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Date: November 1, 2022

Subject: Responses to NYSDEC Comments on Remedy Optimization Work Plan
Krutulis Site
848 Marsh Mill Road, Kirkville, New York
NYSDEC Site No. 72709

Dear Ms. Cahill,

On behalf of Bristol-Myers Squibb Company (BMS), Arcadis of New York, Inc. (Arcadis) has prepared this letter responding to comments received from the New York State Department of Environmental Conservation (NYSDEC) on the Remedy Optimization Work Plan (Work Plan) for the Krutulis Site (Site) in Kirkville, New York. The comments were included in a letter from the NYSDEC dated October 3, 2022. We have provided responses to each of your comments below. A copy of the final Work Plan, which has been revised to incorporate these comments, is attached.

Comment

The cover letter and introduction use “dichlorination” instead of “dechlorination”. Please correct this substitution where it occurs throughout the work plan.

Response

The Work Plan has been updated accordingly.

Comment

If not already completed, the PVC riser pipe for MW-3S must be repaired as soon as reasonably possible.

Response

BMS is currently working with their groundwater monitoring contractor for this site (Ramboll) to arrange for repair of the damaged riser pipe. This will be completed as soon as possible.

Comment

Elevated ECD and PID responses were observed at approximately 16 to 25 feet bgs in MIP-10, MIP-3 and MIP-7 located upgradient of the inferred area of highest remaining contamination as shown in Figure 4 and Figure 6. These depths also correspond with lower recoveries in these boring intervals and elevated trichloroethene (TCE) concentrations, indicating a possible transmissive zone. Depending upon the results of the Predesign Investigation (PDI), consideration must be given to installing a 4th injection well upgradient of MW-3D.

Response

These observations will be considered when evaluating the PDI results. The final remedy design may be modified to include a fourth injection well upgradient of MW-3D if warranted by the data.

Comment

Section 4.2 of the work plan indicates that the ERD injection remedy will be finalized based on results from the Predesign Investigation (PDI). Table 2 indicates that the PDI will not be conducted until month 11. In order to expedite remedy implementation, the PDI should be conducted during the permitting phase of the project.

Response

We had intended to follow this proposed sequence initially, but it was necessary to modify the schedule after consulting with our wetland permitting experts. Although an aquatic resources delineation has not yet been performed at the site, the PDI borings are likely within the 100-foot buffer zone that is established surrounding listed wetland in New York. Any work that has the potential to damage/disturb the ground surface within this 100-foot buffer zone is subject to the same permitting requirements as work within the wetland itself. Unfortunately, this means that the PDI cannot be performed until after the necessary wetland permitting/approvals have been secured. The actual location of the wetland boundary at the site will be identified during the aquatic resources delineation. If the resulting mapping shows that the PDI borings are located outside of the 100-foot buffer zone, then the PDI work will be performed as soon as possible/practical.

Comment

The three new injection wells must be developed prior to the initial sampling event.

Response

The injections wells will be developed prior to the initial sampling event. This has been added to the Work Plan.

Comment

Please indicate the direction of groundwater flow on Figure 2.

Response

Figure 2 has been updated accordingly.

If you have any questions or comment regarding this submittal, please contact Mr. Richard Mator of BMS at Richard.Mator@bms.com or 609-252-4273.

Sincerely,
Arcadis U.S., Inc.

Matthew Swensson
Principal Engineer Specialist

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CC. Gary Wroblewski, Arcadis
Richard Mator, BMS

Enclosure: Remedy Optimization Work Plan

Bristol Myers Squibb Company

Remedy Optimization Work Plan

Krutulis Site, Kirkville, New York

November 1, 2022

Remedy Optimization Work Plan

Krutulis Site, Kirkville, New York

November 1, 2022

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Certification Statement

I, KEVIN WALTER JAY, certify that I am currently a NYS registered professional engineer as in defined in 6 NYCRR Part 375 and that this Operation, Maintenance, and Monitoring Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

KEVIN WALTER JAY
11-1-2022
093165

Kevin Walter Jay P.E.

November 1, 2022 Date

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Acronyms and Abbreviations

AS/SVE	Air Sparging and Soil Vapor Extraction
BGS	Below Grade Surface
BMS	Bristol Myers Squibb Company
COC	Constituent of Concern
CSM	Conceptual Site Model
CVOC	Chlorinated Volatile Organic Compound
DCE	Dichloroethene
DO	Dissolved Oxygen
DPT	Direct Push Technology
ERD	Enhanced Reductive Dechlorination
EVO	Emulsified Vegetable Oil
GPM	Gallons Per Minute
ISCO	In-situ Chemical Oxidation
JPA	Joint Permit Application
LTM	Long Term Monitoring
MNA	Monitored Natural Attenuation
MW	Monitoring Well
NWI	National Wetland Inventory
NY NHP	New York National Heritage Program
NYSDEC	New York State Department of Environmental Conservation
NYSHPO	New York State Preservation Office
ORP	Oxidation Reduction Potential
PDI	Predesign Investigation
PID	Photoionization Detector
ROI	Radius of Influence
SB	Soil Boring
TCE	Trichloroethene
TOC	Total Organic Carbon
UIC	Underground Injection Control

USACE	U.S. Army Corp of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VC	Vinyl chloride
VOC	Volatile Organic Compound
WQC	Water Quality Certification

1 Introduction

On behalf of Bristol Myers Squibb Company (BMS), Arcadis is submitting this Remedy Optimization Work Plan (Work Plan) for the Krutulis Property Site located at 848 Marsh Mill Road in Kirkville, New York (site). The site location and layout are shown on Figures 1 and 2, respectively. In a letter dated May 31, 2022, the New York State Department of Environmental Conservation (NYSDEC) noted that chlorinated volatile organic compound (CVOC) concentrations in site groundwater appear to have stabilized recently and are no longer decreasing. NYSDEC requested that BMS re-evaluate the current monitored natural attenuation (MNA) with long-term monitoring (LTM) remedy and submit a work plan proposing additional remedial measures for the site. BMS is aware of the recent CVOC concentration trends in site groundwater and has been exploring the possibility of implementing active remediation at the site. In 2021, Arcadis completed a focused evaluation at the site, including a limited field investigation to evaluate groundwater geochemistry and subsurface hydraulics, to assess potential remedial alternatives. The results of the evaluation were presented to BMS in a Focused Evaluation Technical Memorandum (Appendix A). This Work Plan builds upon the findings of the focused evaluation and includes an updated conceptual site model, a screening of potential site remedial alternatives, and a proposed plan to implement an injection-based enhanced reductive dechlorination (ERD) remedy that will accelerate CVOC attenuation and expedite site closure.

2 Conceptual Site Model

At the request of BMS, Arcadis performed a focused evaluation of the site in 2021 to evaluate whether an injection-based remedy could be implemented to expedite site closure. The evaluation included reviewing available site soil and groundwater characterization data and performing additional sampling to evaluate site groundwater geochemistry and hydraulic testing. The findings of the evaluation were presented to BMS in a Focused Evaluation Technical Memorandum dated May 12, 2022, which included an updated conceptual site model (CSM) incorporating additional insights gained from the focused evaluation. A summary of the updated CSM is presented below. The CSM was developed using groundwater analytical results from the October 2019 sampling event, the most recent data set available at the time; however, the findings are still representative of current conditions as CVOCs were detected at similar concentrations during the December 2021 monitoring event. Additional details are available in the Focused Evaluation Technical Memorandum (see Appendix A). Historical site groundwater monitoring data are included as Appendix B for reference.

Site Hydrogeology

- The hydrogeology of the site consists of 25 to 30 feet (ft) of interbedded silt, fine sand, and clay, identified as lacustrine deposits on surficial geology maps, overlying a dense glacial till.
- Madison County watershed maps indicate the site is part of the Chittenango watershed. Site surface water drains to Black Creek which flows northwest into Chittenango Creek.
- The site is not situated within any mapped primary, principal, or sole source aquifers. There are no potable wells in the downgradient or side gradient directions. There is one private residential well located hydraulically upgradient of the plume.
- Shallow groundwater generally flows from the north-northeast to the south-southwest across the site at a hydraulic gradient of approximately 0.005 foot per foot (ft/ft).
- Groundwater is inferred to discharge into low lying wetlands along the Black Creek floodplain.

- The results from slug testing completed during the 2021 focused evaluation indicate that the hydraulic conductivity of the lacustrine deposits is approximately 0.59 to 0.78 ft/day, which is within the range of published values for fine sand or silty sand material.
- Assuming an effective porosity of 0.15, the average groundwater flow velocity through the formation is estimated to be on the order of 0.02 ft/day. The slow average groundwater flow velocity supports the stability of the plume over the past 20 years.

Nature and Extent of Site Impacts

The extent of site soil impacts is illustrated in plan view on Figure 3, and in section views on Figure 4 and Figure 5. The following key observations are evident from the data.

- Trichloroethene (TCE) is the primary constituent of concern (COC) detected historically in soil at the site at concentrations ranging from 1,800 micrograms per kilogram (µg/kg) to 12,000 µg/kg. Break-down daughter products cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC) were also detected at elevated concentrations in many of the soil samples.
- TCE and cis-1,2-DCE are the primary COCs in site groundwater. TCE and cis-1,2-DCE were detected in MW-3S at concentrations of approximately 1,100 micrograms per liter (µg/L) and 4,100 µg /L, respectively in October 2019. Historical groundwater monitoring data are included for reference as Appendix B.
- The remaining COC mass at the site appears to be centered in the vicinity of MW-3S and the surrounding historical soil borings SB-02, SB-03, SB-06, SB-07, and SB-08 (see Figure 3).
- Within the source area, the COC mass appears to be concentrated in a zone of finer-grained soil (silt and clay) that occurs in the 16- to 26-feet below grade surface (ft bgs) depth range (see Figures 4 and 5).
- 1,2-DCE and VC concentrations in groundwater at MW-3S, combined with decreasing TCE concentrations and groundwater geochemistry that is reducing, suggest that reductive dechlorination is occurring naturally within the source area. However, it is likely that reductive dechlorination processes within the plume are rate limited based on the low concentrations of total organic carbon (TOC) detected in groundwater.
- Clean water injection testing conducted at MW-3D and MW-6S indicate the formation can accept a slug of fluid at a flow rate greater than 1 gallon per minute (gpm) over a short duration with little to no backpressure. This suggests that an injection based remedial strategy is feasible for the site.

During the focused evaluation completed for BMS, Arcadis evaluated the relationship of soil and groundwater data collected at and in the vicinity of MW-3D and MW-6D during a 2007 field investigation. A site-specific soil/water partition coefficient was determined using the following equation:

$$K_{SW} = \frac{X}{C}$$

where,

K_{SW} = site-specific soil/water partition coefficient (unitless)

X = concentration of chemical in soil (parts per billion, ppb, or µg/kg)

C = concentration of chemical in water (ppb or µg/L)

The site-specific soil/water partition coefficient for TCE at the time of the 2007 field investigation was roughly 2.9 utilizing paired soil and groundwater data from MW-3D and MW-6D. Applying this soil/water partition coefficient inferred TCE concentrations in groundwater were likely one to two orders of magnitude (likely 500 to 2,000 µg/L) above the New York State Department of Environmental Conservation (NYSDEC) Groundwater Quality

Standards at soil borings SB-02, SB-03, SB-06, SB-07, and SB-08 in 2007. The locations of these borings relative to source area wells MW-3S and MW-3D are shown on Figure 3.

This relationship allows an estimate for how COC concentrations may have attenuated in soil at these locations since 2007. For example, TCE was observed in groundwater at a concentration of 13,200 µg/L at MW-3S during the May 2007 sampling event, which would coincide with a sorbed TCE mass of approximately 38,000 µg/kg in soil. The December 2021 groundwater analytical data at MW-3S indicates TCE concentrations in groundwater have attenuated down to approximately 1,100 µg/L. This groundwater TCE concentration correlates to a potential soil concentration of 3,100 µg/kg which is an order of magnitude lower than what the soil concentrations may have been in 2007. This indicates that TCE mass is desorbing from soil into groundwater where attenuation and degradation of TCE is occurring.

Assuming the attenuation of TCE concentrations in groundwater observed at MW-3S is representative of groundwater conditions plume-wide, then this analysis suggests that the current area of highest remaining groundwater impacts at the site is smaller than would be inferred by the 2007 investigation data. Accounting for attenuation, the inferred current extent of the remaining groundwater hot spot is shown on Figure 3.

3 Remedial Alternatives Evaluation

3.1 Preliminary Screening of Remedial Alternatives

The following remedial technologies are effective for CVOCs but were not included in the preliminary screening of alternatives due to obvious implementability concerns.

- Excavation – Not implementable due to depth of CVOC mass, difficulty accessing plume source area with construction equipment and potential for damaging wetland area.
- Air sparging and soil vapor extraction (AS/SVE) – Interbedded lithology would limit distribution of airflow through the formation and CVOC mass removal. AS/SVE system construction at plume source area would be difficult due to access limitations and potential for damaging wetland area. Also, there is no power source nearby.
- Groundwater Recirculation – Not implementable for same reasons as AS/SVE. Remedy would require installing remediation wells and below-grade conveyance piping in the wetland area.

The findings of the focused evaluation indicate an in-situ injection-based remedy is viable and can be implemented at the site to address the remaining CVOC mass in soil and groundwater. ERD using a carbon source such as molasses and/or emulsified vegetable oil (EVO) and in-situ chemical oxidation (ISCO) using an oxidant such as sodium permanganate were identified as the two most viable injection-based remedies given the site COCs and the groundwater geochemistry in the target treatment area (see Appendix A). Based on the results of the clean water injection testing performed during the focused evaluation, a full-scale injection-based remedy would likely be implemented at flow rates of approximately 0.5 to 1.5 gpm to allow the aquifer time to accommodate the solution with minimal backpressure.

A preliminary screening of the two injection-based remedies and the current site strategy of MNA with LTM is presented in Exhibit 1 below.

Exhibit 1 – Preliminary Screening of Remedial Alternatives

Remedial Technology	Effective at Treating CVOCs in Groundwater	Effective at Enhancing Reducing Conditions in Groundwater	Cost
ERD – Molasses/EVO	Yes	Yes	Moderate
ISCO - Permanganate	Yes	No	High
MNA/LTM	Yes	No	Low

Although ISCO is effective for the target CVOCs, there are several potentially significant drawbacks associated with it when compared to ERD. ISCO is more expensive than ERD due to higher reagent and health and safety costs associated with chemical handling and injection that are not required for ERD. ISCO would also likely be a less efficient remedy than ERD, since site groundwater geochemistry is currently reducing in the areas exhibiting the highest CVOC impacts, thus a majority of the oxidant injected initially may be consumed by natural oxidant demand of the soil and groundwater while converting the aquifer from reducing to oxidizing conditions. Thus, multiple injections could be required to overcome the natural oxidant demand before oxidizing the target CVOCs, which would increase the cost. Since it offers no advantages over ERD and more potential drawbacks, ISCO is not recommended at this time and is not carried forward into the detailed evaluation of alternatives below.

3.2 Detailed Evaluation of Remedial Alternatives

The following two remedial alternatives are selected for further evaluation based on the preliminary screening.

- Monitored Natural Attenuation with Long Term Monitoring
- Enhanced Reductive Dechlorination

The following two sections provide a brief description of each remedial alternative.

3.2.1 Description of Alternatives

3.2.1.1 Monitored Natural Attenuation with Long Term Monitoring

MNA with LTM is a remedial approach that relies on natural subsurface processes to reduce the contaminant mass in soil and groundwater. Natural attenuation of dissolved phase CVOCs typically occurs under anaerobic conditions. In general, anaerobic biodegradation is the principal attenuation mechanism for CVOC-contaminated groundwater which creates a clean water gradient allowing adsorbed CVOC mass to partition from soil into groundwater. The reduction of CVOCs by way of this desorption and biological reduction cycle can be rate limited by multiple factors including available organic carbon and/or the microbial consortium capable of fully reducing TCE into innocuous byproducts such as ethene and ethane.

Critical factors to be evaluated when considering MNA include:

- Whether the contaminants are likely to be effectively addressed by natural attenuation processes (e.g., degraded if organic contaminants, immobilized or decayed if inorganic contaminants).
- The groundwater plume's potential for migration.
- The potential for unacceptable risks to human health and the environment.
- Whether land use changes could influence the effectiveness of MNA.

MNA with LTM is typically appropriate at sites where the contamination will safely and naturally attenuate without risk to human health or the environment. Generally, MNA is considered a low-cost approach compared to most other active remedial technologies, although monitoring costs may be greater over extended periods of time. Implementation of the technology causes only minimal disturbance to site operations.

The current MNA/LTM remedy in place at the site consists of gauging and sampling a network of eight groundwater monitoring wells (MW-1, MW-2, MW-3S, MW-3D, MW-4, MW-5, MW-6S, and MW-6D) annually (monitoring frequency reduced from semiannual to annual in 2020) with annual reporting to NYSDEC. Groundwater samples are collected by low flow sampling methodology and analyzed for VOCs by United States Environmental Protection Agency (USEPA) Method 8260. Alternative 1 assumes that the current MNA/LTM monitoring program would continue for a minimum of 30 years.

3.2.1.2 Alternative 2 – Enhanced Reductive Dechlorination

ERD is a remedial technology that relies on the natural metabolic processes of subsurface microorganisms to degrade COCs in groundwater. Specifically, during ERD of CVOCs, the chlorinated compound (e.g., TCE) can be used as the electron acceptor for microbial respiration. For this to occur, an electron donor (e.g., hydrogen generated from fermentation of a carbon source) must be present in sufficient quantities. If the correct microbes are present in sufficient quantities, this process occurs intrinsically in the presence of naturally occurring carbon sources; however, this process can be enhanced by injecting a carbon substrate (e.g., cheese whey, EVO, lactate, molasses, etc.) into the subsurface to create a biological in-situ reactive zone. Organic carbon injections are conducted to achieve three basic goals.

- Overcome the continuous electron acceptor supply - This includes oxygen, nitrate, and other electron acceptors that tend to support a more aerobic microbial community that is not readily conducive to CVOC bioremediation. Note, this goal is not applicable for this site since the groundwater geochemistry is already reducing.

- Produce molecular hydrogen through fermentation - Molecular hydrogen is a product of fermentation and is used as an electron donor by dechlorinating bacteria.

- Achieve complete dechlorination of the target compounds - dechlorinating bacteria use the hydrogen produced through fermentation as an electron donor and CVOCs as electron acceptors. Hydrogen atoms are substituted for chlorine atoms in the dehalorespiration process, resulting in biologically mediated sequential dechlorination of CVOC molecules, which for TCE follows the pathway:

$$\text{TCE} \rightarrow \text{cis-1,2-DCE} \rightarrow \text{VC} \rightarrow \text{Ethene}$$

The characteristics and extent of an established reactive zone are generally determined by the effectiveness of carbon substrate delivery over the targeted treatment area. By maintaining an in-situ TOC concentration greater than background within the reactive zone, the microbial ecology will adapt, encouraging proliferation of bacteria that participate directly in CVOC reduction to the innocuous end products ethene and ethane. If necessary, commercially available dechlorinating microbial cultures can be included for bioaugmentation, with delivery of carbon substrate to facilitate complete dechlorination.

At this site, ERD will be used to accelerate the rate of natural attenuation of CVOCs by engineering highly reducing conditions in groundwater through the introduction of organic carbon to the plume source area. This will be accomplished using a two-phased approach with injection of both soluble and semi-soluble carbon substrates. During the first phase, molasses will be injected using traditional injection wells. Molasses is a soluble substrate that will provide a rapid infusion of organic carbon and generate strong reducing conditions in groundwater within the treatment area. Once the desired strong reducing conditions are established, EVO will be injected as the second phase using temporary injection points advanced by direct push technology (DPT) drilling. EVO is a sparingly soluble substrate with a higher organic carbon content than molasses and will provide a long-lasting organic carbon source that will sustain strongly reducing conditions within the treatment area for an additional 12 to 24 months. It is assumed that up to two EVO injections will be necessary.

TCE is degrading to cis-1,2-DCE and VC with higher concentrations of cis-1,2-DCE in the vicinity of MW-3S and MW-3D as observed in groundwater analytical data collected in 2021 (see Appendix B). The addition of TOC in the vicinity of MW-3S and MW-3D in the form of molasses should increase the conversion rate of cis-1,2-DCE to VC accelerating the biodegradation of CVOC mass into innocuous end products and accelerating the site closure timeframe.

Groundwater monitoring will be performed at the following frequency before, during, and after the injections to evaluate remedial performance.

- Once before injections to establish baseline conditions
- Quarterly during molasses injections to monitor performance
- Quarterly after EVO injection for first year and annually thereafter

Additional injection events would be performed if needed based on post-injection performance monitoring results.

3.2.2 Evaluation of Alternatives

3.2.2.1 Alternative 1 – Monitored Natural Attenuation with Long Term Monitoring

MNA with LTM is expected to continue for at least 30 years with 30 annual sampling events. Some advantages and potential drawbacks associated with Alternative 1 are discussed below and summarized in Table 1.

Advantages

- No additional design, permitting, or construction are required for this alternative.
- There are no accessibility issues associated with this alternative. Most of the site monitoring wells are accessible by existing dirt roads and should remain so with periodic brush clearing. Two of the monitoring wells are in the marsh area but are still accessible by sampling personnel.

Potential Drawbacks

- Longer duration with greater uncertainty. Alternative 1 assumes that the remaining CVOC mass in soil and groundwater will continue to attenuate naturally and that dissolved phase CVOC concentrations will fall below regulatory standards within a reasonable timeframe (minimum 30-year lifecycle). Since the remaining CVOC mass is concentrated within the fine-grained soil, biodegradation is likely the primary attenuation process occurring at the site. Other natural attenuation processes, such as dispersion and dilution, are likely limited by the lack of groundwater flow and resulting minimal pore volume flushes through this fine-grained soil. Groundwater within the plume source area is currently carbon deficient and without a carbon source microbial activity driving biodegradation will slow and/or potentially cease, which would extend the remedial timeframe.

- Greater risk that the remedy could be impacted by external factors. With a minimum lifecycle of 30 years, there is a greater potential for changes to occur that could impact the remedy and site in general. Some examples include changes in property ownership, changes in regulations and/or regulatory standards, and changes in regulatory or other stakeholder acceptance of the MNA/LTM remedy. These changes could require a re-evaluation of the remedial approach at some point in the future, which could extend the timeframe to closure.

3.2.2.2 Alternative 2 – Enhanced Reductive Dechlorination

The expected duration of the injection remedy is approximately 9 years, which assumes that up to three injections of molasses and up to two injections of EVO will be sufficient to reduce dissolved phase CVOC concentrations at the plume source area below regulatory standards within a 5-year post-injection performance monitoring period. Some advantages and potential drawbacks associated with Alternative 2 are discussed below and summarized in Table 1.

Advantages

- Shorter duration. Engineering optimal reducing conditions in the subsurface will increase the CVOC reduction rates leading to a shorter timeframe for contaminant mass reduction and shorter path to site closure.
- Less risk that remedy could be impacted by external factors. Since the duration is shorter, there is less chance that unforeseen conditions might occur that could impact the remedy or require a re-evaluation of the remedial approach.
- Stakeholder acceptance. An ERD remedy is more likely to be accepted by stakeholders such as the property owner and NYSDEC.

Potential Drawbacks

- Permitting is one of the main potential drawbacks associated with ERD. The ERD treatment area is located within and immediately adjacent to a wetland which is identified on both the National Wetland Inventory (NWI) and NYSDEC Resource Mapper. Since drilling work will create a physical disturbance within the wetland and the area adjacent to it, wetland permitting, and associated approvals will be required. The wetlands delineation and permitting process is estimated to take up to 10 months to complete and will involve coordination between the New York State Preservation Office (NYSHPO), the New York National Heritage Program (NY NHP), the U.S. Fish and Wildlife Service, (USFWS), the United States Army Corp of Engineers (USACE), and the NYSDEC. An Underground Injection Control (UIC) permit is also necessary for the injections.
- Accessibility is another potential drawback associated with Alternative 2. Vehicle access to the treatment area can be challenging due to soft ground conditions and tall vegetation. Marsh mats will be required to allow the drill rig access to the wetlands area for both injection well installation and EVO injections. Drilling work will need to be coordinated to take place during the summer and early fall months when

ground conditions are typically firmer and the water level in the wetland area should be low enough to allow rig access using marsh mats. Proper precautions will be necessary during injection events to prevent carbon solution from surfacing into the wetlands area as the carbon source would likely spur microbial species capable of competing for oxygen in the surface water associated with the wetlands. This will increase implementation costs and could complicate scheduling of the drilling and injection events.

- There is also some uncertainty in the design assumptions for Alternative 2. The remaining groundwater hot spot area at monitoring wells MW-3S and 3D may be larger than expected, which would require expanding the treatment area to include more injection points. It may also take longer than expected for CVOC concentrations in groundwater to attenuate below standards, or additional injections may be needed to achieve the standards. This would increase the overall cost of the ERD remedy.

3.2.3 Recommendations

Based on the evaluation above, ERD using molasses and EVO, is considered the best option for optimizing the existing site remedy and accelerating closure timeframe. ERD is the most efficient and effective way to expedite contaminant mass reduction, as it will enhance the existing natural attenuation processes in place at the site. ERD requires minimal infrastructure (injection wells) and thus the accessibility issues and disturbance to the site and adjacent wetland during construction and implementation will be limited. An ERD injection remedy design is provided in the following section.

4 Optimized Remedy

The proposed ERD treatment area is shown on Figure 6. As discussed above, the treatment area represents the CVOC plume is currently centered based on the available site characterization data. A limited predesign investigation (PDI) will be performed to define the current CVOC plume surrounding MW-3S and MW-3D and confirm that the proposed ERD treatment area is accurate. The ERD treatment area will be updated as necessary based on the PDI results and used to develop the layout of injection wells/points in the final design.

4.1 Predesign Investigation

Nine soil borings will be advanced to a depth of approximately 35 feet bgs using DPT drilling in the vicinity of wells MW-3S and MW-3D. The borings will be installed at an approximate 30-foot spacing working outward from wells MW-3S and 3D toward the adjacent soil and grab groundwater sampling points where CVOCs were detected at elevated concentrations during the 2007 site investigation. Boring locations are shown on Figure 6. Three soil samples will be collected from each boring within the following depth ranges: 5 to 15-foot bgs, 15 to 25-foot bgs, and 25 to 35-foot bgs. Two groundwater samples will be collected from each boring: one from the 10 to 20-foot bgs depth range and the other from the 20 to 30-foot bgs depth range. Soil samples will be collected from the depth exhibiting the greatest CVOC impacts within each of these intervals, as indicated by field measured photoionization detector (PID) screening results or visual evidence of impacts. Grab groundwater samples will be collected either using a well point sampler attached to the drilling tooling, or a temporary screen installed in the borehole. Groundwater and soil samples will be analyzed for CVOCs by EPA Method 8260. Sample results will be reviewed to determine whether the plume source area is adequately delineated for the purposes of the ERD remedy design. If the results indicate that additional delineation is necessary, then up to six additional soil borings will be advanced where needed to fill in the gaps. Reporting associated with the PDI is discussed below.

4.2 Final Design and Permitting

The ERD injection remedy will be updated and finalized based additional insights gained about the plume source area from the PDI. The final ERD injection layout and any other design updates will be provided to NYSDEC for reference prior to implementation. Arcadis expects that the following permits/approvals will be required for the injection remedy and will be obtained after the design is finalized.

Underground Injection Control Permit

A UIC Permit will be obtained from EPA Region 2 for the proposed molasses and EVO substrate injections.

NYSDEC – USACE Joint Permit Application for Disturbance of Regulated Wetlands

The ERD treatment area is located within and immediately adjacent to a wetland which is identified on both the NWI and NYSDEC Resource Mapper, so it is assumed that the wetland is regulated by both the Federal Government and the State of New York. Since the proposed remedy may disturb a portion of the wetland, clearance is required under Section 404/401 of the Federal Clean Water Act, along with a separate clearance from New York State in the form of a Section 401 Water Quality Certification (WQC). Since the project involves remediation within federally jurisdictional waters, a Nationwide Permit 38 (NWP-38) for Cleanup of Hazardous and Toxic Waste will also likely be required. Finally, since the freshwater wetland area appears to be greater than 12.4 acres in size, a NYSDEC Article 15/24 permit will also likely be required in accordance with Title 6 of the New York Codes, Rules, and Regulations (6 NYCRR) Part 608. A single Joint Permit Application (JPA) will be filed with the NYSDEC and USACE for all the above-listed permits.

The following supporting activities will be performed as part of the JPA process.

- An Aquatic Resource Delineation will be performed within the proposed ERD treatment area and immediately adjacent areas to determine the presence or absence of jurisdictional waters and their boundaries. Arcadis will perform an on-site routine wetland determination as described in the USACE Wetland Delineation Manual, Technical Report Y-87-1 (Environmental Laboratory, 1987) using wetland criteria detailed in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0) (USACE, 2012). Arcadis will develop a wetland delineation report to satisfy state and federal jurisdictions. This report will be included in the JPA.
- Since the project requires federal authorization, consultation with the NYSHPO under Section 106 of the National Historic Preservation Act (1966) and the New York State Historic Preservation Act (1980) is required to determine whether there is a potential for the project to impact cultural resources.
- Since the project requires federal authorization, a Threatened and Endangered Species review/screening will be performed through the NY NHP and the USFWS to determine whether rare plants/animals or federally listed species might be present within the project area.
- An Erosion and Sedimentation Control Plan will be prepared for the project work area that adheres to the NYSDEC Stormwater Management Program Best Management Practices and submitted with the JPA.

4.3 ERD Injections and Performance Monitoring

ERD injections will be performed in two phases beginning with injections of a soluble molasses substrate followed by injection of a semi-soluble EVO substrate. A preliminary ERD injection design and implementation plan is provided below. As discussed, these details (e.g., final number, layout and depths of injection wells/points, injection volumes, etc.) are subject to change in the final design based on the results of the PDI. Additionally, the injection plan outlined below may also be adjusted during implementation, if necessary to optimize remedial performance. Any such modifications will be communicated to NYSDEC.

4.3.1 Phase 1 – Soluble Substrate Injections

Once the ERD remedy design is finalized, and the necessary wetland permitting is in place, injection wells will be installed within the treatment area for the first phase of soluble substrate injections. Injection wells will be installed with ten-foot-long 4-inch diameter continuous-wrap vee-wire stainless steel screens, set at a depth of approximately 16 to 26 feet bgs, across the zone of highest observed CVOC impacts in subsurface soil within the plume source area. The wells will be developed prior to sampling/injection to remove fines from the filterpack and improve hydraulic communication with the surrounding formation. Three injection wells are currently proposed at the locations shown on Figure 6. Well construction details are provided on Figure 7. The current injection well layout was developed based on an approximately 20-foot lateral spacing with an assumed 10-foot injection radius of influence (ROI) and an estimated mobile porosity of 15%.

Three injections of dilute molasses solution will be performed once a quarter for three quarters during Phase 1. A total volume of approximately 11,000-gallons of 2% by volume dilute molasses injection solution injected per event. Molasses is a soluble substrate that will provide a rapid infusion of organic carbon and generate strong reducing conditions in groundwater within the treatment area, effectively jump-starting the anaerobic biodegradation process. Baseline and post injection performance monitoring associated with the molasses injection events are discussed in Section 4.4.

4.3.2 Phase 2 – Semi-Soluble Substrate Injections

Once the desired strong reducing conditions are established by the molasses injections, EVO will be injected using temporary injection points advanced by DPT drilling. EVO is a sparingly soluble substrate with a higher organic carbon content than molasses and will provide a long-lasting organic carbon source that will sustain strongly reducing conditions within the treatment area for an additional 12 to 24 months. DPT application is the preferred method for EVO application due to the oil droplet size in an EVO emulsion and its propensity to clog fixed injection well screens.

Eight injection points are proposed across the treatment area upgradient from MW-3S, as shown on Figure 6. EVO will be injected across the same depth interval as the molasses solution during Phase 1. The EVO injection points will be advanced in-between and around the proposed molasses injection wells, at an approximately 10-foot lateral spacing based on a 5-foot injection ROI, to provide adequate distribution of organic carbon in the treatment area. The DPT injection interval will be the same as the injection well screen interval above. A total volume of approximately 8,500 gallons of 2% by volume dilute EVO injection solution will be injected per event.

It is assumed that up to two EVO injection events will be necessary to sustain the desired reduction in CVOC concentrations long-term. If needed, the second injection will be performed approximately 12 to 24 months after the first. The actual timing of the second injection will be determined based on performance monitoring results. Performance monitoring associated with the EVO injection events are discussed in Section 4.4.

4.4 ERD Performance Monitoring

Groundwater monitoring will be performed before, during, and after the injections to evaluate remedial performance. Sampling will be performed following low-flow sampling protocols.

Pre-Injection Baseline Monitoring

The three new injection wells and existing monitoring wells MW-3S and MW-3D will be sampled before the first molasses injection to establish baseline groundwater conditions. Groundwater samples will be analyzed for the following constituents.

- Water quality parameters: dissolved oxygen (DO), oxidation reduction potential (ORP), pH, specific conductance, temperature, and turbidity – field measured
- VOCs by EPA Method 8260
- TOC by Method SM-5310B (for emulsion), or EPA Method 9060A (for non-emulsion)
- Total and dissolved iron and manganese by EPA method 6010C (dissolved metals samples to be field filtered)
- Sulfate/Sulfide – field measured by test kit
- Dissolved gases (ethene, ethane, methane) by Method RSK 175
- Alkalinity – by EPA method 310.2
- Chloride – by EPA Method 9056A

Phase 1 – Post Injection Monitoring

The same five wells sampled during the baseline event will be sampled quarterly during the molasses injections to evaluate performance. Samples will be collected before the start of each quarterly injection event and analyzed for the following list of constituents.

- Water quality parameters: DO, ORP, pH, specific conductance, temperature, and turbidity – field measured
- VOCs by EPA Method 8260
- TOC by Method SM-5310B (for emulsion), or EPA Method 9060A (for non-emulsion)
- Total and dissolved iron and manganese by EPA method 6010C (dissolved metals samples to be field filtered)
- Sulfate/Sulfide – field measured by test kit
- Dissolved gases (ethene, ethane, methane) by Method RSK 175

Phase 2 – Post-Injection Monitoring

The same five wells sampled during the baseline event will be sampled quarterly for one year after each EVO injection, and then annually until the next injection event, assuming a second EVO injection is necessary. If the second injection is performed between one and two years after the first, then the annual monitoring event will be rescheduled and performed before the second injection. Samples will be analyzed for the following list of constituents.

- Water quality parameters: DO, ORP, pH, specific conductance, temperature, and turbidity – field measured
- VOCs by EPA Method 8260
- TOC by Method SM-5310B (for emulsion), or EPA Method 9060A (for non-emulsion)
- Total and dissolved iron and manganese by EPA method 6010C (dissolved metals samples to be field filtered)
- Sulfate/Sulfide – field measured by test kit
- Dissolved gases (ethene, ethane, methane) by Method RSK 175

Following completion of EVO injections, performance monitoring will continue annually until CVOC concentrations in the groundwater plume fall below their respective NYSDEC groundwater quality standards, or a clear trend of decreasing CVOC concentrations in groundwater is established which demonstrates that the remaining CVOC mass in the plume will continue to attenuate naturally toward groundwater quality standards without the need for additional injections. Note, the current annual site-wide groundwater monitoring program will continue during the ERD injection remedy. Post-injection monitoring events will be performed in conjunction with routine annual site groundwater monitoring events where possible/practical.

4.5 Contingency

Enhanced bioattenuation is controlled by several factors including heterogeneities in subsurface hydrogeology within the treatment area that affect injectability and injectant distribution, groundwater geochemistry, and the presence/abundance of a CVOC degrading microbial community within the treatment area. As such, it is difficult to predict exactly how an ERD injection remedy will progress at a particular site. As a result, adjustments to the remedy are often necessary during implementation to optimize performance. Several such potential adjustments are presented below as contingencies.

TCE appears to be readily degrading to cis-1,2-DCE in the vicinity of MW-3S and MW-3D as observed in groundwater analytical data collected in 2021 where the TCE to cis-1,2-DCE with presence of VC at lower concentrations (see Appendix B). The addition of TOC in the vicinity of MW-3S and MW-3D in the form of molasses should increase the conversion rate of cis-1,2-DCE to VC then to innocuous end products. Arcadis will evaluate these contaminant concentration trends during injection performance monitoring to determine if TOC alone will expedite cis-1,2-DCE degradation. Bioaugmentation may be considered in conjunction with the EVO DPT injection if increased TOC loading alone does not result in accelerated reduction of CVOCs to innocuous end products. The addition of CVOC reducing cultures may help expedite degradation rates and reduce the MNA period following remedy implementation.

Similarly, it is assumed that two EVO injection events spaced at 12 to 24 months apart will provide sufficient carbon substrate to the formation to sustain anaerobic biodegradation of the remaining CVOC long-term. If the post-injection performance monitoring data indicate that this is not the case, then additional injections may be performed to sustain TOC loading in the formation and sustain CVOC attenuation in the plume source area.

4.6 Reporting

Upon completion of the PDI, BMS will submit a PDI summary report to NYSDEC. The summary report will include a final ERD design if updates to the design presented in this Work Plan are necessary based on the PDI results.

A summary of ERD injection activities and performance monitoring results will be included in the sitewide groundwater monitoring reports that are currently submitted to NYSDEC annually. The summary information will include any adjustments made to the final ERD design and implementation plan to optimize performance of the remedy.

Once CVOC concentrations at plume source area wells MW-3S and MW-3D fall below their respective NYSDEC groundwater quality standards, or a clear trend of decreasing CVOC concentrations in groundwater is established which demonstrates that additional injections are not necessary to sustain natural attenuation of the remaining CVOC mass, BMS will submit a request to discontinue post-injection performance monitoring to NYSDEC.

4.7 Schedule

A preliminary schedule for the ERD remedy is provided in Table 2. The estimated duration of the active portion of the remedy, including the PDI, design/permitting, and injections with initial post-injection performance monitoring is approximately four years. This assumes that up to two EVO injections will be performed with 12-months between events. This schedule is subject to change based on the actual number of EVO injections required to achieve the objectives and the timing of the injections. The schedule assumes that the extended annual post-injection performance monitoring period will begin in year five. The duration of annual post-injection monitoring will be determined based on the performance monitoring results and CVOC concentration trends.

5 References

United States Army Corps of Engineers, Environmental Laboratory. 1987. Wetland Delineation Manual, Wetland Research Program Technical Report Y-87-1. January 1987.

United States Army Corps of Engineers, Engineer Research and Development Center. 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0). January 2012.

Tables

Table 1
Remedial Alternatives Evaluation

Remedy Optimization Work Plan
BMS Krutulis Site
848 Marsh Mill Road, Kirkville, New York

Remedial Alternatives	Alternative 1 Monitored Natural Attenuation with Long Term Monitoring	Alternative 2 Enhanced Reductive Dechlorination
Description	Monitored Natural Attenuation (MNA) with Long Term Monitoring (LTM) is a remedial approach that relies on natural subsurface processes to reduce contaminant mass in soil and groundwater. Microbial species use the carbon atom in the chlorinated volatile organic compound (CVOC) such as TCE as a food source and convert the hydrocarbon to innocuous end products such as ethene and ethane.	Same biological process as outlined in Alternative 1 but Alternative 2 increases the organic carbon loading in the plume footprint to enhance reductive dechlorination rates. This would be achieved using a 2-phase approach. First, injecting a soluble molasses substrate into the subsurface via permanent injection wells for up to three treatment events to create strongly reducing conditions and drive contaminant mass down. Second, injecting EVO by direct push technology to provide a sparingly soluble carbon source to sustain long term reductive dechlorination. EVO DPT locations would be advanced in-between and around the permanent molasses injection wells to allow for adequate distribution of organic carbon. A predesign investigation would be performed to confirm the extent of the current groundwater hot spot and ERD treatment area.
Advantages	• Remedy is already in place - no additional design, permitting, or construction are required. • No accessibility issues associated with this alternative.	• Shorter timeframe for contaminant mass reduction and shorter path to site closure. • Shorter duration and less risk that remedy could be impacted by changes to status quo or other external factors that could require future re-evaluation of the remedial approach. • Stakeholder acceptance: An ERD remedy is likely to be accepted by stakeholders such as the property owner and NYSDEC.
Potential Drawbacks	• Longer duration with greater uncertainty. Assumes that the remaining CVOC mass in soil and groundwater will continue to attenuate naturally and that dissolved phase CVOC concentrations will fall below regulatory standards within the assumed 30-year lifecycle; but that is not guaranteed. Formation is carbon deficient so biodegradation will slow and could stop altogether which could extend the remedial timeframe beyond 30 years. • With 30-year duration there is a greater potential for changes to occur to the current status quo that could impact the remedy and Site in general such as changes in Site ownership, changes in regulations and/or regulatory standards, and changes in regulatory or other stakeholder acceptance of the MNA/LTM remedy. These changes could potentially require re-evaluation of the remedial approach which could extent the timeframe to closure and/or increase the total cost.	• Wetland delineation and permitting is required from NYSDEC and U.S. Army Corps, which is expected to take up to 10 months. UIC permit is also required from USEPA Region 2. • Vehicle access to the treatment area can be challenging due to soft ground conditions and tall vegetation. Marsh mats will be required to drill in the wetland area and drilling work will need to take place in the summer/early fall when ground conditions are typically firmer and the water levels are lowest. This will increase implementation costs and could complicate scheduling of the drilling and injection events. • Some uncertainty in the ERD design assumptions (size of treatment area, number of injection events, post-injection time to closure), which could potentially increase cost.
Estimated Schedule	Estimated sampling frequency: **1 sampling event per year** Estimated total duration of remedy: **30 years**	Estimated duration of ERD injection remedy with post-injection monitoring: **9 years**

Table 2
Preliminary ERD Remedy Implementation Schedule
Remedy Optimization Work Plan
BMS Krutulis Site
848 Marsh Mill Road, Kirkville, New York

Preliminary ERD Remedy Implementation Schedule

Task	Time (months)																																																Time (years)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	5 - ?(4)
Remedial Action Workplan, Design, UIC Permit	▨	▨	▨	▨	▨	▨																																											
Wetlands Delineation and Permitting	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨																																							
Predesign Investigation											▨																																						
Predesign Investigation Report and ERD Final Design Update(3)												▨	▨																																				
Injection Well Installation														▨																																			
Pre-Injection Baseline Sampling															▨																																		
Molasses Injections (3 total events)																▨			▨			▨																											
EVO DPT Injection 1(5)																								▨																									
EVO DPT Injection 2(5)																																				▨													
Post-Injection Performance Monitoring(2)																		▨			▨			▨			▨			▨			▨			▨			▨			▨			▨			▨	▨

Notes:

1. Schedule is tentative based on conceptual remedy design and operation. Dates are subject to change based on actual agency/permitting entity review timeframe and other external factors.
2. Post injection performance monitoring will be completed during annual site-wide sampling events where possible. Schedule assumes that a second EVO injection event is necessary and will be performed 12 months after the first. Performance monitoring schedule is subject to change based on post-injection performance monitoring results. Post-injection monitoring frequency becomes annual if duration between EVO injections > 12 months.
3. ERD final design to be included only if design update is necessary based on predesign investigation results.
4. Post injection monitoring to be performed annually upon completion of ERD injections until CVOC concentration trends demonstrate it can be discontinued.
5. Schedule assumes second EVO injection event necessary and performed 12 months after first. Actual number and schedule of EVO injections to be determined based on performance monitoring results.

Acronyms and Abbreviations:

ERD = enhanced reductive dechlorination
EVO = emulsified vegetable oil
DPT = direct push technology

Figures

CITY: MANCHESTER DIV/GROUP: ENVCAD DB: B.SMALL PM: TM:
C:\Users\BSSmall\ACCDocs\Arcadis\AUS-BRISTOL MYERS-KIRKVILLE-KIRKVILLE New York\Project Files\2022\01-In Progress\01-DWG\GEN-F01-SITELOC.dwg LAYOUT: 1 SAVED: 7/11/2022 9:58 AM ACADVER: 23.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 7/11/2022 9:59 AM
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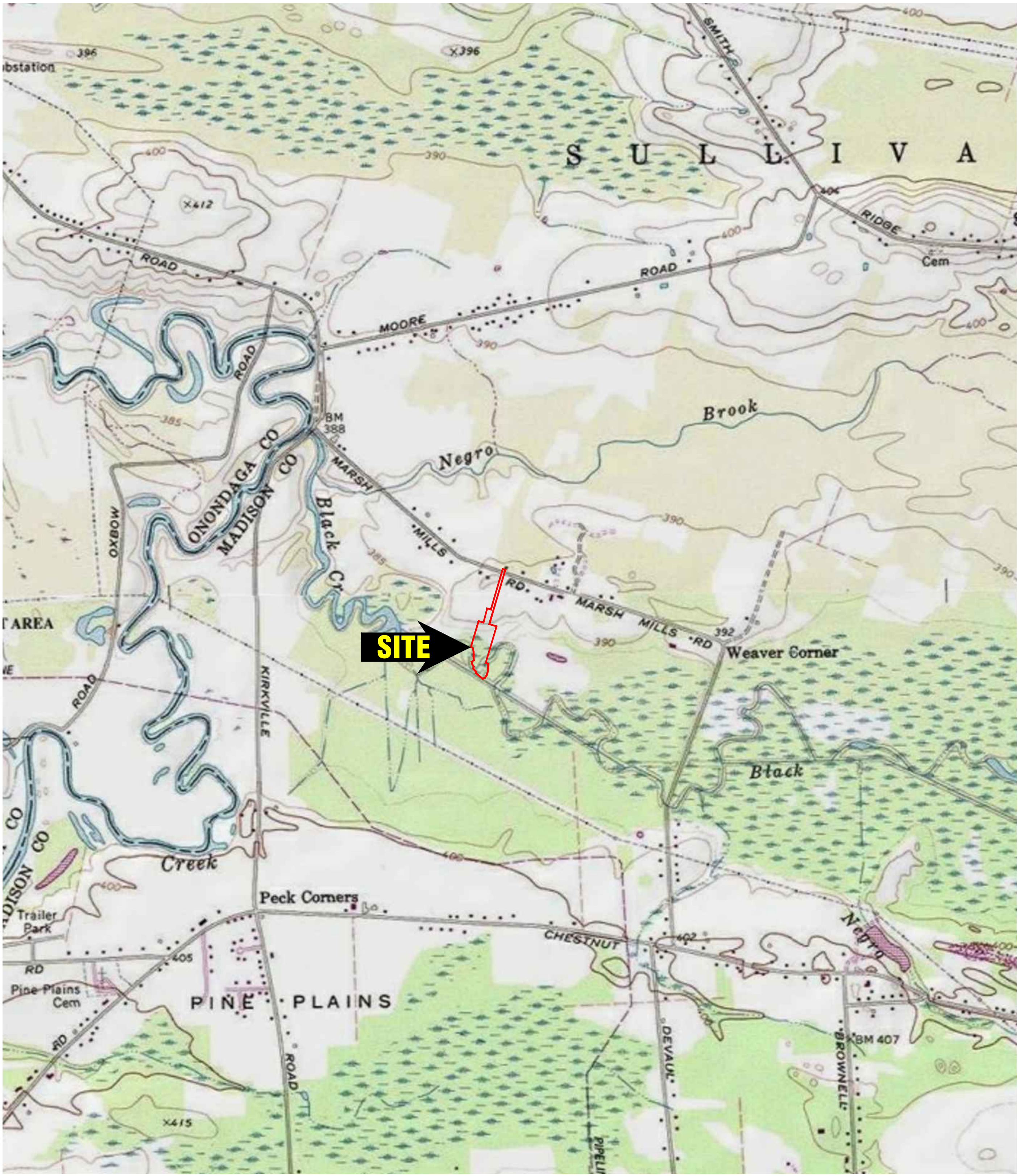
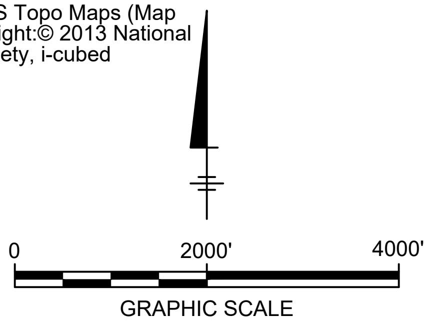


SOURCE: USGS Topo Maps (Map Service) - Copyright:© 2013 National Geographic Society, i-cubed

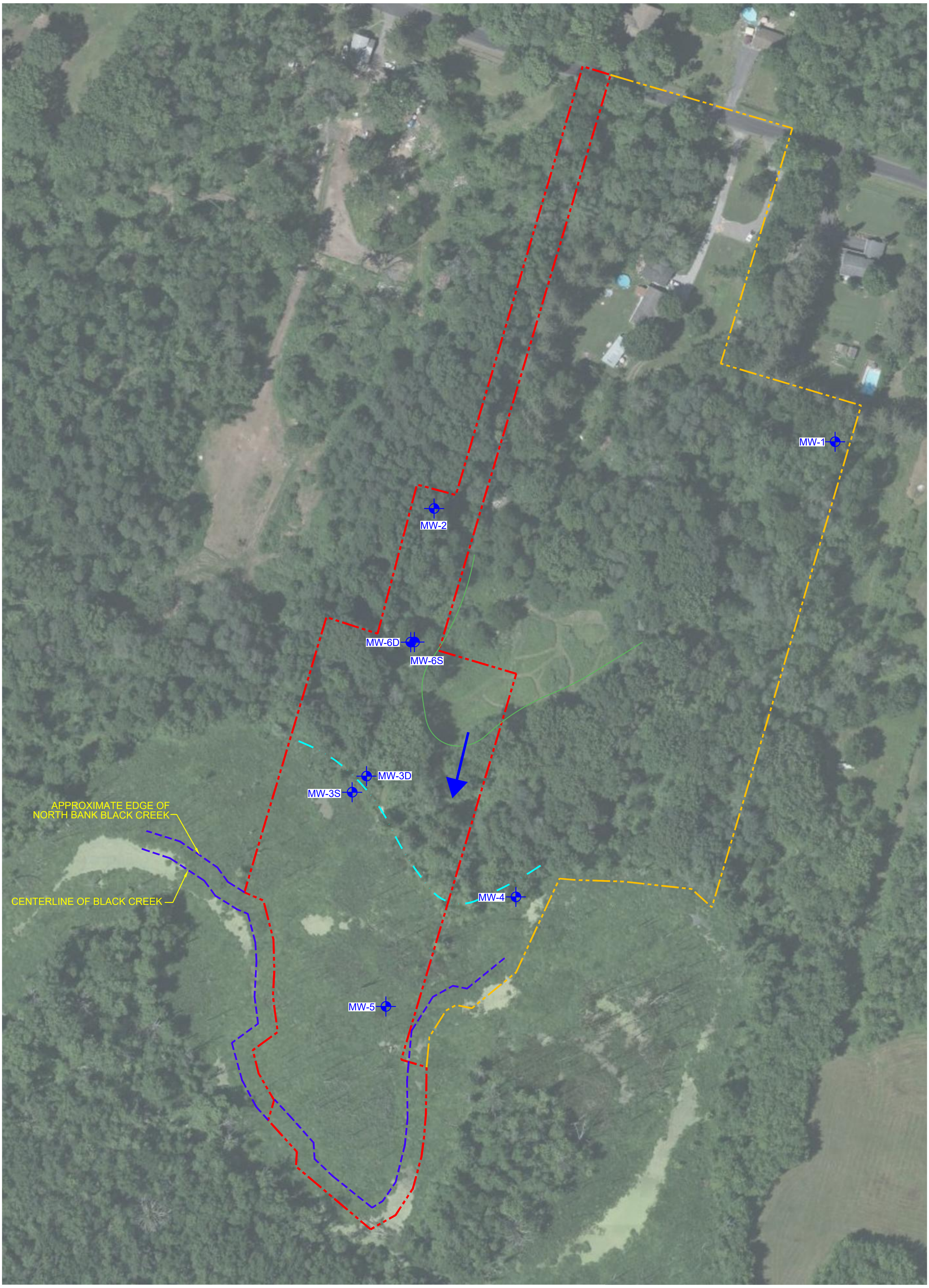


BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD
KIRKVILLE, NEW YORK

SITE LOCATION MAP

ARCADIS

FIGURE
1



LEGEND:

SITE BOUNDARY (NYSDEC REGISTRY SITE #727009)

SURVEY PROPERTY BOUNDARY (RYBINSKI, 1997)

APPROXIMATE WETLAND BOUNDARY

MONITORING WELL LOCATION

APPROXIMATE DIRECTION OF GROUNDWATER FLOW (DECEMBER 8, 2021)

0 125' 250'

GRAPHIC SCALE

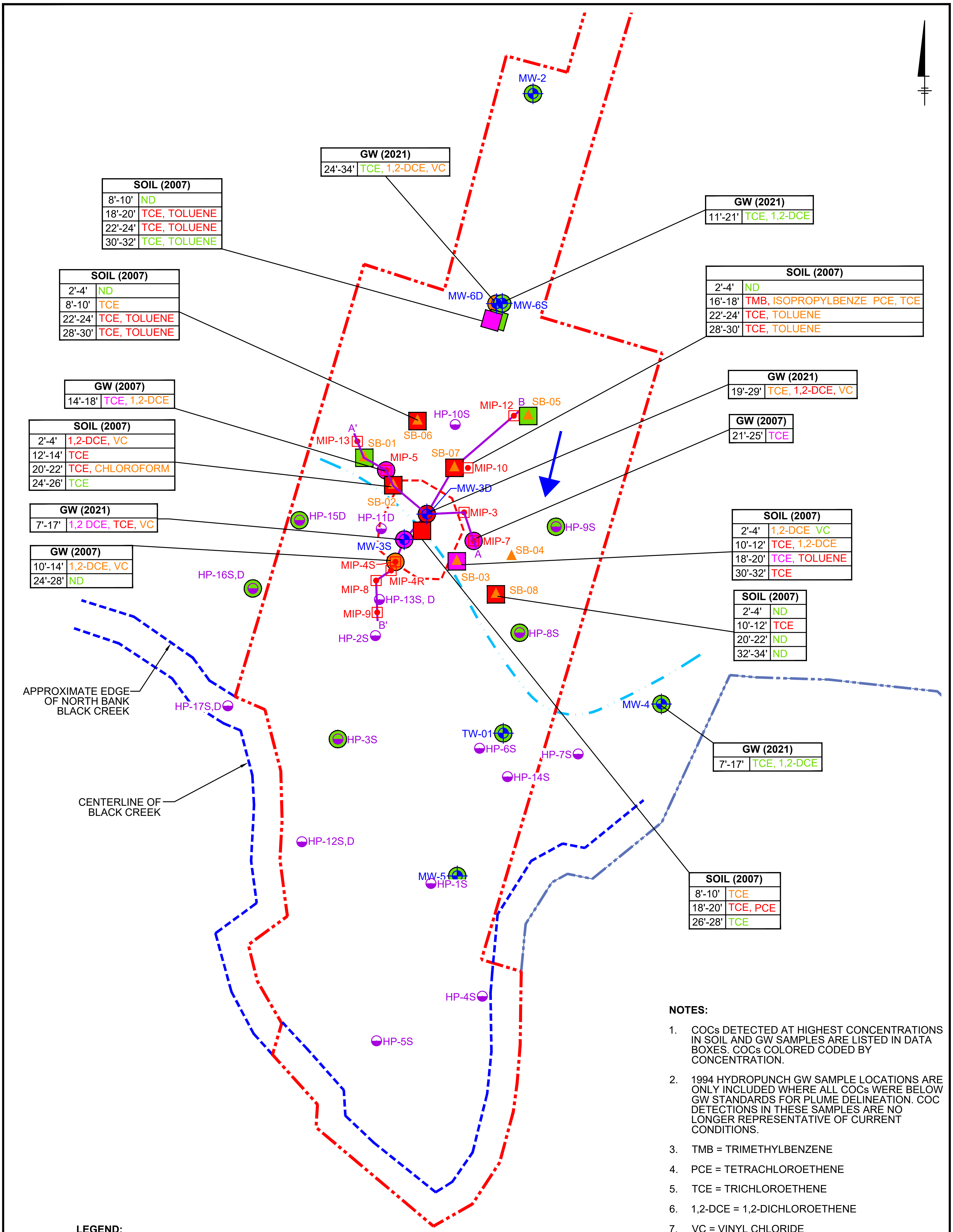
AERIAL SOURCE: © 2022 MICROSOFT CORPORATION © (2022) MAXAR © CNEW (2022)

BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD
KIRKVILLE, NEW YORK

SITE PLAN

ARCADIS

FIGURE
2



NOTES:

1. COCs DETECTED AT HIGHEST CONCENTRATIONS IN SOIL AND GW SAMPLES ARE LISTED IN DATA BOXES. COCs COLORED CODED BY CONCENTRATION.
2. 1994 HYDROPUNCH GW SAMPLE LOCATIONS ARE ONLY INCLUDED WHERE ALL COCs WERE BELOW GW STANDARDS FOR PLUME DELINEATION. COC DETECTIONS IN THESE SAMPLES ARE NO LONGER REPRESENTATIVE OF CURRENT CONDITIONS.
3. TMB = TRIMETHYLBENZENE
4. PCE = TETRACHLOROETHENE
5. TCE = TRICHLOROETHENE
6. 1,2-DCE = 1,2-DICHLOROETHENE
7. VC = VINYL CHLORIDE
8. ND = NOT DETECTED

0 80' 160'

GRAPHIC SCALE

LEGEND:

–··–	SITE BOUNDARY (NYSDEC REGISTRY SITE #727009)
–··–	SURVEY PROPERTY BOUNDARY (RYBINSKI, 1997)
– · –	APPROXIMATE WETLAND BOUNDARY
⊕	MONITORING WELL LOCATION
⊡	MEMBRANE INTERFACE PROBE
◒	HYDROPUNCH
▲	SOIL BORING
➡	APPROXIMATE DIRECTION OF GROUNDWATER FLOW (DECEMBER 8, 2021)
A—A'	CROSS SECTION TRANSECT LINE
– – –	INFERRED AREA OF HIGHEST REMAINING GROUNDWATER IMPACTS

GROUNDWATER IMPACTS:

🟣	TOTAL VOCs > 1,000 ug/L
🔴	100 ug/L < TOTAL VOCs < 1,000 ug/L
🟠	ND < TOTAL VOCs < 100 ug/L
🟢	COC < GW STANDARDS

SOIL IMPACTS:

🟪	TOTAL VOCs > 10 mg/kg
🟥	1 mg/kg < TOTAL VOCs < 10 mg/kg
🟧	0.1 mg/kg < TOTAL VOCs < 1 mg/kg
🟩	TOTAL VOCs < 0.1 mg/kg

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KRUTULIS SITE
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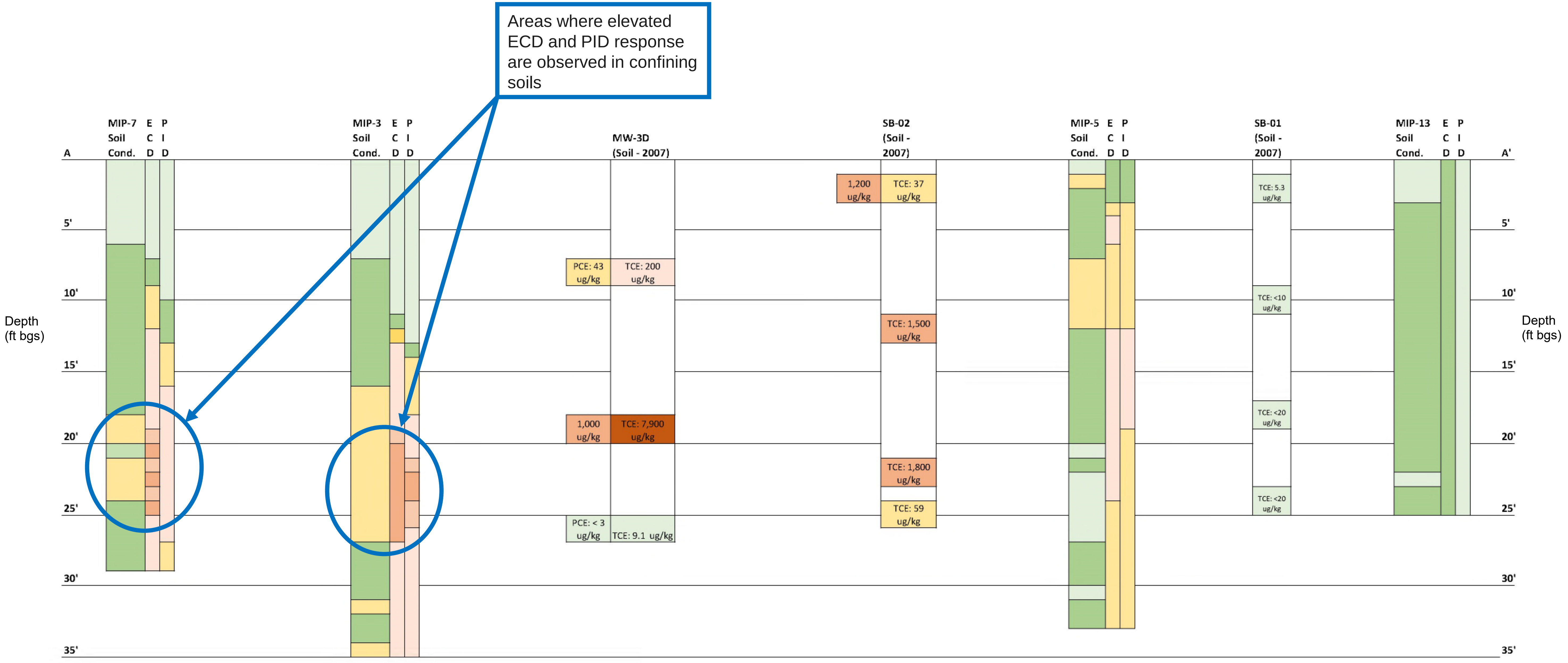
KIRKVILLE, NEW YORK

SOIL AND GROUNDWATER IMPACTS

ARCADIS

FIGURE
3


Areas where elevated ECD and PID response are observed in confining soils

MIP Soil Conductivity	🟩	0-5 mS/M	**ECD Maximum Response**	🟩	0.0E+00 < 2.0E+05	**PID Maximum Response**	🟩	0.0E+00 < 4.0E+04	**PCE/TCE/CIS Concentrations in soil**	🟩	< 20 ug/kg
	🟩	5-10 mS/M		🟩	2.0E+05 < 6.0E+05		🟩	4.0E+04 < 5.0E+04		🟨	20 < 100 ug/kg
	🟨	10-20 mS/M		🟨	6.0E+05 < 1.0E+06		🟨	5.0E+04 < 1.0E+05		🟧	100 < 500 ug/kg
	🟧	20-30 mS/M		🟧	1.0E+06 < 6.0E+06		🟧	1.0E+05 < 3.0E+05		🟧	500 < 1, 000 ug/kg
	🟧	30-40 mS/M		🟧	6.0E+06 < 1.0E+07		🟧	3.0E+05 < 5.0E+05		🟧	1,000 < 5,000 ug/kg
	🟧	40-50 mS/M		🟧	1.0E+07 < 1.6E+07		🟧	5.0E+05 < 7.5E+05		🟫	< 5,000 ug/kg
	🟫	50-60 mS/M									

Notes:

MIP - Membrane Interface Probe
PID - Photoionization Detector
TCE - Trichloroethene
mS/M - millisiemens per meter
ECD - Electron Capture Device
PCE - Tetrachloroethene
CIS - cis-1.2-Dichlorothene
ug/kg - micrograms per kilogram

Scale: N.T.S.

BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD, KIRKVILLE, NY

CROSS SECTION A-A'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4

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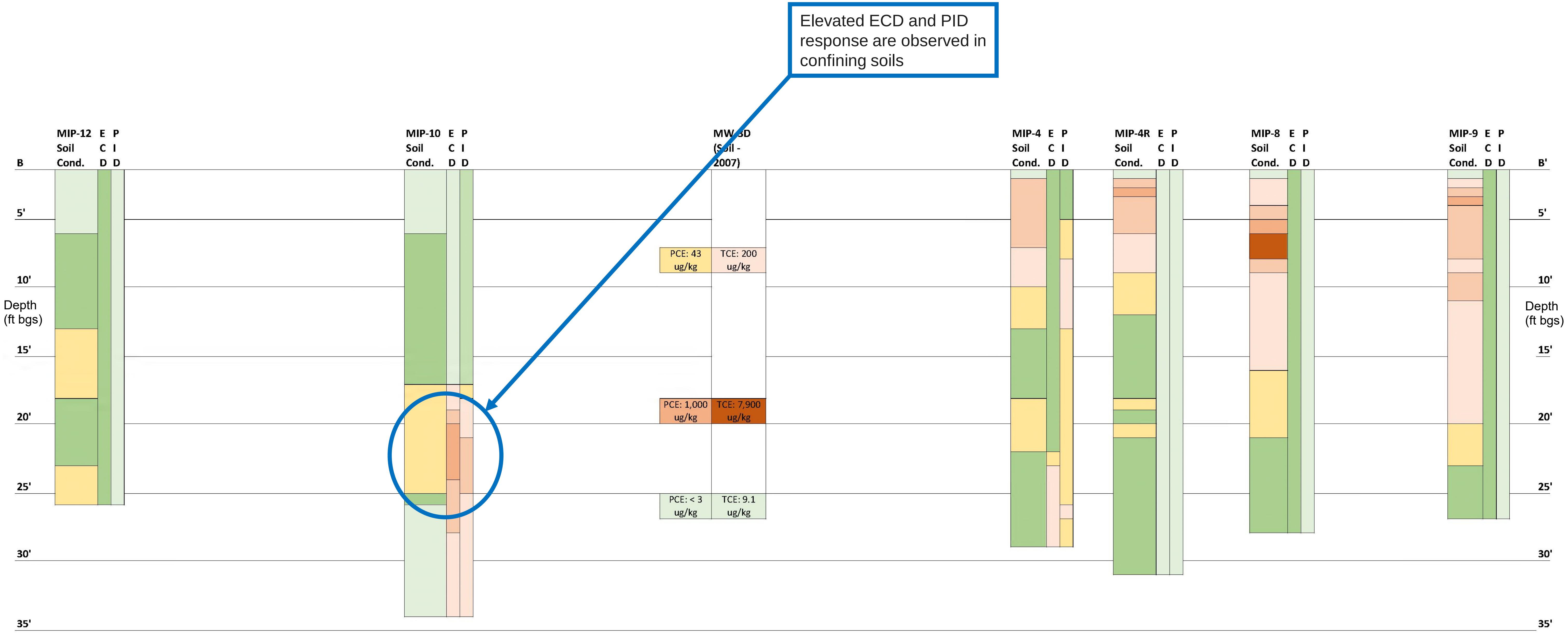
Elevated ECD and PID response are observed in confining soils

MIP Soil Conductivity		
	🟩	0-5 mS/M
	🟩	5-10 mS/M
	🟨	10-20 mS/M
	⬜	20-30 mS/M
	🟧	30-40 mS/M
	🟧	40-50 mS/M
	🟫	50-60 mS/M

ECD Maximum Response		
	🟩	0.0E+00 < 2.0E+
	🟩	2.0E+05 < 6.0E+
	🟨	6.0E+05 < 1.0E+
	⬜	1.0E+06 < 6.0E+
	🟧	6.0E+06 < 1.0E+
	🟧	1.0E+07 < 1.6E+

PID Maximum Response		
	🟩	0.0E+00 < 4.0E+04
	🟩	4.0E+04 < 5.0E+04
	🟨	5.0E+04 < 1.0E+05
	⬜	1.0E+05 < 3.0E+05
	🟧	3.0E+05 < 5.0E+05
	🟧	5.0E+05 < 7.5E+05

PCE/TCE/CIS Concentrations in soil		
	🟩	< 20 ug/kg
	🟨	20 < 100 ug/kg
	⬜	100 < 500 ug/kg
	🟧	500 < 1, 000 ug/kg
	🟧	1,000 < 5,000 ug/kg
	🟫	< 5,000 ug/kg

Notes:

MIP - Membrane Interface Probe
PID - Photoionization Detector
TCE - Trichloroethene
mS/M - millisiemens per meter
ECD - Electron Capture Device
PCE - Tetrachloroethene
CIS - cis-1.2-Dichlorothene
ug/kg - micrograms per kilogram

Scale: N.T.S.

BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD, KIRKVILLE, NY

CROSS SECTION B-B’

ARCADIS Design & Consultancy for natural and built assets

FIGURE
5

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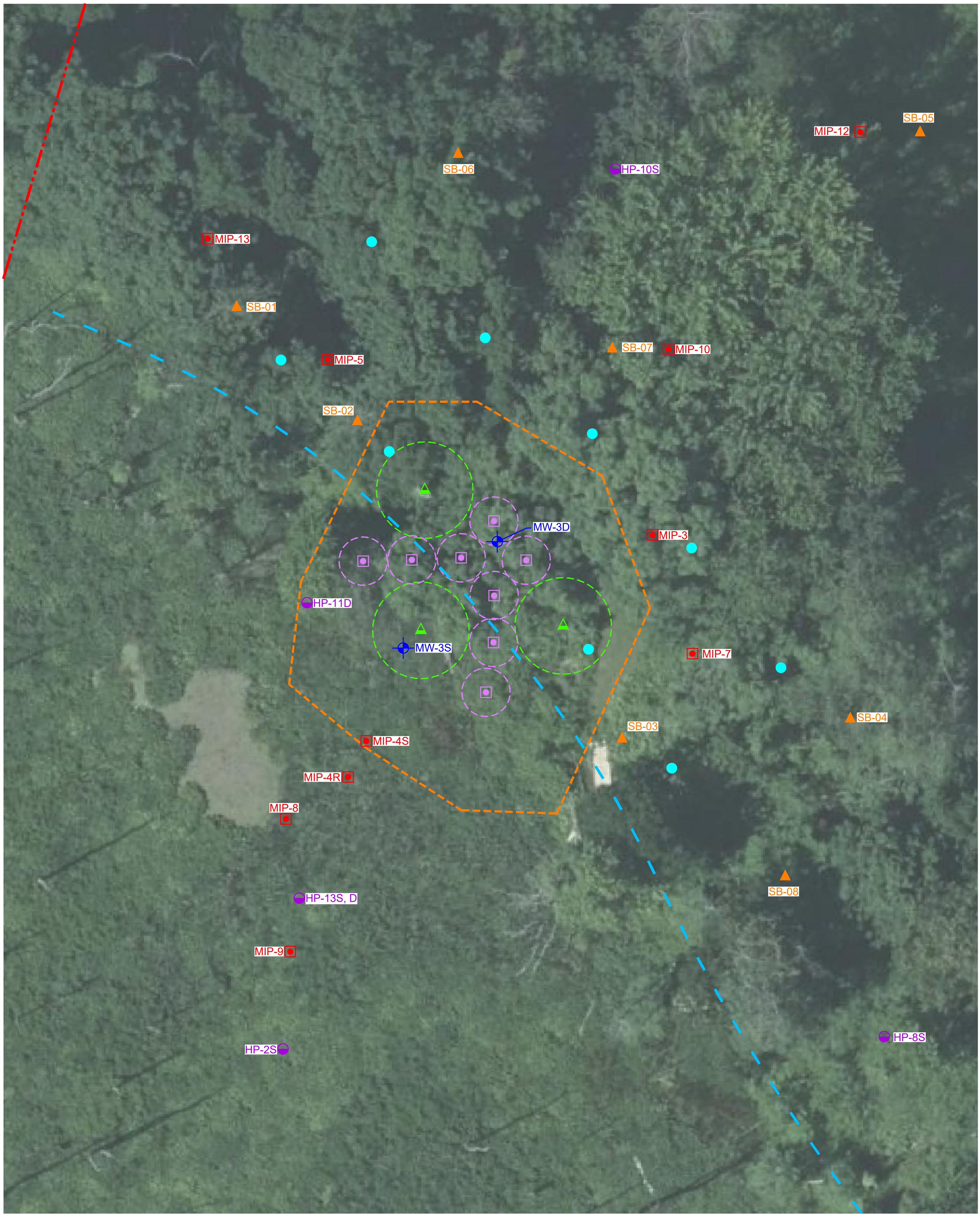
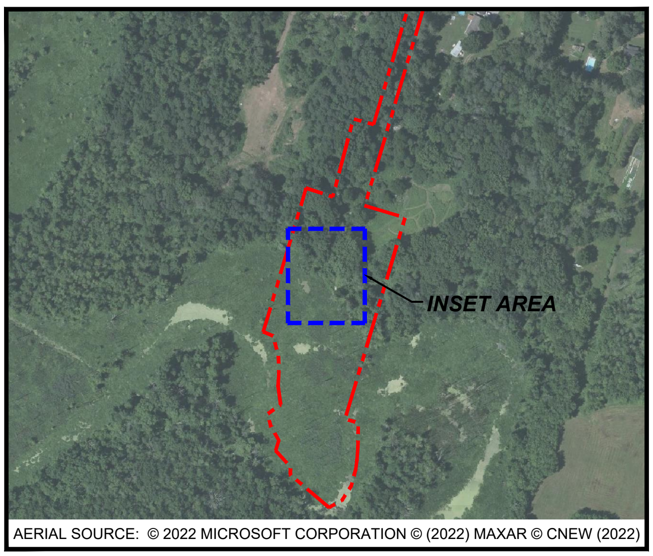


LEGEND:

- SITE BOUNDARY (NYSDEC REGISTRY SITE #727009)
- APPROXIMATE WETLAND BOUNDARY
- EXISTING MONITORING WELL LOCATION
- MEMBRANE INTERFACE PROBE
- HYDROPUNCH
- ▲ SOIL BORING
- PROPOSED INJECTION WELL WITH 10' RADIUS OF INFLUENCE
- PROPOSED DPT INJECTION POINT WITH 5' RADIUS OF INFLUENCE
- ● PROPOSED PDI BORING
- INFERRED AREA OF HIGHEST REMAINING CVOC CONCENTRATIONS IN GROUNDWATER



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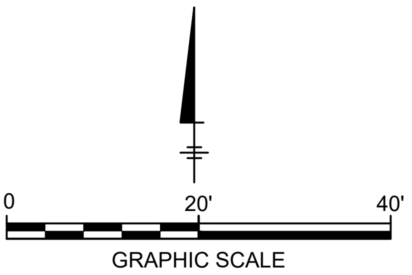


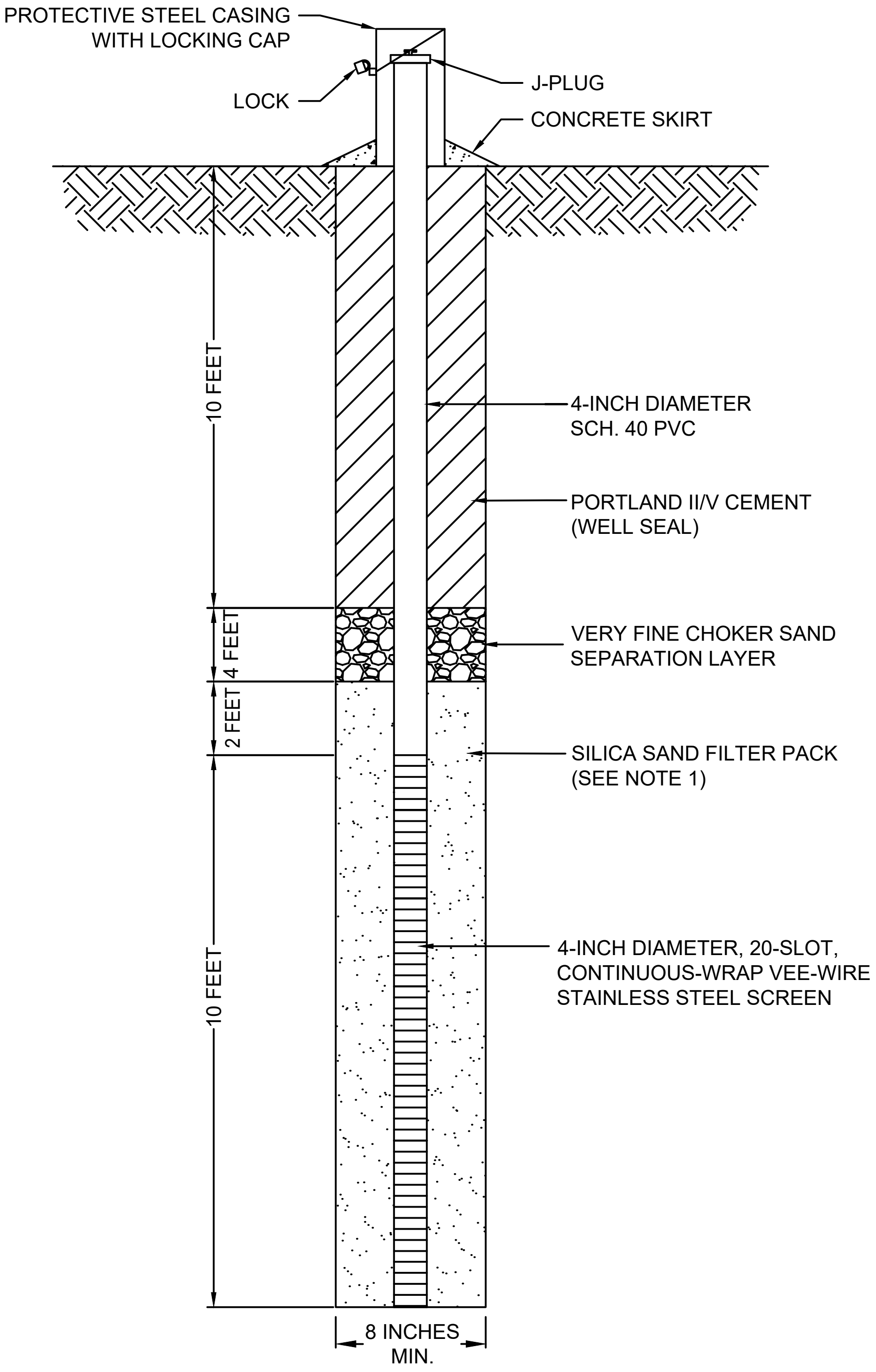
GRAPHIC SCALE

BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD
KIRKVILLE, NEW YORK

PDI AND ERD INJECTION PLAN

ARCADIS

FIGURE
6



NOTE:

1. SAND FILTER PACK SHALL BE OF APPROXIMATE SIZE FOR FORMATION AND WELL SCREEN SLOT SIZE.

NOT TO SCALE

BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD
KIRKVILLE, NEW YORK

ERD INJECTION WELL CONSTRUCTION DETAIL

ARCADIS

FIGURE
7

Appendix A

Focused Evaluation Technical Memorandum

Mr. Rich Mator
Associate Director, Environmental Remediation
Bristol Myers Squibb Company
3551 Lawrenceville Rd.
Princeton, New Jersey 08540

Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette Street
Suite 300
Syracuse
New York 13202
Tel 315 446 9120
Fax 315 449 0017
www.arcadis.com

ENVIRONMENT

Date:
May 12, 2022

Contact:
Matthew Swensson

Phone:
724-934-9514

Email:
matthew.swensson@arcadis.com

Our ref:
30066204

Subject:
Focused Evaluation Technical Memorandum
Krutulis Farms Site
848 Marsh Mill Road, Kirkville, New York

Dear Mr. Mator:

Arcadis of New York, Inc. (Arcadis) has prepared this technical memorandum outlining the findings of the focused evaluation performed at the Krutulis Farms Site located at 848 Marsh Mill Road in Kirkville, New York (Site). The following objectives were defined for the focused evaluation to determine whether an injection-based remedial alternative can be implemented at the site to achieve long-term cost efficiencies and/or potential expedited site closure:

- Evaluate groundwater geochemistry within the dissolved-phase plume
- Evaluate injectability of the formation

Arcadis provided our current understanding of the conceptual site model (CSM) in our original December 1, 2020 proposal. Arcadis recommended performing the following additional sampling and hydraulic testing to refine the CSM and inform evaluation of injection-based remedial alternatives:

- Geochemical groundwater sampling at monitoring wells MW-2, MW-3S, MW-3D, MW-5, and MW-6S
- Hydraulic conductivity testing at monitoring wells MW-3S, MW-3D, and MW-6S
- Clean water injection testing at monitoring wells MW-3S, MW-3D, and MW-6S

A summary of the field activities completed during the focused evaluation is provided below, followed by an updated CSM and preliminary screening of injection-based remedial alternatives that could be implemented at the site.

Geochemical Sampling

Geochemical groundwater sampling was conducted on May 10, 2021 at monitoring wells MW-2, MW-3S, MW-3D, MW-5, and MW-6S. Depth to groundwater and total well depths were collected from each well prior to groundwater sampling. Groundwater sampling was performed using low flow sampling methods where groundwater was pumped from the well through a flow-through cell using a peristaltic pump to allow for the collection of groundwater parameters including temperature, pH, specific conductivity, dissolved oxygen (DO), oxidation reduction potential (ORP), and turbidity. Groundwater parameters were generally monitored for approximately 30 minutes at purge rates ranging from 100 to 150 milliliters per minute (ml/min) or until they stabilized prior to sample collection. Groundwater sampling forms have been included as **Attachment A**. Final groundwater parameters collected at each monitoring well are presented in Exhibit 1.

Exhibit 1 – Final Groundwater Field Parameter Readings

Field Parameter	MW-2	MW-3S	MW-3D	MW-5	MW-6S
pH (su)	5.86	7.75	7.93	7.84	8.05
Temperature (C)	16.48	20.41	14.27	20.27	12.27
Conductivity (mS/cm)	0.091	0.290	0.230	0.278	0.234
Dissolved Oxygen (mg/L)	0.35	0.0	0.19	0.0	0.0
ORP (mV)	190	-132	-137	-115	-174
Turbidity (NTU)	9.4	4.4	7.1	47.2	3.7

gal – gallon
ml/min – milliliter per minute
ft btoc – feet below top of casing
su – standard units
C –Celsius
mS/cm – microsiemens per centimeter
mg/L – milligram per liter
mV – millivolts
NTU – nephelometric turbidity unit

Groundwater samples were collected in clean laboratory provided bottleware and submitted to Test America Eurofins located in Amherst, New York under a chain of custody for analysis of the following geochemical analytes:

- Total Alkalinity as Calcium Carbonate by United States Environmental Protection Agency (EPA) method 310.2
- Sulfate by EPA method 300.0
- Sulfide by EPA method SM 4500-S2 F
- Nitrate as Nitrogen by EPA method 352.2 (calculated)
- Total Organic Carbon (TOC) by EPA method 9060A
- Total Iron and Manganese by EPA method 6010C
- Dissolved Iron and Manganese by EPA method 6010C
- Methane, Ethane, Ethene, and Carbon Dioxide by method RSK 175

Geochemical groundwater data results have been tabulated and are provided in **Table 1**. The Test America Eurofins laboratory analytical report has been included as **Attachment B**.

Groundwater geochemistry paired with field parameters provides insight into the reducing-oxidizing (redox) conditions of the aquifer. Dependent on the aquifer conditions, anaerobic or aerobic processes will be favored that effect the fate and transport of a chlorinated volatile organic compound (CVOC) plume differently. Furthermore, the general geochemistry combined with the hydrogeology may favor or limit certain in-situ or ex-situ remedial strategies.

Overall, the data indicate an anoxic environment. The most reducing conditions (methanogenic) appear to coincide with the area with the highest observed VOC concentrations.

Field parameters of DO and ORP are generally used as indicators of anaerobic or aerobic processes occurring. Other field parameters of pH and specific conductivity indicate geochemical characteristics of the aquifer. DO is typically the first compound scavenged in the presence of CVOC impacts, as it is the most energetically favorable compound to reduce in groundwater. DO readings collected from all monitoring wells were below 0.5 milligrams per liter (mg/L), indicating that reducing conditions are occurring. ORP indicates the aquifer redox conditions and monitoring wells MW-3D, MW-3S, MW-5 and MW-6S all had negative ORP, with only MW-2 having a positive ORP reading. Overall, pH is neutral with readings ranging between 7 to 8 s.u and specific conductivity ranging from 0.2 to 0.3 millisiemens per centimeter (mS/cm) at all the monitoring wells except MW-2, which has a marginally lower specific conductivity of 0.091 mS/cm.

The groundwater nitrate/nitrogen, total iron/dissolved iron, total manganese/dissolved manganese, sulfate/sulfide, and dissolved gases (methane, ethane, ethene, and carbon dioxide) are indicators of anaerobic geochemically reducing conditions. Methane, a byproduct of the fermentation of TOC, is observed in MW-3S and MW-3D at concentrations of 8,800 and 7,000 micrograms per liter (µg/L), respectively, which suggests that strongly reducing conditions exist in in the source area; however, this process appears to be rate limited by the availability of TOC. TOC is present at concentrations of 1.1 mg/L and 2.3 mg/L in wells MW-5 and MW-2 (located outside the plume) but non-detect in plume source area wells MW-3S and MW-3D, which indicates that the available organic carbon in the source area has been depleted due to active microbial processes.

Comparison of total and dissolved metals (iron/manganese), nitrate/nitrogen, and sulfate/sulfide are often used as indicators to understand processes within the aquifer that are driving either aerobic or anaerobic conditions. Dissolved manganese and nitrate were detected within areas of the CVOC plume and indicate manganese reducing conditions are occurring. Iron is detected at the site as only total iron, whereas dissolved iron concentrations were below the analytical laboratory detection limit. The difference in the presence of dissolved manganese and lack of dissolved iron presence indicates a lack of TOC to continue to drive reducing conditions. Sulfate concentrations in groundwater generally ranged from below 2 mg/L to 28 mg/L. Sulfide was not detected in any of the samples.

In summary, the geochemical data suggests that the groundwater is strongly reducing in the center of the CVOC plume based on the high concentrations of methane and becomes less reducing moving outward toward the periphery of the plume. It is likely the reductive dechlorination processes are rate limited based on the concentrations of TOC detected in groundwater. Nothing was observed in the groundwater geochemistry that would be problematic for either an in-situ chemical oxidation (ISCO) or enhanced bioattenuation remedy.

Hydraulic Conductivity Testing

Hydraulic conductivity testing was conducted at monitoring wells MW-3D and MW-6S immediately after groundwater sampling on May 10, 2021. Arcadis was unable to test well MW-3S, as the polyvinyl chloride (PVC) casing was punctured and deformed slightly above grade, rendering the well unable to contain displaced groundwater or fit the solid slug used for hydraulic testing. The tests were conducted using solid slugs that cause a temporary displacement of the water column. A falling head slug test and a rising head slug test were performed at each monitoring well. A pressure transducer was deployed in each well prior to the start of the falling head test. The pressure transducers were calibrated to read and record feet of water column in logarithmic intervals above the pressure transducer. A solid slug was inserted into the well to begin the falling head test once the static water level had equilibrated from deploying the pressure transducers. Manual depth to water data was collected in conjunction with the pressure transducer data to confirm when the displacement in water column had returned to equilibrium. A total of 0.96 and 0.81 feet of water column displacement were observed during the falling head test in MW-3D and MW-6S, respectively. Once the water level had equilibrated to within 0.04-feet of static, the slug was then removed from the well to begin the rising head test. A total of 1.03 and 0.89 feet of water column displacement were observed during the rising head test in MW-3D and MW-6S, respectively. Data collection continued until the groundwater equilibrated to within 0.01-feet of static. Manual water level data collected during the falling head and rising head slug tests are included as **Attachment C**.

The pressure transducer data were downloaded and the results of each test were interpreted using AQTESOLV aquifer test analysis software. Data was analyzed using the Bouwer-Rice, Hvorslev, and in some cases the Dagan and Springer-Gelhar methods to estimate hydraulic conductivity at each monitoring well for both the falling head and rising head tests. The results of each test method were averaged to generate a geometric mean hydraulic conductivity measured in feet per day (ft/day). The average hydraulic conductivity is estimated to be approximately 0.59 ft/day for MW-3D, and between 0.73 ft/day and 0.78 ft/day for MW-6S (**Table 2**). These estimates fall within the expected values for the geology.

Clean Water Injection Test

Clean water injection testing was completed at the site on September 3, 2021 at monitoring wells MW-3D and MW-6S. Clean water injection testing was not completed at MW-3S, as the PVC casing was punctured and deformed slightly above grade, making it impossible to seal off the well.

The clean water injection system consisted of a 125-gallon clean water injection tote, a 250-gallon water storage tote, a gasoline operated pump, and an injection manifold consisting of a totalizer, ball and gate valves, a wellhead manifold fitted with a pressure gauge and pressure relief valve, and PVC hosing to convey clean water from the tank, through the pump, to the wellhead. An all-terrain vehicle (ATV) was used to transport the 125-gallon water tote from the 250-gallon water storage tote staging area to each of the test monitoring wells to avoid damaging the lawn of the residence at the entrance to the site. Clean water injections were initially conducted under gravity flow by allowing the water head in the tank to push water through the injection system towards each test well. The pressure relief valve on the test well remained open to atmosphere until all the air in the injection system and wellhead had been evacuated. Following the initial gravity flow injection, an injection pump was utilized to assess flow rates under additional pressure.

Clean water injection test data are presented in **Table 3**. Plots showing injection volumes and flow rates over time are presented as **Figures 1 and 2**. Injection field logs and a photo log are included as **Attachment D and Attachment E**.

A total of approximately 29 gallons of water was injected at MW-3D under gravity flow conditions over a 15-minute period. This corresponds to an average formation injection flow rate of approximately 1.8 gallons per minute (gpm), accounting for the volume of water required to prime the injection system and fill the headspace in monitoring well MW-3D. An additional approximately 40 gallons of clean water was injected over a 22-minute period under pumping conditions, at an average flow rate of approximately 1.8 gpm. A total of approximately 13 gallons of water was injected at MW-6S under gravity flow conditions over a 12-minute period at an average flow rate of approximately 0.95 gpm. An additional approximately 38 gallons of water was injected over a 16-minute period under pumping conditions at an average flow rate of approximately 2.4 gpm. The increase in flow rate observed at MW-6S between gravity and pumping injection suggests that MW-6S has a higher specific capacity than MW-3D, which saw no increase in flow rate. This could be due, at least in part, to MW-6S being installed approximately 8 feet shallower than MW-3D, as an aquifer will be more accommodating to groundwater displacement at shallower depths.

The clean water injection test results indicate that the formation can accept a slug of fluid at a flow rate greater than 1 gpm over a short duration with little to no backpressure. This suggests that an injection based remedial strategy is feasible for the site.

Updated Conceptual Site Model

Arcadis has updated the CSM that was included in our proposal to incorporate the additional insights gained from the focused evaluation.

Site Hydrogeology

The hydrogeology of the site can be characterized as 25 to 30 feet (ft) of interbedded silt, fine sand, and clay, identified as lacustrine deposits on surficial geology maps, overlying a dense glacial till. Bedrock maps indicate the till sits atop limestone and dolostone of the Lockport Group. Madison County watershed maps indicate the site is part of the Chittenango watershed. Site surface water drains to Black Creek which flows northwest into Chittenango Creek. The property on which the Site is located is zoned for industrial use and is not situated within any mapped primary, principal, or sole source aquifers. There are no potable wells in the downgradient or side gradient directions. There is one private residential well located hydraulically upgradient of the plume and monitoring well network installed at the site.

Shallow groundwater generally flows from the north-northeast to the south-southwest across the Site. The hydraulic gradient is approximately 0.005 foot per foot (ft/ft) and groundwater is inferred to discharge into low lying wetlands along the Black Creek floodplain. Slug testing results indicate that the hydraulic conductivity of the lacustrine deposits is approximately 0.59 to 0.78 ft/day, which is within the range of published values for fine sand or silty sand material. Assuming an effective porosity of 0.15, the average groundwater flow velocity through the formation is estimated to be on the order of 0.02 ft/day. The slow average groundwater flow velocity helps explain the stability of the plume over the past 20 years.

Nature and Extent of Site Impacts

Site soils and groundwater are impacted by CVOCs and petroleum hydrocarbon compounds (PHCs) that were released from drums formerly staged on the property between the 1950s and early 1990s. The extent of Site soil impacts is illustrated in plan view on **Figure 3**, and in section view on **Figure 4** and **Figure 5**. The following key observations are evident from the data.

- Trichloroethene (TCE) is the primary constituent of concern at the Site and was detected in soil at concentrations ranging from 1,800 micrograms per kilogram (µg/kg) to 12,000 µg/kg in 2007. Breakdown daughter products cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC) were also detected at elevated concentrations in many of the soil samples.
- Tetrachloroethene (PCE) and toluene were also detected at elevated concentrations in soil samples collected during the installation of monitoring wells MW-3S and MW-6D, but it appears that these constituents have attenuated naturally over time since they are no longer detected above regulatory standards in groundwater samples from these monitoring wells.
- The remaining CVOC mass in soil at the Site appears to be centered in the vicinity of MW-3S and historical soil borings SB-02, SB-03, SB-06, SB-07, and SB-08.
- Within this source area, the remaining CVOC mass appears to be concentrated within layers of finer-grained soil (silt and clay) that occur in the 16 to 26 ft bgs depth range.
- CVOC impacts appear to be confined within the shallow interbedded soil and do not extend into the underlying till.
- Historical drilling (with dye testing in the field) and groundwater monitoring data do not indicate the presence of separate phase product.
- The Site groundwater plume is currently centered in the vicinity of monitoring wells MW-3S and MW-3D. TCE and 1,2-DCE are the two primary CVOCs in Site groundwater. PCE, VC, and toluene have all been detected at elevated concentrations in Site groundwater, but at lower concentrations than TCE and are not currently the main drivers for remediation at the site.
- The plume extent appears to be limited, at least in part, due to low groundwater seepage velocities.
- TCE was detected at up to 20,000 µg/L in groundwater at MW-3S historically, but concentrations have attenuated and range from 1,000 µg/L to 1,500 µg/L in more recent sampling conducted in October 2019. Dissolved-phase 1,2-DCE concentrations have also attenuated at MW-3S from a high of 34,000 µg/L in 2000 to the 4,000 µg/L range in 2019. VC was detected in the 100 µg/L range at MW-3S in 2019.
- Elevated concentrations of TCE and 1,2-DCE are also observed in MW-3D but at an order of magnitude lower than those at MW-3S.
- The presence of 1,2-DCE and VC in groundwater at MW-3S combined with a decreasing TCE concentration trend and slightly reducing groundwater geochemistry suggests that reductive dechlorination is occurring naturally at the site; but the process appears to be rate limited by low groundwater TOC concentrations.

Discussion and Preliminary Screening of Remedial Alternatives

The findings of this focused evaluation indicate that an in-situ injection-based remedy is viable and can be implemented at the site to address the remaining CVOC mass. Slug testing and injection testing results indicate that the aquifer hydraulic conductivity is in the range of 0.59 to 0.78 ft/day and can sustain short term injection flow rates of between 1.1 and 2 gpm. A full-scale injection-based remedy would likely be implemented at flow rates closer to 0.5 to 1.5-gpm to allow the aquifer time to accommodate the solution with minimal backpressure; but this is still adequate for an effective injection application.

The data indicate that reductive dechlorination of CVOC mass is occurring under slightly reducing conditions in the aquifer, but is rate limited by a lack of organic carbon. Injecting an organic carbon substrate into the aquifer should generate strongly reducing conditions in the aquifer, which would enhance the co-metabolic breakdown of CVOC mass.

ISCO is another injection-based remedy that could potentially be effective. ISCO enhances aerobic geochemical conditions and increases the oxidation potential in groundwater. Oxidants will react with organic contaminant mass once the natural oxidant demand of soil and groundwater has been satisfied. A range of chemical oxidants including sodium persulfate and sodium permanganate are effective for the treatment of CVOCs present in site groundwater and should be appropriate for the groundwater geochemistry based on our current understanding of the CSM. Sodium permanganate is typically the preferred oxidant for treating dissolved phase CVOCs as it can persist in an active state in groundwater for a longer time than other ISCO reagents like activated sodium persulfate. Thus, when applied at sites like this with fine grained lithology and slow advective travel times, the oxidant will remain in contact with the contaminant mass while it is active and will not travel much beyond the injection radius of influence. Sodium permanganate also does not require addition of an activator chemical, which simplifies field injections.

Based on this preliminary assessment, Arcadis recommends selecting the following potential injection-based remedies for further evaluation of feasibility and cost.

- ERD using a fully soluble carbon-based injection reagent (molasses)
- ERD using a sparingly soluble carbon-based injection reagent (emulsified vegetable oil)
- ISCO using an oxidant such as sodium permanganate

Arcadis also recommends that BMS repair the PVC riser pipe for MW-3S as soon as possible/practical, as the integrity of this plume source area well is currently compromised.

Schedule

After BMS has reviewed this technical memo, Arcadis recommends that we schedule a call to discuss the results, conclusions, and any questions that you might have. After receiving feedback from BMS on the technical memorandum and concurrence on the short list of remedial options for the Site, Arcadis will submit estimates of probable cost and an engineering evaluation for the three remaining potentially applicable remedial options to BMS for review.

Arcadis appreciates the opportunity to complete this focused evaluation and look forward to providing evaluation and screening level costing of the remedial alternatives selected for additional assessment. Please contact me at 724-934-9514 with any questions.

Sincerely,

Arcadis of New York, Inc.

Matthew Swensson
Principal Environmental Engineering Specialist

Eric Killenbeck
Technical Expert

Attachment:

Table 1 – Geochemical Groundwater Data
Table 2 – Slug Test Analysis Results
Table 3 – Clean Water Injection Data

Figure 1 – MW-3D Clean Water Injection Data
Figure 2 – MW-6S Clean Water Injection Data
Figure 3 – Site Soil and Groundwater Impacts
Figure 4 – Cross Section A – A’
Figure 5 – Cross Section B – B’

Attachment A – Low Flow Sampling Forms
Attachment B – Laboratory Analytical Report
Attachment C – Slug Test Field Forms
Attachment D – Injection Data Forms
Attachment E – Photo Log

Tables

Table 1. Geochemcal Groundwater Data
Technical Memo
Bristol Myers Squibb
Krutulis Farms Site
848 Marsh Mill Road
Kirkville, New York

Sample ID/Sample Location		MW-2	MW-3S	MW-3D	MW-5	MW-6S
Date		5/10/2021	5/10/2021	5/10/2021	5/10/2021	5/10/2021
Dissolved Gases						
Carbon dioxide	ug/L	51,000	ND < 5,000	ND < 5,000	5,400	ND < 5,000
Methane	ug/L	ND < 4.0	8,800	7,000	4,700	ND < 4.0
Ethane	ug/L	ND < 7.5	3.1 J	ND < 7.5	ND < 7.5	ND < 7.5
Ethene	ug/L	ND < 7.0	ND < 7.0	ND < 7.0	ND < 7.0	ND < 7.0
Metals						
Total Iron	mg/L	1.63	0.423	0.455	24.1	0.51
Total Manganese	mg/L	0.636	0.0372	0.0185	1.18	0.216
Metals - Dissolved						
Dissolved Iron	mg/L	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050
Dissolved Manganese	mg/L	0.090	0.027	0.013	0.0010 J	0.21
General Chemistry						
Sulfate	mg/L	18.0	28.0	2.9	ND < 2.0	5.3
Total Alkalinity	mg/L	11.1	162 **B**	148 **B**	142 **B**	163 **B**
Total Organic Carbon	mg/L	2.3	ND < 1.0	ND < 1.0	1.1	0.59 **J**
Nitrate as N	mg/L	0.047 **J**	0.025 **J**	0.031 **J**	0.046 **J**	ND < 0.050
Sulfide	mg/L	ND < 1.0	ND < 1.0	ND < 1.0	ND < 1.0	ND < 1.0

Notes:
ID = identification
ug/L = micrograms per liter
mg/L = milligrams per liter
B = Compound was found in the blank and sample
J = Estimated value greater than the Method Detection Limit and less than the Reporting Limit
ND <___ = Not detected above laboratory Reporting Limit (RL)

Table 2. Slug Test Analysis Results
Technical Memo
Bristol Myers Squibb
Krutulis Farms Site
848 Marsh Mill Road
Kirkville, New York

Monitoring Wells	Test Type	Analytical Solution	Hydraulic Conductivity, K (ft/day)	Geomean K (ft/day)
MW-3D	Falling Head	Bouwer-Rice	0.53	0.59
		Hvorslev	0.67	
	Rising Head	Bouwer-Rice	0.46	0.59
		Hvorslev	0.61	
		Springer-Gelhar	0.74	
MW-6S	Falling Head	Bouwer-Rice	0.63	0.73
		Hvorslev	0.84	
	Rising Head	Bouwer-Rice	0.70	0.78
		Hvorslev	0.95	
		Dagan	0.75	
		Springer-Gelhar	0.75	

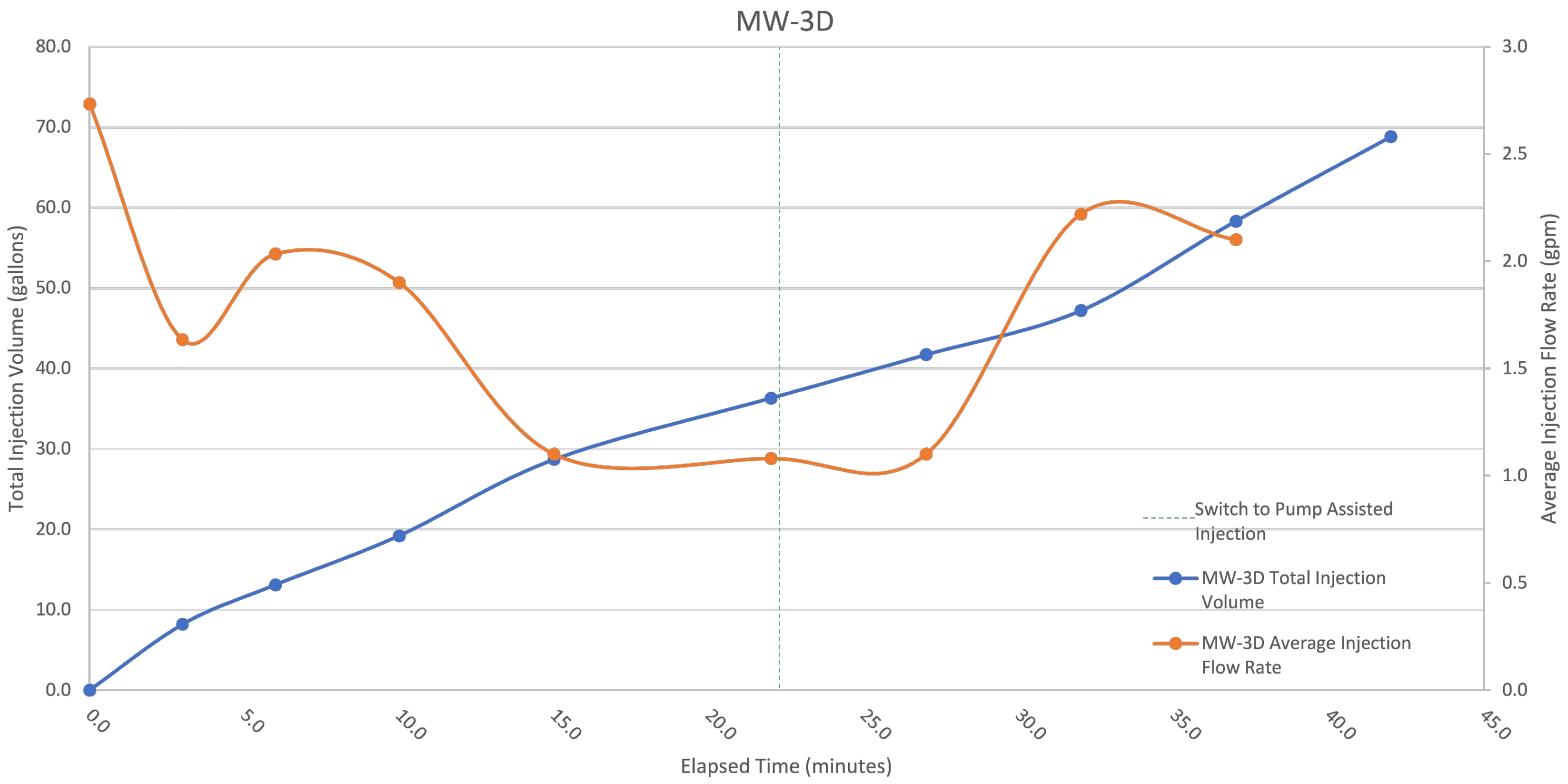
Notes:
ft/day = feet per day.

Table 3. Clean Water Injection Data
Technical Memo
Bristol Myers Squibb
Krutulis Farms Site
848 Marsh Mill Road
Kirkville, New York

Monitoring Well ID	Injection Method	Date and Time	Injection Pressure (psi)	Totalizer Flow Rate (gpm)	Calculated Flow Rate (gpm)	Total Injection Volume (Gallons)
MW-3D	Gravity Injection	9/3/21 11:23 AM	--	--	--	0.0
		9/3/21 11:26 AM	0	0.7	2.7	8.2
		9/3/21 11:29 AM	0	0.7	1.6	13.1
		9/3/21 11:33 AM	0	0.7	2.0	19.2
		9/3/21 11:38 AM	0	0.7	1.9	28.7
	Pumping Injection	9/3/21 11:43 AM	0	--	--	--
		9/3/21 11:45 AM	0	1.0	1.1	36.3
		9/3/21 11:50 AM	0	1.0	1.1	41.7
		9/3/21 11:55 AM	0	1.0	1.1	47.2
		9/3/21 12:00 PM	0	1.0	2.2	58.3
		9/3/21 12:05 PM	0	1.0	2.1	68.8
MW-6S	Gravity Injection	9/3/21 10:17 AM	--	--	--	0.0
		9/3/21 10:19 AM	0	0.7	0.7	1.4
		9/3/21 10:25 AM	0	0.7	1.3	9.3
		9/3/21 10:29 AM	0	0.7	0.9	12.9
	Pumping Injection	9/3/21 10:33 AM	0	--	--	--
		9/3/21 10:34 AM	0	1.0	0.7	16.5
		9/3/21 10:38 AM	0	1.0	2.3	25.7
		9/3/21 10:45 AM	0	1.0	2.3	42.1
		9/3/21 10:49 AM	0	1.0	2.2	50.8

Notes:
psi = pounds per square inch
gpm = gallons per minute

Figures



BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD, KIRKVILLE, NY

MW-3D
CLEAN WATER INJECTION DATA

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FIGURE
1

C:\BIM\OneDrive - ARCADIS\BIM 360 Docs\2021\AUS-BRISTOL MYERS-KIRKVILLE-NY\2021\01-In Progress\01-DWG\TABLE-F05-MW6S.dwg LAYOUT: 5 SAVED: 10/26/2021 11:54 AM ACADVER: 23.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 10/26/2021 11:54 AM BY: SMALL, BRIAN

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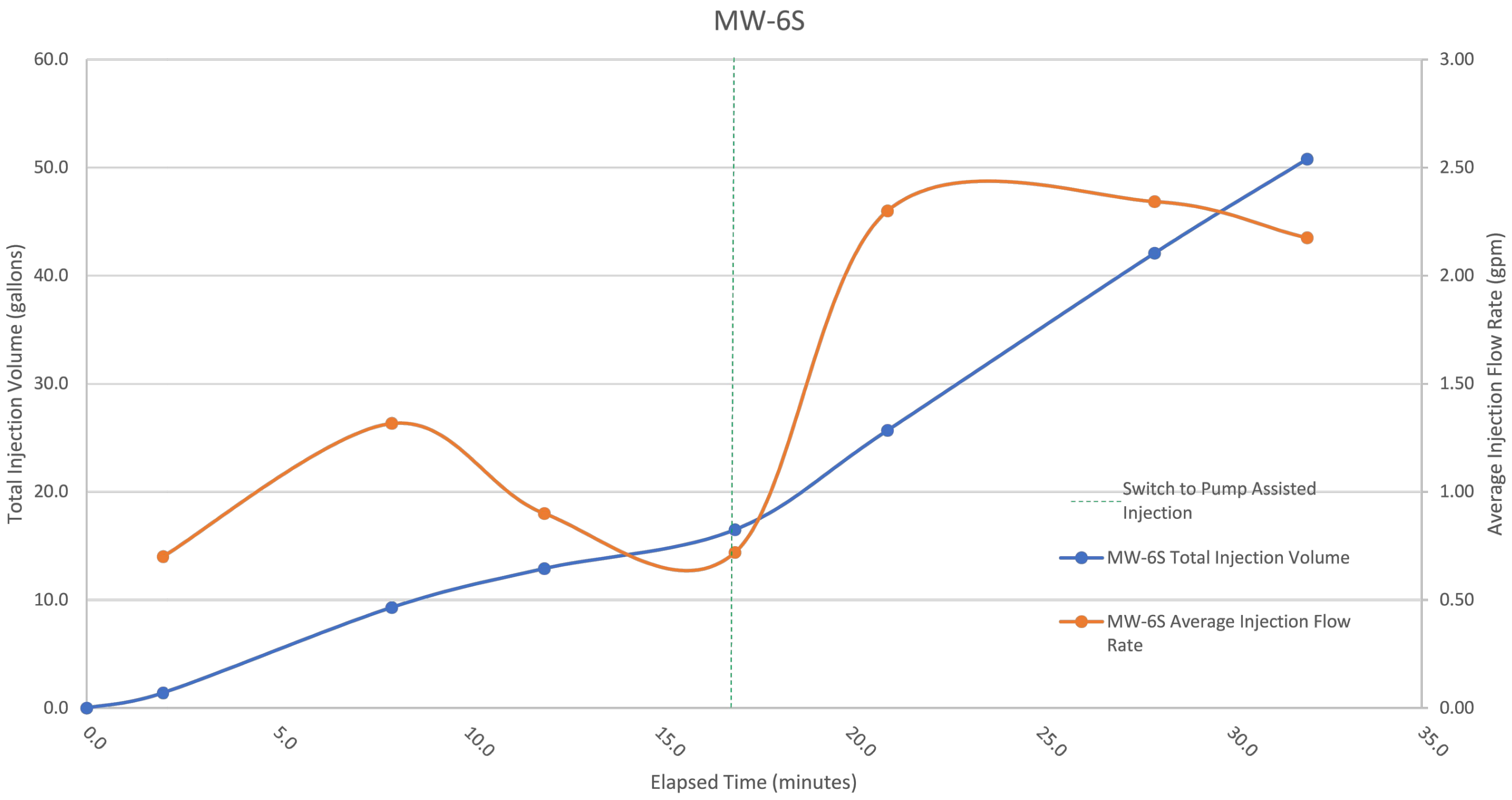

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KRUTULIS SITE
852 MARSH MILL ROAD, KIRKVILLE, NY

MW-6S
CLEAN WATER INJECTION DATA

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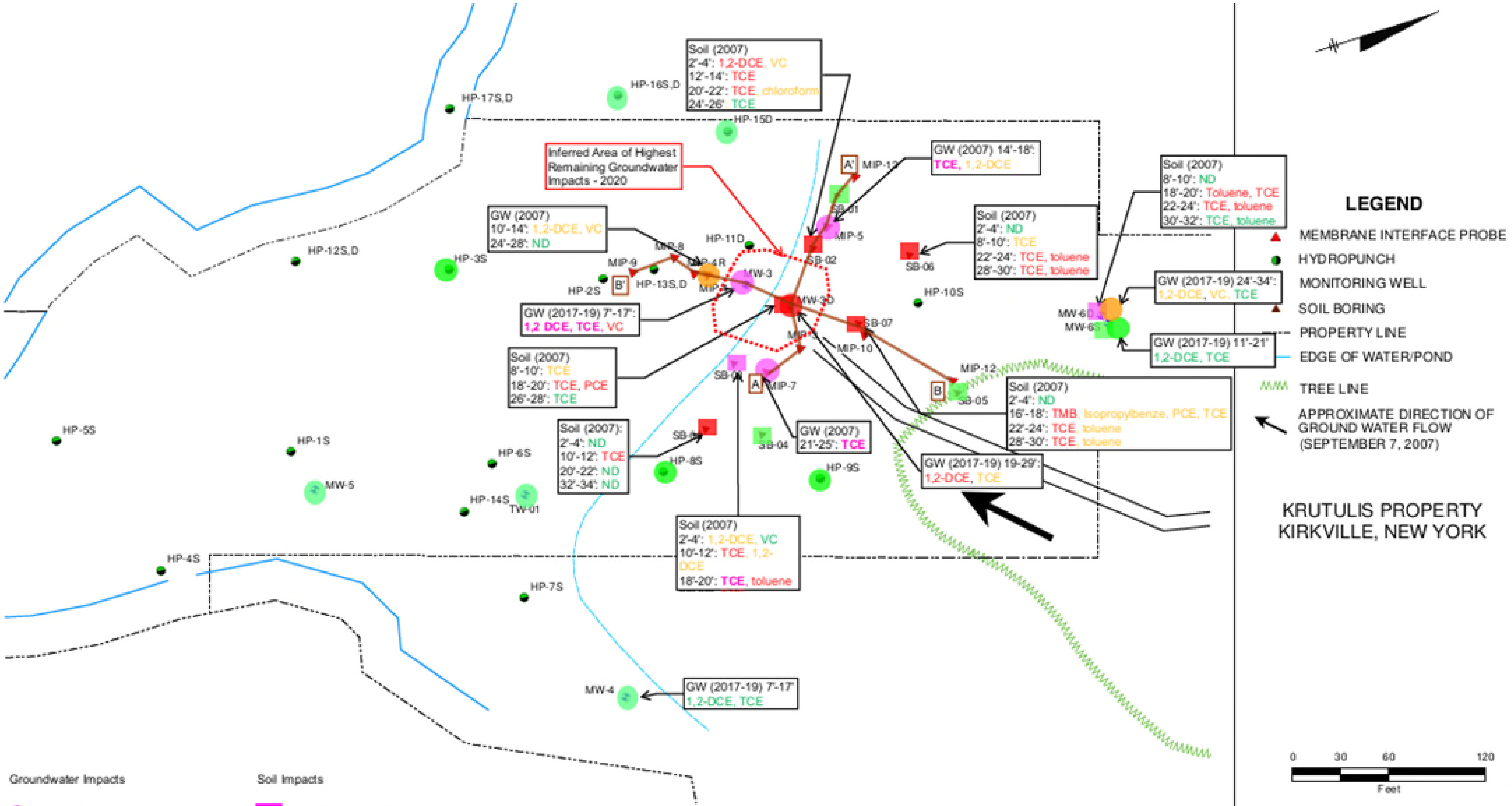
FIGURE
2



Groundwater Impacts

- ● Total VOCs > 1,000 ug/L
- ● 100 ug/L < Total VOCs < 1,000 ug/L
- ● ND < Total VOCs < 100 ug/L
- ● COC < GW Standards

Soil Impacts

- ■ Total VOCs > 10 mg/kg
- ■ 1 mg/kg < Total VOCs < 10 mg/kg
- ■ 0.1 mg/kg < Total VOCs < 1 mg/kg
- ■ Total VOCs < 0.1 mg/kg

Notes:
COCs detected at highest concentrations in soil and GW samples are listed in data boxes. COCs colored coded by concentration.
1994 hydropunch GW sample locations are only included where all COCs were below GW standards for plume delineation. COC detections in these samples are no longer representative of current conditions.
TMB = trimethylbenzene, PCE = tetrachloroethene, TCE = trichloroethene
1,2-DCE = 1,2-dichloroethene, VC = vinyl chloride, ND = not detected

BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD, KIRKVILLE, NY

SITE SOIL AND GROUNDWATER IMPACTS

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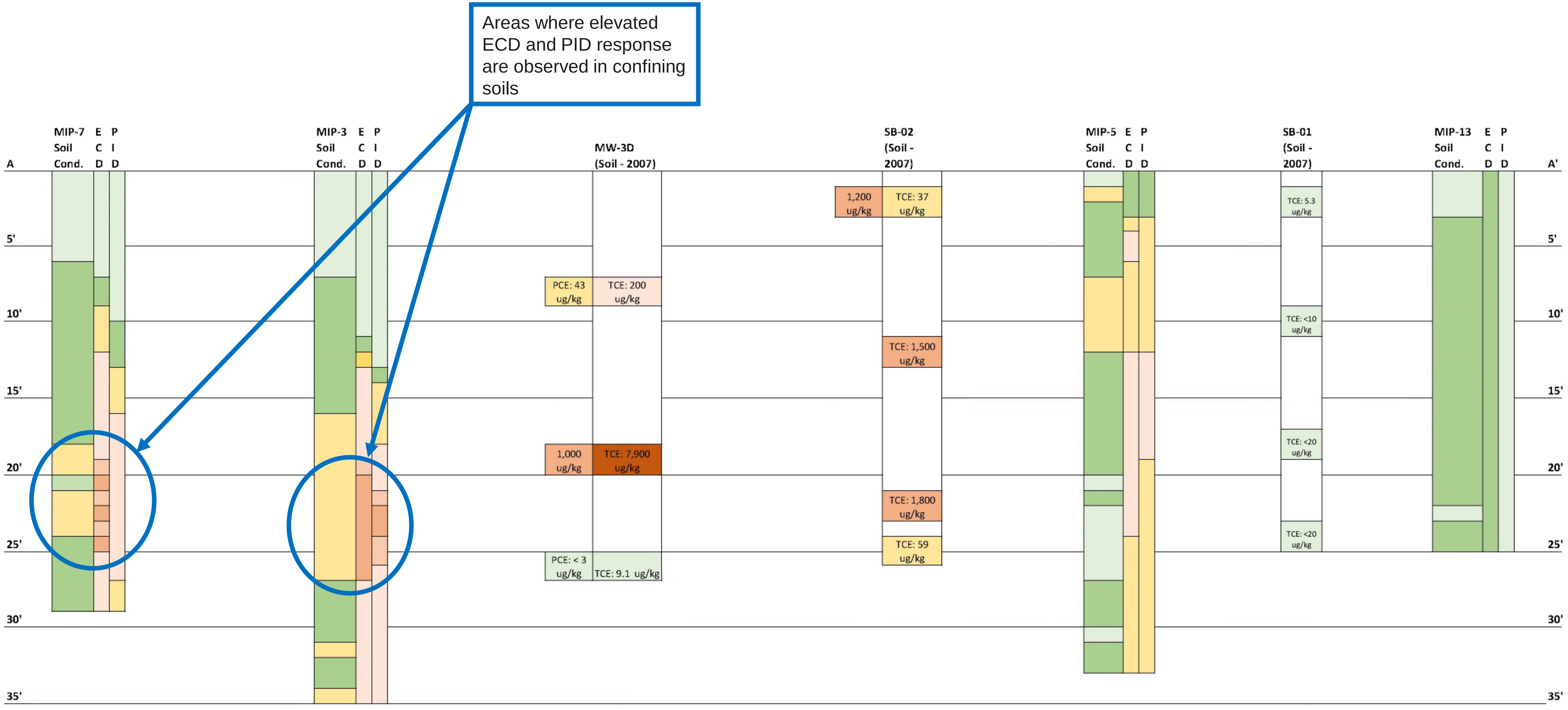
FIGURE
3



Areas where elevated ECD and PID response are observed in confining soils

MIP Soil Conductivity			ECD Maximum Response			PID Maximum Response			PCE/TCE/CIS Concentrations in soil		
	🟩	0-5 mS/M		🟩	0.0E+00 < 2.0E+05		🟩	0.0E+00 < 4.0E+04		🟩	< 20 ug/kg
	🟩	5-10 mS/M		🟩	2.0E+05 < 6.0E+05		🟩	4.0E+04 < 5.0E+04		🟨	20 < 100 ug/kg
	🟨	10-20 mS/M		🟨	6.0E+05 < 1.0E+06		🟨	5.0E+04 < 1.0E+05		🟧	100 < 500 ug/kg
	🟧	20-30 mS/M		🟧	1.0E+06 < 6.0E+06		🟧	1.0E+05 < 3.0E+05		🟧	500 < 1, 000 ug/kg
	🟧	30-40 mS/M		🟧	6.0E+06 < 1.0E+07		🟧	3.0E+05 < 5.0E+05		🟧	1,000 < 5,000 ug/kg
	🟧	40-50 mS/M		🟧	1.0E+07 < 1.6E+07		🟧	5.0E+05 < 7.5E+05		🟥	< 5,000 ug/kg
	🟥	50-60 mS/M									

Scale: N.T.S.

BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD, KIRKVILLE, NY

CROSS SECTION A-A'

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FIGURE
4

11/24/2020 1:10:45 PM

Elevated ECD and PID response are observed in confining soils

Scale: N.T.S.

BRISTOL MYERS SQUIBB
KRUTULIS SITE
852 MARSH MILL ROAD, KIRKVILLE, NY

CROSS SECTION B-B'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
5

11/24/2020 1:11:54 PM

Attachment A

Low Flow Sampling Forms

Site: BMS Krutulis

Event

GROUND-WATER SAMPLING LOG

Sampling Personnel: E Green
Client / Job Number:
Weather: 50's, Cloudy

Well ID: MW-6S
Date: 3/10/21
Time In: 1045
Time Out: 1155

Well Information

Depth to Water:	(feet)	6.16	(from MP)
Total Depth:	(feet)	21.96	(from MP)
Length of Water Column:	(feet)	15.8	
Volume of Water in Well:	(gal)	2.58	
Three Well Volumes:	(gal)	7.72	

Well Type: Flushmount [✓ Stick-Up]
Well Material: Stainless Steel [✓ PVC]
Well Locked: [✓ Yes] No
Measuring Point Marked: [✓ Yes] No
Well Diameter: 1" [✓ 2"] Other:

Purging Information

Purging Method: Bailer [✓ Peristaltic] Waterra Other:
Tubing/Bailer Material: Steel [✓ Polyethylene] Teflon Other:
Sampling Method: Bailer [✓ Peristaltic] Waterra Other:

Duration of Pumping: (min) 55
Average Pumping Rate: (ml/min) 100
Total Volume Removed: (gal) 1.5
Water-Quality Meter Type: Horib U-52
Did well go dry: Yes [✓ No]

Conversion Factors

	1" ID	2" ID	4" ID	6" ID
gal / ft. of water	0.041	0.163	0.653	1.469

1 gal = 3.785 L =3785 ml = 0.1337 cubic feet

Unit Stability

pH	DO	Cond.	ORP
± 0.1	±10%	± 3.0%	± 10 mV

	1	2	3	4	5	6	7	8	9
Parameter:	1100	1105	1110	1115	1120	1125	1130	1135	1140
Volume Purged (gal)	0	0.13	6.26	0.39	6.52	6.65	0.78	0.91	
Rate (mL/min)	100	100	100	100	100	100	100	100	
Depth to Water (ft.)	6.51	6.53	6.56	6.56	6.58	6.56	6.57	6.58	
pH	8.18	8.01	7.96	8.02	8.02	8.03	8.04	8.05	
Temp. (C)	12.07	11.97	12.03	12.07	12.12	12.20	12.25	12.27	
Conductivity (mS/cm)	0.246	6.238	0.234	6.233	6.232	0.233	0.233	0.234	
Dissolved Oxygen (mg/L)	2.42	0.64	6.00	0.00	6.00	6.00	6.00	6.00	
ORP (mV)	-53	-95	-142	-156	-167	-171	-172	-174	
Turbidity (NTU)	7.1	3.9	4.8	3.6	3.6	3.8	3.9	3.7	
Notes:									Sampled

Sampling Information

Analyses	#	Laboratory
RSK 175 CO2	3	Eurofins Buffalo
300.0_28D	1	
6010C	2	
RSK 175 Methane	3	
9060A (TOC)	2	
SM4500_S2-	1	

Sample ID: MW-6S
Sample Time: 1140
MS/MSD: Yes [✓ No]
Duplicate: Yes [✓ No]
Duplicate ID
Dup. Time:
Chain of Custody Signed By:

Problems / Observations

Analyses	#
Nitrate	1
3162	1

Pg 1 of 1

BMS Krutulis
Site

Event

GROUND-WATER SAMPLING LOG

Sampling Personnel: DRM
Client / Job Number:
Weather: 50's, Cloudy
Well ID: MW-3D
Date: 5-10-21
Time In: 1225 **Time Out:** 1320

Well Information

Depth to Water:	3.76	(feet)	(from MP)
Total Depth:	31.91	(feet)	(from MP)
Length of Water Column:	(feet)	28.15	
Volume of Water in Well:	(gal)	4.59	
Three Well Volumes:	(gal)	13.77	

Well Type:	Flushmount	[✓ Stick-Up]	
Well Material:	Stainless Steel	[✓ PVC]	
Well Locked:	[✓ Yes]	No	
Measuring Point Marked:	[✓ Yes]	No	
Well Diameter:	1"	[✓ 2"]	Other:

Purging Information

Purging Method:	Bailer	[✓ Peristaltic]	Waterra	Other:
Tubing/Bailer Material:	Steel	[✓ Polyethylene]	Teflon	Other:
Sampling Method:	Bailer	[✓ Peristaltic]	Waterra	Other:

Duration of Pumping: 40 (min)
Average Pumping Rate: 100 (ml/min)
Water-Quality Meter Type: Horiba
Total Volume Removed: 1.1 (gal)
Did well go dry: Yes [✓ No]

Conversion Factors

	1" ID	2" ID	4" ID	6" ID
gal / ft. of water	0.041	0.163	0.653	1.469

1 gal = 3.785 L =3785 ml = 0.1337 cubic feet

Unit Stability

pH	DO	Cond.	ORP
± 0.1	±10%	± 3.0%	± 10 mV

Parameter:	1 1235	2 1240	3 1245	4 1250	5 1255	6 1300	7 1305	8 1310	9
Volume Purged (gal)	0.13	0.26	0.39	0.52	0.65	0.78	0.91		
Rate (mL/min)	100	100	100	100	100	100	100		
Depth to Water (ft.)	4.49	4.75	4.81	4.84	4.85	4.85	4.85		
pH	7.96	7.96	7.92	7.92	7.91	7.92	7.93		
Temp. (C)	15.16	14.44	14.22	14.33	14.23	14.25	14.27		
Conductivity (mS/cm)	0.223	0.224	0.225	0.244	0.228	0.229	0.230		
Dissolved Oxygen (mg/L)	0.44	0.31	0.28	0.25	0.23	0.21	0.19		
ORP (mV)	-83	-67	-106	-123	-130	-134	-137		
Turbidity (NTU)	11.1	8.8	9.3	8.5	7.3	7.6	7.1		
Notes:								Sampled	

Sampling Information

Analyses	#	Laboratory
RSK 175 CO2	3	Eurofins
300.0 28D	1	Buffalo
6010C	2	
RSK 175 Methane	3	
9060A (TOC)	2	
SM4500 S2F	1	

Sample ID: MW-3D Sample Time: 1310
MS/MSD: Yes [✓ No]
Duplicate: Yes [✓ No]
Duplicate ID — Dup. Time: —
Chain of Custody Signed By:

Problems / Observations

Pump started @ 1232

Analyses	#
Nitrate	1
353.2	1

BMS Keokuk
Site

Event

GROUND-WATER SAMPLING LOG

Sampling Personnel: D Meandro/E Green
Client / Job Number:
Weather: 60's, Partly Cloudy

Well ID: MW-3S
Date: 5/10/21
Time In: 1335 **Time Out:** 1435

Well Information

Depth to Water:	(feet)	0	(from MP)
Total Depth:	(feet)	18.31	(from MP)
Length of Water Column:	(feet)	18.31	
Volume of Water in Well:	(gal)	2.98	
Three Well Volumes:	(gal)	8.95	

Well Type:	Flushmount	[✓ Stick-Up]	
Well Material:	Stainless Steel	[✓ PVC]	
Well Locked:	[✓ Yes]	No	
Measuring Point Marked:	[✓ Yes]	No	
Well Diameter:	1"	[✓ 2"]	Other:

Purging Information

Purging Method:	Bailer	[✓ Peristaltic]	Waterra	Other:
Tubing/Bailer Material:	Steel	[✓ Polyethylene]	Teflon	Other:
Sampling Method:	Bailer	[✓ Peristaltic]	Waterra	Other:

Duration of Pumping:	(min)	60		
Average Pumping Rate:	(ml/min)	150	Water-Quality Meter Type:	Horiba - U52
Total Volume Removed:	(gal)	1.75	Did well go dry:	Yes [✓ No]

Conversion Factors

	1" ID	2" ID	4" ID	6" ID
gal / ft. of water	0.041	0.163	0.653	1.469

1 gal = 3.785 L =3785 ml = 0.1337 cubic feet

Unit Stability

pH	DO	Cond.	ORP
± 0.1	±10%	± 3.0%	± 10 mV

Parameter:	1 1345	2 1350	3 1355	4 1400	5 1405	6 1410	7 1415	8 1420	9 1430
Volume Purged (gal)	0	0.2	0.4	0.6	0.8	1.0	1.20	1.4	
Rate (mL/min)	150	150	150	150	150	150	150	150	
Depth to Water (ft.)	0.02	0.14	0.23	0.30	0.32	0.34	0.37	0.38	
pH	7.87	7.81	7.78	7.77	7.77	7.77	7.76	7.75	
Temp. (C)	14.36	14.41	19.63	19.87	20.23	20.33	20.39	20.41	
Conductivity (mS/cm)	0.298	0.294	0.291	0.293	0.291	0.290	0.288	0.290	
Dissolved Oxygen (mg/L)	2.85	0.09	0.0	0.0	0.0	0.0	0.0	0.0	
ORP (mV)	-87	-107	-118	-122	-127	-131	-131	-132	
Turbidity (NTU)	11.5	7.6	5.8	5.5	5.4	4.7	4.6	4.4	
Notes:									Sampled

Sampling Information

Analyses	#	Laboratory
RSK 175 CO2	3	Eurofins
300.0 28D	1	Buffalo
6010C	2	
RSK 175 Methane	3	
9060A (TOC)	2	
SM4500 S2F	1	

Sample ID: MW-3S Sample Time: 1430
MS/MSD: Yes [✓ No]
Duplicate: Yes [✓ No]
Duplicate ID Dup. Time:
Chain of Custody Signed By:

Problems / Observations

Analyses	#
Nitrate	1
310.2	1

Pg 1 of 1

BMS Krutulis
Site | Event

GROUND-WATER SAMPLING LOG

Sampling Personnel: DRM
Well ID: MW-5
Client / Job Number:
Date: 5-10-21
Weather: 59° Cloudy
Time In: 1440 **Time Out:** 1535

Well Information

Depth to Water:	0.54	(feet)	(from MP)
Total Depth:	18.06	(feet)	(from MP)
Length of Water Column:	(feet)	17.52	
Volume of Water in Well:	(gal)	2.85	
Three Well Volumes:	(gal)	8.55	

Well Type:	Flushmount	[✓ Stick-Up]
Well Material:	Stainless Steel	[✓ PVC]
Well Locked:	Yes	[✓ No]
Measuring Point Marked:	[✓ Yes]	No
Well Diameter:	1" [✓ 2"]	Other:

Purging Information

Purging Method:	Bailer	[✓ Peristaltic]	Waterra	Other:
Tubing/Bailer Material:	Steel	[✓ Polyethylene]	Teflon	Other:
Sampling Method:	Bailer	[✓ Peristaltic]	Waterra	Other:

Duration of Pumping: 45 (min)
Average Pumping Rate: 100 (ml/min) Water-Quality Meter Type: Horiba
Total Volume Removed: 1.3 (gal) Did well go dry: Yes [✓ No]

Conversion Factors

gal / ft. of water	1" ID	2" ID	4" ID	6" ID
	0.041	0.163	0.653	1.469

1 gal = 3.785 L =3785 ml = 0.1337 cubic feet

Unit Stability

pH	DO	Cond.	ORP
± 0.1	±10%	± 3.0%	± 10 mV

Parameter:	1 1445	2 1450	3 1455	4 1500	5 1505	6 1510	7 1515	8 1520	9 1525
Volume Purged (gal)	0.13	0.26	0.39	0.52	0.65	0.78	0.91	1.04	
Rate (mL/min)	100	100	100	100	100	100	100	100	
Depth to Water (ft.)	0.79	0.90	1.01	1.14	1.30	1.38	1.42	1.42	
pH	7.59	7.65	7.68	7.70	7.74	7.81	7.83	7.84	
Temp. (C)	19.48	19.56	19.79	20.01	20.15	20.22	20.24	20.27	
Conductivity (mS/cm)	0.269	0270	0.273	0.274	0.275	0.277	0.278	0.278	
Dissolved Oxygen (mg/L)	1.94	0.83	0.41	0.16	0.0	0.0	0.0	0.0	
ORP (mV)	-81	-82	-84	-92	-101	-109	-111	-115	
Turbidity (NTU)	73.6	70.2	64.8	60.9	59.6	55.8	49.3	47.2	
Notes:									Sampled

Sampling Information

Analyses	#	Laboratory
RSK 175 CO_2	3	Eurofins
300.0 28D	1	Buffalo
6010C	2	
RSK 175 Methane	3	
9060A (TOC)	2	
SM4500 S2 F	1	

Sample ID: MW-5 Sample Time: 1525
MS/MSD: Yes [✓ No]
Duplicate: Yes [✓ No]
Duplicate ID / Dup. Time: /
Chain of Custody Signed By:

Problems / Observations

Analyses	#
Nitrate	1
310.2	1

BMS Krutulis

Site | Event

GROUND-WATER SAMPLING LOG

Sampling Personnel: DRM
Well ID: MW-2
Client / Job Number:
Date: 5-18-21
Weather: 60's Sunny
Time In: 1600 **Time Out:** 1650

Well Information

Depth to Water:	7.81	(feet)	(from MP)
Total Depth:	19.22	(feet)	(from MP)
Length of Water Column:	(feet)	11.41	
Volume of Water in Well:	(gal)	1.86	
Three Well Volumes:	(gal)	5.58	

Well Type:	Flushmount	[✓ Stick-Up]	
Well Material:	Stainless Steel	[✓ PVC]	
Well Locked:	Yes	[✓ No]	
Measuring Point Marked:	[✓ Yes]	No	
Well Diameter:	1"	[✓ 2"]	Other:

Purging Information

Purging Method:	Bailer	[✓ Peristaltic]	Waterra	Other:
Tubing/Bailer Material:	Steel	[✓ Polyethylene]	Teflon	Other:
Sampling Method:	Bailer	[✓ Peristaltic]	Waterra	Other:

Duration of Pumping: (min) 45
Average Pumping Rate: (ml/min) 100 Water-Quality Meter Type: Horiba
Total Volume Removed: (gal) 1.2 Did well go dry: Yes [✓ No]

Conversion Factors

	1" ID	2" ID	4" ID	6" ID
gal / ft. of water	0.041	0.163	0.653	1.469

1 gal = 3.785 L =3785 ml = 0.1337 cubic feet

Unit Stability

pH	DO	Cond.	ORP
± 0.1	±10%	± 3.0%	± 10 mV

Parameter:	1 1605	2 1610	3 1615	4 1620	5 1625	6 1630	7 1635	8 1640	9
Volume Purged (gal)	0.13	0.26	0.39	0.52	0.65	0.78	0.91		
Rate (mL/min)	100	100	100	100	100	100	100		
Depth to Water (ft.)	7.82	7.84	7.91	7.94	7.96	7.96	7.96		
pH	6.71	6.73	5.98	5.94	5.89	5.88	5.86		
Temp. (C)	17.84	17.56	16.74	16.53	16.49	16.47	16.48		
Conductivity (mS/cm)	0.093	0.097	0.095	0.093	0.092	0.091	0.091		
Dissolved Oxygen (mg/L)	2.54	2.07	1.15	0.84	0.43	0.37	0.35		
ORP (mV)	140	147	175	179	183	188	190		
Turbidity (NTU)	11.9	10.7	10.0	11.7	12.8	10.9	9.4		
Notes:								Sampled	

Sampling Information

Analyses	#	Laboratory
RSK 175 CO2	3	Eurofins
300.0 280	1	Buffalo
6010 C	2	
RSK 175 Methane	3	
9060A (TOC)	2	
SM4500 S2 F	1	

Sample ID: MW-2 Sample Time: 1640
MS/MSD: Yes [✓ No]
Duplicate: Yes [✓ No]
Duplicate ID — Dup. Time: —
Chain of Custody Signed By:

Problems / Observations

Analyses	#
Nitrate	1
310.2	1

Pg 1 of 1

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Attachment B

Laboratory Analytical Report

eurofins

Environment Testing
America

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ANALYTICAL REPORT

Eurofins TestAmerica, Buffalo
10 Hazelwood Drive
Amherst, NY 14228-2298
Tel: (716)691-2600

Laboratory Job ID: 480-184468-1
Client Project/Site: BMS Krutulis Farms

For:
ARCADIS U.S. Inc
213 Court Street
Suite 700
Middletown, Connecticut 06457

Attn: Mr. Richard Hatch

Authorized for release by:
5/25/2021 2:46:46 PM
Rebecca Jones, Project Management Assistant I
Rebecca.Jones@Eurofinset.com

Designee for

John Schove, Project Manager II
(716)504-9838
John.Schove@Eurofinset.com

Table of Contents

Definitions/Glossary

Client: ARCADIS U.S. Inc
Project/Site: BMS Krutulis Farms

Job ID: 480-184468-1

Qualifiers

GC VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 480-184468-1

Laboratory: Eurofins TestAmerica, Buffalo

Narrative

Job Narrative
480-184468-1

Comments
No additional comments.

Receipt
The samples were received on 5/11/2021 8:00 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 3.0º C.

HPLC/IC
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC VOA
Method RSK-175: The following samples were diluted to bring the concentration of target analytes within the calibration range: MW-3D (480-184468-2), MW-3S (480-184468-3) and MW-5 (480-184468-4). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: ARCADIS U.S. Inc
Project/Site: BMS Krutulis Farms

Job ID: 480-184468-1

Client Sample ID: MW-6S — Lab Sample ID: 480-184468-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Iron	510		50.0	19.3	ug/L	1		6010C	Total/NA
Manganese	216		3.0	0.40	ug/L	1		6010C	Total/NA
Manganese, Dissolved	0.21		0.0030	0.00040	mg/L	1		6010C	Dissolved
Sulfate	5.3		2.0	0.35	mg/L	1		300.0	Total/NA
Alkalinity, Total	163	B	50.0	20.0	mg/L	5		310.2	Total/NA
Total Organic Carbon	0.59	J	1.0	0.43	mg/L	1		9060A	Total/NA

Client Sample ID: MW-3D — Lab Sample ID: 480-184468-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Methane - DL	7000		180	44	ug/L	44		RSK-175	Total/NA
Iron	455		50.0	19.3	ug/L	1		6010C	Total/NA
Manganese	18.5		3.0	0.40	ug/L	1		6010C	Total/NA
Manganese, Dissolved	0.013		0.0030	0.00040	mg/L	1		6010C	Dissolved
Sulfate	2.9		2.0	0.35	mg/L	1		300.0	Total/NA
Alkalinity, Total	148	B	50.0	20.0	mg/L	5		310.2	Total/NA
Nitrate as N	0.031	J	0.050	0.020	mg/L	1		Nitrate by calc	Total/NA

Client Sample ID: MW-3S — Lab Sample ID: 480-184468-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Ethane	3.1	J	7.5	1.5	ug/L	1		RSK-175	Total/NA
Methane - DL	8800		180	44	ug/L	44		RSK-175	Total/NA
Iron	423		50.0	19.3	ug/L	1		6010C	Total/NA
Manganese	37.2		3.0	0.40	ug/L	1		6010C	Total/NA
Manganese, Dissolved	0.027		0.0030	0.00040	mg/L	1		6010C	Dissolved
Sulfate	28.0		2.0	0.35	mg/L	1		300.0	Total/NA
Alkalinity, Total	162	B	50.0	20.0	mg/L	5		310.2	Total/NA
Nitrate as N	0.025	J	0.050	0.020	mg/L	1		Nitrate by calc	Total/NA

Client Sample ID: MW-5 — Lab Sample ID: 480-184468-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Carbon dioxide	5400		5000	4000	ug/L	1		RSK-175	Total/NA
Methane - DL	4700		180	44	ug/L	44		RSK-175	Total/NA
Iron	24100		50.0	19.3	ug/L	1		6010C	Total/NA
Manganese	1180		3.0	0.40	ug/L	1		6010C	Total/NA
Manganese, Dissolved	0.0010	J	0.0030	0.00040	mg/L	1		6010C	Dissolved
Alkalinity, Total	142	B	50.0	20.0	mg/L	5		310.2	Total/NA
Total Organic Carbon	1.1		1.0	0.43	mg/L	1		9060A	Total/NA
Nitrate as N	0.046	J	0.050	0.020	mg/L	1		Nitrate by calc	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 480-184468-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Carbon dioxide	51000		5000	4000	ug/L	1		RSK-175	Total/NA
Iron	1630		50.0	19.3	ug/L	1		6010C	Total/NA
Manganese	636		3.0	0.40	ug/L	1		6010C	Total/NA
Manganese, Dissolved	0.090		0.0030	0.00040	mg/L	1		6010C	Dissolved
Sulfate	18.0		2.0	0.35	mg/L	1		300.0	Total/NA
Alkalinity, Total	11.1		10.0	4.0	mg/L	1		310.2	Total/NA
Total Organic Carbon	2.3		1.0	0.43	mg/L	1		9060A	Total/NA
Nitrate as N	0.047	J	0.050	0.020	mg/L	1		Nitrate by calc	Total/NA

This Detection Summary does not include radiochemical test results.

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Client Sample ID: MW-6S

Lab Sample ID: 480-184468-1

Date Collected: 05/10/21 11:40

Matrix: Water

Date Received: 05/11/21 08:00

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbon dioxide	ND		5000	4000	ug/L			05/17/21 18:20	1
Methane	ND		4.0	1.0	ug/L			05/12/21 10:30	1
Ethane	ND		7.5	1.5	ug/L			05/12/21 10:30	1
Ethene	ND		7.0	1.5	ug/L			05/12/21 10:30	1

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	**510**		50.0	19.3	ug/L		05/12/21 09:46	05/12/21 17:25	1
Manganese	**216**		3.0	0.40	ug/L		05/12/21 09:46	05/12/21 17:25	1

Method: 6010C - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron, Dissolved	ND		0.050	0.019	mg/L		05/24/21 11:00	05/24/21 17:55	1
Manganese, Dissolved	**0.21**		0.0030	0.00040	mg/L		05/24/21 11:00	05/24/21 17:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**5.3**		2.0	0.35	mg/L			05/12/21 02:01	1
Alkalinity, Total	**163**	**B**	50.0	20.0	mg/L			05/12/21 15:54	5
Total Organic Carbon	**0.59**	**J**	1.0	0.43	mg/L			05/12/21 22:37	1
Nitrate as N	ND		0.050	0.020	mg/L			05/11/21 15:55	1
Sulfide	ND		1.0	0.67	mg/L			05/13/21 12:20	1

Client Sample ID: MW-3D

Lab Sample ID: 480-184468-2

Date Collected: 05/10/21 13:10

Matrix: Water

Date Received: 05/11/21 08:00

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbon dioxide	ND		5000	4000	ug/L			05/17/21 18:29	1
Ethane	ND		7.5	1.5	ug/L			05/12/21 10:49	1
Ethene	ND		7.0	1.5	ug/L			05/12/21 10:49	1

Method: RSK-175 - Dissolved Gases (GC) - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**7000**		180	44	ug/L			05/12/21 12:04	44

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	**455**		50.0	19.3	ug/L		05/12/21 09:46	05/12/21 17:44	1
Manganese	**18.5**		3.0	0.40	ug/L		05/12/21 09:46	05/12/21 17:44	1

Method: 6010C - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron, Dissolved	ND		0.050	0.019	mg/L		05/24/21 11:00	05/24/21 18:10	1
Manganese, Dissolved	**0.013**		0.0030	0.00040	mg/L		05/24/21 11:00	05/24/21 18:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**2.9**		2.0	0.35	mg/L			05/12/21 02:19	1
Alkalinity, Total	**148**	**B**	50.0	20.0	mg/L			05/12/21 15:54	5
Total Organic Carbon	ND		1.0	0.43	mg/L			05/12/21 23:35	1

Client Sample Results

Client Sample ID: MW-3D
Lab Sample ID: 480-184468-2
Date Collected: 05/10/21 13:10
Matrix: Water
Date Received: 05/11/21 08:00

General Chemistry (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	**0.031**	**J**	0.050	0.020	mg/L			05/11/21 15:56	1
Sulfide	ND		1.0	0.67	mg/L			05/13/21 12:20	1

Client Sample ID: MW-3S
Lab Sample ID: 480-184468-3
Date Collected: 05/10/21 14:30
Matrix: Water
Date Received: 05/11/21 08:00

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbon dioxide	ND		5000	4000	ug/L			05/17/21 18:37	1
Ethane	**3.1**	**J**	7.5	1.5	ug/L			05/12/21 11:08	1
Ethene	ND		7.0	1.5	ug/L			05/12/21 11:08	1

Method: RSK-175 - Dissolved Gases (GC) - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**8800**		180	44	ug/L			05/12/21 12:23	44

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	**423**		50.0	19.3	ug/L		05/12/21 09:46	05/12/21 17:47	1
Manganese	**37.2**		3.0	0.40	ug/L		05/12/21 09:46	05/12/21 17:47	1

Method: 6010C - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron, Dissolved	ND		0.050	0.019	mg/L		05/24/21 11:00	05/24/21 18:14	1
Manganese, Dissolved	**0.027**		0.0030	0.00040	mg/L		05/24/21 11:00	05/24/21 18:14	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**28.0**		2.0	0.35	mg/L			05/12/21 02:37	1
Alkalinity, Total	**162**	**B**	50.0	20.0	mg/L			05/12/21 16:01	5
Total Organic Carbon	ND		1.0	0.43	mg/L			05/13/21 00:33	1
Nitrate as N	**0.025**	**J**	0.050	0.020	mg/L			05/11/21 15:57	1
Sulfide	ND		1.0	0.67	mg/L			05/13/21 12:20	1

Client Sample ID: MW-5
Lab Sample ID: 480-184468-4
Date Collected: 05/10/21 15:25
Matrix: Water
Date Received: 05/11/21 08:00

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbon dioxide	**5400**		5000	4000	ug/L			05/17/21 18:46	1
Ethane	ND		7.5	1.5	ug/L			05/12/21 11:27	1
Ethene	ND		7.0	1.5	ug/L			05/12/21 11:27	1

Method: RSK-175 - Dissolved Gases (GC) - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**4700**		180	44	ug/L			05/12/21 12:42	44

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	**24100**		50.0	19.3	ug/L		05/12/21 09:46	05/12/21 17:51	1

Client Sample ID: MW-5

Lab Sample ID: 480-184468-4

Date Collected: 05/10/21 15:25

Matrix: Water

Date Received: 05/11/21 08:00

Method: 6010C - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	**1180**		3.0	0.40	ug/L		05/12/21 09:46	05/12/21 17:51	1

Method: 6010C - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron, Dissolved	ND		0.050	0.019	mg/L		05/24/21 11:00	05/24/21 18:17	1
Manganese, Dissolved	**0.0010**	**J**	0.0030	0.00040	mg/L		05/24/21 11:00	05/24/21 18:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	0.35	mg/L			05/12/21 02:55	1
Alkalinity, Total	**142**	**B**	50.0	20.0	mg/L			05/12/21 15:55	5
Total Organic Carbon	**1.1**		1.0	0.43	mg/L			05/13/21 01:32	1
Nitrate as N	**0.046**	**J**	0.050	0.020	mg/L			05/11/21 19:00	1
Sulfide	ND		1.0	0.67	mg/L			05/13/21 12:20	1

Client Sample ID: MW-2

Lab Sample ID: 480-184468-5

Date Collected: 05/10/21 16:40

Matrix: Water

Date Received: 05/11/21 08:00

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbon dioxide	**51000**		5000	4000	ug/L			05/17/21 18:55	1
Methane	ND		4.0	1.0	ug/L			05/12/21 11:46	1
Ethane	ND		7.5	1.5	ug/L			05/12/21 11:46	1
Ethene	ND		7.0	1.5	ug/L			05/12/21 11:46	1

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	**1630**		50.0	19.3	ug/L		05/12/21 09:46	05/12/21 17:55	1
Manganese	**636**		3.0	0.40	ug/L		05/12/21 09:46	05/12/21 17:55	1

Method: 6010C - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron, Dissolved	ND		0.050	0.019	mg/L		05/24/21 11:00	05/24/21 18:21	1
Manganese, Dissolved	**0.090**		0.0030	0.00040	mg/L		05/24/21 11:00	05/24/21 18:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**18.0**		2.0	0.35	mg/L			05/12/21 03:13	1
Alkalinity, Total	**11.1**		10.0	4.0	mg/L			05/12/21 15:44	1
Total Organic Carbon	**2.3**		1.0	0.43	mg/L			05/13/21 02:01	1
Nitrate as N	**0.047**	**J**	0.050	0.020	mg/L			05/11/21 16:00	1
Sulfide	ND		1.0	0.67	mg/L			05/13/21 12:20	1

Method: RSK-175 - Dissolved Gases (GC)

Lab Sample ID: MB 200-166949/4
Matrix: Water
Analysis Batch: 166949

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbon dioxide	ND		5000	4000	ug/L			05/17/21 18:11	1

Lab Sample ID: LCS 200-166949/2
Matrix: Water
Analysis Batch: 166949

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Carbon dioxide	40000	33900		ug/L		85	70 - 130

Lab Sample ID: LCSD 200-166949/3
Matrix: Water
Analysis Batch: 166949

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Carbon dioxide	40000	38000		ug/L		95	70 - 130	11	30

Lab Sample ID: MB 480-580497/3
Matrix: Water
Analysis Batch: 580497

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methane	ND		4.0	1.0	ug/L			05/12/21 09:14	1
Ethane	ND		7.5	1.5	ug/L			05/12/21 09:14	1
Ethene	ND		7.0	1.5	ug/L			05/12/21 09:14	1

Lab Sample ID: LCS 480-580497/4
Matrix: Water
Analysis Batch: 580497

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Methane	19.2	19.7		ug/L		103	85 - 120
Ethane	36.8	37.9		ug/L		103	79 - 120
Ethene	33.7	34.1		ug/L		101	85 - 120

Lab Sample ID: LCSD 480-580497/5
Matrix: Water
Analysis Batch: 580497

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Methane	19.2	19.3		ug/L		100	85 - 120	2	50
Ethane	36.8	37.1		ug/L		101	79 - 120	2	50
Ethene	33.7	34.7		ug/L		103	85 - 120	2	50

QC Sample Results

Client: ARCADIS U.S. Inc
Project/Site: BMS Krutulis Farms

Job ID: 480-184468-1

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 480-580380/1-A
Matrix: Water
Analysis Batch: 580706

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 580380

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	ND		50.0	19.3	ug/L		05/12/21 09:46	05/12/21 17:07	1
Manganese	ND		3.0	0.40	ug/L		05/12/21 09:46	05/12/21 17:07	1

Lab Sample ID: LCS 480-580380/2-A
Matrix: Water
Analysis Batch: 580706

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 580380

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Iron			10000	9760		ug/L		98	80 - 120		
Manganese			200	204.2		ug/L		102	80 - 120		

Lab Sample ID: 480-184468-1 MS
Matrix: Water
Analysis Batch: 580706

Client Sample ID: MW-6S
Prep Type: Total/NA
Prep Batch: 580380

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Iron	510		10000	10140		ug/L		96	75 - 125		
Manganese	216		200	419.2		ug/L		102	75 - 125		

Lab Sample ID: 480-184468-1 MSD
Matrix: Water
Analysis Batch: 580706

Client Sample ID: MW-6S
Prep Type: Total/NA
Prep Batch: 580380

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Iron	510		10000	10480		ug/L		100	75 - 125	3	20
Manganese	216		200	430.8		ug/L		108	75 - 125	3	20

Lab Sample ID: MB 480-580383/1-A
Matrix: Water
Analysis Batch: 580709

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 580383

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	ND		50.0	19.3	ug/L		05/12/21 09:47	05/12/21 21:45	1
Manganese	ND		3.0	0.40	ug/L		05/12/21 09:47	05/12/21 21:45	1

Lab Sample ID: LCS 480-580383/2-A
Matrix: Water
Analysis Batch: 580709

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 580383

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Iron			10000	10260		ug/L		103	80 - 120		
Manganese			200	216.5		ug/L		108	80 - 120		

Lab Sample ID: 480-184468-3 MS
Matrix: Water
Analysis Batch: 580709

Client Sample ID: MW-3S
Prep Type: Total/NA
Prep Batch: 580383

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Iron	423		10000	10270		ug/L		98	75 - 125		
Manganese	37.2		200	246.1		ug/L		104	75 - 125		

QC Sample Results

Method: 6010C - Metals (ICP)

Lab Sample ID: 480-184468-3 MSD
Matrix: Water
Analysis Batch: 580709

Client Sample ID: MW-3S
Prep Type: Total/NA
Prep Batch: 580383

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Iron	423		10000	10470		ug/L		100	75 - 125	2	20
Manganese	37.2		200	250.8		ug/L		107	75 - 125	2	20

Lab Sample ID: MB 480-582175/1-B
Matrix: Water
Analysis Batch: 582521

Client Sample ID: Method Blank
Prep Type: Dissolved
Prep Batch: 582288

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron, Dissolved	ND		0.050	0.019	mg/L		05/24/21 11:00	05/24/21 17:29	1
Manganese, Dissolved	ND		0.0030	0.00040	mg/L		05/24/21 11:00	05/24/21 17:29	1

Lab Sample ID: LCS 480-582175/2-B
Matrix: Water
Analysis Batch: 582521

Client Sample ID: Lab Control Sample
Prep Type: Dissolved
Prep Batch: 582288

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Iron, Dissolved	10.0	9.09		mg/L		91	80 - 120
Manganese, Dissolved	0.200	0.203		mg/L		101	80 - 120

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 480-580337/4
Matrix: Water
Analysis Batch: 580337

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	0.35	mg/L			05/12/21 01:43	1

Lab Sample ID: LCS 480-580337/3
Matrix: Water
Analysis Batch: 580337

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	50.0	48.57		mg/L		97	90 - 110

Method: 310.2 - Alkalinity

Lab Sample ID: MB 480-580627/21
Matrix: Water
Analysis Batch: 580627

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity, Total	ND		10.0	4.0	mg/L			05/12/21 15:39	1

Lab Sample ID: MB 480-580627/32
Matrix: Water
Analysis Batch: 580627

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity, Total	ND		10.0	4.0	mg/L			05/12/21 15:41	1

QC Sample Results

Client: ARCADIS U.S. Inc
Project/Site: BMS Krutulis Farms

Job ID: 480-184468-1

Method: 310.2 - Alkalinity (Continued)

Lab Sample ID: MB 480-580627/43
Matrix: Water
Analysis Batch: 580627

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity, Total	6.83	J	10.0	4.0	mg/L			05/12/21 15:51	1

Lab Sample ID: LCS 480-580627/19
Matrix: Water
Analysis Batch: 580627

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity, Total			50.0	50.87		mg/L		102	90 - 110		

Lab Sample ID: LCS 480-580627/30
Matrix: Water
Analysis Batch: 580627

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity, Total			50.0	50.69		mg/L		101	90 - 110		

Lab Sample ID: LCS 480-580627/41
Matrix: Water
Analysis Batch: 580627

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity, Total			50.0	48.88		mg/L		98	90 - 110		

Method: 9060A - Organic Carbon, Total (TOC)

Lab Sample ID: MB 480-580766/4
Matrix: Water
Analysis Batch: 580766

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	ND		1.0	0.43	mg/L			05/12/21 21:39	1

Lab Sample ID: LCS 480-580766/5
Matrix: Water
Analysis Batch: 580766

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Carbon			60.0	61.09		mg/L		102	90 - 110		

Lab Sample ID: 480-184468-2 MS
Matrix: Water
Analysis Batch: 580766

Client Sample ID: MW-3D
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Carbon	ND		23.3	26.35		mg/L		113	54 - 131		

Method: 9060A - Organic Carbon, Total (TOC) (Continued)

Lab Sample ID: 480-184468-3 DU
Client Sample ID: MW-3S
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 580766

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Organic Carbon	ND			0.472	J	mg/L				NC	20

Method: SM 4500 S2 F - Sulfide, Total

Lab Sample ID: MB 480-580785/3
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 580785

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		1.0	0.67	mg/L			05/13/21 12:20	1

Lab Sample ID: LCS 480-580785/4
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 580785

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Sulfide			10.0	9.60		mg/L		96	90 - 110		

GC VOA

Analysis Batch: 166949

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	RSK-175	
480-184468-2	MW-3D	Total/NA	Water	RSK-175	
480-184468-3	MW-3S	Total/NA	Water	RSK-175	
480-184468-4	MW-5	Total/NA	Water	RSK-175	
480-184468-5	MW-2	Total/NA	Water	RSK-175	
MB 200-166949/4	Method Blank	Total/NA	Water	RSK-175	
LCS 200-166949/2	Lab Control Sample	Total/NA	Water	RSK-175	
LCSD 200-166949/3	Lab Control Sample Dup	Total/NA	Water	RSK-175	

Analysis Batch: 580497

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	RSK-175	
480-184468-2	MW-3D	Total/NA	Water	RSK-175	
480-184468-2 - DL	MW-3D	Total/NA	Water	RSK-175	
480-184468-3	MW-3S	Total/NA	Water	RSK-175	
480-184468-3 - DL	MW-3S	Total/NA	Water	RSK-175	
480-184468-4	MW-5	Total/NA	Water	RSK-175	
480-184468-4 - DL	MW-5	Total/NA	Water	RSK-175	
480-184468-5	MW-2	Total/NA	Water	RSK-175	
MB 480-580497/3	Method Blank	Total/NA	Water	RSK-175	
LCS 480-580497/4	Lab Control Sample	Total/NA	Water	RSK-175	
LCSD 480-580497/5	Lab Control Sample Dup	Total/NA	Water	RSK-175	

Metals

Prep Batch: 580380

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	3005A	
480-184468-2	MW-3D	Total/NA	Water	3005A	
480-184468-3	MW-3S	Total/NA	Water	3005A	
480-184468-4	MW-5	Total/NA	Water	3005A	
480-184468-5	MW-2	Total/NA	Water	3005A	
MB 480-580380/1-A	Method Blank	Total/NA	Water	3005A	
LCS 480-580380/2-A	Lab Control Sample	Total/NA	Water	3005A	
480-184468-1 MS	MW-6S	Total/NA	Water	3005A	
480-184468-1 MSD	MW-6S	Total/NA	Water	3005A	

Prep Batch: 580383

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 480-580383/1-A	Method Blank	Total/NA	Water	3005A	
LCS 480-580383/2-A	Lab Control Sample	Total/NA	Water	3005A	
480-184468-3 MS	MW-3S	Total/NA	Water	3005A	
480-184468-3 MSD	MW-3S	Total/NA	Water	3005A	

Analysis Batch: 580706

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	6010C	580380
480-184468-2	MW-3D	Total/NA	Water	6010C	580380
480-184468-3	MW-3S	Total/NA	Water	6010C	580380
480-184468-4	MW-5	Total/NA	Water	6010C	580380
480-184468-5	MW-2	Total/NA	Water	6010C	580380

Metals (Continued)

Analysis Batch: 580706 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 480-580380/1-A	Method Blank	Total/NA	Water	6010C	580380
LCS 480-580380/2-A	Lab Control Sample	Total/NA	Water	6010C	580380
480-184468-1 MS	MW-6S	Total/NA	Water	6010C	580380
480-184468-1 MSD	MW-6S	Total/NA	Water	6010C	580380

Analysis Batch: 580709

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 480-580383/1-A	Method Blank	Total/NA	Water	6010C	580383
LCS 480-580383/2-A	Lab Control Sample	Total/NA	Water	6010C	580383
480-184468-3 MS	MW-3S	Total/NA	Water	6010C	580383
480-184468-3 MSD	MW-3S	Total/NA	Water	6010C	580383

Filtration Batch: 582175

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Dissolved	Water	FILTRATION	
480-184468-2	MW-3D	Dissolved	Water	FILTRATION	
480-184468-3	MW-3S	Dissolved	Water	FILTRATION	
480-184468-4	MW-5	Dissolved	Water	FILTRATION	
480-184468-5	MW-2	Dissolved	Water	FILTRATION	
MB 480-582175/1-B	Method Blank	Dissolved	Water	FILTRATION	
LCS 480-582175/2-B	Lab Control Sample	Dissolved	Water	FILTRATION	

Prep Batch: 582288

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Dissolved	Water	3005A	582175
480-184468-2	MW-3D	Dissolved	Water	3005A	582175
480-184468-3	MW-3S	Dissolved	Water	3005A	582175
480-184468-4	MW-5	Dissolved	Water	3005A	582175
480-184468-5	MW-2	Dissolved	Water	3005A	582175
MB 480-582175/1-B	Method Blank	Dissolved	Water	3005A	582175
LCS 480-582175/2-B	Lab Control Sample	Dissolved	Water	3005A	582175

Analysis Batch: 582521

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Dissolved	Water	6010C	582288
480-184468-2	MW-3D	Dissolved	Water	6010C	582288
480-184468-3	MW-3S	Dissolved	Water	6010C	582288
480-184468-4	MW-5	Dissolved	Water	6010C	582288
480-184468-5	MW-2	Dissolved	Water	6010C	582288
MB 480-582175/1-B	Method Blank	Dissolved	Water	6010C	582288
LCS 480-582175/2-B	Lab Control Sample	Dissolved	Water	6010C	582288

General Chemistry

Analysis Batch: 580337

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	300.0	
480-184468-2	MW-3D	Total/NA	Water	300.0	
480-184468-3	MW-3S	Total/NA	Water	300.0	
480-184468-4	MW-5	Total/NA	Water	300.0	
480-184468-5	MW-2	Total/NA	Water	300.0	

General Chemistry (Continued)

Analysis Batch: 580337 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 480-580337/4	Method Blank	Total/NA	Water	300.0	
LCS 480-580337/3	Lab Control Sample	Total/NA	Water	300.0	

Analysis Batch: 580437

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	Nitrate by calc	
480-184468-2	MW-3D	Total/NA	Water	Nitrate by calc	
480-184468-3	MW-3S	Total/NA	Water	Nitrate by calc	
480-184468-4	MW-5	Total/NA	Water	Nitrate by calc	
480-184468-5	MW-2	Total/NA	Water	Nitrate by calc	

Analysis Batch: 580627

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	310.2	
480-184468-2	MW-3D	Total/NA	Water	310.2	
480-184468-3	MW-3S	Total/NA	Water	310.2	
480-184468-4	MW-5	Total/NA	Water	310.2	
480-184468-5	MW-2	Total/NA	Water	310.2	
MB 480-580627/21	Method Blank	Total/NA	Water	310.2	
MB 480-580627/32	Method Blank	Total/NA	Water	310.2	
MB 480-580627/43	Method Blank	Total/NA	Water	310.2	
LCS 480-580627/19	Lab Control Sample	Total/NA	Water	310.2	
LCS 480-580627/30	Lab Control Sample	Total/NA	Water	310.2	
LCS 480-580627/41	Lab Control Sample	Total/NA	Water	310.2	

Analysis Batch: 580766

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	9060A	
480-184468-2	MW-3D	Total/NA	Water	9060A	
480-184468-3	MW-3S	Total/NA	Water	9060A	
480-184468-4	MW-5	Total/NA	Water	9060A	
480-184468-5	MW-2	Total/NA	Water	9060A	
MB 480-580766/4	Method Blank	Total/NA	Water	9060A	
LCS 480-580766/5	Lab Control Sample	Total/NA	Water	9060A	
480-184468-2 MS	MW-3D	Total/NA	Water	9060A	
480-184468-3 DU	MW-3S	Total/NA	Water	9060A	

Analysis Batch: 580785

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-184468-1	MW-6S	Total/NA	Water	SM 4500 S2 F	
480-184468-2	MW-3D	Total/NA	Water	SM 4500 S2 F	
480-184468-3	MW-3S	Total/NA	Water	SM 4500 S2 F	
480-184468-4	MW-5	Total/NA	Water	SM 4500 S2 F	
480-184468-5	MW-2	Total/NA	Water	SM 4500 S2 F	
MB 480-580785/3	Method Blank	Total/NA	Water	SM 4500 S2 F	
LCS 480-580785/4	Lab Control Sample	Total/NA	Water	SM 4500 S2 F	

Lab Chronicle

Client: ARCADIS U.S. Inc
Job ID: 480-184468-1
Project/Site: BMS Krutulis Farms

Client Sample ID: MW-6S
Lab Sample ID: 480-184468-1
Date Collected: 05/10/21 11:40
Matrix: Water
Date Received: 05/11/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	RSK-175		1	166949	05/17/21 18:20	MJZ	TAL BUR
Total/NA	Analysis	RSK-175		1	580497	05/12/21 10:30	JLS	TAL BUF
Dissolved	Filtration	FILTRATION			582175	05/22/21 13:02	ADM	TAL BUF
Dissolved	Prep	3005A			582288	05/24/21 11:00	KMP	TAL BUF
Dissolved	Analysis	6010C		1	582521	05/24/21 17:55	LMH	TAL BUF
Total/NA	Prep	3005A			580380	05/12/21 09:46	KMP	TAL BUF
Total/NA	Analysis	6010C		1	580706	05/12/21 17:25	LMH	TAL BUF
Total/NA	Analysis	300.0		1	580337	05/12/21 02:01	IMZ	TAL BUF
Total/NA	Analysis	310.2		5	580627	05/12/21 15:54	SRW	TAL BUF
Total/NA	Analysis	9060A		1	580766	05/12/21 22:37	CLA	TAL BUF
Total/NA	Analysis	Nitrate by calc		1	580437	05/11/21 15:55	ALT	TAL BUF
Total/NA	Analysis	SM 4500 S2 F		1	580785	05/13/21 12:20	SRA	TAL BUF

Client Sample ID: MW-3D
Lab Sample ID: 480-184468-2
Date Collected: 05/10/21 13:10
Matrix: Water
Date Received: 05/11/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	RSK-175		1	166949	05/17/21 18:29	MJZ	TAL BUR
Total/NA	Analysis	RSK-175		1	580497	05/12/21 10:49	JLS	TAL BUF
Total/NA	Analysis	RSK-175	DL	44	580497	05/12/21 12:04	JLS	TAL BUF
Dissolved	Filtration	FILTRATION			582175	05/22/21 13:02	ADM	TAL BUF
Dissolved	Prep	3005A			582288	05/24/21 11:00	KMP	TAL BUF
Dissolved	Analysis	6010C		1	582521	05/24/21 18:10	LMH	TAL BUF
Total/NA	Prep	3005A			580380	05/12/21 09:46	KMP	TAL BUF
Total/NA	Analysis	6010C		1	580706	05/12/21 17:44	LMH	TAL BUF
Total/NA	Analysis	300.0		1	580337	05/12/21 02:19	IMZ	TAL BUF
Total/NA	Analysis	310.2		5	580627	05/12/21 15:54	SRW	TAL BUF
Total/NA	Analysis	9060A		1	580766	05/12/21 23:35	CLA	TAL BUF
Total/NA	Analysis	Nitrate by calc		1	580437	05/11/21 15:56	ALT	TAL BUF
Total/NA	Analysis	SM 4500 S2 F		1	580785	05/13/21 12:20	SRA	TAL BUF

Client Sample ID: MW-3S
Lab Sample ID: 480-184468-3
Date Collected: 05/10/21 14:30
Matrix: Water
Date Received: 05/11/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	RSK-175		1	166949	05/17/21 18:37	MJZ	TAL BUR
Total/NA	Analysis	RSK-175		1	580497	05/12/21 11:08	JLS	TAL BUF
Total/NA	Analysis	RSK-175	DL	44	580497	05/12/21 12:23	JLS	TAL BUF
Dissolved	Filtration	FILTRATION			582175	05/22/21 13:02	ADM	TAL BUF
Dissolved	Prep	3005A			582288	05/24/21 11:00	KMP	TAL BUF
Dissolved	Analysis	6010C		1	582521	05/24/21 18:14	LMH	TAL BUF

Lab Chronicle

Client Sample ID: MW-3S

Date Collected: 05/10/21 14:30
Date Received: 05/11/21 08:00

Lab Sample ID: 480-184468-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3005A			580380	05/12/21 09:46	KMP	TAL BUF
Total/NA	Analysis	6010C		1	580706	05/12/21 17:47	LMH	TAL BUF
Total/NA	Analysis	300.0		1	580337	05/12/21 02:37	IMZ	TAL BUF
Total/NA	Analysis	310.2		5	580627	05/12/21 16:01	SRW	TAL BUF
Total/NA	Analysis	9060A		1	580766	05/13/21 00:33	CLA	TAL BUF
Total/NA	Analysis	Nitrate by calc		1	580437	05/11/21 15:57	ALT	TAL BUF
Total/NA	Analysis	SM 4500 S2 F		1	580785	05/13/21 12:20	SRA	TAL BUF

Client Sample ID: MW-5

Date Collected: 05/10/21 15:25
Date Received: 05/11/21 08:00

Lab Sample ID: 480-184468-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	RSK-175		1	166949	05/17/21 18:46	MJZ	TAL BUR
Total/NA	Analysis	RSK-175		1	580497	05/12/21 11:27	JLS	TAL BUF
Total/NA	Analysis	RSK-175	DL	44	580497	05/12/21 12:42	JLS	TAL BUF
Dissolved	Filtration	FILTRATION			582175	05/22/21 13:02	ADM	TAL BUF
Dissolved	Prep	3005A			582288	05/24/21 11:00	KMP	TAL BUF
Dissolved	Analysis	6010C		1	582521	05/24/21 18:17	LMH	TAL BUF
Total/NA	Prep	3005A			580380	05/12/21 09:46	KMP	TAL BUF
Total/NA	Analysis	6010C		1	580706	05/12/21 17:51	LMH	TAL BUF
Total/NA	Analysis	300.0		1	580337	05/12/21 02:55	IMZ	TAL BUF
Total/NA	Analysis	310.2		5	580627	05/12/21 15:55	SRW	TAL BUF
Total/NA	Analysis	9060A		1	580766	05/13/21 01:32	CLA	TAL BUF
Total/NA	Analysis	Nitrate by calc		1	580437	05/11/21 19:00	ALT	TAL BUF
Total/NA	Analysis	SM 4500 S2 F		1	580785	05/13/21 12:20	SRA	TAL BUF

Client Sample ID: MW-2

Date Collected: 05/10/21 16:40
Date Received: 05/11/21 08:00

Lab Sample ID: 480-184468-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	RSK-175		1	166949	05/17/21 18:55	MJZ	TAL BUR
Total/NA	Analysis	RSK-175		1	580497	05/12/21 11:46	JLS	TAL BUF
Dissolved	Filtration	FILTRATION			582175	05/22/21 13:02	ADM	TAL BUF
Dissolved	Prep	3005A			582288	05/24/21 11:00	KMP	TAL BUF
Dissolved	Analysis	6010C		1	582521	05/24/21 18:21	LMH	TAL BUF
Total/NA	Prep	3005A			580380	05/12/21 09:46	KMP	TAL BUF
Total/NA	Analysis	6010C		1	580706	05/12/21 17:55	LMH	TAL BUF
Total/NA	Analysis	300.0		1	580337	05/12/21 03:13	IMZ	TAL BUF
Total/NA	Analysis	310.2		1	580627	05/12/21 15:44	SRW	TAL BUF
Total/NA	Analysis	9060A		1	580766	05/13/21 02:01	CLA	TAL BUF
Total/NA	Analysis	Nitrate by calc		1	580437	05/11/21 16:00	ALT	TAL BUF

Lab Chronicle

Client: ARCADIS U.S. Inc
Project/Site: BMS Krutulis Farms

Job ID: 480-184468-1

Client Sample ID: MW-2
Date Collected: 05/10/21 16:40
Date Received: 05/11/21 08:00

Lab Sample ID: 480-184468-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	SM 4500 S2 F		1	580785	05/13/21 12:20	SRA	TAL BUF

Laboratory References:

TAL BUF = Eurofins TestAmerica, Buffalo, 10 Hazelwood Drive, Amherst, NY 14228-2298, TEL (716)691-2600
TAL BUR = Eurofins TestAmerica, Burlington, 530 Community Drive, Suite 11, South Burlington, VT 05403, TEL (802)660-1990

Accreditation/Certification Summary

Client: ARCADIS U.S. Inc
Project/Site: BMS Krutulis Farms

Job ID: 480-184468-1

Laboratory: Eurofins TestAmerica, Buffalo

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
New York	NELAP	10026	04-01-22

Laboratory: Eurofins TestAmerica, Burlington

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2336	02-25-23
Connecticut	State	PH-0751	09-30-21
Florida	NELAP	E87467	06-30-21
Minnesota	NELAP	050-999-436	12-31-21
New Hampshire	NELAP	2006	12-18-21
New Jersey	NELAP	VT972	06-30-21
New York	NELAP	10391	04-01-22
Pennsylvania	NELAP	68-00489	04-30-22
Rhode Island	State	LAO00298	12-30-21
US Fish & Wildlife	US Federal Programs	058448	07-31-21
USDA	US Federal Programs	P330-17-00272	10-30-23
Vermont	State	VT4000	02-10-22
Virginia	NELAP	460209	12-14-21
Wisconsin	State	399133350	08-31-21

Method Summary

Method	Method Description	Protocol	Laboratory
RSK-175	Dissolved Gases (GC)	RSK	TAL BUF
RSK-175	Dissolved Gases (GC)	RSK	TAL BUR
6010C	Metals (ICP)	SW846	TAL BUF
300.0	Anions, Ion Chromatography	MCAWW	TAL BUF
310.2	Alkalinity	MCAWW	TAL BUF
9060A	Organic Carbon, Total (TOC)	SW846	TAL BUF
Nitrate by calc	Nitrogen, Nitrate-Nitrite	SM	TAL BUF
SM 4500 S2 F	Sulfide, Total	SM	TAL BUF
3005A	Preparation, Total Metals	SW846	TAL BUF
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL BUF
FILTRATION	Sample Filtration	None	TAL BUF

Protocol References:

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

None = None

RSK = Sample Prep And Calculations For Dissolved Gas Analysis In Water Samples Using A GC Headspace Equilibration Technique, RSKSOP-175, Rev. 0, 8/11/94, USEPA Research Lab

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL BUF = Eurofins TestAmerica, Buffalo, 10 Hazelwood Drive, Amherst, NY 14228-2298, TEL (716)691-2600

TAL BUR = Eurofins TestAmerica, Burlington, 530 Community Drive, Suite 11, South Burlington, VT 05403, TEL (802)660-1990

Sample Summary

Client: ARCADIS U.S. Inc
Project/Site: BMS Krutulis Farms

Job ID: 480-184468-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
480-184468-1	MW-6S	Water	05/10/21 11:40	05/11/21 08:00	
480-184468-2	MW-3D	Water	05/10/21 13:10	05/11/21 08:00	
480-184468-3	MW-3S	Water	05/10/21 14:30	05/11/21 08:00	
480-184468-4	MW-5	Water	05/10/21 15:25	05/11/21 08:00	
480-184468-5	MW-2	Water	05/10/21 16:40	05/11/21 08:00	

Eurofins TestAmerica, Buffalo
10 Hazelwood Drive
Amherst, NY 14228-2298
Phone: 716-691-2600 Fax: 716-691-7991

Chain of Custody Record

eurofins | Environment Testing America

Syracuse

Client Information	Sampler: E Green / D Meandro	Lab PM: Schove, John R	Carrier Tracking No(s): #225	COC No: 480-160150-35245.1
Client Contact: Mr. Richard Hatch	Phone: 603-305-2697	E-Mail: John.Schove@Eurofinset.com	State of Origin:	Page: Page 1 of 1
Company: ARCADIS U.S. Inc	PWSID:			Job #:
Address: 213 Court Street Suite 700	Due Date Requested:			
City: Middletown	TAT Requested (days): Standard			
State, Zip: CT, 06457	Compliance Project: Δ Yes [✓ Δ No]			
Phone: 860-533-9947(Tel)	PO #: Purchase Order Requested			
Email: richard.hatch@arcadis.com	WO #:			
Project Name: BMS Krutulis Farms	Project #: 48023742			
Site:	SSOW#:			

480-184468 Chain of Custody

Preservation Codes: ... ahydrate ... K - EDTA L - EDA ... V - MCAA W - pH 4-5 Z - other (specify) Other:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	m MS	RSK_175_CO2 - Dissolved Gases - Carbon Dioxide	300.0_28D - Sulfate	6010C - Metals - Iron & Manganese	6010C - Metals - Dissolved Iron & Manganese	RSK_175 - Methane, Ethane, Ethene	9060A - Organic Carbon, Total (TOC)	SM4500_S2_F - Sulfide, Total	Nitrate_Calc - Nitrate	310.2 - Alkalinity	Total Number of containers	Special Instructions/Note:
				Preservation Code:	X	X	N	N	D	D	A	A	CB	N	N	X	
MW-6S	5/10/21	1140	G	Water	N	N	X	X	X	X	X	X	X	X	X		Please lab filter
MW-3D	5/10/21	1310	G	Water	N	N	X	X	X	X	X	X	X	X	X		all sample where
MW-3S	6/10/21	1430	G	Water	N	N	X	X	X	X	X	X	X	X	X		needed. We were
MW-5	5/10/21	1525	G	Water	N	N	X	X	X	X	X	X	X	X	X		Unable to field filter
MW-2	5/10/21	1640	G	Water	N	N	X	X	X	X	X	X	X	X	X		samples

RE 5-10-21

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Deliverable Requested: I, II, III, [✓ IV], Other (specify)

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ____ Months

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:	
Relinquished by:	Date/Time: 5/10/21 1730	Company: Arcadis	Received by: R Englich	Date/Time: 5-10-21 17:30	Company: Eyn
Relinquished by: R Englich	Date/Time: 5-10-21, 1900	Company: Eyn	Received by:	Date/Time: 5/11/21 0800	Company: TAS
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks: #1 3.0		

Ver: 11/01/2020

Eurofins TestAmerica, Buffalo
10 Hazelwood Drive
Amherst, NY 14228-2298
Phone: 716-691-2600 Fax: 716-691-7991

Chain of Custody Record

480-184468 Chain of Custody

eurofins | Environment Testing America

Client Information (Sub Contract Lab)

Client Contact: Shipping/Receiving

Company: TestAmerica Laboratories, Inc.

Address: 530 Community Drive, Suite 11,

City: South Burlington

State, Zip: VT, 05403

Phone: 802-660-1990(Tel) 802-660-1919(Fax)

Email:

Project Name: BMS Krutulis Farms

Site:

Sampler:

Phone:

Due Date Requested: 5/24/2021

TAT Requested (days):

PO #:

WO #:

Project #: 48023742

SSOW#:

Lab PM: Schove, John R

E-Mail: John.Schove@Eurofinset.com

State of Origin: New York

Accreditations Required (See note): NELAP - New York

480-63553.1

Page: Page 1 of 1

Job #: 480-184468-1

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	RSK_175_CO2/ Dissolved Gases - Carbon Dioxide	Total Number of containers	Special Instructions/Note:
				Preservation Code:					
MW-6S (480-184468-1)	5/10/21	11:40 Eastern		Water			X	3	
MW-3D (480-184468-2)	5/10/21	13:10 Eastern		Water			X	3	
MW-3S (480-184468-3)	5/10/21	14:30 Eastern		Water			X	3	
MW-5 (480-184468-4)	5/10/21	15:25 Eastern		Water			X	3	
MW-2 (480-184468-5)	5/10/21	16:40 Eastern		Water			X	3	

Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica.

Possible Hazard Identification

Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ______ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Primary Deliverable Rank: 2

Special Instructions/QC Requirements:

Empty Kit Relinquished by:

Date:

Time:

Method of Shipment:

Relinquished by:	Date/Time: 5/11/21 1700	Company TA	Received by:	Date/Time: 5/12/21 11:30	Company TABUR 1
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No

Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Ver: 11/01/2020

Do Not Lift Using This Tag

eurofins | E[illegible]esting

A
9297
05.12
10:30
RT 916
FZ 915

Part # 159469-434 RIT2 EXP 01/22

ORIGIN ID:DKKA (716) 691-2600
SAMPLE RECEIPT
EUROFINS TESTAMERICA BUFFALO
10 HAZELWOOD DR

AMHERST, NY 14228
UNITED STATES US

[illegible]E: 11MAY21
[illegible]16.90 LB
CAD: [illegible]6654/CAFE3409
DIMS: 19x15x10 IN

BILL SENDER

TO **SAMPLE MGT.**
TA BURLINGTON
530 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 923-1026
REF: TA BURLINGTON

56DC3/71DC/05A2

FedEx
Express
E

J201120121801uv

WED - 12 MAY 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **1888 3863 9297**

NL BTVA

05403
VT-US **BTV**

Login Sample Receipt Checklist

Client: ARCADIS U.S. Inc

Job Number: 480-184468-1

Login Number: 184468

List Source: Eurofins TestAmerica, Buffalo

List Number: 1

Creator: Wallace, Cameron

Question	**Answer**	**Comment**
Radioactivity either was not measured or, if measured, is at or below background	True	
The cooler's custody seal, if present, is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time (Excluding tests with immediate HTs)..	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	True	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Sampling Company provided.	True	ARCADIS
Samples received within 48 hours of sampling.	True	
Samples requiring field filtration have been filtered in the field.	True	
Chlorine Residual checked.	True	

Login Sample Receipt Checklist

Client: ARCADIS U.S. Inc

Job Number: 480-184468-1

Login Number: 184468
List Number: 2
Creator: Khudaier, Zahraa

List Source: Eurofins TestAmerica, Burlington
List Creation: 05/12/21 03:53 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	Lab does not accept radioactive samples.
The cooler's custody seal, if present, is intact.	True	1452933
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.1ºC
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Attachment C

Slug Test Field Forms

Log 3 - Slug Test Monitoring Log

BMS Krutulis Farms

848 Marsh Mill Road, Kirkville, New York

ARCADIS Personnel: E Green

	Date	**Time**	**MW-** 6S	
			Time Elapsed ~~**(minutes)**~~	**Depth to Water (ft bgs)**
Slug In →	5/10/21	~~1245~~	0	6.01
		1245	0:28	5.20
			0:46	5.31
			1:16	5.44
			1:35	5.52
			2:42	5.71
			4:50	5.89
			6:30	5.95
			7:52	5.99
Slug Out —		1256	9:00	—
			9:32	6.92
			10:00	6.72
			10:52	6.51
			11:17	6.43
			12:04	6.33
			13:00	6.21
			13:53	6.15
			14:58	6.10
			16:00	6.07
Pull Transducer —			18:00	6.03

Initial DTW 6.15

Start 1245

Slug out 1256

End 1303

Log 3 - Slug Test Monitoring Log

BMS Krutulis Farms
848 Marsh Mill Road, Kirkville, New York

ARCADIS Personnel:

	Date	Time	MW- MW3D	
			Time Elapsed (minutes)	Depth to Water (ft bgs)
	5/10/21	1452	0	3.75
Slug In -		1455	0	
			0:25	2.79
			0:44	2.90
			1:20	3.0
			2:04	3.16
			2:55	3.28
			4:00	3.40
			6:15	3.55
			8:05	3.62
			9:20	3.65
			13:20	3.71
Slug Out -		1510		
			15:25	4.77
			16:30	4.48
			18:05	4.22
			19:30	4.04
			20:20	4.0
			22:20	3.9
			23:45	3.85
			26:55	3.80
			34:30	3.75
Pull Transducers -		1530		

Log 3 - Slug Test Monitoring Log

BMS Krutulis Farms

848 Marsh Mill Road, Kirkville, New York

ARCADIS Personnel:

	Date	Time	MW- 35	
			Time Elapsed (minutes)	Depth to Water (ft bgs)
	5/10/21	1552	0	~~3.45~~
~~Slug In~~ –		~~1555~~		
Slug Out –	5/10/21	1605		

* Bulge in side wall of casing prevents slug from entering casing. Will perform slug out using bailer only

* Hole in side wall of casing ~~prevents~~ allows water from annular space to enter casing

Attachment D

Injection Data Forms

9-3-21 0950

Log 4 - Clean Water Injection Log

BMS Krutulis Farms
848 Marsh Mill Road, Kirkville, New York

ARCADIS Personnel: DRM, DR

MW-6D

Time-	DTW
0955	7.94
1019	7.93
1024	7.93
1029	7.93
1034	7.93
1039	7.93
1044	7.93
1049	7.93

Date	Time	Total Volume Injected (Gallons)	MW- 6S 7.58		
			Injection Pressure (psi)	Flow Rate (gpm)	Totalizer (Gallons)
9-3-21	Sta @1017				
"	1019	1.40	0	0.7	1.40
"	1025	9.11	0	0.7	9.30
"	1029	12.93	0	0.6	12.93
"	1030	Pause test for active pumping			
"	1033	Begin active pumping			
"	1034	16.50	0	1.0	16.50
"	1038	25.70	0	1.0	25.70
"	1045	42.1	0	1.0	42.1
	1049	50.8	0	1.0	50.8
	Pump stopped				
	When injection assembly removed water @~2.3'				

Log 4 - Clean Water Injection Log

BMS Krutulis Farms
848 Marsh Mill Road, Kirkville, New York

ARCADIS Personnel: DRM, DR

MW-3S
Time - DTW

1118	1.08
1125	1.08
1130	1.08
1135	1.08
1140	1.08
1145	1.08
1150	1.08
1155	1.08
1200	1.08

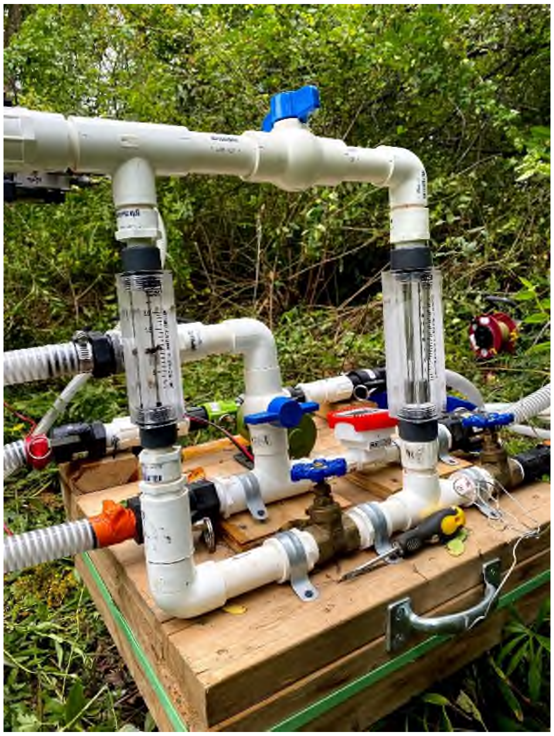
Date	Time	Total Volume Injected (Gallons)	MW-3D 4.71		
			Injection Pressure (psi)	Flow Rate (gpm)	Totalizer (Gallons)
9-3-21	1123	Test	Started		
"	1126	8.2	0	0.7	8.2
"	1129	13.1	0	0.7	13.1
"	1133	19.2	0	0.7	19.2
"	1138	28.7	0	0.7	28.7
"		Test Paused to switch to active			
"	1143	Test resumed			
"	1145	36.3	0	1.0	36.3
"	1150	41.7	0	1.0	41.7
"	1155	47.2	0	1.0	47.2
"	1200	58.3	0	1.0	58.3
"	1205	68.8	0	1.0	68.8
"					
"					

* Return flow observed out of bleed valve

Attachment E

Photo Log

	**Photograph # 1** **Description of Photograph:** View of MW-3S steel outer casing and warped inner PVC casing **Site Location:** 848 Marsh Mill Road, Kirkville, New York **Photograph Taken By:** Dan Meandro **Date of Photograph:** 9/3/2021

	**Photograph # 2** **Description of Photograph:** Clean water injection manifold setup in vicinity of MW-3D **Site Location:** 848 Marsh Mill Road, Kirkville, New York **Photograph Taken By:** Dan Meandro **Date of Photograph:** 9/3/2021

	**Photograph # 3** **Description of Photograph:** Clean water injection occurring at MW-3D. Water tank shown on the right and injection manifold and MW-3D shown on the left. **Site Location:** 848 Marsh Mill Road, Kirkville, New York **Photograph Taken By:** Dan Meandro **Date of Photograph:** 9/3/2021

Appendix B

Historical Groundwater Monitoring Data

TABLE 3
Krutulis Property
Kirkville, New York Site
Historical Groundwater Analytical Data
Volatile Organic Compounds

MW-1

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	6/01/93	6/27/97	9/16/97	12/18/97	03/18/98	09/23/98	03/26/99	09/24/99	03/15/00	09/13/00	03/29/01	09/25/01
Benzene	1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	7	<10	**1**	**2**	<1	<1	<1	<1	<1	<1	**1**	**0.7 J**	**1**
1,1-Dichloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethene (total)	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl chloride	2	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<10	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acetone	50	<10	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100

MW-1

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	03/14/02	09/10/02	05/16/03	09/22/03	05/04/04	09/30/04	03/28/05	09/29/05	04/19/06	10/02/06	05/17/07	09/07/07
Benzene	1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	**2**	**1**	**1**	**1**	<1	**1.6**	**1.1**	**1.3**	**2.1**	**2.3**	**1.1**	**2.0**
1,1-Dichloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	**2**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<3	<3	<3	<3	<3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<100	<100	<100	<100	<100	<10	<10	<10	<10	<10	<10	<10

MW-1

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	04/30/08	10/16/08	4/30/09	10/06/09	04/29/10	10/14/10	05/12/11	10/26/11	04/19/12	11/20/12	04/25/13	10/24/13
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	**4.1**	**7.8**	**4.1**	**5.1**	**3.9**	**4.68**	**1.41**	**3.98**	**3.01**	**1.96**	**1.34**	**2.28**
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.30**	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-1

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	04/23/14	10/28/14	04/28/15	10/22/15	04/21/16	10/19/16	04/25/17	10/18/17	05/02/18	10/23/18	04/17/19	10/30/19
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	**1.04**	**3.05**	**0.77**	**1.37**	**1.00**	**1.42**	**0.73**	<0.5	**0.62**	**0.86**	<0.5	**0.73**
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-1

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/14/20	12/08/21
Benzene	1	<0.5	<0.5
Chloroform	7	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5
Toluene	5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5
Vinyl chloride	2	<1	<1
Xylene (total)	5	<1	<1
Methyl isobutyl ketone	NA	<5	<5
Acetone	50	<10	<10

TABLE 3
Krutulis Property
Kirkville, New York Site
Historical Groundwater Analytical Data
Volatile Organic Compounds

MW-2

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	6/01/93	6/27/97	9/16/97	12/18/97	03/18/98	09/23/98	03/26/99	09/24/99	03/15/00	09/13/00	03/29/01	09/25/01
Benzene	1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	7	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethene (total)	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl chloride	2	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<10	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acetone	50	<10	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100

MW-2

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	03/14/02	09/10/02	05/16/03	09/22/03	05/04/04	09/30/04	03/28/05	09/29/05	04/19/06	10/02/06	05/17/07	09/07/07
Benzene	1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<3	<3	<3	<3	<3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<100	<100	<100	<100	<100	<10	<10	<10	<10	<10	<10	<10

MW-2

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	04/30/08	10/16/08	04/30/09	10/06/09	04/29/10	10/14/10	05/12/11	10/26/11	04/19/12	11/20/12	04/25/13	10/24/13
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-2

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	04/23/14	10/28/14	04/28/15	10/22/15	04/21/16	10/19/16	04/25/17	10/18/17	05/02/18	10/23/18	04/17/19	10/30/19
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-2

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/14/20	12/08/21
Benzene	1	<0.5	<0.5
Chloroform	7	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5
Toluene	5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5
Vinyl chloride	2	<1	<1
Xylene (total)	5	<1	<1
Methyl isobutyl ketone	NA	<5	<5
Acetone	50	<10	<10

TABLE 3
Krutulis Property
Kirkville, New York Site
Historical Groundwater Analytical Data
Volatile Organic Compounds

MW-3S

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	6/01/93	8/23/93	6/27/97	9/16/97	12/18/97	03/18/98	9/23/98	03/26/99	09/24/99	03/15/00	09/13/00	03/29/01
Benzene	1	<10	<1,000	<200	<100	<200	<1,000	<100	<500	<50	<200	**6**	**10**
Chloroform	7	<10	<1,000	<200	<100	<200	<1,000	<100	<500	<50	<200	<1	<1
1,1-Dichloroethene	5	**31**	<1,000	<200	<100	<200	<1,000	<100	<500	<50	150 J	<500	<1,000
1,2-Dichloroethene (total)	5	**4,000**	**8,600**	**10,000**	**9,800**	<200	**22,000**	**2,200**	**17,000**	**3,300**	**34,000**	**11,053**	**27,000**
Tetrachloroethene	5	**60**	<1,000	<200	<100	<200	<1,000	<100	<500	<50	<200	**62**	<1,000
Toluene	5	**710**	<1,000	<200	<100	<200	<1,000	<100	<500	<50	<200	**8**	**15**
Trichloroethene	5	**20,000**	**18,000**	**3,900**	**2,100**	**1,400**	**7,300**	**1,500**	**7,200**	**400**	**8,900**	**7,400**	**20,000**
Vinyl chloride	2	**51**	<2,000	**280**	**440**	**850**	<1,000	<100	<500	420	<200	<500	**51**
Xylene (total)	5	**12**	<1,000	<600	<300	<600	<3,000	<300	<1,500	<150	<600	**3**	**8**
Methyl isobutyl ketone	NA	**21**	<2,000	<2,000	<1,000	<2,000	<500	<1,000	<5,000	<500	<2,000	<10	<10
Acetone	50	**75**	<2,000	<20,000	<10,000	<20,000	<5,000	<1,000	<50,000	<5,000	<20,000	<100	<100

MW-3S

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	09/25/01	03/14/02	09/10/02	05/16/03	09/22/03	05/04/04	09/30/04	03/28/05	09/29/05	04/19/06	10/02/06	05/17/07
Benzene	1	**6**	**7**	**5**	**6**	**5**	**5**	<50	**6**	**4**	**6**	**5**	**5**
Chloroform	7	<1	<1	<1	<1	<1	<1	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<250	**73**	**53**	**68**	**45**	**48**	**42 J**	**40**	**18**	**28**	**33**	**28**
1,2-Dichloroethene (total)	5	**8,165**	**11,056**	**6,847**	**9,271**	**4,441**	**5,835**	**2,842 J**	**2,100**	**2,419**	**2,440**	**2,460**	**1,270**
Tetrachloroethene	5	<250	<250	<500	**95**	<1	**99**	**170**	**200 J**	**14**	<500	<250	<500
Toluene	5	**4**	**6**	**4**	**5**	**3**	**4**	<50	**4**	**1**	**3**	**2**	**2**
Trichloroethene	5	**8,900**	**12,000**	**8,400**	**14,000**	**6,800**	**18,000**	**17,000**	**17,000**	**2,120**	**14,300**	**8,220**	**13,200**
Vinyl chloride	2	**62 J**	**79**	<500	**46**	<500	**16**	**22 J**	**16**	**150**	**10**	<500	**5**
Xylene (total)	5	**3**	<3	<3	<3	<1500	**3**	<50	**2**	<0.5	**2**	**1**	**1**
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<10	<500	<5	<5	<5	<5	<5
Acetone	50	<100	<100	<100	<100	<100	<100	<1,000	<10	<10	**51**	<10	63

MW-3S

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	09/07/07	10/18/07	04/30/08	10/16/08	04/30/09	10/06/09	04/29/10	10/14/10	05/12/11	10/26/11	04/19/12	11/20/12
Benzene	1	**4**	<100	**2**	**4**	**2**	**3**	**3**	**2.49**	**2.41**	**3.90**	**4.14**	**2.00**
Chloroform	7	<0.5	<100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	**23**	<100	**18**	**24**	**39**	**29**	**23**	**34.7**	**22.3**	**67.0**	**28.5**	**13.9**
1,2-Dichloroethene (total)	5	**2,292**	**3,230**	**1,900**	**2,490**	**5,040**	**2,470**	**3,073**	**3,388.6**	**3,275.5**	**2,278.2**	**3,840**	**2,950.8**
Tetrachloroethene	5	**7**	<100	<250	**5**	**103 E**	**4**	**10**	**26.7**	**27.3**	**4.62**	**4.70**	<0.5
Toluene	5	**<0.5**	<100	**2**	<0.5	**1**	<0.5	**1**	**0.73**	**0.74**	**0.73**	**0.50**	<0.5
Trichloroethene	5	**1,650**	**1,140**	**10,400**	**1,760**	**7,820**	**1,430**	**2,380**	**3,620**	**4,160**	**2,380**	**2,080**	**102**
Vinyl chloride	2	**167**	**624**	**28**	**107**	**73.3 E**	**132 E**	**32**	**35.1**	**19.2**	**105**	<100	**564**
Xylene (total)	5	<0.5	<200	**1**	<1	**2**	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	NA	<10	<10	<10	<10	<10	<10	<10	**54.3**	<10	<10

MW-3S

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	04/25/13	10/24/13	04/23/14	10/28/14	04/28/15	10/22/15	04/21/16	10/19/16	04/25/17	10/18/17	05/02/18	10/23/18
Benzene	1	**2.43**	**2.80**	**2.20**	**3.31**	**2.04**	**2.59**	**2.37**	**2.53**	**2.09**	**2.24**	**2.32**	**2.21**
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	**26.7**	**13.6**	**29.6**	**19.6**	**22.9**	**10.7**	**14.3**	**5.01**	**31.0**	**5.05**	**16.7**	**1.35**
1,2-Dichloroethene (total)	5	**6,771.1**	**3,064.3**	**5,397.8**	**5,038**	**3,943.3**	**3062.4**	**4,060**	**1,754**	**4,653.1**	**2,089.2**	**4,281.1**	**824.3**
Tetrachloroethene	5	**30.8**	**0.60**	**17.6**	<0.5	**5.79**	<0.5	**1.64**	<0.5	**6.65**	<0.5	**2.64**	<0.5
Toluene	5	**0.58**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	**4,840**	**305**	**2,300**	**316**	**1,140**	**164**	**846**	**16.3**	**1,620**	**52.8**	**942**	**2.21**
Vinyl chloride	2	**26.2**	**109**	**47.9**	**335**	**31.9**	**189**	<100	**413**	**104**	**323.0**	**76.9**	**281**
Xylene (total)	5	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	**59.4**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-3S

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	04/17/19	10/30/19	10/14/20	12/08/21
Benzene	1	<5	**1.88**	**2.36**	**1.94**
Chloroform	7	<5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	**15.4**	**19.7**	**2.27**	**21.7**
1,2-Dichloroethene (total)	5	**4,574.3**	**4,113.5**	**1,046**	**4,523.9**
Tetrachloroethene	5	<5	**2.0**	<0.5	**0.60**
Toluene	5	<5	<0.5	<0.5	<0.5
Trichloroethene	5	**1,220**	**1,070**	**25.3**	**710**
Vinyl chloride	2	**60**	**107**	**204**	**87.0**
Xylene (total)	5	<10	<1	<1.0	<1.0
Methyl isobutyl ketone	NA	<50	<5	<5.0	<5.0
Acetone	50	<100	<10	<10.0	<10.0

TABLE 3
Krutulis Property
Kirkville, New York Site
Historical Groundwater Analytical Data
Volatile Organic Compounds

MW-3D

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/18/07	04/30/08	10/16/08	04/30/09	10/06/09	04/29/10	10/14/10	05/12/11	10/26/11	04/19/12	11/20/12	04/25/13
Benzene	1	<100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<100	**1**	**1**	**1**	<0.5	**1**	**0.75**	**0.74**	**1.03**	**0.74**	**0.76**	**0.56**
1,2-Dichloroethene (total)	5	<100	**255**	**370**	**184**	**286**	**173**	**178.3**	**211.9**	**221**	**222.3**	**284.6**	**186.4**
Tetrachloroethene	5	<100	**1**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<100	**3**	**1**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	**1,030**	**728**	**318**	**193**	**126**	**110**	**77.3**	**78.2**	**58.8**	**52.2**	**38.8**	**46.1**
Vinyl chloride	2	<200	<1	<1	<1	**4**	**1**	**3.16**	**1.81**	**4.62**	**4.56**	**10.7**	**2.83**
Xylene (total)	5	<200	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-3D

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/24/13	04/23/14	10/28/14	04/28/15	10/22/15	04/21/16	10/19/16	04/25/17	10/18/17	05/02/18	10/23/18	04/17/19
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	**0.74**	**0.67**	**0.83**	**0.51**	**0.61**	**0.51**	**0.86**	<0.5	<0.5	**0.56**	<0.5	<0.5
1,2-Dichloroethene (total)	5	**344.6**	**189.7**	**264.9**	**129.7**	**194.8**	**163**	**299.3**	**139.6**	**224.8**	**192.5**	**261**	**240.5**
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	**77.6**	**58.6**	**31.4**	**46.6**	**22.5**	**43.4**	**50.1**	**35.8**	**26.1**	**37.6**	**50.1**	**45.9**
Vinyl chloride	2	**8.39**	**2.42**	**12.4**	<1	**7.26**	**4.15**	**16.1**	**3.40**	**9.94**	**5.92**	**11.2**	**5.33**
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-3D

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/30/19	10/14/20	12/08/21
Benzene	1	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	**0.53**	<0.5	<0.5
1,2-Dichloroethene (total)	5	**193.7**	**141.2**	**198.4**
Tetrachloroethene	5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5
Trichloroethene	5	**19.8**	**6.94**	**26.2**
Vinyl chloride	2	**5.23**	**10.9**	**4.38**
Xylene (total)	5	<1	<1.0	<1.0
Methyl isobutyl ketone	NA	<5	<5.0	<5.0
Acetone	50	<10	<10.0	<10.0

TABLE 3
Krutulis Property
Kirkville, New York Site
Historical Groundwater Analytical Data
Volatile Organic Compounds

MW-4

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	6/01/93	6/27/97	9/16/97	12/18/97	03/18/98	9/23/98	03/26/99	09/24/99	03/15/00	09/13/00	03/29/01	09/25/01
Benzene	1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	7	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethene (total)	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	5	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl chloride	2	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<10	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acetone	50	<10	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100

MW-4

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	03/14/02	09/10/02	05/16/03	09/22/03	05/04/04	09/30/04	03/28/05	09/29/05	04/19/06	10/02/06	05/17/07	09/07/07
Benzene	1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<3	<3	<3	<3	<3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<100	<100	<100	<100	<100	<10	<10	<10	<10	<10	<10	<10

MW-4

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	04/30/08	10/16/08	04/30/09	10/06/09	04/29/10	10/14/10	05/12/11	10/26/11	04/19/12	11/20/12	04/25/13	10/24/13
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-4

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	04/23/14	10/28/14	04/28/15	10/22/15	04/21/16	10/19/16	04/25/17	10/18/17	05/02/18	10/23/18	04/17/19	10/30/19
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.85**
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.67**
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-4

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/14/20	12/08/21
Benzene	1	<0.5	<0.5
Chloroform	7	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	**2.25**
Tetrachloroethene	5	<0.5	<0.5
Toluene	5	<0.5	<0.5
Trichloroethene	5	<0.5	**0.50**
Vinyl chloride	2	<1	<1.0
Xylene (total)	5	<1	<1.0
Methyl isobutyl ketone	NA	<5	<5.0
Acetone	50	<10	<10.0

TABLE 3
Krutulis Property
Kirkville, New York Site
Historical Groundwater Analytical Data
Volatile Organic Compounds

MW-5

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	6/01/93	8/23/93	6/27/97	9/16/97	12/18/97	03/18/98	9/23/98	03/26/99	09/24/99	03/15/00	09/13/00	03/29/01
Benzene	1	<10	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	7	<10	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	5	<10	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethene (total)	5	<10	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	<10	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	5	<10	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	5	<10	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl chloride	2	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<10	<5	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acetone	50	**75**	**28**	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100

MW-5

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	9/25/2001	03/14/02	09/10/02	05/16/03	09/22/03	05/04/04	09/30/04	03/28/05	09/29/05	04/19/06	10/02/06	05/17/07
Benzene	1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<3	<3	<3	<3	<3	<3	<0.5	<0.5	<0.5	<0.5	<0.5	<1
Methyl isobutyl ketone	NA	<10	<10	<10	<10	<10	<10	<5	<5	<5	<5	<5	<5
Acetone	50	<100	<100	<100	<100	<100	<100	<10	<10	<10	<10	<10	<10

MW-5

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	09/07/07	04/30/08	10/16/08	04/30/09	10/06/09	04/29/10	10/14/10	05/12/11	10/26/11	04/19/12	11/20/12	04/25/13
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	**1**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-5

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/24/13	04/23/14	10/28/14	04/28/15	10/22/15	04/21/16	10/19/16	04/25/17	10/18/17	05/02/18	10/23/18	04/17/19
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-5

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/30/19	10/14/20	12/08/21
Benzene	1	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	**0.87**	<0.5	**0.80**
Tetrachloroethene	5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1.0
Xylene (total)	5	<1	<1	<1.0
Methyl isobutyl ketone	NA	<5	<5	<5.0
Acetone	50	<10	<10	<10.0

TABLE 3
Krutulis Property
Kirkville, New York Site
Historical Groundwater Analytical Data
Volatile Organic Compounds

MW-6S

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/24/13	04/23/14	10/28/14	04/28/15	10/22/15	04/21/16	10/19/16	04/25/17	10/18/17	05/02/18	10/23/18	04/17/19
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	**1.12**	<0.5	<0.5	<0.5	**0.58**	**0.87**	**1.59**	<0.5	**0.64**	<0.5	<0.5	<0.5
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-6S

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/30/19	10/14/20	12/08/21
Benzene	1	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	**0.55**	<0.5	**0.56**
Tetrachloroethene	5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5
Trichloroethene	5	**0.57**	**0.75**	**0.57**
Vinyl chloride	2	<1	<1	<1.0
Xylene (total)	5	<1	<1	<1.0
Methyl isobutyl ketone	NA	<5	<5	<5.0
Acetone	50	<10	<10	<10.0

TABLE 3
Krutulis Property
Kirkville, New York Site
Historical Groundwater Analytical Data
Volatile Organic Compounds

MW-6D

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/18/07	04/30/08	10/16/08	4/30/09	10/06/09	04/29/10	10/14/10	05/12/11	10/26/11	04/19/12	11/20/12	04/25/13
Benzene	1	<25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	<25	**10**	**6**	**2**	**8**	**8**	**23.01**	**6.73**	**54.66**	**33.21**	**35.75**	**31.26**
Tetrachloroethene	5	<25	**1**	**1**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	**1,470**	**59**	**6**	**1**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	**1,940**	**253**	**175**	**82**	**77**	**71**	**42.1**	**13.5**	**14.0**	**11.9**	**5.83**	**6.61**
Vinyl chloride	2	<50	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (total)	5	<50	**1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-6D

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/24/13	04/23/14	10/28/14	04/28/15	10/22/15	04/21/16	10/19/16	04/25/17	10/18/17	05/02/18	10/23/18	04/17/19
Benzene	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	**29.06**	**38.55**	**27.35**	**33.28**	**25.05**	**28.77**	**7.82**	**26.95**	**26.2**	**21.63**	**18.71**	**25.03**
Tetrachloroethene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	**4.72**	**5.62**	**3.43**	**2.96**	**1.52**	**2.64**	**0.67**	**1.43**	**1.25**	**0.98**	**0.54**	**1.56**
Vinyl chloride	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**3.12**	<1
Xylene (total)	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl isobutyl ketone	NA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

MW-6D

PARAMETERS	NYSDEC Groundwater Quality Standards and Guidance Values	10/30/19	10/14/20	12/08/21
Benzene	1	<0.5	<0.5	<0.5
Chloroform	7	<0.5	<0.5	<0.5
1,1-Dichloroethene	5	<0.5	<0.5	<0.5
1,2-Dichloroethene (total)	5	**17.07**	**11.0**	**23.9**
Tetrachloroethene	5	<0.5	<0.5	<0.5
Toluene	5	<0.5	<0.5	<0.5
Trichloroethene	5	**1.08**	**0.56**	**0.74**
Vinyl chloride	2	**4.46**	**3.77**	**3.01**
Xylene (total)	5	<1	<1	<1.0
Methyl isobutyl ketone	NA	<5	<5	<5.0
Acetone	50	<10	<10	<10.0

Notes:
1) All values are in mg/L. Detected values shown in **bold** text.
2) J or E - Estimated Value.
3) < - Not detected above the corresponding laboratory Practical Quantitation Limit.
4) NA - Not Applicable.
5) The routine detection limit for acetone by Gas Chromatography (GC) is 100 mg/L. Samples that contain elevated concentrations of other parameters require a dilution of the sample to enable the instrument to analyze those parameters within the linear range. Therefore, the detection limits for the non-detected parameters must be raised by a correction factor equivalent to the dilution factor.
6) The 3/15/00 and 9/13/00 samples for MW-3 were re-analyzed to achieve lower detection limits. As a result, a J value of 150 mg/L for 1,1-Dichloroethylene was determined for the 3/15/00 sample.
7) The two 9/30/04 samples for MW-3 were analyzed at diluted concentrations resulting in higher detection levels than as presented for previous sampling events.
8) On 10/18/07 during site investigation activities, groundwater samples were collected from monitoring wells MW-3S, MW-3D, MW-6S, and MW-6D.
9) Effective 2020, the semi-annual monitoring program transitioned to annual monitoring
10) For the 12/08/21, cis-1,2-Dichloroethene for MW-3S = 4490 µg/L E and the trans-1,2-Dichloroethene = 33.9 µg/L

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