INFERRED)
- () POSSIBLE MEASUREMENT ERROR
- ON/OFF INDICATES WHETHER A PRODUCTION WELL IS IN OPERATION
- GROUNDWATER FLOW DIRECTION
- CONTOUR INTERVAL = 1 FOOT

POTENTIOMETRIC SURFACE (LOWER AQUIFER)
ON SEPTEMBER 15 AND 16, 2003
GENERAL MOTORS CORPORATION
MORaine, OHIO



6397 Emerald Parkway
Suite 150, Dublin, OH 43016
Tel: 614/764-2310 Fax: 614/764-1270

DATE 4/29/2003	PROJECT MANAGER N. GILLOTTI	DRAWING NAME CRA\OTR03\DEE03
DRAWN R. SMITH	LEAD DESIGN PROF. J. RED	CHECKED N. GILLOTTI
PROJECT NUMBER OH000294.0006.0003	DRAWING NUMBER 4	



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Appendix E

In-Situ Reactive Zones Performance
Results for 2003



In-Situ Reactive Zones Performance Results

As described in Section 3.1.1 of the Site-Wide Groundwater Monitoring Report for 2003, the carbon solution delivery network consists of three reactive zones, RZ-1, RZ-2, and RZ-3 (West and East). During 2003 molasses was introduced into the groundwater through introduction points at RZ-1 and RZ-3 (East and West) shown on Figures 10 and 12 of the Monitoring Report, respectively. No molasses was introduced into RZ-2 (Figure 11) in 2003. The following sections discuss the monitoring completed to assess the effectiveness of the in-situ reactive zones and the results of this monitoring.

Reactive Zone Monitoring

Operation of the reactive zones was monitored through the collection of field parameter measurements, and laboratory analyses of biogeochemical indicator parameters and volatile organic compounds (VOCs), according to the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002). Field parameter measurements included: pH, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and temperature. Biogeochemical parameters included nitrate, nitrite, nitrogen (ammonia), manganese (total and dissolved), iron (total and dissolved), sulfate, sulfide, total organic carbon (TOC), chlorides, light hydrocarbons (ethane and ethene), and methane. The monitored VOCs included: benzene, toluene, ethylbenzene, xylenes, tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-DCE), vinyl chloride, 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), and trans-1,2-dichloroethene (trans-DCE). The data collected are presented in Tables 9 through 12 of the Monitoring Report and Figures E-1 through E-10, for RZ-1, RZ-2, RZ-3 West and RZ-3 East. The bioattenuation parameter data is presented on Tables 13 through 16 of the Monitoring Report and Figures E-11 through E-18 for RZ-1, RZ-2, RZ-3 West and RZ-3 East, respectively. An evaluation of pertinent monitoring data is presented in the following sections.

The operational monitoring data collected, as indicated above, can be broadly categorized as: (i) "primary" operational monitoring data, which tracks the actual operation of the remediation system and determines whether the operation is proceeding as planned, and (ii) "secondary" operational monitoring data, which assists in the occasional troubleshooting of the system. The secondary data becomes important in the event that degradation of the VOCs is not proceeding as expected, and the cause cannot be determined from the primary operational monitoring data. The primary operational monitoring data includes pH, TOC, VOCs, ethene, ethane, and methane. Secondary operational monitoring data includes ORP, temperature, specific conductance, nitrate, nitrite, total and dissolved manganese, total and dissolved iron, sulfate, sulfite, and chlorides.

The purpose of upgradient and downgradient monitoring wells, separate from the introduction points within the reactive zones, is to collect and compare data before and after biodegradation by the stimulated microbial population. Locations of these wells are shown on Figures 10, 11, and 12 of the Monitoring Report.

- At RZ-1, GM-29 is designated as the upgradient monitoring well, while GM-28 is designated as the downgradient monitoring well. These wells are ideally positioned, relative to estimated groundwater travel time, approximately 100 days upgradient, and 100 days

downgradient from the RZ-1 introduction zone. GM-29 is located within the area of the RZ-1 expansion wells.

- At RZ-2, existing monitoring wells, screened at the top of the water table, were used for introduction points in this area during the initial phase of this remedial action. After a period of introduction in all ME-series wells, it was decided to stop introducing in the most upgradient (ME-6) and downgradient (ME-3) monitoring wells, so that they could be used for RZ-2 monitoring. ME-6 and ME-3 were used during 2003 to monitor RZ-2. Groundwater quality was also monitored at GM-31, which is an upper aquifer monitor well screened at the top of the regional clay till, below the introduction zone.
- For RZ-3 West, monitoring wells EAST and GM-19S are used as the upgradient wells. At RZ-3 West, GM-32, which is within the introduction zone due to its location being constrained by the proximity of Landfill L1, is designated as the downgradient monitoring well. Results at GM-32 are analyzed with caution, as this well is located in the early stages of the reactive zone due to its proximity to the introduction points. Annual data collected from GM-8 and GM-6, which are further downgradient from the introduction zone and located along the west side of Landfill L1, have also been evaluated with respect to monitoring the performance of RZ-3 West.
- For RZ-3 East, GM-22 is designated as the upgradient monitoring well and GM-21 is designated as the downgradient monitoring well.

Analysis of Primary Operational Monitoring Data

The primary operational data is comprised of a limited number of variables that are monitored at a high frequency, supplying the information required for the operation of the remediation system. The entire data set is presented in Tables 9 through 16 of the Monitoring Report. These tables are organized such that upgradient and downgradient changes can be easily identified for each reactive zone.

pH

The preferred pH range for reductive dechlorination is between 6 and 8, and the acceptable pH range extends from 5 to 9. All pH measurements collected during 2003 were in the preferred pH range.

Total Organic Carbon

In 2003, molasses was injected into the introduction wells of RZ-1 during January, May through September, and November. No molasses was injected in RZ-2 during 2003. The introduction wells at RZ-3 West received molasses in January, and May through December. The introduction wells at RZ-3 East received molasses during January, May, and June.

At RZ-1, the reductive dechlorination process was most effective when introduction zone carbon loadings were high enough to leave more than 100 milligrams per liter (mg/L) TOC at a distance of 100 days downgradient from the introduction zone (the downgradient well, GM-28, is

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approximately 100 days downgradient from the introduction zone). Under these conditions, the dechlorination of vinyl chloride appears to have proceeded at rates more than 20-fold greater than those for cis-DCE, suppressing the formation of a vinyl chloride concentration peak¹. Though a decrease in TOC content was observed in RZ-1 downgradient well GM-28 during the 2003 sampling events (May and October, 2003), the ongoing reductive dechlorination process was not adversely affected.

As indicated earlier, no molasses was injected in the RZ-2 wells during 2003, resulting in an overall reduction of TOC in this area. A slight increase in TCE concentrations and decrease in daughter products was observed in RZ-2 monitoring wells during 2003.

The TOC levels at RZ-3 West downgradient well GM-32 were consistently high. The level of TOC recorded at RZ-3 East downgradient well GM-21 was approximately 2 mg/L, indicating absence of carbon at this location. Investigation activities concerning carbon levels at RZ-3 East are discussed in detail later.

VOC Analytical Results

The groundwater analytical data for the site-specific list of VOCs are presented in Table 9 for RZ-1, Table 10 for RZ-2, Table 11 for RZ-3 West, and Table 12 for RZ-3 East in the Monitoring Report. Additionally, the degradation of PCE and TCE (parent compounds) to cis-DCE, vinyl chloride (daughter products), and ethene (end product) are provided for the upgradient and downgradient monitoring wells in RZ-1, RZ-2, RZ-3 West and RZ-3 East on Figures E-1 through E-10, respectively.

The following bullets summarize the observations and trends evident among the three reactive zones at the Moraine facilities that indicate that enhanced reduction of the targeted chlorinated VOCs is progressing as a result of the carbon introduction process:

- Comparing the 2003 profiles of chlorinated compounds in the upgradient and downgradient wells in RZ-1 (Figures E-1 and E-2, respectively), it was found that degradation of the chlorinated VOCs was maintained throughout 2003. Consistent amounts of ethane and ethene, which are the end products of the reductive dechlorination process, were observed.
- The concentrations of PCE, TCE, cis-DCE, and vinyl chloride at the monitoring well ME-3 in RZ-2 decreased to non-detectable levels by the end of 2002. No molasses was injected in 2003 in response to the 2002 data. Slight increases in total VOCs were observed at ME-3 and GM-31 in 2003. The latest data show a total of 33.5 micrograms per liter (µg/L), with the maximum contributor being 1,1-DCA (concentration at 24 µg/L), which is a daughter product of 1,1,1-TCA degradation. Concentrations of TCE detected at GM-31 were close to pre-carbon

¹ It is also possible that abiotic destruction of cis-DCE was responsible for elimination of the vinyl chloride peak. The DCE-to-ethene reaction can be accomplished by a 2-chlorine removal reaction that forms acetylene (β -elimination), which is then reduced to ethene. The abiotic reaction cannot be ruled out, although redox conditions in the dechlorinating zone appear to be too low to support iron-mediated abiotic β -elimination.

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introduction levels, though a significant cis-DCE concentration was also detected at GM-31 indicating some on-going degradation.

- At RZ-3 West, concentrations of PCE, TCE, cis-DCE, and vinyl chloride monitored at GM-32, located within the influence of the introduction zone, remained at non-detectable levels at the end of 2003 (Table 11 of the Monitoring Report). It is important to note that GM-32 is close to the introduction zone, and VOC results at this location may not reflect the full extent of dechlorination achieved by the reactive zone. The fact that PCE, TCE, cis-DCE, and vinyl chloride are below detection at GM-32 indicates the dechlorination is proceeding very rapidly in this area.
- Data from monitoring wells GM-8 and GM-6, which are located downgradient of RZ-3 West along the west side of Landfill L1, is being considered to evaluate the effect of carbon introductions at RZ-3 West. As shown in Figures E-7 and E-8, significant decrease was noted in total VOCs for GM-8 and GM-6. Concentrations of PCE, TCE, cis-DCE, and vinyl chloride at GM-8 were below detection limits by the end of 2003. Though GM-6 is located further downgradient, concentrations of PCE and TCE have consistently decreased since 1998. An increase in cis-DCE and vinyl chloride at GM-6 was observed during September 2002 corresponding with a decrease in parent products. It is expected that consistent molasses introduction at RZ-3 West will eventually reduce the concentrations of all chlorinated VOCs at GM-6. It is important to realize that though GM-6 is located in the redox recovery zone for the RZ-3 West (because of their distance from the introduction zone), the effectiveness of the enhanced reductive dechlorination in this downgradient area may be adversely affected by the proximity of GM-6 to groundwater recovery well TW-2 which draws fresh, oxygenated groundwater into the area, thereby limiting the ability to develop the desired reducing conditions.
- No significant degradation of VOCs was evident from the data collected from GM-21, which is the downgradient monitoring well for RZ-3 East. The lack of dechlorination appears to be linked to an absence of TOC at this point, indicating that the reactive zone is not receiving sufficient loading and/or groundwater flow is not directed towards GM-21.
- The concentrations of VOCs at the influent to the air-stripper tower are being monitored on a monthly basis since the startup of the air stripper unit on January 31, 1996 (Figure 5 of the Monitoring Report). The first monitoring event was on February 1996, and the introduction of molasses in RZ-3 commenced from December 1999. On reviewing the data presented in Figure 5, it is seen that the concentrations of chlorinated VOCs decreased consistently contributing to the observed decrease in total VOCs. Immediately following the startup of the groundwater recovery system, an aerobic zone was created leading to the decrease in BTEX concentrations.

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Methane

Methane concentrations can increase during methanogenesis when acetate (a product of sugar fermentation) is split to form carbon dioxide and methane, or when carbon dioxide is utilized as an electron acceptor under extreme reducing conditions, producing methane. The presence of increased methane concentrations in the downgradient wells of RZ-1 and RZ-3 West (Figures E-12 and E-16, respectively) is further evidence that strongly reducing conditions have developed and are a sign that methanogenesis is occurring. Concentrations of methane increased consistently at GM-8 with corresponding increase in TOC. A similar observation was made at GM-6. The methanogens can provide a significant contribution to dechlorination through the production of enzymes and cofactors that cometabolically dechlorinate ethenes such as PCE and TCE.

Analysis of Secondary Operational Monitoring Data

Dissolved Manganese and Iron

An increase in concentrations of dissolved manganese in groundwater is an indication of reducing conditions, as the reduced form of manganese is more soluble. The concentration of manganese at the site prior to injecting the carbon solution was fairly low, as indicated by the results of the baseline groundwater sampling event in September 1999 (Tables 13 through 16 of the Monitoring Report).

Comparing the dissolved manganese concentrations at the upgradient and downgradient monitoring wells at RZ-1, it was found that the dissolved manganese concentrations at the downgradient well GM-28 were consistently higher than those recorded at GM-29 (Table 13 of the Monitoring Report). Increases in the concentration of dissolved manganese at the downgradient monitoring wells provide a good indication of increased anaerobic conditions in groundwater, and progression of the effects of carbon source introduction away from the reactive zone.

Ferric iron (Fe^{3+}) can also be used as an electron acceptor and the appearance of soluble, ferrous iron (Fe^{2+}) indicates development of more reducing conditions. Increases in dissolved iron are an important indication of the depletion of more "aerobic" electron acceptors. The aquifer bacteria communities that persist at iron-reducing and lower redox levels are capable of reductive dechlorination. The observation of significant increases in dissolved iron marks the passing of an important benchmark in development of the dechlorinating reactive zone.

Strong reducing conditions were evident in RZ-1 as the dissolved iron concentrations at GM-28 (downgradient) were considerably higher than that of GM-29 (upgradient). Also, concentration peaks for dissolved iron, observed in Figure E-12, can be directly correlated to periods of molasses introduction. Similar observations were made in RZ-2 and RZ-3 West.

These dissolved metals data provide strong evidence that the effects of carbon source introductions changed the groundwater geochemistry and promoted reducing conditions in the targeted portions of the upper aquifer at the site. The less distinct effects noted within the RZ-3

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areas are likely due to the larger area of the aquifer being targeted for remediation (thickness of aquifer up to 30 ft) compared to RZ-1 where the aquifer thickness is between 10 and 15 ft.

Sulfate

Under more strongly reducing conditions, sulfate can be used as an alternate electron acceptor, and in the process is reduced to elemental sulfur or sulfide. However, the phenomenon of sulfate reduction can be masked in some cases by the introduction of sulfur present in the molasses solution. The sulfate concentrations within GM-28 in RZ-1 were found to be low (65 and 31 mg/L during 2003 sampling events), compared to the sulfate concentrations measured in GM-29 (91 and 52 mg/L), and this provides evidence of the presence of anaerobic and reducing conditions favorable for reductive dechlorination. Similar observations were made within RZ-3 West.

Oxidation/Reduction Potential

The ORP of groundwater is a measure of electron activity and is an indicator of the relative tendency of a solution to accept or transfer electrons. ORP reactions in groundwater containing organic compounds are usually biologically mediated and, therefore, the ORP of a groundwater system is dependent on and influences biodegradation. ORP measurements below 0 millivolts (mV) (i.e. negative measurements) are indicative of reducing conditions in the groundwater. The ORP readings measured during the site-wide groundwater monitoring events (Tables 13 through 16 of the Monitoring Report) indicate that reducing conditions were maintained within RZ-1, RZ-2, and RZ-3 West due to the introduction of the carbon source. For instance, within RZ-1, the ORP measurements recorded at the downgradient monitoring well GM-28 since the completion of the 6-month study in May 2000 indicates that reducing conditions were maintained with ORP readings ranging between -70 mV and -203 mV. Similar observations were made in RZ-2, where the ORP readings at GM-31 were -82 mV and -66 mV in 2001 and 2002, respectively. In well ME-3, the ORP readings ranged between -36 mV and -193 mV since the completion of the 6-month study in May 2000. Finally, in RZ-3 West, highly reducing conditions were noted in the downgradient monitoring well GM-32, where the ORP readings ranged between -152 mV and -354 mV. The ORP readings at GM-6 changed from 57.6 mV measured during March 1998 to -223 mV measured during December 2003. In contrast to the above reactive zones, the ORP measurements recorded at the RZ-3 East downgradient monitoring well GM-21 showed positive values, indicative of non-reducing conditions.

Bioattenuation Indicator Parameter Diagrams

Figures E-11 through E-18 show the trends for biogeochemical indicator parameters for RZ-1, RZ-2, RZ-3 West, and RZ-3 East, respectively, as a means of demonstrating the interaction of the bioattenuation indicator parameters discussed above. These indicators show that the biogeochemistry of the upper aquifer at the Moraine facilities has been altered to more reducing conditions, and thereby, more conducive to enhanced reductive dechlorination. These figures have been developed to include dissolved manganese, dissolved iron, sulfate, and methane.

Figures E-11 and E-12 illustrate conditions upgradient and downgradient of the RZ-1 introduction wells, respectively. The shapes of the plots for the two wells in RZ-1 indicate that increases in

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dissolved manganese and iron coincides with the introduction of molasses, with high levels of the reduced form persisting in the period between introductions. Sulfate reduction was also occurring as a result of molasses introduction. Evidence of methanogenesis was also present from the increased levels of methane.

Figures E-13 and E-14 illustrate conditions in RZ-2. No molasses was introduced during 2003. Even without carbon introductions, sustained levels of dissolved manganese and iron, and methane are noted in ME-3, likely supported by TOC associated with residual levels of molasses and biomass.

Figures E-15 and E-16 represent the upgradient and immediate downgradient conditions in RZ-3 West, respectively. Increases in dissolved manganese and iron concentrations were found coincident with molasses introduction. On comparing the plots for concentrations of methane, which is the distinct evidence of ongoing methanogenesis, it was found that methane concentrations in GM-32 were significantly higher than the upgradient well. Biogeochemical conditions at GM-8 and GM-6, which are located downgradient to RZ-3 West, are shown in Figures E-17 and E-18. Significant increases in methane production has occurred since molasses introduction has commenced at RZ-3 West wells. Consistent decreases in sulfate concentration in the same period also indicate favorable conditions for the reductive dechlorination process. The biogeochemical conditions existing at the upgradient and downgradient wells of RZ-3 East are shown in Figures E-19 and E-20.

By-products Formed

Vinyl chloride is one of the daughter products of the reductive dechlorination process of PCE and TCE. As indicated earlier, carbon introduction rates can be adjusted so that the dechlorination of vinyl chloride proceeds at rates more than 20-fold greater than those for cis-DCE, thus circumventing the formation of a vinyl chloride concentration peak. On reviewing the data collected and the preceding discussion, no vinyl chloride peak was observed in the downgradient monitoring wells of RZ-1, RZ-2, and RZ-3 West. A transient peak of vinyl chloride was observed at GM-6 during the September 2002 sampling event; however, the concentrations subsided in 2003.

Data collected for metals during the 2000 sampling event (ARCADIS Geraghty & Miller, Inc., 2001), indicated that detected arsenic and barium concentrations exceeded Maximum Contaminant Levels (MCLs) at wells GM-28, HR-17 and/or GM-32. Additional data collected in May and September 2003 (Table 18 of the Monitoring Report) showed arsenic above its MCL at GM-28 and GM-32. However, these data appear to be anomalous with respect to the other data collected during site-wide monitoring event. In particular, sampling of monitoring wells immediately downgradient of these wells either did not detect these constituents, or detected these constituents at concentrations lower than their respective MCLs. Despite the increased levels of arsenic observed at GM-28 and GM-32, which are located downgradient to RZ-1 and RZ-3 West respectively, concentrations above MCLs were not detected in any of the downgradient wells located at the property boundary. Therefore, it was concluded that there is no evidence that a significant release of arsenic and/or barium to groundwater has occurred at the facilities. Additional information on arsenic and barium was presented in the Responses to U.S. EPA Items for Discussion Regarding the Site-Wide Groundwater Monitoring Plan and the Interim

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Measures/Corrective Measures Report by General Motors Corporation, Moraine, Ohio, dated December 10, 2002.

Higher levels of the naturally occurring arsenic and barium in groundwater may be associated with localized changes in groundwater geochemistry immediately downgradient of the in-situ reactive zone barriers. The groundwater conditions downgradient of the reactive zones are changed to a more reducing environment (i.e., the oxidation reduction potential is less than -200 mV) in order to degrade the chlorinated VOCs. This process can contribute to solubilizing arsenic bound to the naturally occurring iron hydroxide molecule (Welch, A.H., et al, 2000). A similar process occurs for barium where it is bound to the naturally occurring calcium carbonate present in the upper aquifer. The Dayton, Ohio area has elevated concentrations of calcium carbonate in the groundwater (CH₂M Hill, Inc., 1986). Both arsenic and barium are naturally occurring elements in the clay-rich soils of Ohio (Shacklette, H.T. et al, 1984; Dragun, J., et al, 1991; Cox, C.A., et al, 1996). Therefore, the presence of these constituents in wells immediately downgradient of the reactive zones is due to solubilizing of natural constituents. However, as groundwater migrates into more natural, less reducing groundwater, this effect will abate. As discussed in the Monitoring Report, GM will continue to monitor the presence of arsenic and barium in designated monitoring wells.

RZ-3 East Evaluation

Molasses has been introduced at RZ-3 East on a periodic basis from December 1999 to June 2003. Unlike other reactive zones, a significant decrease in VOC concentrations has not been observed at RZ-3 East downgradient monitoring well GM-21, which is located approximately 136 feet south of the RZ-3 East introduction wells. In addition, biogeochemical parameters at GM-21 have shown little influence from the molasses introduction. To evaluate the pathway in which the carbon was traveling from RZ-3 East, a soil boring (HP-1 - to collect hydropunch samples) and three 1-inch nested observation points (HP-2, set to monitor several depths) were installed approximately 45 and 25 feet, respectively, to the south of RZ-3 East. The results of the laboratory analysis of the hydropunch samples and the samples from the observation points indicated some elevated concentrations of TOC, as shown below, but much less than anticipated or required for effective reductive dechlorination.

The hydropunch data at approximately 45 feet downgradient from RZ-3 East:

Depth (ft)	Dissolved Organic Carbon (mg/L)
25-29	12
29-33	13
33-37	19
37-41	13
41-45	11
45-49	11
55-59	20

The organic carbon data at 25 feet south-southeast from RZ-3II:

Depth (ft)	Dissolved Organic Carbon (mg/L)
24-29	12

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36-41 19
49-54 23

Based on these results, the introduction of carbon into RZ-3 East ceased in June 2003 until the direction and/or velocity of groundwater flow in this localized area is better understood.

To support an evaluation of localized groundwater flow in the RZ-3 area water level measurements were obtained from several RZ-3 wells and numerous monitoring wells in October and November 2003. Figures E-21 and E-22 show the groundwater elevations and groundwater contours. These groundwater flow maps indicate that the localized groundwater flow downgradient of RZ-3 East has a more pronounced southwesterly direction of flow than previously thought. The influence of RZ-3 East will be further evaluated in 2004, such that the reactive zone may be re-started in support of the site-wide objective for decreasing VOC concentrations in this southern portion of the site.

Conclusions

The following observations can be made:

- Existing aquifer conditions have been converted to more reducing conditions through the introduction of a carbon source, as evidenced by the changes in field and bioattenuation parameters.
- The target compounds (PCE and TCE) have been effectively reduced to daughter products (cis-DCE and vinyl chloride) and ultimately to ethene and ethane based on a review of the VOC results.
- Levels of vinyl chloride were consistently low to non-detect in all downgradient wells, indicating degradation of cis-DCE to ethene and ethane, without production of significant vinyl chloride peaks.
- Collateral effects of the carbon introductions caused desorption of chlorinated solvents that would have been unaffected by other remedial measures. This desorption effect is probably due to the solvent effects of fermentation products, and effects of microbial surfactants that are released into the formation.
- VOC concentrations at RZ-3 East have not decreased in response to molasses introductions, in contrast to the other three reaction zone segments. TOC levels, as well as other primary and secondary operational monitoring data, indicate that the effects of molasses introductions are not reaching the GM-21 downgradient monitoring location.

Overall, the process of enhanced reductive dechlorination at this site has been successful in achieving the desired reduction of VOC concentrations. Additional investigation is being conducted so that suitable corrective actions can be undertaken in RZ-3 East to achieve the desired reduction in VOCs.

Figure E-1: Reductive Dechlorination at GM-29 - Upgradient Well in RZ-1

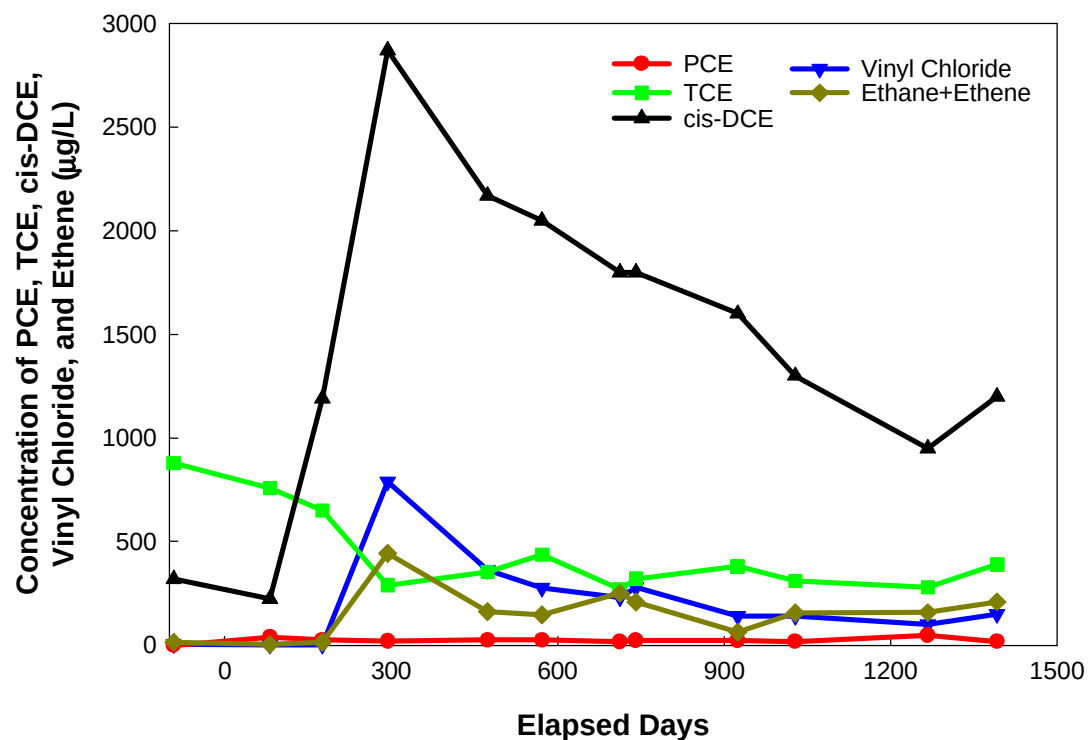


Figure E-2: Reductive Dechlorination at GM-28 - Downgradient Well in RZ-1

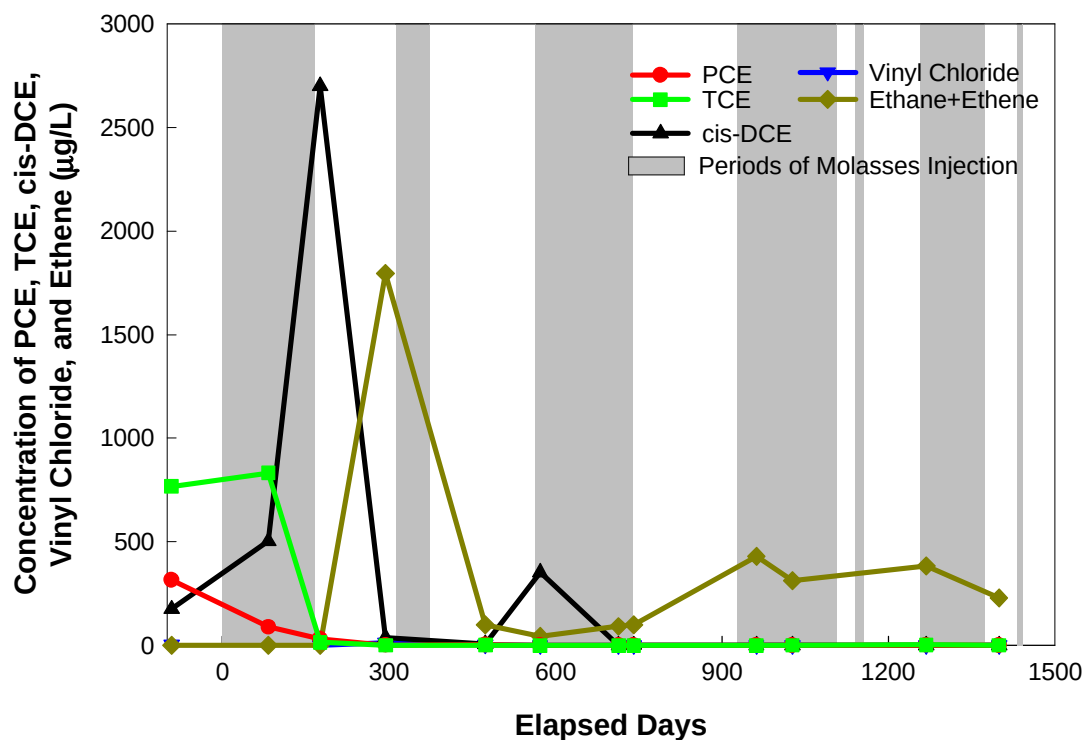


Figure E-3. Reductive Dechlorination at ME-6 - Upgradient Well in RZ-2

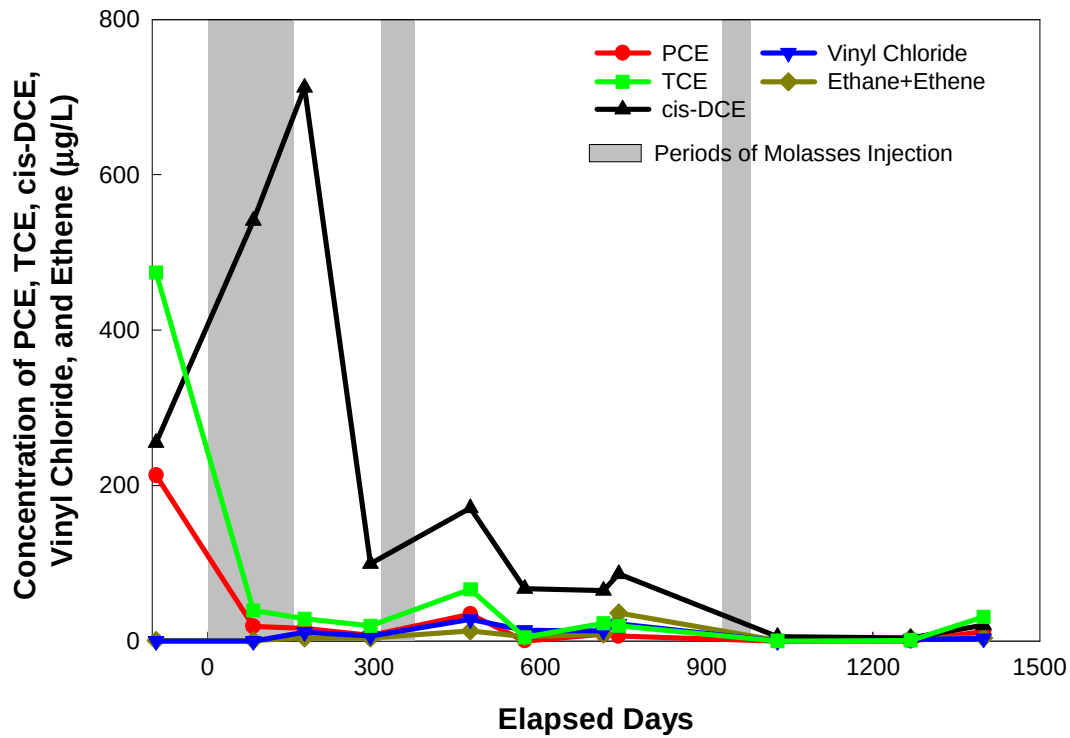


Figure E-4. Reductive Dechlorination at ME-3 - Downgradient Well in RZ-2

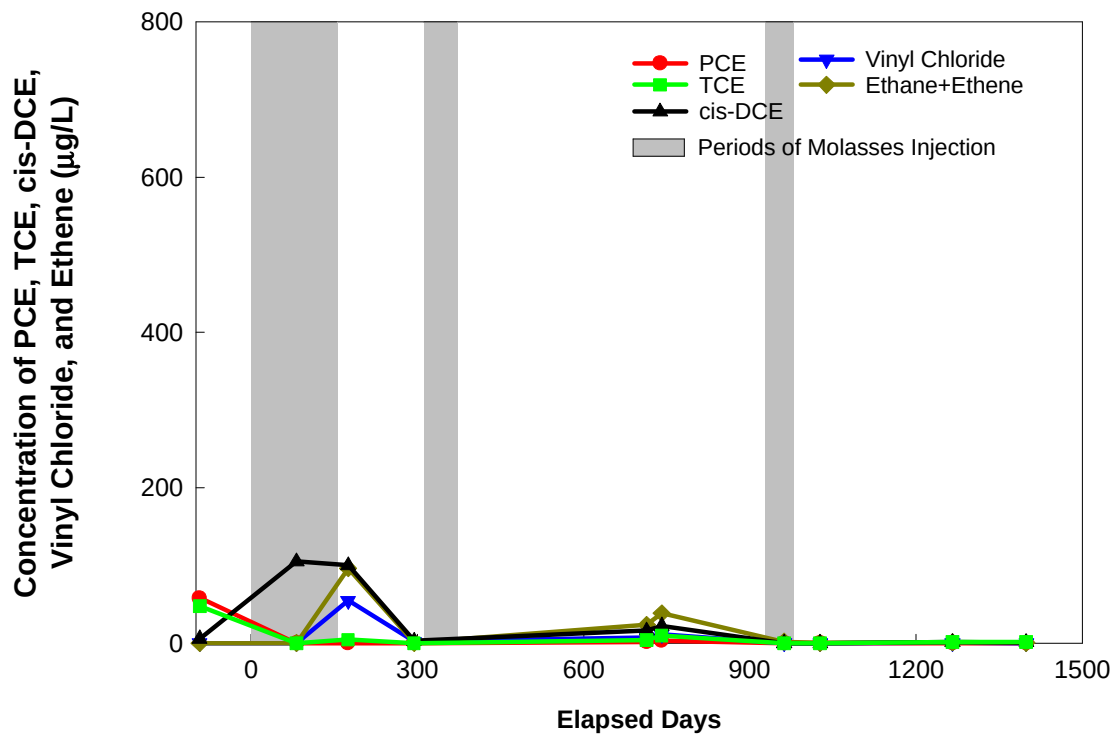


Figure E-5. Reductive Dechlorination at EAST - Upgradient Well in RZ-3 West

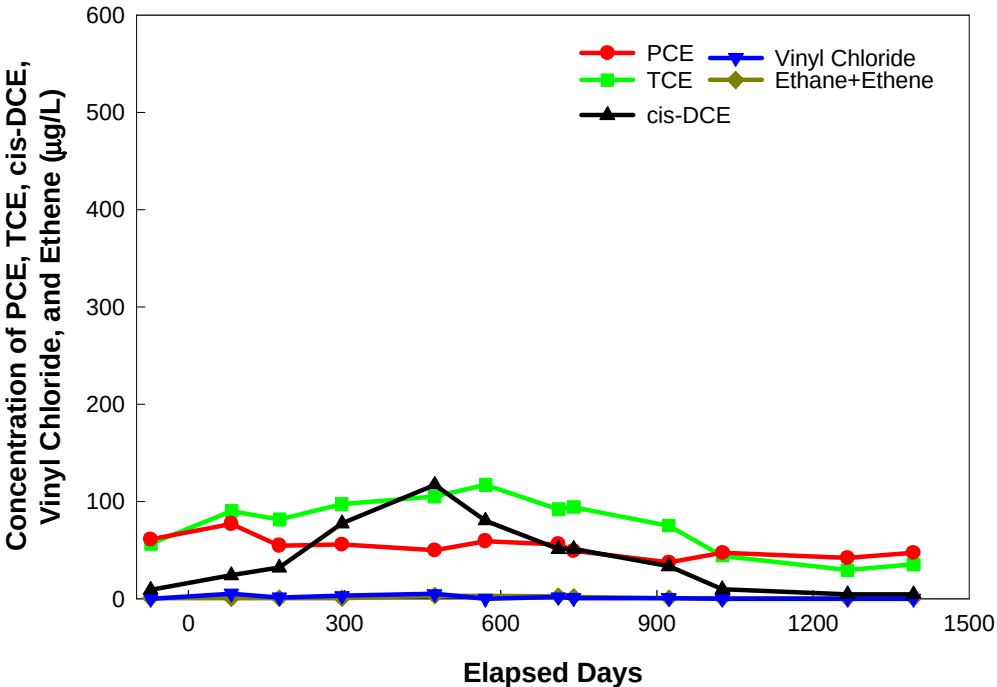


Figure E-6. Reductive Dechlorination at GM-32 - Downgradient Well in RZ-3 West

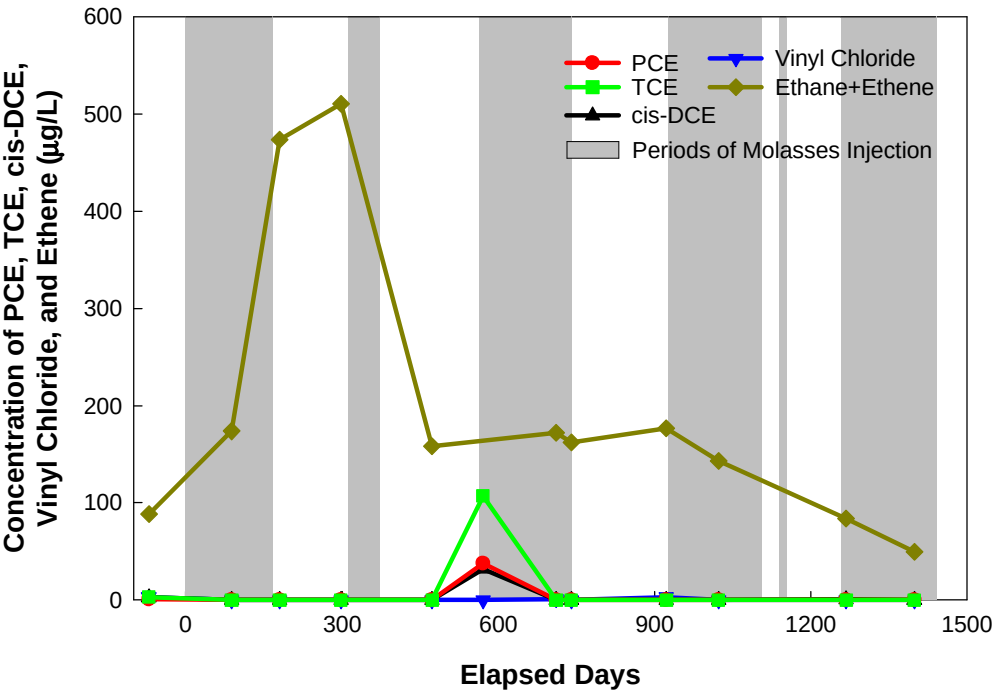


Figure E-7: Reductive Dechlorination at GM-8 - Downgradient to RZ-3 West

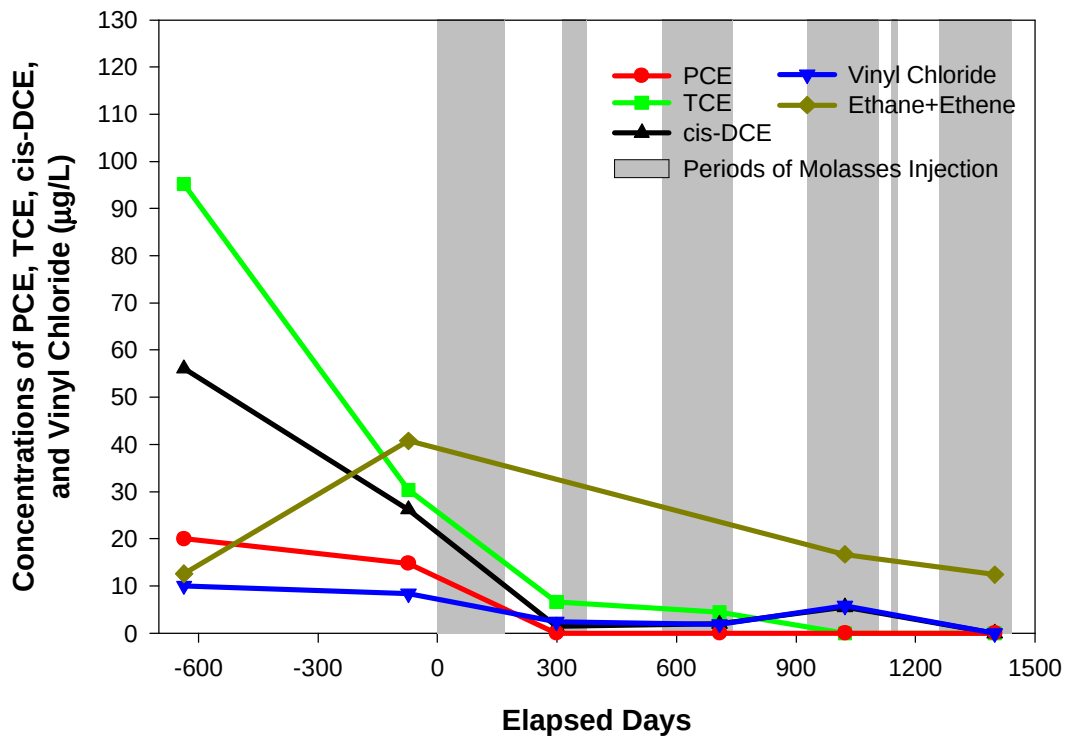


Figure E-8: Reductive Dechlorination at GM-6 - Downgradient to RZ-3 West

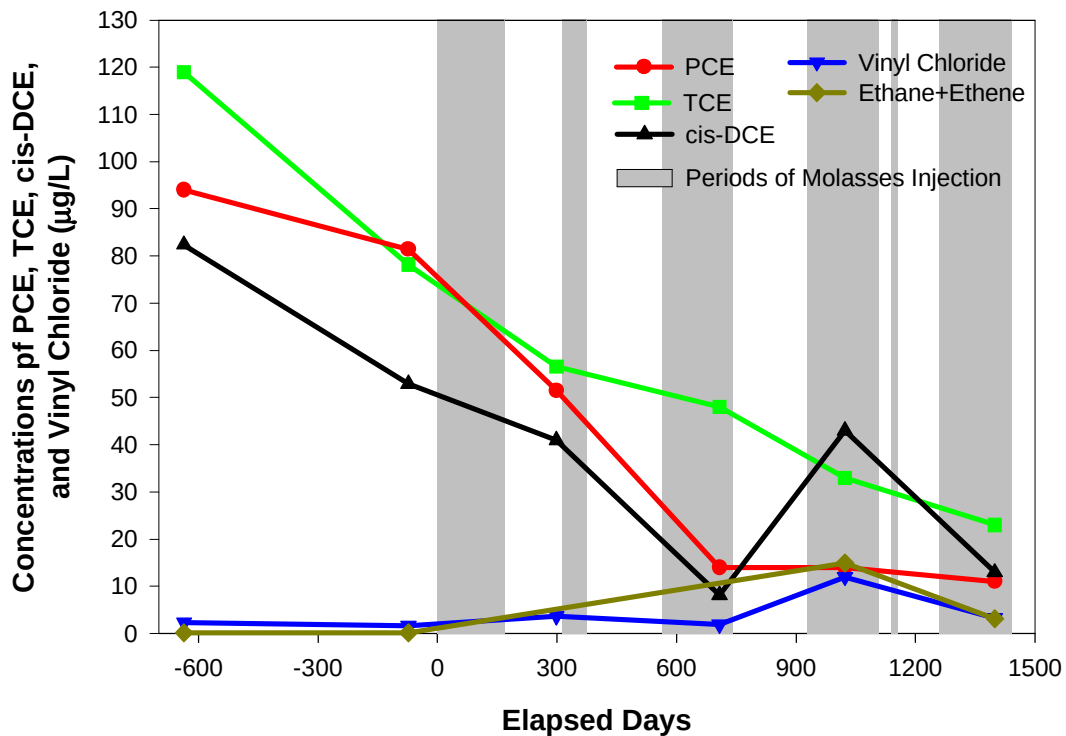


Figure E-7: Reductive Dechlorination at GM-8 - Downgradient to RZ-3 West

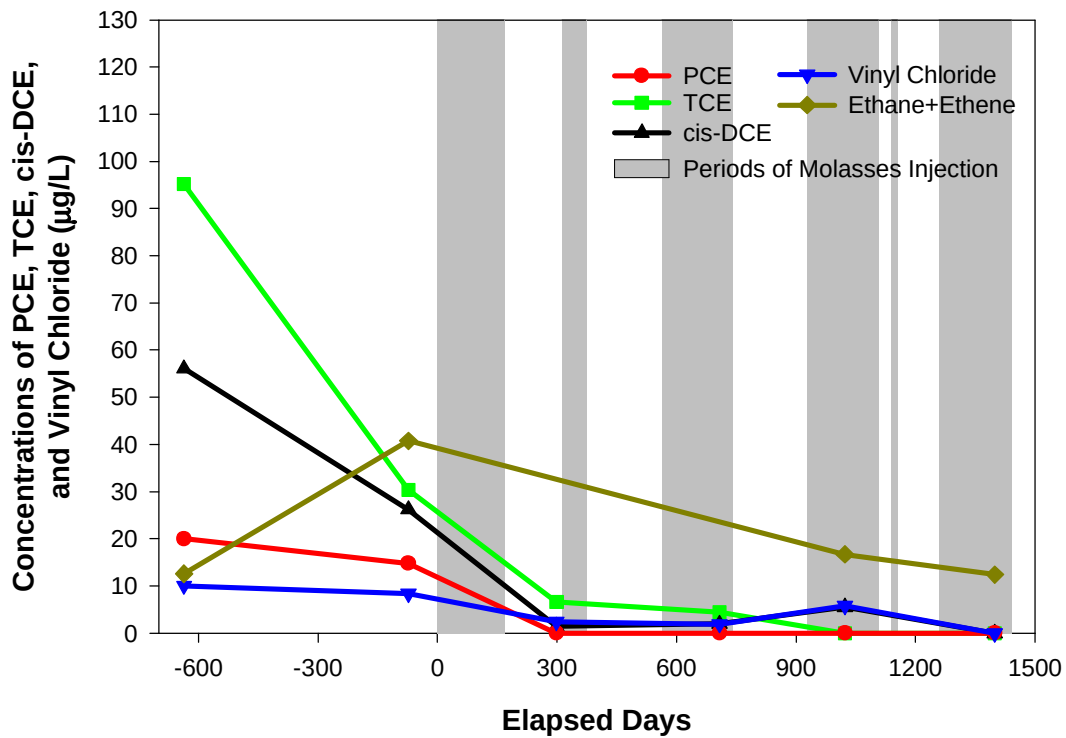


Figure E-8: Reductive Dechlorination at GM-6 - Downgradient to RZ-3 West

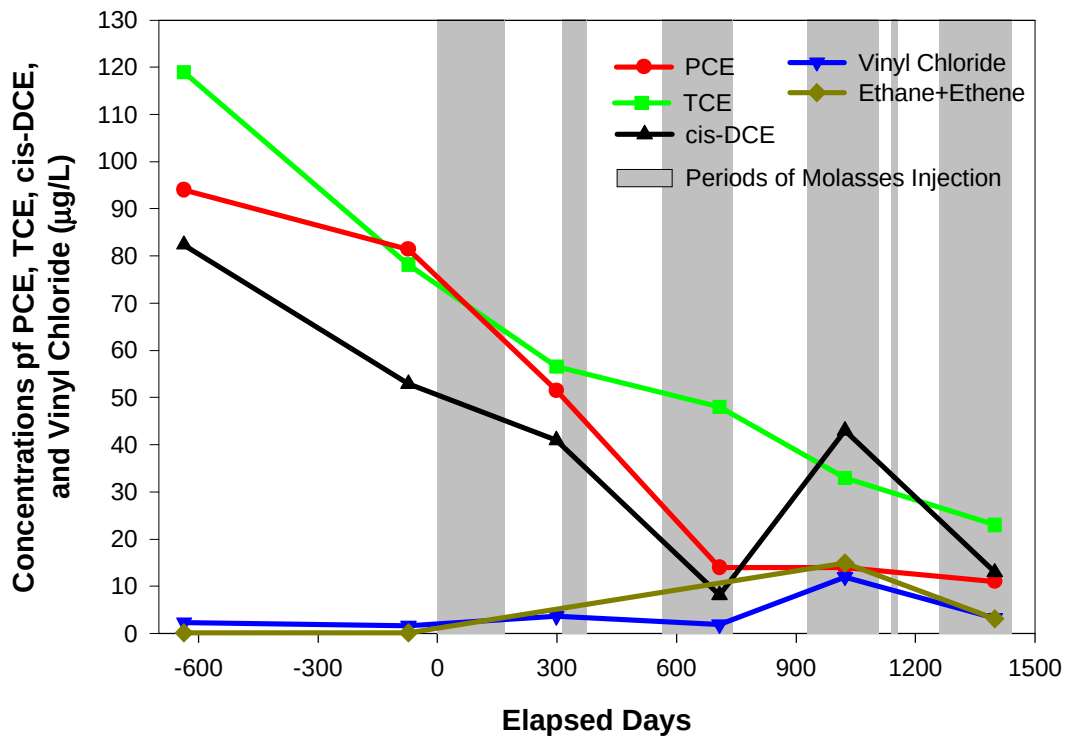


Figure E-9. Reductive Dechlorination at GM-22 - Upgradient Well in RZ-3 East

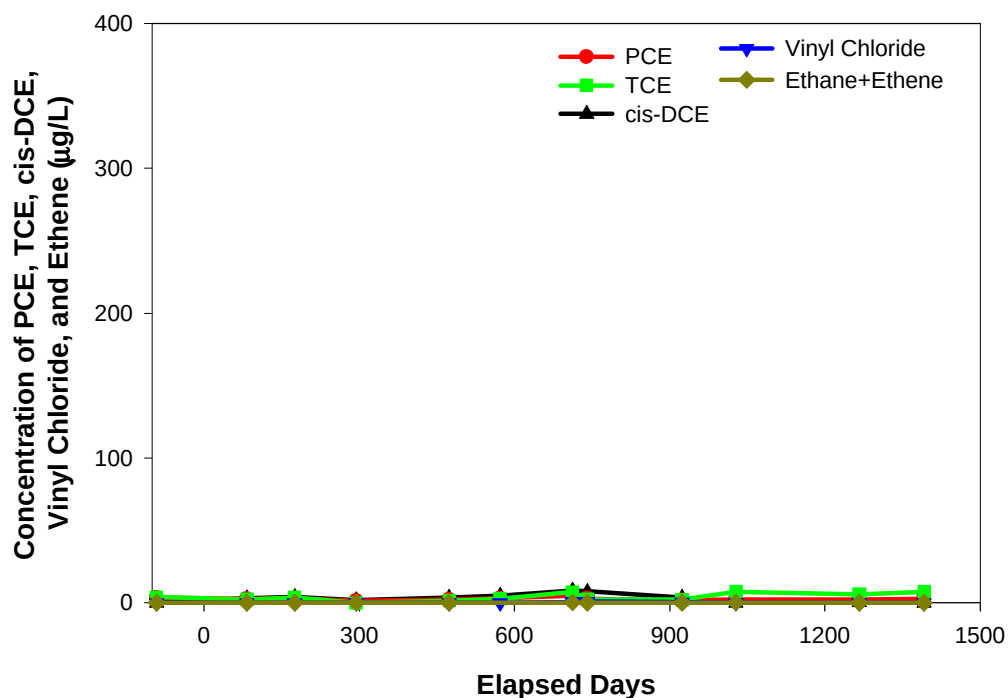


Figure E-10. Reductive Dechlorination at GM-21 - Downgradient Well in RZ-3 East

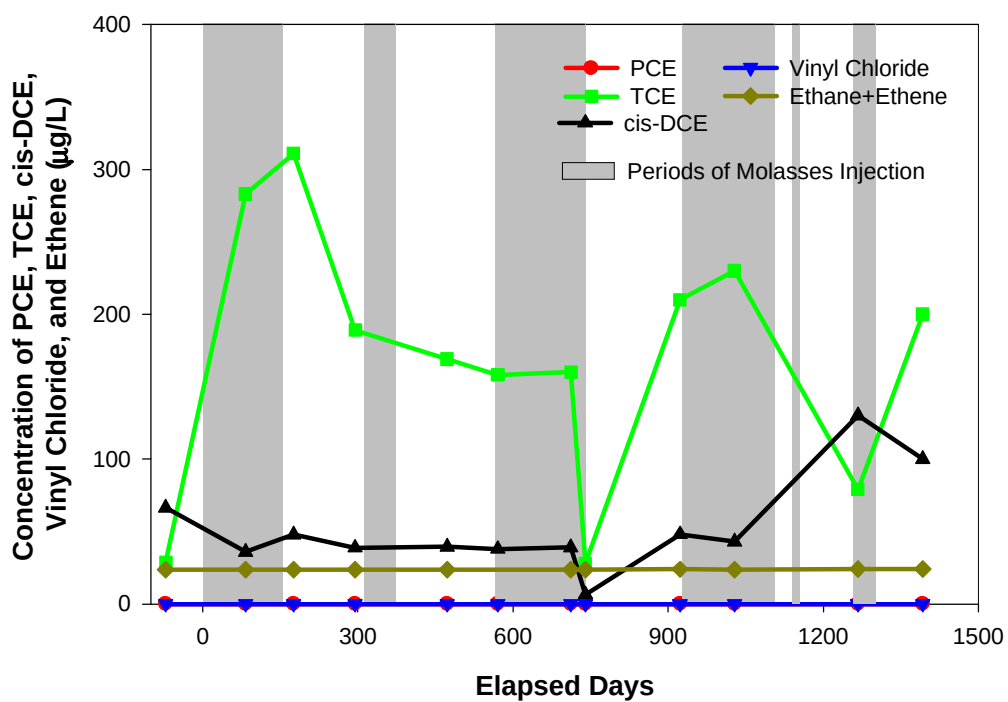


Figure E-11. Bioattenuation Parameters at GM-29 - Upgradient Well in RZ-1

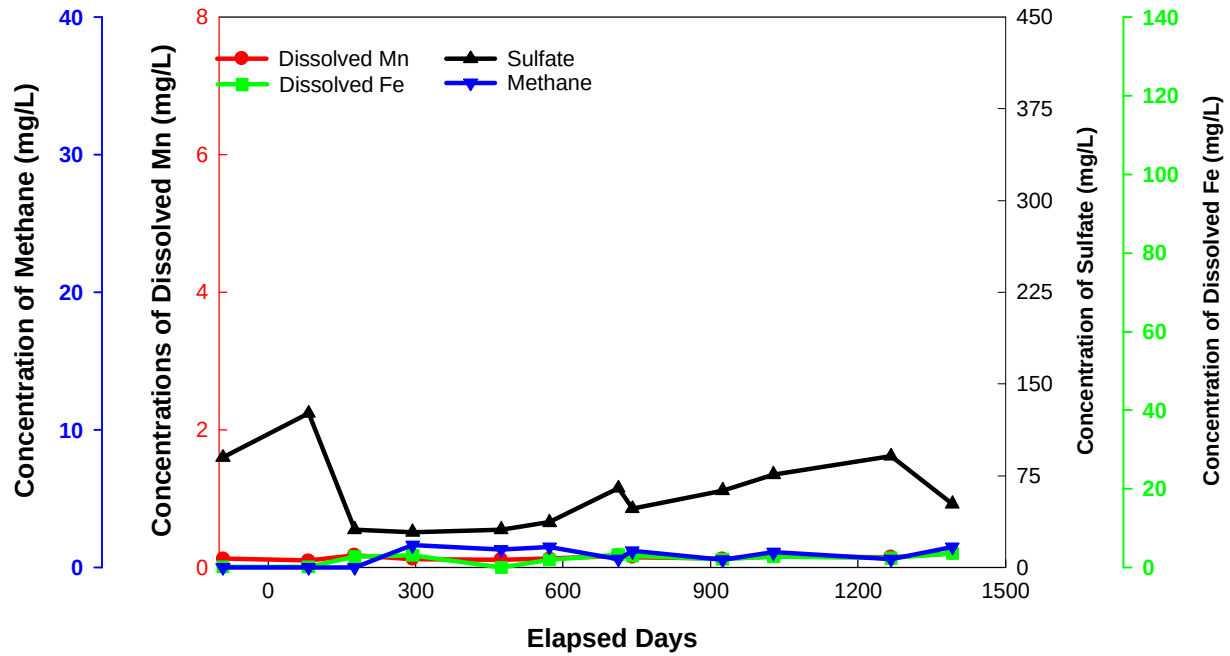


Figure E-12. Bioattenuation Parameters at GM-28 - Downgradient Well in RZ-1

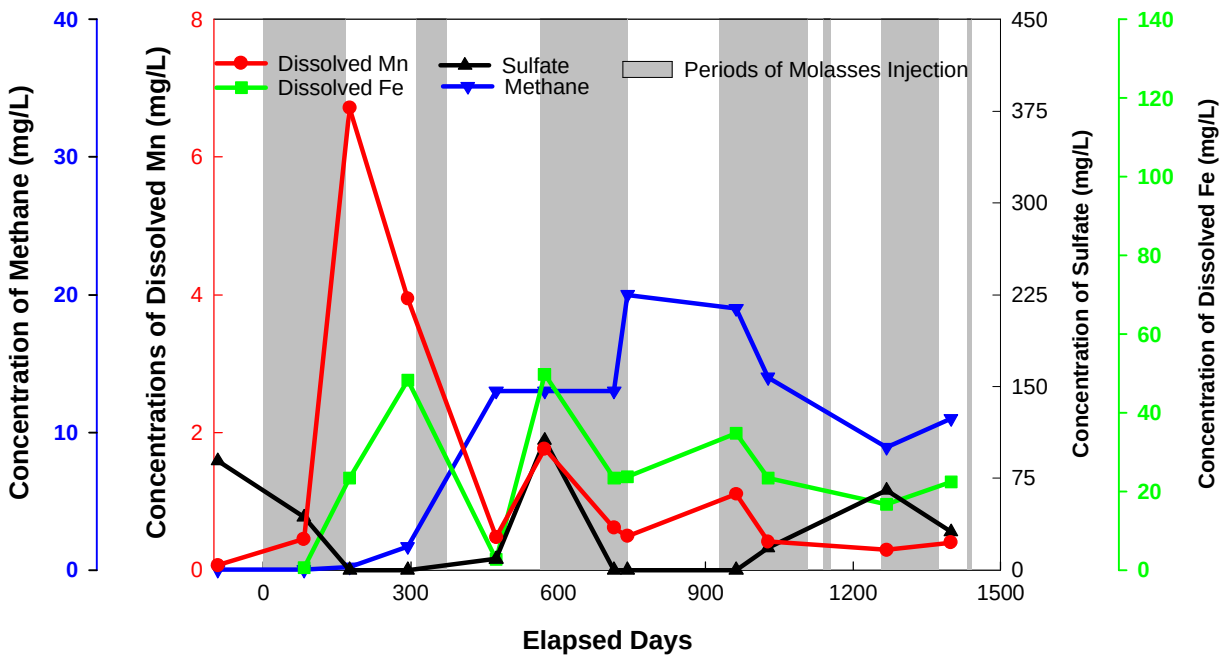


Figure E-13. Bioattenuation Parameters at ME-6 - Upgradient Well in RZ-2

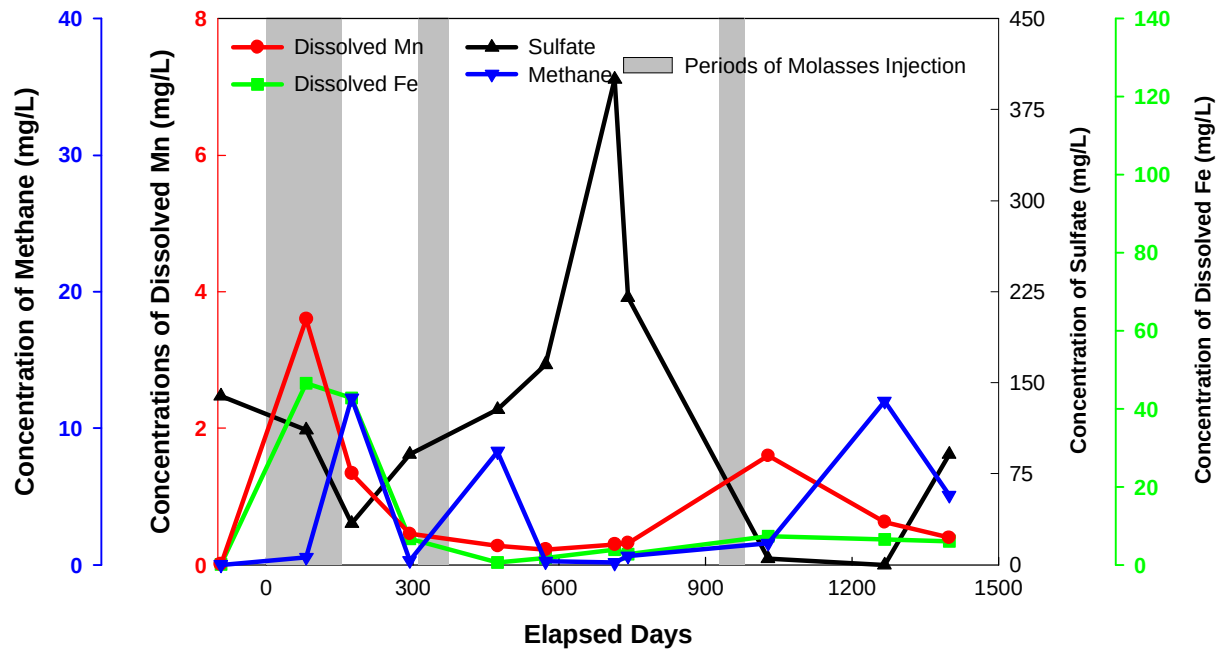


Figure E-14. Bioattenuation Parameters at ME-3 - Downgradient Well in RZ-2

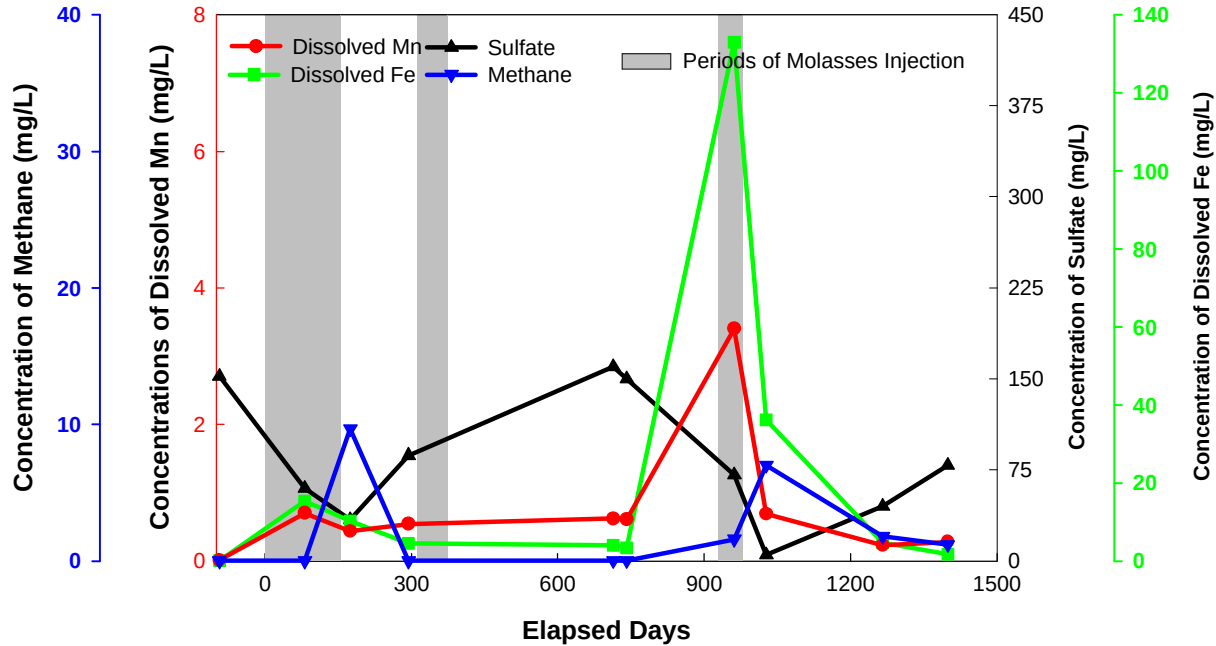


Figure E-15. Bioattenuation Parameters at EAST - Upgradient Well in RZ-3 West

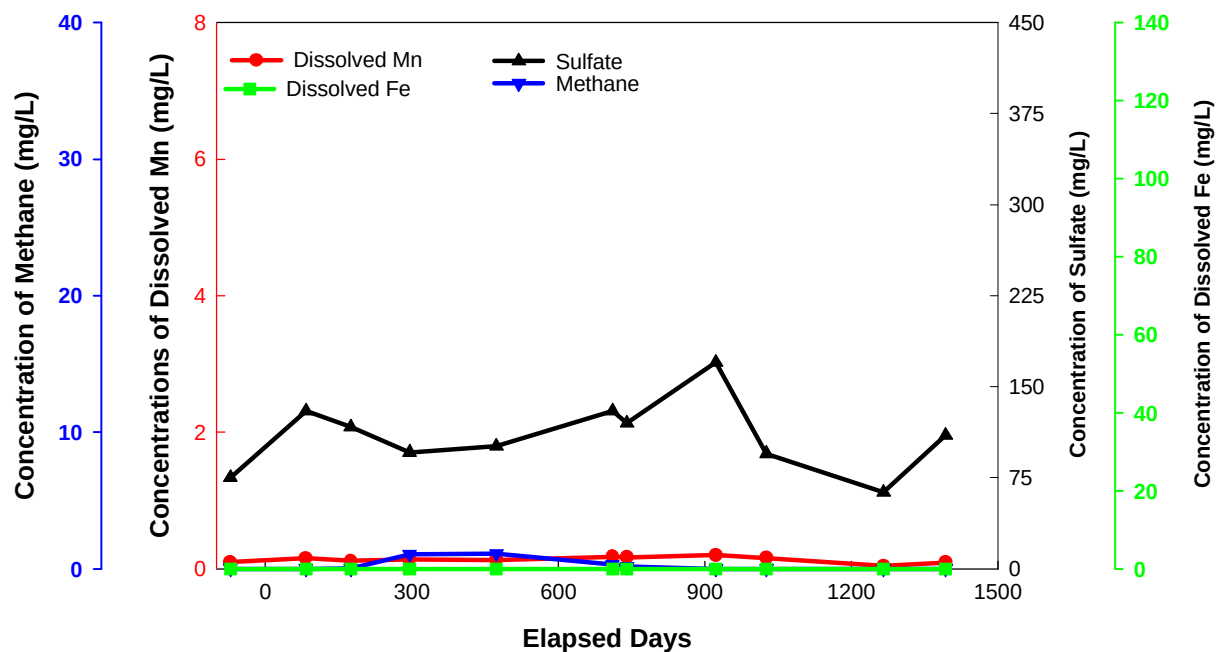


Figure E-16. Bioattenuation Parameters at GM-32 - Downgradient Well in RZ-3 West

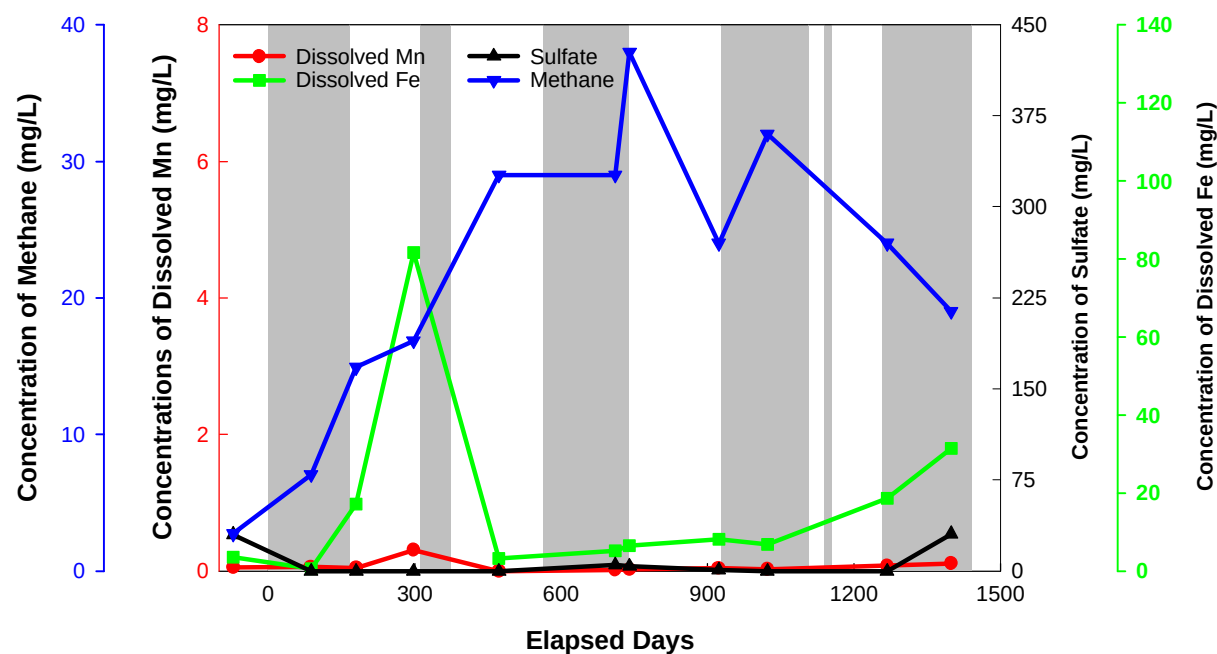


Figure E-17. Bioattenuation Parameters at GM-8 - Downgradient to RZ-3 West

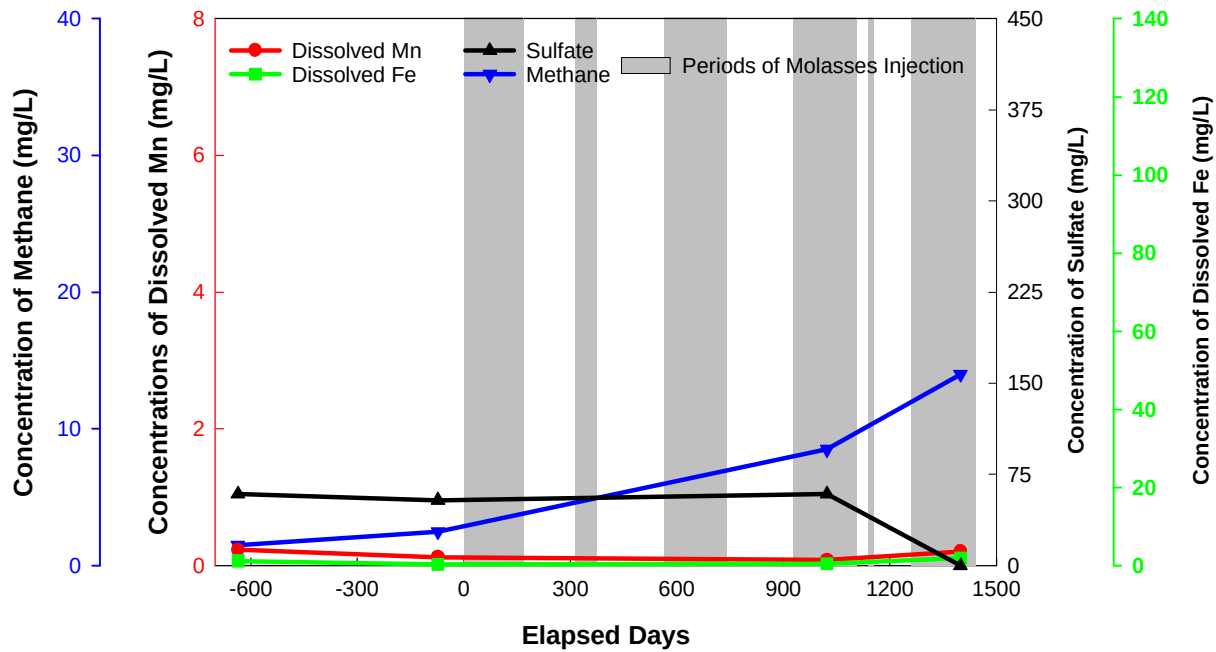


Figure E-18. Bioattenuation Parameters at GM-6 - Downgradient to RZ-3 West

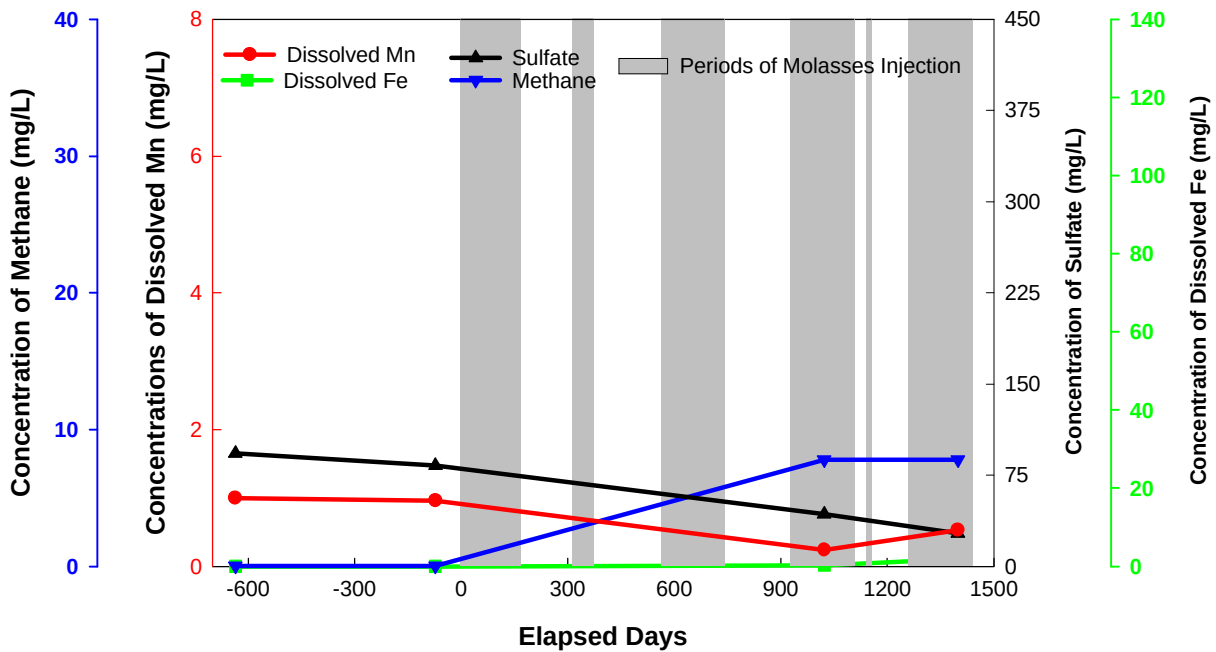


Figure E-19. Bioattenuation Parameters at GM-22 - Upgradient Well in RZ-3 East

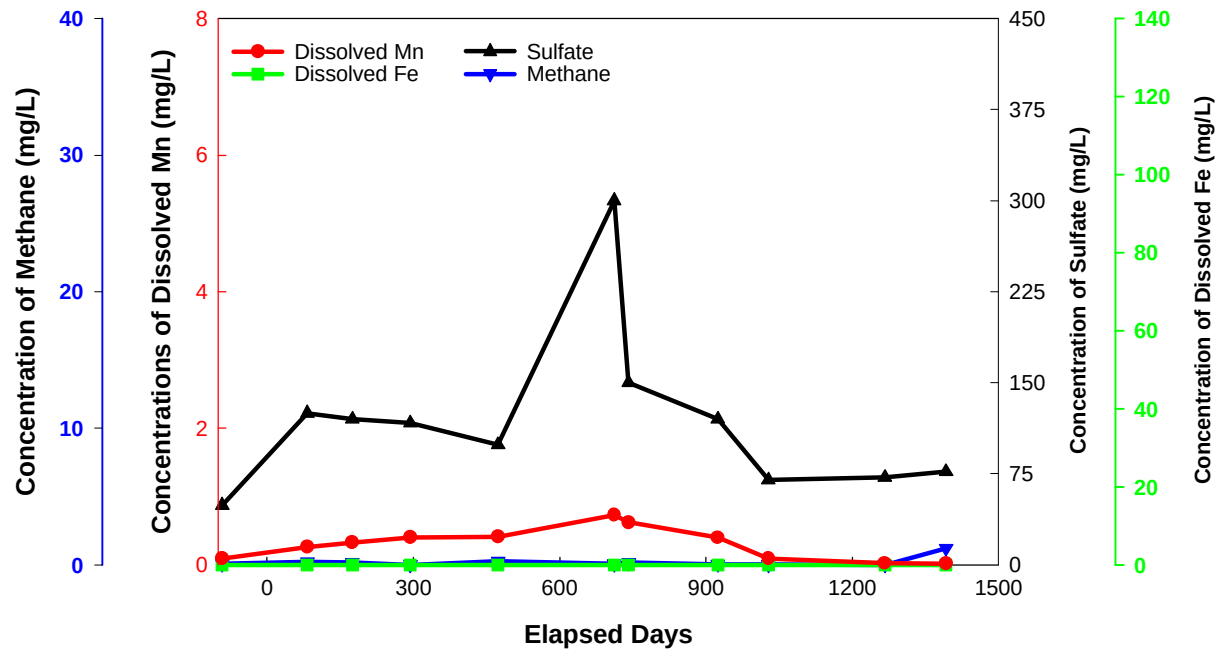
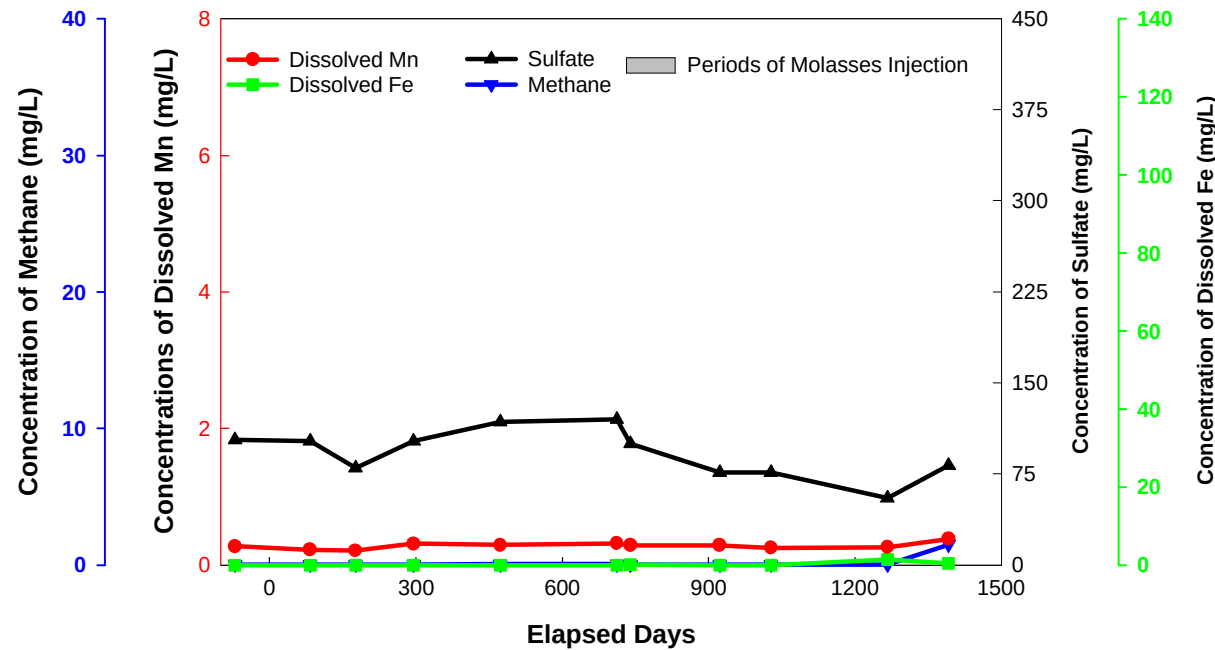
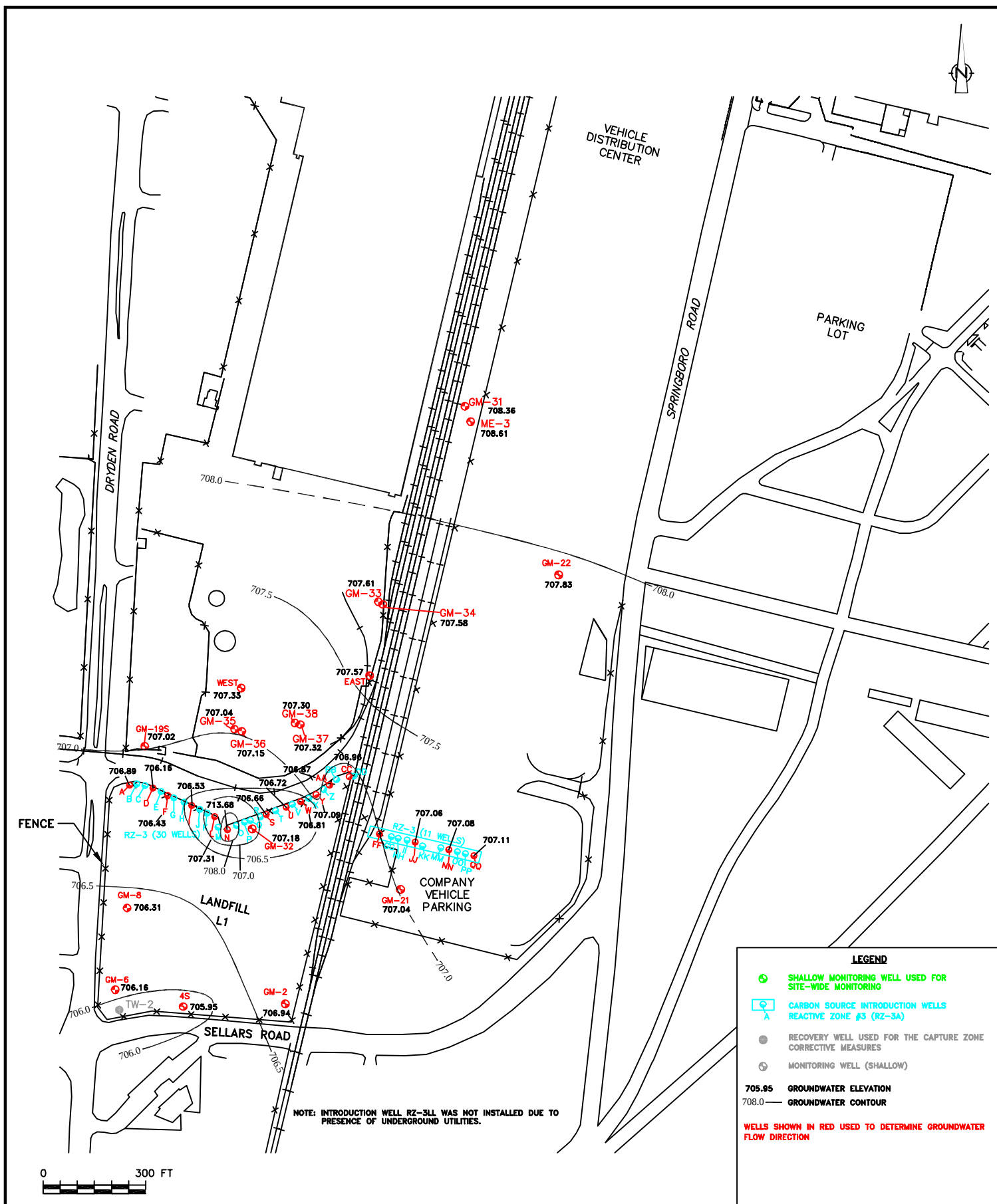


Figure E-20. Bioattenuation Parameters at GM-21 - Downgradient Well in RZ-3 East

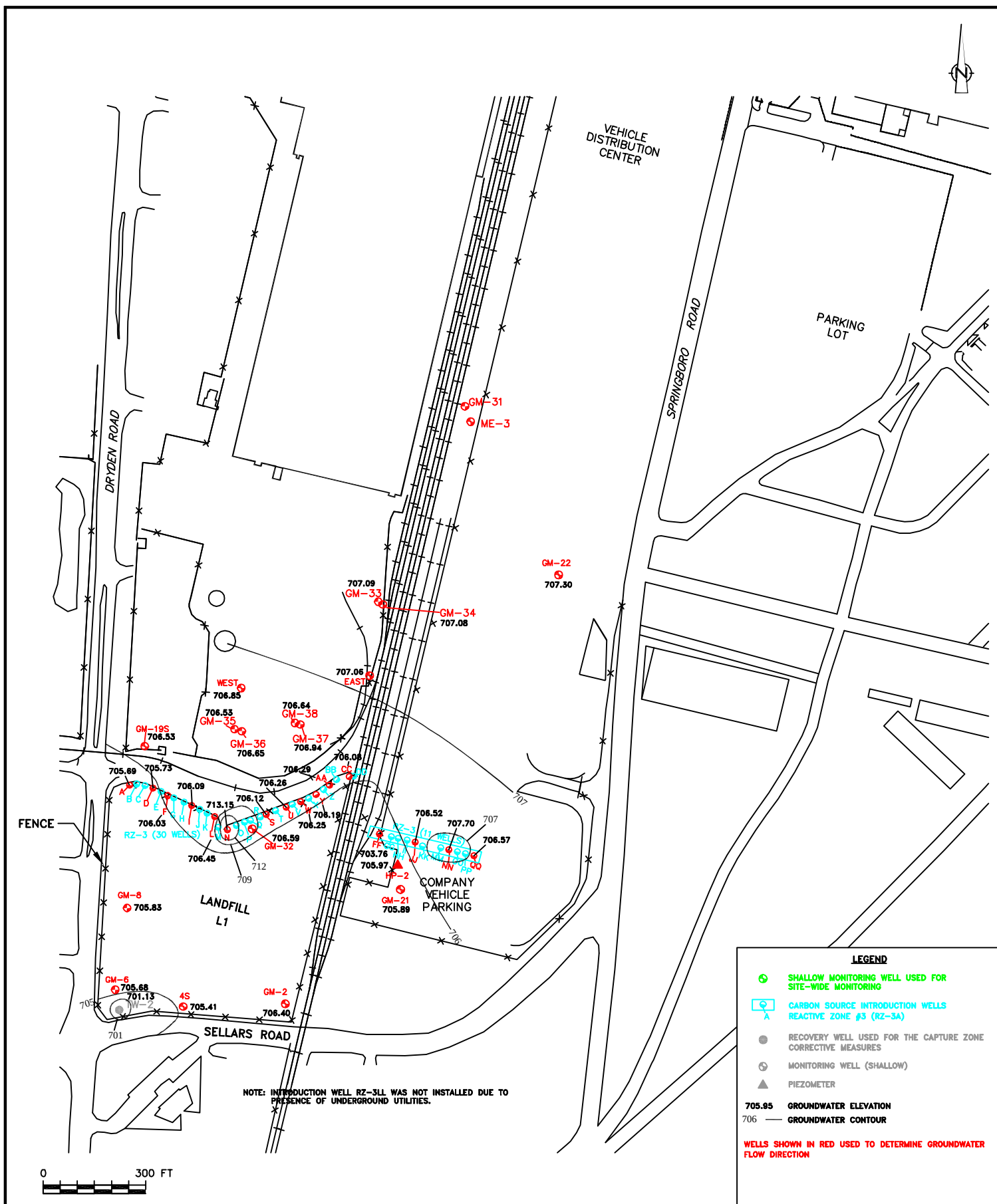




6397 Emerald Parkway
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GROUNDWATER ELEVATIONS COLLECTED ON OCTOBER 10, 2003 GENERAL MOTORS CORPORATION MORAIN, OHIO

DATE 2/11/2004	PROJECT MANAGER N. GILLOTTI	DRAWING NAME CRA/SITEW/SWS6130A
DRAWN R. SMITH	LEAD DESIGN PROF. J. REID	CHECKED J. REID
PROJECT NUMBER OH000294.0006.0003	FIGURE NUMBER E-21	



6397 Emerald Parkway
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GROUNDWATER ELEVATIONS COLLECTED ON NOVEMBER 4, 2003 GENERAL MOTORS CORPORATION MORAIN, OHIO

DATE 2/11/2004	PROJECT MANAGER N. GILLOTT	DRAWING NAME CRA\SITEW\SWSG140A
DRAWN R. SMITH	LEAD DESIGN PROF. J. REID	CHECKED J. REID
PROJECT NUMBER OH000294.0006.0003	FIGURE NUMBER E-22	



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Appendix F

Supporting Documentation for Risk
Evaluation



Supporting Calculations
Table F-1: Source Reduction Factors

Potential Receptors Points	Well ID	Model Location (row, column, layer)	Pumping Rates	Potential Source Areas			
				Landfill 1	Landfill 2	Landfill 3	South Settling Lagoon
Proposed Shallow Well	TW-2	(82,55,1)	166	1.00E+00	9.50E-04	4.56E-03	2.60E-02
Dryden North Well	DW-13	(89,46,3)	1850	8.89E-02	8.13E-05	1.66E-03	8.17E-03
Dryden South Well	DS-7	(98,43,3)	463	1.29E-02	8.09E-06	2.98E-04	1.14E-03
Miami Shores Well Field	MS-14						2.99E-02
	MS-15	(98,38,3)	257	4.03E-03	2.38E-06	9.61E-05	4.01E-04
	MS-16						
	MS-17	(98,35,3)	257	3.88E-03	2.03E-06	9.20E-05	4.21E-04
	MS-18						
	MS-19						
	MS-20	(100,37,3)	257	3.70E-03	1.89E-07	8.53E-05	3.42E-04
Moraine Assembly Production Wells	MS-21	(100,34,3)	257	3.29E-03	1.50E-07	7.65E-05	3.25E-04
	MS-22	(101,33,3)	257	2.79E-03	1.42E-07	5.63E-05	2.62E-04
	11A	(50,94,3)	353	0.00E+00	1.31E-02	5.36E-04	3.67E-05
	12A	(46,93,3)	117	0.00E+00	5.81E-05	5.67E-07	2.55E-08
Moraine Engine Well 28	28	(58,80,3)	235	0.00E+00	7.73E-02	2.06E-02	1.12E-03
Moraine Engine Plant	31	(37,82,3)	35	0.00E+00	1.73E-04	1.31E-07	2.00E-10
	39	(40,81,3)	154	0.00E+00	1.01E-02	1.03E-03	2.26E-05
Harrison Production Wells	44	(29,70,3)	176	0.00E+00	7.12E-06	1.70E-02	0.00E+00
	42	(54,59,3)	176	0.00E+00	1.36E-08	5.88E-05	2.07E-02
	45	(74,56,3)	176	0.00E+00	4.56E-03	4.31E-02	8.02E-02
							0.00E+00
West Carrollton Well Field	MI-41AP	(111, 21, 3)	347	3.26E-04	0.00E+00	0.00E+00	7.20E-07
	MI-41CP	(111, 20, 3)	347	4.55E-04	0.00E+00	0.00E+00	8.63E-07
	MI-41DP	(112, 19, 3)	347	3.72E-04	1.80E-09	0.00E+00	4.57E-07
Miami River 1	--	--	--	3.94E-03	1.78E-07	0.00E+00	2.16E-04
							8.27E-01

¹ Dilution factors reported for the Miami River are mass loading factors to the river [$\text{lb/day}/\text{mg/L}$]

Supporting Calculations
Table F-2: Source Concentrations for In-Place Waste Management Units
(Based on 2003 Sampling Data)

SWMU	Constituent	CASRN	Maximum Downgradient Ground Water Concentration (mg/L)
Landfill L1	1,1,1-Trichloroethane	71-55-6	0.0007
Landfill L1	1,1-Dichloroethane	75-34-3	0.02
Landfill L1	1,1-Dichloroethene	75-35-4	0.0001
Landfill L1	Benzene	71-43-2	0.0016
Landfill L1	cis-1,2-Dichloroethene	156-59-2	0.013
Landfill L1	Ethyl Benzene	100-41-4	0.0017
Landfill L1	Tetrachloroethene	127-18-4	0.011
Landfill L1	Toluene	108-88-3	0.0001
Landfill L1	trans-1,2-Dichloroethene	156-60-5	0.0025
Landfill L1	Trichloroethene	79-01-6	0.024
Landfill L1	Vinyl Chloride	75-01-4	0.0033
Landfill L1	Xylenes (total)	1330-20-7	0.0002
Landfill L1	Arsenic	7440-38-2	0.036
Landfill L1	Barium	7440-39-3	0.52
Landfill L1	Manganese	7439-96-5	0.58
Landfill L2	1,1,1-Trichloroethane	71-55-6	0.0003
Landfill L2	1,1-Dichloroethane	75-34-3	0.0045
Landfill L2	1,1-Dichloroethene	75-35-4	0.0001
Landfill L2	Benzene	71-43-2	0.0001
Landfill L2	cis-1,2-Dichloroethene	156-59-2	0.0072
Landfill L2	Ethyl Benzene	100-41-4	0.0001
Landfill L2	Tetrachloroethene	127-18-4	0.0011
Landfill L2	Toluene	108-88-3	0.0001
Landfill L2	trans-1,2-Dichloroethene	156-60-5	0.001
Landfill L2	Trichloroethene	79-01-6	0.0081
Landfill L2	Vinyl Chloride	75-01-4	0.0005
Landfill L2	Xylenes (total)	1330-20-7	0.0002
Landfill L3	1,1,1-Trichloroethane	71-55-6	0.0003
Landfill L3	1,1-Dichloroethane	75-34-3	0.0045
Landfill L3	1,1-Dichloroethene	75-35-4	0.0001
Landfill L3	Benzene	71-43-2	0.0001
Landfill L3	cis-1,2-Dichloroethene	156-59-2	0.0072
Landfill L3	Ethyl Benzene	100-41-4	0.0001
Landfill L3	Tetrachloroethene	127-18-4	0.0011
Landfill L3	Toluene	108-88-3	0.0001
Landfill L3	trans-1,2-Dichloroethene	156-60-5	0.001
Landfill L3	Trichloroethene	79-01-6	0.0081
Landfill L3	Vinyl Chloride	75-01-4	0.0005
Landfill L3	Xylenes (total)	1330-20-7	0.0002

Supporting Calculations
Table F-2: Source Concentrations for In-Place Waste Management Units
(Based on 2003 Sampling Data)

SWMU	Constituent	CASRN	Maximum Downgradient Ground Water Concentration (mg/L)
North Settling Lagoon	1,1,1-Trichloroethane	71-55-6	0.0003
North Settling Lagoon	1,1-Dichloroethane	75-34-3	0.0009
North Settling Lagoon	1,1-Dichloroethene	75-35-4	0.0001
North Settling Lagoon	Benzene	71-43-2	0.0001
North Settling Lagoon	cis-1,2-Dichloroethene	156-59-2	0.1
North Settling Lagoon	Ethyl Benzene	100-41-4	0.0001
North Settling Lagoon	Tetrachloroethene	127-18-4	0.0051
North Settling Lagoon	Toluene	108-88-3	0.0001
North Settling Lagoon	trans-1,2-Dichloroethene	156-60-5	0.0016
North Settling Lagoon	Trichloroethene	79-01-6	0.011
North Settling Lagoon	Vinyl Chloride	75-01-4	0.0066
North Settling Lagoon	Xylenes (total)	1330-20-7	0.0002
South Settling Lagoon	1,1,1-Trichloroethane	71-55-6	0.002
South Settling Lagoon	1,1-Dichloroethane	75-34-3	0.001
South Settling Lagoon	1,1-Dichloroethene	75-35-4	0.0001
South Settling Lagoon	Benzene	71-43-2	0.0001
South Settling Lagoon	cis-1,2-Dichloroethene	156-59-2	0.0036
South Settling Lagoon	Ethyl Benzene	100-41-4	0.0001
South Settling Lagoon	Tetrachloroethene	127-18-4	0.024
South Settling Lagoon	Toluene	108-88-3	0.0003
South Settling Lagoon	trans-1,2-Dichloroethene	156-60-5	0.0008
South Settling Lagoon	Trichloroethene	79-01-6	0.013
South Settling Lagoon	Vinyl Chloride	75-01-4	0.0001
South Settling Lagoon	Xylenes (total)	1330-20-7	0.0002

Supporting Calculations
Table F-3a: Estimated Contributions to Ground Water Concentrations (mg/L) at Moraine Assembly Receptor Point
(Pumping Scenario 1)

TCL/TAL Group	Constituent	CASRN	Landfill L1	Landfill L2	Landfill L3	N Settling Lagoon	S Settling Lagoon	Total	Criteria	Flag
VOC	1,1,1-Trichloroethane	71-55-6								
VOC	1,1-Dichloroethane	75-34-3		2.56E-06	1.05E-07	7.17E-09		0.	0.2	
VOC	1,1-Dichloroethene	75-35-4		4.43E-05	1.81E-06	2.59E-08		0.	3.65	
VOC	1,2-Dichloroethene (total)	540-59-0		1.08E-06	4.43E-08	3.03E-09		0.	0.007	
VOC	2-Butanone	78-93-3							0.07	
VOC	Acetone	67-64-1							21.9	
VOC	Benzene	71-43-2							3.65	
VOC	Carbon Disulfide	75-15-0		9.85E-07	4.03E-08	2.76E-09		0.	0.005	
VOC	Chlorobenzene	108-90-7							3.65	
VOC	Chloroethane	75-00-3							0.1	
VOC	Chloroform	67-66-3							0.01	
VOC	cis-1,2-Dichloroethene	156-59-2		7.09E-05	2.90E-06	2.76E-06		0.0001	0.07	
VOC	Ethyl Benzene	100-41-4		9.36E-07	3.83E-08	2.62E-09		0.	0.7	
VOC	Styrene	100-42-5							0.1	
VOC	Tetrachloroethene	127-18-4		1.08E-05	4.43E-07	1.41E-07		0.	0.005	
VOC	Toluene	108-88-3		8.38E-07	3.42E-08	2.34E-09		0.	1.	
VOC	trans-1,2-Dichloroethene	156-60-5		9.46E-06	3.87E-07	4.41E-08		0.	0.1	
VOC	Trichloroethene	79-01-6		7.98E-05	3.26E-06	3.03E-07		0.0001	0.005	
VOC	Trichlorofluoromethane	75-69-4							10.95	
VOC	Vinyl Chloride	75-01-4		4.73E-06	1.93E-07	1.82E-07		0.	0.002	
VOC	Xylenes (total)	1330-20-7		2.22E-06	9.06E-08	6.20E-09		0.	10.	
SVOC	1,2-Dichlorobenzene	95-50-1							0.6	
SVOC	2-Methylnaphthalene	91-57-6							0.73	
SVOC	Benzo(a)anthracene	56-55-3							0.01	
SVOC	Benzo(a)pyrene	50-32-8							0.0002	
SVOC	Benzo(b)fluoranthene	205-99-2							0.01	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7							0.006	
SVOC	Butylbenzylphthalate	85-68-7							7.3	
SVOC	Chrysene	218-01-9							0.0117	
SVOC	Di-n-butylphthalate	84-74-2							3.65	
SVOC	Fluoranthene	206-44-0							1.46	
SVOC	Fluorene	86-73-7							1.46	
SVOC	Naphthalene	91-20-3							0.73	
SVOC	Phenanthrene	85-01-8							1.095	
SVOC	Pyrene	129-00-0							1.095	
P/PCB	Aroclor-1242	53469-21-9							0.0005	
P/PCB	Aroclor-1254	11097-69-1							0.0005	
P/PCB	Aroclor-1260	11096-82-5							0.0005	
INORG	Antimony	7440-36-0							0.006	
INORG	Arsenic	7440-38-2							0.05	
INORG	Barium	7440-39-3							2.	
INORG	Beryllium	7440-41-7							0.004	
INORG	Cadmium	7440-43-9							0.005	
INORG	Chromium (total)	7440-47-3							0.1	
INORG	Cobalt	7440-48-4							2.19	
INORG	Copper	7440-50-8							1.3	
INORG	Cyanide (total)	57-12-5							0.2	
INORG	Lead	7439-92-1							0.015	
INORG	Manganese	7439-96-5							5.11	
INORG	Mercury	7439-97-6							0.002	
INORG	Nickel	7440-02-0							0.1	
INORG	Selenium	7782-49-2							0.05	
INORG	Silver	7440-22-4							0.1825	
INORG	Thallium	7440-28-0							0.002	
INORG	Vanadium	7440-62-2							0.2555	
INORG	Zinc	7440-66-6							10.95	

Supporting Calculations
Table F-3b: Estimated Contributions to Ground Water Concentrations (mg/L) at Moraine Engine Receptor Point
(Pumping Scenario 1)

TCL/TAL Group	Constituent	CASRN	Landfill L1	Landfill L2	Landfill L3	N Settling Lagoon	S Settling Lagoon	Total	Criteria	Flag
VOC	1,1,1-Trichloroethane	71-55-6		2.15E-06	2.18E-07	4.79E-09		0.	0.2	
VOC	1,1-Dichloroethane	75-34-3		3.72E-05	3.78E-06	1.73E-08		0.	3.65	
VOC	1,1-Dichloroethene	75-35-4		9.09E-07	9.23E-08	2.03E-09		0.	0.007	
VOC	1,2-Dichloroethene (total)	540-59-0								
VOC	2-Butanone	78-93-3							0.07	
VOC	Acetone	67-64-1							21.9	
VOC	Benzene	71-43-2		8.26E-07	8.39E-08	1.84E-09		0.	3.65	
VOC	Carbon Disulfide	75-15-0							0.005	
VOC	Chlorobenzene	108-90-7							3.65	
VOC	Chloroethane	75-00-3							0.1	
VOC	Chloroform	67-66-3							0.01	
VOC	cis-1,2-Dichloroethene	156-59-2		5.95E-05	6.04E-06	1.84E-06		0.0001	0.1	
VOC	Ethyl Benzene	100-41-4		7.85E-07	7.97E-08	1.75E-09		0.	0.07	
VOC	Styrene	100-42-5							0.7	
VOC	Tetrachloroethene	127-18-4		9.09E-06	9.23E-07	9.39E-08		0.	0.1	
VOC	Toluene	108-88-3		7.02E-07	7.13E-08	1.57E-09		0.	0.005	
VOC	trans-1,2-Dichloroethene	156-60-5		7.93E-06	8.06E-07	2.95E-08		0.	1.	
VOC	Trichloroethene	79-01-6		6.69E-05	6.80E-06	2.03E-07		0.	0.1	
VOC	Trichlorofluoromethane	75-69-4						0.0001	0.005	
VOC	Vinyl Chloride	75-01-4		3.97E-06	4.03E-07	1.22E-07		0.	10.95	
VOC	Xylenes (total)	1330-20-7		1.86E-06	1.89E-07	4.14E-09		0.	0.002	
SVOC	1,2-Dichlorobenzene	95-50-1						0.	10.	
SVOC	2-Methylnaphthalene	91-57-6							0.6	
SVOC	Benzo(a)anthracene	56-55-3							0.73	
SVOC	Benzo(a)pyrene	50-32-8							0.01	
SVOC	Benzo(b)fluoranthene	205-99-2							0.0002	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7							0.01	
SVOC	Butylbenzylphthalate	85-68-7							0.006	
SVOC	Chrysene	218-01-9							7.3	
SVOC	Di-n-butylphthalate	84-74-2							0.0117	
SVOC	Fluoranthene	206-44-0							3.65	
SVOC	Fluorene	86-73-7							1.46	
SVOC	Naphthalene	91-20-3							1.46	
SVOC	Phenanthrene	85-01-8							0.73	
SVOC	Pyrene	129-00-0							1.095	
P/PCB	Aroclor-1242	53469-21-9							1.095	
P/PCB	Aroclor-1254	11097-69-1							0.0005	
P/PCB	Aroclor-1260	11096-82-5							0.0005	
INORG	Antimony	7440-36-0							0.0005	
INORG	Arsenic	7440-38-2							0.006	
INORG	Barium	7440-39-3							0.05	
INORG	Beryllium	7440-41-7							2.	
INORG	Cadmium	7440-43-9							0.004	
INORG	Chromium (total)	7440-47-3							0.005	
INORG	Cobalt	7440-48-4							0.1	
INORG	Copper	7440-50-8							2.19	
INORG	Cyanide (total)	57-12-5							1.3	
INORG	Lead	7439-92-1							0.2	
INORG	Manganese	7439-96-5							0.015	
INORG	Mercury	7439-97-6							5.11	
INORG	Nickel	7440-02-0							0.002	
INORG	Selenium	7782-49-2							0.1	
INORG	Silver	7440-22-4							0.05	
INORG	Thallium	7440-28-0							0.1825	
INORG	Vanadium	7440-62-2							0.002	
INORG	Zinc	7440-66-6							0.2555	
									10.95	

Supporting Calculations
Table F-3c: Estimated Contributions to Ground Water Concentrations (mg/L) at West Carrollton Receptor Point
(Pumping Scenario 1)

TCL/TAL Group	Constituent	CASRN	Landfill L1	Landfill L2	Landfill L3	N Settling Lagoon	S Settling Lagoon	Total	Criteria	Flag
VOC	1,1,1-Trichloroethane	71-55-6	2.54E-07	1.56E-13		1.77E-10	7.35E-06	0.	0.2	
VOC	1,1-Dichloroethane	75-34-3	7.69E-06	2.70E-12		6.39E-10	3.64E-06	0.	3.65	
VOC	1,1-Dichloroethene	75-35-4	4.23E-08	6.60E-14		7.48E-11	4.04E-07	0.	0.007	
VOC	1,2-Dichloroethene (total)	540-59-0								
VOC	2-Butanone	78-93-3							0.07	
VOC	Acetone	67-64-1							21.9	
VOC	Benzene	71-43-2	6.15E-07	6.00E-14					3.65	
VOC	Carbon Disulfide	75-15-0				6.80E-11	3.68E-07	0.	0.005	
VOC	Chlorobenzene	108-90-7							3.65	
VOC	Chloroethane	75-00-3							0.1	
VOC	Chloroform	67-66-3							0.01	
VOC	cis-1,2-Dichloroethene	156-59-2	5.00E-06	4.32E-12					0.1	
VOC	Ethyl Benzene	100-41-4	6.53E-07	5.70E-14		6.80E-08	1.32E-05	0.	0.07	
VOC	Styrene	100-42-5				6.46E-11	3.49E-07	0.	0.7	
VOC	Tetrachloroethene	127-18-4	4.23E-06	6.60E-13					0.1	
VOC	Toluene	108-88-3	3.27E-08	5.10E-14		3.47E-09	8.82E-05	0.0001	0.005	
VOC	trans-1,2-Dichloroethene	156-60-5	9.61E-07	5.76E-13		5.78E-11	9.19E-07	0.	1.	
VOC	Trichloroethene	79-01-6	9.22E-06	4.86E-12		1.09E-09	2.87E-06	0.	0.1	
VOC	Trichlorofluoromethane	75-69-4				7.48E-09	4.78E-05	0.0001	0.005	
VOC	Vinyl Chloride	75-01-4	1.27E-06	2.88E-13					10.95	
VOC	Xylenes (total)	1330-20-7	8.65E-08	1.35E-13		4.49E-09	4.78E-07	0.	0.002	
SVOC	1,2-Dichlorobenzene	95-50-1				1.53E-10	8.27E-07	0.	10.	
SVOC	2-Methylnaphthalene	91-57-6							0.6	
SVOC	Benzo(a)anthracene	56-55-3							0.73	
SVOC	Benzo(a)pyrene	50-32-8							0.01	
SVOC	Benzo(b)fluoranthene	205-99-2							0.0002	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7							0.01	
SVOC	Butylbenzylphthalate	85-68-7							0.006	
SVOC	Chrysene	218-01-9							7.3	
SVOC	Di-n-butylphthalate	84-74-2							0.0117	
SVOC	Fluoranthene	206-44-0							3.65	
SVOC	Fluorene	86-73-7							1.46	
SVOC	Naphthalene	91-20-3							1.46	
SVOC	Phenanthrene	85-01-8							0.73	
SVOC	Pyrene	129-00-0							1.095	
P/PCB	Aroclor-1242	53469-21-9							1.095	
P/PCB	Aroclor-1254	11097-69-1							0.0005	
P/PCB	Aroclor-1260	11096-82-5							0.0005	
INORG	Antimony	7440-36-0							0.0005	
INORG	Arsenic	7440-38-2	1.11E-05						0.006	
INORG	Barium	7440-39-3	2.00E-04					0.	0.05	
INORG	Beryllium	7440-41-7						0.0002	2.	
INORG	Cadmium	7440-43-9							0.004	
INORG	Chromium (total)	7440-47-3							0.005	
INORG	Cobalt	7440-48-4							0.1	
INORG	Copper	7440-50-8							2.19	
INORG	Cyanide (total)	57-12-5							1.3	
INORG	Lead	7439-92-1							0.2	
INORG	Manganese	7439-96-5	2.04E-04						0.015	
INORG	Mercury	7439-97-6						0.0002	5.11	
INORG	Nickel	7440-02-0							0.002	
INORG	Selenium	7782-49-2							0.1	
INORG	Silver	7440-22-4							0.05	
INORG	Thallium	7440-28-0							0.1825	
INORG	Vanadium	7440-62-2							0.002	
INORG	Zinc	7440-66-6							0.2555	
									10.95	

Supporting Calculations
Table F-3d: Estimated Contributions to Ground Water Concentrations (mg/L) at Great Miami River Receptor Point
(Pumping Scenario 1)

TCL/TAL Group	Constituent	CASRN	Landfill L1	Landfill L2	Landfill L3	N Settling Lagoon	S Settling Lagoon	Total	Criteria	Flag
VOC	1,1,1-Trichloroethane	71-55-6	1.96E-10	3.50E-15		4.24E-12	1.25E-07	0	0.2	
VOC	1,1-Dichloroethane	75-34-3	5.95E-09	6.05E-14		1.53E-11	6.19E-08	0	3.65	
VOC	1,1-Dichloroethene	75-35-4	3.27E-11	1.48E-15		1.80E-12	6.87E-09	0	0.007	
VOC	1,2-Dichloroethene (total)	540-59-0								
VOC	2-Butanone	78-93-3							0.07	
VOC	Acetone	67-64-1							21.9	
VOC	Benzene	71-43-2	4.76E-10	1.34E-15					3.65	
VOC	Carbon Disulfide	75-15-0				1.63E-12	6.25E-09	0	0.005	
VOC	Chlorobenzene	108-90-7							3.65	
VOC	Chloroethane	75-00-3							0.1	
VOC	Chloroform	67-66-3							0.01	
VOC	cis-1,2-Dichloroethene	156-59-2	3.87E-09	9.68E-14					0.1	
VOC	Ethyl Benzene	100-41-4	5.06E-10	1.28E-15		1.63E-09	2.25E-07	0	0.07	
VOC	Styrene	100-42-5				1.55E-12	5.94E-09	0	0.7	
VOC	Tetrachloroethene	127-18-4	3.27E-09	1.48E-14					0.1	
VOC	Toluene	108-88-3	2.53E-11	1.14E-15		8.32E-11	1.50E-06	0	0.005	
VOC	trans-1,2-Dichloroethene	156-60-5	7.44E-10	1.29E-14		1.39E-12	1.56E-08	0	1	
VOC	Trichloroethene	79-01-6	7.14E-09	1.09E-13		2.61E-11	4.87E-08	0	0.1	
VOC	Trichlorofluoromethane	75-69-4				1.80E-10	8.12E-07	0	0.005	
VOC	Vinyl Chloride	75-01-4	9.82E-10	6.46E-15					10.95	
VOC	Xylenes (total)	1330-20-7	6.70E-11	3.03E-15		1.08E-10	8.12E-09	0	0.002	
SVOC	1,2-Dichlorobenzene	95-50-1				3.67E-12	1.41E-08	0	10	
SVOC	2-Methylnaphthalene	91-57-6							0.6	
SVOC	Benzo(a)anthracene	56-55-3							0.73	
SVOC	Benzo(a)pyrene	50-32-8							0.01	
SVOC	Benzo(b)fluoranthene	205-99-2							0.0002	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7							0.01	
SVOC	Butylbenzylphthalate	85-68-7							0.006	
SVOC	Chrysene	218-01-9							7.3	
SVOC	Di-n-butylphthalate	84-74-2							0.0117	
SVOC	Fluoranthene	206-44-0							3.65	
SVOC	Fluorene	86-73-7							1.46	
SVOC	Naphthalene	91-20-3							1.46	
SVOC	Phenanthrene	85-01-8							0.73	
SVOC	Pyrene	129-00-0							1.095	
P/PCB	Aroclor-1242	53469-21-9							1.095	
P/PCB	Aroclor-1254	11097-69-1							0.0005	
P/PCB	Aroclor-1260	11096-82-5							0.0005	
INORG	Antimony	7440-36-0							0.0005	
INORG	Arsenic	7440-38-2	8.63E-09						0.006	
INORG	Barium	7440-39-3	1.55E-07					0	0.05	
INORG	Beryllium	7440-41-7						0	2	
INORG	Cadmium	7440-43-9							0.004	
INORG	Chromium (total)	7440-47-3							0.005	
INORG	Cobalt	7440-48-4							0.1	
INORG	Copper	7440-50-8							2.19	
INORG	Cyanide (total)	57-12-5							1.3	
INORG	Lead	7439-92-1							0.2	
INORG	Manganese	7439-96-5	1.58E-07						0.015	
INORG	Mercury	7439-97-6						0	5.11	
INORG	Nickel	7440-02-0							0.002	
INORG	Selenium	7782-49-2							0.1	
INORG	Silver	7440-22-4							0.05	
INORG	Thallium	7440-28-0							0.1825	
INORG	Vanadium	7440-62-2							0.002	
INORG	Zinc	7440-66-6							0.2555	
									10.95	