April 10, 2019

Jennifer Borski
Wisconsin Department of Natural Resources
625 E. County Rd Y, Suite 700
Oshkosh, WI 54901

Re: Remediation Injection Request
BRRTS# 02-45-000015
FIN# 61613

Dear Ms. Borski:

EnviroForensics is proposing a subsurface injection utilizing products that create and support reducing geochemical conditions as a method of groundwater treatment at the former Appleton Wire facility in Appleton, Wisconsin (Site). On behalf of the responsible party, we are requesting review and approval of the attached request. Site information is provided below.

Site Details:	Appleton Wire (Former) 908 N. Lawe Street Appleton, WI 53122 BRRTS# 02-45-000015
Site Owner:	Luvata Appleton, LLC P.O. Box 1714 Appleton, WI 54912
Responsible Party:	Albany International Corp. Joseph Gaug, Associate General Counsel P.O.1907 Albany, NY 12201 (518) 445-2273 joseph.gaug@albint.com
Consultant:	EnviroForensics, LLC Wayne Fassbender, Senior Project Manager N16 W23390 Stone Ridge Drive, Suite G, Waukesha, WI 53188 262-290-4001 wfassbender@enviroforensics.com

EnviroForensics LLC
N16 W23390 Stone Ridge Dr, Suite G, Waukesha, WI 53188
Phone: 262-290-4001 • Fax 317-972-7875

An injection request is attached. Coverage under WPDES Permit No. WI-0046566-07-0 was previously granted and remains valid through 2023. The site was assigned FIN# 61613. A Technical Assistance review fee of $700 is enclosed with the copy of this letter sent to Ms. Danelski.

Sincerely,
EnviroForensics, LLC

Wayne Fassbender, PG, PMP
Senior Project Manager

Brian Kappen, PG
Project Manager

cc: Denise Danelski, WDNR – Green Bay Service Center

enclosure

INJECTION REQUEST
APPLETON WIRE (FORMER)
908 N. LAWE STREET, APPLETON, WI

EnviroForensics is requesting approval to perform injections for groundwater remediation at the former Appleton Wire facility in Appleton, Wisconsin (Site). The objective of the remedial injections is to reduce concentrations of hexavalent chromium in groundwater.

Soil beneath the Site consists of a relatively homogenous blanket of reddish-brown lean clay, having trace amounts of sand to the maximum sampling depth of 60 feet. Discontinuous seams of clayey, medium to coarse sand and fine to medium gravel were observed in a few soil borings at depths below our target injection zone of 6-20 feet. Sand and gravel fill is present within a few feet of the warehouse foundation and behind the east and south concrete basement walls which are inset from the exterior of the building.

The shallow water table is encountered at the Site within the glacial clay overburden at between approximately 3-6 feet below ground surface (bgs). Recharge of groundwater to Site monitoring wells is extremely slow due to the very low hydraulic conductivity of the clay soil. Recharge of the wells is not consistent across the Site, takes days to weeks for full recharge upon evacuating the water, and is reliant on precipitation. The vertical separation of water levels between water table wells and deeper piezometers varies between each well cluster, but ranges between from approximately 7 to 16 feet.

It is expected that the direction of shallow groundwater flow is to the east towards a drainage channel following the slope of topography, or to the southeast towards the Fox River, which is the primary discharge point in this area for groundwater within the shallow unconsolidated soil. The Fox River at its closest point to the Site is located approximately 2,800 feet to the southeast.

The target compound for treatment is hexavalent chromium [Cr(VI)], identified in Site groundwater at concentrations up to 170 milligrams per liter (mg/L). The remedial technology selected for groundwater treatment is reduction of Cr(VI) to the less toxic and less mobile trivalent form [Cr(III)] and subsequent formation of insoluble chromium hydroxide and iron-chromium hydroxide co-precipitates by chemical and microbial processes. The proposed amendment to be injected is a combination of the following products:

- Anaerobic BioChem (ABC®), a mixture of lactates, fatty acids, alcohols and a phosphate buffer; and
- Zero-valent iron (ZVI).

The product brochure for ABC® prepared by the manufacturer is provided in **Attachment 1**. These products are non-hazardous and safe to handle with level D personal protective equipment; however, respiratory protection will be used if significant ZVI dust is generated during preparation of the solution.

INJECTION REQUEST
APPLETON WIRE (FORMER)
908 N. LAWE STREET, APPLETON, WI

Implementation Plan

Five (5) separate groundwater remediation areas have been defined based on the magnitude and distribution of hexavalent chromium impacts identified during the site investigation. The areas that will be treated by injection are highlighted and designated A through E on **Figure 1**. The total treatment application will consist of 24,600 pounds of ABC+ZVI (50% of each by weight) along with a minimal amount of guar to keep the ZVI in suspension. The products will be mixed with potable water to produce a total of 8,400 gallons of a slurry at the desired concentration. This is equivalent to approximately 5 percent of the treatment volume pore space assuming a porosity of 30 percent.

The ABC+ ZVI slurry will be similar in viscosity to the Provect-IRM slurry that was injected for pilot testing. Therefore, the injection pressure and flow rate are anticipated to be similar to those observed during the pilot test injections. The pilot test injection pressure ranged from 31 to 62 psi, and the flow rate ranged from 2.0 to 4.9 gallons per minute.

The products will be delivered directly to the site in 2,000 pound super sacks and stored inside the site building prior to use. Mixing will be performed in large, trailer-mounted tanks with continuous agitation. The solution will then be pumped from the tanks, through a manifold to the injection points via flexible hosing. Injection will occur at up to four (4) points simultaneously. The solution will be injected directly through the bottom of direct-push rods in 1 to 2 foot intervals in a bottom-up approach. Pressure and flow rate will be monitored separately at each injection point and recorded to confirm that injection design parameters are met.

The proposed direct-push injection points are arranged in a grid pattern within each area as shown on **Figure 1**. However, the final locations may be adjusted slightly to avoid subsurface utilities. The injection plan for each area A through E is summarized below:

- Area A: Advance 28 injection points at locations surrounding the southern pilot test area.

- Area B: Advance nine (9) injection points through the basement floor, and seven (7) injection points around the perimeter of the south and east basement walls. The target injection interval in the basement will be from just beneath the floor slab to 10 feet bgs.

- Area C: Advance 19 injection points to the south and east of the northern pilot test area. Injection Area C overlaps the northern pilot test area around the MW-20 well nest to address elevated hexavalent chromium concentrations detected during pilot test performance monitoring. A higher percentage of ZVI may be applied to the mixture in this location depending on subsurface response to injection and daylighting issues.

- Area D: Advance 12 injection points west of the northern pilot test area.

- Area E: Advance 16 injection points outside south of the warehouse building, surrounding the MW-5 well nest.

In addition, nine (9) injection points will be advanced in a row outside the north building wall. The purpose of this row of injections is to treat contaminated soil below and around the footing.

The direct-push tooling will be removed from each location after the prescribed volume of solution is injected, and the boreholes will be abandoned in accordance with Chapter NR 141.25.

Monitoring Plan

Groundwater elevation measurements will be collected from Site monitoring wells before, during, and after injections to evaluate the temporary effect of injection on potentiometric surfaces and flow direction. The depth to water in each well will be measured to the nearest 0.01 foot using an electronic water level indicator.

The post-injection groundwater monitoring program is detailed on **Table 1** (attached). The objectives of monitoring are to verify that subsurface conditions are conducive to reductive processes and to document decreasing Cr(VI) concentration trends. It is anticipated that monitoring will be conducted for two (2) years following injections.

The monitoring well locations are depicted on **Figure 2**. Existing wells (MW-2, -5, -5A, and MW-25), post-remediation replacement wells (MW-19R, -19AR, -20R, -20AR, -26R, -28R, and MW-30R), and new well clusters (MW-31/31A and MW-32/32A) will be used for remediation performance monitoring purposes. These wells are positioned both within and immediately surrounding the target remediation areas. Groundwater samples will be collected by bailer due to slow recharge, and analyzed for dissolved chromium, iron, and manganese according to EPA test method 6010. Water quality data including electrical conductivity, temperature, dissolved oxygen, total dissolved solids, pH and oxidation-reduction potential (ORP) will be measured in the field with a portable meter during each sampling event.

Investigation-derived media (IDM), including purge water and decontamination fluids, will be containerized in 55-gallon drums. A licensed contractor will be retained to remove drums following each monitoring event. The IDM will be managed under existing non-hazardous waste profiles.

Vapor Screening

Although the risk of generating high concentrations of flammable gas is low considering the nature and distribution of contaminants at the site, methane and hydrogen sulfide can be produced via in-situ chemical reduction processes. The production of vapors at each injection area will be evaluated by collecting headspace field measurements at monitoring wellheads using a portable gas analyzer. Vapor screening measurements will be collected prior to injections and during the groundwater monitoring events. The wellheads will be fitted with expandable plugs with ports designed for vapor monitoring. If the vapor concentration exceeds 10% of the LEL (i.e., 0.5% by volume methane or 0.4% by volume hydrogen sulfide), vapors will be evacuated using appropriate, intrinsically-safe equipment. Additional mitigation methods will be evaluated if necessary.

Timeframe

The remedial injections are tentatively scheduled to begin in July 2019. EnviroForensics anticipates the injection activities can be completed in ten (10) days. Post-injection monitoring will be performed as prescribed on **Table 1**, with the first monitoring event to occur approximately six (6) months after the injection activities are completed to allow time for the subsurface environment to equilibrate and the sequestering of Cr(VI) to be complete. EnviroForensics is requesting injection approval through the end of 2020 in case remediation activities are delayed.

INJECTION REQUEST
APPLETON WIRE (FORMER)
908 N. LAWE STREET, APPLETON, WI

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.

Senior Engineer, PE License No. E-43831-6

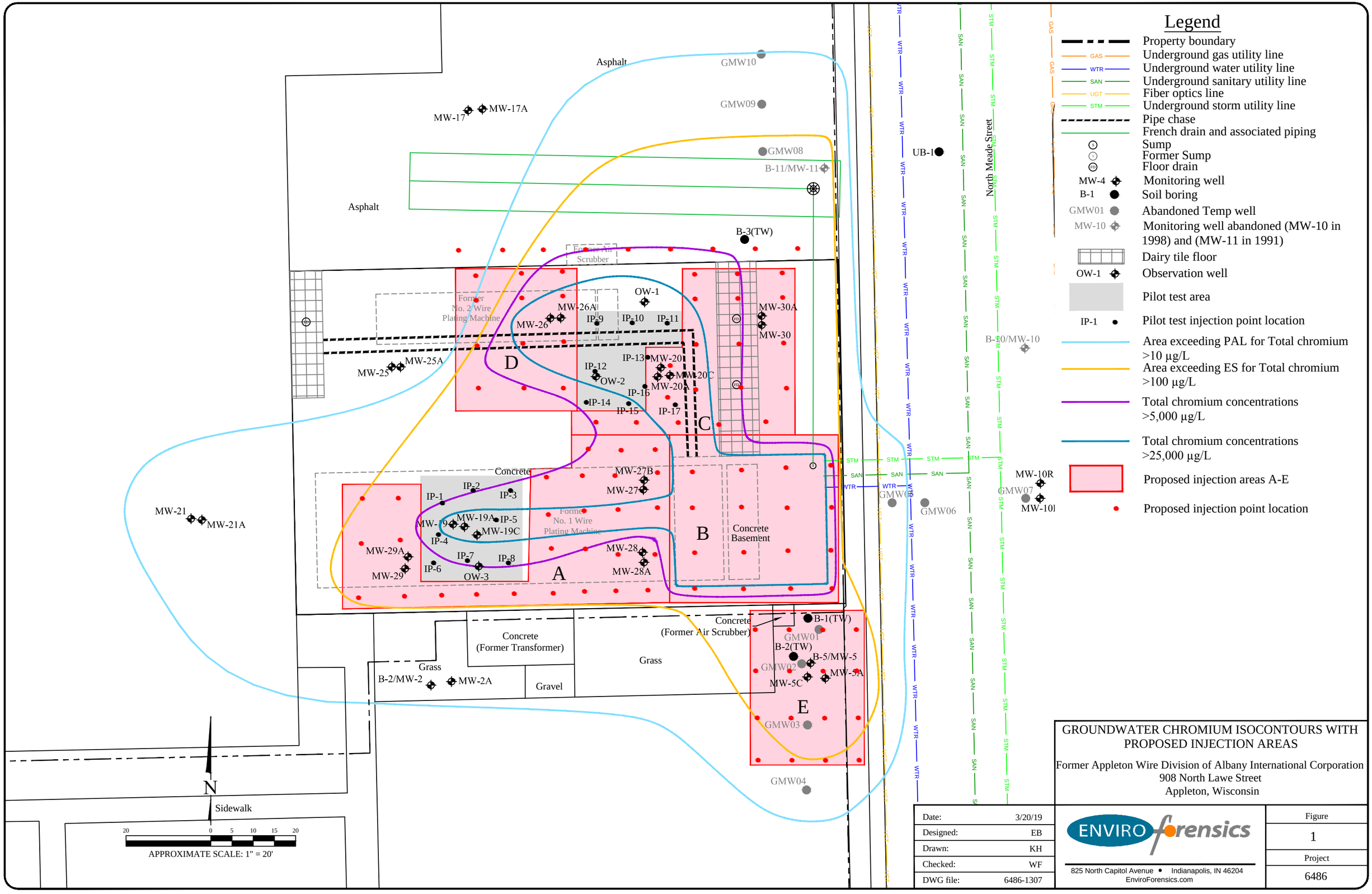
WISCONSIN
ANDREW D
HORWATH
E-43831-6
NOBLESVILLE
IN
PROFESSIONAL ENGINEER

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 — 4/10/19

Signature and title | Date



GROUNDWATER CHROMIUM ISOCONTOURS WITH PROPOSED INJECTION AREAS

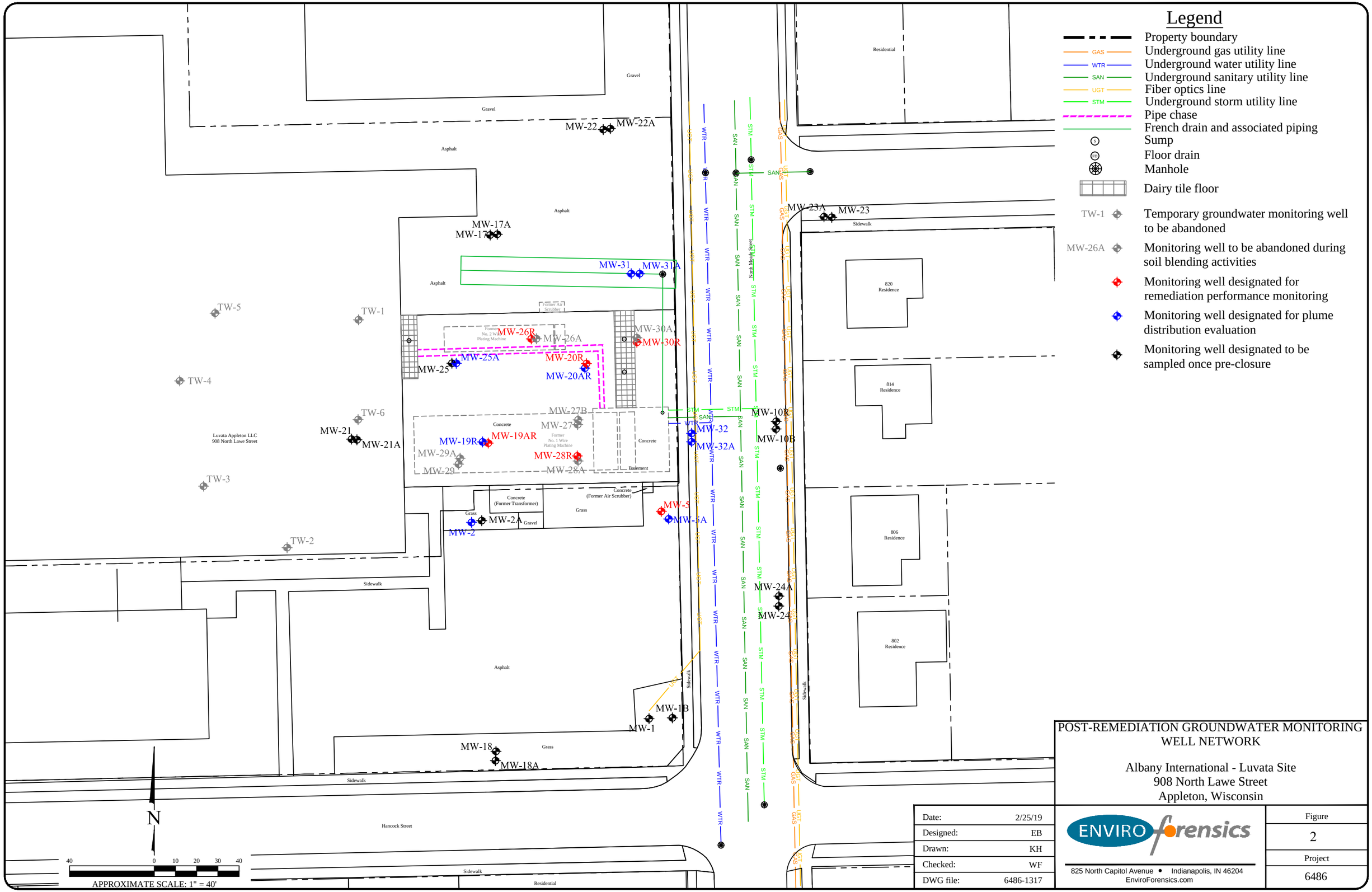
Former Appleton Wire Division of Albany International Corporation
908 North Lawe Street
Appleton, Wisconsin

Date:	3/20/19
Designed:	EB
Drawn:	KH
Checked:	WF
DWG file:	6486-1307

ENVIRO forensics
825 North Capitol Avenue • Indianapolis, IN 46204
EnviroForensics.com

Figure 1

Project 6486


Legend
Property boundary
Underground gas utility line
Underground water utility line
Underground sanitary utility line
Fiber optics line
Underground storm utility line
Pipe chase
French drain and associated piping
Sump
Floor drain
Manhole
Dairy tile floor
TW-1 Temporary groundwater monitoring well to be abandoned
MW-26A Monitoring well to be abandoned during soil blending activities
Monitoring well designated for remediation performance monitoring
Monitoring well designated for plume distribution evaluation
Monitoring well designated to be sampled once pre-closure
MW-22
MW-22A
MW-17A
MW-17
MW-31
MW-31A
MW-23A
MW-23
MW-26R
MW-26A
MW-30A
MW-30R
MW-25A
MW-25
MW-20R
MW-20AR
MW-27B
MW-27
MW-19R
MW-19AR
MW-29A
MW-29
MW-28R
MW-28A
MW-32
MW-32A
MW-10R
MW-10B
MW-5
MW-5A
MW-2A
MW-2
MW-24A
MW-24
MW-1B
MW-1
MW-18
MW-18A
MW-21
MW-21A
TW-1
TW-2
TW-3
TW-4
TW-5
TW-6
Gravel
Asphalt
Residential
Sidewalk
Grass
Concrete
Concrete (Former Transformer)
Concrete (Former Air Scrubber)
Former No. 2 Wire Plating Machine
Former No. 1 Wire Plating Machine
Former Air Scrubber
Basement
820 Residence
814 Residence
806 Residence
802 Residence
Luvata Appleton LLC
908 North Lawe Street
Hancock Street
N
40 0 10 20 30 40
APPROXIMATE SCALE: 1" = 40'
POST-REMEDIATION GROUNDWATER MONITORING WELL NETWORK
Albany International - Luvata Site
908 North Lawe Street
Appleton, Wisconsin
Date: 2/25/19
Designed: EB
Drawn: KH
Checked: WF
DWG file: 6486-1317
ENVIROforensics
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EnviroForensics.com
Figure
2
Project
6486

TABLE 1
POST-REMEDIATION GROUNDWATER MONITORING PLAN
Former Appleton Wire Facility
908 N. Lawe Street, Appleton, Wisconsin

	Frequency of Monitoring		
Monitoring Well ID	**Quarterly for 2 Years** (Remediation Performance)	**Annually for 2 Years** (Plume Distribution)	**Final Pre-Closure Event**
MW-1			C
MW-1B			C
MW-2		C, I, M	
MW-2A			C
MW-5	C, I, M		
MW-5A		C, I, M	
MW-10R			C
MW-10B			C
MW-17			C
MW-17A			C
MW-18			C
MW-18A			C
MW-19R	C, I, M		
MW-19AR		C, I, M	
MW-20R	C, I, M		
MW-20AR		C, I, M	
MW-21			C
MW-21A			C
MW-22			C
MW-22A			C
MW-23			C
MW-23A			C
MW-24			C
MW-24A			C
MW-25		C, I, M	
MW-25A			C
MW-26R	C, I, M		
MW-28R	C, I, M		
MW-30R	C, I, M		
MW-31		C, I, M	
MW-31A		C, I, M	
MW-32		C, I, M	
MW-32A		C, I, M	

Notes:

Groundwater monitoring will begin approximately six (6) months after completion of the remedial actions

C = total chromium analysis

I = iron analysis

M = manganese analysis