



2024 Evaluation of Enhanced Attenuation, Endoline Area Chlorinated Solvent Plume General Motors Tonawanda Engine Plant

General Motors, LLC

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Contents

1.	Introduction	1
1.1	Purpose of this report	1
1.2	Scope and limitations	1
2.	Background	1
3.	Groundwater Monitoring Program	2
4.	Monitoring Results	3
4.1	Chlorinated Volatile Organic Compounds	3
4.2	Dissolved Gases	3
4.3	Natural Attenuation Parameters	4
4.4	Field Parameters	4
4.5	Plume Migration	4
5.	Conclusions and Recommendations	5
5.1	Conclusions	5
5.2	Recommendations	5

Table index

Table 1	Analytical Results Summary – Natural Attenuation Monitoring
Table 2	Analytical Results Summary – Plume Migration Monitoring
Table 3	Groundwater Monitoring Parameters

Figure index

Figure 1	Well Locations
Figure 2	Concentration versus Time Plot for Well MW-2
Figure 3	Concentration versus Time Plot for Well MW-2
Figure 4	Concentration versus Time Plot for Well MW-2
Figure 5	Concentration versus Time Plot for Well MW-2
Figure 6	Concentration versus Time Plot for Well MW-11
Figure 7	Concentration versus Time Plot for Well MW-11
Figure 8	Concentration versus Time Plot for Well MW-11
Figure 9	Concentration versus Time Plot for Well MW-11
Figure 10	Concentration versus Time Plot for Well MW-12
Figure 11	Concentration versus Time Plot for Well MW-12
Figure 12	Concentration versus Time Plot for Well MW-12
Figure 13	Concentration versus Time Plot for Well MW-12

Appendices

Appendix A	Field Sampling Forms
Appendix B	Data Validation Report

1. Introduction

On behalf of General Motors, LLC (GM), GHD Services, Inc. (GHD) completed groundwater monitoring on February 27, 2024 as part of the Enhanced Attenuation (EA) program to address the Endline Area chlorinated solvent plume at the GM Tonawanda Engine Plant located in Tonawanda, New York (Site). New York State Department of Environmental Conservation (NYSDEC) Spill Number 9875474 has been assigned to this Site.

1.1 Purpose

The purpose of this report is to summarize the groundwater monitoring activities, present the data in comparison to regulatory criteria and the historical record for the Endline Area, provide an assessment of the current conditions and progress of the enhanced attenuation program, and provide a recommendation for future activities.

1.2 Scope and Limitations

This report: has been prepared by GHD for General Motors, LLC and may only be used and relied on by General Motors, LLC and the NYSDEC for the purpose agreed between GHD and General Motors, LLC as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than General Motors, LLC and the NYSDEC arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

2. Background

Beginning in 2005, GHD conducted multi-phased investigation activities to delineate the chlorinated solvent plume and performed a remedial technology evaluation to identify feasible remedial options for the Endline Area. GHD submitted the "Report of Findings for the Supplemental Phase I and Phase II of the Endline Area Chlorinated Solvent Subsurface Investigation" to the NYSDEC on July 1, 2008. Based on the results of the investigation and remedial technology evaluation, monitored natural attenuation (MNA) was the recommended remedial alternative. The NYSDEC approved the report and agreed with the selection of MNA as the remedial alternative for the Site in a letter dated July 9, 2008.

The first MNA groundwater monitoring program was completed between October 2008 and April 2010. An evaluation of the effectiveness of the MNA remedy was prepared and submitted to the NYSDEC in October 2010. The evaluation recommended the implementation of an In Situ Enhanced Biodegradation (ISEB) program to promote attenuation consisting of the application of a carbon source and an additional 2 years of monitoring followed by an evaluation of the progress of attenuation.

A work plan for implementation of the ISEB program was submitted to the NYSDEC in February 2011. The NYSDEC approved the work plan in a letter dated March 14, 2011. Baseline sampling was completed in April 2011, and the injection program was completed in September 2011, followed by 2 years of post-injection monitoring. Samples were also collected annually to monitor the concentrations of residual petroleum compounds in monitoring wells MW-2, MW-3, MW-4, and MW-5.

An evaluation of the ISEB program was prepared and submitted to NYSDEC in August 2014. The evaluation report recommended a second round of injections followed by another 2 years of monitoring and evaluation. The NYSDEC approved the injections in an email dated May 15, 2015.

The second round of ISEB injections was completed in November and December 2015. Monitoring events were completed at 90- and 180-days post-injection with the 180-day event being the first semi-annual event. The four semi-annual events were completed in May 2016, November 2016, May 2017, and November 2017. In addition to the second round of post-injection monitoring, samples were also collected in May of 2016 to monitor the concentrations of residual petroleum compounds in monitoring wells MW-2, MW-3, MW-4, and MW-5.

GHD submitted a third evaluation report dated June 2021, which indicated attenuation was occurring at a slow rate and recommended triennial sampling for the chlorinated solvent and MNA parameters and elimination of the petroleum monitoring. The NYSDEC approved the triennial groundwater monitoring in a letter dated June 25, 2021.

The groundwater monitoring event completed on February 27, 2024 is the first triennial event. This report summarizes the groundwater monitoring for this event and evaluates the ISEB program to date.

3. Groundwater Monitoring Program

The groundwater monitoring program was designed to assess the attenuation of the chlorinated solvent contamination and monitor for any migration of the chlorinated solvent plume.

Groundwater monitoring wells MW-2, MW-11, and MW-12, located within the chlorinated solvent plume, were sampled to monitor the progress of attenuation. Monitoring wells MW-1, MW-9, MW-101, and MW-102 were sampled to monitor for plume migration. MW-103 was previously included for plume migration, but it was inaccessible during this sampling event. Groundwater monitoring well locations are shown on Figure 1. The groundwater monitoring field forms are included as Appendix A.

The groundwater samples collected from MW-2, MW-11, and MW-12 were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), and the following natural attenuation parameters:

- | | |
|-----------------------------------|--|
| 1. Total organic carbon (TOC) | 8. Orthophosphate phosphorus |
| 2. Chemical oxygen demand (COD) | 9. Alkalinity |
| 3. Biological oxygen demand (BOD) | 10. Methane |
| 4. Sulfate | 11. Ethane |
| 5. Sulfide | 12. Total nitrogen (as ammonia) |
| 6. Nitrate | 13. Total heterotrophic microbial count |
| 7. Nitrite | 14. Total 1,1,1-TCA-specific microbial count |

Table 1 presents the historical analytical results as well as the analytical results for the sampling conducted on February 27, 2024 for plume monitoring wells MW-2, MW-11, and MW-12.

The groundwater samples collected from perimeter monitoring wells MW-1, MW-9, MW-101, and MW-102 were analyzed for TCL VOCs to monitor plume migration. Monitoring well MW-103, located within Plant 1, was under machinery and was not accessible at the time of the 2024 sampling. The analytical results for the plume migration monitoring conducted on February 27, 2024 as well as historical analytical results are presented on Table 2.

The data was validated by GHD. Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Superfund Methods Data Review," United States Environmental Protection Agency (EPA)-540-R-20-005, November 2020, and "National Functional Guidelines for Inorganic Superfund Methods Data Review," EPA-542-R-20-006, November 2020. The data were found to exhibit acceptable levels of accuracy and precision with the qualifiers noted on the tables. The data validation report is included as Appendix B.

4. Monitoring Results

4.1 Chlorinated Volatile Organic Compounds

The data for 1,1,1-trichloroethane (1,1,1-TCA) at monitoring well MW-2 demonstrates a 96% reduction from 12,000 µg/L in April 2011 to non-detect in February 2024, although the elevated detection limits observed in February 2024 result in a low bias for the % reduction. The daughter/breakdown product concentrations at well MW-2 have increased, as expected, and are now exhibiting a downward trend as they convert to ethane.

The 1,1,1-TCA data for well MW-11 show a 67% reduction (730 µg/L to 240 µg/L) at MW-11 since 2011, with expected increases in breakdown products during this period.

Although 1,1,1-TCA was never detected at MW-12, the breakdown product 1,1,-dichloroethane (1,1-DCA) has been detected. Concentrations of 1,1-DCA have exhibited a 41% reduction during the 2011 to 2024 monitoring period.

This data is shown in Table 1 and graphically on Figures 2 through 5 for MW-2, Figures 6 through 9 for MW-11, and Figures 10 through 13 for MW-12. Where results are reported as non-detect, a value of ½ the laboratory detection limit has been used to generate the graphs.

4.2 Dissolved Gases

The dissolved gases monitored in the groundwater included ethane, which is the final product of the anaerobic biodegradation of 1,1,1 TCA, and methane, which is produced under strictly anaerobic conditions. Methane is an indicator that highly anaerobic conditions have been established.

The ethane and methane concentrations at well MW 2 both remain high suggesting that conditions are anaerobic and complete dechlorination of 1,1,1-TCA is occurring.

Methane concentrations have been slowly increasing at MW-11. The ethane concentration is low but detectable and gradually increasing at MW-11 indicating that biodegradation continues at a slow rate at this location.

The ethane concentration at MW-12 has increased slightly since the second injection in 2015 as 1,1-DCA slowly breaks down. The methane concentration at MW-12 has decreased from an average of 3,550 µg/L in October 2018 to 1,900 µg/L in February 2024, but indicates that conditions are still anaerobic and biodegradation is progressing at a slow rate.

4.3 Natural Attenuation Parameters

Alkalinity remained relatively constant during the 2011 to 2024 monitoring period, but remains high in all monitoring wells suggesting a slow but steady rate of biodegradation.

Nitrate and nitrite were not detected above their detection limits in any of the wells either before or after EVO treatment, which indicates that the conditions were anaerobic before the injection event and continue to be anaerobic long after the injection event.

Concentrations of ammonia nitrogen increased after the EVO injection events, particularly in monitoring well MW-2, but have decreased in the last 3 years. Ammonia nitrogen is currently present at 1,600 µg/L in well MW-2, 310 µg/L in well MW-11, and 130 µg/L in well MW-12. These levels are sufficient to sustain microbial activity at a low level.

Orthophosphate phosphorus remained present at low concentrations throughout the monitoring period. Increased concentrations were not observed after injection events. Low levels of orthophosphate are required for microbial activity so the low phosphate concentrations may have limited microbial growth.

BOD, COD, and TOC all showed increases in well MW-2 after each injection event and have decreased between 2018 and 2020. BOD and COD have increased in Well MW-2 in 2024, but the concentration still remains lower than before the second injection event in 2015. TOC is currently present at 29 mg/L in well MW 2, 6.9 mg/L in well MW-11, and 14 mg/L in well MW-12. These concentrations may sustain a low level of ongoing biodegradation.

The sulfate concentration at well MW 2 was low initially (5.6 mg/L) and decreased further to non-detect levels. Sulfate fluctuated between low and non-detect levels in well MW-2, but showed an increase in 2024. Sulfide was detected in well MW-2 during some monitoring events; however, sulfide is not soluble in water and tends to settle out of groundwater so its absence does not mean that sulfate reduction is not occurring. Sulfate is significantly higher in wells MW-11 and MW-12, while sulfide remains non-detect at 1 mg/L. Sulfate is reduced to sulfide under anaerobic conditions; therefore, the sulfate/sulfide data suggests that conditions are more highly anaerobic at well MW 2, than at MW-11 and MW-12.

Total aerobic and anaerobic microbial counts increased in well MW-2 after each of the injection events but then stabilized. Microbial counts remain at a similar level through the October 2020 monitoring event. These microbial numbers suggest that biodegradation is ongoing. The 2020 microbial counts were much lower for wells MW-11 and MW-12 and suggest that biodegradation is not proceeding as quickly in these wells. In 2024, the highest concentrations of heterotrophs were found in well MW-12 where concentrations of CVOCs are lowest and higher concentrations of anaerobic TCA degraders were found in the wells where CVOCs were higher. This suggests that the presence of CVOCs inhibits overall microbial growth, but that CVOC degraders are present in all wells and higher where higher concentrations of CVOCs are present.

4.4 Field Parameters

Dissolved oxygen (DO) and oxidation-reduction potential (ORP) in well MW-2 were low before the injection events and ORP has remained low negative to low positive range throughout the monitoring period indicating that conditions are naturally anaerobic in this well. DO appears to be fluctuating, however. More fluctuations in DO and ORP have been observed in wells MW-11 and MW-12 than in well MW-2. In both MW-11 and MW-12, DO has generally been low, although 2024 DO values were in the moderate range for well MW-12. In MW-11, ORP has been fairly high, which may indicate the potential for aerobic activity in this well. In MW-12, ORP is in the low negative to low positive range, indicating that conditions are fairly anaerobic in this well. In 2024, pH was in the neutral range in wells MW-2, MW-11 and MW-12.

4.5 Plume Migration

A review of the VOC data for perimeter monitoring wells MW 1, MW 9, MW 101, and MW 102 shows that there are no detections of 1,1,1-TCA or associated daughter/breakdown products in any of the perimeter wells. This indicates that the plume is stable and not migrating.

5. Conclusions and Recommendations

5.1 Conclusions

The plume well data continues to show that biodegradation is progressing at a slow rate in the plume monitoring wells, and the soil conditions are sufficient for anaerobic biodegradation to continue. The perimeter well data confirms that the tight clay soils continue to prevent migration of the plume.

5.2 Recommendations

Conditions in the perimeter monitoring wells appear to be stable and no degradation of water quality has been observed over the last 3 years. Chlorinated solvents continue to biodegrade at a slow pace. GHD is recommending continuing to sample on a triennial basis. Sampling will be completed in 2026 and 2029. The monitoring parameters for the plume wells MW-2, MW-11, and MW-12 are presented on Table 3. Samples from the perimeter wells, MW-1, MW-9, MW-101, and MW-102 will continue to be analyzed for only the VOC parameters listed on Table 3.

GHD will continue to evaluate the effectiveness of the remedy after each triennial event.

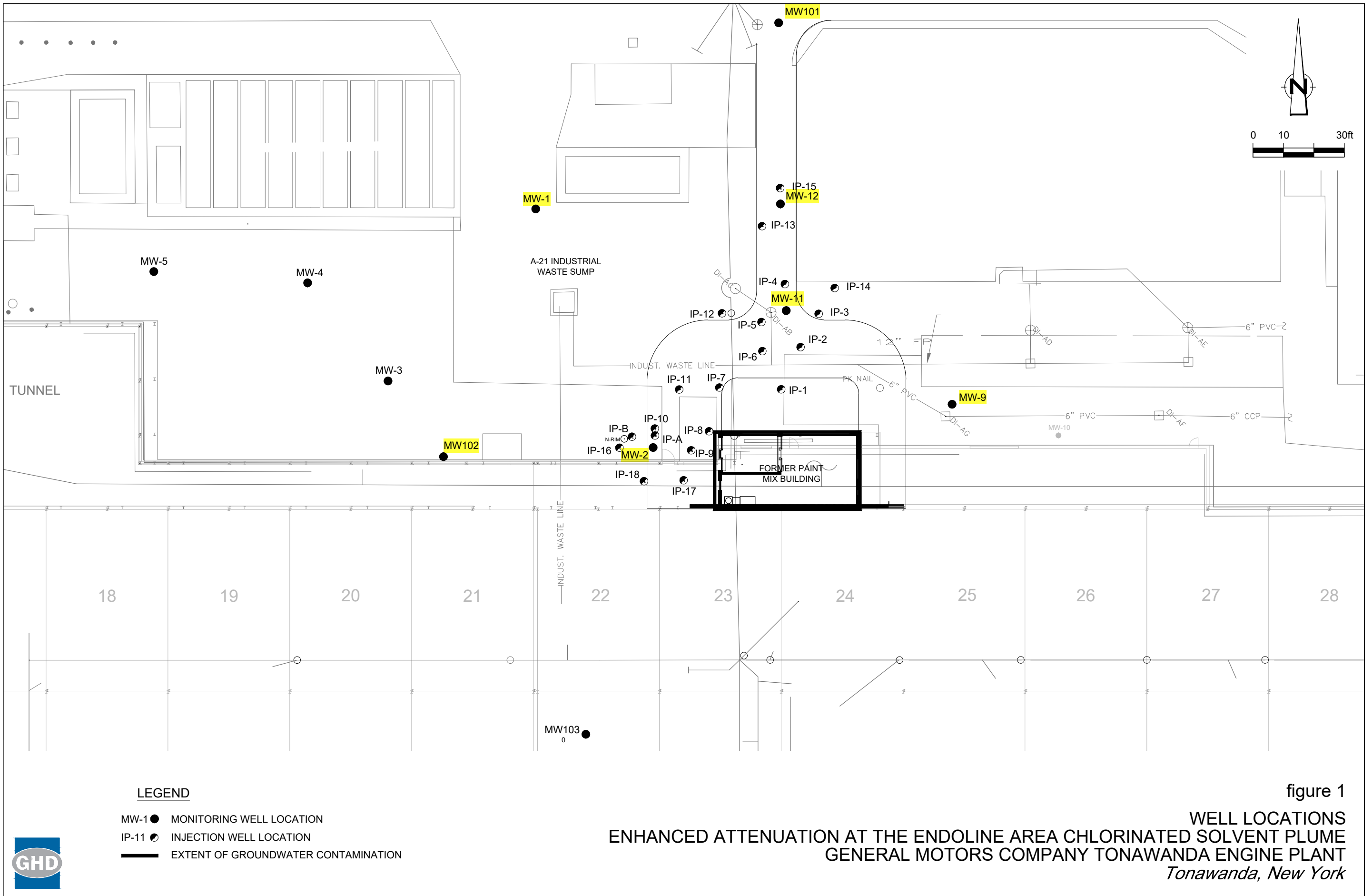


Figure 2. Concentration Versus Time Plot for Well MW-2

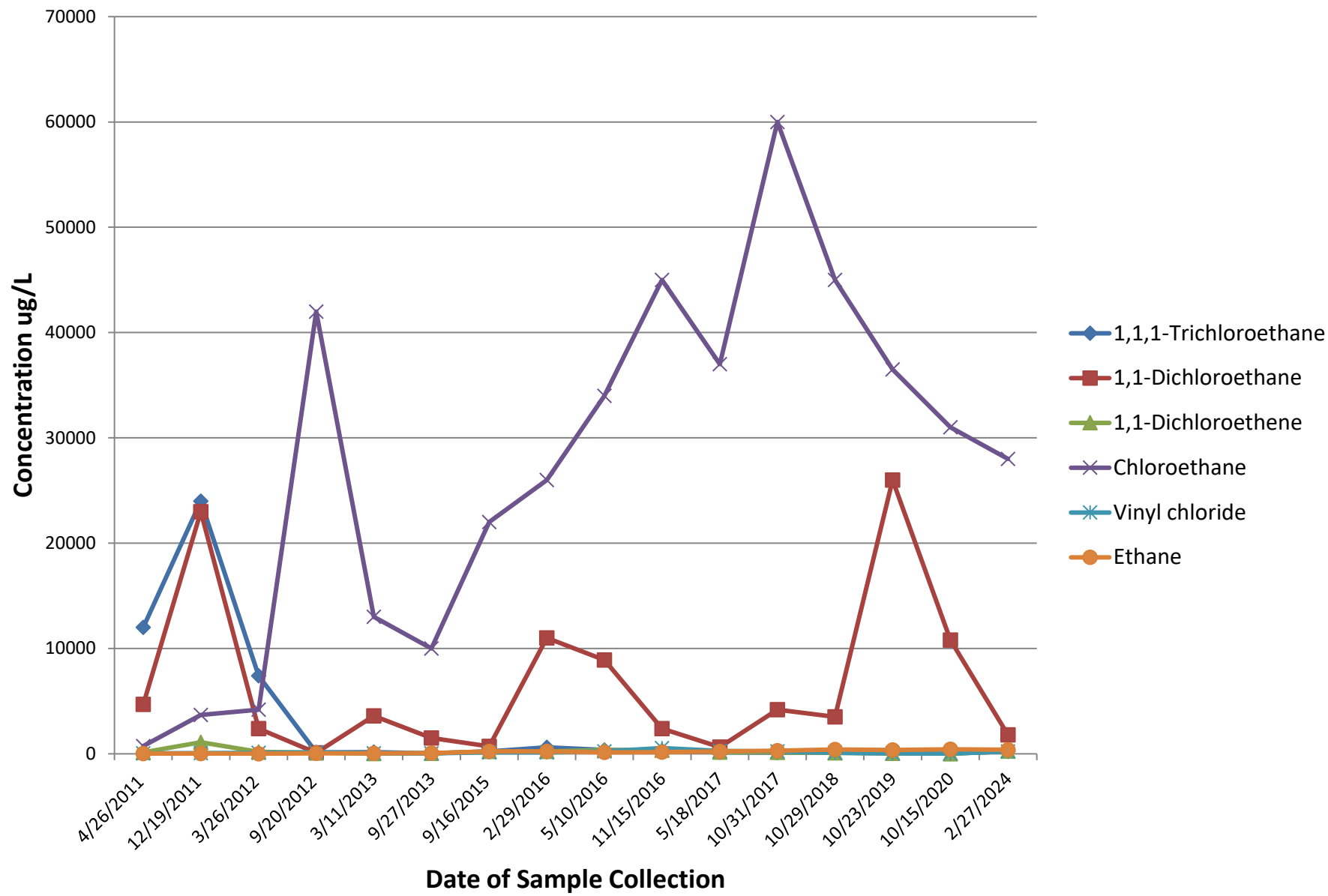


Figure 3. Concentration Versus Time Plot for Well MW-2

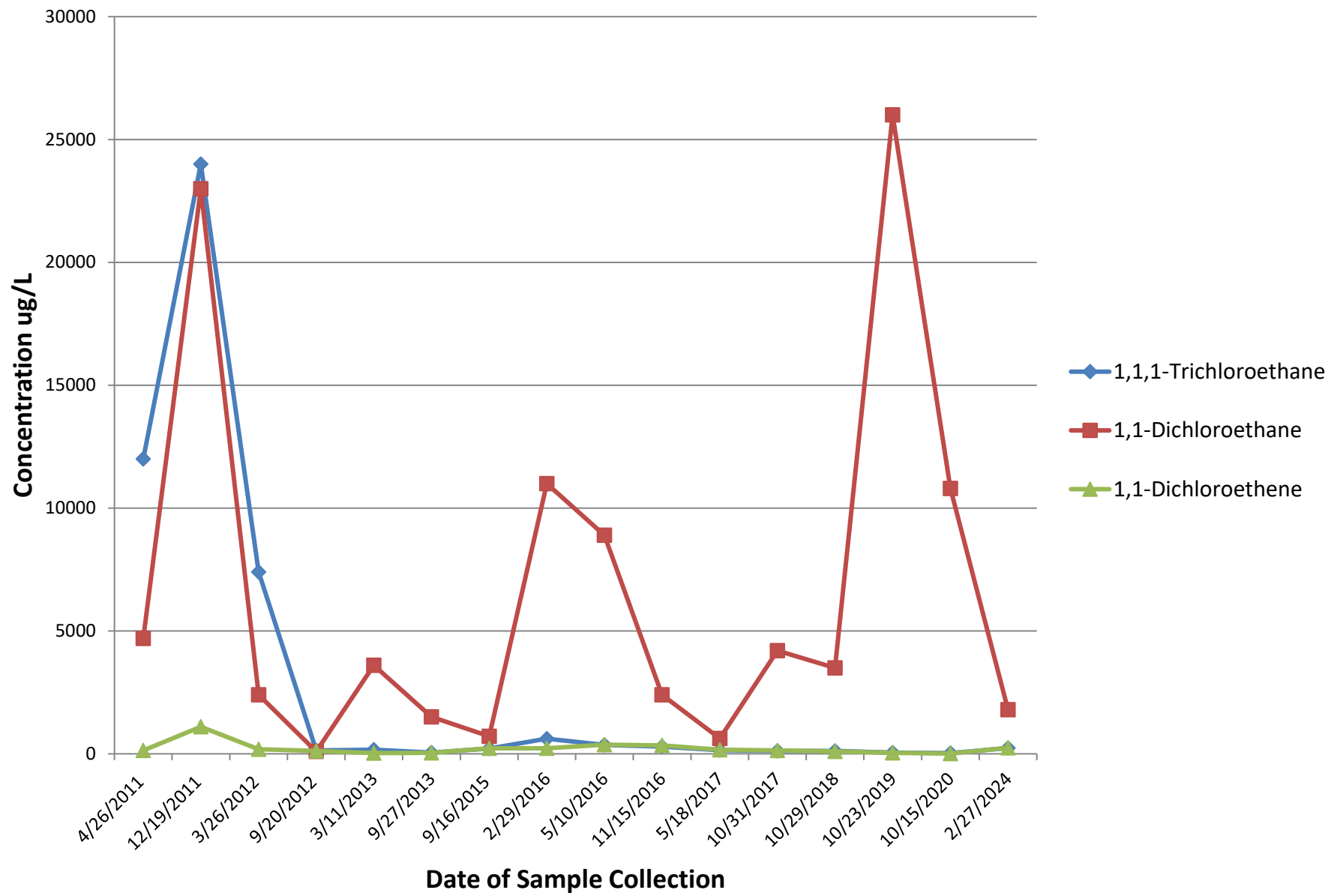


Figure 4. Concentration Versus Time Plot for Well MW-2

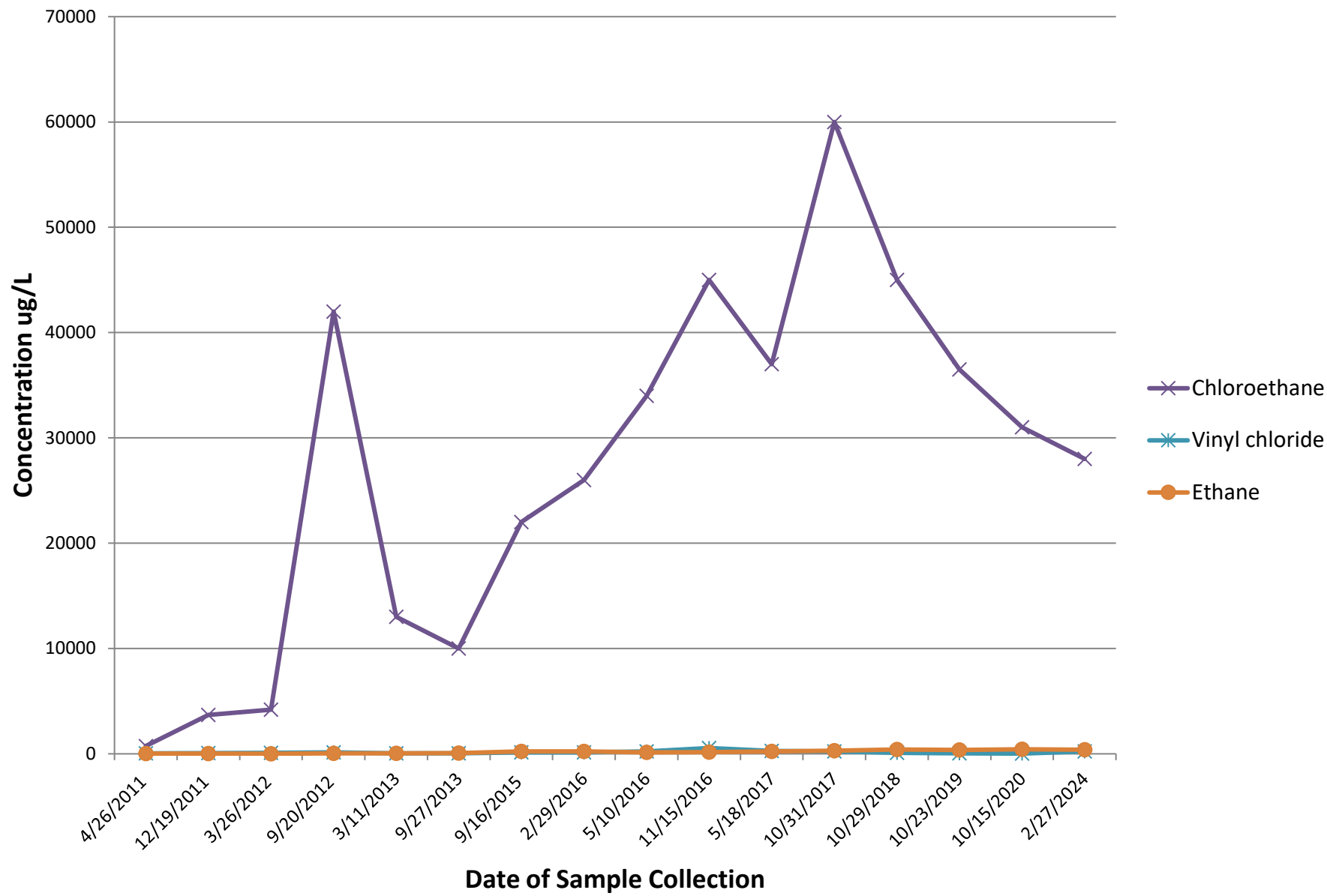


Figure 5. Concentration Versus Time Plot for Well MW-2

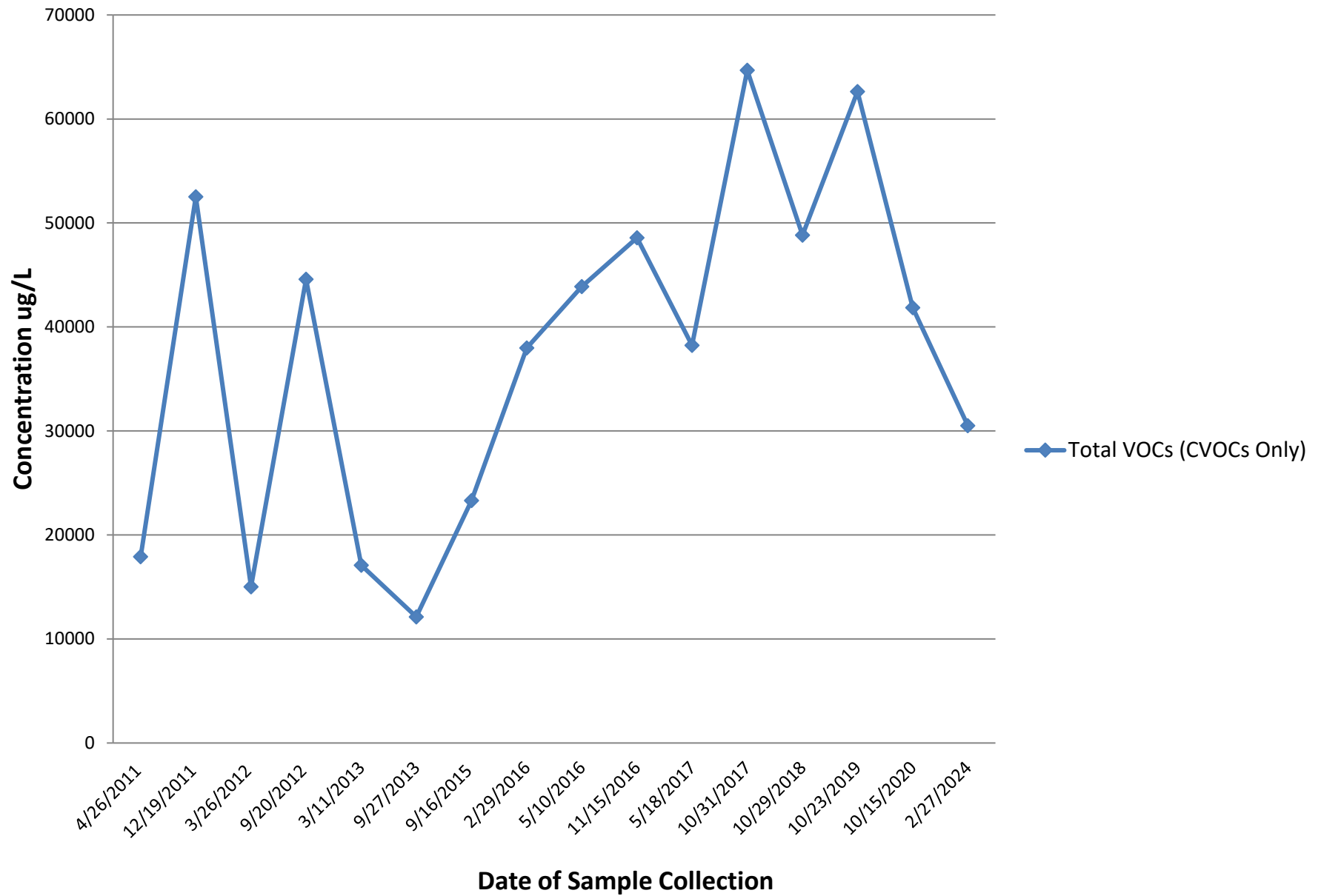


Figure 6. Concentration Versus Time Plot for Well MW-11

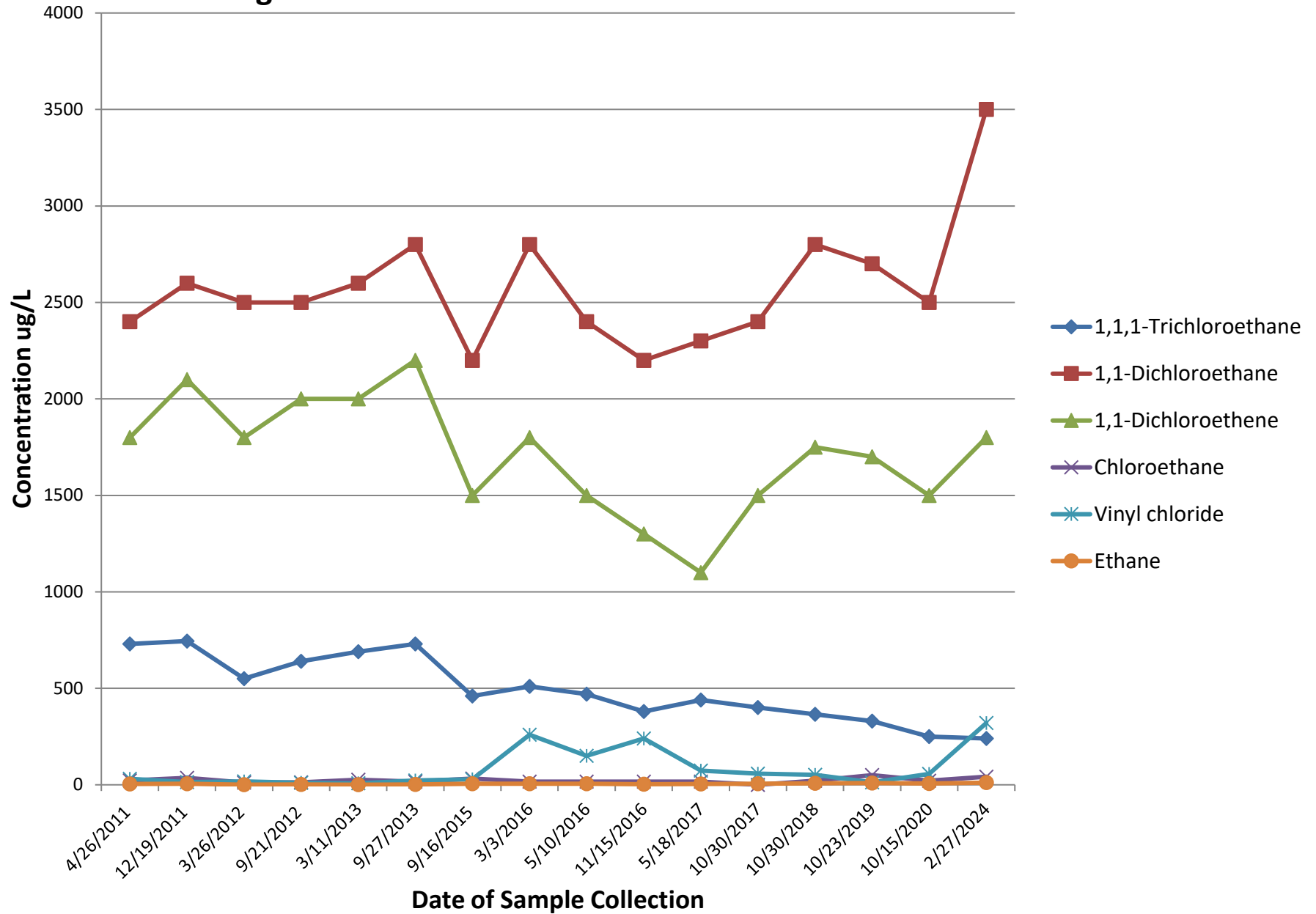


Figure 7. Concentration Versus Time Plot for Well MW-11

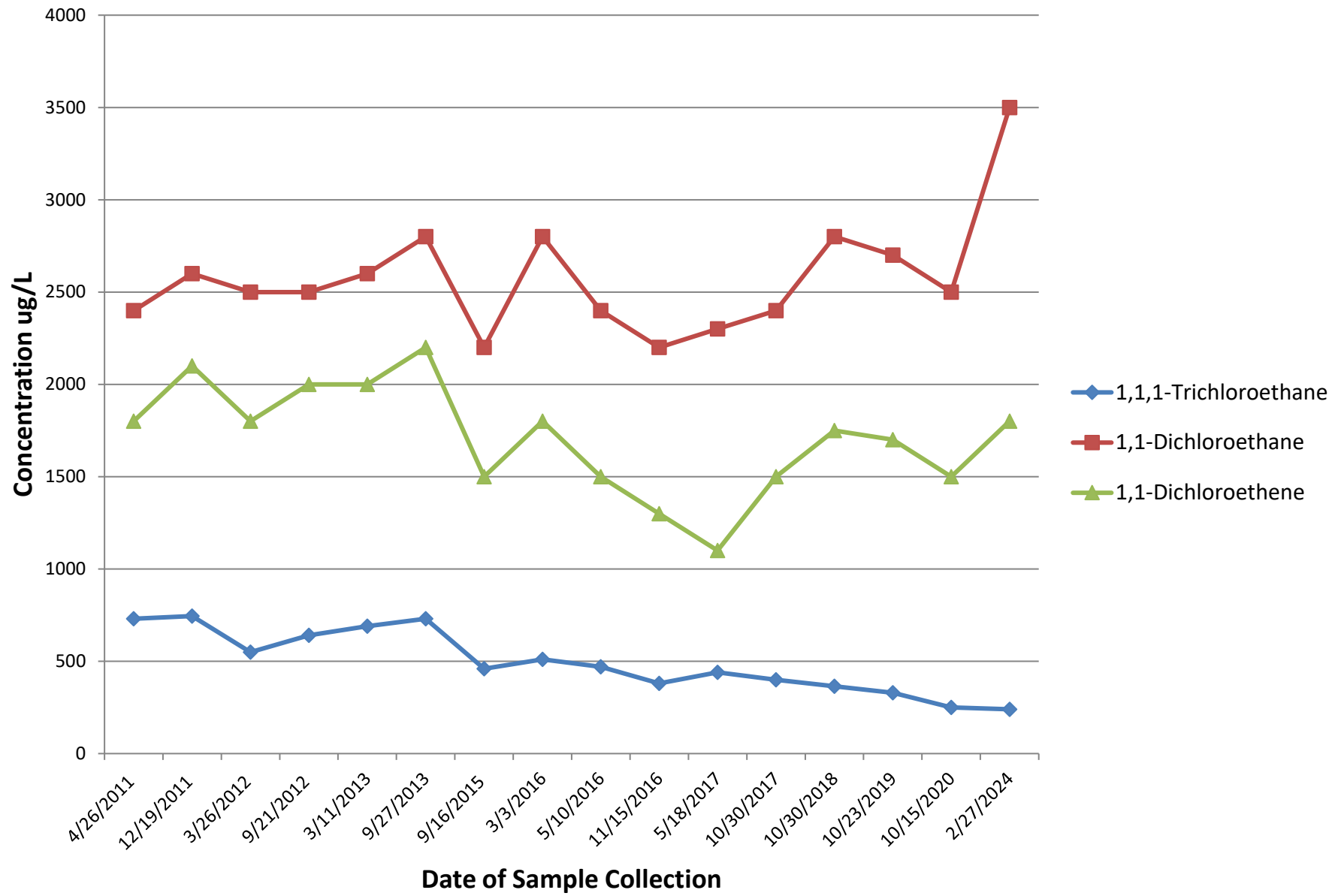


Figure 8. Concentration Versus Time Plot for Well MW-11

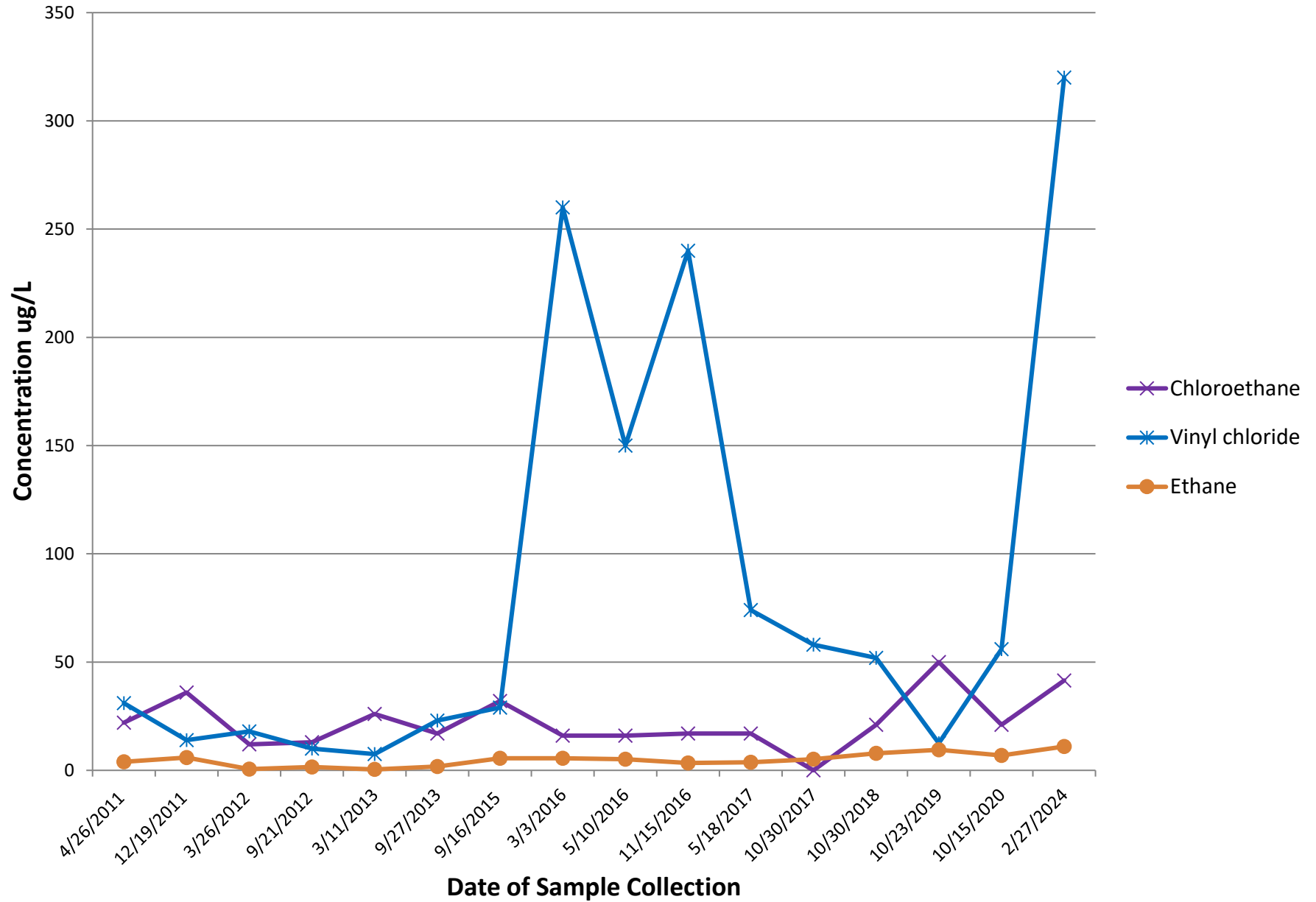


Figure 9. Concentration Versus Time Plot for Well MW-11

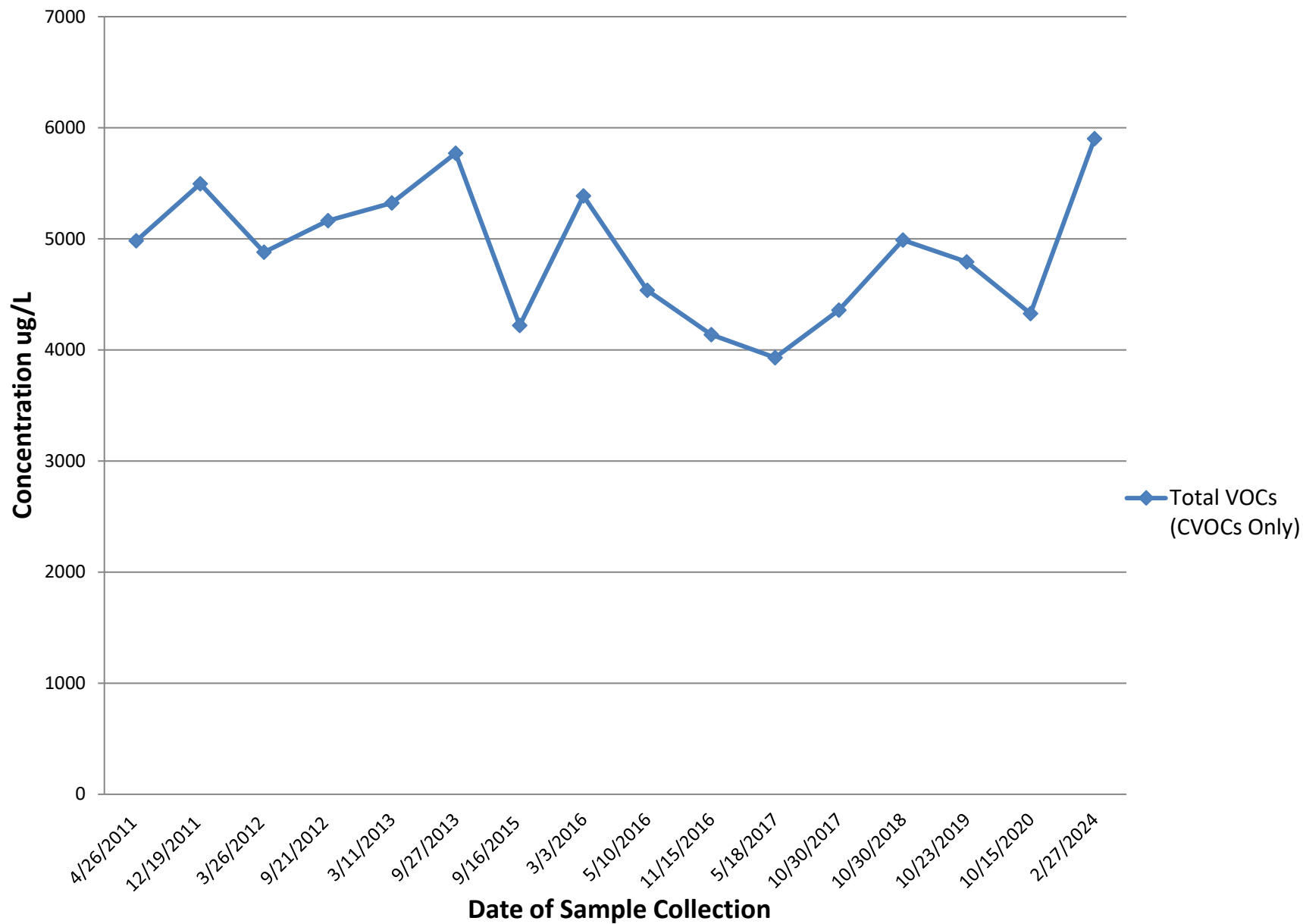


Figure 10. Concentration Versus Time Plot for Well MW-12

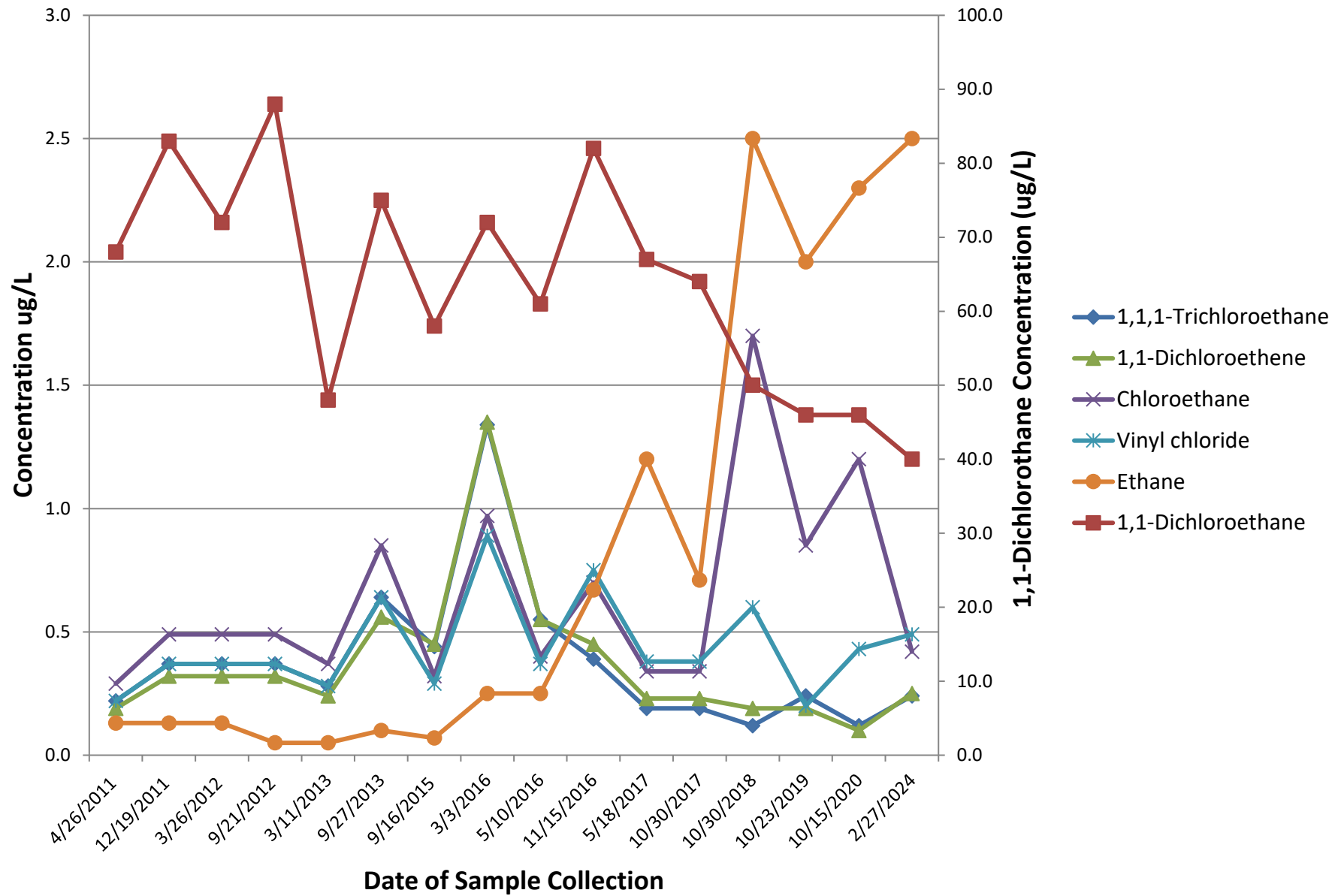


Figure 11. Concentration Versus Time Plot for Well MW-12

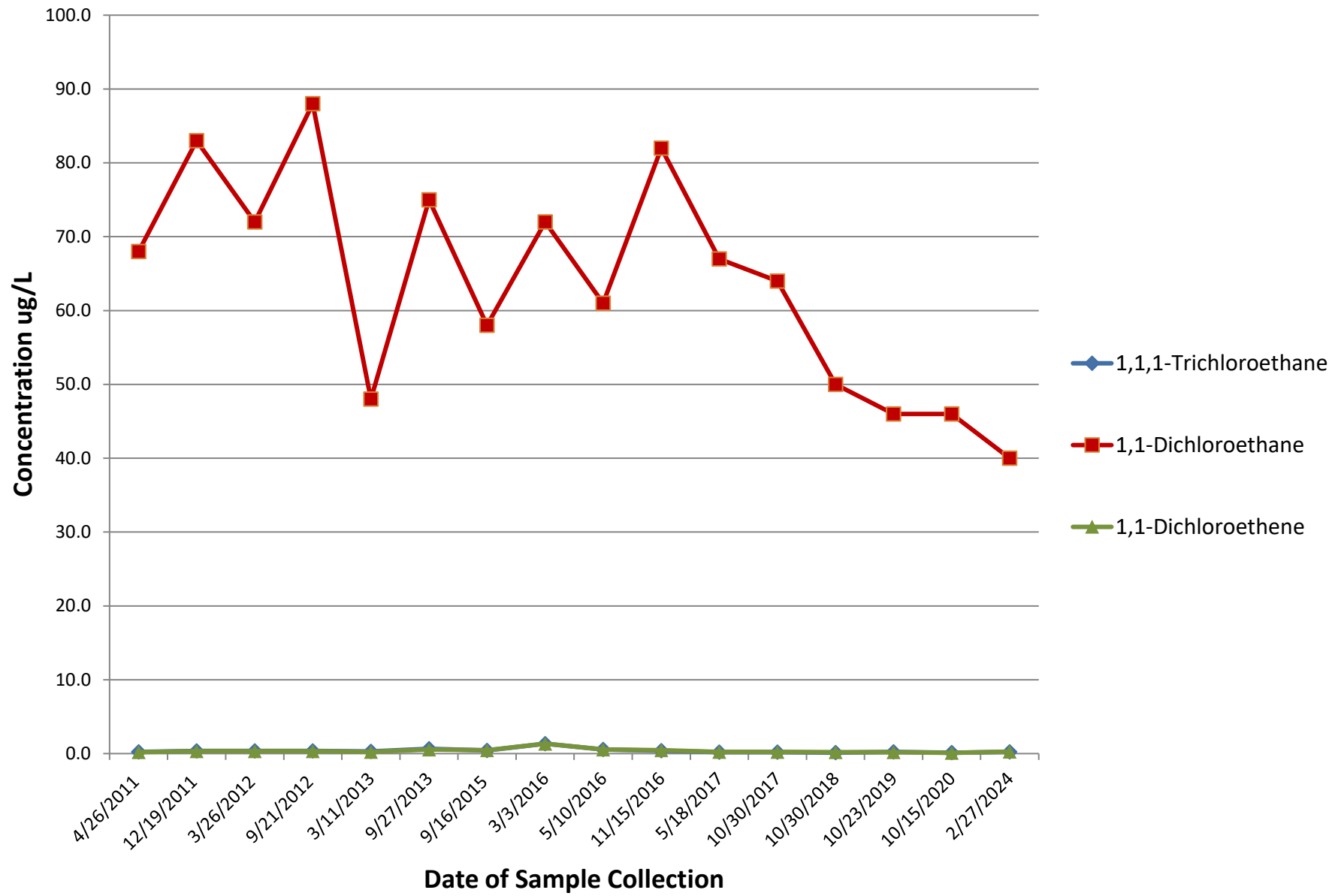


Figure 12. Concentration Versus Time Plot for Well MW-12

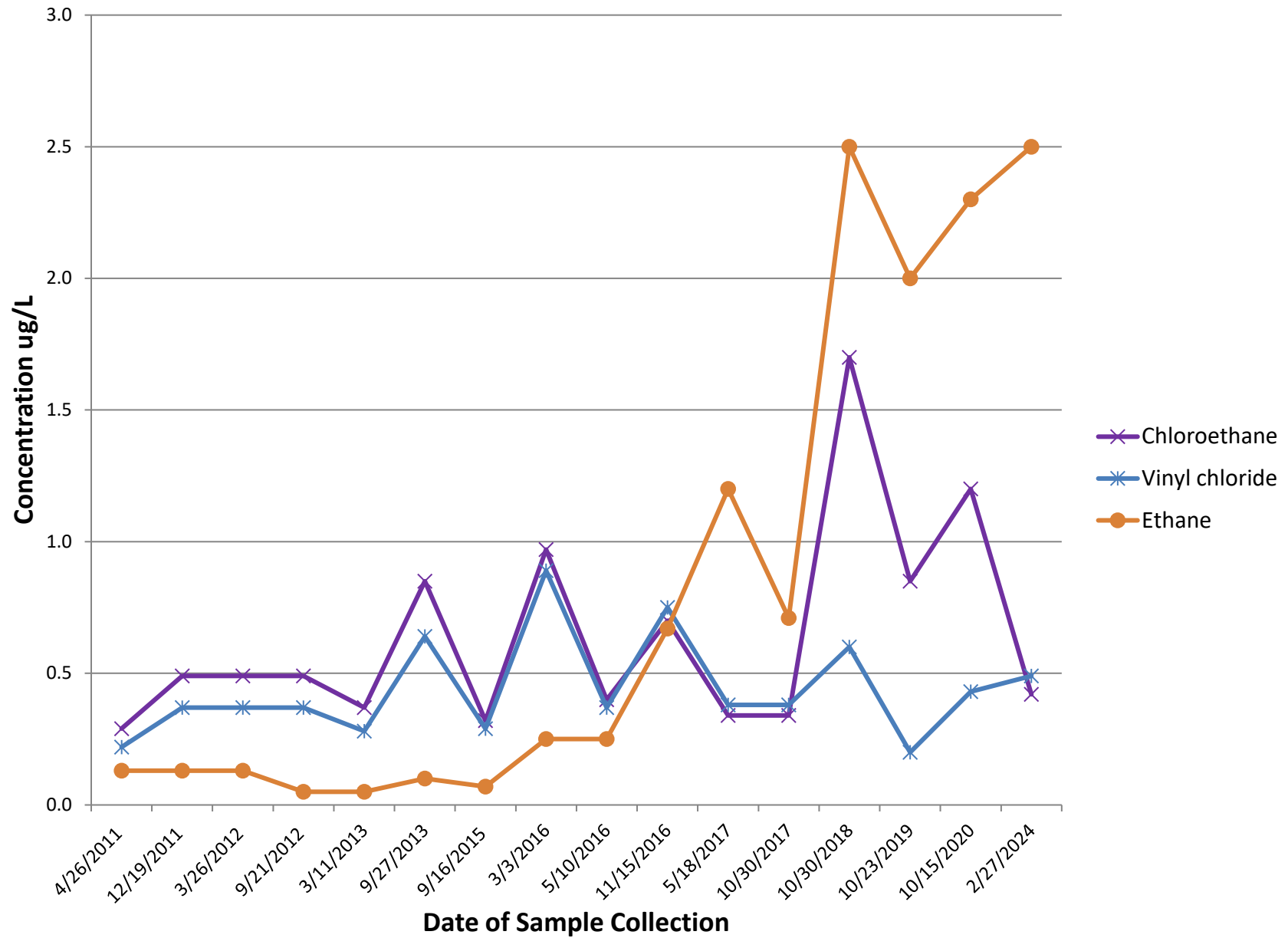


Figure 13. Concentration Versus Time Plot for Well MW-12

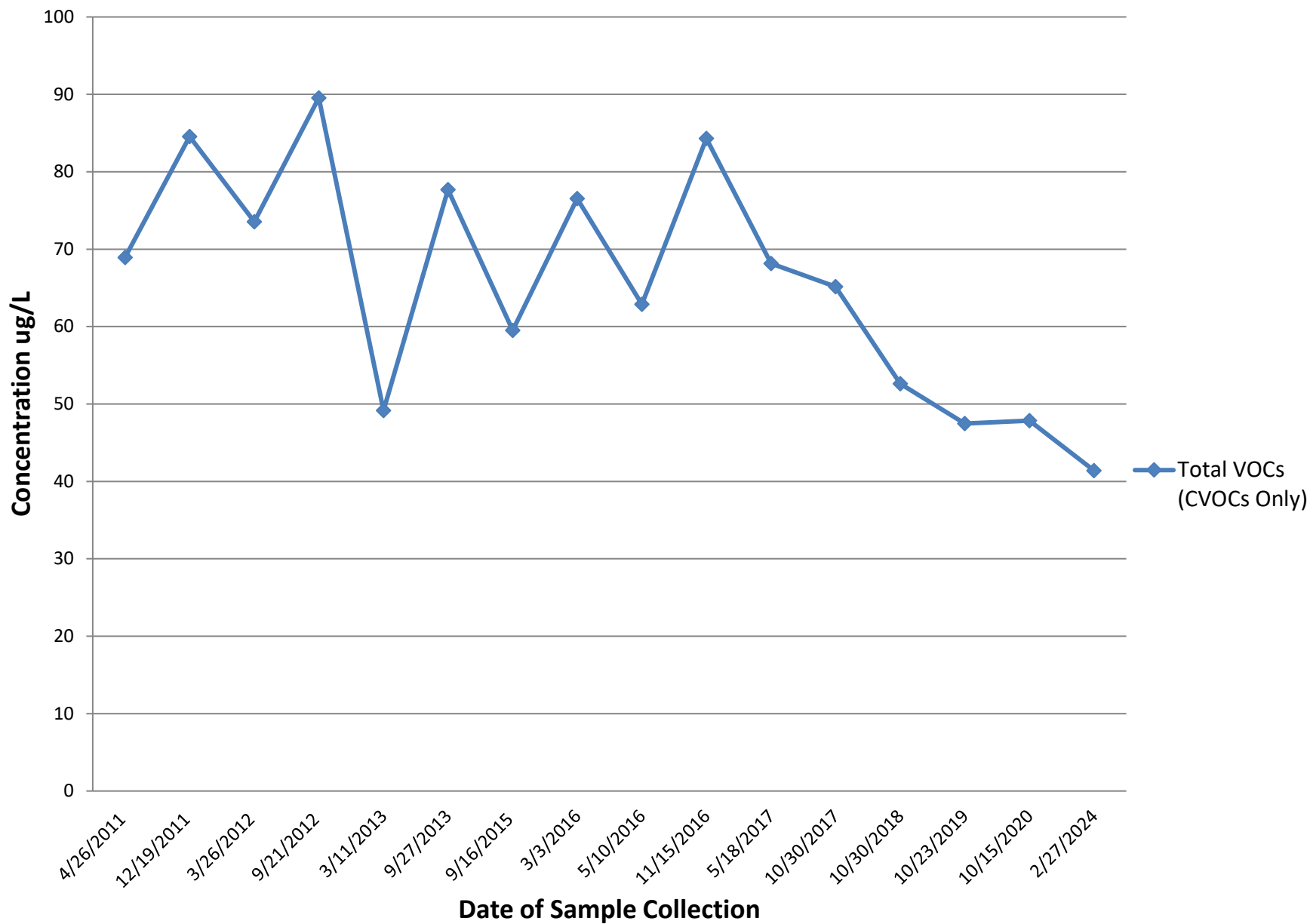


Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:				MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
Sample Name:				GW-17390-042611-KL-04	WG-17390-121911-KL-01	WG-17390-032612-KL-01	WG-17390-032612-KL-02	WG-17390-092012-001	WG-17390-031113-KL-002	WG-17390-092713-KL-010	WG-17390-091615-006
Sample Date:				4/26/2011	12/19/2011	3/26/2012	3/26/2012 (Duplicate)	9/20/2012	3/11/2013	9/27/2013	9/16/2015
Parameters	Units	NYSDEC TOGs	Guidance Value Standard								
Volatile Organic Compounds											
1,1,1-Trichloroethane	ug/L	NC	5	12000	24000	7400	7500	1300 U	170 J	420 U	1000 U
1,1,2,2-Tetrachloroethane	ug/L	NC	5	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
1,1,2-Trichloroethane	ug/L	NC	1	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
1,1-Dichloroethane	ug/L	NC	5	4700	23000	24000	22000	1300 U	3600	1500	710 J
1,1-Dichloroethene	ug/L	NC	5	140 J	1100	190 J	170 J	1300 U	330 U	420 U	1000 U
1,2-Dichloroethane	ug/L	NC	0.6	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
1,2-Dichloroethene (total)	ug/L	5	NC	670 U	-	-	-	-	-	-	2000 U
1,2-Dichloropropane	ug/L	NC	1	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
1,4-Dioxane	ug/L	0.35	NC	17000 U	-	42000 U	31000 U	63000 U	17000 U	21000 U	50000 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	50	NC	3300 U	7100 U	8300 U	6300 U	13000 U	3300 U	4200 U	10000 U
2-Hexanone	ug/L	50	NC	3300 U	7100 U	8300 U	6300 U	13000 U	3300 U	4200 U	10000 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	NC	NC	3300 U	7100 U	8300 U	6300 U	13000 U	3300 U	4200 U	10000 U
Acetone	ug/L	50	NC	3300 U	7100 U	1200 J	980 J	13000 U	3300 U	1600 J	10000 U
Benzene	ug/L	NC	1	330 U	200 J	270 J	260 J	320 J	190 J	170 J	1000 U
Bromodichloromethane	ug/L	50	NC	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Bromoform	ug/L	50	NC	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Bromomethane (Methyl bromide)	ug/L	NC	5	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Carbon disulfide	ug/L	60	60	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Carbon tetrachloride	ug/L	NC	5	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Chlorobenzene	ug/L	NC	5	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Chloroethane	ug/L	NC	5	740	3700	4200 J	2400 J	42000	13000	10000	22000
Chloroform (Trichloromethane)	ug/L	NC	7	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Chloromethane (Methyl chloride)	ug/L	NC	5	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
cis-1,2-Dichloroethene	ug/L	NC	5	-	710 U	830 U	630 U	1300 U	330 U	420 U	-
cis-1,3-Dichloropropene	ug/L	NC	NC	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Dibromochloromethane	ug/L	50	NC	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Ethylbenzene	ug/L	NC	5	80 J	120 J	160 J	140 J	1300 U	90 J	84 J	1000 U
Methylene chloride	ug/L	NC	5	330 U	710 U	320 J	230 J	1300 U	340 U	420 U	1000 U
Styrene	ug/L	NC	5	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Tetrachloroethene	ug/L	NC	5	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Toluene	ug/L	NC	5	68 J	190 J	180 J	170 J	390 J	220 J	200 J	1000 U
trans-1,2-Dichloroethene	ug/L	NC	5	-	710 U	830 U	630 U	1300 U	330 U	420 U	-
trans-1,3-Dichloropropene	ug/L	NC	NC	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Trichloroethene	ug/L	NC	5	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Vinyl chloride	ug/L	NC	2	330 U	710 U	830 U	630 U	1300 U	330 U	420 U	1000 U
Xylenes (total)	ug/L	NC	5	380 J	590 J	680 J	600 J	410 J	450 J	480 J	2000 U
Dissolved Gases											
Ethane	ug/L	NC	NC	19	25	11	18	54	48	79	240
Methane	ug/L	NC	NC	5800	3700	2700	3300	1200	6300	3500	5100
Wet Chemistry											
Alkalinity, total (as CaCO3)	ug/L	NC	NC	209000	240000	260000 J	280000	230000	330000	220000	310000
Ammonia	ug/L	NC	2000	3000	4200	3600	3600	4200	3400 J	2900	2100
Biochemical oxygen demand (BOD)	ug/L	NC	NC	12000	43000 J	94000	98000	91000 J	71000	69000	24000 U
Chemical oxygen demand (COD)	ug/L	NC	NC	35000	200000	190000 J	180000	210000	130000	84000	81000
Dehalobacter spp.	unknown	NC	NC	absent	present	present	-	-	-	-	-
Dehalococcoides spp.	unknown	NC	NC	present	present	present	-	-	-	-	-
Nitrate (as N)	ug/L	NC	10000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	500 U
Nitrite (as N)	ug/L	NC	1000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	500 U
Orthophosphate	ug/L	NC	NC	-	-	61 J	54 J	40 J	45 J	500 U	-
Phosphorus	ug/L	NC	NC	200	130	-	-	-	-	-	80 J
Sulfate	ug/L	NC	250000	6000	1000	460 J	400 J	4700	850 J	4300	5600
Sulfide	ug/L	50	NC	1400	2400	1100	960 J	2100	1000 U	470 J	5500
Total organic carbon (TOC)	ug/L	NC	NC	10000	65000	46000	43000	78000	37000	22000	24000
Anaerobic 1,1,1-TCA specific microbial population	cfu/mL	NC	NC	1260	1470	10900	-	-	-	-	-
Total microbial population - aerobic	cfu/mL	NC	NC	56640	1770	15200	-	-	-	-	-
Total microbial population - anaerobic	cfu/mL	NC	NC	11880	3520	13900	-	-	-	-	-

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:				MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
Sample Name:				GW-17390-042611-KL-04	WG-17390-121911-KL-01	WG-17390-032612-KL-01	WG-17390-032612-KL-02	WG-17390-092012-001	WG-17390-031113-KL-002	WG-17390-092713-KL-010	WG-17390-091615-006
Sample Date:				4/26/2011	12/19/2011	3/26/2012	3/26/2012 (Duplicate)	9/20/2012	3/11/2013	9/27/2013	9/16/2015
Parameters	Units	NYSDEC TOGs Groundwater		Standard							
Field Parameters											
Conductivity	mS/cm	NC	NC	-	1.289	1.47	-	1.76	1.49	4.66	1.03
Dissolved oxygen (DO)	ug/L	NC	NC	-	280	2800	-	5560	6580	420	540
Oxidation reduction potential (ORP)	millivolts	NC	NC	-	-209.2	-119	-	-153	-148	-166	-134
pH	s.u.	NC	NC	-	6.82	7.11	-	6.77	7.32	7.29	7.08
Temperature	Deg C	NC	NC	-	8.4	6.1	-	18	11	17.73	18.67
Turbidity	NTU	NC	NC	-	1	5.8	-	1	11	0	1.37

Notes:
¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998 and addenda.
ug/L - micrograms per liter or parts per billion (ppb)
NC - No Criteria
3.1 J - Estimated Concentration. Analyte was detected at a concentration below the reporting limit
100 U - result is non-detect at the associated value

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	
Sample Name:	WG-17390-022916-001	WG-17390-051016-002	WG-17390-111516-KL-08	WG-17390-111516-KL-09	WG-17390-051817-DO-005	WG-17390-051817-DO-006	WG-17390-103117-005	WG-17390-102918-001	
Sample Date:	2/29/2016	5/10/2016	11/15/2016	11/15/2016 (Duplicate)	5/18/2017	5/18/2017 Duplicate	10/31/17	10/29/2018	
Parameters	Units								
Volatile Organic Compounds									
1,1,1-Trichloroethane	ug/L	620 J	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	
1,1,2,2-Tetrachloroethane	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	
1,1,2-Trichloroethane	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	
1,1-Dichloroethane	ug/L	11000	8900	2400 J	2600	1300 U	630 J	4200	3500
1,1-Dichloroethene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
1,2-Dichloroethane	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
1,2-Dichloroethene (total)	ug/L	2000 U	3300 U	5000 U	5000 U	2500 U	2500 U	2000 U	2000 U
1,2-Dichloropropane	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
1,4-Dioxane	ug/L	50000 U	83000 U	130000 U	130000 U	63000 U	63000 U	50000 U	50000 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	10000 U	17000 U	25000 U	25000 U	13000 U	13000 U	10000 U	10000 U
2-Hexanone	ug/L	10000 U	17000 U	25000 U	25000 U	13000 U	13000 U	10000 U	10000 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10000 U	17000 U	25000 U	25000 U	13000 U	13000 U	10000 U	10000 U
Acetone	ug/L	1100 JB	17000 U	25000 U	25000 U	13000 U	13000 U	10000 U	10000 U
Benzene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	230 J
Bromodichloromethane	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Bromoform	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Bromomethane (Methyl bromide)	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Carbon disulfide	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Carbon tetrachloride	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Chlorobenzene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Chloroethane	ug/L	26000	34000	45000	49000	37000	38000	60000	45000
Chloroform (Trichloromethane)	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Chloromethane (Methyl chloride)	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
cis-1,2-Dichloroethene	ug/L	-	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
cis-1,3-Dichloropropene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Dibromochloromethane	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Ethylbenzene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Methylene chloride	ug/L	1000 U	1700 U	2500 U	3850 U	1300 U	1300 U	1000 U	5000 U
Styrene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Tetrachloroethene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Toluene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
trans-1,2-Dichloroethene	ug/L	-	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
trans-1,3-Dichloropropene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Trichloroethene	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Vinyl chloride	ug/L	1000 U	1700 U	2500 U	2500 U	1300 U	1300 U	1000 U	1000 U
Xylenes (total)	ug/L	2000 U	3300 U	5000 U	5000 U	2500 U	2500 U	350 J	240 J
Dissolved Gases									
Ethane	ug/L	-	140	170	180	230	230	290	410
Methane	ug/L	-	6300	4400	5200	9600	9000	9800	14000
Wet Chemistry									
Alkalinity, total (as CaCO3)	ug/L	350000	360000	310000	320000	280000	290000	260000	250000
Ammonia	ug/L	1500	1700 B	2800 B	2800 B	--	--	3500	3300
Biochemical oxygen demand (BOD)	ug/L	26000	43000	60000 B	68000 B	95000 J	82000 J	35000	9300
Chemical oxygen demand (COD)	ug/L	120000	140000	250000 J	240000 J	230000	220000	250000	180000
Dehalobacter spp.	unknown	-	-	-	-	-	-	-	-
Dehalococcoides spp.	unknown	-	-	-	-	-	-	-	-
Nitrate (as N)	ug/L	100 U	100 U	100 U	100 U	100 UJ	100 UJ	100 U	100 U
Nitrite (as N)	ug/L	100 U	500 U	100 U	100 U	100 UJ	100 UJ	100 U	100 U
Orthophosphate	ug/L	-	-	-	-	--	--	--	-
Phosphorus	ug/L	100 U	-	61 J	100 U	96 J	68 J	54 J	90 J
Sulfate	ug/L	1400	810 J	760 J	1300	1000 U	1000 U	1000 U	3100
Sulfide	ug/L	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U
Total organic carbon (TOC)	ug/L	29000	30000	68000	66000	37000	36000	75000	27000
Anaerobic 1,1,1-TCA specific microbial population	cfu/mL	-	-	-	-	--	--	--	-
Total microbial population - aerobic	cfu/mL	-	-	-	-	-	-	-	-
Total microbial population - anaerobic	cfu/mL	-	-	-	-	-	-	-	-

Table 1
Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
Sample Name:		WG-17390-022916-001	WG-17390-051016-002	WG-17390-111516-KL-08	WG-17390-111516-KL-09	WG-17390-051817-DO-005	WG-17390-051817-DO-006	WG-17390-103117-005	WG-17390-102918-001
Sample Date:		2/29/2016	5/10/2016	11/15/2016	11/15/2016 (Duplicate)	5/18/2017	5/18/2017 Duplicate	10/31/17	10/29/2018
Parameters	Units								
Field Parameters									
Conductivity	mS/cm	1.51	1.36	1.65	1.65	1.48	1.48	1.86	1.71
Dissolved oxygen (DO)	ug/L	0	3800	580	580	0.24	0.24	0.98	--
Oxidation reduction potential (ORP)	millivolts	-152	-	-101	-101	-145	-145	-52	-156
pH	s.u.	7.67	7.43	7.71	7.71	7.29	7.29	7.11	6.95
Temperature	Deg C	8.02	14.87	14.0	14.0	17.58	17.58	13.77	14.3
Turbidity	NTU	4.04	3.8	3.6	3.6	2.52	2.52	28.6	13.2

Notes:
¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water ` Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.
ug/L - micrograms per liter or parts per billion (ppb)
NC - No Criteria
3.1 J - Estimated Concentration. Analyte was detected at a concentration below the 100 U - result is non-detect at the associated value

Table 1

Analytical Results Summary - Natural Attenuation Monitoring Endoline Area Chlorinated Solvent Plume Monitoring Program GM Tonawanda Engine Plant Tonawanda, New York									
Location ID:	MW-2	MW-2	MW-2	MW-2	MW-2	MW-11	MW-11	MW-11	
Sample Name:	WG-17390-102319-003	WG-17390-102319-004	WG-17390-101520-001	WG-17390-101520-002	WG-017390-022724-KM-001	GW-17390-042611-KL-07	WG-17390-121911-KL-02	WG-17390-121911-KL-03	
Sample Date:	10/23/2019	10/23/2019 Duplicate	10/15/2020	10/15/2020 Duplicate	2/27/2024	4/26/2011	12/19/2011	12/19/2011 (Duplicate)	
Parameters	Units								
Volatile Organic Compounds									
1,1,1-Trichloroethane	ug/L	400 U	400 U	13 J	45 J	1000 U	730	760	730
1,1,2,2-Tetrachloroethane	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
1,1,2-Trichloroethane	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
1,1-Dichloroethane	ug/L	28000	24000	1600 J	20000 J	1800	2400	2600	2500
1,1-Dichloroethene	ug/L	400 U	400 U	6.0	130 U	1000 U	1800	2100	2100
1,2-Dichloroethane	ug/L	400 U	400 U	4.0 U	130 U	1000 U	16 J	130 U	130 U
1,2-Dichloroethene (total)	ug/L	400 U	400 U	6.5	130 U	1000 U	98 J	-	-
1,2-Dichloropropane	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
1,4-Dioxane	ug/L	20000 U	20000 U	200 U	6300 U	50000 U	3600 U	-	-
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	4000 U	4000 U	40 U	1300 U	10000 U	710 U	1300 U	1300 U
2-Hexanone	ug/L	4000 U	4000 U	40 U	1300 U	10000 U	710 U	1300 U	1300 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	4000 U	4000 U	40 U	1300 U	10000 U	710 U	1300 U	1300 U
Acetone	ug/L	4000 U	4000 U	40 U	1300 U	10000 U	710 U	1300 U	1300 U
Benzene	ug/L	180 J	190 J	300 J	160 J	1000 U	71 U	130 U	130 U
Bromodichloromethane	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Bromoform	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Bromomethane (Methyl bromide)	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Carbon disulfide	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Carbon tetrachloride	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Chlorobenzene	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Chloroethane	ug/L	36000	37000	32000	30000	28000	22 J	130 U	36 J
Chloroform (Trichloromethane)	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Chloromethane (Methyl chloride)	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
cis-1,2-Dichloroethene	ug/L	400 U	400 U	2.8 J	130 U	1000 U	-	110 J	110 J
cis-1,3-Dichloropropene	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Dibromochloromethane	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Ethylbenzene	ug/L	400 U	400 U	43 J	24 J	1000 U	71 U	130 U	130 U
Methylene chloride	ug/L	2000 U	2000 U	20 U	630 U	630 U	71 U	130 U	130 U
Styrene	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Tetrachloroethene	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Toluene	ug/L	400 U	400 U	13	18 J	1000 U	71 U	130 U	130 U
trans-1,2-Dichloroethene	ug/L	400 U	400 U	3.7 J	130 U	1000 U	-	130 U	130 U
trans-1,3-Dichloropropene	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Trichloroethene	ug/L	400 U	400 U	4.0 U	130 U	1000 U	71 U	130 U	130 U
Vinyl chloride	ug/L	400 U	400 U	12 J	31 J	1000 U	31 J	130 U	130 U
Xylenes (total)	ug/L	93 J	98 J	300 J	120 J	2000 U	140 U	250 U	250 U
Dissolved Gases									
Ethane	ug/L	370	-	290 J	570 J	380	4.0	5.9	6.2
Methane	ug/L	11000	-	7700 J	16000 J	8900	860	1200	1200
Wet Chemistry									
Alkalinity, total (as CaCO3)	ug/L	290000	-	290000	-	400000	422000	450000	460000
Ammonia	ug/L	3400	-	4300	-	1600	2000 U	2000 U	2000 U
Biochemical oxygen demand (BOD)	ug/L	8400 J	-	15000 J	-	12000	2000 U	2000 UJ	2000 UJ
Chemical oxygen demand (COD)	ug/L	120000	-	140000	-	95000	180000	190000	160000
Dehalobacter spp.	unknown	-	-	-	-	-	present	present	-
Dehalococcoides spp.	unknown	-	-	-	-	-	absent	absent	-
Nitrate (as N)	ug/L	500 UJ	-	100 UJ	-	250 U	100 U	500 U	500 U
Nitrite (as N)	ug/L	100 UJ	-	100 UJ	-	250 U	5000 U	500 U	5000 U
Orthophosphate	ug/L	-	-	-	-	-	-	-	-
Phosphorus	ug/L	100 U	-	57 J	-	100 U	40 J	100 U	100 U
Sulfate	ug/L	3000	-	3100	-	17000	1960000	2000000	2000000
Sulfide	ug/L	1000 U	-	1500	-	1000 U	1000 U	1000 U	1000 U
Total organic carbon (TOC)	ug/L	26000	-	29000	-	19000	5000	6500	6900
Anaerobic 1,1,1-TCA specific microbial population	cfu/mL	-	-	15400	-	2250	3360	115	-
Total microbial population - aerobic	cfu/mL	-	-	20900	-	280	40800	1670	-
Total microbial population - anaerobic	cfu/mL	-	-	15400	-	1490	6080	1450	-

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-2	MW-2	MW-2	MW-2	MW-2	MW-11	MW-11	MW-11
Sample Name:		WG-17390-102319-003	WG-17390-102319-004	WG-17390-101520-001	WG-17390-101520-002	WG-017390-022724-KM-001	GW-17390-042611-KL-07	WG-17390-121911-KL-02	WG-17390-121911-KL-03
Sample Date:		10/23/2019	10/23/2019 Duplicate	10/15/2020	10/15/2020 Duplicate	2/27/2024	4/26/2011	12/19/2011	12/19/2011 (Duplicate)
Parameters	Units								
Field Parameters									
Conductivity	mS/cm	2.14	-	1.49	-	1.48	-	14.67	-
Dissolved oxygen (DO)	ug/L	310	-	6.58	-	3510	-	230	-
Oxidation reduction potential (ORP)	millivolts	-187	-	-148	-	-70	-	-12.7	-
pH	s.u.	7.71	-	7.32	-	6.99	-	6.12	-
Temperature	Deg C	15.9	-	11,0	-	13,36	-	10.04	-
Turbidity	NTU	50.2	-	11	-	2.73	-	5.2	-

Notes:
¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water ` Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.
ug/L - micrograms per liter or parts per billion (ppb)
NC - No Criteria
3.1 J - Estimated Concentration. Analyte was detected at a concentration below the 100 U - result is non-detect at the associated value

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	
Sample Name:		WG-17390-032612-KL-03	WG-17390-092112-003	WG-17390-031113-KL-001	WG-17390-092713-KL-005	WG-17390-091615-009	WG-17390-030316-004	WG-17390-051016-001	WG-17390-111516-KL-07	WG-17390-051817-DO-007
Sample Date:		3/26/2012	9/21/2012	3/11/2013	9/27/2013	9/16/2015	3/3/2016	5/10/2016	11/15/2016	5/18/2017
Parameters	Units									
Volatile Organic Compounds										
1,1,1-Trichloroethane	ug/L	550	640	690	730	460	510	470	380	440
1,1,2,2-Tetrachloroethane	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
1,1,2-Trichloroethane	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
1,1-Dichloroethane	ug/L	2500	2500	2600	2800	2200	2800	2400	2200	2300
1,1-Dichloroethene	ug/L	1800	2000	2000	2200	1500	1800	1500	1300	1100
1,2-Dichloroethane	ug/L	83 U	91 U	67 U	14 J	200 U	100 U	100 U	83 U	83 U
1,2-Dichloroethene (total)	ug/L	-	-	-	-	89 J	110 J	100 J	89 J	83 J
1,2-Dichloropropane	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
1,4-Dioxane	ug/L	4200 U	4500 U	3300 U	2000 U	10000 U	5000 U	5000 U	4170 U	4200 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	830 U	910 U	670 U	400 U	2000 U	1000 U	1000 U	830 U	830 U
2-Hexanone	ug/L	830 U	910 U	670 U	400 U	2000 U	1000 U	1000 U	830 U	830 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	830 U	910 U	670 U	400 U	2000 U	1000 U	1000 U	830 U	830 U
Acetone	ug/L	130 J	910 U	670 U	400 U	2000 U	110 JB	1000 U	830 U	830 U
Benzene	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Bromodichloromethane	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Bromoform	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 UJ
Bromomethane (Methyl bromide)	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Carbon disulfide	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Carbon tetrachloride	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Chlorobenzene	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Chloroethane	ug/L	83 U	91 U	26 J	17 J	200 U	100 U	100 U	83 U	83 U
Chloroform (Trichloromethane)	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Chloromethane (Methyl chloride)	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
cis-1,2-Dichloroethene	ug/L	110	100	100	120	-	-	100	89	83
cis-1,3-Dichloropropene	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Dibromochloromethane	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Ethylbenzene	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Methylene chloride	ug/L	83 U	91 U	83 U	40 U	200 U	100 U	100 U	83 U	83 U
Styrene	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Tetrachloroethene	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Toluene	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
trans-1,2-Dichloroethene	ug/L	83 U	91 U	67 U	40 U	-	-	100 U	83 U	83 U
trans-1,3-Dichloropropene	ug/L	83 U	91 U	67 U	40 U	200 U	100 U	100 U	83 U	83 U
Trichloroethene	ug/L	16 J	16 J	20 J	19 J	200 U	100 U	100 U	83 U	83 U
Vinyl chloride	ug/L	83 U	91 U	67 U	23 J	200 U	260	150	240	74 J
Xylenes (total)	ug/L	170 U	180 U	130 U	80 U	400 U	200 U	200 U	170 U	170 U
Dissolved Gases										
Ethane	ug/L	0.65	1.5	0.42 J	1.8	5.6	-	5.1	3.4	3.7
Methane	ug/L	93	280	59	340	1200	-	1200	670	840
Wet Chemistry										
Alkalinity, total (as CaCO3)	ug/L	440000 J	450000	470000	440000	480000	490000	460000	440000	410000
Ammonia	ug/L	2000 U	2000 U	2000 U	870 J	6300	670	170 JB	260 B	350
Biochemical oxygen demand (BOD)	ug/L	2000 U	2000 U	2000 U	2000 U	3500	2000 U	2000 U	2000 U	2600 J
Chemical oxygen demand (COD)	ug/L	100000 J	160000	99000	220000	150000	17000	62000	52000 J	56000
Dehalobacter spp.	unknown	present	-	-	-	-	-	-	-	-
Dehalococcoides spp.	unknown	absent	-	-	-	-	-	-	-	-
Nitrate (as N)	ug/L	100 U	100 U	100 U	100 U	5000 U	500 U	100 U	1000 U	100 UJ
Nitrite (as N)	ug/L	2500 U	100 U	2500 U	500 U	5000 U	500 U	2500 U	1000 U	100 UJ
Orthophosphate	ug/L	100 U	R	100 U	500 U	-	-	-	-	-
Phosphorus	ug/L	-	-	-	-	82 J	100 U	-	100 U	100 U
Sulfate	ug/L	3100000	3900000	2600000	2300000	1700000	930000	2000000	2200000	2000000
Sulfide	ug/L	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U
Total organic carbon (TOC)	ug/L	3100	4000	4800	4300	28000	1600	1300	2300	3200
Anaerobic 1,1,1-TCA specific microbial population	cfu/mL	200	-	-	-	-	-	-	-	-
Total microbial population - aerobic	cfu/mL	555	-	-	-	-	-	-	-	-
Total microbial population - anaerobic	cfu/mL	215	-	-	-	-	-	-	-	-

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11
Sample Name:		WG-17390-032612-KL-03	WG-17390-092112-003	WG-17390-031113-KL-001	WG-17390-092713-KL-005	WG-17390-091615-009	WG-17390-030316-004	WG-17390-051016-001	WG-17390-111516-KL-07	WG-17390-051817-DO-007
Sample Date:		3/26/2012	9/21/2012	3/11/2013	9/27/2013	9/16/2015	3/3/2016	5/10/2016	11/15/2016	5/18/2017
Parameters	Units									
Field Parameters										
Conductivity	mS/cm	16.3	15.6	15.5	26.1	13.9	18.4	14.2	20.5	14.7
Dissolved oxygen (DO)	ug/L	-	5030	1120	-	5120	0	8100	460	0.26
Oxidation reduction potential (ORP)	millivolts	97	-73	155	-58	-146	-110	-	15	-33
pH	s.u.	6.27	6.23	7.08	6.86	6.75	7.53	6.86	7.15	7.01
Temperature	Deg C	10.1	19.4	9.74	18.62	24.99	7.75	12.59	15.7	16.44
Turbidity	NTU	-	0	3.4	0	4.84	1.07	11.2	1.6	2.41

Notes:

¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water ` Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.

ug/L - micrograms per liter or parts per billion (ppb)

NC - No Criteria

3.1 J - Estimated Concentration. Analyte was detected at a concentration below the 100 U - result is non-detect at the associated value

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-12	MW-12	
Sample Name:	WG-17390-103017-001	WG-17390-103018-003	WG-17390-103018-004	WG-17390-102319-002	WG-17390-101520-003	WG-017390-022724-JK-008	GW-17390-042611-KL-06	WG-17390-121911-KL-04	
Sample Date:	10/30/17	10/30/2018	10/30/2018 Duplicate	10/23/2019	10/15/2020	2/27/2024	4/26/2011	12/19/2011	
Parameters	Units								
Volatile Organic Compounds									
1,1,1-Trichloroethane	ug/L	400	370	360	330	250	240	2.0 U	3.3 U
1,1,2,2-Tetrachloroethane	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
1,1,2-Trichloroethane	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
1,1-Dichloroethane	ug/L	2400	2800	2800	2700	2500	3500	68	83
1,1-Dichloroethene	ug/L	1500	1800	1700	1700	1500	1800	2.0 U	3.3 U
1,2-Dichloroethane	ug/L	63 U	15 J	15 J	130 U	11 J	100 U	2.0 U	3.3 U
1,2-Dichloroethene (total)	ug/L	94 J	100	100	100 J	76	91 J	4.0 U	-
1,2-Dichloropropane	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
1,4-Dioxane	ug/L	3100 U	2500 U	2500 U	6300 U	2500 U	5000 U	100 U	-
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	630 U	500 U	62 J	1300 U	500 U	1000 U	20 U	33 U
2-Hexanone	ug/L	630 U	500 U	500 U	1300 U	500 U	1000 U	20 U	33 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	630 U	500 U	500 U	1300 U	500 U	1000 U	20 U	33 U
Acetone	ug/L	630 U	500 U	500 U	1300 U	500 U	1000 U	20 U	33 U
Benzene	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Bromodichloromethane	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Bromoform	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Bromomethane (Methyl bromide)	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Carbon disulfide	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Carbon tetrachloride	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Chlorobenzene	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Chloroethane	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Chloroform (Trichloromethane)	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Chloromethane (Methyl chloride)	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
cis-1,2-Dichloroethene	ug/L	94	100	100	100 J	76	91 J	-	3.3 U
cis-1,3-Dichloropropene	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Dibromochloromethane	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Ethylbenzene	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Methylene chloride	ug/L	63 U	250 U	250 U	630 U	250 U	500 U	2.0 U	3.3 U
Styrene	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Tetrachloroethene	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Toluene	ug/L	63 U	10 J	10 J	130 U	7.9 J	100 U	2.0 U	3.3 U
trans-1,2-Dichloroethene	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	-	3.3 U
trans-1,3-Dichloropropene	ug/L	63 U	50 U	50 U	130 U	50 U	100 U	2.0 U	3.3 U
Trichloroethene	ug/L	63 U	16 J	15 J	19 J	15 J	100 U	2.0 U	3.3 U
Vinyl chloride	ug/L	58 J	54	49 J	130 U	56	320	2.0 U	3.3 U
Xylenes (total)	ug/L	130 U	100 U	100 U	250 U	100 U	200 U	4.0 U	6.7 U
Dissolved Gases									
Ethane	ug/L	5.1	7.7	8.1	9.5	6.9	11	0.50 U	0.50 U
Methane	ug/L	1100	2200	2200	2300	2400	4400	0.50	8.1
Wet Chemistry									
Alkalinity, total (as CaCO3)	ug/L	410000	520000	-	490000	450000	490000	484000	510000
Ammonia	ug/L	350	270	-	670	140 J	310	2000 U	2000 U
Biochemical oxygen demand (BOD)	ug/L	2600 J	2000 U	-	2000 UJ	1900 J	5800	2000 U	2000 UJ
Chemical oxygen demand (COD)	ug/L	56000	53000	-	63000	58000	56000	56000	72000
Dehalobacter spp.	unknown	-	-	-	-	-	-	present	present
Dehalococcoides spp.	unknown	-	-	-	-	-	-	absent	absent
Nitrate (as N)	ug/L	100 UJ	500 U	-	10000 UJ	4000 UJ	2500 U	53 J	500 U
Nitrite (as N)	ug/L	100 UJ	500 U	-	1000 UJ	4000 UJ	2500 U	1000 U	500 U
Orthophosphate	ug/L	-	-	-	-	-	-	-	-
Phosphorus	ug/L	100 U	96 J	-	880	100 U	100 U	40 J	100 U
Sulfate	ug/L	2000000	2000000	-	1900000	1800000	1700000	1020000	130000
Sulfide	ug/L	1000 U	1000 U	-	1000 U	1000 U	1000 U	1000 U	1000 U
Total organic carbon (TOC)	ug/L	3200	3200	-	2500	6900	4800	7000	8400
Anaerobic 1,1,1-TCA specific microbial population	cfu/mL	-	-	-	-	0	3200	490	0 U
Total microbial population - aerobic	cfu/mL	-	-	-	-	25	965	3440	10
Total microbial population - anaerobic	cfu/mL	-	-	-	-	0	1115	42400	10

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-12	MW-12
Sample Name:		WG-17390-103017-001	WG-17390-103018-003	WG-17390-103018-004	WG-17390-102319-002	WG-17390-101520-003	WG-017390-022724-JK-008	GW-17390-042611-KL-06	WG-17390-121911-KL-04
Sample Date:		10/30/17	10/30/2018	10/30/2018	10/23/2019	10/15/2020	2/27/2024	4/26/2011	12/19/2011
Parameters	Units								
Field Parameters									
Conductivity	mS/cm	18.3	18.2	-	17.8	15.5	18.5	-	5.775
Dissolved oxygen (DO)	ug/L	0.88	-	-	140	1.12	2230	-	1610
Oxidation reduction potential (ORP)	millivolts	43	-61	-	-44	155	122	-	43.8
pH	s.u.	6.66	6.76	-	7.28	7.08	6.66	-	6.52
Temperature	Deg C	14.27	14.3	-	16.5	9.74	12.99	-	10
Turbidity	NTU	3.3	13	-	164	3.4	7.75	-	0.2

Notes:
¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water ` Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.
ug/L - micrograms per liter or parts per billion (ppb)
NC - No Criteria
3.1 J - Estimated Concentration. Analyte was detected at a concentration below the 100 U - result is non-detect at the associated value

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	
Sample Name:	WG-17390-032712-KL-04	WG-17390-092112-004	WG-17390-031113-KL-003	WG-17390-092713-KL-006	WG-17390-092713-KL-007	WG-17390-091615-007	WG-17390-091615-008	WG-17390-030316-002	WG-17390-030316-003	WG-17390-051016-003	
Sample Date:	3/27/2012	9/21/2012	3/11/2013	9/27/2013	9/27/2013 (Duplicate)	9/16/2015	9/16/2015 (Duplicate)	3/3/2016	3/3/2016 (Duplicate)	5/10/2016	
Parameters	Units										
Volatile Organic Compounds											
1,1,1-Trichloroethane	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
1,1,2,2-Tetrachloroethane	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
1,1,2-Trichloroethane	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
1,1-Dichloroethane	ug/L	72	88	48	75	76	58	53	72	72	61
1,1-Dichloroethene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
1,2-Dichloroethane	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.2	2.5 U
1,2-Dichloroethene (total)	ug/L	-	-	-	-	-	4.0 U	4.0 U	8.0 U	4.0 U	5.0 U
1,2-Dichloropropane	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
1,4-Dioxane	ug/L	170 U	170 U	130 U	130 U	170 U	100 U	100 U	200 U	100 U	130 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	33 U	33 U	25 U	25 U	33 U	20 U	20 U	40 U	20 U	25 U
2-Hexanone	ug/L	33 U	33 U	25 U	25 U	33 U	20 U	20 U	40 U	20 U	25 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	33 U	33 U	25 U	25 U	33 U	20 U	20 U	40 U	20 U	25 U
Acetone	ug/L	33 U	33 U	25 U	25 U	33 U	20 U	20 U	4.7 JB	2.9 JB	25 U
Benzene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Bromodichloromethane	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Bromoform	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Bromomethane (Methyl bromide)	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Carbon disulfide	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Carbon tetrachloride	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Chlorobenzene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Chloroethane	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Chloroform (Trichloromethane)	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Chloromethane (Methyl chloride)	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
cis-1,2-Dichloroethene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	-	-	-	-	2.5 U
cis-1,3-Dichloropropene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Dibromochloromethane	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Ethylbenzene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Methylene chloride	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Styrene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Tetrachloroethene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Toluene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
trans-1,2-Dichloroethene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	-	-	-	-	2.5 U
trans-1,3-Dichloropropene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Trichloroethene	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Vinyl chloride	ug/L	3.3 U	3.3 U	2.5 U	2.5 U	3.3 U	2.0 U	2.0 U	4.0 U	2.0 U	2.5 U
Xylenes (total)	ug/L	6.7 U	6.7 U	5.0 U	5.0 U	6.7 U	4.0 U	4.0 U	8.0 U	4.0 U	5.0 U
Dissolved Gases											
Ethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	-	0.50 U	-	-	-	0.25 J
Methane	ug/L	1.1	5.1	5.8	14	-	3.1	-	-	-	32
Wet Chemistry											
Alkalinity, total (as CaCO3)	ug/L	500000	510000	450000	490000	-	460000	-	430000	-	480000
Ammonia	ug/L	2000 U	2000 U	850 J	2000 U	-	200 U	-	200 U	-	64 JB
Biochemical oxygen demand (BOD)	ug/L	2000 U	2000 U	2000 U	2000 U	-	2000 U	-	2000 U	-	2000 U
Chemical oxygen demand (COD)	ug/L	45000	27000	25000	35000 U	-	37000	-	30000	-	20000
Dehalobacter spp.	unknown	present	-	-	-	-	-	-	-	-	-
Dehalococcoides spp.	unknown	absent	-	-	-	-	-	-	-	-	-
Nitrate (as N)	ug/L	100 U	100 U	150	100 U	-	2500 U	-	500 U	-	100 U
Nitrite (as N)	ug/L	2000 U	100 U	1000 U	500 U	-	2500 U	-	500 U	-	2500 U
Orthophosphate	ug/L	100 U	R	100 U	500 U	-	-	-	-	-	-
Phosphorus	ug/L	-	-	-	-	-	100 U	-	100 U	-	-
Sulfate	ug/L	1100000	1900000	1100000	1400000	-	780000	-	900000	-	960000
Sulfide	ug/L	1000 U	1000 U	1000 U	1000 U	-	1000 U	-	1000 U	-	1000 U
Total organic carbon (TOC)	ug/L	5500	5700	6100	6500	-	1800	-	1900	-	1400
Anaerobic 1,1,1-TCA specific microbial population	cfu/mL	10	-	-	-	-	-	-	-	-	-
Total microbial population - aerobic	cfu/mL	80	-	-	-	-	-	-	-	-	-
Total microbial population - anaerobic	cfu/mL	10	-	-	-	-	-	-	-	-	-

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12
Sample Name:		WG-17390-032712-KL-04	WG-17390-092112-004	WG-17390-031113-KL-003	WG-17390-092713-KL-006	WG-17390-092713-KL-007	WG-17390-091615-007	WG-17390-091615-008	WG-17390-030316-002	WG-17390-030316-003	WG-17390-051016-003
Sample Date:		3/27/2012	9/21/2012	3/11/2013	9/27/2013	9/27/2013 (Duplicate)	9/16/2015	9/16/2015 (Duplicate)	3/3/2016	3/3/2016 (Duplicate)	5/10/2016
Parameters	Units										
Field Parameters											
Conductivity	mS/cm	5.03	4.94	4.63	4.63	-	8.22	-	7.57	-	6.5
Dissolved oxygen (DO)	ug/L	3700	6150	7530	2930	-	4170	-	0	-	4480
Oxidation reduction potential (ORP)	millivolts	79	19	125	-32	-	65	-	-147	-	-
pH	s.u.	6.99	6.5	7.47	5.53	-	6.97	-	7.79	-	7.21
Temperature	Deg C	8.5	19.6	13.17	18.43	-	20.93	-	9.56	-	15.02
Turbidity	NTU	140	0	0	76.2	-	0.61	-	1.2	-	1.71

Notes:
¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water ` Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.
ug/L - micrograms per liter or parts per billion (ppb)
NC - No Criteria
3.1 J - Estimated Concentration. Analyte was detected at a concentration below the 100 U - result is non-detect at the associated value

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12
Sample Name:	WG-17390-051016-004	VG-17390-111516-KL-01	WG-17390-051817-DO-008	WG-17390-103017-003	WG-17390-103018-002	WG-17390-102319-001	WG-17390-101520-004	WG-017390-022724-JK-006
Sample Date:	5/10/2016	11/15/2016	5/18/2017	10/30/17	10/30/2018	10/23/2019	10/15/2020	2/27/2024
	(Duplicate)							
Parameters	Units							
Volatile Organic Compounds								
1,1,1-Trichloroethane	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
1,1-Dichloroethane	ug/L	64	82	67	64	50	46	40
1,1-Dichloroethene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	0.19 J	2.0 U	1.0 U
1,2-Dichloroethane	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	5.0 U	6.7 U	3.3 U	3.3 U	0.57 J	2.0 U	1.0 U
1,2-Dichloropropane	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
1,4-Dioxane	ug/L	130 U	170 U	34 J	62 J	49 J	60 J	54
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	25 U	33 U	17 U	17 U	10 U	20 U	10 U
2-Hexanone	ug/L	25 U	33 U	17 U	17 U	10 U	20 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	25 U	33 U	17 U	17 U	10 U	20 U	10 U
Acetone	ug/L	25 U	33 U	17 U	18 U	410	340	140
Benzene	ug/L	2.5 U	3.3 U	1.7 U	1.2 J	0.72 J	0.54 J	0.40 J
Bromodichloromethane	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Bromoform	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Carbon disulfide	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Carbon tetrachloride	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Chlorobenzene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Chloroethane	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.7	2.0 U	1.2
Chloroform (Trichloromethane)	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	2.5 U	3.3 U	1.7 U	0.50 J	0.57 J	0.61 J	0.40 J
cis-1,3-Dichloropropene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Dibromochloromethane	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Ethylbenzene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Methylene chloride	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	5.0 U	10 U	5.0 U
Styrene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Tetrachloroethene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Toluene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
trans-1,3-Dichloropropene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Trichloroethene	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	1.0 U	2.0 U	1.0 U
Vinyl chloride	ug/L	2.5 U	3.3 U	1.7 U	1.7 U	0.60 J	2.0 U	0.43 J
Xylenes (total)	ug/L	5.0 U	6.7 U	3.3 U	3.3 U	2.0 U	4.0 U	2.0 U
Dissolved Gases								
Ethane	ug/L	0.33 J	0.67	1.2	0.71 J	2.4 / 2.6	2.0	2.3
Methane	ug/L	51	590	1300	3200	4100 / 3000	2600	2400
Wet Chemistry								
Alkalinity, total (as CaCO3)	ug/L	490000	540000	480000	480000	640000	660000	610000
Ammonia	ug/L	44 JB	200 U	-	-	530	1800	900
Biochemical oxygen demand (BOD)	ug/L	2000 U	2000 U	2000 UJ	2000 UJ	5700	4200 J	3600
Chemical oxygen demand (COD)	ug/L	20000	30000 J	19000	19000	81000	49000	51000
Dehalobacter spp.	unknown	-	-	-	-	-	-	-
Dehalococcoides spp.	unknown	-	-	-	-	-	-	-
Nitrate (as N)	ug/L	100 U	2000 U	100 UJ	100 UJ	200 U	2000 UJ	2000 UJ
Nitrite (as N)	ug/L	2500 U	2000 U	100 UJ	100 UJ	200 U	100 UJ	2000 UJ
Orthophosphate	ug/L	-	-	-	-	-	-	-
Phosphorus	ug/L	-	100 U	100 U	100 U	120	93 J	93 J
Sulfate	ug/L	950000	1000000	1600000	1600000	460000	610000	560000
Sulfide	ug/L	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U
Total organic carbon (TOC)	ug/L	1300	3800	2200	2200	15000	15000	14000
Anaerobic 1,1,1-TCA specific microbial population	cfu/mL	-	-	-	-	-	-	1460
Total microbial population - aerobic	cfu/mL	-	-	-	-	-	-	5100
Total microbial population - anaerobic	cfu/mL	-	-	-	-	-	-	4360

Table 1

Analytical Results Summary - Natural Attenuation Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12
Sample Name:		WG-17390-051016-004	VG-17390-111516-KL-01	WG-17390-051817-DO-008	WG-17390-103017-003	WG-17390-103018-002	WG-17390-102319-001	WG-17390-101520-004	WG-017390-022724-JK-006
Sample Date:		5/10/2016	11/15/2016	5/18/2017	10/30/17	10/30/2018	10/23/2019	10/15/2020	2/27/2024
		(Duplicate)							
Parameters	Units								
Field Parameters									
Conductivity	mS/cm	-	6.23	4.93	6.66	7.15	7.10	4.63	7.92
Dissolved oxygen (DO)	ug/L	-	540	0.32	0	-	250	7.53	2810
Oxidation reduction potential (ORP)	millivolts	-	-19	-76	.61	1164	-148	125	46
pH	s.u.	-	6.67	7.14	6.69	6.78	7.19	7.47	6.77
Temperature	Deg C	-	16.4	18.12	14.5	15.7	16.3	13.17	14.53
Turbidity	NTU	-	1.8	1.09	15	62.4	57.6	0.7	11.5

Notes:

¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.

ug/L - micrograms per liter or parts per billion (ppb)

NC - No Criteria

3.1 J - Estimated Concentration. Analyte was detected at a concentration below the 100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:				MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1
Sample Name:				GW-17390-042511-KL-02	WG-17390-032712-KL-11	WG-17390-092112-007	WG-17390-031113-KL-006	WG-17390-092613-KL-002	WG-17390-091515-001	WG-17390-051016-005	WG-17390-111416-KL-03
Sample Date:				4/25/2011	3/27/2012	9/21/2012	3/11/2013	9/26/2013	9/15/2015	5/10/2016	11/14/2016
Parameters	Units	NYSDEC TOGs Groundwater Guidance Value Standard									
Volatile Organic Compounds											
1,1,1-Trichloroethane	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	NC	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	ug/L	NC	0.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	5	NC	2.0 U	-	-	-	-	2.0 U	2.0 U	2.0 U
1,2-Dichloropropane	ug/L	NC	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dioxane	ug/L	0.35	NC	50 U	50 U	50 U	50 U	20 J	50 U	50 U	26 J
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	50	NC	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	ug/L	50	NC	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	NC	NC	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	ug/L	50	NC	10 U	10 U	1.1 J	10 U	10 U	10 U	10 U	10 U
Benzene	ug/L	NC	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/L	50	NC	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/L	50	NC	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	ug/L	60	60	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	ug/L	NC	7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	NC	5	-	1.0 U	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U
cis-1,3-Dichloropropene	ug/L	NC	NC	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	50	NC	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	NC	5	-	1.0 U	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/L	NC	NC	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	NC	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	NC	2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	ug/L	NC	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Field Parameters											
Conductivity	mS/cm	NC	NC	-	3.92	4.17	4.22	4.53	4.77	6.07	6.65
Dissolved oxygen (DO)	ug/L	NC	NC	-	20	4820	1260	4380	3220	6730	1130
Oxidation reduction potential (ORP)	millivolts	NC	NC	-	-20	-127	176	-144	-163	-	160
pH	s.u.	NC	NC	-	7.05	6.44	7.1	6.65	6.54	6.96	6.62
Temperature, field	Deg C	NC	NC	-	11.7	21.2	10.45	20.2	22.46	17.26	14.5
Turbidity	NTU	NC	NC	-	0	0	12.2	73.9	1.5	2.84	2.40

Notes:

¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998 and addenda.

ug/L - micrograms per liter or parts per billion (ppb)

NC - No Criteria

3.1 J - Estimated Concentration. Analyte was detected at a concentration below the reporting limit

100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-9	MW-9	MW-9
Sample Name:		WG-17390-051717-DO-001	WG-17390-103017-004	WG-17390-110118-007	WG-17390-102419-006	WG-17390-101620-006	WG-017390-022724-KM-005	GW-17390-042711-KL-10	GW-17390-042711-KL-11	WG-17390-032712-KL-05
Sample Date:		5/17/2017	10/30/17	11/01/2018	10/24/2019	10/16/2020	2/27/2024	4/28/2011	4/28/2011 (Duplicate)	3/27/2012
Parameters	Units									
Volatile Organic Compounds										
1,1,1-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.3	1.3	1.7
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	2.0 U	2.0 U	2.0 U	1.0 U	1.0 U	1.0 U	2.0 U	2.0 U	-
1,2-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dioxane	ug/L	36 J	34 J	15 J	39 J	18 J	28 J+	50 U	50 U	50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	10 U	10 U	2.2 J	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10 U	10 U	0.96 J	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	ug/L	10 U	10 U	6.9 J	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	1.0 U
cis-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/L	1.0 U	1.0 U	5.0 U	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U
Styrene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	1.0 U
trans-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Field Parameters										
Conductivity	mS/cm	6.51	8.06	7.67	8.83	3.44	11.7	-	-	2.61
Dissolved oxygen (DO)	ug/L	0.26	0.41	3030	220	1.38	3240	-	-	3870
Oxidation reduction potential (ORP)	millivolts	-3	2	-49	-70	-247	43	-	-	93
pH	s.u.	7.03	6.71	6.09	7.32	7.61	6.89	-	-	7.35
Temperature, field	Deg C	18.82	15.05	15.1	16.3	15.3	10.25	-	-	4.9
Turbidity	NTU	1.65	4.2	--	12.1	13	2.84	-	-	0

Notes:
¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water
Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance
June 1998 and addenda.
ug/L - micrograms per liter or parts per billion (ppb)
NC - No Criteria
3.1 J - Estimated Concentration. Analyte was detected at a concentration below 1
100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-9	MW-9	MW-9	MW-9	MW-9R	MW-9R	MW-9R	MW-9R	
Sample Name:		WG-17390-092012-002	WG-17390-031213-KL-010	WG-17390-092613-KL-004	WG-17390-091515-005	WG-17390-051116-010	WG-17390-111416-KL-01	WG-17390-051717-DO-003	WG-17390-103117-009	WG-17390-103018-006
Sample Date:		9/20/2012	3/12/2013	9/26/2013	9/15/2015	5/11/2016	11/14/2016	5/17/2017	10/31/17	10/30/2018
Parameters	Units									
Volatile Organic Compounds										
1,1,1-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/L	1.5	1.6	1.2	1.2	1.9	1.8	1.5	0.69 J	1.3
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	-	-	-	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dioxane	ug/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	10 U	10 U	10 U	10 U	2.7 J	10 U	10 U	10 U	10 U
2-Hexanone	ug/L	10 U	10 U	10 U	10 U	1.2 J	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	ug/L	10 U	10 U	10 U	10 U	5.6 J	10 U	1.9 J	10 U	10 U
Benzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	ug/L	0.87 J	1.0 U	1.0 U	1.0 U	11	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.68 J	1.0 U
Chloroform (Trichloromethane)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U
Styrene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Field Parameters										
Conductivity	mS/cm	2.82	2.71	97.6	1.95	5.7	6.29	5.19	5.34	4.91
Dissolved oxygen (DO)	ug/L	5830	1330	6870	230	3600	620	0.1	1.31	-
Oxidation reduction potential (ORP)	millivolts	-36	54	-64	17	-	-49	-126	-43	-112
pH	s.u.	7.05	7.68	6.87	7.36	6.88	6.36	7.12	6.89	7.08
Temperature, field	Deg C	19.3	7.16	18.01	22.82	13.77	14.8	16.74	15.14	15.6
Turbidity	NTU	0	3	14.53	18.2	12.9	29	6.17	0.2	75.3

Notes:

¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.

ug/L - micrograms per liter or parts per billion (ppb)

NC - No Criteria

3.1 J - Estimated Concentration. Analyte was detected at a concentration below 100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-9R	MW-9R	MW-9R	MW-101	MW-101	MW-101	MW-101	MW-101	MW-101
Sample Name:		WG-17390-102419-008	WG-17390-101620-008	WG-017390-022724-KM-007	GW-17390-042611-KL-05	WG-17390-032812-KL-14	WG-17390-092112-005	WG-17390-092112-006	WG-17390-031113-KL-005	WG-17390-092613-KL-003
Sample Date:		10/24/2019	10/16/2020	2/27/2024	4/26/2011	3/28/2012	9/21/2012	9/21/2012	3/11/2013	9/26/2013
								(Duplicate)		
Parameters	Units									
Volatile Organic Compounds										
1,1,1-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.41 J
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/L	1.2	1.2	1.2	1.0 U	1.0 U	0.39 J	0.29 J	1.0 U	1.0 U
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	1.0 U	1.0 U	1.0 U	2.0 U	-	-	-	-	-
1,2-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dioxane	ug/L	50 U	50 U	50 U	50 U	-	50 U	50 U	50 U	50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	10 U	10 U	10 U	0.98 J	10 U	10 U	10 U	10 U	10 U
2-Hexanone	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	ug/L	10 U	10 U	10 U	3.9 J	10 U	1.1 J	1.4 J	10 U	1.8 J
Benzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0	0.53 J	1.0 U	1.0 U
Chloroform (Trichloromethane)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/L	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Field Parameters										
Conductivity	mS/cm	4.79	2.71	4.36	-	26.7	24.9	24.9	69.6	34.9
Dissolved oxygen (DO)	ug/L	240	1.33	2820	-	2160	4280	4280	1830	1020
Oxidation reduction potential (ORP)	millivolts	-167	54	19	-	70	-161	-161	66	21
pH	s.u.	7.68	7.68	7.14	-	7.16	6.67	6.67	7.22	6.98
Temperature, field	Deg C	16.3	7.16	9.41	-	11.2	22.7	22.7	10.96	22.04
Turbidity	NTU	30.9	3.0	29.7	-	0.4	20	20	9.4	5.8

Notes:
¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water
Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance
June 1998 and addenda.
ug/L - micrograms per liter or parts per billion (ppb)
NC - No Criteria
3.1 J - Estimated Concentration. Analyte was detected at a concentration below 1
100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-101	MW-101	MW-101	MW-101	MW-101	MW-101	MW-101	MW-101
Sample Name:		WG-17390-091515-003	WG-17390-051016-007	WG-17390-111416-KL-02	WG-17390-051717-DO-004	WG-17390-103117-007	WG-17390-103018-005	WG-17390-102419-007	WG-17390-101620-005
Sample Date:		9/15/2015	5/10/2016	11/14/2016	5/17/2017	10/31/17	10/30/2018	10/24/2019	10/16/2020
Parameters	Units								
Volatile Organic Compounds									
1,1,1-Trichloroethane	ug/L	1.0 U	1.0 U	0.31 J	1.0 U	1.0 U	0.25 J	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.0 U	1.0 U
1,2-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dioxane	ug/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	0.99 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	ug/L	2.4 J	1.5 J	1.0 U	2.0 J	10 U	10 U	10 U	10 U
Benzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	5.0 U
Styrene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Field Parameters									
Conductivity	mS/cm	49.2	58.4	62	39.5	49.1	47	45.9	69.6
Dissolved oxygen (DO)	ug/L	2900	3430	720	0.64	0.91	-	230	1.83
Oxidation reduction potential (ORP)	millivolts	-136	-	-48	-64	-12	-62	9	66
pH	s.u.	6.81	7.47	7.37	7.36	6.9	7.06	7.66	7.22
Temperature, field	Deg C	28.35	15.97	15.1	20.72	10.61	15.8	16.7	10.96
Turbidity	NTU	19.6	4.2	24	4.65	16.9	59.2	26.4	9.4

Notes:

¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.

ug/L - micrograms per liter or parts per billion (ppb)

NC - No Criteria

3.1 J - Estimated Concentration. Analyte was detected at a concentration below 100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:	MW-101	MW-101	MW-102	MW-102	MW-102	MW-102	MW-102	MW-102	MW-102
Sample Name:	WG-017390-022724-JK-002	WG-017390-022724-JK-004	GW-17390-042511-KL-01	WG-17390-032712-KL-09	WG-17390-092112-008	WG-17390-031213-KL-011	WG-17390-092613-KL-001	WG-17390-091515-002	WG-17390-051016-006
Sample Date:	2/27/2024	2/27/2024 (Duplicate)	4/25/2011	3/27/2012	9/21/2012	3/12/2013	9/26/2013	9/15/2015	5/10/2016
Parameters	Units								
Volatile Organic Compounds									
1,1,1-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/L	1.0 U	1.0 U	2.6	2.7	3.2	2.1	1.7	1.9
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	1.0 U	1.0 U	2.0 U	-	-	-	2.0 U	2.0 U
1,2-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
1,4-Dioxane	ug/L	50 U	50 U	50 U	84 U	77 U	50 U	50 U	50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	10 U	10 U	10 U	17 U	15 U	10 U	10 U	10 U
2-Hexanone	ug/L	10 U	10 U	10 U	17 U	15 U	10 U	10 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10 U	10 U	10 U	17 U	15 U	10 U	10 U	10 U
Acetone	ug/L	10 U	10 U	10 U	17 U	2.1 J	10 U	10 U	10 U
Benzene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.1	1.0 U	1.0 U
Bromodichloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Chloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	-	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/L	5.0 U	5.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Styrene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	-	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	1.0 U	1.0 U	1.0 U	1.7 U	1.5 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	ug/L	2.0 U	2.0 U	2.0 U	3.3 U	3.1 U	2.0 U	2.0 U	2.0 U
Field Parameters									
Conductivity	mS/cm	32.5	32.5	-	1.6	1.8	1.57	13.4	0.884
Dissolved oxygen (DO)	ug/L	860	860	-	210	5250	2110	480	8060
Oxidation reduction potential (ORP)	millivolts	90	90	-	-100	-136	-5	-159	-
pH	s.u.	7.11	7.11	-	7.24	6.59	7.25	7.01	7.12
Temperature, field	Deg C	12.83	12.83	-	10.1	19.5	8.5	19.31	15.52
Turbidity	NTU	6.3	6.3	-	0	12	17	0	8.76

Notes:

¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.

ug/L - micrograms per liter or parts per billion (ppb)

NC - No Criteria

3.1 J - Estimated Concentration. Analyte was detected at a concentration below 100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-102	MW-102	MW-102	MW-102	MW-102	MW-102	MW-102	MW-103
Sample Name:		WG-17390-111416-KL-04	WG-17390-051717-DO-002	WG-17390-103117-006	WG-17390-110118-008	WG-17390-102419-005	WG-17390-101620-007	WG-017390-022724-KM-003	WG-17390-032812-KL-13
Sample Date:		11/14/2016	5/17/2017	10/31/2017	11/01/2018	10/24/2019	10/16/2020	2/27/2024	3/28/2012
Parameters	Units								
Volatile Organic Compounds									
1,1,1-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/L	2.6	1.8	0.40 J	0.33 J	1.1	1.7	1.5	1.0 U
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	1.0 U	1.0 U	1.0 U	-
1,2-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dioxane	ug/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U	-
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/L	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	5.0 U	5.0 U	1.0 U
Styrene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Field Parameters									
Conductivity	mS/cm	1.82	1.42	1.42	1.37	1.72	1.57	1.38	3.62
Dissolved oxygen (DO)	ug/L	810	0.33	0.8	3650	240	2.11	1630	640
Oxidation reduction potential (ORP)	millivolts	-21	108	-30	-145	-166	-5	-4	-65
pH	s.u.	6.42	7.21	7.07	6.47	7.69	7.25	7.09	7.78
Temperature, field	Deg C	13.7	21.26	11.34	15.9	15.8	18.5	15.11	16.8
Turbidity	NTU	2.75	1.23	5.4	-	16.8	17	1.3	-

Notes:

¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.

ug/L - micrograms per liter or parts per billion (ppb)

NC - No Criteria

3.1 J - Estimated Concentration. Analyte was detected at a concentration below 100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID:		MW-103	MW-103	MW-103	MW-103	MW-103	MW-103	MW-103	MW-103	MW-103
Sample Name:		WG-17390-092112-009	WG-17390-031213-KL-015	WG-17390-092713-KL-012	WG-17390-091515-004	WG-17390-051116-012	WG-17390-111416-KL-05	WG-17390-103117-008	WG-17390-110118-009	WG-17390-102419-009
Sample Date:		9/21/2012	3/12/2013	9/27/2013	9/15/2015	5/11/2016	11/14/2016	10/31/17	11/01/2018	10/24/2019
Parameters	Units									
Volatile Organic Compounds										
1,1,1-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	ug/L	-	-	-	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.0 U
1,2-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dioxane	ug/L	50 U	50 U	50 U	50 U	50 U	18 J	50 U	18 J	50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	ug/L	1.0 U	0.17 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U
Styrene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	1.0 U	1.0 U	0.14 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Field Parameters										
Conductivity	mS/cm	3.13	3.18	2.98	2.85	-	3.04	3.77	2.84	3.21
Dissolved oxygen (DO)	ug/L	4770	2150	3660	3510	-	1310	0.99	410	310
Oxidation reduction potential (ORP)	millivolts	-47	-52	-45	-102	-	68	28	-40	-32
pH	s.u.	6.38	7.12	5.4	6.81	6	6.25	6.82	7.01	7.41
Temperature, field	Deg C	20.2	18.6	21.16	24.89	-	20.1	16.61	19.5	19.3
Turbidity	NTU	16	0	5.8	2.23	-	1.9	25.1	-	7.3

Notes:
¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water
Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance
June 1998 and addenda.
ug/L - micrograms per liter or parts per billion (ppb)
NC - No Criteria
3.1 J - Estimated Concentration. Analyte was detected at a concentration below 1
100 U - result is non-detect at the associated value

Table 2

Analytical Results Summary - Plume Migration Monitoring
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York

Location ID: MW-103
Sample Name: WG-17390-101620-009
Sample Date: 10/16/2020

Parameters	Units	
Volatile Organic Compounds		
1,1,1-Trichloroethane	ug/L	1.0 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U
1,1,2-Trichloroethane	ug/L	1.0 U
1,1-Dichloroethane	ug/L	1.0 U
1,1-Dichloroethene	ug/L	1.0 U
1,2-Dichloroethane	ug/L	1.0 U
1,2-Dichloroethene (total)	ug/L	1.0 U
1,2-Dichloropropane	ug/L	1.0 U
1,4-Dioxane	ug/L	50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	10 U
2-Hexanone	ug/L	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	10 U
Acetone	ug/L	10 U
Benzene	ug/L	1.0 U
Bromodichloromethane	ug/L	1.0 U
Bromoform	ug/L	1.0 U
Bromomethane (Methyl bromide)	ug/L	1.0 U
Carbon disulfide	ug/L	1.0 U
Carbon tetrachloride	ug/L	1.0 U
Chlorobenzene	ug/L	1.0 U
Chloroethane	ug/L	1.0 U
Chloroform (Trichloromethane)	ug/L	1.0 U
Chloromethane (Methyl chloride)	ug/L	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U
cis-1,3-Dichloropropene	ug/L	1.0 U
Dibromochloromethane	ug/L	1.0 U
Ethylbenzene	ug/L	1.0 U
Methylene chloride	ug/L	5.0 U
Styrene	ug/L	1.0 U
Tetrachloroethene	ug/L	1.0 U
Toluene	ug/L	1.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U
trans-1,3-Dichloropropene	ug/L	1.0 U
Trichloroethene	ug/L	1.0 U
Vinyl chloride	ug/L	1.0 U
Xylenes (total)	ug/L	2.0 U

Field Parameters		
Conductivity	mS/cm	3.18
Dissolved oxygen (DO)	ug/L	2.15
Oxidation reduction potential (ORP)	millivolts	-52
pH	s.u.	7.12
Temperature, field	Deg C	18.6
Turbidity	NTU	1

Notes:

¹ - NYSDEC TOGs Groundwater Standards and Guidance - NYSDEC Division of Water Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance June 1998 and addenda.

ug/L - micrograms per liter or parts per billion (ppb)

NC - No Criteria

3.1 J - Estimated Concentration. Analyte was detected at a concentration below 100 U - result is non-detect at the associated value

Table 3

**Groundwater Monitoring Parameters
Endoline Area Chlorinated Solvent Plume Monitoring Program
GM Tonawanda Engine Plant
Tonawanda, New York**

Volatile Organic Compounds

1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2,4-Trimethylbenzene
1,2-Dichloroethane
1,2-Dichloroethene (total)
1,2-Dichloropropane
1,3,5-Trimethylbenzene
1,4-Dioxane
2-Butanone (Methyl ethyl ketone) (MEK)
2-Hexanone
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane (Methyl bromide)
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform (Trichloromethane)
Chloromethane (Methyl chloride)
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
Dibromochloromethane
Ethylbenzene
m&p-Xylene
Methylene chloride
o-Xylene
Styrene
Tetrachloroethene
Toluene
trans-1,2-Dichloroethene
trans-1,3-Dichloropropene
Trichloroethene
Vinyl chloride
Xylene (total)

Dissolved Gas

Ethane
Methane

Field Parameters

Conductivity
Dissolved oxygen (DO)
Oxidation reduction potential (ORP)
pH
Temperature, field
Turbidity

Wet Chemistry

Aerobic 1,1,1-TCA specific microbial population
Ammonia
Alkalinity, total (as CaCO₃)
Anaerobic 1,1,1-TCA specific microbial population
Biochemical oxygen demand (BOD)
Nitrate (as N)
Nitrite (as N)
Orthophosphate
Phosphate, total
Sulfate
Sulfite
Chemical oxygen demand (COD)
Total microbial population - aerobic
Total microbial population - anaerobic
Total organic carbon (TOC)

Appendices

Appendix A

Field Sampling Forms

GM Endline GW Sampling

02/27/2023

DAILY LOG

Weather: 60-50 degrees partly cloudy
Winds S 12 mph

07:25- Calibrated Hach U-S2 NFO9029 with autocal soln
4.00 pH / 4.49 mS/cm Lot # 24007124 Exp. 02/2025

pH before: 3.98, after: 4.00

Sp. Cond. before: 4.48, after: 4.48

Calibrated Turbidimeter control # NFO 8992 Standards

10 NTU - Lot A2264 100 NTU - Lot A2239 ~~800~~ 800 Lot A2228

10 NTU - 9.78 100 NTU - 99.8 800 NTU - 779

0830 onsite meet up with Corey Essary to do safety training and receive green books

0930 Doug Oscar gives locations of wells

0945 searched for MW103 - well covered inaccessible

1000 Set up on MW-2 Purge and sample well (all parameters)

1235 set up on MW102 Purge and sample well (VOCs only)

1335 Set up on MW-1 Purge and sample well (VOCs only)

1455 set up on MW-9 Purge and sample well (VOCs only)

1530 Dump purge water Rick coder, Fill out COC

1545 offsite

1KM

K2

017390

GM Embolite Area

017358

02/27/2024

DAILY LOG

0745 Calibrated HANNA US2 GSH10002 w/

Antical Solution lot # 24002781 Exp 08/24

pH before 4.30 standard 4.0 after 3.97

SPC before 4.59 standard 4.45 mS/cm after 4.48

Checked Carl Turbiditymeter NF07613

10 NTU lot A2304 Exp Feb 24 : 10.5

100 NTU lot A2319 Exp Feb 24 : 101

800 NTU lot A2319 Exp Feb 24 : 816

0830 On-site; met up with site contact
for safety briefing

0920 Doug Osear gives well tour

0945 MW103 located; well obstructed

Weather 40-63° mostly cloudy 14 mph winds

1100 Setup on MW101, purge and sample low
flow

1230 Setup on MW12 - purge and sample low flow

1345 Setup on MW11 purge and sample low flow

1530 Pumped purge water

1545 OFF-SITE

JIK

**Monitoring Well Record for Low-Flow Purging
(Form SP-09)**

Project Data:

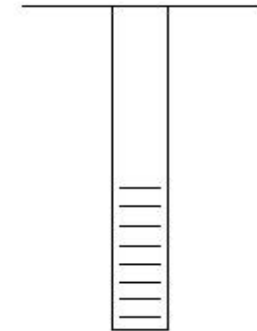
Project Name: GM Endline Area Groundwater Monitoring
Ref. No.: 017390.01.70101

Date: 2/27/2024
Personnel: K. Miller

Monitoring Well Data:

Well No.: MW-2
Vapour PID (ppm): _____
Measurement Point: Top of Riser
Constructed Well Depth (m/ft): _____
Measured Well Depth (m/ft): _____
Depth of Sediment (m/ft): _____

Saturated Screen Length (m/ft): _____
Depth to Pump Intake (m/ft)⁽¹⁾: _____
Well Diameter, D (cm/in): 2 inch
Well Screen Volume, V_s (L)⁽⁴⁾: _____
Initial Depth to Water (m/ft): 1.83



Time	Pumping Rate (mL/min)	Depth to Water (m/ft)	Drawdown from Initial Water Level ⁽³⁾ (m/ft)	Temperature °C	Conductivity (mS/cm)	Turbidity NTU	DO (mg/L)	pH	ORP (mV)	Volume Purged, V _p (L)	No. of Well Screen Volumes Purged ⁽⁴⁾
Start Purge at 10:35		Precision Required ⁽⁵⁾ :		±3 %	±0.005 or 0.01 ⁽⁶⁾	±10 %	±10 %	±0.1 Units	±10 mV		
1038	100	2.46	0.63	14.75	1.52	4.71	3.31	6.39	10		
1043	92	2.78		14.56	1.49	3.02	3.49	6.65	-26		
1048	92	3.02		13.91	1.50	2.47	3.38	6.77	-41		
1053	92	3.41		13.45	1.50	2.00	3.41	6.87	-54		
1058	108	3.60		13.35	1.50	1.88	3.44	6.91	-59		
1103	92	3.77		13.51	1.48	2.61	3.63	6.95	-65		
1108	92	3.91		13.42	1.48	2.02	3.55	6.97	-68		
1113	92	4.04		13.36	1.48	2.73	3.51	6.99	-70		

Sample ID: WG-017390-022724-KM-001 MS/MSD collected on VOCs only

Sample Time: 11:20

Notes: Clear and colorless

- (1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.
- (2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s = \pi \cdot (r^2) \cdot L$ in mL, where r (r=D/2) and L are in cm.
For Imperial units, $V_s = \pi \cdot (r^2) \cdot L \cdot (2.54)^3$, where r and L are in inches
- (3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 500 mL/min.
- (4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= V_p/V_s .
- (5) For conductivity, the average value of three readings <1 mS/cm ±0.005 mS/cm or where conductivity >1 mS/cm ±0.01 mS/cm.

**Monitoring Well Record for Low-Flow Purging
(Form SP-09)**

Project Data:

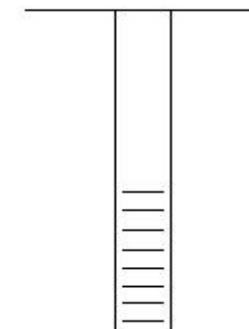
Project Name: GM Endline Area Groundwater Monitoring
Ref. No.: 017390.01.70101

Date: 2/27/2024
Personnel: J. Kawecki
D. Burr

Monitoring Well Data:

Well No.: MW-101
Vapour PID (ppm): _____
Measurement Point: Top of Riser
Constructed Well Depth (m/ft): _____
Measured Well Depth (m/ft): _____
Depth of Sediment (m/ft): _____

Saturated Screen Length (m/ft): _____
Depth to Pump Intake (m/ft)⁽¹⁾: _____
Well Diameter, D (cm/in): 2 inch
Well Screen Volume, V_s (L)⁽⁴⁾: _____
Initial Depth to Water (m/ft): 17.53



Time	Pumping Rate (mL/min)	Depth to Water (m/ft)	Drawdown from Initial Water Level ⁽³⁾ (m/ft)	Temperature °C	Conductivity (mS/cm)	Turbidity NTU	DO (mg/L)	pH	ORP (mV)	Volume Purged, V _p (L)	No. of Well Screen Volumes Purged ⁽⁴⁾
Start Purge at 11:09		Precision Required⁽⁵⁾:		±3 %	±0.005 or 0.01⁽⁶⁾	±10 %	±10 %	±0.1 Units	±10 mV		
1110	192	17.76	0.43	13.79	32.6	120	4.36	6.75	238		
1115	152	17.79	0.46	13.30	33.3	87.8	3.34	7.09	205		
1120	112	17.82	0.49	13.42	33.2	50.9	2.70	7.11	167		
1125	96	17.80	0.47	13.00	33.5	35.2	2.23	7.10	148		
1130	92	17.79	0.46	12.74	33.8	24.7	2.10	7.08	120		
1135	96	17.77	0.44	12.62	33.8	16.4	1.40	7.10	98		
1140	80	17.76	0.43	12.70	34.6	11.8	1.25	7.10	98		
1145	80	17.75	0.42	12.68	34.4	11.1	1.07	7.09	89		
1150	80	17.75	0.42	12.03	34.2	11.7	0.98	7.09	88		
1155	72	17.73	0.40	12.30	33.6	7.12	0.94	7.08	88		
1200	84	17.74	0.41	12.07	33.7	8.41	0.92	7.10	88		
1205	72	17.75	0.42	12.30	33.0	9.47	0.90	7.10	88		
1210	72	17.75	0.42	12.83	32.5	6.30	0.86	7.11	90		

Sample ID: WG-017390-022724-JK-002

Sample Time: 12:15

Notes: WG-017390-022724-JK-004 (DUPLICATE)

Clear and colorless

- (1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.
- (2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s = \pi \cdot (r^2) \cdot L$ in mL, where r (r=D/2) and L are in cm.
For Imperial units, $V_s = \pi \cdot (r^2) \cdot L \cdot (2.54)^3$, where r and L are in inches
- (3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 500 mL/min.
- (4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= V_p/V_s .
- (5) For conductivity, the average value of three readings <1 mS/cm ±0.005 mS/cm or where conductivity >1 mS/cm ±0.01 mS/cm.

**Monitoring Well Record for Low-Flow Purging
(Form SP-09)**

Project Data:

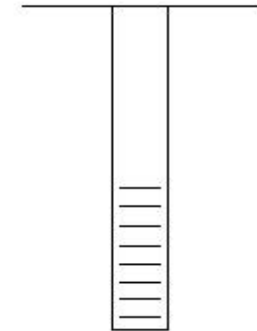
Project Name: GM Endline Area Groundwater Monitoring
Ref. No.: 017390.01.70101

Date: 2/27/2024
Personnel: K. Miller

Monitoring Well Data:

Well No.: MW-102
Vapour PID (ppm): _____
Measurement Point: Top of Riser
Constructed Well Depth (m/ft): _____
Measured Well Depth (m/ft): _____
Depth of Sediment (m/ft): _____

Saturated Screen Length (m/ft): _____
Depth to Pump Intake (m/ft)⁽¹⁾: _____
Well Diameter, D (cm/in): 2 inch
Well Screen Volume, V_s (L)⁽⁴⁾: _____
Initial Depth to Water (m/ft): 4.28



Time	Pumping Rate (mL/min)	Depth to Water (m/ft)	Drawdown from Initial Water Level ⁽³⁾ (m/ft)	Temperature °C	Conductivity (mS/cm)	Turbidity NTU	DO (mg/L)	pH	ORP (mV)	Volume Purged, V _p (L)	No. of Well Screen Volumes Purged ⁽⁴⁾
Start Purge at 12:44		Precision Required ⁽⁵⁾ :		±3 %	±0.005 or 0.01 ⁽⁶⁾	±10 %	±10 %	±0.1 Units	±10 mV		
1248	92	4.97		15.46	1.37	3.11	2.64	7.08	43		
1253	88	5.43		15.05	1.39	2.28	2.01	7.07	23		
1258	80	5.93		14.93	1.39	1.76	1.79	7.09	6		
1303	64	6.27		15.01	1.39	1.97	1.72	7.08	-6		
1308	64	6.65		15.21	1.38	1.47	1.66	7.08	-9		
1313	60	6.96		15.11	1.38	1.30	1.63	7.09	-4		

Sample ID: WG-017390-022724-KM-003

Sample Time: 13:15

Notes: Clear and colorless

- (1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.
- (2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s = \pi \cdot (r^2) \cdot L$ in mL, where r (r=D/2) and L are in cm.
For Imperial units, $V_s = \pi \cdot (r^2) \cdot L \cdot (2.54)^3$, where r and L are in inches
- (3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 500 mL/min.
- (4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= V_p/V_s .
- (5) For conductivity, the average value of three readings <1 mS/cm ±0.005 mS/cm or where conductivity >1 mS/cm ±0.01 mS/cm.

**Monitoring Well Record for Low-Flow Purging
(Form SP-09)**

Project Data:

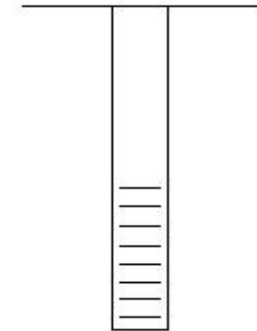
Project Name: GM Endline Area Groundwater Monitoring
Ref. No.: 017390.01.70101

Date: 2/27/2024
Personnel: K. Miller

Monitoring Well Data:

Well No.: MW-1
Vapour PID (ppm): _____
Measurement Point: Top of Riser
Constructed Well Depth (m/ft): _____
Measured Well Depth (m/ft): _____
Depth of Sediment (m/ft): _____

Saturated Screen Length (m/ft): _____
Depth to Pump Intake (m/ft)⁽¹⁾: _____
Well Diameter, D (cm/in): 2 inch
Well Screen Volume, V_s (L)⁽⁴⁾: _____
Initial Depth to Water (m/ft): 2.97



Time	Pumping Rate (mL/min)	Depth to Water (m/ft)	Drawdown from Initial Water Level ⁽³⁾ (m/ft)	Temperature °C	Conductivity (mS/cm)	Turbidity NTU	DO (mg/L)	pH	ORP (mV)	Volume Purged, V _p (L)	No. of Well Screen Volumes Purged ⁽⁴⁾
Start Purge at 13:38				Precision Required ⁽⁵⁾ : ±3 %	±0.005 or 0.01 ⁽⁶⁾	±10 %	±10 %	±0.1 Units	±10 mV		
1344	64	3.42		14.79	10.6	4.44	3.35	6.96	7		
1349	64	3.86		12.83	11.0	5.00	3.10	6.93	6		
1354	64	4.00		12.03	11.3	4.48	3.11	6.91	16		
1359	64	4.08		11.47	11.4	4.71	3.07	6.91	21		
1404	64	4.17		11.06	11.5	4.14	3.11	6.90	29		
1409	72	4.30		10.59	11.7	4.36	3.34	6.89	32		
1414	72	4.38		10.27	11.7	2.69	3.25	6.90	36		
1419	72	4.44		10.29	11.7	3.01	3.23	6.89	37		
1424	72	4.52		10.25	11.7	2.84	3.24	6.89	43		

Sample ID: WG-017390-022724-KM-005

Sample Time: 14:30

Notes: Clear and colorless

- (1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.
- (2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s = \pi \cdot (r^2) \cdot L$ in mL, where r (r=D/2) and L are in cm.
For Imperial units, $V_s = \pi \cdot (r^2) \cdot L \cdot (2.54)^3$, where r and L are in inches
- (3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 500 mL/min.
- (4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= V_p/V_s.
- (5) For conductivity, the average value of three readings <1 mS/cm ±0.005 mS/cm or where conductivity >1 mS/cm ±0.01 mS/cm.

Monitoring Well Record for Low-Flow Purging (Form SP-09)

Project Data:

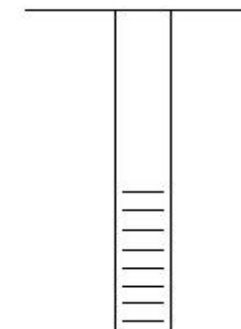
Project Name: GM Endline Area Groundwater Monitoring
Ref. No.: 017390.01.70101

Date: 2/27/2024
Personnel: J. Kawecki
D. Burr

Monitoring Well Data:

Well No.: MW-12
Vapour PID (ppm):
Measurement Point: Top of Riser
Constructed Well Depth (m/ft):
Measured Well Depth (m/ft):
Depth of Sediment (m/ft):

Saturated Screen Length (m/ft):
Depth to Pump Intake (m/ft)⁽¹⁾:
Well Diameter, D (cm/in): 2 inch
Well Screen Volume, V_s (L)⁽⁴⁾:
Initial Depth to Water (m/ft): 7.65



Time	Pumping Rate (mL/min)	Depth to Water (m/ft)	Drawdown from Initial Water Level ⁽³⁾ (m/ft)	Temperature °C	Conductivity (mS/cm)	Turbidity NTU	DO (mg/L)	pH	ORP (mV)	Volume Purged, V _p (L)	No. of Well Screen Volumes Purged ⁽⁴⁾
Start Purge at 12:34		Precision Required ⁽⁵⁾ :		±3 %	±0.005 or 0.01 ⁽⁶⁾	±10 %	±10 %	±0.1 Units	±10 mV		
1235	100	7.75	0.10	13.30	27.4	12.5	5.36	6.98	84		
1240	180	7.95	0.30	13.48	16.0	14.3	4.93	6.82	90		
1245	80	8.12	0.47	13.57	10.5	13.9	4.60	6.80	84		
1250	80	8.20	0.55	13.72	9.64	14.7	4.34	6.79	78		
1255	100	8.30	0.65	13.85	8.92	15.9	4.07	6.79	70		
1300	80	8.42	0.77	14.11	8.50	14.2	3.80	6.78	62		
1305	80	8.51	0.86	14.17	8.35	14.1	3.61	6.78	64		
1310	80	8.59	0.94	14.24	8.26	13.5	3.47	6.78	57		
1315	80	8.68	1.03	14.34	8.20	14.3	3.34	6.78	51		
1320	80	8.75	1.10	14.35	8.14	13.7	3.26	6.77	55		
1325	80	8.85	1.20	14.24	8.08	11.6	3.10	6.78	45		
1330	80	8.99	1.34	14.50	7.97	11.9	2.87	6.78	47		
1335	80	9.09	1.44	14.53	7.92	11.5	2.81	6.77	46		

Sample ID: WG-017390-022724-JK-006

Sample Time: 13:40

Notes: Clear and colorless

- (1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.
- (2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s = \pi \cdot (r^2) \cdot L$ in mL, where r (r=D/2) and L are in cm.
For Imperial units, $V_s = \pi \cdot (r^2) \cdot L \cdot (2.54)^3$, where r and L are in inches
- (3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 500 mL/min.
- (4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= V_p/V_s .
- (5) For conductivity, the average value of three readings <1 mS/cm ±0.005 mS/cm or where conductivity >1 mS/cm ±0.01 mS/cm.

**Monitoring Well Record for Low-Flow Purging
(Form SP-09)**

Project Data:

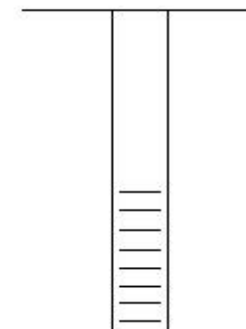
Project Name: GM Endline Area Groundwater Monitoring
Ref. No.: 017390.01.70101

Date: 2/27/2024
Personnel: K. Miller
D. Burr

Monitoring Well Data:

Well No.: MW-9
Vapour PID (ppm): _____
Measurement Point: Top of Riser
Constructed Well Depth (m/ft): _____
Measured Well Depth (m/ft): _____
Depth of Sediment (m/ft): _____

Saturated Screen Length (m/ft): _____
Depth to Pump Intake (m/ft)⁽¹⁾: _____
Well Diameter, D (cm/in): 2 inch
Well Screen Volume, V_s (L)⁽⁴⁾: _____
Initial Depth to Water (m/ft): 3.02



Time	Pumping Rate (mL/min)	Depth to Water (m/ft)	Drawdown from Initial Water Level ⁽³⁾ (m/ft)	Temperature °C	Conductivity (mS/cm)	Turbidity NTU	DO (mg/L)	pH	ORP (mV)	Volume Purged, V _p (L)	No. of Well Screen Volumes Purged ⁽⁴⁾
Start Purge at 14:55		Precision Required ⁽⁵⁾ :		±3 %	±0.005 or 0.01 ⁽⁶⁾	±10 %	±10 %	±0.1 Units	±10 mV		
1500	80	3.90	0.88	10.03	4.46	62.5	3.24	7.31	4		
1515	88	4.66	1.64	9.45	4.38	46.9	3.82	7.16	20		
1520	88	4.78	1.76	9.39	4.37	39.8	2.75	7.14	22		
1525	88	4.84	1.82	9.41	4.36	29.7	2.82	7.14	19		

Sample ID: WG-017390-022724-KM-007

Sample Time: 15:30

Notes: Clear and colorless

- (1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.
- (2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s = \pi \cdot (r^2) \cdot L$ in mL, where r (r=D/2) and L are in cm.
For Imperial units, $V_s = \pi \cdot (r^2) \cdot L \cdot (2.54)^3$, where r and L are in inches
- (3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 500 mL/min.
- (4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= V_p/V_s.
- (5) For conductivity, the average value of three readings <1 mS/cm ±0.005 mS/cm or where conductivity >1 mS/cm ±0.01 mS/cm.

**Monitoring Well Record for Low-Flow Purging
(Form SP-09)**

Project Data:

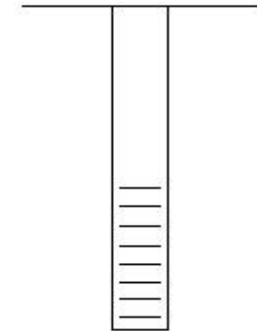
Project Name: GM Endline Area Groundwater Monitoring
Ref. No.: 017390.01.70101

Date: 2/27/2024
Personnel: J. Kawecki
D. Burr

Monitoring Well Data:

Well No.: MW-11
Vapour PID (ppm): _____
Measurement Point: Top of Riser
Constructed Well Depth (m/ft): _____
Measured Well Depth (m/ft): _____
Depth of Sediment (m/ft): _____

Saturated Screen Length (m/ft): _____
Depth to Pump Intake (m/ft)⁽¹⁾: _____
Well Diameter, D (cm/in): 2 inch
Well Screen Volume, V_s (L)⁽⁴⁾: _____
Initial Depth to Water (m/ft): 3.61



Time	Pumping Rate (mL/min)	Depth to Water (m/ft)	Drawdown from Initial Water Level ⁽³⁾ (m/ft)	Temperature °C	Conductivity (mS/cm)	Turbidity NTU	DO (mg/L)	pH	ORP (mV)	Volume Purged, V _p (L)	No. of Well Screen Volumes Purged ⁽⁴⁾
Start Purge at 13:51		Precision Required⁽⁵⁾:		±3 %	±0.005 or 0.01⁽⁶⁾	±10 %	±10 %	±0.1 Units	±10 mV		
1355	60	4.10	0.49	13.96	17.1	14.6	2.47	6.68	81		
1400	60	4.43	0.84	13.32	18.2	9.96	2.37	6.65	102		
1405	120	4.60	0.99	13.24	18.5	10.4	2.44	6.65	114		
1410	100	4.63	1.02	13.04	18.5	8.66	2.25	6.66	121		
1415	100	4.70	1.09	12.99	18.5	7.75	2.23	6.66	122		

Sample ID: WG-017390-022724-JK-008

Sample Time: 14:20

Notes: Clear and colorless, fine red sediment

- (1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.
- (2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s = \pi \cdot (r^2) \cdot L$ in mL, where r (r=D/2) and L are in cm.
For Imperial units, $V_s = \pi \cdot (r^2) \cdot L \cdot (2.54)^3$, where r and L are in inches
- (3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 500 mL/min.
- (4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= V_p/V_s.
- (5) For conductivity, the average value of three readings <1 mS/cm ±0.005 mS/cm or where conductivity >1 mS/cm ±0.01 mS/cm.



CHAIN OF CUSTODY RECORD

COC NO.: 61211

Address: 2055 Niagara Falls Blvd. Niagara Falls, NY

PAGE 1 OF 1

Phone: (716) 297-1450

Fax:

Project No/Phase/Task Code: 017390				Laboratory Name: Eurofins Buffalo				Lab Location: 10 Hazelwood				SSOW ID:			
Project Name: GM Endline GW Sampling				Lab Contact: Denise Heckler								Cooler No:			
Project Location: 2995 River Rd.				SAMPLE TYPE				ANALYSIS REQUESTED (See Back of COC for Definitions)				Carrier: Hand Delivered			
GHD Chemistry Contact:												Airbill No:			
Sampler(s): D. Burr, K. Miller, J. Kawecki												Total # of Containers: 66			
SAMPLE IDENTIFICATION (Containers for each sample may be combined on one line)				DATE (mm/dd/yy)				TIME (hh:mm)				COMMENTS/ SPECIAL INSTRUCTIONS:			
PRESERVATION - (SEE BACK OF COC FOR ABBREVIATIONS)															
Item	WG-017390-022724-KM-001	02/27/24	11:20	WG	G	N	X	X	X	X	X	X	X	20	✓
2	WG-017390-022724-JK-002	02/27/24	12:15	WG	G	N	X							3	
3	WG-017390-022724-KM-003	02/27/24	13:15	WG	G	N	X							3	
4	WG-017390-022724-JK-004	02/27/24	12:15	WG	G	N	X							3	
5	WG-017390-022724-KM-005	02/27/24	14:30	WG	G	N	X							3	
6	WG-017390-022724-JK-006	02/27/24	13:40	WG	G	N	X	X	X	X	X	X	X	14	
7	WG-017390-022724-KM-007	02/27/24	15:30	WG	G	N	X							3	
8	WG-017390-022724-JK-008	02/27/24	14:20	WG	G	N	X	X	X	X	X	X	X	14	
9	TB-017390-022724-KM	02/27/24		TB	G	N	X							3	
10															
11															
12															

TAT Required in business days (use separate COCs for different TATs):

☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 1 Week ☐ 2 Week ☐ Other:

Notes/ Special Requirements:

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
1. <i>Dan Burr</i>	GHS	02/27/24	16:17	1.			
2.				2.			
3.				3.			

THE CHAIN OF CUSTODY IS A LEGAL DOCUMENT - ALL FIELDS MUST BE COMPLETED ACCURATELY

Distribution: WHITE - Fully Executed Copy (CRA)

YELLOW - Receiving Laboratory Copy

PINK - Shipper

GOLDENROD - Sampling Crew

CRA Form: COC-10B (20110804)

Appendix B

Data Validation Report

Data Verification Report

March 18, 2024

To	Kathy Galanti, GHD	Project No.	12616852
Copy To	MaryKate Mooney	Email	ruth.mickle@ghd.com
From	Ruth Mickle/lg/18	Contact No.	612-524-6872
Project Name	GM Tonawanda		
Subject	Analytical Results and Data Verification Groundwater Plume Monitoring Endoline Area Remediation/GM Tonawanda Tonawanda, New York February 2024		

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

1. Introduction

The following document details a reduced validation of analytical results for groundwater samples collected in support of the Groundwater Plume Monitoring at the GM Tonawanda site during February 2024. Nitrate, nitrite and biochemical oxygen demand (BOD) samples were delivered to Eurofins Environment Testing (EET) in Buffalo, New York for analysis. The remaining samples were submitted to EET in Barberton, Ohio. A sample collection and analysis summary is presented in Table 1. The validated analytical results are summarized in Table 2. A summary of the analytical methodology is presented in Table 3.

Standard GHD report deliverables were submitted by the laboratory. The final results and supporting quality assurance/quality control (QA/QC) data were assessed. Evaluation of the data was based on information obtained from the chain of custody forms, finished report forms, method blank data, duplicate data, recovery data from surrogate spikes, laboratory control samples (LCS), matrix spikes (MS) and field QA/QC samples.

The QA/QC criteria by which these data have been assessed are outlined in the analytical methods referenced in Table 3 and applicable documents entitled:

1. "National Functional Guidelines for Inorganic Superfund Methods Data Review", EPA-542-R-20-006, November 2020.
2. "National Functional Guidelines for Organic Superfund Methods Data Review", EPA-540-R-20-005, November 2020.

Items 1. and 2. will subsequently be referred to as the "Guidelines" in this Memorandum.

2. Sample Holding Time and Preservation

The sample holding time requirements for the analyses are summarized in Table 3. The sample chain of custody document and analytical report were used to determine sample holding times. The samples were prepared and analyzed within the required holding times. The samples were properly preserved and delivered on ice and stored by the laboratory at the required temperature (0-6°C).

3. Laboratory Method Blank Analyses

Method blanks are prepared from a purified matrix and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the analytical procedures.

For this study, laboratory method blanks were analyzed at a minimum frequency of one per 20 investigative samples and/or one per analytical batch.

All method blank results were non-detect, indicating that laboratory contamination was not a factor for this investigation.

4. Surrogate Spike Recoveries - Organic Analyses

In accordance with the methods employed, all samples, blanks and QC samples analyzed for organics are spiked with surrogate compounds prior to sample analysis. Surrogate recoveries provide a means to evaluate the effects of laboratory performance on individual sample matrices.

All samples submitted for dissolved gases and volatile organic compound (VOC) determinations were spiked with the appropriate number of surrogate compounds prior to sample analysis.

Surrogate recoveries were assessed against laboratory control limits. The surrogate recoveries met the above criteria for investigative samples.

5. Laboratory Control Sample Analyses

LCS are prepared and analyzed as samples to assess the analytical efficiencies of the methods employed, independent of sample matrix effects.

For this study, LCS were analyzed at a minimum frequency of one per 20 investigative samples and/or one per analytical batch.

Organic Analyses

The LCS contained all compounds of interest. With one exception, the percent recoveries were within the laboratory control limits criteria. A 1,4-dioxane LCS recovery was reported above the upper control limit. Table 4 presents the associated detection that was qualified estimated, with a potential high bias.

Inorganic Analyses

The LCS contained all analytes of interest. LCS recoveries were assessed per the "Guidelines". The LCS recoveries were within the control limits.

6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

To evaluate the effects of sample matrices on the preparation process, measurement procedures, and accuracy of a particular analysis, samples are spiked with a known concentration of the analyte of concern and analyzed as MS or MS/MSD samples. The relative percent difference (RPD) between the MS and MSD is used to assess analytical precision.

If the original sample concentration is significantly greater than the spike concentration, the recovery is not assessed. MS/MSD analyses were performed as specified in Table 1.

Organic Analyses

The matrix spike samples were spiked with target compounds of interest. Acetone and 1,4-dioxane in sample WG-017390-022724-KM-005 yielded high biased spike recoveries. Since the associated sample results were non-detect, no data qualification was required. The remaining spike recoveries and RPD values were within the laboratory control limits.

Inorganic Analyses

The MS/MSD samples were spiked with the analytes of interest, and the results were evaluated per the "Guidelines" using the laboratory control limits. All percent recoveries and RPD values were within the control limits criteria, demonstrating acceptable analytical accuracy and precision.

7. Field QA/QC Samples

The field QA/QC consisted of one trip blank sample and one field duplicate set.

Trip Blank Sample Analysis

To evaluate contamination from sample collection, transportation, storage, and analytical activities, one trip blank was submitted to the laboratory for VOC analysis. The trip blank results were non-detect for the compounds of interest.

Field Duplicate Sample Analysis

To assess the analytical and sampling protocol precision, one field duplicate sample set was collected and submitted "blind" to the laboratory, as specified in Table 1. The RPDs associated with these duplicate samples must be less than 50 percent for water samples. If the reported concentration in either the investigative sample or its duplicate is less than five times the reporting limit (RL), the evaluation criteria is one times the RL value for water samples.

The field duplicate results, all non-detect, were within acceptable agreement.

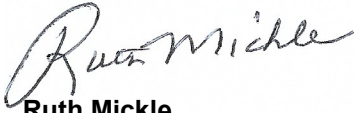
8. Analyte Reporting

The laboratory reported detected results down to the laboratory's sample-specific method detection limit (MDL) for each analyte. Positive analyte detections less than the RL but greater than the sample-specific MDL were qualified as estimated (J) in Table 2 unless qualified otherwise in this report. Non-detect results were presented as non-detect at the RL in Table 2.

9. Conclusion

Based on the assessment detailed in the foregoing, the data summarized in Table 2 are acceptable with the qualification noted herein.

Regards,

A handwritten signature in black ink, appearing to read "Ruth Mickle". The signature is written in a cursive style with a large initial "R".

Ruth Mickle
Digital Intelligence - Data Management – Team Lead

Encl.

Table 1

**Sample Collection and Analysis Summary
Groundwater Plume Monitoring
Endline Area Remediation/GM Tonawanda
Tonawanda, New York
February 2024**

					Analysis/Parameters											Comments
Sample Identification	Location	Matrix	Collection Date (mm/dd/yyyy)	Collection Time (hr:min)	VOCs	Methane, Ethane	Sulfate	Nitrate/Nitrite	Alkalinity	Ammonia	Phosphorous	Sulfide	BOD	COD	TOC	
Eurofins Report #: 240-138499-1																
WG-017390-022724-KM-001	MW-2	Water	02/27/2024	11:20	X	X	X	X	X	X	X	X	X	X	X	MS/MSD
WG-017390-022724-JK-002	MW-101	Water	02/27/2024	12:15	X											
WG-017390-022724-KM-003	MW-102	Water	02/27/2024	13:15	X											
WG-017390-022724-JK-004	MW-101	Water	02/27/2024	12:15	X											
WG-017390-022724-KM-005	MW-1	Water	02/27/2024	14:30	X											
WG-017390-022724-JK-006	MW-12	Water	02/27/2024	13:40	X	X	X	X	X	X	X	X	X	X	X	FD (WG-017390-022724-JK-002)
WG-017390-022724-KM-007	MW-9	Water	02/27/2024	15:30	X											
WG-017390-022724-JK-008	MW-11	Water	02/27/2024	14:20	X	X	X	X	X	X	X	X	X	X		
TB-017390-022724-KM	Trip Blank	Water	02/27/2024	--	X											Trip Blank

Notes:

BOD - Biochemical Oxygen Demand

COD - Chemical Oxygen Demand

FD - Field Duplicate of sample in parentheses

MS/MSD- Matrix Spike/Matrix Spike Duplicate

TOC - Total Organic Carbon

VOCs - Volatile Organic Compounds

-- - Not applicable

Table 2
Validated Analytical Results Summary
Groundwater Plume Monitoring
Endoline Area Remediation/GM Tonawanda
Tonawanda, New York
February 2024

Location ID: Sample Name: Sample Date:		MW-1 WG-017390-022724-KM-005 02/27/2024	MW-2 WG-017390-022724-KM-001 02/27/2024	MW-9 WG-017390-022724-KM-007 02/27/2024	MW-101 WG-017390-022724-JK-002 02/27/2024	MW-101 WG-017390-022724-JK-004 02/27/2024 Duplicate	MW-102 WG-017390-022724-KM-003 02/27/2024	MW-11 WG-017390-022724-JK-008 02/27/2024	MW-12 WG-017390-022724-JK-006 02/27/2024
Parameters	Unit								
Volatile Organic Compounds									
1,1,1-Trichloroethane	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	240	1.0 U
1,1,2,2-Tetrachloroethane	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
1,1,2-Trichloroethane	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
1,1-Dichloroethane	µg/L	1.0 U	1800	1.2	1.0 U	1.0 U	1.5	3500	40
1,1-Dichloroethene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	1800	1.0 U
1,2-Dichloroethane	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
1,2-Dichloroethene (total)	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	91 J	1.0 U
1,2-Dichloropropane	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
1,4-Dioxane	µg/L	28 J+	50000 U	50 U	50 U	50 U	50 U	5000 U	54
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	10 U	10000 U	10 U	10 U	10 U	10 U	1000 U	10 U
2-Hexanone	µg/L	10 U	10000 U	10 U	10 U	10 U	10 U	1000 U	10 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	10 U	10000 U	10 U	10 U	10 U	10 U	1000 U	10 U
Acetone	µg/L	10 U	10000 U	10 U	10 U	10 U	10 U	1000 U	20
Benzene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Bromodichloromethane	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Bromoform	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Bromomethane (Methyl bromide)	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Carbon disulfide	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Carbon tetrachloride	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Chlorobenzene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Chloroethane	µg/L	1.0 U	28000	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Chloroform (Trichloromethane)	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Chloromethane (Methyl chloride)	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
cis-1,2-Dichloroethene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	91 J	1.0 U
cis-1,3-Dichloropropene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Dibromochloromethane	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Ethylbenzene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Methylene chloride	µg/L	5.0 U	5000 U	5.0 U	5.0 U	5.0 U	5.0 U	500 U	5.0 U
Styrene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Tetrachloroethene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Toluene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
trans-1,2-Dichloroethene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
trans-1,3-Dichloropropene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Trichloroethene	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U
Vinyl chloride	µg/L	1.0 U	1000 U	1.0 U	1.0 U	1.0 U	1.0 U	320	0.49 J
Xylenes (total)	µg/L	2.0 U	2000 U	2.0 U	2.0 U	2.0 U	2.0 U	200 U	2.0 U
Dissolved Gases									
Ethane	µg/L	--	380	--	--	--	--	11	2.5
Methane	µg/L	--	8900	--	--	--	--	4400	1900
General Chemistry									
Alkalinity, total (as CaCO3)	mg/L	--	400	--	--	--	--	490	600
Ammonia-N	mg/L	--	1.6	--	--	--	--	0.31	0.13 J
Biochemical oxygen demand (BOD)	mg/L	--	12	--	--	--	--	5.8	2.7
Chemical oxygen demand (COD)	mg/L	--	95	--	--	--	--	56	50
Nitrate (as N)	mg/L	--	0.25 U	--	--	--	--	2.5 U	1.0 U
Nitrite (as N)	mg/L	--	0.25 U	--	--	--	--	2.5 U	1.0 U
Phosphorus	mg/L	--	0.10 U	--	--	--	--	0.10 U	0.10 U
Sulfate	mg/L	--	17	--	--	--	--	1700	600
Sulfide	mg/L	--	1.0 U	--	--	--	--	1.0 U	1.0 U
Total organic carbon (TOC)	mg/L	--	19	--	--	--	--	4.8	6.0

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
J+ - Estimated concentration; result may be biased high

Table 3

**Analytical Methods
Groundwater Plume Monitoring
Endoline Area Remediation/GM Tonawanda
Tonawanda, New York
February 2024**

Parameter	Method	Matrix	Holding Time	
			Collection to Extraction (Days)	Collection or Extraction to Analysis (Days)
Volatile Organic Compounds (VOCs)	SW-846 8260D	Water	-	14
Alkalinity	SM 2320 B	Water	-	14
Ammonia	SM 4500 NH3 D	Water	-	28
Nitrate/Nitrite	EPA 300.0	Water	-	48 hours
Sulfate	EPA 300.0	Water	-	28
Sulfide	SM 4500 S2 F	Water	-	7
Phosphorus	SM 4500 P E	Water	-	28
Chemical Oxygen Demand (COD)	SM 5220	Water	-	28
Biochemical Oxygen Demand (BOD)	SM 5210 B	Water	-	48 hours
Total Organic Carbon (TOC)	SM 5310 C	Water	-	28
Methane, Ethane	RSK-175	Water	-	14

Note:

- - Not applicable

Method References:

- SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, 1986, with subsequent revisions
- EPA - Methods for Chemical Analysis of Water and Wastes", USEPA 600/4-79-202, March 1983 (with all subsequent revisions)
- SM - "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, with subsequent revisions
- RSK - Sample Prep and Calculations for Dissolved Gas Analysis in Water Samples Using a GC Headspace Equilibration Technique, RSKSOP-175, Rev. 0, 8/11/94, USEPA Research Lab

Table 4

Qualified Sample Results Due to Outlying Laboratory Control Sample Results
Groundwater Plume Monitoring
Endoline Area Remediation/GM Tonawanda
Tonawanda, New York
February 2024

Parameter	Analyte	LCS Date (mm/dd/yyyy)	LCS % Recovery	<u>Control Limits</u> % Recovery	Associated Sample ID	Qualified Results	Units
VOCs	1,4-Dioxane	03/07/2024	156	39-145	WG-017390-022724-KM-005	28 J+	µg/L

Notes:
LCS - Laboratory Control Sample
VOCs - Volatile Organic Compounds
J+ - Estimated concentration; result may be biased high

