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Subject: Off-Site Focused Feasibility Study - Delavan site

Cynde,

Attached please find the Off-Site Feasibility Study Work Plan for the Delavan project site in Bamberg SC.

The Groundwater report for the October 2022 monitoring event is in final editing and we hope to share it soon. Please contact me with any questions or comments on the Work Plan.

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Feasibility Study Work Plan for Off-Site Areas

Delavan Spray Technologies Site

4334 Main Highway
US Highway 301 South
Bamberg, South Carolina
VCC 13-4762-RP

Prepared by:
AECOM Technical Services, Inc.
5438 Wade Park Boulevard, Suite 200
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February 2023

Delivering a better world

212a

FEASIBILITY STUDY

DELAVAN SPRAY TECHNOLOGIES SITE
BAMBERG, SOUTH CAROLINA

RESPONSIBILITY PARTY VOLUNTARY CLEANUP CONTRACT NUMBER 13-4762

The undersigned certify that they have reviewed the attached document and that the document is in material compliance with the guidelines and requirements of the State of South Carolina and the South Carolina Department of Health and Environmental Control (SCDHEC) and specifically, requirements under the SCDHEC Voluntary Cleanup Contract (VCC). The data presentations contained herein are consistent with generally accepted practices in the environmental profession.

Prepared by:

Conan Fitzgerald, PE
AECOM Engineering Manager

Date: 2/14/23

Jasen Zinna, PE
South Carolina PE No. 31786
AECOM Senior Engineer

Date: 2/14/23

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Figures

Tables

Acronym

ACE	Ashepoo, Combahee and Edisto
AECOM	AECOM Technical Services, Inc.
ALARs	applicable laws and regulations
AMIBA	aqueous and mineralogical intrinsic bioremedation assessment
AST	aboveground storage tank
COC	contaminant of concern
cVOC	chlorinated volatile organic compound
ft	feet
ft/day	feet per day
ft/ft	feet per foot
GAC	granular activated carbon
ICs	institutional controls
MCL	maximum contaminant level
MNA	monitored natural attenuation
PCE	tetrachloroethylene
RGs	remedial goals
RI	remedial investigation
SCDHEC	South Carolina Department of Health and Environmental Control
SCEM	site conceptual exposure model
Site	Delevan Spray Technologies Site
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VCC	voluntary cleanup contract

1. Introduction

AECOM Technical Services, Inc. (AECOM) has prepared this Feasibility Study Work Plan for Raytheon Technologies on behalf of Delevan Spray LLC to gather data to complete the conceptual site model, establish remedial objectives, and complete a feasibility study for remediation of residual chlorinated volatile organic compounds (cVOCs) off-site (downgradient) of the Delavan Spray Technologies Site (Site). The work plan is being submitted in accordance with the Voluntary Cleanup Contract (VCC) (VCC 13-4762-RP) signed by the South Carolina Department of Health and Environmental Control (SCDHEC) and Delavan Spray, LLC in July 2013.

This report provides Site background (**Section 2.0**), discusses the proposed remedial investigation (**Section 3.0**), outlines the feasibility study (**Section 4.0**), and presents the anticipated schedule (**Section 5.0**). Cited references are provided in **Section 6.0**.

2. Site Background

2.1 Site Description

The Site is located at 4334 Main Highway in Bamberg, South Carolina (**Figure 1**). The Site is comprised of a main manufacturing building and smaller associated support buildings, which are located on approximately 20 acres (**Figure 2**). A chain-link fence surrounds the operational portion of the Site and an old family cemetery is located within a small, discrete portion of the 20-acre Site.

An unnamed creek flows through the area immediately north and northwest of the Site and enters Halfmoon Branch approximately 300 feet (ft) west of the Site. The City of Bamberg wastewater treatment plant is located to the northwest beyond the creek and approximately 500 ft from the Site perimeter, with its surrounding spray infiltration fields extending to within approximately 200 ft of the Site. Properties to the northeast across Log Branch Road consist of residential properties and the County of Bamberg Rhodes Senior Center. Properties to east and southeast across Main Highway (US Highway 301 South) include a propane distribution facility, Jeff's Auto Care, and a sparsely populated residential area. Remaining properties to the south across Main Highway are undeveloped and used for silviculture. Properties to the southwest consist of a sparsely populated residential area, a junk yard, and a machinery shop (**Figure 2**). Further details for the Site are identified in the Post Remedial Investigation (RI) Report (AECOM, May 2016).

Chlorinated solvents were reportedly utilized at the Site from the early 1970s until 2002. Delavan Spray Technology personnel indicated that tetrachloroethene (PCE) was historically stored in a 750-gallon underground storage tank (UST) that was located along the southern side of the manufacturing building (**Figure 2**). The PCE UST was reportedly closed by removal from the ground sometime in the 1970s. PCE was also historically stored in above-ground storage tanks (ASTs) (a 1,000-gallon virgin PCE AST and a 2,000-gallon used PCE AST) in a concrete secondary containment area located along the southeast corner of the manufacturing building. According to facility personnel, the ASTs were removed from the containment area in 2002. No specific release incidents are reported to have occurred at the Site.

2.1 Previous Investigations

Multiple phases of environmental assessments have been performed at the Site to characterize the subsurface geology and groundwater quality since December 2002. Previous reports submitted to SCDHEC to document these investigations have included, but are not limited to, the following:

- *Ground Water Assessment Report,* Hart & Hickman, August 29, 2003
- *Report of HRC Injection and Pre- and Post-Injection Ground Water Monitoring,* Hart & Hickman, January 31, 2006
- *Supplemental Site Assessment Report,* Hart & Hickman, December 5, 2012
- *Remedial Investigation Report*, AECOM, July 3, 2014
- *Post Remedial Investigation Report*, AECOM, May 17, 2016
- *Groundwater Delineation Report,* AECOM, June 23, 2017
- *Residential Sampling Activities and Results*, AECOM, February 15 and June 4, 2018
- *Fall 2019 Residential Sampling Activities and Results,* AECOM, February 21, 2020
- *Deep Groundwater Delineation Technical Memorandum,* AECOM, June 10, 2020
- *Fall 2020 Residential Sampling Activities and Results,* AECOM, March 5, 2021

- *High-Resolution Source Characterization Report,* AECOM, March 9, 2021

Following the *Post Remedial Investigation Report* (AECOM, May 2016), SCDHEC requested a work plan to delineate Site related contaminant of concerns (COCs) in the shallow (surficial) and deep (limestone) groundwater beneath the Site. The *Groundwater Delineation Work Plan* (AECOM, September 2016), which included groundwater screening with temporary wells and permanent monitoring well installation, was approved by SCDHEC in correspondence dated October 31, 2016, and was implemented between March 27, 2017, and May 10, 2017. The results of the investigation, which are documented in the *Groundwater Delineation Report* (AECOM, June 2017), confirmed the presence of PCE at concentrations greater than the United States Environmental Protection Agency (USEPA) Maximum Contaminant Level (MCL) in the limestone aquifer monitoring wells located approximately 3,200 ft south/southwest of the Site. SCDHEC approved the *Groundwater Delineation Report* in correspondence dated June 26, 2017 and agreed with the recommendation that additional delineation was needed for PCE in the limestone aquifer south/southwest of the monitoring well network.

Regular sampling and analysis of Site monitoring wells has been conducted at the Site since 2003. Semi-annual groundwater sampling and reporting has occurred each spring and fall since October 2014. In accordance with SCDHEC directives, a formal groundwater quality monitoring program was established for the Site in 2017 and is currently being performed on a semi-annual basis. The analytical results are evaluated and submitted to SCDHEC as spring and fall semi-annual groundwater monitoring reports, respectively, and include tables of available historical groundwater data. The most recent report is the *Spring 2022 Semi-Annual Groundwater Monitoring Report* (AECOM, July 2022), which documents groundwater monitoring performed in April 2022. A report documenting the October 2022 sampling event was being prepared concurrent with this document.

In correspondence dated December 18, 2017, SCDHEC requested the sampling of select private residential water supply wells along Lemon Creek and Orange Grove Roads. Subsequently, residential well sampling activities were conducted and documented in two separate technical memoranda submitted to SCDHEC on February 15, 2018, and June 4, 2018. In nine of the 27 residential well samples collected between January 4, 2018, and April 19, 2019, PCE was detected at trace levels but below the respective MCL. At that time eight of the residential wells with PCE detections were used for drinking water and one was used for irrigation water for a pond. PCE was not detected in the remaining residential well samples (AECOM, February 2018, and June 2018). Raytheon initiated the installation of granular activated carbon (GAC) treatment systems at each of the residential wells where PCE was detected (with the concurrence of the property owners). As documented in correspondence from SCHDEC dated June 27, 2018, it was agreed that the impacted private wells would be resampled during the October 2018 sampling event and annually thereafter. Low level detections of PCE below the MCL were detected in two additional properties during the fall 2018 sampling event. Additionally, a well that did not have a working pump on previous sampling visits was sampled in April 2019 and had a low-level detection of PCE below the MCL. In total, PCE has been detected above the laboratory detection limit but below the MCL in 11 of the 27 residential water supply wells sampled. In accordance with SCDHEC's annual sampling request, the impacted water supply wells have been sampled every October, with results submitted concurrent with the corresponding monitoring event in the following year.

The *Limestone Aquifer Assessment Work Plan* (AECOM, October 2017) was implemented in November 2019 and results were documented in the *Deep Groundwater Delineation Technical Memorandum* (AECOM, June 10, 2020). Surface water sampling results indicate that PCE impacted groundwater from the limestone aquifer discharged to Lemon Creek and/or the lower reaches of Half Moon Branch. Four new monitoring wells (MW-33D-MW-36D) were installed beyond these tributaries and approximately 6,500 ft south (downgradient) of the Site. Groundwater samples from each well were non-detect for PCE and PCE daughter products, indicating that the tributaries were limiting further migration in the limestone aquifer. A map illustrating the extent of monitoring wells installed for the Limestone Aquifer Assessment is provided in **Figure 3**.

2.2 Previous Off-Site Remediation Activities

On-Site Remediation activities are discussed in the *On-Site Focused Feasibility Study* (AECOM, February 2023). This section reviews work implemented off-site to mitigate potential impacts to receptors.

PCE has been detected above the laboratory detection limit but below the MCL in 11 residential water supply wells located southwest of the Site. Since the PCE detections in the residential wells were well below the MCL, there was no regulatory requirement to install water treatment units for any of the residents. Nevertheless, Delavan offered to install GAC treatment units at no cost to the residents whose drinking water wells had detections of PCE. This was implemented prior to the Limestone Aquifer Assessment work in the absence of confirmation of the extent of PCE impact south of the Delavan facility. All 11 residential property owners with wells exhibiting PCE detections that were also used for drinking water elected to have the GAC units installed. The GAC treatment units were installed in July 2018 and October 2019. Technical memorandums documenting the installation of GAC treatment systems were submitted to SCDHEC on January 15, 2019, and February 21, 2020. Following installation, AECOM performed annual sampling of the residential wells with GAC systems installed as well as performed routine maintenance of the systems. The results from the annual sampling have concluded that no detections were found in post-treatment (after GAC system) samples, confirming that the GAC systems are working as intended. It is important to note that in the interest of protecting human health, the GAC systems were installed without definitively establishing that the source of traces of PCE in these private wells was the Site.

2.3 Geological Setting

2.3.1 Regional Setting

The Site lies within the western portion of the South Carolina Coastal Plain Province, which is characterized as a seaward thickening wedge of sediments from the fall line to the coast. These sediments consist of sands, silts, clays and limestones; representing a variety of non-marine and marine depositional environments. Changes in depositional environment are due, in part, to changes in sea level. During transgression (rising sea level), sedimentary units tend to fine upward. During regression (falling sea level) sedimentary units tend to coarsen upward. During periods of regression, sediments can be left exposed and subject to erosion. The resulting geologic complexity can make it challenging to correlate geologic units over long distances (Logan and Euler, 1989).

The surficial geologic units that have been identified in the Bamberg County area of South Carolina include the Huber/Lisbon/Barnwell Formations of Eocene age, the Duplin Formation of Pliocene age, and the Penholoway Formation of Pleistocene age. The undifferentiated sands and clays in that occur in the vicinity of the Delavan Spray Site are likely Pliocene in age and are assigned to the Duplin Formation (Willoughby and others, 2005).

The Santee Limestone (of middle Eocene age) underlies the Site at depths of approximately 12 to 20 ft. The Santee Limestone is used extensively in the southeastern part of the Coastal Plain as a groundwater resource for private, municipal, and industrial use. Often, the limestone is not confined and is hydraulically connected to underlying and overlying units. In these cases, the units are often referred to as the Floridan or Tertiary Limestone Aquifer system (Logan and Euler, 1989).

Bamberg County and thus, the Site, lie within the Ashepoo, Combahee and Edisto (ACE) River Basin of South Carolina. The ACE Basin is drained by the Ashley-Cooper, Combahee-Coosawhatchie, and Edisto rivers. The Town of Bamberg is located at the junction between the Salkehatchie River and Edisto River watersheds, with the South Fork Edisto River being the closest major river to the Site, located approximately four miles to the northeast.

Groundwater occurrence in the Coastal Plain is typically within the intergranular pore spaces of the sands, silts, and limestones (primary porosity) and within solution cavities or fractures of indurated sediments (secondary porosity). Primary production of groundwater occurs from within the more permeable units, while lower permeability clay layers typically retard groundwater movement. Recharge for significant aquifers in the Coastal Plain occurs both as transport from up-dip areas toward the Fall Line, where the sediments are generally exposed at the land surface, and as leakage from adjacent aquifer units through the aquitards.

Groundwater flow in deeper confined aquifer units is typically to the south and southeast toward the coast. Locally, the water-table surface can subtly mimic land surface topography, with recharge of shallow unconfined aquifers occurring from direct infiltration of precipitation in upland areas and discharge occurring within nearby creeks and streams.

2.3.2 Site Geology

For the purposes of characterization, Site geology has been subdivided into three general geologic zones. The upper zone consists of undifferentiated sands, clayey sands, sandy clays, and silts. In the northern portion of the Site, these sediments tend to contain a higher percentage of clay and silty layers. The middle zone consists of fossiliferous limestone; with a layer of pale yellow, poorly cemented, coarse shell fragments overlying a layer of white, poorly- to moderately-cemented limestone containing finer-grained shell fragments. The lower geologic zone has been described as a loose- to moderately-cemented, calcareous, fine- to medium-grained clayey sandstone based on borings for monitoring wells MW-3D1 and MW-15D1 (Hart & Hickman, August 2013). However, this zone was not encountered during the limestone aquifer delineation downgradient (south) of the Site, where the white, cemented limestone and shell fragments were observed to become finer-grained and persist to a depth of at least 84 ft below ground surface. These relationships are illustrated in the cross-sections provided in **Figure 4**.

2.3.3 Site Hydrogeology

Groundwater occurrence in the Coastal Plain is typically within the intergranular pore spaces of the sands, silts, and limestones (primary porosity) and within solution cavities or fractures of indurated sediments (secondary porosity). Primary production of groundwater occurs from within the more permeable units, while lower permeability clay layers typically retard groundwater movement. Recharge for significant aquifers in the Coastal Plain occurs both as transport from up-dip areas, toward the Fall Line, where the sediments are generally exposed at the land surface and as leakage from adjacent aquifer units through lower permeability aquitards.

The shallow potentiometric map from October 2022 is included as **Figure 5**. The equal potential lines indicate groundwater flow beneath the facility varies between southwestward and westward flow directions, with local groundwater highs at MW-9 and beneath the facility building at monitoring wells MW-2, MW-19, MW-20 and MW-37. Groundwater levels appear depressed at MW-3 and MW-8. This phenomenon was previously recognized in the RI Work Plan (Hart & Hickman, August 2013) and characterized as a “groundwater trough”, a feature that has been observed to extend to MW-6, MW-20, and MW-21 during previous field investigation efforts. The variances in groundwater elevation and flow directions in this portion of the Site could be the result of preferential flow pathways resulting from higher permeability zones due to local facies changes or induced drainage from the sanitary sewer line or incised drainage ditch, which forms the northern boundary of the Site. However, the primary shallow horizontal groundwater flow direction is inferred to be toward the west, toward Halfmoon Branch, which is consistent with findings from prior investigations conducted at the Site. The wells west of the facility indicate an isolated groundwater mound at MW-27, which has been observed intermittently during previous groundwater monitoring events.

The deep potentiometric map from October 2022 is included as **Figure 6**. From the equal potential lines, the inferred horizontal groundwater flow direction is to the south-southwest and is consistent with regional topography, drainage and findings from prior investigations conducted at the Site.

Vertical gradients between the shallow aquifer and deeper limestone aquifer are typically downward for most well pairs and ranged from 1.86E-02 ft per foot (ft/ft) at MW-21/MW-21D to 1.02E-01 ft/ft at MW-9/MW-9D in April 2021. Upward gradients are generally evident in the vicinity of Halfmoon Branch (i.e., at MW-15/MW-15D), indicating groundwater discharge to surface water.

Slug tests have been used to estimate the horizontal hydraulic conductivity of the uppermost aquifer units beneath the Site. Slug tests were performed in shallow monitoring wells MW-27, MW-28, and MW-29 and deeper monitoring wells MW-30D, MW-31D, and MW-32DR to evaluate hydrologic properties of the aquifer units (AECOM, June 2017). The estimated horizontal hydraulic conductivity values calculated for the shallow monitoring wells ranged from 0.215 ft/day (ft/day) in MW-28 to 0.701 ft/day in MW-29, with a geometric mean of 0.355 ft/day. The estimated horizontal hydraulic conductivity values for the deeper limestone aquifer monitoring wells ranged from 10.7 ft/day in MW-31D to 161 ft/day in MW-30D, with a geometric mean of 63.5 ft/day. These values were similar to those previously estimated for shallow and deeper aquifer wells in the Site vicinity. Slug tests have also been performed in limestone monitoring wells MW-33D, MW-34D, MW-35D, and MW-36D to evaluate hydrologic properties of the limestone aquifer. The estimated horizontal hydraulic conductivity values from these limestone aquifer monitoring wells ranged from 45.22 ft/day in MW-33D to 121.6 ft/day in MW-36D, with a geometric mean of 85.57 ft/day. These values are within the range of those previously estimated for deeper aquifer wells in the Site vicinity (AECOM, June 2017).

2.4 Preliminary Site Conceptual Exposure Model

A preliminary site conceptual exposure model (SCEM) has been developed based on available investigation results to provide a technical basis for the identification, evaluation, and selection of remedial alternatives. The following sections present key components of the SCEM.

2.4.1 Impacted Areas

Site investigations have delineated the cVOC source areas at the Site within the manufacturing building footprint and directly adjacent to the building footprint near the southeast corner of the building. These areas also contain the cVOC source mass that contributes to the downgradient dissolved phase plumes within shallow groundwater and the deeper limestone aquifer. The source area is being addressed through the on-site feasibility study.

2.4.2 Migration Pathways

CVOC mass is present off-site across Highway 301 and is migrating in the direction of the confluence of Halfmoon Branch and Lemon Creek. Hydrogeologic information developed to date indicate that the primary pathway for dissolved phase cVOC migration from on-site is downward, into the more permeable limestone aquifer. Further vertical migration is apparently limited by the moderately cemented clayey sandstone beginning at approximately 60 ft below grade (as indicated in MW-31D). Thus, cVOC transport is primarily horizontal to the south within the pale yellow and white shell bearing limestones. Once across Highway 301 the plume broadens but appears to be bounded by Halfmoon Branch to the west and southwest, Lemon Creek to the southeast, and an unnamed tributary to Lemon Creek to the east. The presence of PCE at trace concentrations within Lemon Creek as it crosses US Highway 601 indicate that the PCE plume is discharging from the limestone aquifer unit into the tributaries feeding this surface water feature. The absence of PCE in sentinel monitoring wells and most private wells installed beyond these tributaries strongly suggest that the tributaries create a hydraulic divide that limits further plume expansion.

The presence of trace PCE concentrations (i.e. <0.5 µg/L) in private wells to the southwest along Lemon Creek Road beyond both Halfmoon Branch and Lemon Creek create some uncertainty as to whether the hydraulic divide indicated by these tributaries is absolute. When these private well detections originally occurred, before the Limestone Aquifer Assessment was completed and when the horizontal extent of the plume was still undetermined, Delavan voluntarily and proactively installed GAC treatment systems for all residents willing to accept them. Subsequently, sentinel wells MW-33D through MW-36D were installed in the limestone beyond the various tributaries, and PCE has never been detected in any of these sentinel monitoring wells, despite the often lower method detection limit than the residential well samples. The presence of PCE in a tributary perpendicular to the plume, and the absence of PCE in monitoring wells beyond that same tributary is normally considered conclusive evidence that the extent of the plume does not extend beyond the tributary.

Therefore, the original assumption that the PCE detected in the residential wells in the vicinity of Lemon Creek comes from the Delavan Site may be inaccurate. These private wells are approximately 2,500 – 4,000 ft away from MW-30D, the southern-most impacted monitoring well. For the Delavan PCE plume to reach these private wells, it would have to cross underneath both Halfmoon Branch and Lemon Creek (while also discharging to at least one of these features) and evade detection in sentinel monitoring wells MW-33D, MW-34D, and MW-35D. Alternatively, it may be reasonable to conclude that the traces of PCE detected in the Lemon Creek community residential wells could be derived from an alternative unknown source that exists to the south of Lemon Creek. Since the detections are generally an order of magnitude less than the MCL (even less than the laboratory method reporting limit) and since affected residents are protected by the GAC treatment systems voluntarily maintained by Delavan, a separate investigation to confirm (or deny) the existence of an alternative source does not seem to be warranted. However, a better understanding of the hydrology of the tributaries between the off-site plume and the Lemon Creek area residential wells will be beneficial for refining the conceptual site model for the off-site plume. Therefore, a component of this work plan will be to better understand the interaction of the PCE groundwater plume entering the surface water features of Half-Moon Branch and Lemon Creek.

2.5 Data Gaps

Data gaps have been identified that need to be addressed prior to finalizing the SCEM, completing the risk assessment, and preparing the feasibility study report. The data gaps are summarized below and will be addressed in the proposed remedial investigation:

- CVOC trends and plume stability analyses should be performed on the off-site monitoring wells.
- A better understanding of the biotic and abiotic methods of plume attenuation currently occurring needs to be developed, through gathering data on standard monitored natural attenuation (MNA) groundwater parameters and possibly other methods.
- Additional surface water samples need to be collected from Halfmoon Branch and/or Lemon Creek to better understand where PCE infiltrates the tributaries, despite the access and accessibility challenges.
- The rate of cVOC mass flux at the Site needs to be characterized and how that may be impacted as in-situ remediation is performed in the on-site area.
- As discussed in Section 2.4.2, the source of the trace amounts of PCE in downgradient private potable wells in the Lemon Creek Road area is uncertain and is therefore recognized as a data gap. However, the absence of any groundwater exceedance in this area, and the relative stability of PCE detections over five years of monitoring demonstrate that affected private well users are protected by the carbon systems. Thus, unless a spike in cVOCs is detected in the private wells, an investigation to better identify the source(s) of PCE in this area is not recommended.

3. Off-Site Remedial Investigation

This section presents the technical approach for the investigations that will be performed in order to fill in the data gaps identified above. The scope of work will be modified as needed as information is gathered during the investigation. The proposed groundwater, surface water, and soil sampling is summarized in **Table 1**.

3.1 Groundwater & Soil Sampling

Additional groundwater sampling needs to be completed to evaluate biotic and abiotic attenuation. Parameters that will be collected from select monitoring wells are nitrate, ferrous/ferric iron, sulfate, sulfide, manganese, methane, ethene, ethane, acetylene, and chloride. These parameters are known in the remediation industry as MNA parameters and will be subject to change as initial analytical data is reviewed. The monitoring wells that will be sampled are MW-3D, MW-13D, MW-14D, MW-21D, MW-22D, MW-25D, MW-26D, MW-30D, MW-31D, and MW-32DR.

Additionally, groundwater samples will also be analyzed by Microbial Insights utilizing compound-specific isotope analysis to evaluate degradation. This analysis compares carbon isotope ratios ($^{13}C/^{12}C$) from groundwater samples collected at different locations along the plume (source area to toe). The lighter fraction (^{12}C) will degrade faster than the heavier fraction, so that the products of degradation are enriched with ^{12}C while the parent PCE is enriched with the heavier isotope ^{13}C. Measuring the differences in isotope ratio between PCE detected close to the source and cVOCs detected downgradient can help identify biotic and abiotic processes degrading the plume. For example, a ratio increase of 2 parts per thousand (2‰) can provide evidence of degradation. Comparisons of ratios between daughter products can assist in determining the primary mechanisms of contaminant degradation.

Soil samples from select areas off-site will be collected and analyzed to investigate abiotic degradation processes and soil oxidant demand. Soil samples from the limestone aquifer will be sent to Microbial Insights for magnetic susceptibility, x-ray diffraction, and aqueous and mineralogical intrinsic bioremediation assessment (AMIBA) analyses. Magnetic susceptibility quantifies magnetite which is a naturally occurring iron mineral believed to mediate abiotic degradation of PCE. X-ray diffraction can provide abundances of reactive iron-bearing minerals (e.g., pyrite and mackinawite) that will transform chlorinated compounds. AMIBA is a collection of analyses performed to quantify iron and sulfur availability in various redox states to allow assessment of the microbial/mineral/contaminant interaction. The areas proposed for soil sampling are illustrated in **Figure 7**.

3.2 Surface Water Sampling

Currently, there are surface water results from Lemon Creek upgradient of the off-site impacted area, from Halfmoon Branch upgradient of the off-site impacted area, and from Lemon Creek downgradient of the off-site impacted area in two locations. It is proposed to collect surface water samples from intermediate locations in Lemon Creek and Halfmoon Branch as feasible. Access is limited by dense, marshy wooded areas as well as property owners that have not always proved to be accommodating. Thus, locations will be modified as access is granted and to allow safe passage by AECOM personnel. Initially samples will be collected in Halfmoon Branch and Lemon Creek just upstream of their confluence, as well as just downstream to better understand which branch is most affected by the PCE plume. The proposed sampling locations are illustrated in **Figure 7**.

The upstream sections of each creek are greater than 2/3 of a mile, long, so to identify where the groundwater plume is entering surface water, AECOM may use an unmanned aerial vehicle or drone outfitted with an infrared camera. The infrared camera is able to locate areas in the creek where there are temperature differences which are indicative of infiltration of groundwater. In order for the drone fly over to be successful, the creek area will need to be clear of as much vegetation as possible and the surface water temperature and groundwater temperature needs to be at least a 10-degree difference. Thus, the drone fly over with infrared camera may need to be completed over the winter when the trees have lost their leaves and surface water will be colder than groundwater.

The surface water investigation will support determining how and where PCE is infiltrating the creeks and possibly assist in better understanding PCE fate and transport in the region, including areas south of Lemon Creek.

3.3 Passive Samplers

Passive flux meters can be installed in monitoring wells to quantify the mass of contaminants absorbed as well as to calculate groundwater flux. Passive flux meters will be installed in select monitoring wells on the Site property before/during/following active remediation occurs at the Site in the source area. The passive flux meters are typically left in monitoring wells for a period up to four weeks. Comparing the mass of contaminants absorbed during each of the three stages will assist in evaluating how source zone treatment may impact the off-site dissolved plume. The passive flux meters will be deployed at MW-13D, MW-14D, MW-24, and MW-37.

3.4 Data Evaluation

- Conduct non-parametric trend analysis using Mann-Kendall for Limestone Aquifer wells to better understand concentration trends (e.g., stable, decreasing, etc.) prior to impact from the on-site remedies. This trend analysis would continue as the on-site remedies are installed and begin to impact the plume.
- Conduct bulk plume analysis to better characterize the off-site component of the plume. Total dissolved mass, center of mass, and spread of mass about the center of the plume will be calculated and subjected to a Mann-Kendall analysis to evaluate trends.
- Evaluate results from natural attenuation parameter analyses to determine the dominant processes occurring between 1) Degradation; 2) Advection, Dispersion, Dilution; 3) Diffusion; 4) Sorption/Desorption; 5) Volatilization; and 6) Stabilization. Based upon these results, technologies that could improve naturally occurring remedial processes can be considered.
- Better understand the rate of mass flux departing the site both currently and following implementation of on-site remedies.
- Improve the conceptual site model for the off-site plume, particularly in regard to the interaction of groundwater and surface water at the perceived boundary of the off-site plume.

4. Feasibility Study

4.1 Remedial Goals and Applicable or Relevant and Appropriate Requirements

4.1.1 Target Media and Contaminants of Concern

There are no current or immediate risks to off-Site human receptors. Therefore, the preliminary objectives are to mitigate potential future risks and to address groundwater cVOC exceedances. The media that will be addressed through remedial actions include groundwater of the shallow and limestone aquifers containing cVOCs. The primary site-specific compound, or COC, at the Site is PCE.

4.1.2 Remedial Action Objectives

Remedial action objectives can be divided into short-term and long-term objectives and are defined as the following:

- Short-term – Protection of human health and the environment by keeping cVOC concentrations in drinking water below MCLs and in surface water below Region 4 Ecological Risk screening values. Ecological risk criteria are proposed since the tributaries west of Highway 601 are inaccessible to recreational or sustenance fishing human receptors.

- Long-term - Meet remedial goals (RGs) in groundwater and maintain compliance with applicable surface water standards.

4.1.3 Remedial Goals

For the purposes of this Feasibility Study, RGs are defined as numerical criteria for environmental media that, when exceeded, result in a violation of statutory regulations. For the State of South Carolina, the RGs are based on USEPA MCLs and Region 4 ecological surface water screening values for hazardous sites. The MCLs and screening values for the COCs in groundwater off-site is presented in **Table 2**. The remedial alternatives that are screened will include remedial technologies that are most capable of achieving the RGs.

4.2 Identification and Screening of Technologies

Based on the class of COCs that are present at the Site, a list of applicable remedial technologies was developed as a preliminary screening step in the evaluation process.

Candidate technologies will be screened based on the following criteria:

- Applicability and appropriateness to the Site

- Technical feasibility and implementability

- Relative cost

Applicability and appropriateness of a potential technology must consider the specific constituents present; the media; the nature, extent, and status of sources of contamination; the physical condition of the Site and surroundings; and the ability of the technology to achieve the stated remedial action objectives.

Technical feasibility and implementability of a potential technology must consider steps and procedures required to implement the remedy; site-specific conditions (size, topography, current and future land use, drainage routes, surface conditions, and other permanent conditions); practicality; and probability of success. In assessing practicality and probability of success, the remedial approach performance history and implementation impacts to public welfare and the environment must also be considered.

Relative cost of a technology examines the expected level of expense required to implement the technology at the Site relative to the other remedial technologies. This is not a detailed cost estimate but, rather, a general judgment based on experience implementing the technology at similar sites.

General remedial actions that may be evaluated as part of the preliminary screening process are summarized below:

No Action

No Action is included as a benchmark for the comparison of costs and benefits associated with other technologies. No corrective action would be taken as a result of no-action response; however, monitoring would be conducted.

Institutional Controls

Institutional Controls (ICs), in the form of the land use restrictions imposed by a Declaration of Covenants and Restrictions, have not been implemented in off-site areas. ICs are typically implemented as tools designed to protect human health, the environment, and to maintain the current and future integrity of the remedy at contaminated sites. ICs are generally non-engineered mechanisms such as administrative and/or legal controls that minimize or eliminate the potential for human exposure to contamination and/or protect the integrity of a remedy. These are typically designed to work by limiting land and resource use at a site, or by providing guidance to help modify human behavior at a site. ICs that are implemented via deed restrictions offer greater risk control than local or regional zoning. Potential ICs for off-site properties include the following:

1. Use of groundwater will be limited to monitoring wells for environmental testing, and for other purposes to support selected corrective measures. Installation of groundwater wells for any other purpose will be prohibited.

2. Future recreational activities in the tributaries could be limited.

There is relatively minimal cost associated with the implementation of this technology and, while this is a technically feasible remedial alternative, community resistance by property owners could prevent implementation.

Containment

Containment will be evaluated as an alternative to prevent risk to human health and the environment by restricting migration in soil or groundwater pathways. A number of technologies and different materials are available for use in establishing migration barriers. There are two principal means: containment through physical methods and through hydraulic methods. Physical methods include capping, vertical barriers such as slurry walls, grout curtains, or sheet piling. Hydraulic containment includes wells or subsurface interceptor trenches, or underdrains to collect groundwater before it migrates to a receptor.

Removal

Removal involves physically removing the media from the subsurface to reduce the risk. This action may consist of extracting groundwater by wells for hydraulic control.

Treatment

Treatment actions involve the reduction of concentrations in the groundwater or altering the constituents to reduce the mobility, volume, and/or toxicity of the contaminants. This action may consist of injecting a chemical oxidant or enhanced reductive dichlorination.

4.3 Detailed Analysis of Alternatives

Detailed evaluation of the remedial alternatives was performed using the following criteria:

- **Protection of human health and the environment, including attainment of remediation goals.** The assessment against this criterion describes how the alternative, as a whole, achieves and maintains protection of human health and the environment.

- **Compliance with applicable federal, state, and local regulations.** The assessment against this criterion describes how the alternative complies with applicable laws and regulations (ALARs) or if a waiver is required and how it is justified. The assessment also addresses other information from advisories, criteria, and guidance that the lead and support agencies have agreed is “to be considered.” The ALARs can be chemical specific, location specific and action specific. Chemical specific ALARs are generally numerical values, thus the chemical ALARs for the Site will be MCLs. Location specific ALARs place restrictions on the conduct of the cleanup activities because they are in a particular location. Action specific ALARs are related to implementation of the technology.

- **Long-term effectiveness and permanence.** The assessment of alternatives against this criterion evaluates the long-term effectiveness of alternatives in maintaining protection of human health and the environment after conclusion of active remediation activities as it pertains to the remedial action objectives.

- **Reduction of toxicity, mobility, and volume through treatment.** The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies to permanently and significantly reduce the toxicity, mobility and/or volume of COCs.

    - **Short-term effectiveness.** The assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of a remedy as it pertains to the remedial action objectives.

- **Implementability.** This assessment evaluates the technical and administrative feasibility of alternatives and the availability of required goods and services.

- **Cost.** This assessment evaluates the capital and operation and maintenance costs of each alternative.

- **Community and state acceptance.** This assessment reflects the community and state’s (or support agency’s) apparent preferences or concerns about alternatives. These criteria are assessed formally after public comment and will not be further discussed herein.

4.4 Feasibility Study Report

Following the completion of the feasibility study work plan, a Feasibility Study Report will be prepared and submitted to SCDHEC. The report will summarize the results of the data gap investigation and the human health and ecological risk assessments. Additionally, it will describe and present the results of the remedial alternatives development, the preliminary screening task, and the detailed analysis of alternatives. All supporting data and information utilized in preparing the report will be referenced.

5. Schedule

The following table summarizes the proposed project schedule for milestone activities described in this work plan. This schedule assumes no limitations are encountered due to contractor availability or weather or other uncontrollable factors.

Project Activity or Task	Estimated Start Date	Estimated Duration	Estimated Completion or Delivery Date
Groundwater MNA Parameters	April 2023 or October 2023	Collect Semi-Annual	January 2024
Compound-Specific Isotope Analysis	April 2023 or October 2023	90 days	July 2023 or January 2024
Soil Sampling and Analysis	June 2023	90 days	September 2023
Surface Water Sampling (Initial)	April 2023 or October 2023	60 days	June 2023 or December 2023
Passive Flux Meters (Pre-Remediation)	June 2023	90 days	September 2023
Mann Kendall Analysis	April 2023 or October 2023	Perform Semi-Annually	April 2024
Additional Surface Water Sampling (if needed)	April 2024	60 days	June 2024
Prepare Off-Site Feasibility Study Report	Not Applicable	Not Applicable	December 2024

6. References

AECOM, May 17, 2016. *Post Remedial Investigation Report, Delavan Spray Technologies Site, Bamberg, South Carolina*.

AECOM, September 13, 2016. *Groundwater Delineation Work Plan, Delavan Spray Technologies Site, Bamberg, South Carolina*.

AECOM, June 14, 2017. *Spring 2017 Semi-Annual Groundwater Monitoring Report, Delavan Spray Technologies Site, Bamberg, South Carolina*.

AECOM, October 13, 2017. *Limestone Aquifer Assessment Work Plan, Delavan Spray Technologies Site, Bamberg, South Carolina*.

AECOM, July 30, 2022. *Spring 2022 Semi-Annual Groundwater Monitoring Report, Delavan Spray Technologies Site, Bamberg, South Carolina.*

AECOM, February 15, 2018. *Technical Memorandum – Residential Sampling Activities and Results, Delavan Spray LLC, Bamberg, South Carolina.*

AECOM, June 4, 2018. *Technical Memorandum – Residential Sampling Activities and Results, Delavan Spray LLC, Bamberg, South Carolina.*

AECOM, June 20, 2020. *Deep Groundwater Delineation Technical Memorandum, Bamberg, South Carolina.*

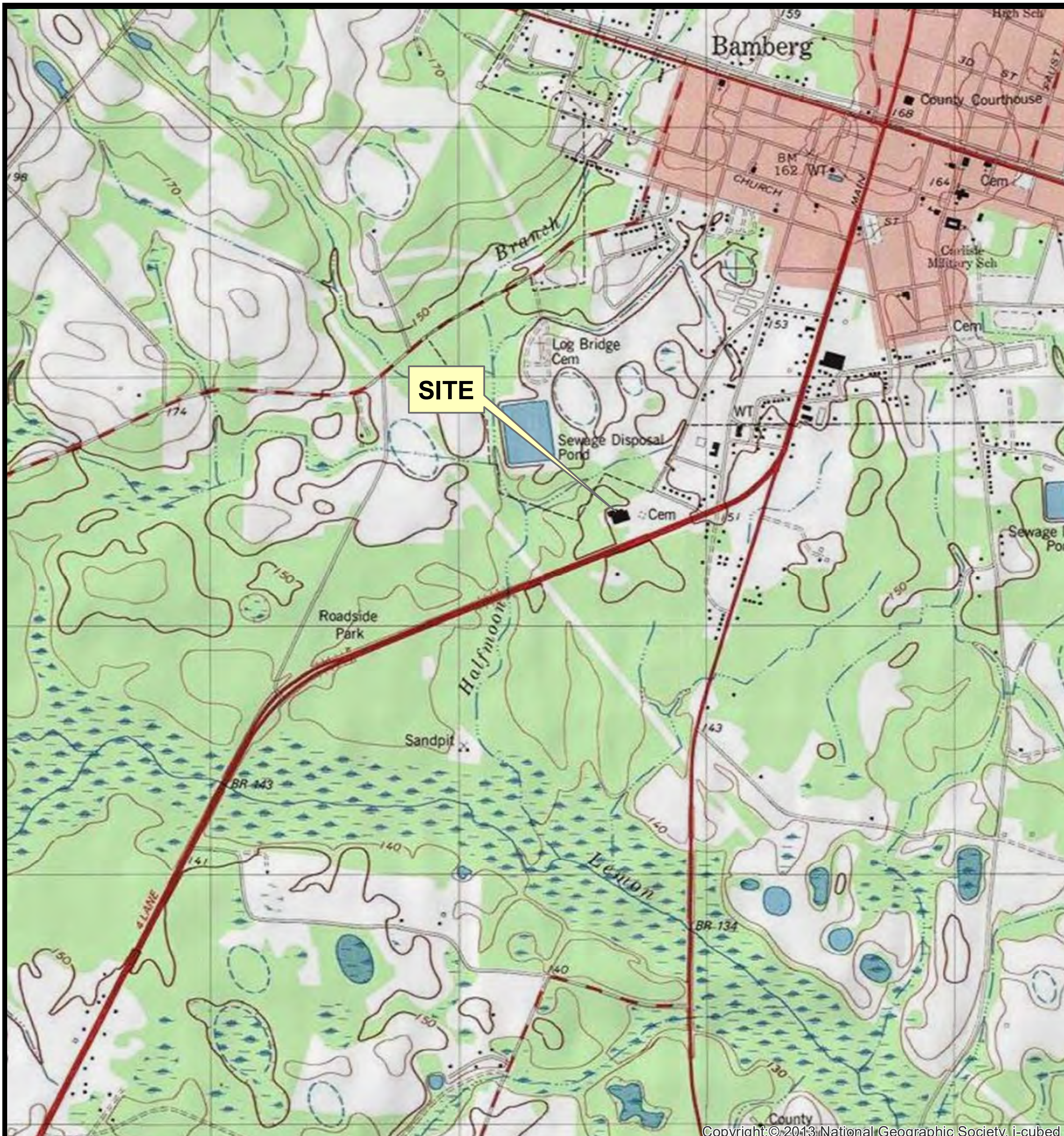
AECOM, February 9, 2023. *On-Site Focused Feasibility Study, Delevan Spray Technologies Site, Bamberg, South Carolina*

H&H, August 1, 2013, *Remedial Investigation Work Plan, Delavan Spray Technologies Site, Bamberg, South Carolina*.

Logan, W.R., and Euler, G.M., 1989. *Geology and Ground-water Resources of Allendale, Bamberg, and Barnwell Counties and part of Aiken County, South Carolina.* South Carolina Water Resources Commission, Report Number 155.

Willoughby and others, 2005. *Generalized geologic map of South Carolina, South Carolina Department of Natural Resources.*

Figures



N

0 500 1,000 2,000 3,000 4,000 Feet

U.S.G.S. QUADRANGLE MAP

BAMBERG, SC 1979 (PHOTO REVISED 1987)

QUADRANGLE
7.5 MINUTE SERIES (TOPOGRAPHIC)

AECOM
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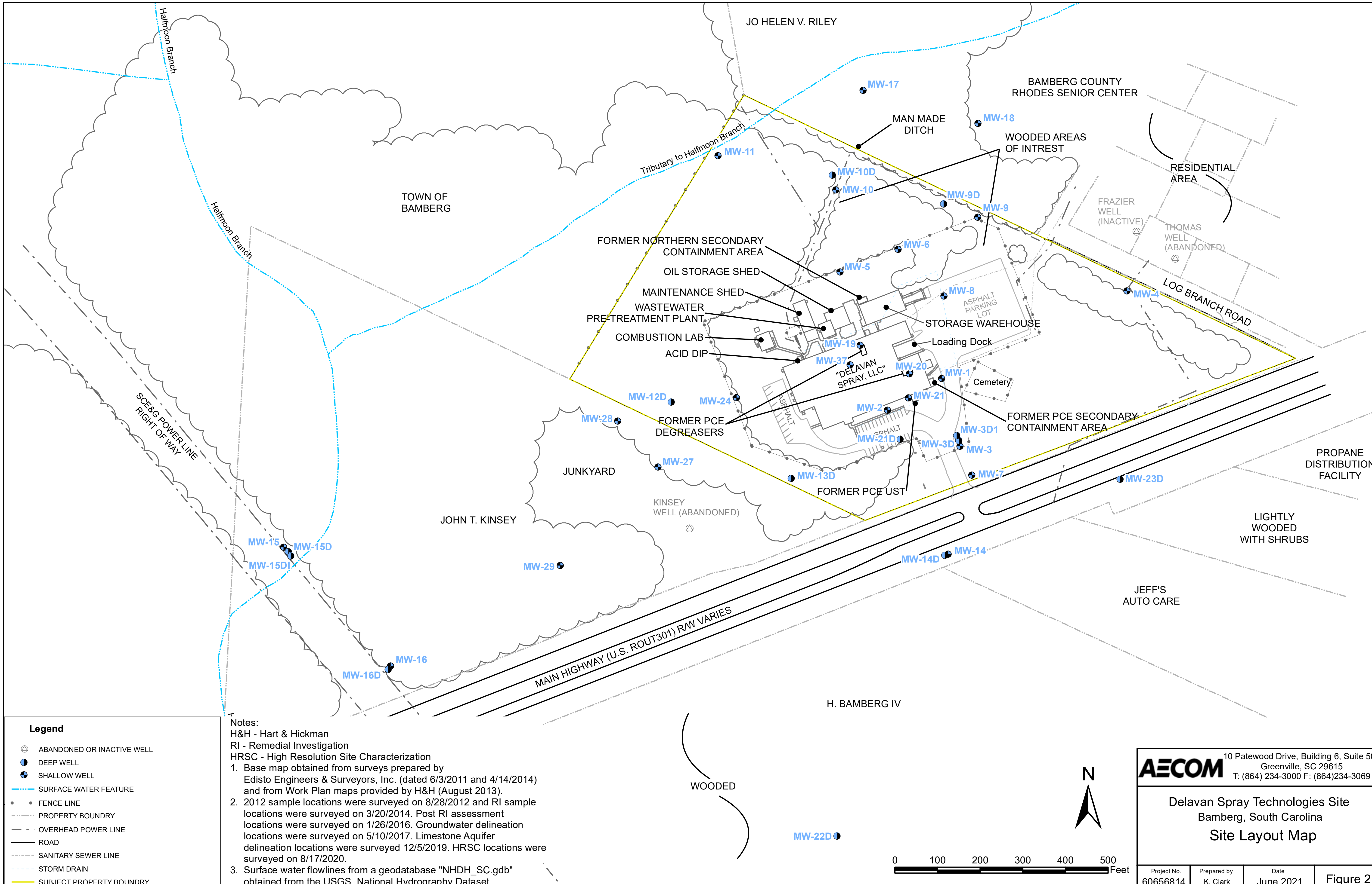
Delavan Spray Technologies Site
Bamberg, South Carolina

Site Location Map

Project No.	Prepared by	Date	
60656814	KCG	June 2021	Figure 1

Path: L:\Projects\60314964 - Bamberg\900-CAD-GIS\920 GIS-Graphics\Maps\Maps June 2021\Figure 1 Site Location Map.mxd



Legend

- ABANDONED OR INACTIVE WELL
- DEEP WELL
- SHALLOW WELL
- SURFACE WATER FEATURE
- FENCE LINE
- PROPERTY BOUNDRY
- OVERHEAD POWER LINE
- ROAD
- SANITARY SEWER LINE
- STORM DRAIN
- SUBJECT PROPERTY BOUNDRY

Notes:
H&H - Hart & Hickman
RI - Remedial Investigation
HRSC - High Resolution Site Characterization

1. Base map obtained from surveys prepared by Edisto Engineers & Surveyors, Inc. (dated 6/3/2011 and 4/14/2014) and from Work Plan maps provided by H&H (August 2013).
2. 2012 sample locations were surveyed on 8/28/2012 and RI sample locations were surveyed on 3/20/2014. Post RI assessment locations were surveyed on 1/26/2016. Groundwater delineation locations were surveyed on 5/10/2017. Limestone Aquifer delineation locations were surveyed 12/5/2019. HRSC locations were surveyed on 8/17/2020.
3. Surface water flowlines from a geodatabase "NHDH_SC.gdb" obtained from the USGS, National Hydrography Dataset.

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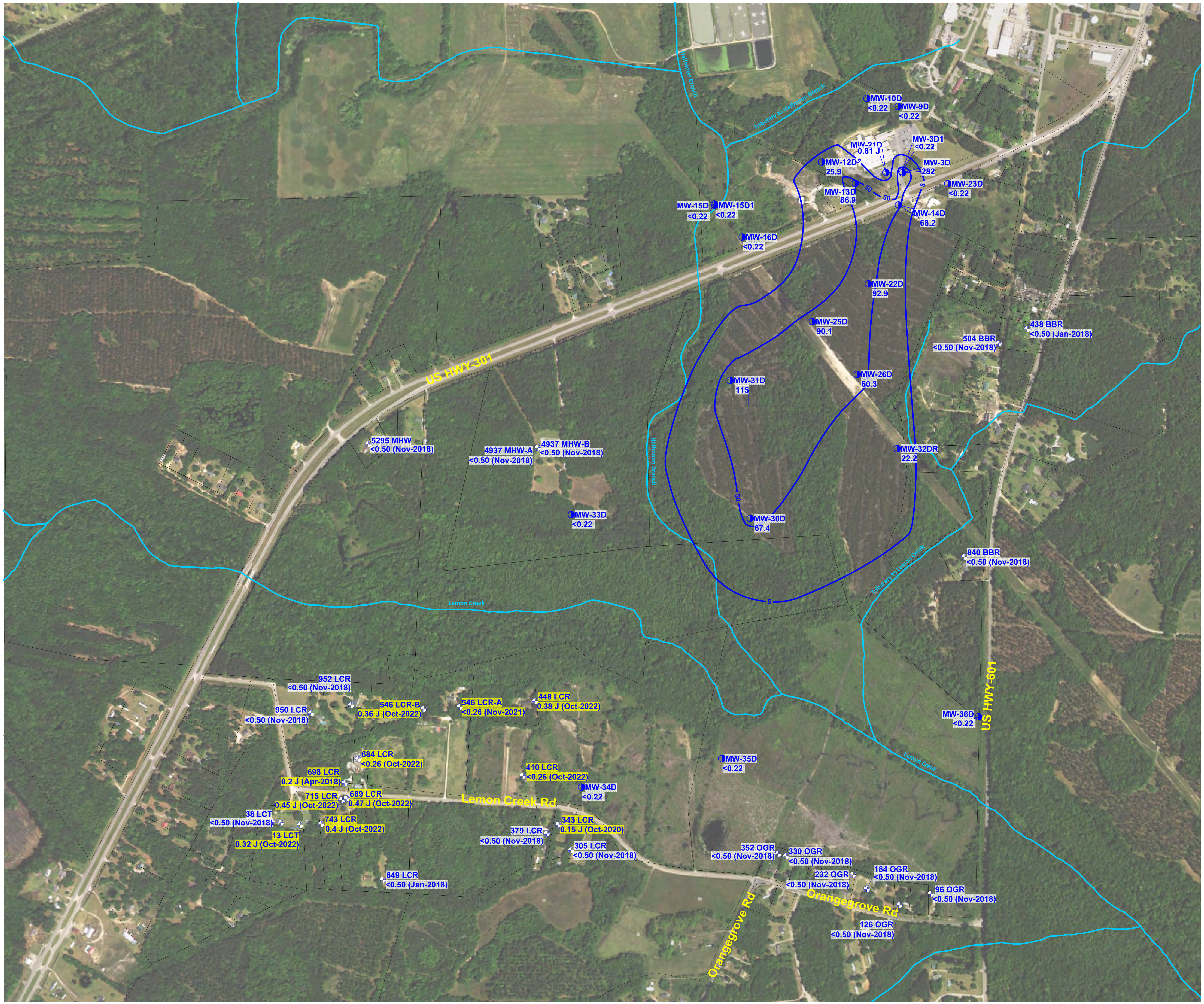
Delavan Spray Technologies Site
Bamberg, South Carolina
Site Layout Map

Project No.	Prepared by	Date	
60656814	K. Clark	June 2021	Figure 2

Path: L:\Projects\60314964 - Bamberg\900-CAD-GIS\920 GIS-Graphics\Maps\Maps June 2021\Figure 2 Site Layout11x17 Landscape.mxd



LEGEND

438BBR	Well Sample ID
	Residential Well Sample Location
	Deep Monitoring Well
	Property Boundary
	Surface Water
	PCE Isoconcentration Contour - October 2022 (µg/L)
< 0.26	Monitoring Well PCE Concentration (µg/L) - October 2022
< 0.26	PCE Concentrations (µg/L) for Residential Well With POE System Installed
< 0.26	PCE Concentrations (µg/L) for Residential Well Without POE System Installed

Notes:
µg/L - micrograms per liter
PCE - Tetrachloroethene
POU - Point-of-Use
Data Qualifiers:
I, J - The reported value is between the laboratory method detection limit and the practical quantitation limit.
1) Surface water flowlines from a geodatabase "NHDH_SC.gdb" obtained from the USGS, National Hydrography Dataset.
2) Imagery obtained from the USGS, The Nation map orthoimagery https://www.usgs.gov/core-science-systems/national-geospatial-program/national-map.
3) The most recent sampling data is provided for each residential well. Sampling dates (month-year) are shown in parentheses.

N

0 121.92024384 243.84048768
FEET

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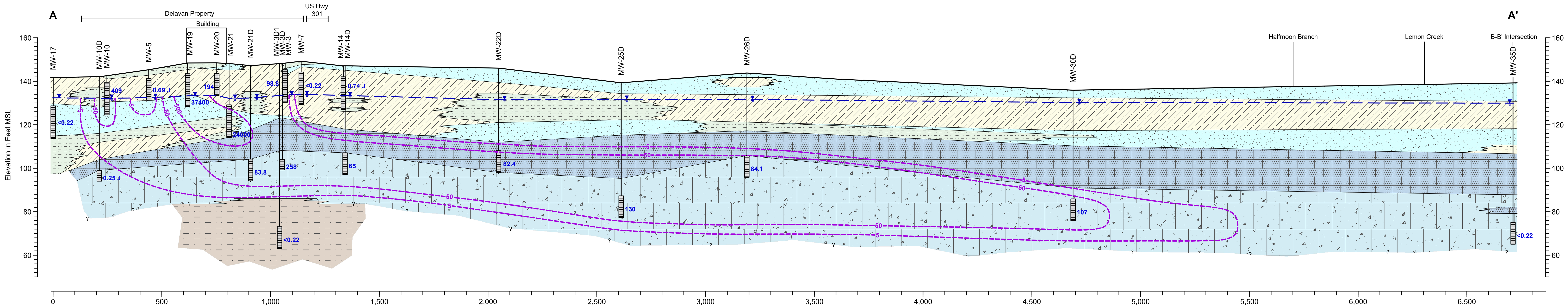
Delavan Spray Technologies Site
Bamberg, South Carolina

PCE Concentrations in Deep Monitoring Wells and Residential Groundwater Samples

Project No.	Prepared by	Date	
60669257	L. Alexander	January 2023	Figure 3

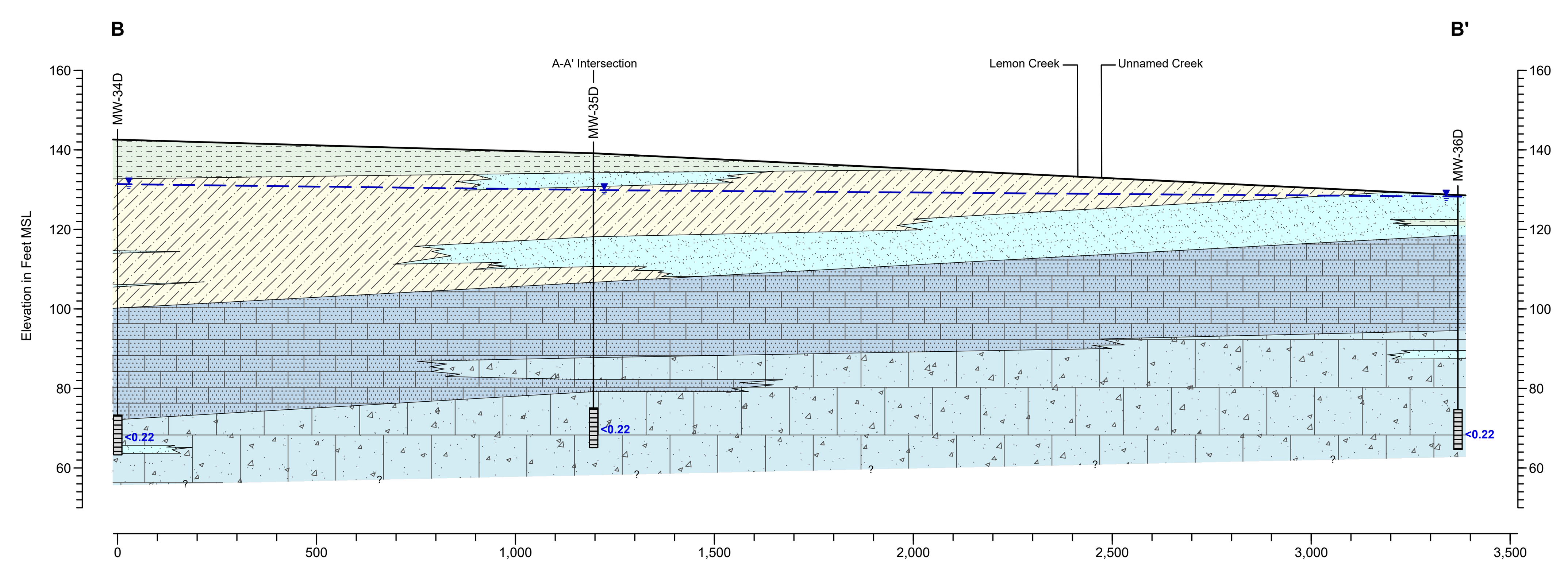
L:\Projects\60314964\400-Technical\406 Surfer\For Oct 2022 Plume maps\Most recent Residential Samples Results - Jan 2023 FS.srf



Cross-Section A-A'

0 150 300 600 900
HORIZONTAL SCALE IN FEET

0 15 30 60 90
VERTICAL SCALE IN FEET
Vertical Exaggeration = 10.0X



Cross-Section B-B'

0 150 300 600 900
HORIZONTAL SCALE IN FEET

0 15 30 60 90
VERTICAL SCALE IN FEET
Vertical Exaggeration = 10.0X

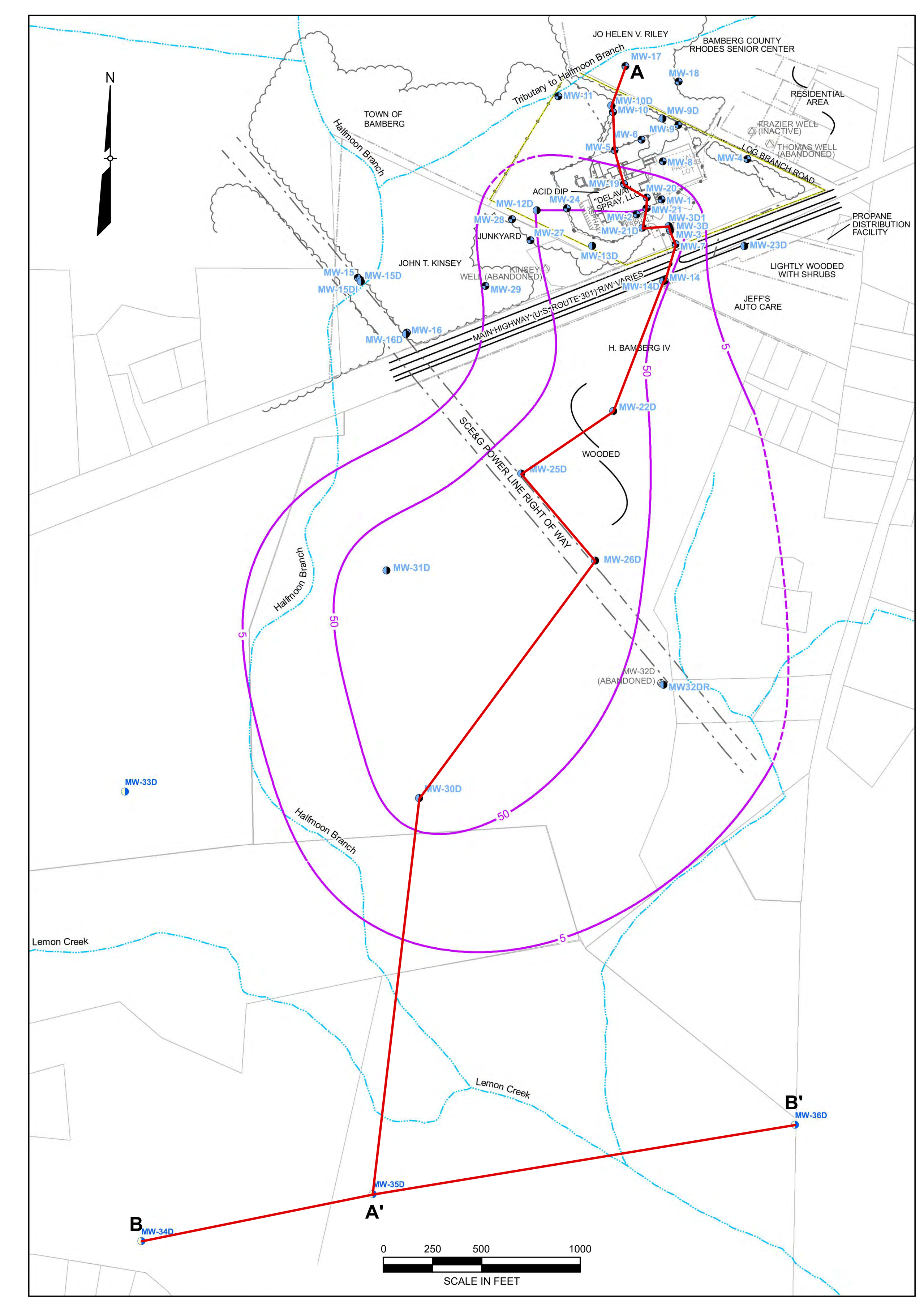
Legend

Monitoring Well Data

- MW-35D — Well ID
- Groundwater Elevation
- PCE Contour
- 65 — October/November 2019 PCE Concentration (µg/L)
- Well Screen

Lithology

- Clayey Sand/Sandy Clay and Clay
- Silt and Sandy Silt/Silty Sand
- Sand
- Pale Yellow Limestone, Sand and Small-Size Shell Hash
- White Limestone, Fossils and Larger Shell Fragments, Some Cementation
- Clayey Sandstone



KEY MAP

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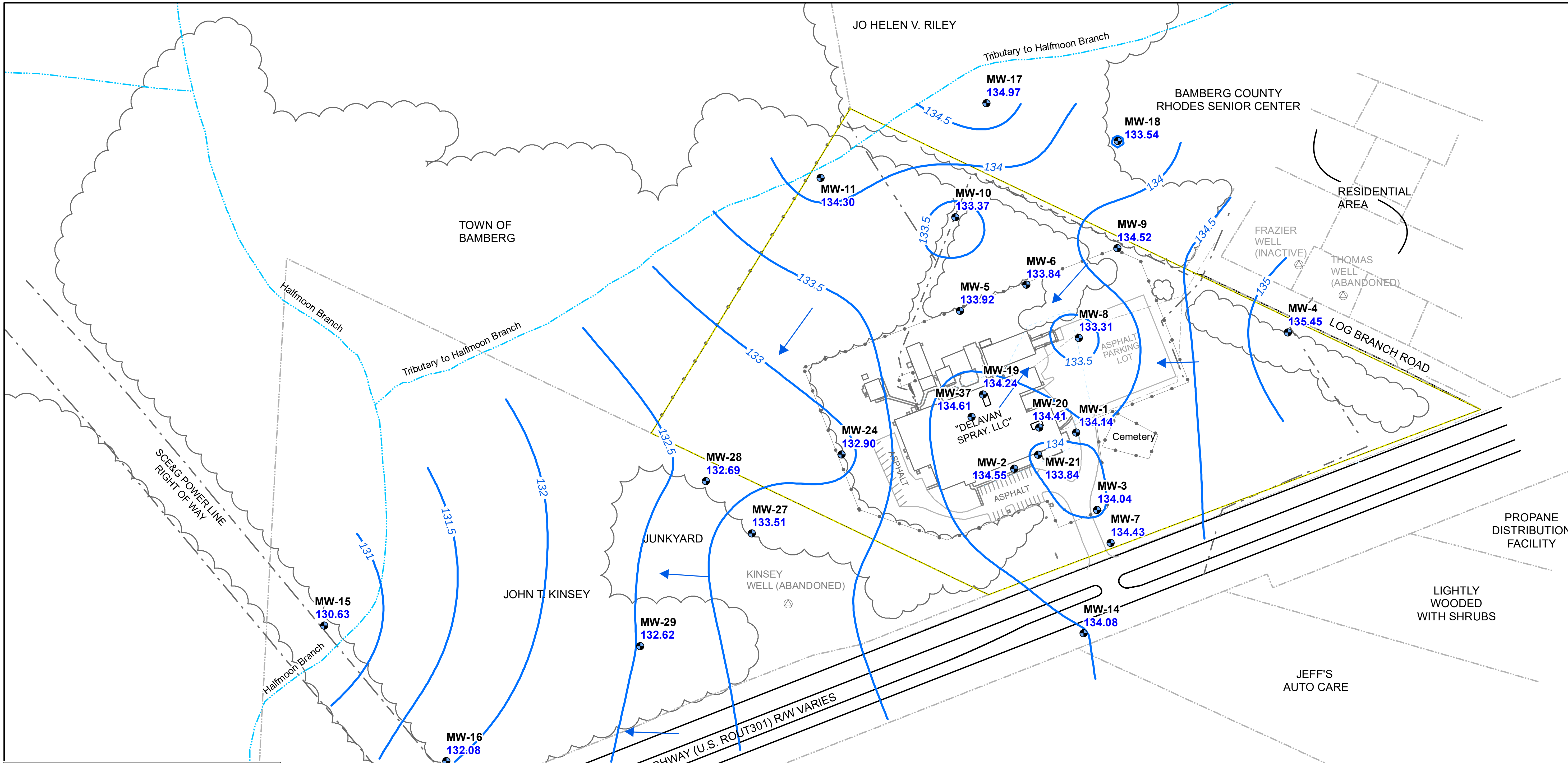
Cross-Section A-A' and Cross-Section B-B'

Delavan Spray Technologies Site
Bamberg, South Carolina

PROJECT NO.	DRAWN BY:	DATE:	
60590866	RJS	April 2020	Figure 4

\\USGRN1FP001\Data\Projects\60314964 - Bamberg\900-CAD-GIS\910 CAD_BIM\Cross-Sections A-A' and B-B' with PCE.dwg, 5/20/2020 3:30:42 PM



Legend

- 132.36 GROUNDWATER ELEVATION OCTOBER 24, 2022 (FT MSL)
- ABANDONED OR INACTIVE WELL
- SHALLOW WELL
- INFERRED GROUNDWATER FLOW DIRECTION
- GROUNDWATER ELEVATION CONTOUR (FT)
- SURFACE WATER FEATURE
- FENCE LINE
- PROPERTY BOUNDRY
- OVERHEAD POWER LINE
- ROAD
- SANITARY SEWER LINE
- STORM DRAIN LINE
- SUBJECT PROPERTY BOUNDRY

Notes:
FT - feet
MSL - mean sea level
H&H - Hart & Hickman
HRSC - High Resolution Site Characterization
RI - Remedial Investigation

1. Base map obtained from surveys prepared by Edisto Engineers & Surveyors, Inc. (dated 6/3/2011 and 4/14/2014) and from Work Plan maps provided by H&H (August 2013).
2. 2012 sample locations were surveyed on 8/28/2012 and RI sample locations were surveyed on 3/20/2014. Post RI assessment locations were surveyed on 1/26/2016. Groundwater delineation locations were surveyed on 5/10/2017. Limestone delineation locations were surveyed on 12/5/2019. Limestone Aquifer delineation locations were surveyed 12/5/2019. HRSC locations were surveyed on 8/17/2020.
3. Water levels were collected by AECOM on October 24, 2022.
4. Surface water flowlines from a geodatabase "NHDH_SC.gdb" obtained from the USGS, National Hydrography Dataset.

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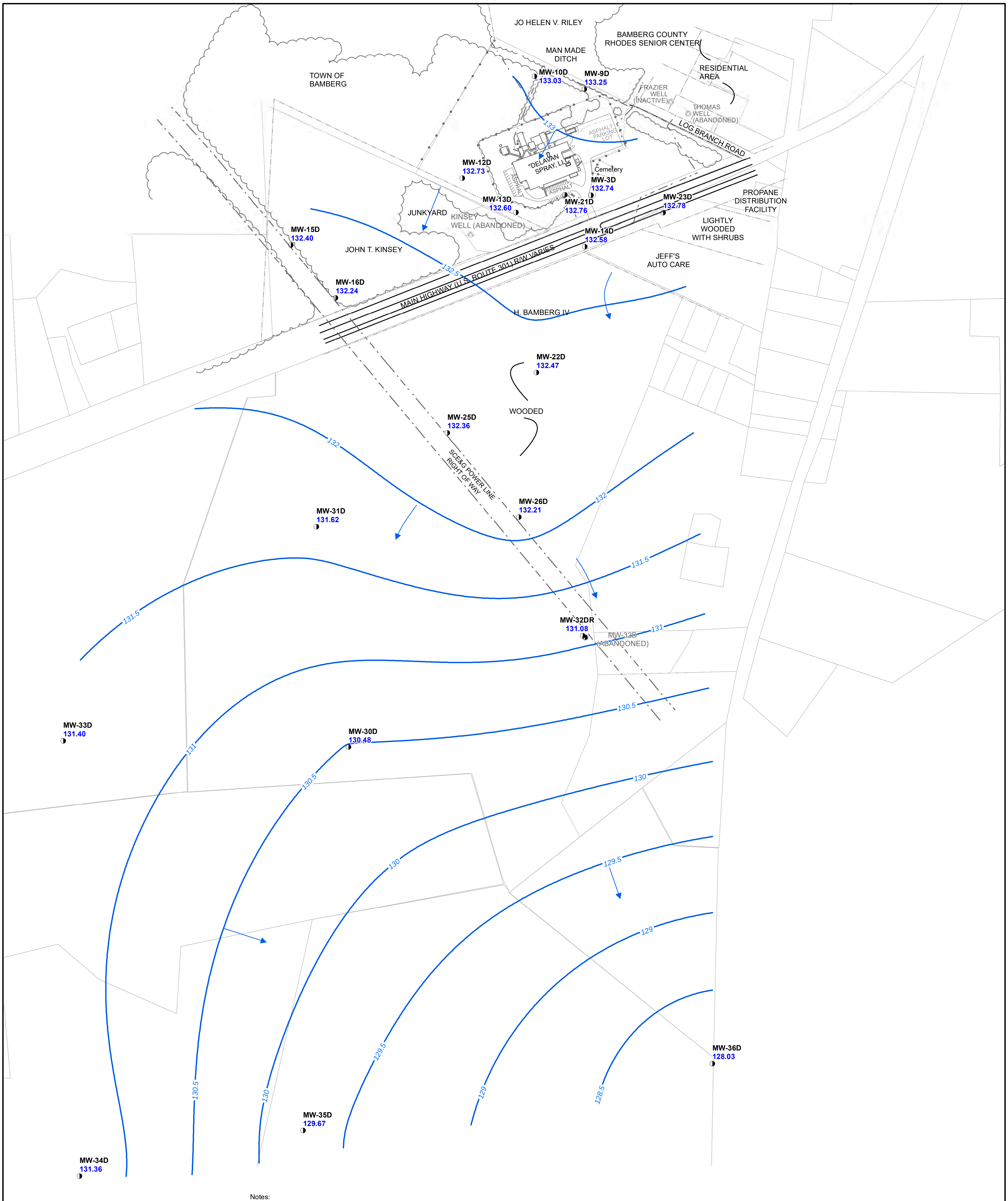
Delavan Spray Technologies Site
Bamberg, South Carolina

Shallow Potentiometric Map
October 2022

Project No.	Prepared by	Date	
60681452	K. Clark	Jan. 2023	Figure 5



Legend

- 128.48 GROUNDWATER ELEVATION OCTOBER 24, 2022 (FT MSL)
- ABANDONED OR INACTIVE WELL
- DEEP WELL
- INFERRED GROUNDWATER FLOW DIRECTION
- GROUNDWATER ELEVATION CONTOUR (FT)
- SURFACE WATER FEATURE
- FENCE LINE
- PROPERTY BOUNDRY
- OVERHEAD POWER LINE
- ROAD
- SANITARY SEWER LINE
- STORM DRAIN LINE
- SUBJECT PROPERTY BOUNDRY

Notes:
H&H - Hart & Hickman
RI - Remedial Investigation
HRSC - High Resolution Site Characterization
NS - Not Sampled; Posted result is from October 2020

1. Base map obtained from surveys prepared by Edisto Engineers & Surveyors, Inc. (dated 6/3/2011 and 4/14/2014) and from Work Plan maps provided by H&H (August 2013).
2. 2012 sample locations were surveyed on 8/28/2012 and RI sample locations were surveyed on 3/20/2014. Post RI assessment locations were surveyed on 1/26/2016. Groundwater delineation locations were surveyed on 5/10/2017. Limestone Aquifer delineation locations were surveyed 12/5/2019. HRSC locations were surveyed on 8/17/2020.
3. Water levels were collected by AECOM on October 24,2022.
4. Surface water flowlines from a geodatabase "NHDH_SC.gdb" obtained from the USGS, National Hydrography Dataset.

N

0 250 500 750 Feet

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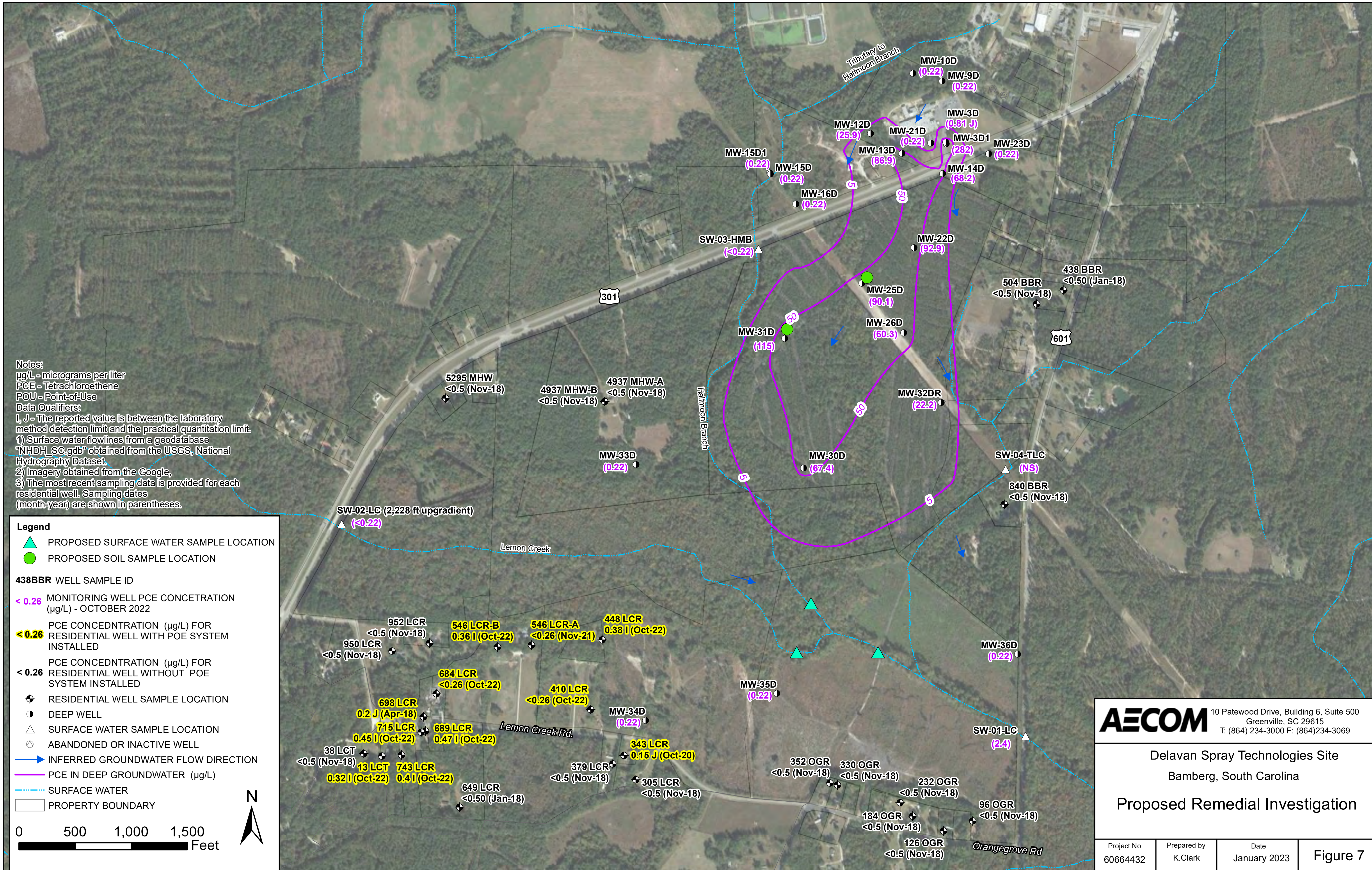
Delavan Spray Technologies Site
Bamberg, South Carolina

Deep Potentiometric Map
October 2022

Project No.	Prepared by	Date	
60681452	K. Clark	Jan. 2023	Figure 6

Path: \\na.aecomnet.com\lfs\AMER\Greenville-USGRN1\Legacy\Projects\60314964 - Bamberg\900-CAD-GIS\920 GIS-Graphics\Maps\Maps January 2023\Figure 6 Deep Pot.mxd


Tributary to Halfmoon Branch
MW-10D (0.22)
MW-9D (0.22)
MW-3D (0.81 J)
MW-12D (25.9)
MW-21D (0.22)
MW-3D1 (282)
MW-23D (0.22)
MW-13D (86.9)
MW-15D1 (0.22)
MW-15D (0.22)
MW-14D (68.2)
MW-16D (0.22)
SW-03-HMB (<0.22)
MW-22D (92.9)
438 BBR <0.50 (Jan-18)
504 BBR <0.5 (Nov-18)
MW-25D (90.1)
MW-26D (60.3)
MW-31D (115)
301
601
5295 MHW <0.5 (Nov-18)
4937 MHW-B <0.5 (Nov-18)
4937 MHW-A <0.5 (Nov-18)
Halfmoon Branch
MW-32DR (22.2)
MW-33D (0.22)
MW-30D (67.4)
SW-04-TLC (NS)
840 BBR <0.5 (Nov-18)
SW-02-LC (2,228 ft upgradient) (<0.22)
Lemon Creek
952 LCR <0.5 (Nov-18)
546 LCR-B 0.36 I (Oct-22)
546 LCR-A <0.26 (Nov-21)
448 LCR 0.38 I (Oct-22)
950 LCR <0.5 (Nov-18)
MW-36D (0.22)
684 LCR <0.26 (Oct-22)
410 LCR <0.26 (Oct-22)
MW-35D (0.22)
698 LCR 0.2 J (Apr-18)
MW-34D (0.22)
715 LCR 0.45 I (Oct-22)
689 LCR 0.47 I (Oct-22)
Lemon Creek Rd.
SW-01-LC (2.4)
343 LCR 0.15 J (Oct-20)
38 LCT <0.5 (Nov-18)
13 LCT 0.32 I (Oct-22)
743 LCR 0.4 I (Oct-22)
379 LCR <0.5 (Nov-18)
305 LCR <0.5 (Nov-18)
352 OGR <0.5 (Nov-18)
330 OGR <0.5 (Nov-18)
232 OGR <0.5 (Nov-18)
649 LCR <0.50 (Jan-18)
184 OGR <0.5 (Nov-18)
96 OGR <0.5 (Nov-18)
126 OGR <0.5 (Nov-18)
Orangegrove Rd
5
50
Notes:
µg/L - micrograms per liter
PCE - Tetrachloroethene
POU - Point-of-Use
Data Qualifiers:
I, J - The reported value is between the laboratory method detection limit and the practical quantitation limit.
1) Surface water flowlines from a geodatabase "NHDH_SC.gdb" obtained from the USGS, National Hydrography Dataset.
2) Imagery obtained from the Google.
3) The most recent sampling data is provided for each residential well. Sampling dates (month-year) are shown in parentheses.
Legend
PROPOSED SURFACE WATER SAMPLE LOCATION
PROPOSED SOIL SAMPLE LOCATION
438BBR WELL SAMPLE ID
< 0.26 MONITORING WELL PCE CONCETRATION (µg/L) - OCTOBER 2022
< 0.26 PCE CONCEDNTRATION (µg/L) FOR RESIDENTIAL WELL WITH POE SYSTEM INSTALLED
< 0.26 PCE CONCEDNTRATION (µg/L) FOR RESIDENTIAL WELL WITHOUT POE SYSTEM INSTALLED
RESIDENTIAL WELL SAMPLE LOCATION
DEEP WELL
SURFACE WATER SAMPLE LOCATION
ABANDONED OR INACTIVE WELL
INFERRED GROUNDWATER FLOW DIRECTION
PCE IN DEEP GROUNDWATER (µg/L)
SURFACE WATER
PROPERTY BOUNDARY
0 500 1,000 1,500 Feet
N
AECOM
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Greenville, SC 29615
T: (864) 234-3000 F: (864)234-3069
Delavan Spray Technologies Site
Bamberg, South Carolina
Proposed Remedial Investigation
Project No. 60664432
Prepared by K.Clark
Date January 2023
Figure 7

Tables

Table 1
Summary of Proposed Sampling
Delavan Spray Technologies Site
Bamberg, South Carolina

	FIELD						**PASSIVE SAMPLER**		**LABORATORY**														
	Water Levels	DO	pH	ORP	Conductivity	Temperature	Flux Meter	ISCO Bench Scale Test	Degradation				VOCs	Chloride	Nitrate	Sulfate	Sulfide	Methane	Ethane/ Ethene	Ferrous Iron	Ferric Iron	Manganese	Acetylene
Sample Location	*Water Level Meter*	*Multi-parameter field insturment with flow through cell*							Magnetic Susceptibility	X-Ray Diffraction	AMIBA	CSIA	EPA 8260	*EPA 300 Series*	*EPA 300 Series*	*EPA 300 Series*	*EPA 300 Series*	*RSK 175*	*RSK 175*	*6020A*	*6020A*	*6020A*	*RSK 175*
SW Locations													x										
MW-3D	x	x	x	x	x	x						x		x	x	x	x	x	x	x	x	x	x
MW-13D	x	x	x	x	x	x	x							x	x	x	x	x	x	x	x	x	x
MW-14D	x	x	x	x	x	x	x					x		x	x	x	x	x	x	x	x	x	x
MW-21D	x	x	x	x	x	x								x	x	x	x	x	x	x	x	x	x
MW-22D	x	x	x	x	x	x						x		x	x	x	x	x	x	x	x	x	x
MW-24							x																
MW-25D	x	x	x	x	x	x		x*	x*	x*	x*	x		x	x	x	x	x	x	x	x	x	x
MW-26D	x	x	x	x	x	x								x	x	x	x	x	x	x	x	x	x
MW-30D	x	x	x	x	x	x						x		x	x	x	x	x	x	x	x	x	x
MW-31D	x	x	x	x	x	x		x*	x*	x*	x*	x		x	x	x	x	x	x	x	x	x	x
MW-32DR	x	x	x	x	x	x								x	x	x	x	x	x	x	x	x	x
MW-37							x																

* denotes soil samples that will be collected near the selected monitoring well

Table 2
Remedial Goals for Site-Specific Chlorinated VOCs
Delavan Spray Technologies Site
Bamberg, South Carolina

Off-Site-Specific Compounds[1]	MCL[2] (µg/L[4])	Maximum Detected Concentration In Off-Site Wells[3] (µg/L)	USEPA Region 4 Surface Water Screening Values (µg/L[4])	Maximum Detected Concentration In Surface Water[3] (µg/L)
1,1,1-Trichloroethane	200	0.38 J	76	ND[5]
1,1-Dichloroethylene	7	4.8	130	ND
Chloroform	80	1.8 [6]	140	ND
cis-1,2-Dichloroethylene	70	2.6	620	0.84 J
Methylene chloride	5	6.1	1,500	ND
Tetrachloroethylene	5	232	53	2.9
Toluene	1,000	2.1	62	ND
Trichloroethylene	5	1.3	220	ND
Vinyl Chloride	2	ND	930	ND

Notes:

[1] Site-Specific Compounds were selected based on historical detections in groundwater at concentrations exceeding their respective Maximum Contaminant Level (MCL).

[2] MCL - United States Environmental Protection Agency Maximum Contaminant Level (April, 2012), or, as defined by South Carolina Department of Health and Environmental Control (SCDHEC) R.61-68 Water Classifications and Standard (June 27, 2014).

[3] Based on comprehensive historical data collected at the Site from June 2003 to October 2022 (AECOM, February 2023).

[4] µg/L - micrograms per liter.

[5] ND - Not Detected .

[6] Chlorform was detected at 180 ug/L in MW-22D in March 11, 2014, but never detected in MW-22D again.