

February 10, 2023

Ms. Jennifer Meyer
Environmental Program Associate
Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
1027 W. St. Paul Avenue
Milwaukee, WI 53233

Subject: Pre-Design Investigation Work Plan
Milwaukee Die Casting Company Site
4132 North Holton Street, Milwaukee, Wisconsin
WDNR BRRTS # 02-41-000023
WDNR FID # 241228240

Dear Ms. Meyer,

We are providing this *Pre-Design Investigation Work Plan* (“Work Plan”) to the Wisconsin Department of Natural Resources (WDNR) for the Milwaukee Die Casting Company Site (“Site”). This Work Plan is being submitted on behalf of Pharmacia LLC (“Pharmacia”), which is acting on behalf of Fisher Controls International, Inc. (“Fisher”) in this matter.¹

This Work Plan presents salient background information and the scope, methods and reporting for pre-design investigation activities to support further evaluation of the need for additional remedial action in the MW-1 area and, if necessary, the identification and evaluation of viable remedial action options. The Wisconsin Administrative Code NR 712.09 submittal certification is attached.

BACKGROUND

Additional investigation has been conducted at the Site in response to a WDNR August 10, 2018 letter to Pharmacia and Fisher. The results of the additional investigation have been reported to WDNR in various documents and demonstrate, among others, that: (1) the nature and extent of groundwater impacts have been defined and (2) there are no potentially complete migration or exposure pathways associated with residual chlorinated volatile organic compounds (CVOCs). During a discussion of the additional investigation results, the WDNR communicated to Pharmacia² its opinion that although current groundwater trend data demonstrate relatively stable concentrations for the residual source area (i.e., MW-1 area; refer to attached **Figure 1**), some MW-1 area data do not demonstrate decreasing

¹ By submitting this Work Plan, neither Pharmacia nor Fisher is waiving any of its rights under federal or state law. Additionally, nothing in this Work Plan should be deemed an admission of fact or law, or a waiver of any defense or right to contest Pharmacia’s or Fisher’s liability under any state or federal law.

² October 25, 2022 conference call with WDNR Project Manager Greg Moll to discuss September 20, 2022 *Groundwater Monitoring Progress Report*.

concentration trends for tetrachloroethene (PCE)/trichloroethene (TCE) (parent chlorinated ethenes). As such, the WDNR communicated a concern that natural attenuation may not achieve compliance with NR 140 groundwater quality standards in a “reasonable period of time” per NR 726.05(6)(b).

As documented in the September 20, 2022 *Groundwater Monitoring Progress Report*, the groundwater data collected to date (8 quarterly sampling events over 2 years) demonstrate that natural anaerobic de-chlorination (degradation) processes are occurring at the Site based on observed PCE/TCE daughter products (including end product ethene) and methane and oxidation-reduction potential (ORP) data. These data also suggest that the natural degradation processes, which may include both microbial and abiotic reactions, may be limited in the MW-1 area due to low concentrations of total organic carbon (TOC).

As depicted on **Figure 1**, the PCE/TCE and daughter product groundwater concentrations at MW-1 are generally 1 to 2 orders of magnitude greater than other Site groundwater monitoring well locations. MW-1 is screened in the shallow groundwater zone from approximately 5 to 15 feet below ground surface (bgs). The average depth to groundwater at MW-1 for the 8 quarterly groundwater sampling events was approximately 4.2 feet bgs.

Excavation of CVOC-impacted unsaturated soil occurred in the MW-1 area in 2015.³ Available pre-excavation saturated soil sample analytical data from the area show that the highest residual saturated soil PCE/TCE concentrations were detected in the shallow groundwater zone located directly upgradient of MW-1 (depicted on attached **Figure 1**). The following table provides a summary of these available historical saturated soil sample data within the approximate area of the 2015 CVOC-impacted soil removal:

Sample Location ID	Sample Date	Sample Depth (feet bgs)	TCE (mg/kg)	PCE (mg/kg)
GP-142	9/8/2004	8	1,100	429
GP-205	3/24/2005	6-8	249	6.170
		8-10	0.522	< 0.027
SB-206	4/5/2005	20-21	0.277	1.220
		21-22	0.048	0.297

mg/kg - milligrams per kilogram

The historical saturated soil sample concentrations result in detected groundwater concentrations in the MW-1 area.

Due to WDNR’s expressed concern that groundwater quality standards may not be reached in a reasonable period of time, a pre-design investigation will be conducted at the Site to aid further

³ CVOC-impacted unsaturated soil removal was part of significant removal action activities conducted at the Site pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) by Pharmacia and Fisher between 2013 and 2015 in accordance with an Administrative Settlement Agreement and Order on Consent for Removal Action (AOC) with the United States Environmental Protection Agency (EPA). The 2015 CVOC-impacted unsaturated soil removal area (approximately 40 feet by 40 feet) was excavated to a depth of 4 feet bgs.

evaluation of the need for additional remedial action in the MW-1 area and, if necessary, the identification and evaluation of viable remedial action options. The groundwater data suggest that, if needed, the Site may be well suited for in-situ enhanced anaerobic bioremediation (bioaugmentation). Therefore, a focus of the pre-design investigation is to collect data that supports the evaluation of bioaugmentation. Bioaugmentation typically consists of injecting a carbon substrate and de-chlorinating microbial cultures capable of de-chlorination of PCE/TCE and daughter products.

SCOPE AND METHODS

The pre-design investigation scope includes soil and groundwater sampling and laboratory testing. The scope and methods are summarized below.

Soil Sampling

The soil sampling scope will consist of advancing approximately 20 Geoprobe® soil borings⁴ in the vicinity of MW-1. The soil borings will be advanced to a depth of approximately 20 feet bgs. Initial soil boring locations will be staked by Geosyntec's survey subcontractor prior to field sampling. The approximate soil boring locations are depicted on attached **Figure 1**.

Soil samples will be field screened for volatile organic compounds (VOCs) with a photoionization detector (PID). Soil samples will be collected from each soil boring for laboratory analysis based on field observation and soil sample field screening. Following soil sample collection, the soil borings will be abandoned with bentonite chips in accordance with NR 141. A boring log (WDNR Form 4400-122) and borehole abandonment form (WDNR Form 3300-005) will be prepared for each soil boring.

Groundwater Sampling

Groundwater samples will be collected from existing groundwater monitoring wells MW-1, PZ-1, MW-6, and MW-7. Water levels will be measured in all Site monitoring wells prior to groundwater sampling.

Groundwater samples will be collected using low-flow purging and sampling methods in accordance with NR 140 and the WDNR *Groundwater Sampling Field Manual* (PUBL-DG-038 96). During low flow purging, field parameters [pH, temperature, conductivity, dissolved oxygen (DO), turbidity and ORP] will be monitored using a portable water quality meter.

Laboratory Analysis

Selected soil and groundwater samples will be submitted to SiREM or Pace Analytical for laboratory analysis. SiREM specializes in laboratory testing to support bioaugmentation design.

⁴ The number of soil borings may be adjusted based on field observation and soil sample field screening.

A minimum of one (1) soil sample from each soil boring will be analyzed for VOCs. Selected soil samples (a total of approximately 6 to 8 samples) will also be analyzed for fraction of organic carbon (f_{oc}), total iron, total sulfur and magnetic susceptibility. The planned laboratory and laboratory methods for these soil parameters are summarized in the following table:

Soil Parameter	Laboratory Method	Planned Laboratory
VOCs	EPA 8260	Pace Analytical
f_{oc}	EPA 9060B	SiREM
total iron	EPA 6010B	SiREM
total sulfur	EPA 6010B	SiREM
magnetic susceptibility	per EPA 600/R-09/115 ⁵	SiREM

Each groundwater sample will be analyzed for VOCs, *Dehalococcoides* (Dhc), TOC, sulfate, sulfide, nitrate, total and dissolved iron, ferrous iron, ethene, ethane and methane. The planned laboratory and laboratory methods for these groundwater parameters are summarized in the following table:

Groundwater Parameter	Laboratory Method	Planned Laboratory
VOCs	EPA 8260	Pace Analytical
Dhc	Gene-Trac ^{®6}	SiREM
TOC	SM 5310C	Pace Analytical
sulfate	EPA 300.0	Pace Analytical
sulfide	SM 4500S2F	Pace Analytical
nitrate	EPA 300.0	Pace Analytical
total and dissolved iron	EPA 6010D	Pace Analytical
ferrous iron	Hach 8146	Pace Analytical
ethene, ethane and methane	EPA 8015B Modified	Pace Analytical

Data Quality Plan

Sampling and analysis quality assurance and quality control (QA/QC) procedures will include the following:

- One duplicate sample for VOC analysis for every 10 or fewer samples (i.e., 2 duplicate soil samples and 1 duplicate groundwater sample).
- One equipment blank for every 10 or fewer samples, unless dedicated sampling equipment is used.
- One trip blank for each shipping container containing samples for VOC analysis.
- Decontamination of sampling equipment between each sampling location, unless dedicated or disposable sampling equipment are used.
- Checking and calibrating field instruments in accordance with manufacturer's instructions.

⁵ *Identification and Characterization Methods for Reactive Minerals Responsible for Natural Attenuation of Chlorinated Organic Compounds in Ground Water*, EPA 600/R-09/115, December 2009.

⁶ https://www.siremlab.com/wp-content/uploads/2022/06/SERVICE-AREA_Gene-Trac_2022.pdf

The quality of the soil and groundwater sample laboratory analytical data will be validated by reviewing the chain-of-custody forms, holding times, analytical detection limits, field QA/QC sample results (duplicate samples and field blanks), and laboratory QA/QC results (method blanks, surrogates, and laboratory control samples). The data validation report will be provided in the *Pre-Design Investigation Report*.

IDW Management

Soil boring soil cuttings and groundwater sampling purge water will be contained in labeled 55-gallon drums. The drums will be staged in the northwest portion of the Site pending disposal. The water drum will be staged in secondary containment.

REPORTING

The pre-design investigation field sampling and laboratory testing will be documented in a *Pre-Design Investigation Report* for submittal to WDNR.

SCHEDULE

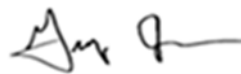
It is anticipated that pre-design investigation field sampling and laboratory testing will be completed in 1Q2023 contingent upon weather conditions.

Please contact us if you have any questions regarding this Work Plan.

Sincerely,



Jeremiah Johnson, P.G.
Senior Geologist
(Licensed P.G. in WI)



Greg Johnson, P.H., P.G., P.E.
Senior Engineer
(Licensed P.E. in WI, P.H. in WI, P.G. in IL, WI)

Attachments:

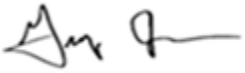

NR 712.09 Submittal Certification
Figure 1 - Proposed Soil Boring Locations Map

cc: Mr. Christopher Clark, Pharmacia LLC
Ms. Mary Jo Anzia, BSI

NR 712.09 Submittal certification.

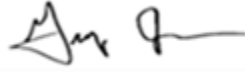
Document Name	PRE-DESIGN INVESTIGATION WORK PLAN
Document Date	February 10, 2023
Site Name	Milwaukee Die Casting Company Site
WDNR BRRTS #	02-41-000023

"I, Greg Johnson, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

 Greg Johnson, P.H., P.G., P.E. Senior Engineer P.E. #: 29898-006	 2/10/2023
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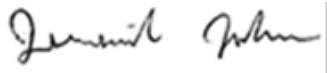
Signature, title and P.E. number	P.E. stamp
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"I, Greg Johnson, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

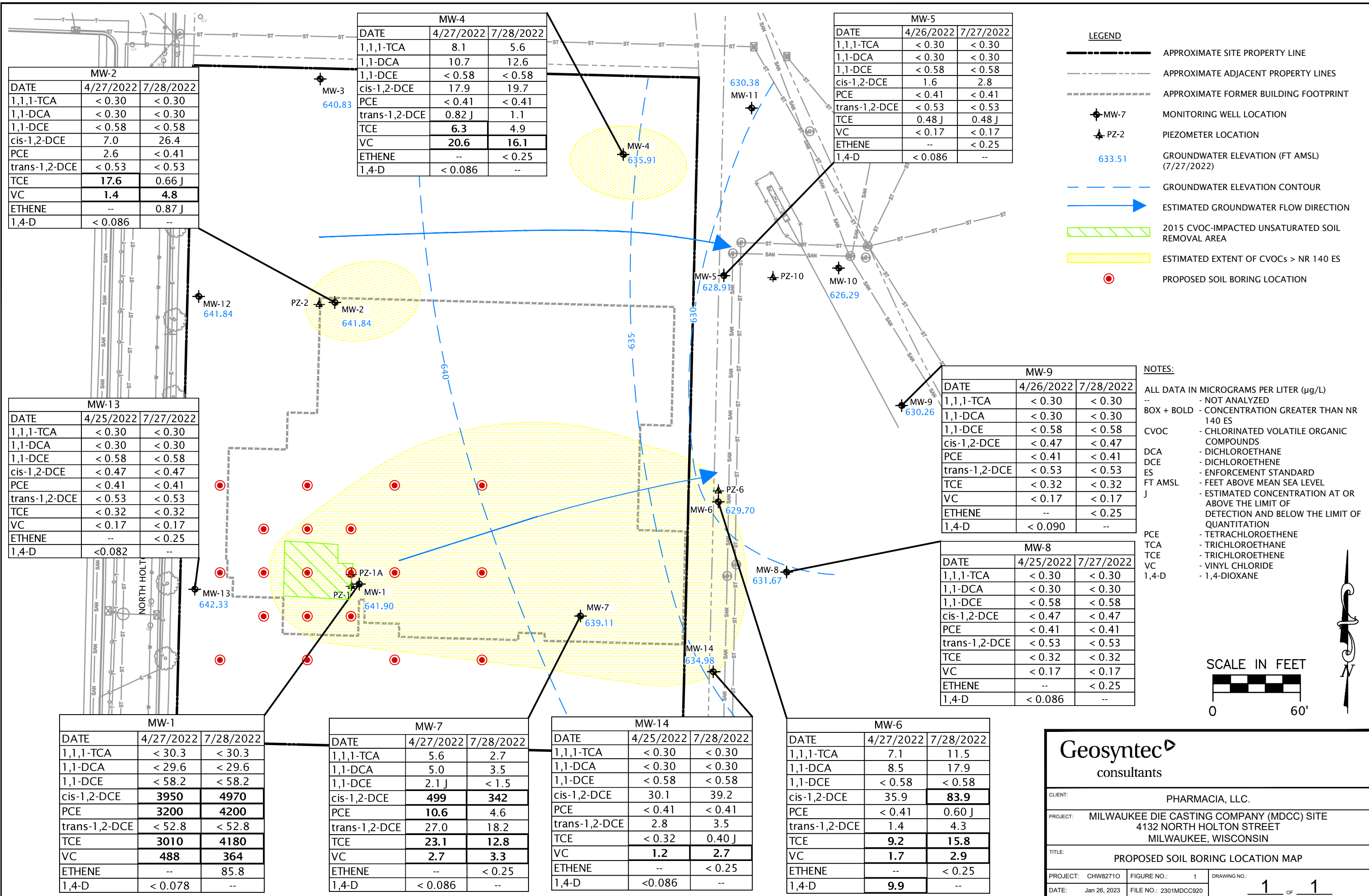
 Senior Engineer	2/10/2023
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Signature and title	Date
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"I, Jeremiah Johnson, hereby certify that I am a scientist as that term is defined in s. NR 712.03 (3), Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

 Senior Geologist	2/10/2023
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Signature and title	Date
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MW-2		
DATE	4/27/2022	7/28/2022
1,1,1-TCA	< 0.30	< 0.30
1,1-DCA	< 0.30	< 0.30
1,1-DCE	< 0.58	< 0.58
cis-1,2-DCE	7.0	26.4
PCE	2.6	< 0.41
trans-1,2-DCE	< 0.53	< 0.53
TCE	17.6	0.66 J
VC	1.4	4.8
ETHENE	--	0.87 J
1,4-D	< 0.086	--

MW-4		
DATE	4/27/2022	7/28/2022
1,1,1-TCA	8.1	5.6
1,1-DCA	10.7	12.6
1,1-DCE	< 0.58	< 0.58
cis-1,2-DCE	17.9	19.7
PCE	< 0.41	< 0.41
trans-1,2-DCE	0.82 J	1.1
TCE	6.3	4.9
VC	20.6	16.1
ETHENE	--	< 0.25
1,4-D	< 0.086	--

MW-5		
DATE	4/26/2022	7/27/2022
1,1,1-TCA	< 0.30	< 0.30
1,1-DCA	< 0.30	< 0.30
1,1-DCE	< 0.58	< 0.58
cis-1,2-DCE	1.6	2.8
PCE	< 0.41	< 0.41
trans-1,2-DCE	< 0.53	< 0.53
TCE	0.48 J	0.48 J
VC	< 0.17	< 0.17
ETHENE	--	< 0.25
1,4-D	< 0.086	--

- LEGEND**
- APPROXIMATE SITE PROPERTY LINE
 - - - APPROXIMATE ADJACENT PROPERTY LINES
 - APPROXIMATE FORMER BUILDING FOOTPRINT
 - ⊕ MW-7 MONITORING WELL LOCATION
 - ▲ PZ-2 PIEZOMETER LOCATION
 - 633.51 GROUNDWATER ELEVATION (FT AMSL) (7/27/2022)
 - - - - - GROUNDWATER ELEVATION CONTOUR
 - ESTIMATED GROUNDWATER FLOW DIRECTION
 - ▨ 2015 CVOC-IMPACTED UNSATURATED SOIL REMOVAL AREA
 - ▨ ESTIMATED EXTENT OF CVOCs > NR 140 ES
 - PROPOSED SOIL BORING LOCATION

MW-13		
DATE	4/25/2022	7/27/2022
1,1,1-TCA	< 0.30	< 0.30
1,1-DCA	< 0.30	< 0.30
1,1-DCE	< 0.58	< 0.58
cis-1,2-DCE	< 0.47	< 0.47
PCE	< 0.41	< 0.41
trans-1,2-DCE	< 0.53	< 0.53
TCE	< 0.32	< 0.32
VC	< 0.17	< 0.17
ETHENE	--	< 0.25
1,4-D	< 0.082	--

MW-9		
DATE	4/26/2022	7/28/2022
1,1,1-TCA	< 0.30	< 0.30
1,1-DCA	< 0.30	< 0.30
1,1-DCE	< 0.58	< 0.58
cis-1,2-DCE	< 0.47	< 0.47
PCE	< 0.41	< 0.41
trans-1,2-DCE	< 0.53	< 0.53
TCE	< 0.32	< 0.32
VC	< 0.17	< 0.17
ETHENE	--	< 0.25
1,4-D	< 0.090	--

MW-8		
DATE	4/25/2022	7/27/2022
1,1,1-TCA	< 0.30	< 0.30
1,1-DCA	< 0.30	< 0.30
1,1-DCE	< 0.58	< 0.58
cis-1,2-DCE	< 0.47	< 0.47
PCE	< 0.41	< 0.41
trans-1,2-DCE	< 0.53	< 0.53
TCE	< 0.32	< 0.32
VC	< 0.17	< 0.17
ETHENE	--	< 0.25
1,4-D	< 0.086	--

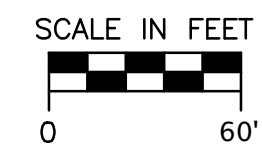
MW-1		
DATE	4/27/2022	7/28/2022
1,1,1-TCA	< 30.3	< 30.3
1,1-DCA	< 29.6	< 29.6
1,1-DCE	< 58.2	< 58.2
cis-1,2-DCE	3950	4970
PCE	3200	4200
trans-1,2-DCE	< 52.8	< 52.8
TCE	3010	4180
VC	488	364
ETHENE	--	85.8
1,4-D	< 0.078	--

MW-7		
DATE	4/27/2022	7/28/2022
1,1,1-TCA	5.6	2.7
1,1-DCA	5.0	3.5
1,1-DCE	2.1 J	< 1.5
cis-1,2-DCE	499	342
PCE	10.6	4.6
trans-1,2-DCE	27.0	18.2
TCE	23.1	12.8
VC	2.7	3.3
ETHENE	--	< 0.25
1,4-D	< 0.086	--

MW-14		
DATE	4/25/2022	7/28/2022
1,1,1-TCA	< 0.30	< 0.30
1,1-DCA	< 0.30	< 0.30
1,1-DCE	< 0.58	< 0.58
cis-1,2-DCE	30.1	39.2
PCE	< 0.41	< 0.41
trans-1,2-DCE	2.8	3.5
TCE	< 0.32	0.40 J
VC	1.2	2.7
ETHENE	--	< 0.25
1,4-D	< 0.086	--

MW-6		
DATE	4/27/2022	7/28/2022
1,1,1-TCA	7.1	11.5
1,1-DCA	8.5	17.9
1,1-DCE	< 0.58	< 0.58
cis-1,2-DCE	35.9	83.9
PCE	< 0.41	0.60 J
trans-1,2-DCE	1.4	4.3
TCE	9.2	15.8
VC	1.7	2.9
ETHENE	--	< 0.25
1,4-D	9.9	--

- NOTES:**
- ALL DATA IN MICROGRAMS PER LITER (µg/L)
 - NOT ANALYZED
 - BOX + BOLD - CONCENTRATION GREATER THAN NR 140 ES
 - CVOC - CHLORINATED VOLATILE ORGANIC COMPOUNDS
 - DCA - DICHLOROETHANE
 - DCE - DICHLOROETHENE
 - ES - ENFORCEMENT STANDARD
 - FT AMSL - FEET ABOVE MEAN SEA LEVEL
 - J - ESTIMATED CONCENTRATION AT OR ABOVE THE LIMIT OF DETECTION AND BELOW THE LIMIT OF QUANTIFICATION
 - PCE - TETRACHLOROETHENE
 - TCA - TRICHLOROETHANE
 - TCE - TRICHLOROETHENE
 - VC - VINYL CHLORIDE
 - 1,4-D - 1,4-DIOXANE



Geosyntec
consultants

CLIENT: PHARMACIA, LLC.

PROJECT: MILWAUKEE DIE CASTING COMPANY (MDCC) SITE
4132 NORTH HOLTON STREET
MILWAUKEE, WISCONSIN

TITLE: PROPOSED SOIL BORING LOCATION MAP

PROJECT: CHW82710 | FIGURE NO.: 1 | DRAWING NO.: 1 OF 1

DATE: Jan 26, 2023 | FILE NO.: 2301MDCC920