REMEDIAL ACTION DESIGN REPORT

FORMER ROBINSON'S CLEANERS
1838 W. COURT STREET
JANESVILLE, WI 53548
BRRTS# 02-54-221852

January 9, 2018

Prepared By:

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Document: 6155-2932

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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.

Manager, Technical Group, P.E. No. E-43831-6

Signature, title and P.E. number

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

Digitally signed by Andrew D. Horwath
Date: 2018.01.10 09:55:48 -05'00'

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

1/8/2018

Date

EXECUTIVE SUMMARY

EnviroForensics, LLC (EnviroForensics) has prepared this Remedial Action Design Report (Report) on behalf of Ray Gehrig formerly d/b/a RayChris, Inc. for the former Robinson's Cleaners facility located at 1838 West Court Street in Janesville, Wisconsin (Site). Soil, groundwater, and soil gas have been contaminated by a release of tetrachloroethene (PCE) from the former Robinson's facility.

Injection of amendment(s) to trap and treat chlorinated volatile organic compound (CVOC) impacts in groundwater was determined to be the most likely remedial approach. Pre-remedial testing was performed to evaluate potential options for delivery of amendments. Initially, a tracer test was performed utilizing an infiltration gallery that was installed in the backfill of an excavation just north of the building. A saline tracer was pumped into the piping and electrical conductivity (EC) data loggers were placed in nearby monitoring wells to evaluate the direction(s) and timeframe for flow through the fractured dolomite unit and into the underlying sandstone. The tracer test results demonstrated that flow through the dolomite fractures is discontinuous and unpredictable. It was determined that the fracture network is not sufficient to reliably distribute remedial amendments added to the infiltration gallery.

Pilot testing was then performed to evaluate the radius of influence of injection through specifically designed points, as well as possible injection rates. The same inert saline solution used for tracer testing was used for pilot testing purposes, along with EC monitoring to evaluate distribution within the subsurface. Pilot testing was performed in both the dolomite and deeper sandstone. New boreholes/ injection points were installed within the dolomite and sandstone, respectively, to facilitate injection activities.

The results of pilot testing in the dolomite unit indicate that delivery of remedial fluids would be unpredictable and distribution of fluid in the subsurface would be entirely dependent on fracture flow. It would be impossible to guarantee coverage in all areas; therefore contaminant mass would likely remain in certain areas after injection. The testing results in the sandstone unit demonstrated that the formation will readily accept remedial fluids at low injection pressures via specifically designed injection points.

The tracer and pilot test results indicated that attempting to directly treat contamination in the dolomite would not be effective. Therefore, the remedial action plan consists of treatment immediately below the dolomite to cut off the source of contamination feeding the downgradient

plume in the sandstone aquifer. A technology designed to sequester the mass flux of contaminants into the sandstone will be applied to the upper part of the sandstone aquifer in the area where mass loading occurs from the dolomite to the sandstone. The goal is to effectively create a horizontal barrier to vertical contaminant movement where subsequent natural biological processes will begin the dechlorination process, thereby keeping carbon sites open for continual sequestration.

A target treatment zone was established based on analysis of the dolomite and sandstone groundwater plumes. PlumeStop® liquid activated carbon, an in-situ sorption product which allows for subsequent natural dechlorination by ubiquitous microbes in the subsurface, has been selected to achieve remediation objectives. PlumeStop is a persistent, black, odorless liquid that is mixed with water to produce a solution. The design calls for approximately 5,985 gallons of concentrated PlumeStop (or 96,000 gallons of solution) to be applied within the 10-foot thick target treatment zone immediately below the transition zone from dolomite to sandstone. A network of 21 injection points has been installed over this area to facilitate injections. Groundwater samples were collected from three (3) of the injection points, and the results verify that mass loading to sandstone is occurring in the treatment zone.

Remediation performance monitoring will be conducted to demonstrate that the remedial actions change the groundwater chemistry, reduce the CVOC mass, and inhibit further contributions to the downgradient plume.

1.0 INTRODUCTION

EnviroForensics, LLC (EnviroForensics) has prepared this Remedial Action Design Report (Report) on behalf of Ray Gehrig and RayChris, Inc. formerly d/b/a Robinson's Cleaners (Robinson's) located at 1838 West Court Street in Janesville, Wisconsin (Site). This Report follows guidelines for remedial action design 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 the Site Investigation Report, dated February 17, 2017, and subsequent communications with the Wisconsin Department of Natural Resources (WDNR) regarding proposed remedial objectives and approach. The preliminary remedial action design was presented to WDNR in a meeting with Jeff Ackerman on October 20, 2017. The design details, including engineering plans and specifications, are provided in this Report. The need for additional remediation will be evaluated based on the results of groundwater monitoring performed after implementation of the remedial action presented herein.

2.0 SITE BACKGROUND

Site investigation activities began at the Site by others in 1999. EnviroForensics assumed management of investigation activities in 2011, and the characterization of the full nature and extent of contamination in all media was completed. This section describes the Site and presents a brief history.

2.1 Site Description

The Site is located in the southeast ¼ of the northwest ¼ of Section 35, Township 3 North, Range 12 East; WTM Coordinates 598365.7 (X); 245741.3 (Y). The topography at the Site is generally flat. In the surrounding area the land surface slopes downward toward the south to the Rock River. The Site is approximately 1.1 miles north of the Rock River. The location of the Site is depicted on **Figure 1**.

The former Robinson's Cleaners was located within the Sunnyside Shopping Center strip mall. The general layout of the Site and surrounding area, including Site features, is depicted on **Figure 2**. The Sunny Side Shopping Center strip mall is bound by West Court Street to the south, North Oakhill Avenue to the east, a city park to the north and commercial properties to the west. Single family residences are located to the northwest, northeast, and east.

2.2 Site History

The Site was agricultural land prior to 1958. Commercial development of the Site as the Sunnyside Shopping Center and the Sunnyside Gasoline Service Station occurred in 1958. Structural additions to the west side of the shopping center in the early 1960s provided room for additional tenants including Robinson's Cleaners. Deliveries and trash storage have always occurred on the north side of the building. Tetrachloroethene (PCE) solvent was utilized as the cleaning solvent for the entire duration of time that dry cleaning operations occurred at the Site. The PCE dry cleaning machine was located in the central part of the original portion of the building. Bulk PCE was likely stored in drums next to the dry cleaning machine. The Site is no longer operated as a dry cleaner.

The source of dry cleaning solvents in the subsurface is not specifically known. However, based on the distribution of subsurface impacts, it is likely that floor spills made their way to the subsurface through leaking sections of a floor drain lateral and other portions of the sanitary

sewer system within the building. The main point of leakage within the system appears to be exterior to the building on the north side of the facility. In addition, it is possible that there has been some leakage from filters disposed of in an outside dumpster which was also located in this general area.

In 2010, Shaw Environmental, Inc. (Shaw) performed a partial excavation of the contaminated soil source area down to bedrock and installed an array of slotted poly vinyl chloride (PVC) piping for possible use to vent the subsurface or for infiltration of amendments. Approximately 157.5 tons (105 cubic yards) of non-hazardous soil and 61.88 tons (41.25 cubic yards) of hazardous soil were removed. The total excavated area extended north 10.5 feet from the north wall of the building to the sanitary sewer and was 30 feet wide. The previously excavated area is shown on **Figure 3**. The layout of PVC pipes installed by Shaw are shown on **Figure 4**.

2.3 Nature and Extent of Contamination

Chlorinated volatile organic compounds (CVOCs) are present in soil and groundwater at the Site and downgradient locations. The compounds consist of PCE and the products of natural degradation of PCE including: trichlorethene (TCE); dichloroethene (DCE); and vinyl chloride. Groundwater impacts are present in the Platteville Dolomite, underlying St. Peter Sandstone, and in sand and in downgradient gravel deposits of an ancestral river valley. The extent of soil impacts has been defined, and the greatest concentrations of CVOCs appear very near the source area of release previously excavated by Shaw. Residual contamination in unconsolidated soil appears to be minor.

PCE released either from leaking sections of the sanitary sewer or from surface spills on the north side of the building migrated vertically to the dolomite bedrock. Groundwater in the Platteville Dolomite is unconfined and generally perched. Groundwater flows toward the south/southwest and into the unconsolidated valley fill deposits and St. Peter Sandstone where the Platteville Dolomite is eroded away. However, vertical leakage into the underlying St. Peter Sandstone also occurs along the path of flow between the Site building and point where the dolomite pinches out. The highest concentrations of PCE occur within the dolomite, very near the source of PCE release, and extend to the west/southwest in the general direction of groundwater flow.

Past groundwater monitoring data has shown that concentrations of PCE can fluctuate widely in wells near the source area. It is likely that fluctuations in groundwater concentrations are the

result of contaminated groundwater moving out of the fractured dolomite and then leaking into the underlying sandstone following significant precipitation events due to direct precipitation and possibly introduction of water from leaky storm water conveyance systems. The lateral extent of impacts within the Platteville Dolomite have been defined to the extent practical. The extent of the PCE groundwater plume in dolomite is depicted on **Figure 5**.

Groundwater within the St. Peter Sandstone is unconfined and flow is to the southeast near the Site. Further down-gradient, the direction of groundwater flow changes more to the south under the influence of the Rock River which flows to the west. A planar view of the plume in the St. Peter Sandstone/valley fill deposits is presented on **Figure 6**. The plume shape is curvilinear due to the influence of the Rock River, with concentrations of PCE above groundwater enforcement standards (ESs) diminishing laterally and with distance down-gradient. CVOC detections in groundwater extend to the south approximately 4,000 feet down-gradient of the release, but concentrations are below the groundwater enforcement standard prior to reaching the Rock River. The width of the CVOC plume is approximately 600 feet.

Dissolved phase impacts in the sandstone/unconsolidated valley fill are greatest directly beneath the dolomite in the source area and in down-gradient well clusters PZ-17, PZ-25, and PZ-48. PCE impacts appear to emanate from the dolomite source area and move into the St. Peter Sandstone, likely during precipitation events. The plume deepens in the sandstone under downward hydraulic gradients.

3.0 PRE-REMEDEAL TESTING

3.1 Tracer Testing

A tracer test was performed to determine potential remedial options and methods of application. The objective was to determine whether the former excavation basin could be a potential point of introduction for remediation substrates to the underlying fractured Platteville Dolomite, and whether the substrates would migrate vertically through the dolomite and into the deeper St. Peter Sandstone. As described in section 2.2, slotted piping was placed in the excavation basin prior to backfilling for the potential introduction of remedial liquids. The layout of the piping is shown on **Figure 4**. The tracer test was designed to evaluate if the slotted piping array would be appropriate for introduction of remedial fluids or if additional injection wells would be needed.

3.1.1 Monitoring Point Installation

Two (2) 2-inch diameter PVC temporary points screened on the top of the bedrock downgradient of the excavation basin were installed at the locations shown on the attached **Figure 7**. These points were designated TP-1 and TP-2. The intent of these wells was to monitor the potential flow over the bedrock surface as opposed to entering the dolomite fracture system. Since the surface of the dolomite in this area has been dry in the past, water levels in these points were measured by hand to determine the presence of the liquid tracer.

3.1.2 Tracer Injection

An inert sodium chloride (saline) tracer was selected for the test. An injection request was submitted to WDNR and an approval letter was issued on May 8, 2017. A copy of the approval letter is included in **Appendix A**. The saline tracer solution was mixed in above ground tanks using water from the City of Janesville municipal supply and salt designed for use in swimming pools. Seventy pounds of salt was dissolved in 2,000 gallons of water to produce a 4,200 ppm sodium chloride solution with an initial EC of 10 millisiemens per centimeter (mS/cm). The solution was introduced by pumping under minimal pressure from the mixing tanks directly into the existing infiltration gallery (i.e., the piping shown in red on **Figure 4**). The solution essentially filled the excavation basin and entered the dolomite fracture system gradually.

3.1.3 Tracer Test Monitoring

Monitoring points TP-1 and TP-2 were checked every 15 minutes during tracer injection for indications of flow on top of bedrock. No flow was observed in these points during the test. Electrical conductivity (EC) data loggers were set in downgradient observation wells to monitor tracer distribution within the subsurface. EC data loggers were installed in five (5) existing downgradient monitoring wells identified as MW-29, MW-29S, MW-30S, MW-30D, and MW-39S (**Figure 7**). Three (3) of the monitoring wells (MW-29S, MW-30S, and MW-39S) are screened within the fracture system of the dolomite. Wells MW-29 and MW-30D are screened at the top of the underlying sandstone where the primary CVOC plume propagates. The selected sandstone wells are located where it is theorized that the largest mass flux from the dolomite to the sandstone is occurring. The sandstone wells were monitored to identify vertical connection between the dolomite and sandstone units.

The data loggers were set to measure and record EC of groundwater on five minute intervals. Additionally, monitoring wells MW-12, MW-12S, MW-14, MW-27S, MW-27D, and MW-36D were monitored manually using a portable water quality meter. The data from the data loggers was accessed and downloaded once per week for two weeks, then every other week for two months. Manual monitoring was also conducted on this schedule.

3.1.4 Tracer Test Results

The EC in monitoring wells dolomite wells MW-29S and MW-30S increased during the test, indicating that the tracer solution flowed through the dolomite to the screened intervals of these wells. These wells are located approximately 110 feet south and 240 feet southwest of the infiltration gallery, respectively. Graphs showing electrical conductivity over time in these two monitoring wells are presented in **Appendix B**. A response was observed at MW-29S ten (10) days after injection. At MW-30S, a longer 15 day lag occurred between injection and EC response, which corresponds to the greater distance between MW-30S and the infiltration gallery.

The remaining dolomite and sandstone monitoring points/wells did not exhibit a response to tracer input (i.e., there was no observed change in EC compared to the baseline value in the monitoring well). This includes dolomite monitoring well MW-39S which lies directly between the infiltration gallery and MW-30S (see **Figure 7**). There was no indication of flow on top of bedrock at test points TP-1 and TP-2.

The tracer test demonstrated that some fracture flow in the dolomite occurs; however, flow is discontinuous due to mud or other obstructions filling the fracture traces, and demonstrates the unpredictable nature of the fracture connections. It is likely that transport of the tracer occurred through major interconnected bedding planes that act as preferential pathways for channelized flow. These channels may have acted as transport conduits for distribution of PCE contaminated groundwater to distant locations away from the source area, but would not be considered reservoirs for PCE contaminants. Though useful data was derived from the tracer test, it appears the fracture network is not sufficiently interconnected to reliably distribute remedial products added to the infiltration gallery. It is not clear that the remediation products would be reliably delivered to where the contamination resides in the dolomite.

3.2 Injection Pilot Testing

Pilot testing was performed to evaluate the radius of influence of injection through specifically designed points, as well as possible injection rates. The injection testing was done to determine if a more homogeneous distribution of remedial fluids could be obtained in the dolomite and underlying sandstone. The same inert saline solution used for tracer testing was used for pilot testing purposes, along with EC monitoring to evaluate distribution within the subsurface. A pilot test injection request was submitted to WDNR and an approval letter was issued on September 18, 2017. A copy of the approval letter is included in **Appendix A**.

3.2.1 Injection Point Installation

Two open boreholes were completed within the Platteville Dolomite to facilitate injection activities. Two (2) 4-inch diameter boreholes designated DIW-1 and DIW-2 were drilled through the entire thickness of the dolomite bedrock downgradient of the former site building. The boreholes are positioned among several monitoring wells utilized for EC monitoring as shown in **Figure 8**. The boreholes were terminated at the transition to sandstone; however, continuous borehole collapse occurred at DIW-2. Despite exhaustive efforts to clear the borehole, DIW-2 was only open to 22 feet below ground surface (bgs).

Two (2) 2-inch diameter PVC injection points designated SIW-1 and SIW-2 were installed within the St. Peter Sandstone. Construction of the injection points followed monitoring well construction requirements listed in WAC Chapter NR 141. The injection points are 65 feet deep and screened within the upper 15 feet of sandstone bedrock. In order to determine potential

radius of influence, SIW-1 was installed 30 feet from monitoring well MW-12, and SIW-2 was installed 15 feet from monitoring well MW-27S as shown on **Figure 9**.

3.2.2 Dolomite Test Injection

In the dolomite boreholes, the injection occurred through a straddle packer assembly placed at various depths to potentially identify intervals of high permeability. The assembly consisted of a 48-inch long metal screen between two inflatable packers. The saline solution was mixed in batches by adding 20 pounds of sodium chloride with approximately 450 gallons of potable water to produce a target solution concentration of 5,300 ppm with an initial EC of 11 to 12 mS/cm.

The injection intervals at DIW-1 were as follows (in feet bgs): 33-37, 29-33, 25-29, and 21-25. As described above, borehole collapse occurred at DIW-2, so only the uppermost interval was accessible for injection. Injection rates ranged from 2 to 19 gallons per minute (gpm) at pressures of 40 to 50 pounds per square inch (psi). The highest injection rate of 19 gpm was achieved at DIW-1 in the 25 to 29 foot depth interval. The lowest injection rate of 2 gpm was recorded at the deepest interval (33 to 37 feet bgs). At DIW-2, an injection rate of 16 gpm was achieved in the 18-22 foot depth interval at an average pressure of 15 psi. The total volume of solution injected into DIW-1 and DIW-2 was 645 gallons and 695 gallons, respectively.

3.2.3 Sandstone Test Injection

Injection into the sandstone was conducted by connecting directly to the PVC injection points. The batch solution mixing process was identical to that described for the dolomite test, with the exception of a smaller 250 gallon mixing tank. The saline solution was mixed in batches by adding 11 pounds of sodium chloride with approximately 250 gallons of potable water to produce the target solution concentration of 5,300 ppm.

At both injection points, injection pressures of 10 to 15 psi resulted in flow rates of 5 to 10 gpm. The total volume of solution injected into SIW-1 and SIW-2 was 460 gallons and 725 gallons, respectively. Additional solution was injected at SIW-2 because we did not see an immediate response at the MW-27 monitoring points located approximately 15 feet from SIW-2.

3.2.4 Pilot Test Monitoring

Monitoring was performed to identify breakthrough of the saline solution at the monitoring wells. For the dolomite test, EC data loggers were installed in five (5) existing monitoring wells (MW-27S, MW-29S, MW-20S, MW-36S and MW-39S) shown in **Figure 8**. These wells are screened within the fracture system of the dolomite. Monitoring was conducted during the injection process and for two (2) days following the injections.

For the sandstone test, EC data loggers were installed in three (3) existing monitoring wells identified as MW-12, MW-27D, and MW-27DS (see **Figure 9**). Monitoring was conducted during the injection process and for two (2) weeks following the injections. The data loggers were set to record EC on 5-minute intervals.

3.2.5 Pilot Test Results

During injection into DIW-1 at the 29-33 feet depth interval, an almost immediate response was observed in monitoring well MW-39S which is located 25 feet west of DIW-1. The EC increased from a baseline of 1,000 µS/cm to approximately 7,000 µS/cm, indicating a direct fracture connection between the two wells. None of the other dolomite monitoring wells exhibited a response, although the EC at MW-29S did increase slightly several hours after the pilot injections. Graphs showing EC over time in MW-39S and MW-29S are included in **Appendix C**.

The results of pilot testing in the dolomite unit indicate that delivery of remedial fluids would be unpredictable and distribution of fluid in the subsurface would be entirely dependent on flow within large open fractures. It would be impossible to guarantee coverage in all areas, and residual contaminant mass in mud-filled, or minor open fractures may never be treated by injection methods.

The monitoring results associated with pilot testing in the sandstone unit include:

- A spike of approximately 100 µS/cm was observed at MW-12 shortly after injection in SIW-1, which indicates a direct connection with the injection well; and

- A gradual increase in EC was observed at MW-27DS during the week following injection in SIW-2; however, we could not be certain if this was a response to injection, or just natural fluctuations in EC over the time period.

It is possible that a greater volume of solution was needed to fill the pore volume in the monitored zone and produce a more obvious EC response in the monitoring wells. However, the testing did demonstrate that the sandstone unit will readily accept remedial fluids at low injection pressures via specifically designed injection points. Based on the pilot test data and observations, EnviroForensics estimates a 20-foot radius of influence is readily achievable.

4.0 REMEDIAL ACTION PLAN

The remedial action plan consists of active trapping and subsequent natural biological treatment to cut off the source of contamination feeding the downgradient plume in the sandstone aquifer. The majority of residual contaminant mass is contained within the mud-filled fractures and other minor open fractures within the dolomite unit. As demonstrated by the pilot testing results, treating contamination in the dolomite would be very difficult given the unpredictable nature of the fracture network and likely uneven distribution of remedial products. Therefore, rather than attempting to directly treat the dolomite, a persistent liquid activated carbon technology will be applied to the upper part of the sandstone aquifer in the area where dissolved contamination is transferred from the dolomite to the sandstone.

Directly treating the entire sandstone plume, which extends approximately 4,000 feet downgradient of the source, is not economically feasible. Additionally, there are no exposure routes associated with the groundwater impacts. The downgradient plume is expected to gradually attenuate once the source of contamination is actively managed. Periodic groundwater sampling will be conducted to monitor the effect of this approach on groundwater conditions.

4.1 Remediation Objectives

The objective of remediation is to greatly reduce CVOC mass loading from the dolomite to the sandstone aquifer. CVOC concentrations in the downgradient plume are expected to decrease gradually as mass loading to the sandstone aquifer is reduced.

4.2 Remedial Design

A 24,000 square foot treatment area was established based on analysis of the dolomite and sandstone groundwater plumes. A network of 21 injection points was specified for the treatment area, each with an estimated radius of influence of 20 feet. The layout of the injection points is shown on **Figure 10**. The goal is to effectively create a horizontal barrier to contaminant movement from the dolomite to the underlying sandstone.

PlumeStop® liquid activated carbon, an in-situ sorption product which allows for subsequent natural dechlorination by ubiquitous microbes in the subsurface, has been selected to achieve remediation objectives. A manufacturer's description of the product is provided in **Appendix D**. PlumeStop is non-toxic and safe to handle, and simple to mix into solution and apply by

injection. PlumeStop is composed of very fine particles of activated carbon (1-2µm) suspended in water. Injected into the top of the sandstone aquifer, it will bind and coat sand grains of the bedrock matrix creating hundreds of thousands of carbon sites for contaminants to bind to. Contaminants leaching out of the overlying dolomite bedrock will enter the top of the sandstone water bearing zone, where they will come out of solution and sorb onto the carbon sites attached to the sand grains. The surface of these carbon coated sand grains concentrate diffuse contaminants and create beneficial microhabitats for microbial growth and contaminant breakdown. The proposed barrier is designed to have excess sorption sites to handle contaminant leaching for a period of time in excess of two or more decades. Contaminant trends in the dolomite unit (consistent decline indicating declining mass holding) suggest that even at the lower limit of carbon activity, a majority of mobile impact will have been sequestered and dechlorinated. In addition, as bacteria break-down contaminants the carbon sorption sites once again become available to absorb additional contaminants.

4.2.1 Permitting

EnviroForensics will prepare an Injection Request document, as required, to obtain approval and an injection permit from the WDNR. A Wisconsin Pollutant Discharge Elimination System (WPDES) permit, which is also required for remedial injection activities, was issued during the site investigation and remains valid.

4.2.2 Injection Point Installation and Groundwater Sampling

The 21 injection points for full-scale remediation were installed October 30 – November 3; and November 13 – 16, 2017. The boreholes were advanced by air and water rotary drilling methods. The points were constructed of 2-inch diameter PVC with a 10-foot, 0.020 slot screen set at 53-63 feet bgs. Depth to sandstone in the source area varies between 42-50 feet bgs, and the upper 5-10 feet of sandstone transitions from dolomite to sandstone, is hard, and fractured. Therefore, screen depths were selected to allow a more homogeneous distribution of remedial fluids just below this transition zone. Filter pack sand was placed from the bottom of the borehole to two (2) feet above the screen, followed by two (2) feet of fine sand and three (3) feet of bentonite chips. The remainder of the annular space was filled with neat cement grout with 10% bentonite. This grout mixture is the recommended seal to prevent daylighting of remedial fluids during injection. A traffic-rated flush-mount vault set in a concrete pad was installed at the surface for protection and access. A threaded fitting was added to the top of the riser for future connection to injection hose.

Groundwater samples were collected from injection points SIW-6, SIW-11, and SIW-12 to assess CVOC concentrations in sandstone in that area and confirm that mass loading is occurring in the center of the treatment zone. Prior to sample collection, 50 gallons of water was purged from each point to remove any drilling fluids from the formation. The samples were collected with disposable bailers and sent by courier to a state-certified laboratory for analysis of volatile organic compounds (VOCs) by EPA Method 8260.

The groundwater sample results are listed in the laboratory report provided in **Appendix E**. PCE and TCE were detected in each of the samples. The PCE concentrations ranged from 520 to 2,200 micrograms per liter (µg/L), and the TCE concentrations ranged from 7.6 to 34 µg/L. No other compounds were detected in the samples. The sampling results verify that mass loading to sandstone is occurring in the target treatment zone from persistent bleeding of contaminated groundwater out of the overlying dolomite.

4.2.3 PlumeStop Injection

EnviroForensics and Regenesis Remediation Services developed an injection design based on groundwater CVOC concentrations and the hydrogeological properties of the sandstone aquifer. The design calls for approximately 5,985 gallons of concentrated PlumeStop (or 96,000 gallons of solution) to be applied within the 10-foot thick target treatment zone immediately below the transition zone from dolomite to sandstone. Design parameters are presented in **Appendix F**.

PlumeStop is a black, odorless liquid shipped in concentrated form in 300 gallon totes. The concentrated PlumeStop will be mixed with water obtained from the City of Janesville to produce a solution. For each injection point, 285 gallons of PlumeStop will be mixed with 4,280 gallons of water to produce the appropriate solution for injection. A total of approximately 96,000 gallons of PlumeStop solution, or 4,565 gallons per injection point, will be added to the treatment zone.

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 hose. Pressure and flow rate will be monitored and recorded to confirm that injection design parameters are met. If the formation will not accept fluid at certain injection locations, the solution will be re-distributed to other injection points. It is anticipated that the injection event can be completed in approximately 5 weeks.

4.3 Performance Monitoring

A remediation performance monitoring program has been developed for the first year following injections. It is designed to demonstrate that the remedial actions have changed the groundwater chemistry, begun to reduce the VOC mass, and inhibited further contributions to the downgradient plume. Monitoring in subsequent years will be recommended after evaluation of the initial data.

Monitoring wells near the treatment zone will be monitored on a quarterly basis for the contaminants of concern as well as geochemical parameters to allow for an evaluation of changes in aquifer conditions resulting from the introduction of PlumeStop. Monitoring wells further from the source area have been selected for sampling because they either define the plume boundary or could indicate potential changes in magnitude near the centerline of the plume. These wells will be sampled less frequently, either semi-annually or once in the first year of monitoring depending on location and historical concentration trends.

The monitoring program is detailed in **Table 1**, including sample frequency, and monitoring wells selected for sampling are depicted on **Figure 11**. Samples collected from six (6) monitoring wells near the treatment zone will be analyzed for VOCs as well as total and dissolved iron, sulfate, nitrate, nitrite, total organic carbon (TOC), and dehalococcoides bacteria. Groundwater purging and sample collection from these wells will be conducted using standard low-flow (minimal drawdown) methods. Field parameters including pH, specific conductivity, temperature, ORP, and DO will be measured during purging and recorded on the groundwater field sampling form. The remaining 31 wells listed on **Table 1** will be sampled for VOCs only, using passive diffusion bags (PDBs). The PDBs will be deployed for a minimum of 30 days before samples are collected. Groundwater samples will be submitted to a state-certified laboratory for all analyses. Duplicate samples and equipment blanks will be collected at the rate specified in NR 716.13 for quality assurance/quality control (QA/QC) purposes.

Groundwater elevation measurements will be collected before, during, and after injections to evaluate the temporary effect of injection on potentiometric surfaces and flow direction. Measurements will be collected from wells within and near the treatment area, including MW-20D, MW-27D, MW-27DS, MW-29, MW-30D, MW-31D, and MW-36D. The depth to water in each well will be measured to the nearest 0.01 foot using an electronic water level indicator.

Groundwater elevation measurements will not be collected from downgradient monitoring wells. The potentiometric surfaces in the dolomite and sandstone/valley fill units have been consistent for several years, with minimal variation. Sufficient data has been collected to understand groundwater flow and there is no reason to suspect that the inferred flow directions in the dolomite or sandstone/valley fill units will change.

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.

4.4 Proposed Implementation Schedule

Planning for the injection has been initiated, and the injection points have been installed. The Injection Request will be submitted to WDNR in early 2018. The timing of injections will depend on approval of the Injection Request; however, it is anticipated that the injection event will be performed during Spring 2018. It will take approximately 27 field days to complete the injections. The first performance monitoring event will occur two (2) months after injections. The three (3) subsequent monitoring events will be conducted quarterly.

4.5 Reporting

Documentation of remediation will be submitted within 60 days after completion of the injections in accordance with NR 724.15. 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 Robinson's Cleaners
Janesville, Wisconsin

Parameter	VOCs	Total Fe	Dissolved Fe	Sulfate	Nitrate	Nitrite	TOC	Dehalococcoides
MW-12	S							
MW-13	S							
MW-20D	Q	Q	Q	Q	Q	Q	Q	S
PZ-25D2	A							
MW-27D	Q	Q	Q	Q	Q	Q	Q	S
MW-27DS	Q	Q	Q	Q	Q	Q	Q	S
MW-29	Q	Q	Q	Q	Q	Q	Q	S
MW-30D	Q	Q	Q	Q	Q	Q	Q	S
MW-31D	S							
MW-32	S							
MW-35D	A							
MW-36D	Q	Q	Q	Q	Q	Q	Q	S
MW-39S	A							
PZ-42D1	S							
PZ-42D2	S							
PZ-42D3	S							
PZ-43D1	S							
MW-44S	A							
PZ-44D1	S							
PZ-44D2	S							
PZ-46D1	A							
PZ-46D2	A							
PZ-46D3	A							
PZ-47D1	S							
PZ-47D2	S							
PZ-47D3	S							
PZ-49D1	S							
PZ-49D2	S							
PZ-49D3	S							
PZ-49D4	S							
MW-51S	A							
PZ-52D1	A							
PZ-52D2	A							
PZ-52D3	A							
PZ-53D1	S							
PZ-53D2	S							
PZ-53D3	S							

Notes:
This program applies to the first year (4 quarters) following injections only
A = Single sample collected approximately one year after injections
Q = Sample collected quarterly
S = Sample collected semi-annually

VOCs - Volatile Organiuc Compounds
Fe = Iron
TOC = Total Organic Carbon

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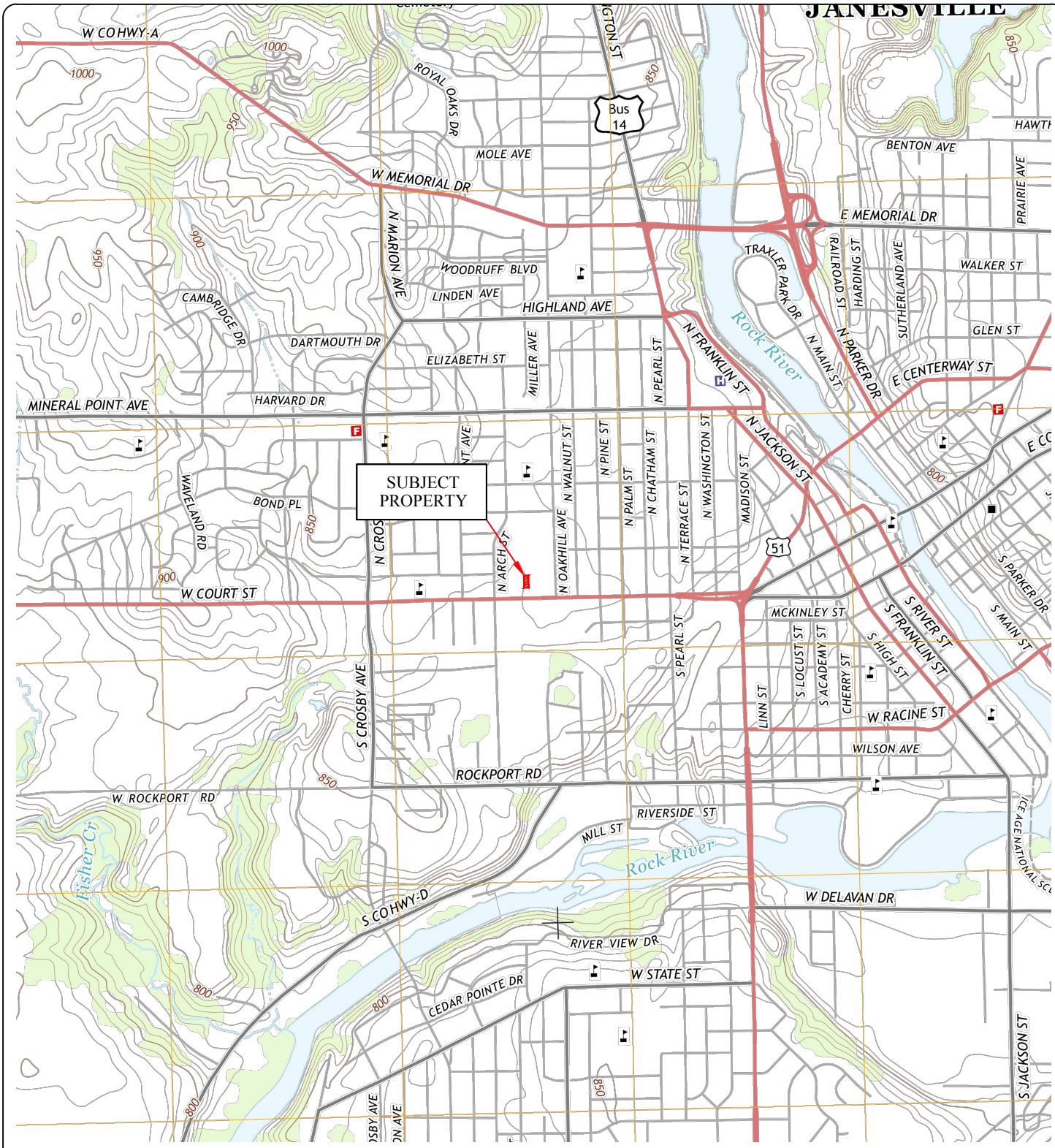
FIGURES



Scale 1:24,000

1 1/2 0 1 Mile

1000 0 1000 2000 3000 4000 5000 6000 7000 Feet

1 .5 0 1 Kilometer

N

Source: US Geological Survey, Janesville, Wisconsin Quadrangle, 7.5 Minute Series, 2013

No.	Date	Revision	Approved

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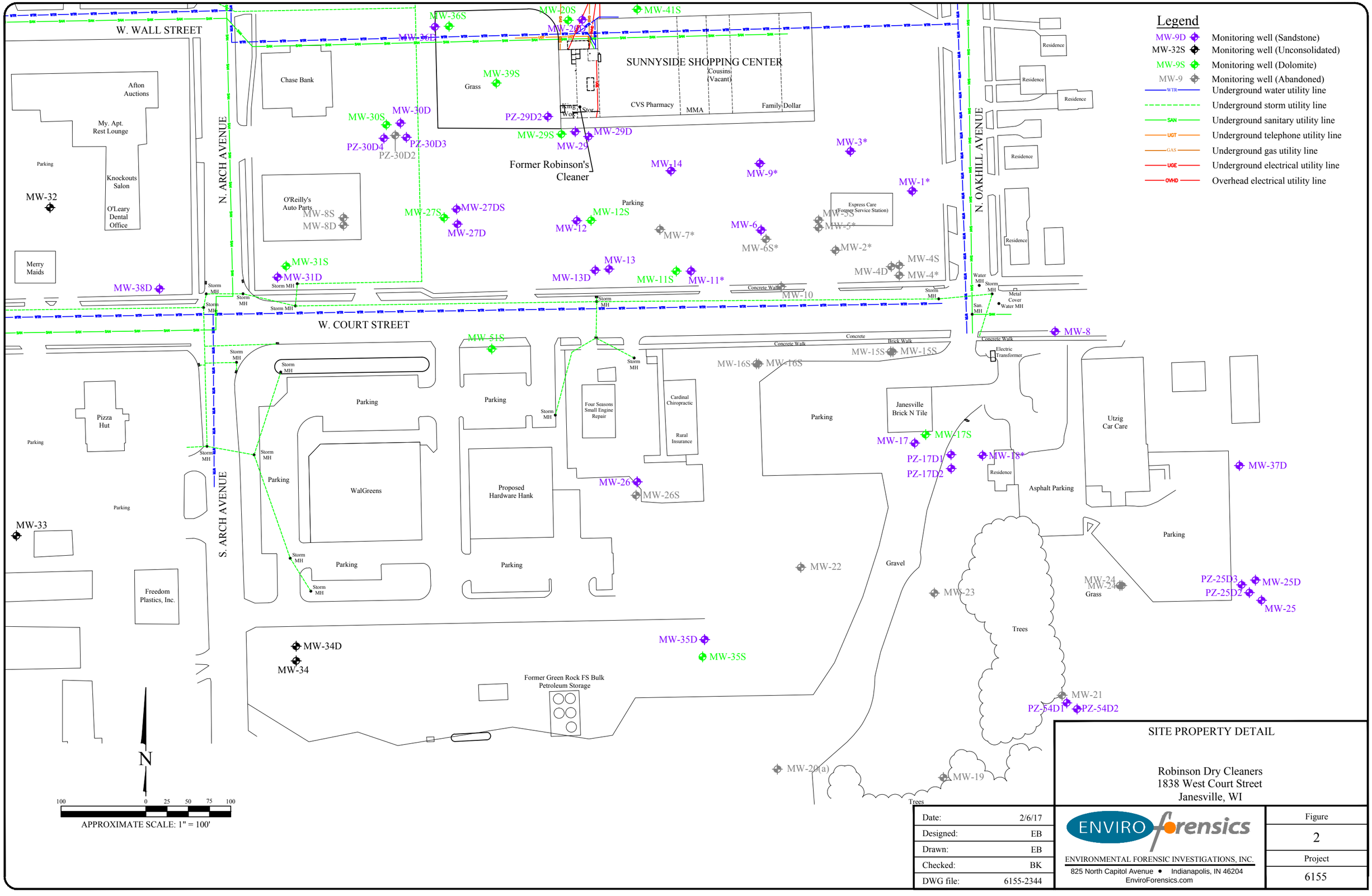
Date:	02/25/11
Designed:	SP
Drawn:	SP
Checked:	KG
DWG file:	62720-11

SITE LOCATION MAP

Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Figure 1

Project 6155



Legend

- MW-9D — Monitoring well (Sandstone)
- MW-32S — Monitoring well (Unconsolidated)
- MW-9S — Monitoring well (Dolomite)
- MW-9 — Monitoring well (Abandoned)
- WTR — Underground water utility line
- Underground storm utility line
- SAN — Underground sanitary utility line
- UGT — Underground telephone utility line
- GAS — Underground gas utility line
- UGE — Underground electrical utility line
- OVHD — Overhead electrical utility line

SITE PROPERTY DETAIL

Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Date:	2/6/17
Designed:	EB
Drawn:	EB
Checked:	BK
DWG file:	6155-2344

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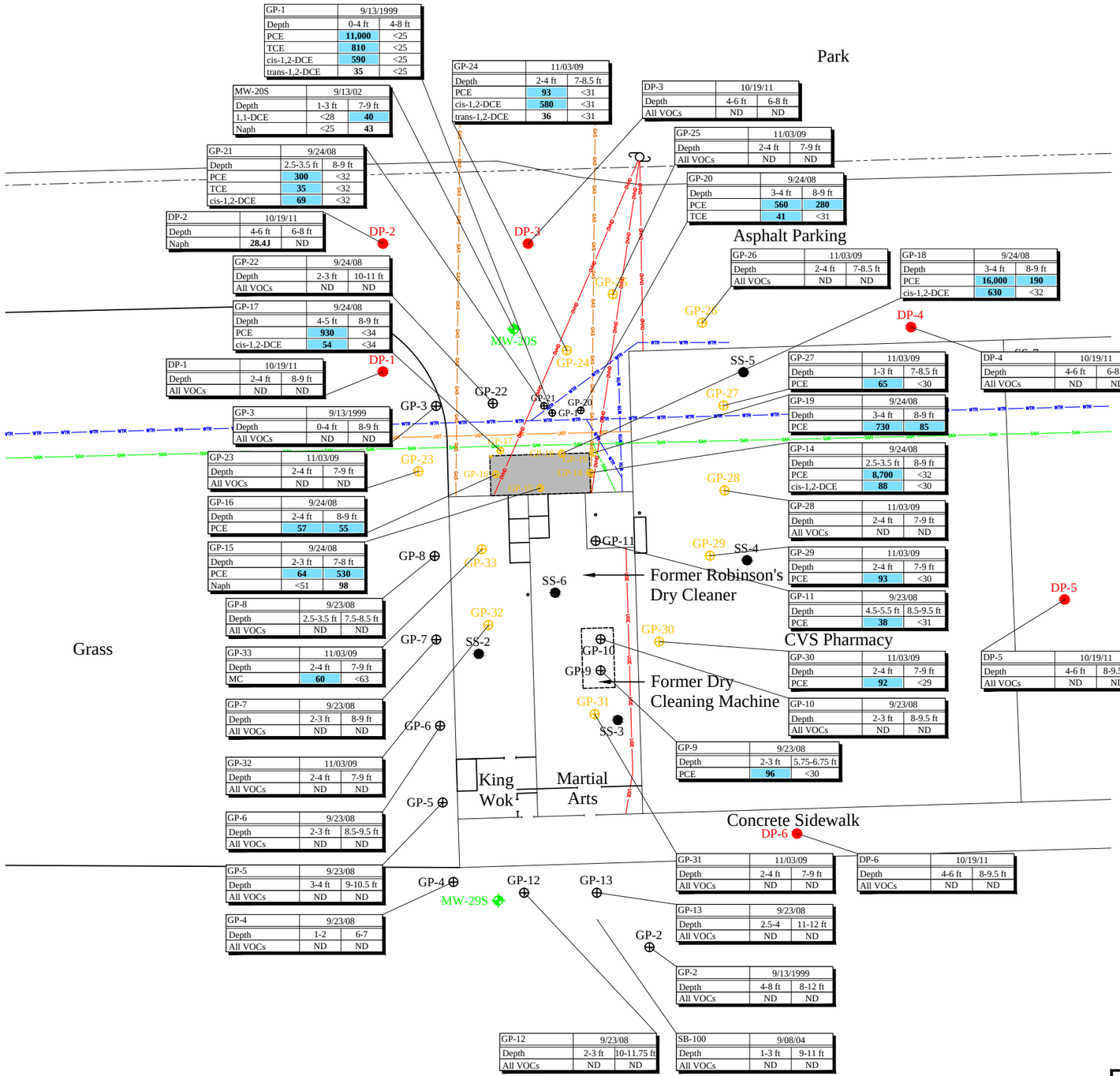
Figure 2

Project 6155



Analytes (µg/kg)	Soil Residual Contaminant Level		
	Ingestion		Soil to Groundwater
	Industrial	Non-Industrial	
PCE	145,000	33,000	4.5
TCE	8,410	1,300	3.6
cis-1,2-DCE	2,340,000	156,000	41.2
trans-1,2-DCE	1,850,000	1,560,000	62.6
1,1-DCE	1,190,000	320,000	5.0
MC	1,150,000	61,800	2.6
Naph	24,100	5,520	658.2

Notes:
1. Bold, shaded orange values are above WDNR Non-Industrial Residual Contaminant Levels
2. Bold, shaded green values are above WDNR Industrial Residual Contaminant Levels
3. Bold, shaded blue values are above WDNR Soil to Groundwater Residual Contaminant Levels
4. Bold values exceed laboratory detection levels.
5. J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.
6. Samples analyzed using EPA SW-846 Method 8260 with Prep Method 5030B
7. µg/kg = micrograms per liter = parts per billion (ppb)
7. PCE = Tetrachloroethene
8. TCE = Trichloroethene
9. cis-1,2-DCE = cis-1,2-Dichloroethene
10. trans-1,2-DCE = trans-1,2-Dichloroethene
11. 1,1-DCE = 1,1-Dichloroethene
8. MC = Methyl Chloride
9. Naph = Napthalene

Legend

- Property boundary
- WTR — Underground water utility line
- SAN — Underground sanitary utility line
- UGT — Underground telephone utility line
- GAS — Underground gas utility line
- UGE — Underground electrical utility line
- OVHD — Overhead electrical utility line
- Excavation area
- MW-9S — Monitoring well (Dolomite)
- GP-1 — Soil boring sample location (GeoProbe)
- GP-23 — Soil boring sample location (GeoProbe), 11-2009
- DP-1 — Direct-push boring sample location

SOIL SAMPLE ANALYTICAL RESULTS AND EXCAVATION AREA

Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Date:	12/11/12
Designed:	MMM
Drawn:	MMM
Checked:	KG
DWG file:	66628-12

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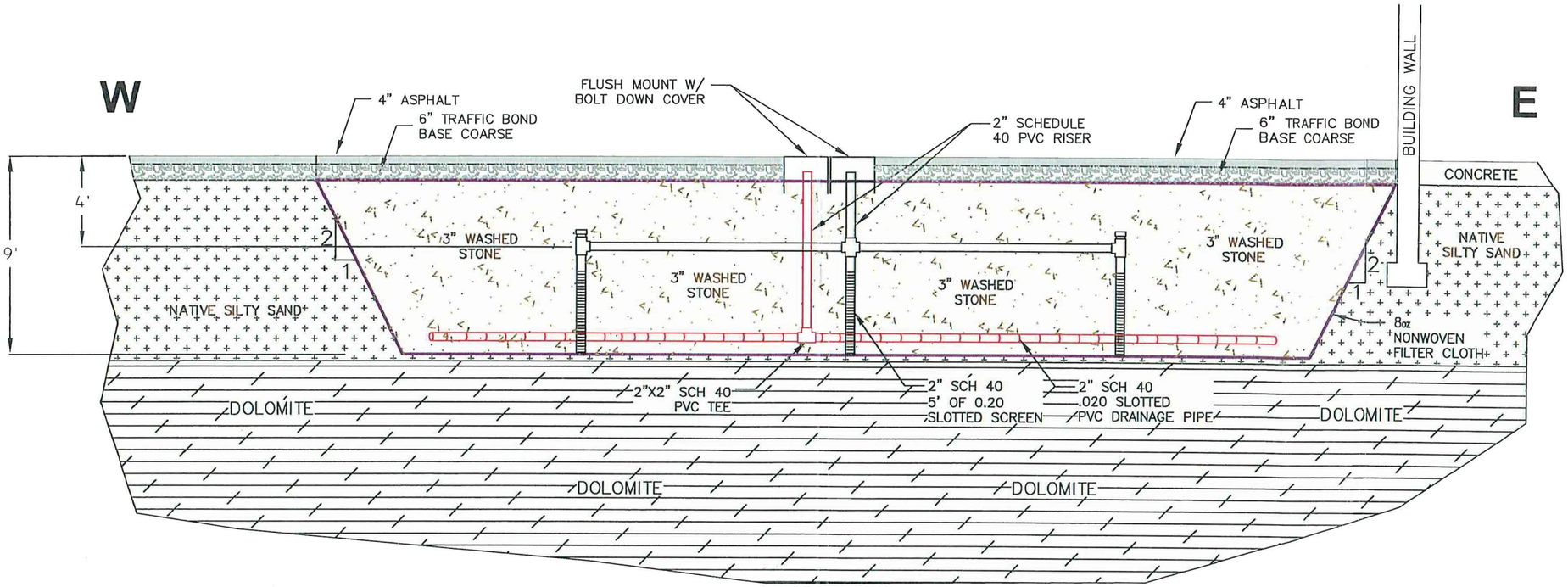
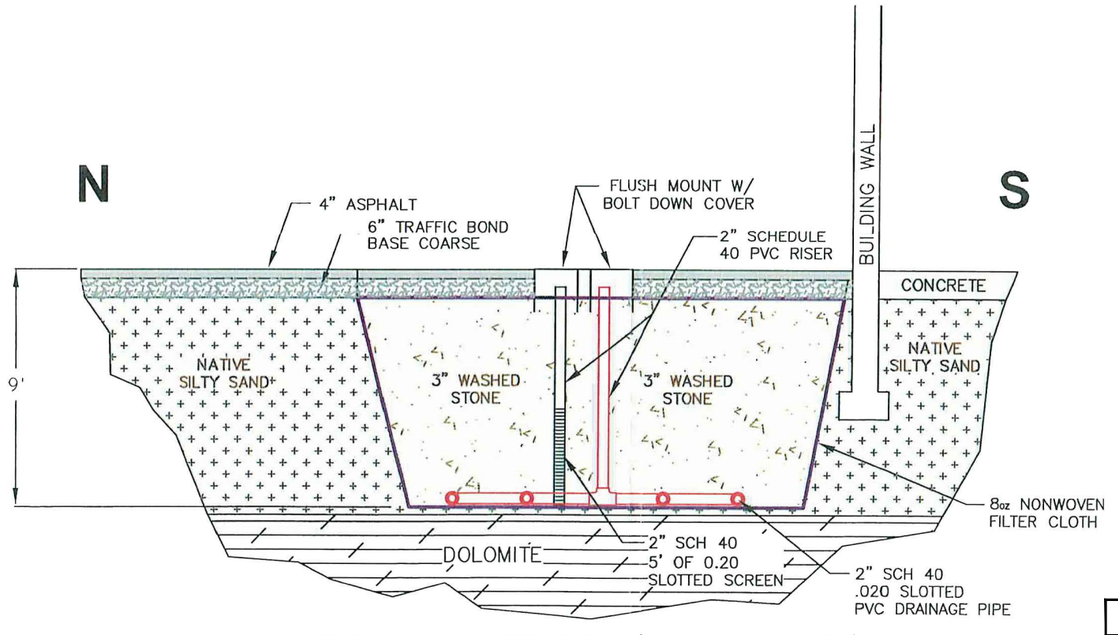
Figure
3
Project
6155

Legend



EXCAVATION SECTION (WEST–EAST)



EXCAVATION SECTION (NORTH–SOUTH)

SCHEMATIC OF INSTALLED VENT AND INFILTRATION PIPING
Source: Shaw Environmental Consultants - 2010
Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Date:	2/8/17
Designed:	EB
Drawn:	EB
Checked:	WF
DWG file:	6155-2347

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Figure	4
Project	6155

MW-40S	6/15/16
CVOCs	ND

MW-36S	3/17/16	6/17/16
PCE	**360**	**830**
TCE	**60**	**114**
cis-1,2-DCE	**28.2**	**44**
Vinyl Chloride	<0.85	**1.75 J**

MW-20S	6/13/16
PCE	**4.1**
TCE	**0.56 J**
cis-1,2-DCE	**9.4**
trans-1,2-DCE	**0.72 J**

MW-41S	6/14/16
CVOCs	ND

MW-39S	3/18/16	6/14/16	9/15/16	12/21/16
PCE	**4,600**	**4,600**	**4,700**	**3,900**
TCE	**244**	**268**	**226**	**182**
cis-1,2-DCE	**102**	**96**	**84**	**50 J**

MW-30S	3/15/16	6/14/16
PCE	**570**	**1,370**

MW-29S	3/18/16	6/14/16	9/13/16
PCE	**200**	**203**	**24.1**
TCE	**7.4**	**4.2**	<0.47
cis-1,2-DCE	**13.7**	**5.6**	<0.47
trans-1,2-DCE	**0.77 J**	<0.54	<0.54

MW-9S	6/14/16
CVOCs	ND

MW-27S	3/17/16	6/14/16	9/13/16
PCE	**193**	**520**	**200**
TCE	**10**	**15.5**	**6.6 J**
cis-1,2-DCE	**12.4**	**17.5**	**5.4 J**

MW-12S	3/17/16	6/14/16
PCE	**85**	**15.9**
TCE	**6.1**	**1.84**
cis-1,2-DCE	**11.1**	**5.7**
Vinyl Chloride	<0.17	**0.47 J**

MW-11S	6/14/16
CVOCs	ND

MW-51S	3/17/16	6/17/16	9/13/16	12/21/16
PCE	<0.49	**1.66**	**1.81**	**1.52**

MW-17S	3/15/16	6/17/16
CVOCs	ND	ND

MW-35S	6/16/16
CVOCs	ND

Legend

- Property boundary
- MW-9S — Monitoring well (Dolomite)
- PCE Isoconcentration >5
- Dashed boundaries are inferred
- Approximate extent of Dolomite

Analytes	Public Health Enforcement Standard	Public Health Preventive Action Limit
PCE	**5**	**0.5**
TCE	**5**	**0.5**
cis-1,2-DCE	**70**	**7**
trans-1,2-DCE	**100**	**20**
Vinyl Chloride	**0.2**	**0.02**

Notes:
1. Bold, shaded blue values are above Public Health Preventive Action Limits
2. Bold, shaded orange values are above Public Health Enforcement Standards
3. Results reported in micrograms per Liter (ug/L)
4. PCE = Tetrachloroethene
5. TCE = Trichloroethene
6. cis-1,2-DCE = cis-1,2-Dichloroethene
8. trans-1,2-DCE = trans-1,2-Dichloroethene
9. ND = CVOCs not detected
10. J = Estimated concentration below reporting limit
11. NS = Not sampled

N

100 0 25 50 75 100

APPROXIMATE SCALE: 1" = 100'

EXTENT OF CVOC IMPACTS IN PLATTEVILLE DOLOMITE

Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Date:	12/13/16
Designed:	EB
Drawn:	EB
Checked:	WF
DWG file:	6155-2189

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Figure 5

Project 6155

EXTENT OF CVOC IMPACTS WITHIN THE ST. PETER SANDSTONE/VALLEY FILL

Robinsons Dry Cleaners
1838 West Court Street
Janesville, WI

Legend

MW-32S Monitoring well (Unconsolidated)
MW-9D Monitoring well (Sandstone)

Analytes	Public Health Enforcement Standard	Public Health Preventive Action Limit
PCE	5	0.5
TCE	5	0.5
cis-1,2-DCE	70	7
trans-1,2-DCE	100	20
Vinyl Chloride	0.2	0.02

Notes:
1. Bold, shaded blue values are above Public Health Preventive Action Limits
2. Bold, shaded orange values are above Public Health Enforcement Standards
3. Results reported in micrograms per Liter (ug/L)
4. PCE = Tetrachloroethene
5. TCE = Trichloroethene
6. cis-1,2-DCE = cis-1,2-Dichloroethene
8. trans-1,2-DCE = trans-1,2-Dichloroethene
9. * = Monitoring well screened across both dolomite and sandstone
10. ND = CVOCs not detected
11. J = Estimated concentration below reporting limit
12. NS = Not sampled

PCE Isoconcentration >400
Dashed boundaries are inferred

Site
Former Robinson's Cleaners
SUNNY SIDE SHOPPING CENTER (1820–1902 W. COURT ST.)
CHASE BANK (35 N. ARCH ST.)
JANESVILLE BRICK AND TILE
UTICA-CAR CARE
GARAGE
McKinley Street
Court Street
Laurel Avenue
Wilson Avenue
N. Arch Street
N. Oakhill Avenue
N. Walnut Street
N. Pine Street
N. Chatham Street
N. Pearl Street
N. Terrace Street
N. Washington Street
Madison Street
N. Academy Street
W. Gateway Street
S. Wash Street
S. Arch Street
S. Palm Street
S. Pearl Street
S. Washington Street
S. Walnut Street
S. Chatham Street
Center Avenue
Linn Street
S. Locust Street
S. Academy Street

MW-29D2	3/18/16	6/14/16
CVOCs	ND	ND

MW-20D	6/13/16
PCE	1,200
TCE	21
cis-1,2-DCE	42
trans-1,2-DCE	1.38 J
Vinyl Chloride	0.473 J

MW-36D	6/17/15
CVOCs	ND

MW-29	3/18/16	6/14/16	9/13/16
PCE	82	158	113
TCE	1.11 J	5.7	5.4 J
cis-1,2-DCE	0.52 J	5.0	3.2 J

MW-14	3/17/16	3/17/16	9/13/16
PCE	154	278	480
TCE	2.9 J	3.8	6.7 J
cis-1,2-DCE	2.9 J	2.62	5.1 J

MW-40D	6/15/15
CVOCs	ND

MW-29D	6/14/16
CVOCs	ND

MW-13D	3/16/16	6/14/16	9/13/16
PCE	73	109	150
TCE	3.2	2.58	4.2
cis-1,2-DCE	0.56 J	<0.45	<0.43

MW-30D	3/15/16	6/14/16
PCE	139	217
TCE	1.53	1.91
cis-1,2-DCE	0.62 J	0.71 J

MW-13	3/16/16	6/14/16	9/13/16
PCE	490	720	650
TCE	8.4 J	8.4 J	7.4 J

MW-30D3	3/15/16	6/14/16	9/13/16
CVOCs	ND	ND	ND

MW-9	6/14/16
CVOCs	ND

MW-30D2	3/15/16	6/27/16
PCE	186	
TCE	22.1	ABANDONED
cis-1,2-DCE	12.5	

MW-3	6/15/16
PCE	23.5

MW-1	6/15/16
PCE	16

MW-30D4	3/15/16	6/14/16	9/13/16
CVOCs	ND	ND	ND

MW-6	6/15/16
PCE	91
TCE	1.76
cis-1,2-DCE	1.87

MW-8	3/18/16	6/15/16
PCE	196	121
TCE	9.1	4.0
cis-1,2-DCE	8.4	1.94

MW-32	3/16/16	6/15/16	9/16/16	12/21/16
PCE	6.9	8.9	23.6	9.6

MW-17	3/15/16	6/17/16
PCE	11.8	<2.45
TCE	47	22.3
cis-1,2-DCE	22.8	18.6
trans-1,2-DCE	8.6	8.7
Vinyl Chloride	2.7	3.4

MW-27DS	3/17/16	6/14/16	9/13/16
PCE	92	284	214
TCE	1.79	3.06	3.4

PZ-17D1	3/16/16	6/17/16	9/13/16
PCE	1,240	1,700	510
TCE	13.7 J	16.9	7.1 J
cis-1,2-DCE	6.0 J	9.7 J	<4.5

MW-27D	3/17/16	6/14/16	9/13/16
PCE	266	430	460
TCE	<0.47	<0.47	5.7 J

MW-18	6/17/16
TCE	0.77 J

PZ-17D2	3/16/16	6/17/16	9/13/16
PCE	14.3	26.5	45
TCE	<0.47	<0.47	0.80 J

MW-38D	6/15/16
PCE	35

MW-31D	6/15/16
PCE	215

PZ-25D2	3/16/16	6/16/16
PCE	730	1,110
TCE	19.1	22.9
cis-1,2-DCE	5.1 J	6.0 J

MW-12	3/17/16	6/14/16
PCE	440	820
TCE	27.2	15.4
cis-1,2-DCE	29.6	17.7
trans-1,2-DCE	0.63 J	<5.4

MW-25	3/15/16	6/16/16
PCE	80	67
TCE	12.2	5.3
cis-1,2-DCE	<2.25	0.74 J

MW-11	6/15/16
PCE	4.4
TCE	2.02
cis-1,2-DCE	14.3

MW-26	6/17/16
PCE	64

MW-37D	6/17/16
PCE	102
TCE	10.8
cis-1,2-DCE	4.3

PZ-25D3	3/15/16	6/16/16
PCE	129	179
TCE	4	4.3
cis-1,2-DCE	0.73 J	0.70 J

MW-33	3/16/16	6/15/16	9/13/16
CVOCs	ND	ND	ND

MW-35D	6/16/15	12/21/15
CVOCs	ND	ND

PZ-25D2	3/15/16	6/16/16
CVOCs	ND	ND

MW-34D	6/16/16
CVOCs	ND

PZ-54D1	3/17/16	6/16/16	9/14/16	12/21/16
PCE	72	166	187	155
TCE	3.10	5.2	4.9	4.6
cis-1,2-DCE	0.71 J	3.4	3.6	2.58

MW-34	3/16/16	6/16/16	9/13/16
CVOCs	ND	ND	ND

PZ-43D1	6/16/16
PCE	11.2

MW-43S	6/16/16	12/21/16
CVOCs	ND	ND

PZ-43D2	6/16/16	12/21/16
CVOCs	ND	ND

PZ-54D2	3/17/16	6/16/16	9/14/16	12/21/16
PCE	33	126	122	107
TCE	1.19 J	1.81	1.44 J	1.33 J

PZ-48D1	3/16/16	6/16/16	9/13/16	12/21/16
PCE	470	790	810	700
TCE	16.9	16.2	24.2	22.45
cis-1,2-DCE	5.8 J	5.1 J	5.3 J	<4.5

PZ-48D2	3/16/16	6/16/16	9/13/16	12/21/16
PCE	99	196	216	204
TCE	1.54	2.0	<4.5	2.1

PZ-48D3	3/16/16	6/16/16	9/13/16	12/21/16
PCE	1.03 J	1.71	0.73 J	<0.49

PZ-42D3	3/17/16	6/15/16	12/21/16
CVOCs	<0.49	<0.49	1.73

PZ-42D2	3/17/16	6/15/16	12/21/16
PCE	82	255	260
TCE	1.56	2.33	<2.35
cis-1,2-DCE	0.63 J	0.85 J	<2.25

PZ-42D1	3/17/16	6/15/16	12/21/16
PCE	16.6	44	40
TCE	<0.47	<0.47	0.63 J

PZ-45D1	6/15/16
CVOCs	ND

PZ-45D2	6/15/16
CVOCs	ND

MW-45S	6/15/16
CVOCs	ND

MW-44D2	6/16/16	12/21/16
PCE	4.6	3.3

PZ-44D1	6/16/16	12/21/16
PCE	5.8	7.8

MW-44S	6/16/16	12/21/16
CVOCs	ND	ND

PZ-52D1	3/15/16	6/16/16	9/14/16
CVOCs	ND	ND	ND

PZ-52D2	3/15/16	6/16/16	9/14/16
CVOCs	ND	ND	ND

PZ-52D3	3/15/16	6/16/16	9/14/16
CVOCs	ND	ND	ND

PZ-47D1	6/15/16	12/21/16
PCE	0.69 J	1.01

PZ-47D2	6/15/16	12/21/16
PCE	7.9	10.8

PZ-47D3	6/15/16	12/21/16
PCE	7.7	9.7

PZ-46D3	6/15/16
CVOCs	ND

PZ-46D1	6/15/16
CVOCs	ND

PZ-46D2	6/15/16
TCE	0.62 J

PZ-49D1	3/18/16	6/15/16	9/13/16	12/21/16
PCE	28.4	40	56	53
TCE	0.59 J	0.69 J	1.1 J	0.99 J

PZ-49D2	3/18/16	6/15/16	9/13/16	12/21/16
PCE	1.06 J	6.4	6.8	13.7

PZ-49D3	3/18/16	6/15/16	9/13/16	12/21/16
PCE	7.2	10.1	12.4	11.7

PZ-49D4	3/18/16	6/15/16	9/13/16	12/21/16
PCE	4.2	3.6	7.1	7.9

PZ-53D1	3/16/16	6/15/16	9/14/16	12/21/16
CVOCs	ND	ND	ND	ND

PZ-53D2	3/16/16	6/15/16	9/14/16	12/21/16
PCE	3.96	3.3	4.0	4.2

PZ-53D3	3/16/16	6/15/16	9/14/16	12/21/16
TCE	<0.49	1.2 J	1.13 J	1.26 J

PZ-53D4	3/16/16	6/15/16
CVOCs	ND	ABANDONED

N

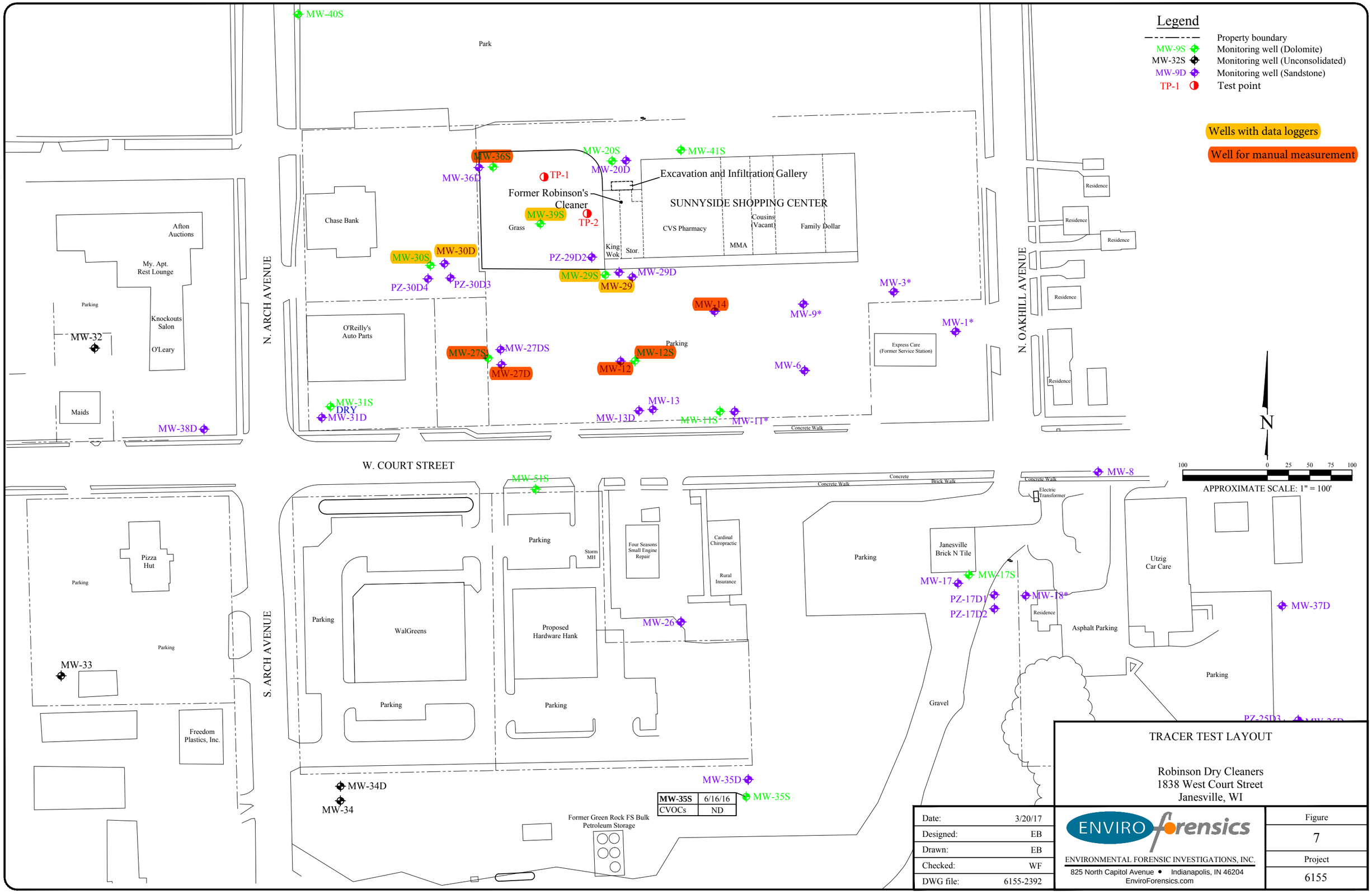
0 50 100 150 200
APPROXIMATE SCALE: 1" = 200'

Figure	6
Project	6155

Date:	4/5/16
Designed:	EB
Drawn:	EB
Checked:	WF
DWG file:	6155-1971

ENVIROforensics
ENVIRONMENTAL FORENSIC INVESTIGATIONS, INC.
602 N. Capitol Ave, Suite 210 • Indianapolis, IN 46204
EnviroForensics.com

No.	Date	Revision	Approved



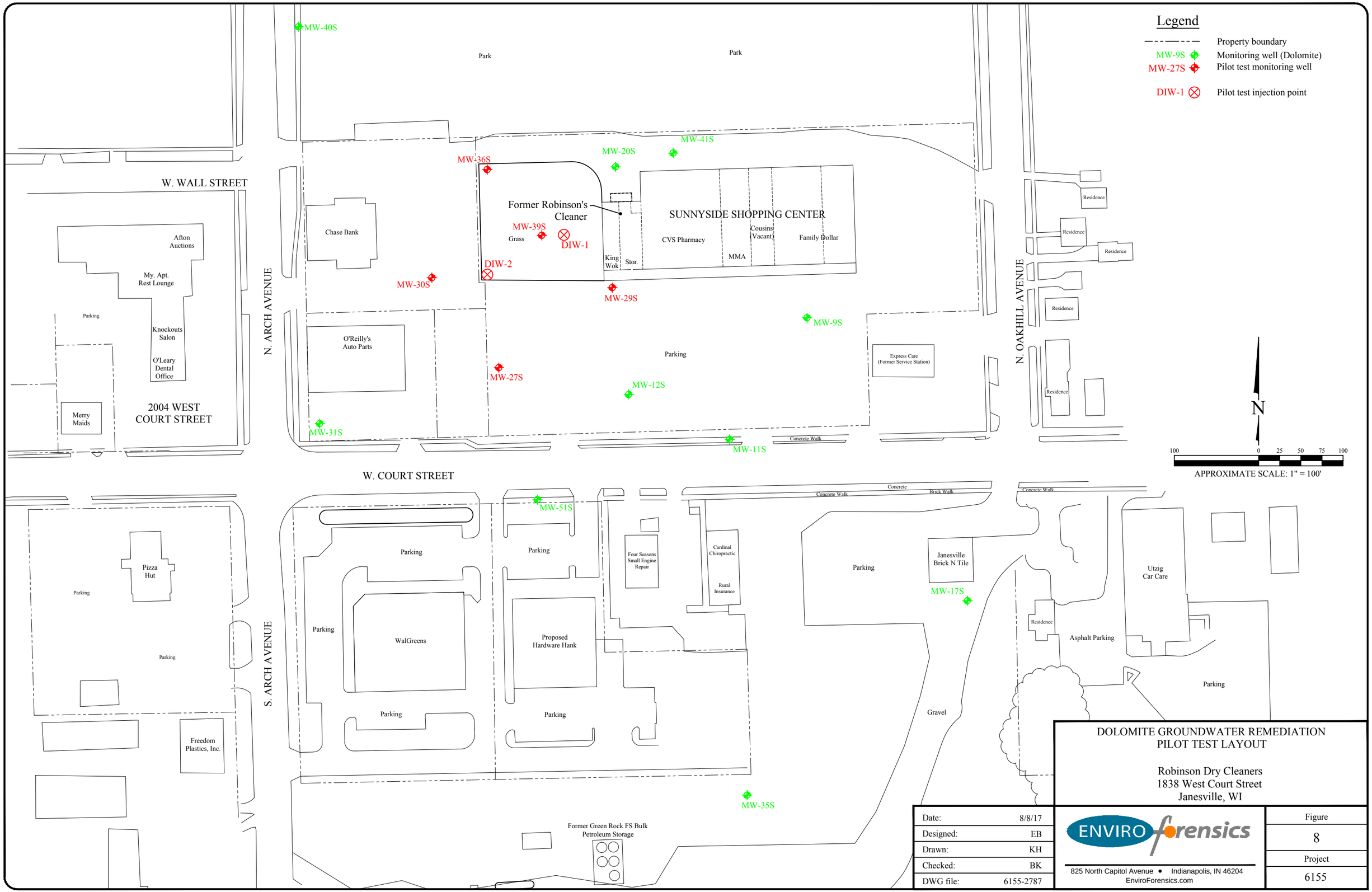
TRACER TEST LAYOUT

Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Date:	3/20/17
Designed:	EB
Drawn:	EB
Checked:	WF
DWG file:	6155-2392

ENVIRO forensics
ENVIRONMENTAL FORENSIC INVESTIGATIONS, INC.
825 North Capitol Avenue • Indianapolis, IN 46204
EnviroForensics.com

Figure
7
Project
6155



DOLOMITE GROUNDWATER REMEDIATION
PILOT TEST LAYOUT

Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Date:	8/8/17
Designed:	EB
Drawn:	KH
Checked:	BK
DWG file:	6155-2787

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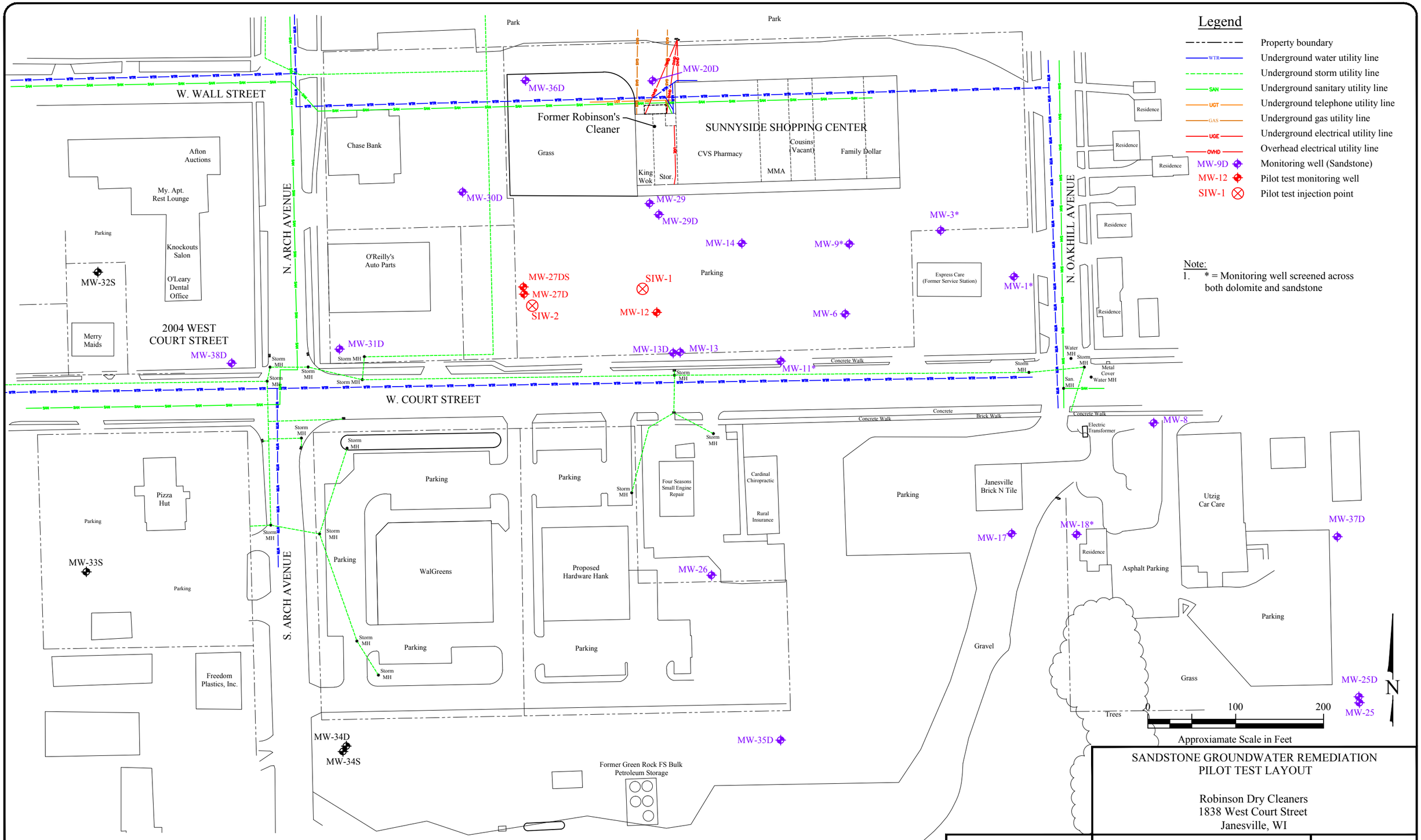
EnviroForensics.com

Figure	8
Project	6155



Legend

- Property boundary
- Underground water utility line (WTR)
- Underground storm utility line
- Underground sanitary utility line (SAN)
- Underground telephone utility line (UGT)
- Underground gas utility line (GAS)
- Underground electrical utility line (UGE)
- Overhead electrical utility line (OVHD)
- MW-9D — Monitoring well (Sandstone)
- MW-12 — Pilot test monitoring well
- SIW-1 — Pilot test injection point

Note:
1. * = Monitoring well screened across both dolomite and sandstone

Approxiamate Scale in Feet

SANDSTONE GROUNDWATER REMEDIATION PILOT TEST LAYOUT

Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Date:	8/8/17
Designed:	EB
Drawn:	KH
Checked:	BK
DWG file:	6155-1868

ENVIRO forensics
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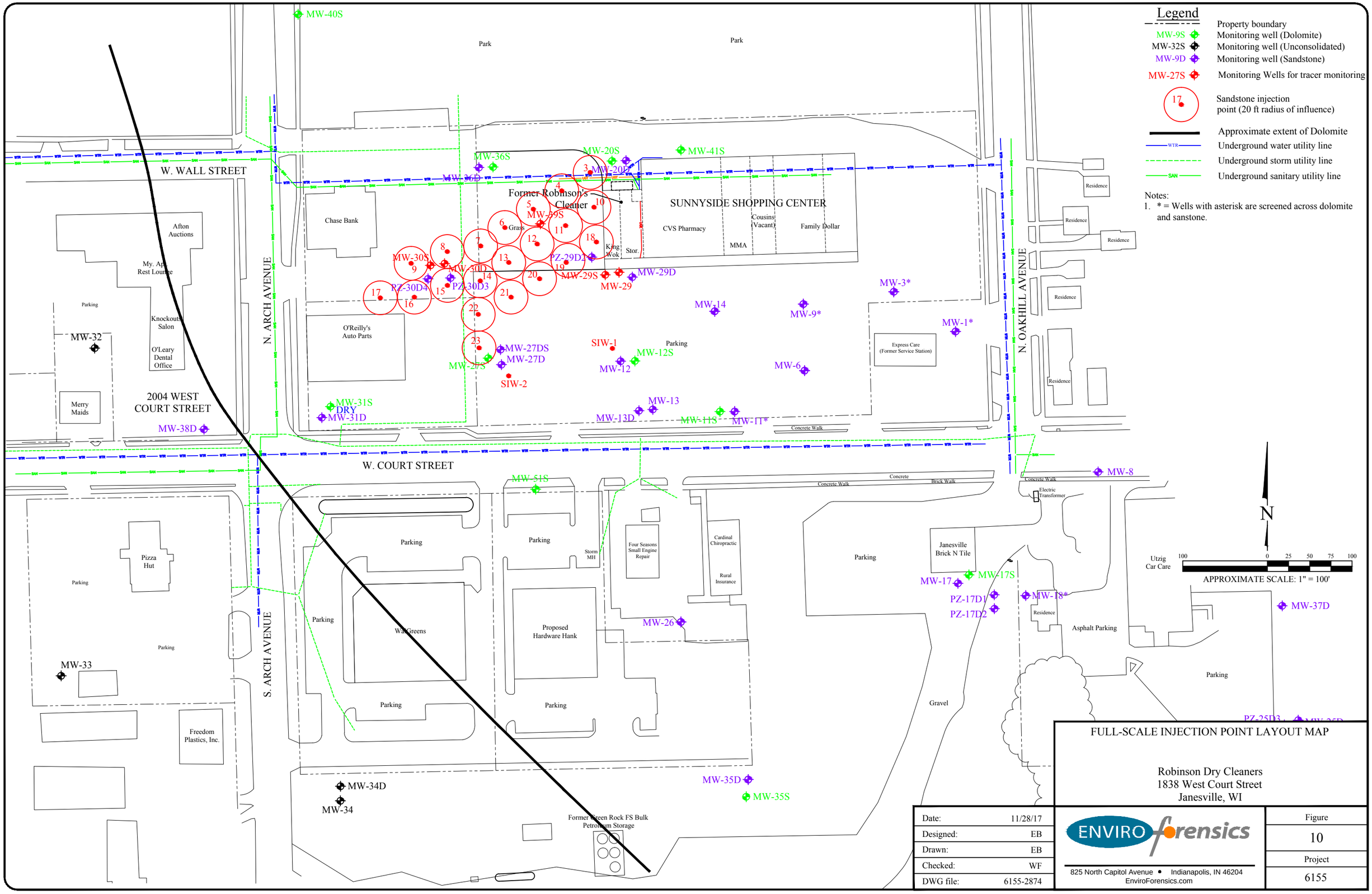
EnviroForensics.com

Figure	9
Project	6155



Legend

- Property boundary
- MW-9S — Monitoring well (Dolomite)
- MW-32S — Monitoring well (Unconsolidated)
- MW-9D — Monitoring well (Sandstone)
- MW-27S — Monitoring Wells for tracer monitoring
- 17 — Sandstone injection point (20 ft radius of influence)
- Approximate extent of Dolomite
- WTR — Underground water utility line
- Underground storm utility line
- SAN — Underground sanitary utility line

Notes:
1. * = Wells with asterisk are screened across dolomite and sanstone.

FULL-SCALE INJECTION POINT LAYOUT MAP

Robinson Dry Cleaners
1838 West Court Street
Janesville, WI

Date:	11/28/17
Designed:	EB
Drawn:	EB
Checked:	WF
DWG file:	6155-2874

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

Figure	10
Project	6155

SITE MAP SHOWING MONITORING WELLS DESIGNATED FOR SAMPLING

Robinsons Dry Cleaners
1838 West Court Street
Janesville, WI

Figure 11

Project 6155

Date:	12/14/17
Designed:	EB
Drawn:	EB
Checked:	WF
DWG file:	6155-2343

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EnviroForensics.com

No.	Date	Revision	Approved

APPENDIX A

WDNR Approval Letters

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Scott Walker, Governor
Cathy Stepp, Secretary
Telephone 608-266-2621
FAX 608-267-3579
TTY Access via relay - 711

May 8, 2017

KIETH M. GASKILL, LPG
ENVIRONMENTAL FORENSICS INVESTIGATIONS, INC.
N16 W23390 STONE RIDGE DR, SUITE G
WAUKESHA, WI 53188

Subject: TRACER FOR HYDROGEOLOGIC INVESTIGATION APPROVAL

Dear Mr. Gaskill:

The Wisconsin Department of Natural Resources (DNR), Division of Water, Bureau of Drinking Water and Groundwater, is conditionally approving your request to inject a limited quantity of sodium chloride solution for the purpose of conducting hydrogeologic investigation. This investigation is being conducted to support the design of a remedial action plan to treat legacy PCE contamination (BRRTS#: 02-54-221852).

Project Description: The proposal is to inject a total of approximately 57 pounds of food grade sodium chloride dissolved in 2,000 gallons of potable water (which will produce a concentration of approximately 3,400 ppm, or about 1/10 the salt content of sea water). The project will utilize an existing infiltration gallery installed in the former excavation basin in the area of the initial PCE release. The objective is to determine if this infiltration gallery will serve as an effective means to introduce and distribute remedial amendments to the underlying fractured Platteville Dolomite, and whether the substrates will migrate into the deeper St. Peter Sandstone formation. The migration of the salt solution will be tracked by measuring electrical conductivity within an extensive array of permanent and temporary monitoring wells completed in both formations. No public or private potable wells are known to exist in the direction of regional groundwater flow, which is to the southeast of the site toward the Rock River.

The Bureau of Drinking Water and Groundwater finds that the proposed tracer investigation poses little risk to local public and private drinking water systems and the regional drinking water aquifers. The request is approved subject to the conditions listed below.

Approval Conditions:

1. Water used to mix tracer injectate solutions shall come from a source that complies with the water quality standards for safe drinking water established in Chapter NR 809, Wis. Admin. Code.

2. The minimum amount of sodium chloride will be utilized as necessary to conduct the investigation. The weight of sodium chloride solute to be injected may be increased by up to 25% without further Department approval.
3. The injection will take place only at the proposed location. Injection at any alternative location will require a separate review and approval.

4. Any complaints or reports of potential water supply contamination shall be immediately reported to the Department. Contact Brian Austin, of the DNR's Bureau of Drinking Water and Groundwater program, at 608-266-3415 and by e-mail at Brian.Austin@wisconsin.gov should any such report need to be made.

5. Should the Department determine that a potable water supply has become contaminated as a result of the tracer injection activities, you will be responsible for remediating the contamination, and for providing an alternative supply of potable water to the users of the water system until such time as use of the water system is restored or until a permanent alternative potable water supply is installed.

Approval Constraints: This request was reviewed in accordance with s. NR 812.05 (4), Wis. Admin. Code, and is approved subject to the conditions listed above. The Department reserves the right to order changes to the approval or make additions to the conditions of approval should conditions arise making such action necessary. The Department may also void this approval if it determines that approval conditions are not being observed.

This approval is valid for two years from the date of the approval. If injection activities have not commenced within two years, the approval shall become void and a new application must be made and approved prior to initiating dye injection activities.

Department approval is based upon the representation that the project description submitted to the DNR was complete and accurately represented the activities being approved. Any approval of activities that do not fairly represent the project because the submittal was incomplete, inaccurate or of insufficient scope and detail is voidable at the option of the Department.

Appeal Rights: If you believe that you have a right to challenge this decision, you should know that the 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 s. 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. Requests for contested case hearings must be made in accordance with ch. NR 2, Wis. Admin. Code. Filing a request for a contested case hearing does not extend the 30 day period for filing a petition for judicial review. For judicial review of a decision pursuant to ss. 227.52 and 227.53, Wis. Stats., you must file your petition with the appropriate circuit court and serve the petition on the Department within 30 days after the decision is mailed. A petition for judicial review must name the Department of Natural Resources as the respondent.

Any questions regarding the conditions or recommendations contained in this action should be directed to Brian Austin, WDNR Groundwater program, at 608-266-3415

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

For the Secretary

Brian P. Austin, P.E.
Bureau of Drinking Water and Groundwater
(608) 266-3415

cc: Jeffrey Ackerman – WDNR Bureau for Remediation and Redevelopment (via Email)
Bruce Rheineck – WDNR Bureau of Drinking Water and Groundwater (via Email)

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Scott Walker, Governor
Kurt A. Thiede, Interim Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

September 18, 2017

BRIAN KAPPEN, LPG
ENVIRONMENTAL FORENSICS INVESTIGATIONS, INC.
N16 W23390 STONE RIDGE DR, SUITE G
WAUKESHA, WI 53188

Subject: TRACER FOR HYDROGEOLOGIC INVESTIGATION APPROVAL

Dear Mr. Gaskill:

The Wisconsin Department of Natural Resources (DNR), Division of Water, Bureau of Drinking Water and Groundwater, is conditionally approving your request to inject a limited quantity of sodium chloride solution for the purpose of conducting hydrogeologic investigation. This investigation is being conducted to support the design of a remedial action plan to treat legacy PCE contamination (Former Robinson Cleaners 1836 Court Street, Janesville, Wisconsin; BRRTS#: 02-54-221852).

Project Description: The proposal is to inject a total of approximately 70 pounds of sodium chloride dissolved in 2,000 gallons of potable water (which will produce a concentration of approximately 4,250 ppm, or about 1/8 the salt content of sea water). The project will utilize new boreholes installed in both the dolomite and sandstone formations underlying the site. Migration of saline solution will be monitored using electrical conductivity probes installed in existing and new monitoring wells. The objective is to evaluate distribution characteristics for injectates and aid in the design of full scale remedial amendment injection activities.

The Bureau of Drinking Water and Groundwater finds that the proposed tracer investigation poses little risk to local public and private drinking water systems and the regional drinking water aquifers. No public or private potable wells are known to exist in the direction of regional groundwater flow, which is to the southeast of the site toward the Rock River. The request is approved subject to the conditions listed below.

Approval Conditions:

1. Water used to mix tracer injectate solutions shall come from a source that complies with the water quality standards for safe drinking water established in Chapter NR 809, Wis. Admin. Code.

2. The minimum amount of sodium chloride will be utilized as necessary to conduct the investigation. The weight of sodium chloride solute to be injected may be increased by up to 25% without further Department approval.

3. The injection will take place only at the proposed location. Injection at any alternative location will require a separate review and approval.

4. Any complaints or reports of potential water supply contamination shall be immediately reported to the Department. Contact Brian Austin, of the DNR's Bureau of Drinking Water and Groundwater program, at 608-266-3415 and by e-mail at Brian.Austin@wisconsin.gov should any such report need to be made.

5. Should the Department determine that a potable water supply has become contaminated as a result of the tracer injection activities, you will be responsible for remediating the contamination, and for providing an alternative supply of potable water to the users of the water system until such time as use of the water system is restored or until a permanent alternative potable water supply is installed.

Approval Constraints: This request was reviewed in accordance with s. NR 812.05 (4), Wis. Admin. Code, and is approved subject to the conditions listed above. The Department reserves the right to order changes to the approval or make additions to the conditions of approval should conditions arise making such action necessary. The Department may also void this approval if it determines that approval conditions are not being observed.

This approval is valid for two years from the date of the approval. If injection activities have not commenced within two years, the approval shall become void and a new application must be made and approved prior to initiating dye injection activities.

Department approval is based upon the representation that the project description submitted to the DNR was complete and accurately represented the activities being approved. Any approval of activities that do not fairly represent the project because the submittal was incomplete, inaccurate or of insufficient scope and detail is voidable at the option of the Department.

Appeal Rights: If you believe that you have a right to challenge this decision, you should know that the 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 s. 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. Requests for contested case hearings must be made in accordance with ch. NR 2, Wis. Admin. Code. Filing a request for a contested case hearing does not extend the 30 day period for filing a petition for judicial review. For judicial review of a decision pursuant to ss. 227.52 and 227.53, Wis. Stats., you must file your petition with the appropriate circuit court and serve the petition on the Department within 30 days after the decision is mailed. A petition for judicial review must name the Department of Natural Resources as the respondent.

Any questions regarding the conditions or recommendations contained in this action should be directed to Brian Austin, WDNR Groundwater program, at 608-266-3415

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

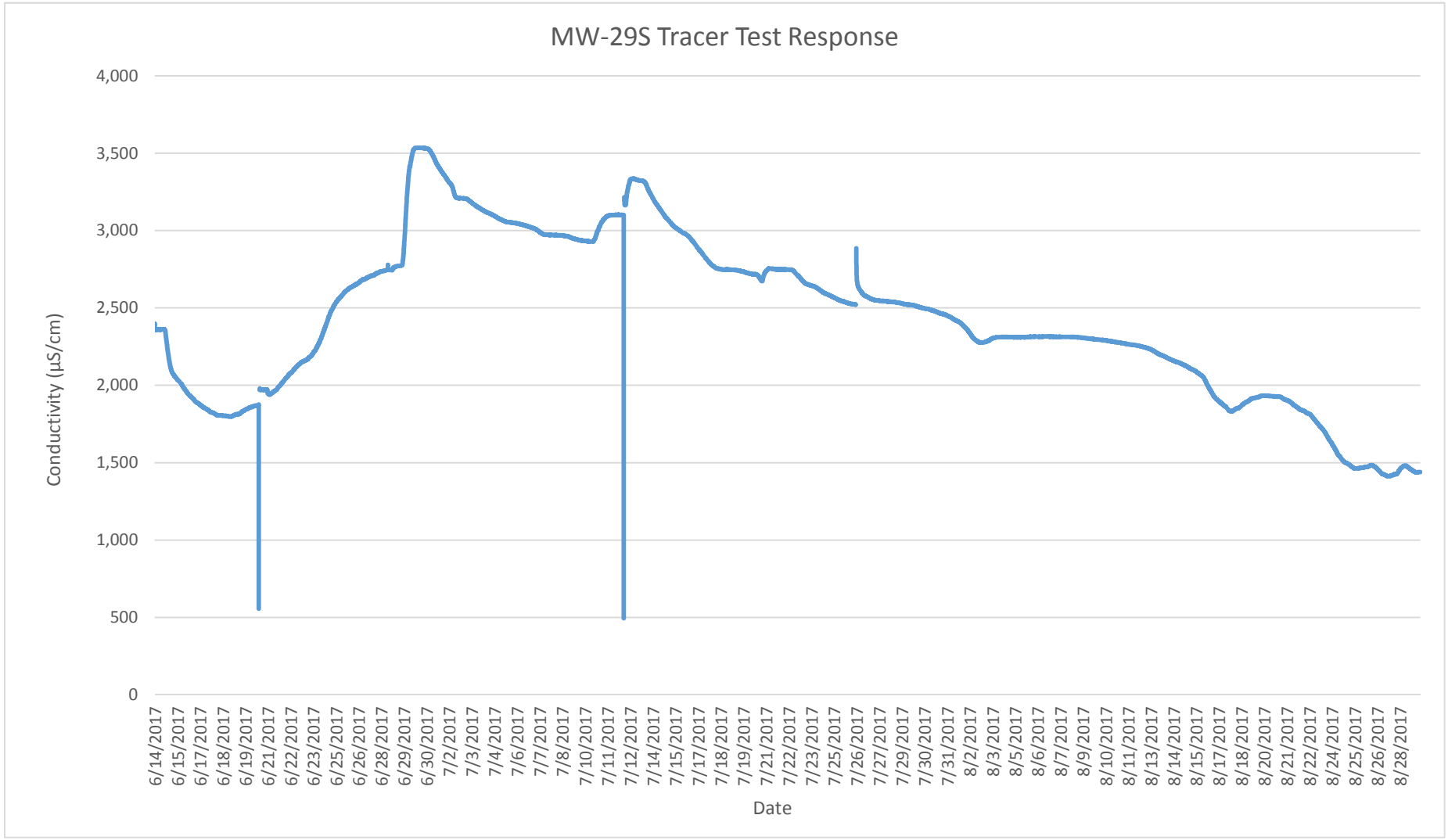
For the Secretary

Brian P. Austin, P.E.
Bureau of Drinking Water and Groundwater
(608) 266-3415

cc: Jeffrey Ackerman – WDNR Bureau for Remediation and Redevelopment (via Email)
Bruce Rheineck – WDNR Bureau of Drinking Water and Groundwater (via Email)
Wayne Fassbender – EnviroForensics (via Email)

APPENDIX B

Tracer Test Charts


MW-29S Tracer Test Response
Conductivity (µS/cm)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
6/14/2017
6/15/2017
6/17/2017
6/18/2017
6/19/2017
6/21/2017
6/22/2017
6/23/2017
6/25/2017
6/26/2017
6/28/2017
6/29/2017
6/30/2017
7/2/2017
7/3/2017
7/4/2017
7/6/2017
7/7/2017
7/8/2017
7/10/2017
7/11/2017
7/12/2017
7/14/2017
7/15/2017
7/17/2017
7/18/2017
7/19/2017
7/21/2017
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7/23/2017
7/25/2017
7/26/2017
7/27/2017
7/29/2017
7/30/2017
7/31/2017
8/2/2017
8/3/2017
8/5/2017
8/6/2017
8/7/2017
8/9/2017
8/10/2017
8/11/2017
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8/15/2017
8/17/2017
8/18/2017
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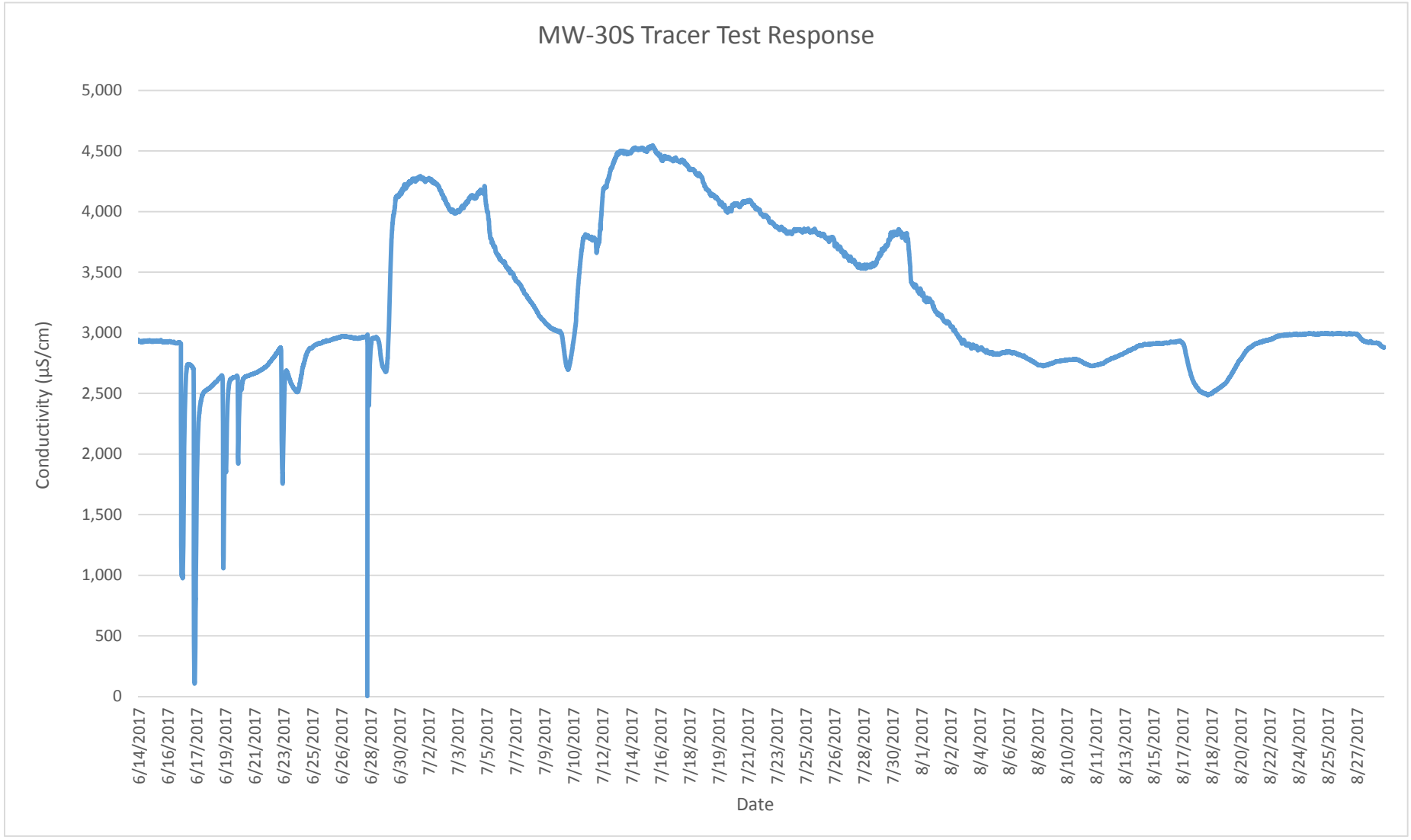
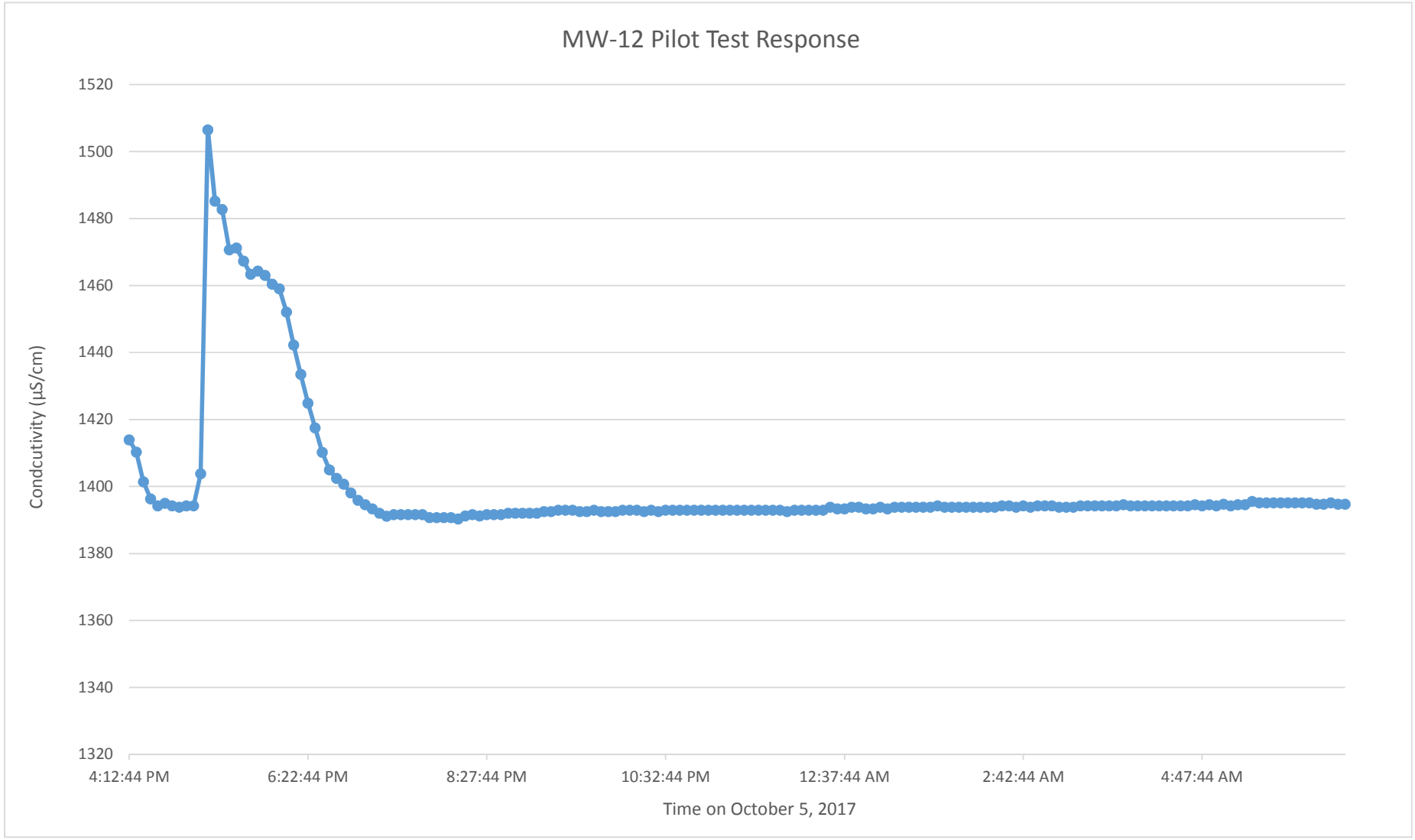
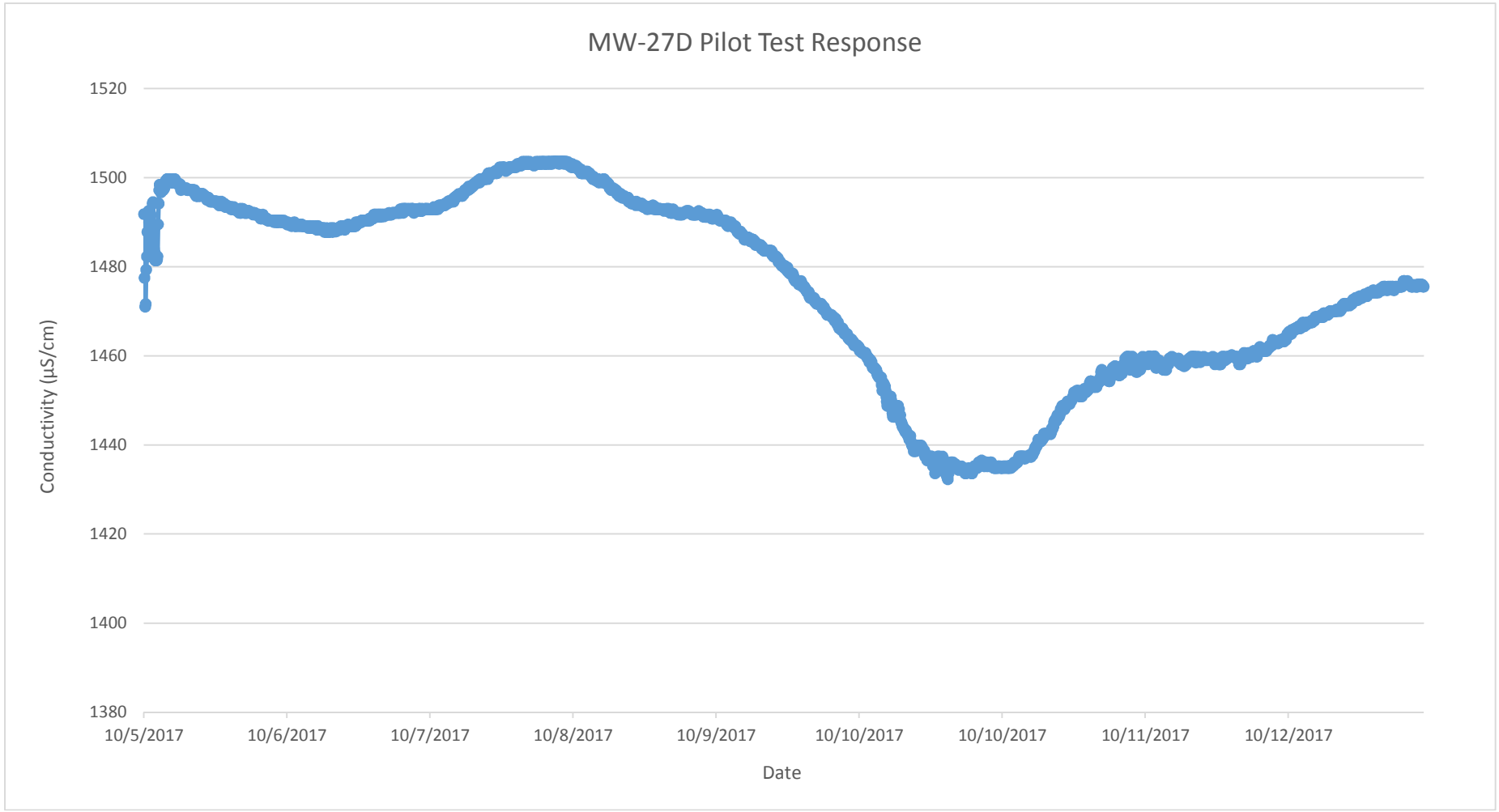
8/22/2017
8/24/2017
8/25/2017
8/26/2017
8/28/2017
Date

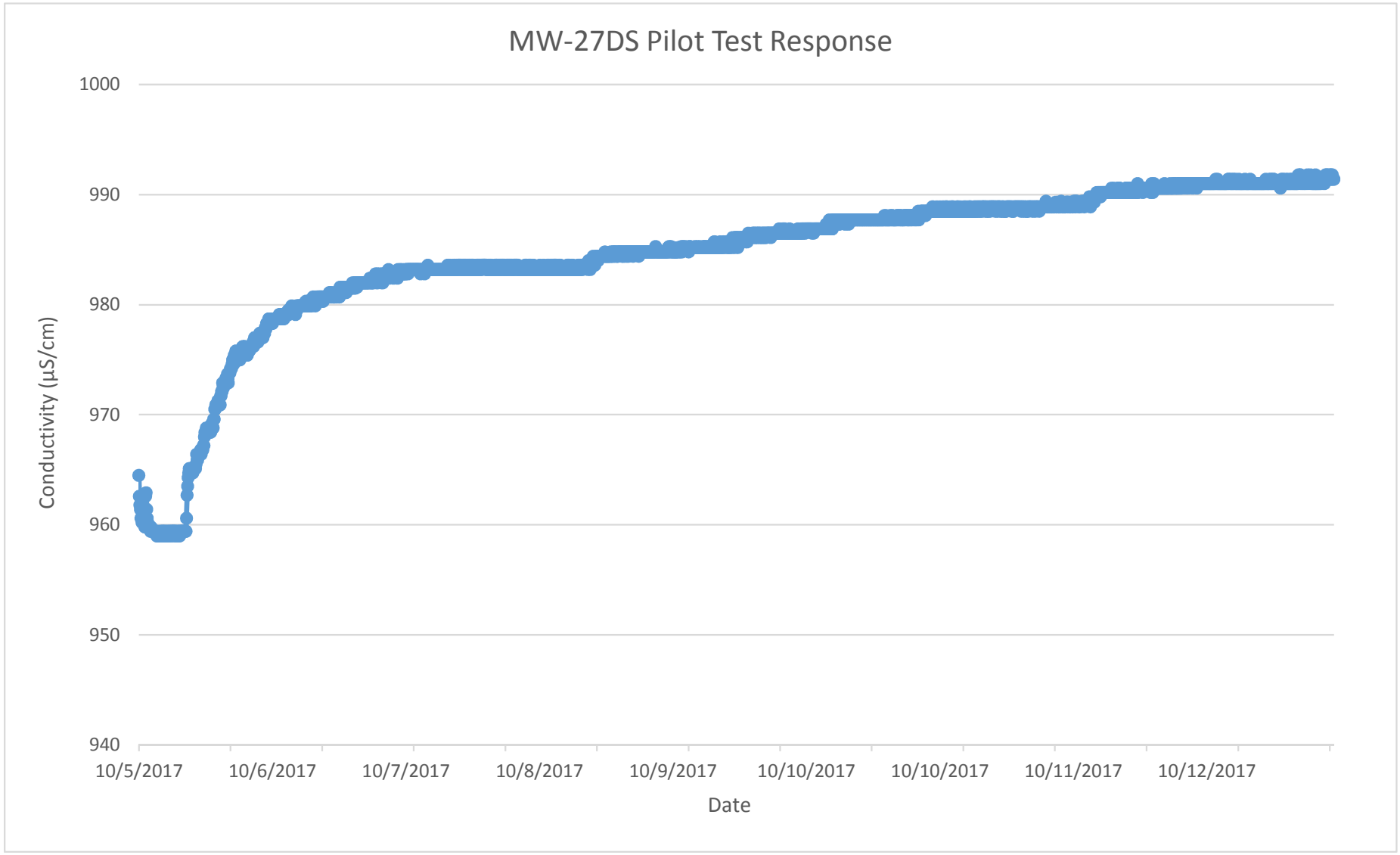

MW-30S Tracer Test Response
Conductivity (µS/cm)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
6/14/2017
6/16/2017
6/17/2017
6/19/2017
6/21/2017
6/23/2017
6/25/2017
6/26/2017
6/28/2017
6/30/2017
7/2/2017
7/3/2017
7/5/2017
7/7/2017
7/9/2017
7/10/2017
7/12/2017
7/14/2017
7/16/2017
7/18/2017
7/19/2017
7/21/2017
7/23/2017
7/25/2017
7/26/2017
7/28/2017
7/30/2017
8/1/2017
8/2/2017
8/4/2017
8/6/2017
8/8/2017
8/10/2017
8/11/2017
8/13/2017
8/15/2017
8/17/2017
8/18/2017
8/20/2017
8/22/2017
8/24/2017
8/25/2017
8/27/2017
Date

APPENDIX C

Pilot Test Charts


MW-12 Pilot Test Response
Condcutivity (µS/cm)
1520
1500
1480
1460
1440
1420
1400
1380
1360
1340
1320
4:12:44 PM
6:22:44 PM
8:27:44 PM
10:32:44 PM
12:37:44 AM
2:42:44 AM
4:47:44 AM
Time on October 5, 2017


MW-27D Pilot Test Response
Conductivity (µS/cm)
1520
1500
1480
1460
1440
1420
1400
1380
10/5/2017
10/6/2017
10/7/2017
10/8/2017
10/9/2017
10/10/2017
10/10/2017
10/11/2017
10/12/2017
Date


MW-27DS Pilot Test Response
1000
990
980
970
960
950
940
Conductivity (µS/cm)
10/5/2017
10/6/2017
10/7/2017
10/8/2017
10/9/2017
10/10/2017
10/10/2017
10/11/2017
10/12/2017
Date

APPENDIX D

PlumeStop® Technical Description

PlumeStop® Liquid Activated Carbon™ Technical Description

PlumeStop Liquid Activated Carbon is an innovative groundwater remediation technology designed to rapidly remove and permanently degrade groundwater contaminants. PlumeStop is composed of very fine particles of activated carbon (1-2µm) suspended in water through the use of unique organic polymer dispersion chemistry. Once in the subsurface, the material behaves as a colloidal biomatrix, binding to the aquifer matrix, rapidly removing contaminants from groundwater, and expediting permanent contaminant biodegradation.

This unique remediation technology accomplishes treatment with the use of highly dispersible, fast-acting, sorption-based technology, capturing and concentrating dissolved-phase contaminants within its matrix-like structure. Once contaminants are sorbed onto the regenerative matrix, biodegradation processes achieve complete remediation at an accelerated rate.

Distribution of PlumeStop in water

To see a list of treatable contaminants with the use of PlumeStop, view the Range of Treatable Contaminants Guide.

Chemical Composition

- Water - CAS# 7732-18-5
- Colloidal Activated Carbon ≤2.5 - CAS# µm 7440-44-0
- Proprietary Additives

Properties

- Physical state: Liquid
- Form: Aqueous suspension
- Color: Black
- Odor: Odorless
- pH: 8 - 10

Storage and Handling Guidelines

Storage
Store in original tightly closed container
Store away from incompatible materials
Protect from freezing

Handling
Avoid contact with skin and eyes
Avoid prolonged exposure
Observe good industrial hygiene practices
Wash thoroughly after handling
Wear appropriate personal protective equipment

PlumeStop® Liquid Activated Carbon™ Technical Description

Applications

PlumeStop is easily applied into the subsurface through gravity-feed or low-pressure injection.

Health and Safety

Wash hands after handling. Dispose of waste and residues in accordance with local authority requirements. Please review the Material Safety Data Sheet for additional storage, usage, and handling requirements here: PlumeStop SDS.

REGENESIS

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

APPENDIX E

Groundwater Sample Laboratory Report

Synergy Environmental Lab, INC.

1990 Prospect Ct., Appleton, WI 54914 *P 920-830-2455 * F 920-733-0631

WAYNE FASSBENDER
ENVIROFORENSICS
825 N. CAPITOL AVENUE
INDIANAPOLIS, IN 46204

Report Date *10-Nov-17*

Project Name ROBINSONS CLEANERS **Invoice #** E33837
Project # 6155 PO#2017-1561

Lab Code 5033837A
Sample ID 6155 SIW-11
Sample Matrix Water
Sample Date 10/31/2017

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Organic										
VOC's										
Benzene	< 8.5	ug/l	8.5	27.5	50	8260B		11/9/2017	CJR	1
Bromobenzene	< 21.5	ug/l	21.5	68.5	50	8260B		11/9/2017	CJR	1
Bromodichloromethane	< 15.5	ug/l	15.5	50	50	8260B		11/9/2017	CJR	1
Bromoform	< 24.5	ug/l	24.5	78	50	8260B		11/9/2017	CJR	1
tert-Butylbenzene	< 19.5	ug/l	19.5	61.5	50	8260B		11/9/2017	CJR	1
sec-Butylbenzene	< 12	ug/l	12	38	50	8260B		11/9/2017	CJR	1
n-Butylbenzene	< 17	ug/l	17	54	50	8260B		11/9/2017	CJR	1
Carbon Tetrachloride	< 10.5	ug/l	10.5	34	50	8260B		11/9/2017	CJR	1
Chlorobenzene	< 13.5	ug/l	13.5	43	50	8260B		11/9/2017	CJR	1
Chloroethane	< 25	ug/l	25	80	50	8260B		11/9/2017	CJR	1
Chloroform	< 48	ug/l	48	152	50	8260B		11/9/2017	CJR	1
Chloromethane	< 65	ug/l	65	207.5	50	8260B		11/9/2017	CJR	1
2-Chlorotoluene	< 18	ug/l	18	57.5	50	8260B		11/9/2017	CJR	1
4-Chlorotoluene	< 17.5	ug/l	17.5	55.5	50	8260B		11/9/2017	CJR	1
1,2-Dibromo-3-chloropropane	< 94	ug/l	94	299	50	8260B		11/9/2017	CJR	1
Dibromochloromethane	< 22.5	ug/l	22.5	72	50	8260B		11/9/2017	CJR	1
1,4-Dichlorobenzene	< 21	ug/l	21	67	50	8260B		11/9/2017	CJR	1
1,3-Dichlorobenzene	< 22.5	ug/l	22.5	71.5	50	8260B		11/9/2017	CJR	1
1,2-Dichlorobenzene	< 17	ug/l	17	54.5	50	8260B		11/9/2017	CJR	1
Dichlorodifluoromethane	< 19	ug/l	19	60	50	8260B		11/9/2017	CJR	1
1,2-Dichloroethane	< 22.5	ug/l	22.5	71.5	50	8260B		11/9/2017	CJR	1
1,1-Dichloroethane	< 21	ug/l	21	67	50	8260B		11/9/2017	CJR	1
1,1-Dichloroethene	< 23	ug/l	23	73.5	50	8260B		11/9/2017	CJR	1
cis-1,2-Dichloroethene	< 20.5	ug/l	20.5	64.5	50	8260B		11/9/2017	CJR	1
trans-1,2-Dichloroethene	< 17.5	ug/l	17.5	56	50	8260B		11/9/2017	CJR	1
1,2-Dichloropropane	< 19.5	ug/l	19.5	62	50	8260B		11/9/2017	CJR	1
1,3-Dichloropropane	< 24.5	ug/l	24.5	77.5	50	8260B		11/9/2017	CJR	1
trans-1,3-Dichloropropene	< 21	ug/l	21	66.5	50	8260B		11/9/2017	CJR	1
cis-1,3-Dichloropropene	< 10.5	ug/l	10.5	32.5	50	8260B		11/9/2017	CJR	1

Project Name ROBINSONS CLEANERS **Invoice #** E33837
Project # 6155 PO#2017-1561

Lab Code 5033837A
Sample ID 6155 SIW-11
Sample Matrix Water
Sample Date 10/31/2017

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Di-isopropyl ether	< 13	ug/l	13	41.5	50	8260B		11/9/2017	CJR	1
EDB (1,2-Dibromoethane)	< 17	ug/l	17	54.5	50	8260B		11/9/2017	CJR	1
Ethylbenzene	< 10	ug/l	10	31.5	50	8260B		11/9/2017	CJR	1
Hexachlorobutadiene	< 73.5	ug/l	73.5	234	50	8260B		11/9/2017	CJR	1
Isopropylbenzene	< 14.5	ug/l	14.5	46.5	50	8260B		11/9/2017	CJR	1
p-Isopropyltoluene	< 14	ug/l	14	45.5	50	8260B		11/9/2017	CJR	1
Methylene chloride	< 47	ug/l	47	149	50	8260B		11/9/2017	CJR	1
Methyl tert-butyl ether (MTBE)	< 41	ug/l	41	130	50	8260B		11/9/2017	CJR	1
Naphthalene	< 108.5	ug/l	108.5	345	50	8260B		11/9/2017	CJR	1
n-Propylbenzene	< 9.5	ug/l	9.5	31	50	8260B		11/9/2017	CJR	1
1,1,2,2-Tetrachloroethane	< 34.5	ug/l	34.5	110.5	50	8260B		11/9/2017	CJR	1
1,1,1,2-Tetrachloroethane	< 23.5	ug/l	23.5	74	50	8260B		11/9/2017	CJR	1
Tetrachloroethene	2220	ug/l	24	76	50	8260B		11/9/2017	CJR	1
Toluene	< 33.5	ug/l	33.5	106.5	50	8260B		11/9/2017	CJR	1
1,2,4-Trichlorobenzene	< 64.5	ug/l	64.5	205	50	8260B		11/9/2017	CJR	1
1,2,3-Trichlorobenzene	< 41.5	ug/l	41.5	131.5	50	8260B		11/9/2017	CJR	1
1,1,1-Trichloroethane	< 17.5	ug/l	17.5	55.5	50	8260B		11/9/2017	CJR	1
1,1,2-Trichloroethane	< 32.5	ug/l	32.5	103	50	8260B		11/9/2017	CJR	1
Trichloroethene (TCE)	34 "J"	ug/l	22.5	71.5	50	8260B		11/9/2017	CJR	1
Trichlorofluoromethane	< 32	ug/l	32	102	50	8260B		11/9/2017	CJR	1
1,2,4-Trimethylbenzene	< 57	ug/l	57	181.5	50	8260B		11/9/2017	CJR	1
1,3,5-Trimethylbenzene	< 45.5	ug/l	45.5	145	50	8260B		11/9/2017	CJR	1
Vinyl Chloride	< 9.5	ug/l	9.5	31	50	8260B		11/9/2017	CJR	1
m&p-Xylene	< 78	ug/l	78	247.5	50	8260B		11/9/2017	CJR	1
o-Xylene	< 19.5	ug/l	19.5	62.5	50	8260B		11/9/2017	CJR	1
SUR - Toluene-d8	97	REC %			50	8260B		11/9/2017	CJR	1
SUR - Dibromofluoromethane	100	REC %			50	8260B		11/9/2017	CJR	1
SUR - 1,2-Dichloroethane-d4	101	REC %			50	8260B		11/9/2017	CJR	1
SUR - 4-Bromofluorobenzene	96	REC %			50	8260B		11/9/2017	CJR	1

Project Name ROBINSONS CLEANERS **Invoice #** E33837
Project # 6155 PO#2017-1561

Lab Code 5033837B
Sample ID 6155 SIW-12
Sample Matrix Water
Sample Date 11/1/2017

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Organic										
VOC's										
Benzene	< 1.7	ug/l	1.7	5.5	10	8260B		11/9/2017	CJR	1
Bromobenzene	< 4.3	ug/l	4.3	13.7	10	8260B		11/9/2017	CJR	1
Bromodichloromethane	< 3.1	ug/l	3.1	10	10	8260B		11/9/2017	CJR	1
Bromoform	< 4.9	ug/l	4.9	15.6	10	8260B		11/9/2017	CJR	1
tert-Butylbenzene	< 3.9	ug/l	3.9	12.3	10	8260B		11/9/2017	CJR	1
sec-Butylbenzene	< 2.4	ug/l	2.4	7.6	10	8260B		11/9/2017	CJR	1
n-Butylbenzene	< 3.4	ug/l	3.4	10.8	10	8260B		11/9/2017	CJR	1
Carbon Tetrachloride	< 2.1	ug/l	2.1	6.8	10	8260B		11/9/2017	CJR	1
Chlorobenzene	< 2.7	ug/l	2.7	8.6	10	8260B		11/9/2017	CJR	1
Chloroethane	< 5	ug/l	5	16	10	8260B		11/9/2017	CJR	1
Chloroform	< 9.6	ug/l	9.6	30.4	10	8260B		11/9/2017	CJR	1
Chloromethane	< 13	ug/l	13	41.5	10	8260B		11/9/2017	CJR	1
2-Chlorotoluene	< 3.6	ug/l	3.6	11.5	10	8260B		11/9/2017	CJR	1
4-Chlorotoluene	< 3.5	ug/l	3.5	11.1	10	8260B		11/9/2017	CJR	1
1,2-Dibromo-3-chloropropane	< 18.8	ug/l	18.8	59.8	10	8260B		11/9/2017	CJR	1
Dibromochloromethane	< 4.5	ug/l	4.5	14.4	10	8260B		11/9/2017	CJR	1
1,4-Dichlorobenzene	< 4.2	ug/l	4.2	13.4	10	8260B		11/9/2017	CJR	1
1,3-Dichlorobenzene	< 4.5	ug/l	4.5	14.3	10	8260B		11/9/2017	CJR	1
1,2-Dichlorobenzene	< 3.4	ug/l	3.4	10.9	10	8260B		11/9/2017	CJR	1
Dichlorodifluoromethane	< 3.8	ug/l	3.8	12	10	8260B		11/9/2017	CJR	1
1,2-Dichloroethane	< 4.5	ug/l	4.5	14.3	10	8260B		11/9/2017	CJR	1
1,1-Dichloroethane	< 4.2	ug/l	4.2	13.4	10	8260B		11/9/2017	CJR	1
1,1-Dichloroethene	< 4.6	ug/l	4.6	14.7	10	8260B		11/9/2017	CJR	1
cis-1,2-Dichloroethene	< 4.1	ug/l	4.1	12.9	10	8260B		11/9/2017	CJR	1
trans-1,2-Dichloroethene	< 3.5	ug/l	3.5	11.2	10	8260B		11/9/2017	CJR	1
1,2-Dichloropropane	< 3.9	ug/l	3.9	12.4	10	8260B		11/9/2017	CJR	1
1,3-Dichloropropane	< 4.9	ug/l	4.9	15.5	10	8260B		11/9/2017	CJR	1
trans-1,3-Dichloropropene	< 4.2	ug/l	4.2	13.3	10	8260B		11/9/2017	CJR	1
cis-1,3-Dichloropropene	< 2.1	ug/l	2.1	6.5	10	8260B		11/9/2017	CJR	1
Di-isopropyl ether	< 2.6	ug/l	2.6	8.3	10	8260B		11/9/2017	CJR	1
EDB (1,2-Dibromoethane)	< 3.4	ug/l	3.4	10.9	10	8260B		11/9/2017	CJR	1
Ethylbenzene	< 2	ug/l	2	6.3	10	8260B		11/9/2017	CJR	1
Hexachlorobutadiene	< 14.7	ug/l	14.7	46.8	10	8260B		11/9/2017	CJR	1
Isopropylbenzene	< 2.9	ug/l	2.9	9.3	10	8260B		11/9/2017	CJR	1
p-Isopropyltoluene	< 2.8	ug/l	2.8	9.1	10	8260B		11/9/2017	CJR	1
Methylene chloride	< 9.4	ug/l	9.4	29.8	10	8260B		11/9/2017	CJR	1
Methyl tert-butyl ether (MTBE)	< 8.2	ug/l	8.2	26	10	8260B		11/9/2017	CJR	1
Naphthalene	< 21.7	ug/l	21.7	69	10	8260B		11/9/2017	CJR	1
n-Propylbenzene	< 1.9	ug/l	1.9	6.2	10	8260B		11/9/2017	CJR	1
1,1,2,2-Tetrachloroethane	< 6.9	ug/l	6.9	22.1	10	8260B		11/9/2017	CJR	1
1,1,1,2-Tetrachloroethane	< 4.7	ug/l	4.7	14.8	10	8260B		11/9/2017	CJR	1
Tetrachloroethene	520	ug/l	4.8	15.2	10	8260B		11/9/2017	CJR	1
Toluene	< 6.7	ug/l	6.7	21.3	10	8260B		11/9/2017	CJR	1
1,2,4-Trichlorobenzene	< 12.9	ug/l	12.9	41	10	8260B		11/9/2017	CJR	1
1,2,3-Trichlorobenzene	< 8.3	ug/l	8.3	26.3	10	8260B		11/9/2017	CJR	1
1,1,1-Trichloroethane	< 3.5	ug/l	3.5	11.1	10	8260B		11/9/2017	CJR	1
1,1,2-Trichloroethane	< 6.5	ug/l	6.5	20.6	10	8260B		11/9/2017	CJR	1
Trichloroethene (TCE)	7.6 "J"	ug/l	4.5	14.3	10	8260B		11/9/2017	CJR	1
Trichlorofluoromethane	< 6.4	ug/l	6.4	20.4	10	8260B		11/9/2017	CJR	1
1,2,4-Trimethylbenzene	< 11.4	ug/l	11.4	36.3	10	8260B		11/9/2017	CJR	1

Project Name ROBINSONS CLEANERS **Invoice #** E33837
Project # 6155 PO#2017-1561

Lab Code 5033837B
Sample ID 6155 SIW-12
Sample Matrix Water
Sample Date 11/1/2017

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
1,3,5-Trimethylbenzene	< 9.1	ug/l	9.1	29	10	8260B		11/9/2017	CJR	1
Vinyl Chloride	< 1.9	ug/l	1.9	6.2	10	8260B		11/9/2017	CJR	1
m&p-Xylene	< 15.6	ug/l	15.6	49.5	10	8260B		11/9/2017	CJR	1
o-Xylene	< 3.9	ug/l	3.9	12.5	10	8260B		11/9/2017	CJR	1
SUR - 1,2-Dichloroethane-d4	95	REC %			10	8260B		11/9/2017	CJR	1
SUR - 4-Bromofluorobenzene	96	REC %			10	8260B		11/9/2017	CJR	1
SUR - Dibromofluoromethane	91	REC %			10	8260B		11/9/2017	CJR	1
SUR - Toluene-d8	98	REC %			10	8260B		11/9/2017	CJR	1

Project Name ROBINSONS CLEANERS **Invoice #** E33837
Project # 6155 PO#2017-1561

Lab Code 5033837C
Sample ID 6155 SIW-6
Sample Matrix Water
Sample Date 11/1/2017

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Organic										
VOC's										
Benzene	< 1.7	ug/l	1.7	5.5	10	8260B		11/9/2017	CJR	1
Bromobenzene	< 4.3	ug/l	4.3	13.7	10	8260B		11/9/2017	CJR	1
Bromodichloromethane	< 3.1	ug/l	3.1	10	10	8260B		11/9/2017	CJR	1
Bromoform	< 4.9	ug/l	4.9	15.6	10	8260B		11/9/2017	CJR	1
tert-Butylbenzene	< 3.9	ug/l	3.9	12.3	10	8260B		11/9/2017	CJR	1
sec-Butylbenzene	< 2.4	ug/l	2.4	7.6	10	8260B		11/9/2017	CJR	1
n-Butylbenzene	< 3.4	ug/l	3.4	10.8	10	8260B		11/9/2017	CJR	1
Carbon Tetrachloride	< 2.1	ug/l	2.1	6.8	10	8260B		11/9/2017	CJR	1
Chlorobenzene	< 2.7	ug/l	2.7	8.6	10	8260B		11/9/2017	CJR	1
Chloroethane	< 5	ug/l	5	16	10	8260B		11/9/2017	CJR	1
Chloroform	< 9.6	ug/l	9.6	30.4	10	8260B		11/9/2017	CJR	1
Chloromethane	< 13	ug/l	13	41.5	10	8260B		11/9/2017	CJR	1
2-Chlorotoluene	< 3.6	ug/l	3.6	11.5	10	8260B		11/9/2017	CJR	1
4-Chlorotoluene	< 3.5	ug/l	3.5	11.1	10	8260B		11/9/2017	CJR	1
1,2-Dibromo-3-chloropropane	< 18.8	ug/l	18.8	59.8	10	8260B		11/9/2017	CJR	1
Dibromochloromethane	< 4.5	ug/l	4.5	14.4	10	8260B		11/9/2017	CJR	1
1,4-Dichlorobenzene	< 4.2	ug/l	4.2	13.4	10	8260B		11/9/2017	CJR	1
1,3-Dichlorobenzene	< 4.5	ug/l	4.5	14.3	10	8260B		11/9/2017	CJR	1
1,2-Dichlorobenzene	< 3.4	ug/l	3.4	10.9	10	8260B		11/9/2017	CJR	1
Dichlorodifluoromethane	< 3.8	ug/l	3.8	12	10	8260B		11/9/2017	CJR	1
1,2-Dichloroethane	< 4.5	ug/l	4.5	14.3	10	8260B		11/9/2017	CJR	1
1,1-Dichloroethane	< 4.2	ug/l	4.2	13.4	10	8260B		11/9/2017	CJR	1
1,1-Dichloroethene	< 4.6	ug/l	4.6	14.7	10	8260B		11/9/2017	CJR	1
cis-1,2-Dichloroethene	< 4.1	ug/l	4.1	12.9	10	8260B		11/9/2017	CJR	1
trans-1,2-Dichloroethene	< 3.5	ug/l	3.5	11.2	10	8260B		11/9/2017	CJR	1
1,2-Dichloropropane	< 3.9	ug/l	3.9	12.4	10	8260B		11/9/2017	CJR	1
1,3-Dichloropropane	< 4.9	ug/l	4.9	15.5	10	8260B		11/9/2017	CJR	1
trans-1,3-Dichloropropene	< 4.2	ug/l	4.2	13.3	10	8260B		11/9/2017	CJR	1
cis-1,3-Dichloropropene	< 2.1	ug/l	2.1	6.5	10	8260B		11/9/2017	CJR	1
Di-isopropyl ether	< 2.6	ug/l	2.6	8.3	10	8260B		11/9/2017	CJR	1
EDB (1,2-Dibromoethane)	< 3.4	ug/l	3.4	10.9	10	8260B		11/9/2017	CJR	1
Ethylbenzene	< 2	ug/l	2	6.3	10	8260B		11/9/2017	CJR	1
Hexachlorobutadiene	< 14.7	ug/l	14.7	46.8	10	8260B		11/9/2017	CJR	1
Isopropylbenzene	< 2.9	ug/l	2.9	9.3	10	8260B		11/9/2017	CJR	1
p-Isopropyltoluene	< 2.8	ug/l	2.8	9.1	10	8260B		11/9/2017	CJR	1
Methylene chloride	< 9.4	ug/l	9.4	29.8	10	8260B		11/9/2017	CJR	1
Methyl tert-butyl ether (MTBE)	< 8.2	ug/l	8.2	26	10	8260B		11/9/2017	CJR	1
Naphthalene	< 21.7	ug/l	21.7	69	10	8260B		11/9/2017	CJR	1
n-Propylbenzene	< 1.9	ug/l	1.9	6.2	10	8260B		11/9/2017	CJR	1
1,1,2,2-Tetrachloroethane	< 6.9	ug/l	6.9	22.1	10	8260B		11/9/2017	CJR	1
1,1,1,2-Tetrachloroethane	< 4.7	ug/l	4.7	14.8	10	8260B		11/9/2017	CJR	1
Tetrachloroethene	820	ug/l	4.8	15.2	10	8260B		11/9/2017	CJR	1
Toluene	< 6.7	ug/l	6.7	21.3	10	8260B		11/9/2017	CJR	1
1,2,4-Trichlorobenzene	< 12.9	ug/l	12.9	41	10	8260B		11/9/2017	CJR	1
1,2,3-Trichlorobenzene	< 8.3	ug/l	8.3	26.3	10	8260B		11/9/2017	CJR	1
1,1,1-Trichloroethane	< 3.5	ug/l	3.5	11.1	10	8260B		11/9/2017	CJR	1
1,1,2-Trichloroethane	< 6.5	ug/l	6.5	20.6	10	8260B		11/9/2017	CJR	1
Trichloroethene (TCE)	9.9 "J"	ug/l	4.5	14.3	10	8260B		11/9/2017	CJR	1
Trichlorofluoromethane	< 6.4	ug/l	6.4	20.4	10	8260B		11/9/2017	CJR	1
1,2,4-Trimethylbenzene	< 11.4	ug/l	11.4	36.3	10	8260B		11/9/2017	CJR	1

Project Name ROBINSONS CLEANERS **Invoice #** E33837
Project # 6155 PO#2017-1561

Lab Code 5033837C
Sample ID 6155 SIW-6
Sample Matrix Water
Sample Date 11/1/2017

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
1,3,5-Trimethylbenzene	< 9.1	ug/l	9.1	29	10	8260B		11/9/2017	CJR	1
Vinyl Chloride	< 1.9	ug/l	1.9	6.2	10	8260B		11/9/2017	CJR	1
m&p-Xylene	< 15.6	ug/l	15.6	49.5	10	8260B		11/9/2017	CJR	1
o-Xylene	< 3.9	ug/l	3.9	12.5	10	8260B		11/9/2017	CJR	1
SUR - Toluene-d8	101	REC %			10	8260B		11/9/2017	CJR	1
SUR - 1,2-Dichloroethane-d4	96	REC %			10	8260B		11/9/2017	CJR	1
SUR - 4-Bromofluorobenzene	94	REC %			10	8260B		11/9/2017	CJR	1
SUR - Dibromofluoromethane	99	REC %			10	8260B		11/9/2017	CJR	1

"J" Flag: Analyte detected between LOD and LOQ LOD Limit of Detection LOQ Limit of Quantitation

Code	*Comment*
1	Laboratory QC within limits.

All solid sample results reported on a dry weight basis unless otherwise indicated. All LOD's and LOQ's are adjusted for dilutions but not dry weight. Subcontracted results are denoted by SUB in the analyst field.

Authorized Signature

CHAIN OF CUSTODY RECORD

PO# 2017-1561

Synergy

WPF

Environmental Lab, Inc.

1990 Prospect Ct. • Appleton, WI 54914
920-830-2455 • FAX 920-733-0631

Chain # Nº 2994

Page 1 of 1

Sample Handling Request
____ Rush Analysis Date Required ____
(Rushes accepted only with prior authorization)
X Normal Turn Around

Lab I.D. #

Account No. : **Quote No.:**

Project #: 6155

Sampler: (signature) R Pruda

Project (Name / Location): Robinsons Cleaners - Court St, Janesville, WI

Reports To: B. Kappen / W. Fassbender	Invoice To:
Company Enviroforensics	Company
Address N16W23390 Stoneridge Dr.	Address
City State Zip Waukesha, WI 53188	City State Zip
Phone 414-326-4412 / 414-982-3988	Phone
FAX 262-510-0460	FAX

Lab I.D.	Sample I.D.	Collection Date	Collection Time	Comp	Grab	Filtered Y/N	No. of Containers	Sample Type (Matrix)*	Preservation	DRO (Mod DRO Sep 95)	GRO (Mod GRO Sep 95)	LEAD	NITRATE/NITRITE	OIL & GREASE	PAH (EPA 8270)	PCB	PVOC (EPA 8021)	PVOC + NAPHTHALENE	SULFATE	TOTAL SUSPENDED SOLIDS	VOC DW (EPA 542.2)	VOC (EPA 8260)	8-RCRA METALS	PID/ FID
5033837A	6155 SIW-11	10-31	1530		X	N	3	GW	HCL													X		
B	6155 SIW-12	11-1	1345		X	N	3	GW	HCL													X		
C	6155 SIW-6	11-1	1440		X	N	3	GW	HCL													X		

Analysis Requested | Other Analysis

Comments/Special Instructions (*Specify groundwater "GW", Drinking Water "DW", Waste Water "WW", Soil "S", Air "A", Oil, Sludge etc.)

Sample Integrity - To be completed by receiving lab.

Method of Shipment: C-C

Temp. of Temp. Blank ___ °C On Ice: X

Cooler seal intact upon receipt: X Yes ___ No

Relinquished By: (sign)	Time	Date	Received By: (sign)	Time	Date
R Pruda	11/2/17	1645	Dale DeCou	1645	11/2/17

Received in Laboratory By: [signature] Time: 8:00 Date: 11/3/17

APPENDIX F

PlumeStop Application Design Summary

REGENESIS

Project Info

Robinson Dry Cleaners
Janesville, WI
Sandstone Vertical Migration PRB
Prepared For:
Keith Gaskill (Enviroforensics)

Target Treatment Zone (TTZ) Info	Unit	Value
Treatment Area	ft^2	26,000
Top Treat Depth	ft	50.0
Bot Treat Depth	ft	60.0
Vertical Treatment Interval	ft	10.0
Treatment Zone Volume	ft^3	260,000
Treatment Zone Volume	cy	9,630
Soil Type	---	sandstone
Porosity	cm^3/cm^3	0.20
Effective Porosity	cm^3/cm^3	0.05
Treatment Zone Pore Volume	gals	388,987
Treatment Zone Effective Pore Volume	gals	97,247
Fraction Organic Carbon (foc)	g/g	0.005
Soil Density	g/cm^3	1.67
Soil Density	lb/ft^3	104
Soil Weight	lbs	2.7E+07
Hydraulic Conductivity	ft/day	12.0
Hydraulic Conductivity	cm/sec	4.23E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	1.20
GW Velocity	ft/yr	438

Application Dosing	Unit	Value
PlumeStop to be Applied	**lbs**	**50,000**

PlumeStop® Application Design Summary

Sandstone Vertical Migration PRB	
Application Method	**Injection Wells**
Spacing Within Rows (ft)	As Depicted
Spacing Between Rows (ft)	As Depicted
Application Points	**21**
Areal Extent (square ft)	26,000
Top Application Depth (ft bgs)	50
Bottom Application Depth (ft bgs)	60
Total PlumeStop to be Applied (lbs)	**50,000**
PlumeStop per point (lbs)	2381
PlumeStop per point (gals)	285
Mixing Water (gal)	**89,907**
Mixing Water (per pt)	4,281
Total Application Volume (gals)	**95,899**
Injection Volume per Point (gals)	4567

Technical Notes/Discussion

Injection volumes per point are estimated. Initial ROI testing to be completed to confirm application rates.

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgments provided by those whom completed the earlier environmental site assessment(s). The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limits on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from the Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the Government.

Prepared by: Doug Davis
Date: 11/22/2017