REMEDIAL ACTION IMPLEMENTATION REPORT

FORMER ONE HOUR MARTINIZING CLEANERS
36929 PLANK ROAD
OCONOMOWOC, WI 53066
BRRTS# 02-68-551911

July 30, 2018

Prepared By:

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Project Manager

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Senior Project Manager

Document: 6143-1157

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CERTIFICATIONS

I, Andrew Horwath, 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.

Director of Engineering and Remediation Services, PE No. E-43831-6

Signature, title and P.E. number

P.E. stamp

I, Brian Kappen, 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.

Project Manager

Signature and title

7/30/18

Date

1.0 INTRODUCTION

EnviroForensics, LLC (EnviroForensics) has prepared this Remedial Action Implementation Report (Report) on behalf of OHM Holdings, Inc. (OHM) for the One Hour Martinizing dry cleaning operation formerly located at 36929 Plank Road, Oconomowoc, Wisconsin (Site). This Report follows guidelines for documentation of remedial actions set forth in Wisconsin Administrative Code (WAC) Chapter NR 724 rule and other associated State of Wisconsin Chapter NR 700 series rules.

This Report follows submittal of a groundwater remediation injection request dated March 2, 2018, which described a plan for in-situ remediation of near-source groundwater contamination. This Report details the implementation of the remedial action, including deviations from the design.

1.1 General Information and Site Description

Property Information
County: Waukesha
PLSS Location: NW 1/4 of the NW 1/4 of Section 03, Township 07N, Range 17E
WTM Coords: X = 643787, Y = 293684

Property Owner Information
Owner Name: McAdams Realty

Responsible Party Information
Name: OHM Holdings, Inc.
Address: N41 W27760 Ishnala Trail, Pewaukee, WI 53072
Contact: Brian Cass
Telephone: 262-521-9710
E-mail Address: brian@ohmholdings.com

The layout of the Site, including Site features, and the surrounding area, is depicted on **Figure 1**. The Site is improved with a 61,300 square foot commercial building containing a Pick ‘n Save grocery store and an asphalt parking area. There is a small storm water retention basin located to the southwest of the Site; however, this area typically does not contain standing water. There are no private wells on the Site. The Site is bound by Wisconsin Avenue and Highway 16 to the

north; Plank Road to the south; State Highway 67 to the west; and a commercial property to the east. The adjacent commercial property to the east is currently Ewald Kia auto dealership. There is residential housing to the south beyond railroad tracks. The surrounding area consists of a mix of industrial, commercial and undeveloped properties.

The Site was leased and operated as an active dry cleaning facility in 1962 by OHM until 2008, when the building was demolished to make way for new construction of a Pick 'n Save grocery store. The dry cleaner was located adjacent to the former Pick 'n Save grocery store along with two (2) other businesses. The building was a one-story, slab on grade structure with masonry walls and steel framed ceiling. The previous location of the building is currently part of an asphalt paved parking lot which services the new Pick 'n Save grocery store on the east portion of the lot. The dry cleaner was not part of the redevelopment plan.

1.2 General Site Geology

The geological profile at the Site consists primarily of densely compacted, fine to coarse grained silty sand and gravel with few cobbles and boulders. An approximately 2 to 3-foot thick layer of anthropogenic subgrade fill is present below the parking areas and driveways. The silty sand and gravel unit has been observed below the subgrade to depths of 55 feet below ground surface (bgs). Zones of decreased permeability have been observed locally within this unit due to increased percentages of silt. Areas in the southern portion of the site near MW-8 contained fluvial deposits of well-rounded coarse-grained gravel having much higher permeability. Drilling in this area has proven to be very difficult due to the presence of cobbles and boulders.

Groundwater is encountered at approximately 28 feet bgs and flow direction is primarily to the east with a westerly component of groundwater flow that may form seasonally as a groundwater divide near monitoring well MW-4. Based on the analysis of slug tests conducted in five (5) wells at the Site, the hydraulic conductivity (K) of the shallow aquifer is fairly uniform, ranging from 0.01 to 0.03 centimeters per second (cm/s). These hydraulic conductivity values are more typical of well-sorted sand deposits.

1.3 Distribution of Impacts and Soil Vapor Extraction

Contaminants within unsaturated soil are limited to the area associated with the location of the former dry cleaner building. A soil vapor extraction (SVE) system was installed and became active in April of 2017 to reduce mass loading to groundwater and mitigate chlorinated volatile

organic compound (CVOC) vapors accumulating within the vadose zone. The SVE system is currently active and has greatly reduced soil vapor concentrations that could pose a risk of vapor intrusion to the Pick ‘n Save building. Additional soil sampling was performed in March of 2018 to evaluate performance of the SVE system. The results of this soil sampling can be seen on **Figure 2**. Additional soil impacts were identified to the north and as a result EnviroForensics plans to install an additional SVE extraction well to accelerate mass removal of CVOCs in this area.

Additional downgradient groundwater monitoring wells MW-18, MW-19, and MW-20 were installed in August of 2017, based on grab water samples collected from temporary wells set in borings DP-16 through DP-23 as shown on **Figure 1**. As can be seen on this figure, the groundwater contaminant plume extends off property to the northeast. The distribution of groundwater impacts as they appeared in September of 2017 can be seen on **Figure 3**. During that monitoring event, a maximum tetrachloroethene (PCE) concentration of 340 micrograms per liter (µg/L) was detected in groundwater at MW-1, which is located within the soil source area. Concentrations of CVOCs in groundwater decrease dramatically with distance from the source area and with depth. Currently, groundwater concentrations of PCE do not exceed the groundwater enforcement standard at downgradient sentinel wells MW-18, MW-19, and MW-20.

1.4 Remedial Action Objective

The remedial objective for the Site is to reduce the mass of CVOCs within the source area to levels that will not further impact downgradient conditions. SVE should reduce or eliminate the continued source of impacts to the water table and the groundwater injections should reduce or eliminate groundwater impacts within the contaminant source area. It is not practical to treat the entire area of groundwater impacts due to the large size of the plume. It is anticipated that the remaining residual contaminant concentrations in groundwater will attenuate over time as CVOC mass in the source area is reduced.

2.0 GROUNDWATER REMEDIAL INJECTIONS

Groundwater sampling has been performed at the Site since 2009. At various sampling events, trichloroethene and dichloroethene have been detected, which are daughter products produced by natural degradation of PCE. Therefore, some degradation of PCE is occurring by natural bacteria through the process of dehalogenation. However, this appears only to occur near the source area, and is minimal.

To stimulate the growth of bacteria capable of complete dehalogenation of the CVOCs, we selected remedial solutions produced by Regenesis®. Three products were injected (Regenesis® product description sheets are provided in **Appendix A**). 3D Microemulsion (3DME®) was mixed with Chemical Reducing Solution (CRS®) to amend existing subsurface conditions. 3DME® contains compounds that act as electron donors for microbial respiration. CRS® contains an iron-based reagent that enhances reducing conditions within the water table and is further capable of destroying chlorinated compounds via chemical reduction pathways. Bio-Dechlor INOCULUM® Plus (BDI®) was the final product injected. This product contains a special culture of anaerobic *Dehalococcoides* bacteria species that are uniquely capable of complete dehalogenation of the chlorinated compounds to non-toxic ethene, carbon dioxide, and water.

2.1 Permitting

EnviroForensics prepared an Injection Request document to obtain approval for the injection and coverage under the Wisconsin Pollutant Discharge Elimination System general permit for contaminated groundwater from remedial action operations. Copies of the WDNR approval letters are provided in **Appendix B**.

2.2 Treatment Area

An approximate 18,000 square foot treatment area was established based on the area having the highest concentrations of PCE in groundwater. A network of 40 injection locations was established to cover the area of treatment. The layout of the injection locations is shown as a grid on **Figures 3** and **4**. The grid architecture was constructed based on a review of various aquifer physical parameters including, but not limited to, porosity and hydraulic conductivity. The resulting grid has rows spaced 15 feet apart based on a calculated radius of influence of 7.5

feet perpendicular to the direction of groundwater flow, and columns spaced 30 feet apart based on a radius of influence of 15 feet in the direction of groundwater flow.

2.3 Injection Activities

At each location, direct-push tooling was utilized to inject remedial fluids at incremental depth intervals between 28-40 feet bgs (the average depth to the water table across the area of treatment is approximately 28 feet). Our remedial plan included injecting a total of 25,039 gallons of combined remedial fluids mixed with water over the area of treatment. This further is subdivided into 611 gallons of 3DME®/CRS® mixture and 15 gallons of BDI® mixture per each injection location.

Injection activities were performed by Horizon Construction and Exploration, LLC, under the direction of EnviroForensics, from June 18-29, 2018. Work was performed on third shift hours to minimize disruption to store employees and patrons. The 3DME®/CRS® solution was produced by mixing the concentrated product with potable water from the City of Oconomowoc municipal supply. Mixing occurred in trailer-mounted tanks. The remedial solutions were delivered from the mixing tanks to the injection rods using a positive displacement pump.

BDI® required special handling techniques to ensure the viability of its live anaerobic microbial population. To ensure viability during shipment, the BDI® was contained in a pressurized vessel infused with nitrogen gas to maintain anoxic conditions. During on-site mixing, nitrogen gas was bubbled in 300-gallon totes filled with the prescribed amount of mixing water until the oxygen levels in the water reduced to below 2 milligrams per liter. The BDI® was then decanted out of the pressurized storage vessel and added to the mix water. BDI® injections began after all of the 3DME®/CRS® was injected across the treatment area. This allowed some time for the 3DME® and CRS® to begin setting up reducing conditions within the subsurface conducive to long-term microbial survival and reproduction. The BDI® was then injected down the same boreholes used to inject the 3DME®/CRS® solution.

2.4 Observations and Troubleshooting

Direct-push drilling was very difficult at many of the injection locations. Several feet of drilling rod and three (3) injection heads were lost during the work effort. This was likely due to bends in the drilling rods resulting from glancing off of cobbles and boulders. When below the water

table, sand filled in these gaps making extraction of the drilling rods difficult and threaded connections sometimes snapped.

Some intervals would not readily accept the remedial fluids and some intervals took the fluids freely. Daylighting of remedial fluids back up the borehole occurred at many locations and injection intervals were adjusted to alleviate the daylighting. As a result, some intervals in each borehole, and also some injection locations, received more remedial fluids than others. In adjusting the injection intervals, daylighting was kept at a minimum. This should not cause a loss of effectiveness in distributing remedial solutions because there is a fairly even mix of sand, silt, gravel, cobbles, and boulders in the zone of treatment having fairly high hydraulic conductivity and the remedial solutions should mix with groundwater evenly over a short period of time. The amount of remedial fluids injected at each location is presented on **Figure 4**.

Daylighting of fluid up the borehole was typical during early interval injections of BDI solution. This was likely due to hole enlargement during the initial injections of 3DME®/CRS®. We did not want to re-drill all 40 locations to inject the much smaller volumes of BDI®. Therefore, a decision was made to inject all 14 gallons of BDI® in each borehole at the mid-point of injection (33-34 feet bgs). This should not cause a loss of effectiveness in distribution since the microbial populations are mobile and are expected to grow and spread fairly quickly throughout the saturated zone of treatment.

2.5 Performance Monitoring

A groundwater remedial performance monitoring program was developed and submitted along with the groundwater injection request. The monitoring program is detailed in **Table 1**, including wells to be sampled and sample frequency

The monitoring program is designed to demonstrate that the remedial actions have changed the groundwater chemistry and begun to reduce the CVOC mass through microbial reductive de-chlorination processes. Monitoring will be conducted on a quarter year basis for four (4) quarters beginning in August 2018. Monitoring in subsequent years is decreased in frequency according to **Table 1**, but may change based on first year sampling results. Any modifications to the monitoring program presented in **Table 1** will be determined after evaluation of the data collected during the first year of monitoring.

2.6 Reporting

EnviroForensics will tabulate and evaluate the groundwater analytical data to determine the effects of remediation on groundwater conditions. Performance monitoring data will be submitted in Remediation Site Operation, Maintenance, Monitoring and Optimization Reports (Form 4400-194) on a semi-annual basis, as required.

Sample results notifications will be prepared and submitted to off-site property owners and WDNR, as required, following each sampling event.

TABLES

TABLE 1
REMEDIATION PERFORMANCE MONITORING PROGRAM
Former One Hour Martinizing
Oconomowoc, Wisconsin

2018								
Parameter	VOCs	Total Fe	Dissolved Fe	Sulfate	Nitrate	Nitrite	Ethene/Ethane/Methane	DHC Population/Species
MW-1	Q	Q	Q	Q	Q	Q	Q	S
MW-1D	S							
MW-2	Q							
MW-3	Q							
MW-4	Q							
MW-5	Q	Q	Q	Q	Q	Q	Q	S
MW-6	Q							
MW-11	Q							
MW-14	A							
MW-16	A							
MW-19	A							
MW-20	A							

2019								
Parameter	VOCs	Total Fe	Dissolved Fe	Sulfate	Nitrate	Nitrite	Ethene/Ethane/Methane	DHC Population/Species
MW-1	Q	S	S	S	S	S	S	A
MW-1D	S							
MW-2	Q							
MW-3	Q							
MW-4	Q							
MW-5	Q	S	S	S	S	S	S	A
MW-6	Q							
MW-11	Q							
MW-14	A							
MW-16	A							
MW-19	A							
MW-20	A							

2020								
Parameter	VOCs	Total Fe	Dissolved Fe	Sulfate	Nitrate	Nitrite	Ethene/Ethane/Methane	DHC Population/Species
MW-1	Q	S	S	S	S	S	S	A
MW-1D	S							
MW-2	Q							
MW-3	Q							
MW-4	Q							
MW-5	Q	S	S	S	S	S	S	A
MW-6	Q							
MW-11	Q							
MW-14	A							
MW-16	A							
MW-19	A							
MW-20	A							

Notes:

Pre remedial monitoring event will be performed approximately 1 month before injections and will include all analyses

The first monitoring event will be performed approximately 3 months after injections and will include all analyses

Q = Sample collected for analysis quarterly

S = Sample collected for analysis semi-annually

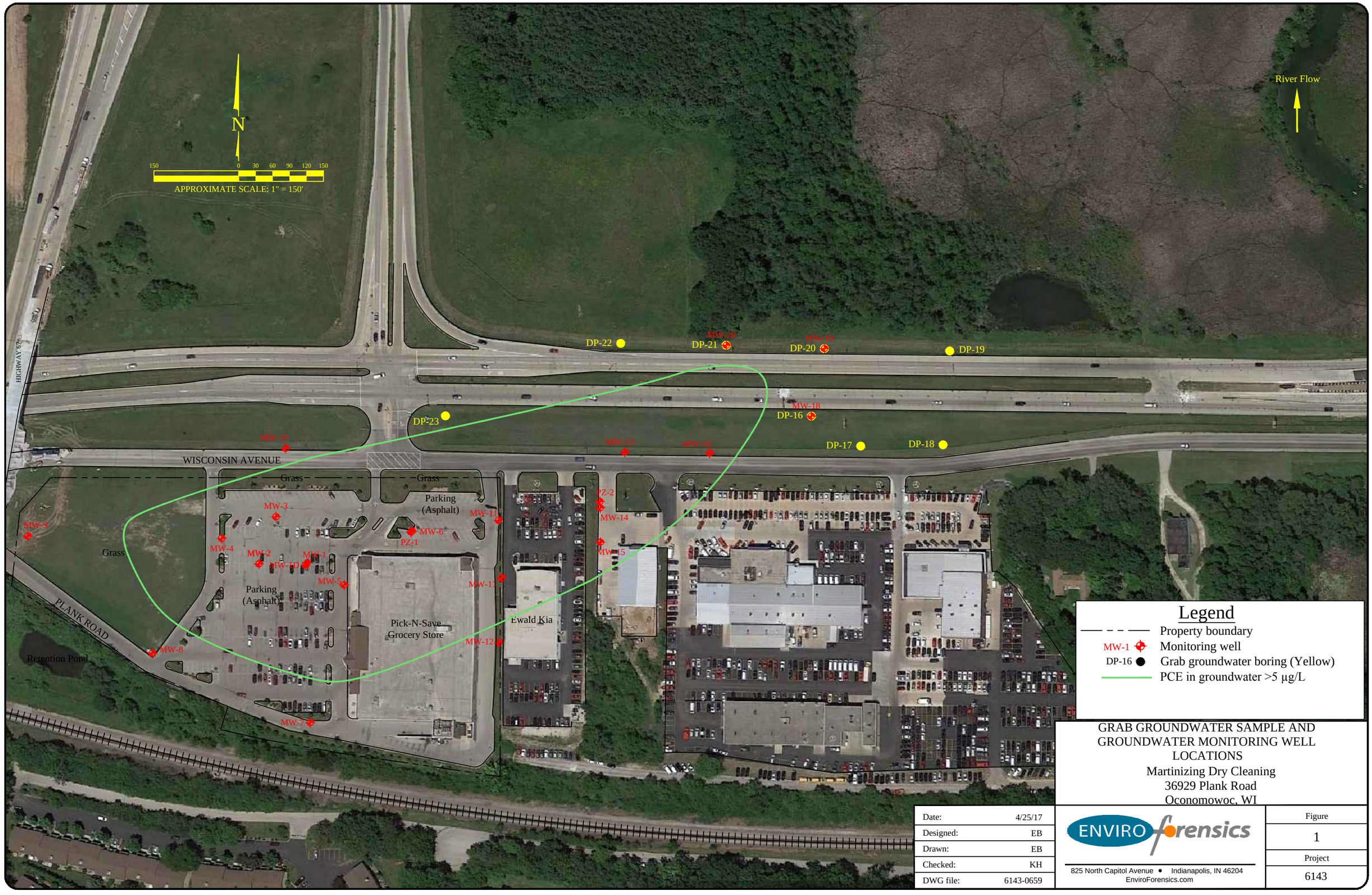
A = Sample collected for analysis annually

DHC = Dehalococcoides

Fe = Iron

VOCs = Volatile Organic Compounds

FIGURES



GRAB GROUNDWATER SAMPLE AND GROUNDWATER MONITORING WELL LOCATIONS
Martinizing Dry Cleaning
36929 Plank Road
Oconomowoc, WI

Date:	4/25/17
Designed:	EB
Drawn:	EB
Checked:	KH
DWG file:	6143-0659

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Figure
1
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Grass

Legend

- Property boundary
- MW-1 — Monitoring well sample location
- B-9 — Soil boring location (EnviroForensics)
- B-9 — 3/28/18 Soil boring location (EnviroForensics)
- B-1 — Soil boring location (KPRG)
- GP-1 — Preliminary site assessment borings (Giles)
- HP-1 — Soil boring location (Giles)
- Soil vapor extraction well location
- >30 ug/kg PCE concentration in soil
- >300 ug/kg PCE concentration in soil
- >3,000 ug/kg PCE concentration in soil

Analyte	Soil Residual Contaminant Level		
	Direct Contact		Soil to Groundwater
	Non-Industrial	Industrial	
PCE	**33,000**	**145,000**	**4.5**

Notes:
1. Bolded and blue shaded values are above WDNR generic Soil to Groundwater Residual Contaminant Levels
2. All concentrations reported in units micrograms per kilogram (ug/kg)
3. PCE = Tetrachloroethene
4. VOCs = Volatile Organic Compounds
5. ND = Not Detected
6. NS = Not Sampled

B-7		
08/12/08	2-4 ft	6-7 ft
VOCs	ND	ND

B-6		
08/12/08	2-4 ft	10-11.5 ft
VOCs	ND	ND

B-9 NS

GP-1		
05/6/08	2-4 ft	14-16 ft
PCE	**40**	**69**

B-1		
08/12/08	2-4 ft	9-11 ft
PCE	**3,080**	**2,090**

B-26				
3/28/18	2-4 ft	6-8 ft	12-14 ft	20-22 ft
PCE	**197**	**950**	**1,720**	**430**

B-28		
3/28/18	2-4 ft	10-12 ft
PCE	<32	**790**

MW-1		
08/12/08	25-27 ft	
PCE	**158**	

B-29				
3/28/18	0-2 ft	8-10 ft	16-18 ft	20-22 ft
PCE	**159**	**3,000**	**3,800**	**53 J**

B-27			
3/28/18	0-2 ft	8-10 ft	18-20 ft
PCE	<32	<32	**470**

HP-1		
05/06/08	2-4 ft	
PCE	**660**	

B-24			
3/28/18	0-2 ft	8-10 ft	12-14 ft
PCE	<32	**370**	**272**

B-13		
5/16/13	5-7 ft	20-22 ft
VOCs	ND	ND

MW-1d	
08/12/08	36-37 ft
VOCs	ND

B-25			
3/28/18	2-4 ft	12-14 ft	20-22 ft
PCE	<32	**39 J**	**720**

B-3		
08/12/08	2-4 ft	10-11 ft
VOCs	ND	ND

B-2		
08/12/08	6-7 ft	
PCE	**1,660**	

HP-2		
05/6/08	2-4 ft	6-8 ft
PCE	**380**	**2,700**

SVE-1s
SVE-1d

B-10 NS

B-10			
01/4/11	0-2 ft	4-6 ft	22-24 ft
PCE	ND	ND	**75.0**

B-5		
08/12/08	2-4 ft	18-20 ft
PCE	ND	**46.1J**

B-4		
08/12/08	2-4 ft	7-8 ft
PCE	ND	**78.2**

B-8		
08/12/08	2-4 ft	10-11ft
VOCs	ND	ND

B-15		
5/14/13	10-12 ft	20-22 ft
VOCs	ND	ND

Parking (Concrete)

Former Dry Cleaner

Pick-N-Save Grocery Store

N

30 0 10 20 30

APPROXIMATE SCALE: 1" = 30'

INTERIM SOIL ANALYTICAL RESULTS MARCH 2018

Martinizing Dry Cleaning
36929 Plank Road
Oconomowoc, WI

Date:	4/17/18
Designed:	EB
Drawn:	KH
Checked:	WF
DWG file:	6143-1052

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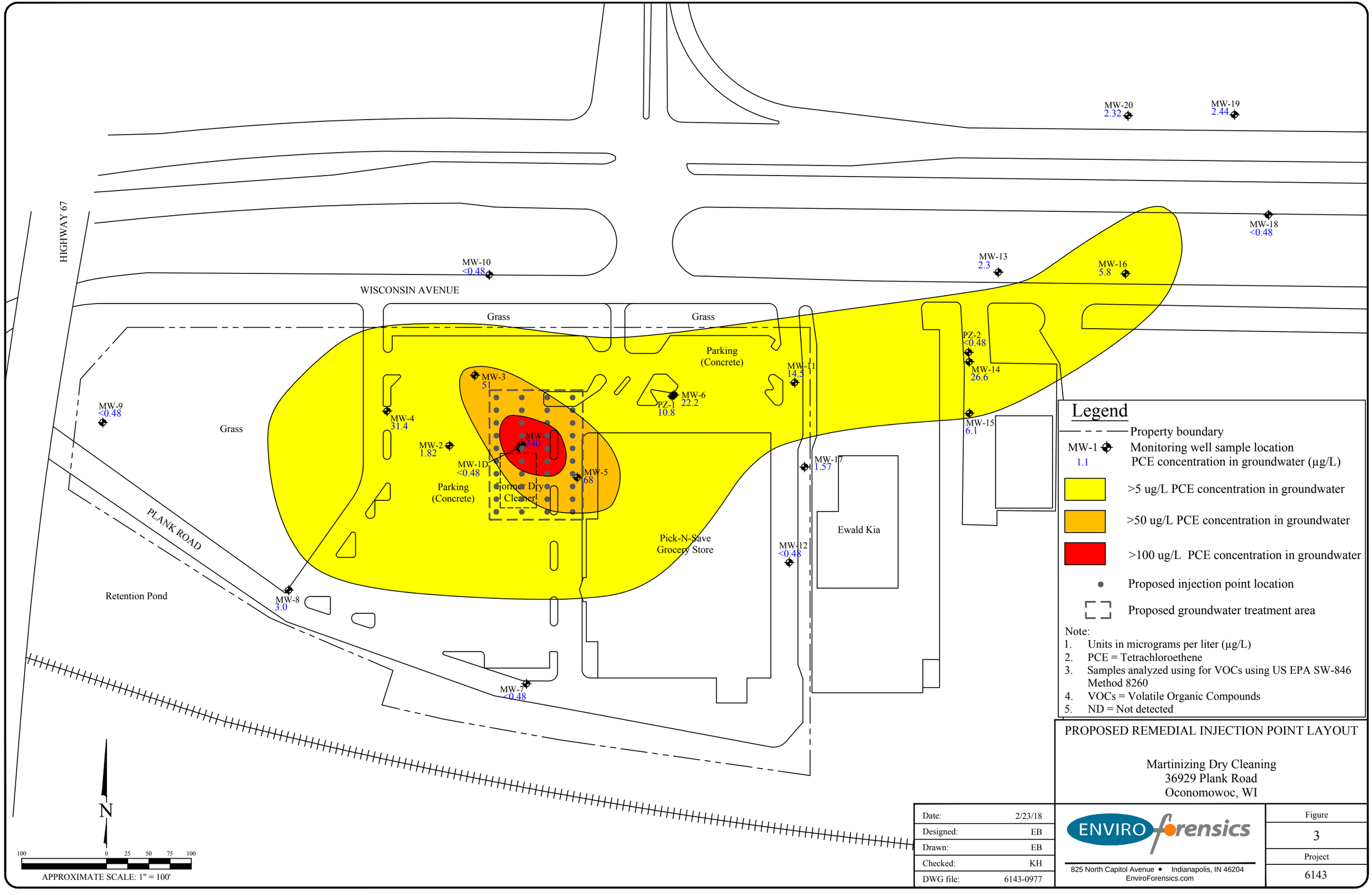
Figure 2

Project 6143



Legend

- Property boundary
- MW-1 / 1.1 — Monitoring well sample location; PCE concentration in groundwater (µg/L)
- >5 ug/L PCE concentration in groundwater
- >50 ug/L PCE concentration in groundwater
- >100 ug/L PCE concentration in groundwater
- Proposed injection point location
- Proposed groundwater treatment area

Note:
1. Units in micrograms per liter (µg/L)
2. PCE = Tetrachloroethene
3. Samples analyzed using for VOCs using US EPA SW-846 Method 8260
4. VOCs = Volatile Organic Compounds
5. ND = Not detected

PROPOSED REMEDIAL INJECTION POINT LAYOUT

Martinizing Dry Cleaning
36929 Plank Road
Oconomowoc, WI

Date:	2/23/18
Designed:	EB
Drawn:	EB
Checked:	KH
DWG file:	6143-0977

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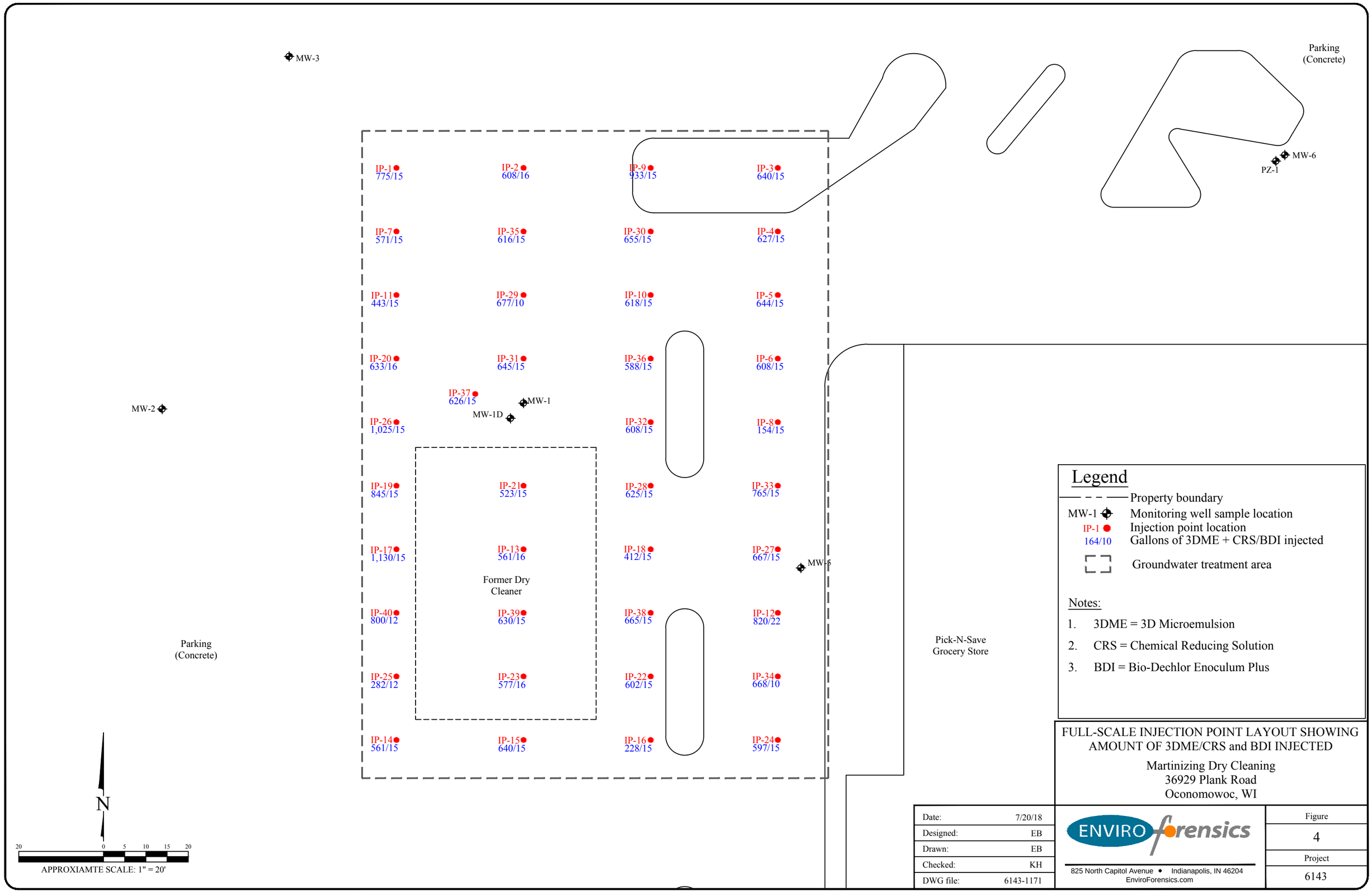
Figure 3

Project 6143



Legend

- Property boundary
- MW-1 — Monitoring well sample location
- IP-1 — Injection point location
- 164/10 — Gallons of 3DME + CRS/BDI injected
- Groundwater treatment area

Notes:

1. 3DME = 3D Microemulsion
2. CRS = Chemical Reducing Solution
3. BDI = Bio-Dechlor Enoculum Plus

FULL-SCALE INJECTION POINT LAYOUT SHOWING AMOUNT OF 3DME/CRS and BDI INJECTED

Martinizing Dry Cleaning
36929 Plank Road
Oconomowoc, WI

Date:	7/20/18
Designed:	EB
Drawn:	EB
Checked:	KH
DWG file:	6143-1171

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Figure
4
Project
6143

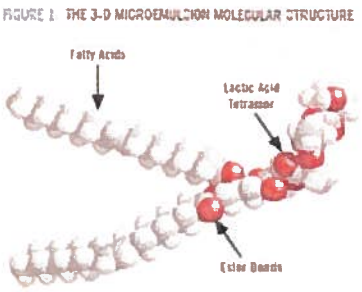
APPENDIX A

Regenesis Remedial Product Descriptions

3-D Microemulsion® Factory Emulsified Technical Description

3-D Microemulsion (3DME®) is comprised of a patented molecular structure containing oleic acids (i.e., oil component) and lactates/polylactates, which are molecularly bound to one another (figure 1). The 3DME molecule contains both a soluble (hydrophilic) and in-soluble (lipophilic) region. These two regions of the molecule are designed to be balanced in size and relative strength. The balanced hydrophilic/lipophilic regions of 3DME result in an electron donor with physical properties allowing it to initially adsorb to the aquifer material in the area of application, then slowly redistribute via very small 3DME "bundles" called micelles. These 3DME micelles spontaneously form within sections of the aquifer where concentrations of 3DME reach several hundred parts per million. The micelles' small size and mobility allow it to move with groundwater flow through the aquifer matrix, passing easily through the pore throats in between soil grains resulting in the further redistribution of 3DME within the aquifer. This allows for advective distribution of the oleic acids which are otherwise insoluble and unable to distribute in this manner, allowing for increased persistence of the lactate/polylactates component due to their initial attachment to the oleic acids.

Example of 3-D Microemulsion



Due to its patented molecular structure, 3DME offers far greater transport when compared to blended emulsified vegetable oil (EVO) products, which fail to distribute beyond the limits of pumping. 3DME also provides greater persistence when compared to soluble substrates such as lactates or simple sugars. The 3DME molecular structures capitalize on the best features of the two electron-donor types while at the same time, minimize their limitations. 3DME is delivered to the site as a ready-to-apply emulsion that is simply diluted with water to generate a large volume of a 3DME colloidal suspension.

Suspension of 3DME generated by this mixing range from micelles on the order of .02 microns to .05 microns in diameter, to "swollen" micelles, (termed "microemulsions") which are on the order of .05 to 5 microns in diameter. Once injected into the subsurface in high volumes, the colloidal suspension mixes and dilutes in existing pore waters. The micelles/microemulsions on the injection front will then begin to sorb onto the surfaces of soils as a result of zeta potential attraction and organic matter within the soils themselves. As the sorption continues, the 3DME will "coat" pore surfaces developing a layer of molecules and in some cases a bilayer. This sorption process continues as the micelles/microemulsion moves outward and disassociates into their hydrophilic/hydrophobic components. The specialized chemistry of 3DME results in a staged release of electron donors: free lactate (immediate); polylactate esters (mid-range) and free fatty acids & fatty acid esters (long-term). Material longevity of three years or greater has been seen at most sites as determined from biogeochemical analyses.

For a list of treatable contaminants with the use of 3DME, view the Range of Treatable Contaminants Guide

Chemical Composition

- Hydrogen Release Compound Partitioning Electron Donor – CAS #823190-10-9
- Sodium Lactate – CAS# 72-17-3
- Water – CAS# – 7732-18-5

3-D MICROEMULSION
Factory Emulsified

3-D Microemulsion® Factory Emulsified Technical Description

Properties

- Density – Approximately 1.0 grams per cubic centimeter (relative to water)
- pH – Neutral (approximately 6.5 to 7.5 standard units)
- Solubility – Soluble in Water
- Appearance – White emulsion
- Odor – Not detectable
- Vapor Pressure – None
- Non-hazardous

Storage and Handling Guidelines

Storage

Store in original tightly closed container

Store in a cool, dry, well-ventilated place

Store away from incompatible materials

Recommended storage containers: plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass

Handling

Avoid contact with eyes, skin, and clothing

Provide adequate ventilation

Wear appropriate personal protective equipment

Observe good industrial hygiene practices

Applications

- 3DME is diluted with water prior to application. Resulting emulsion has viscosity similar to water.
- Easily injects into formation through direct push injection points, injection wells or other injection delivery systems.

Application instructions for this product are contained here 3DME FE Application Instructions.

Health and Safety

Material is food grade and relatively safe to handle. We recommend avoiding contact with eyes and prolonged contact with skin. OSHA Level D personal protection equipment including vinyl or rubber gloves, and eye protection are recommended when handling this product. Please review the Material Safety Data Sheet for additional storage, usage, and handling requirements here: SDS-3DME FE.

REGENESIS

www.regenesis.com
1011 Calle Sombra, San Clemente CA 92673
949.366.8000

BIO-DECHLOR INOCULUM

BDI PLUS® Technical Description

Bio-Dechlor INOCULUM Plus (BDI PLUS®) is an enriched natural consortium containing species of Dehalococcoides sp. (DHC). BDI PLUS has been shown to simulate the rapid and complete dechlorination of chlorinated solvents such as tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride (VC) to non-toxic end products, ethene, carbon dioxide and water.

The culture also contains microbes capable of dehalogenating halomethanes (e.g., carbon tetrachloride and chloroform) and haloethanes (e.g., 1,1,1-TCA and 1,1-DCA) as well as mixtures of these contaminants.

Species of Dehalococcoides sp. (DHC)

For a list of treatable contaminants with the use of BDI PLUS, view the Range of Treatable Contaminants Guide

Chemical Composition

- Non-hazardous, naturally-occurring, non-altered anaerobic microbes and enzymes in a water-based medium.

Properties

- Appearance – Murky, yellow to grey water
- Odor – Musty
- pH 6.0 to 8.0
- Density – Approximately 1.0 grams per cubic centimeter (0.9 to 1.1 g/cc)
- Solubility – Soluble in Water
- Vapor Pressure – None
- Non-hazardous

Storage and Handling Guidelines

Storage

Store in original tightly closed container

Store away from incompatible materials

Recommended storage containers: plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass

Store in a cool, dry area at 4-5°C (39 - 41°F)

Material may be stored for up to 3 weeks at 2-4°C without aeration

Handling

Avoid prolonged exposure

Observe good industrial hygiene practices

Wear appropriate personal protective equipment

BIO-DECHLOR INOCULUM

BDI PLUS® Technical Description

Applications

- BDI PLUS is delivered to the site in liquid form and is designed to be injected directly into the saturated zone requiring treatment.
- Most often diluted with de-oxygenated water prior to injection into either hydraulic push injection points or properly constructed injection wells.
- The typical dilution rate of the injected culture is 10 gallons of deoxygenated water to 1 liter of standard BDI PLUS culture.

Application instructions for this product are contained here BDI PLUS Application Instructions.

Health and Safety

Material is non-hazardous and relatively safe to handle; however avoid contact with eyes and prolonged contact with skin. OSHA Level D personal protection equipment including: vinyl or rubber gloves and safety goggles or a splash shield are recommended when handling this product. An eyewash station is recommended. Please review the Material Safety Data Sheet for additional storage, usage. and handling requirements here: BDI PLUS SDS.

REGENESIS

www.regenesis.com
1011 Calle Sombra. San Clemente CA 92673
949.366.8000

CHEMICAL REDUCING SOLUTION

CRS® Technical Description

CRS® (Chemical Reducing Solution) is an iron-based reagent that facilitates biogeochemical *in situ* chemical reduction (ISCR) of halogenated contaminants such as chlorinated ethenes and ethanes. CRS is a pH neutral, liquid iron solution that is easily mixed with 3-D Microemulsion® Factory Emulsified before injection into a contaminated aquifer. CRS provides a soluble, food-grade source of ferrous iron (Fe^{2+}), designed to precipitate as reduced iron sulfides, oxides, and/or hydroxides. These Fe^{2+} minerals are capable of destroying chlorinated solvents via chemical reduction pathways, thus improving the efficiency of the overall reductive dechlorination process by providing multiple pathways for contaminant degradation in groundwater.

Example of CRS

For a list of treatable contaminants with the use of CRS. view the Range of Treatable Contaminants Guide.

Chemical Composition

• Water	7732-18-5
• Ferrous Gluconate	299-29-6

Properties

- Appearance – Dark green to black
- Odor – Odorless
- pH 6.0 to 8.0
- Density – Approximately 1.0 grams per cubic centimeter (0.9 to 1.1 g/cc)
- Solubility – Miscible
- Vapor Pressure – None
- Non-hazardous

Storage and Handling Guidelines

Storage

Store in original tightly closed container

Store away from incompatible materials

Recommended storage containers: plastic-lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass

Store in a cool, dry, well-ventilated place

Keep away from extreme heat and strong oxidizing agents

Handling

Avoid prolonged exposure

Observe good industrial hygiene practices

Wear appropriate personal protective equipment

Avoid contact with eyes, skin, and clothing

Avoid breathing spray mist

Use with adequate ventilation

CHEMICAL REDUCING SOLUTION

CRS® Technical Description

Applications

- Permanent injection wells
- Direct-push injection points

Application instructions for this product are contained in the CRS Application Instructions.

Health and Safety

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200. Observe good industrial hygiene practices. Wash hands after handling. Store away from incompatible materials. Dispose of waste and residues in accordance with local authority requirements. Please review the CRS PLUS Material Safety Data Sheet for additional storage, usage, and handling requirements.

REGENESIS®

www.regenesis.com
1011 Calle Sombra, San Clemente CA 92673
949.366.8000

APPENDIX B

WDNR Approval Letters

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
Waukesha Service Center
141 NW Barstow St
Waukesha WI 53188

Scott Walker, Governor
Daniel L. Meyer, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay – 711

March 9, 2018

Mr. Charles Cass
OHM Holdings, Inc.
W229 N2494 County Road F
Waukesha, WI 53186-1104

Subject: Groundwater Remediation Injection
Former One Hour Martinizing Cleaners
36929 Plank Road, Oconomowoc, WI
FID# 268087380, BRRTS# 02-68-551911

Dear Mr. Cass:

The Wisconsin Department of Natural Resources (DNR) has reviewed the March 2, 2018 letter report titled *Remediation Injection Request* from Environmental Forensic Investigations, Inc. for case described above. The DNR approves the proposed additional remedial method and subsequent groundwater monitoring, but suggests that piezometer MW-1D be added to the post-injection monitoring schedule.

Prior to proceeding with the remediation injection, you must wait for approval from the DNR's Wastewater Program (WPDES permit approval) and from the DNR Southeast Region's Remediation and Redevelopment Program injection approval hydrogeologist (Mr. Binyoti Amungwafor).

The Department appreciates your efforts to restore the environment at this site. If you have any questions regarding this letter or the case, please contact me at the letterhead address, by calling (262) 574-2166, or by e-mail at david.volkert@wisconsin.gov.

Sincerely,

David G. Volkert, P.G.
Hydrogeologist
Bureau for Remediation & Redevelopment

cc: Wayne Fassbender, Environmental Forensic Investigations, Inc.
SER File

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
2300 N. Dr. Martin Luther King Jr. Drive
Milwaukee WI 53212-3128

Scott Walker, Governor
Daniel L. Meyer, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

March 16, 2018

(via email to: rhoverman@enviroforensics.com)
Rob Hoverman
EnviroForensics
N16 W23390 Stone Ridge Drive
Suite G
Waukesha, WI 53188

SUBJECT:	Coverage under General Permit WI-0046566-06, Contaminated Groundwater from Remedial Action Operations
FACILITY:	Former One Hour Martinizing
LOCATION:	36929 Plank Rd., Oconomowoc, WI
FIN:	61922

Dear Mr. Hoverman,

The Wisconsin Department of Natural Resources, hereafter the Department, has reviewed your application for authorization to inject 3-D Microemulsion® (3-DME), Chemical Reducing Solution (CRS), and Bio-Dechlor Inoculum Plus (BDI) solutions for in-situ treatment of tetrachloroethane (PCE) dissolved in groundwater at 36929 Plank Road, Oconomowoc, WI (Former One Hour Martinizing). The presence of chlorinated solvent PCE and the products of natural degradation of PCE to include: trichloroethene, dichloroethene, and other secondary volatile organic compounds (VOCs) are likely attributable to previous improper handling and disposal of dry cleaning solvents at the Former One Hour Martinizing site (WDNR BRRTS #02-68-551911).

EnviroForensics is authorized by this letter for enhanced biodegradation in-situ treatment of PCEs in contaminated groundwater at the addresses stated above. According to the management plan EnviroForensics has proposed, enhanced biodegradation will be implemented using concentrated 3-DME and CRS liquids which will be mixed with water to produce one solution at a volume of 610 gallons per injection site. Concentrated BDI will be mixed with water for a second solution and will be injected at a volume of 15 gallons per injection site. A network of 40 injection points will be used with a total of approximately 25,000 gallons of solution, or 625 gallons per injection point, will be added to the treatment zone. Additional treatment injection events will be based on the effectiveness of the injections at reducing contaminant levels at the site and the contaminated area is not significantly expanded as a result of the in-situ remedial activities. Any significant injection changes will require Department approval.

Your proposed discharge is eligible for coverage under the general Wisconsin Pollutant Discharge Elimination System (WPDES) permit WI-0046566-06 for Discharge of Contaminated Groundwater from Remedial Action Operations. You are responsible for compliance with the conditions contained in this permit. The permit and fact sheet should be downloaded from the DNR website at http://dnr.wi.gov/topic/wastewater/generalpermits.html.

Discharges under this permit are required to be consistent with a discharge management plan that has been approved by the Department. Your application submitted will be considered as the required discharge management plan. All of your contaminated wastewater treatment, discharges, and remedial actions must be done according to the terms and conditions of the permit, specifically sections 1, 2, 6 and 8.

General Requirements

1. **Effective Term:** Permit Coverage begins on March 16, 2018.

2. **Additives:** The discharge of other water treatment additives is prohibited unless their use is approved in writing by the DNR.

3. **Monitoring requirements:** Monitoring requirements for discharges designed to enhance the remediation of in-situ contaminants are found in Section 6 of the permit.
   - **Flow:** A record must be kept of the total daily volume of each solution injected.
   - **Parameters:** Dave Volkert, DNR Remediation & Redevelopment Project Manager may require additional monitoring and reporting.

4. **Reporting:**
   - Records of effluent volume and chemical monitoring data shall be submitted on discharge monitoring report (DMR) forms following each injection. All sample results must be reported on the DMR. Reports are due on the 15th day of the month following the completion of the injection. The owner must sign the DMRs. DMRs should be sent to the address indicated on the DMR. Please make copies of the enclosed DMR for your use.
   - Records required by this permit must be kept for the duration of the permit and made available for inspection by Department staff upon request.
   - **Any exceedances of the permit limits shall be reported to the Department within 24 hours of the permittee becoming aware of the exceedance.**

Limits based on groundwater quality protection are set at the preventive action limits in ch. NR 140, Wis. Adm. Code. These limits are based on substances reported to be in the discharge, but may not necessarily include all substances of public health or welfare concern, which are in the discharge. However, nothing in this permit allows the permittee to discharge any substance in a concentration that would cause groundwater standards in Ch. NR 140 to be exceeded.

If you have any questions about permit requirements or the contents of this letter, please feel free to contact me at (414) 263-8713.

Sincerely,

Karl Knutson
Wastewater Specialist

cc: Trevor Moen, General Permit Coordinator, WDNR (via email)
Dave Volkert, WDNR (via email)
Wayne Fassbender, EnviroForensics (via email)
Brian Kappen, EnviroForensics (via email)

LEGAL AUTHORITIES AND APPEAL RIGHTS

Section 283.35, Wisconsin Statutes, authorizes the Department to issue general permits for discharges from categories or classes of point sources. If a permittee believes coverage of a facility under a general WPDES permit is not appropriate, the

permittee may apply for issuance of an individual WPDES permit pursuant to section 283.35(2) and may petition the Department for withdrawal of coverage under the general permit. The individual permit application should indicate which site specific factors would justify alternate WPDES limits for the operation. Issuance of such a site specific WPDES permit will provide for a 30 day public comment period, and potentially a public informational hearing and/or an adjudicatory hearing. The Department may withdraw a facility from coverage under a general permit if it is determined that a discharge is a significant contributor of pollutants to waters of Wisconsin, or in certain other cases set out in s. 283.35, Stats. In lieu of general permit withdrawal, the Department may refer any violation of this permit to the Department of Justice for enforcement under s. 283.89, Stats. In order to avoid any enforcement action, **please read the WPDES permit carefully and comply with the permit requirements.**

If you believe you have a right to challenge the Department decision to cover this facility with a WPDES general permit, you should know that Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed. To request a contested case hearing pursuant to section 227.42, Wis. Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to serve a petition for hearing on the Secretary of the Department of Natural Resources. Such a petition should identify pollutant(s) that are believed to be not appropriately regulated by the general permit for the specific site. All requests for contested case hearings must be made in accordance with section NR 2.05(5), Wis. Adm. Code, and served on the Secretary in accordance with section NR 2.03, Wis. Adm. Code. The filing of a request for a contested case hearing is not a prerequisite for judicial review and does not extend the time period for filing a petition for judicial review.

For judicial review of a decision pursuant to sections 227.52 and 227.53, Wis. Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to file your petition with the appropriate circuit court and serve the petition on the Department. A petition for judicial review must name the Department of Natural Resources as the respondent.

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