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From: Fitzgerald, Conan <conan.fitzgerald@aecom.com>
Sent: Friday, October 21, 2022 4:57 PM
To: Devlin, Cynde <devlincl@dhec.sc.gov>
Cc: Cullom, Doria <Doria.Cullom@aecom.com>; Alexander, Leslee (Greenville) <Leslee.Alexander@aecom.com>; Ros, Ian <ian.ros@aecom.com>
Subject: SAP revision

Cynde,

Here is the revised SAP with the tables modified. In response to your questions.

I noticed the sampling method is not specified for each monitoring well on Table 1. Can you revised Table 1 to specify if the well will use a low flow pump or a passive diffusion bag? The intention is to use passive sampling devices in all wells, with low flow pump as a backup. The majority of wells would be served with a 1.5" diameter 30" long Hydrasleeve. The smaller interior wells would be served by 0.75" diameter passive diffusion bags, with varying depths as indicated in the revised Table 1 attached. We acknowledge that something may go awry in a particular well causing active purging to replace the passive technique, but any such deviances will be identified in the report.

Also, Table 1 has specific sampling dates listed. I assumed this is a SAP that would be used for all sampling events going forward. Can you revise the table to remove specific dates? OK. The base table was from our internal well sampling schedule, so date specific criteria was not intended. We have attached revised versions of Table 1 and Table 2 with date specific information removed.

Have you removed any wells that were previously in the sampling schedule? No changes. October 2022 represents a comprehensive sampling event.

Conan Fitzgerald
AECOM – NC
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207a

Revised Sampling and Analysis Plan

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 Blvd.
Suite 200
Raleigh, North Carolina

September 23, 2022

REVISED SAMPLING AND ANALYSIS PLAN

DELAVAN SPRAY TECHNOLOGIES SITE
BAMBERG, SOUTH CAROLINA

RESPONSIBLE 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*:**

Doria R. Cullom

Doria Cullom
AECOM Project Chemist

September 23, 2022
Date

***Reviewed by*:**

Conan Fitzgerald

Conan Fitzgerald, ~~PE~~
AECOM Senior Project Manager

September 23, 2022
Date

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LIST OF ACRONYMS

%	percent
bgs	below ground surface
DO	dissolved oxygen
DPT	soil boring samples (pg 1) or direct-push technology (pg 6)
EFF	effluent
EPA	Environmental Protection Agency
ft	feet
ID	identification
IDW	investigation-derived waste
INF	influent
IS	investigation-derived soil
IW	investigation-derived wastewater
L/min	liters per minute
mL	milliliter
mV	millivolts
MW	groundwater monitor well samples or monitor well
NAD83	North American Datum of 1983
NAVD 88	North American Vertical Datum of 1988
O.D.	outside diameter
ORP	oxidation reduction potential
PDB	passive diffusion bag
pH	potential of hydrogen
PID	photo-ionization detector
ppm	parts per million
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SC	South Carolina
DHEC	Department of Health and Environmental Control
SESD	Science and Ecosystem Support Division
SS	surface soil
SSV	sub-slab vapor
SVE	soil vapor extraction
SVOC	semi-volatile organic compounds
TCLP	toxicity characteristic leaching procedure
TOC	total organic carbon
VOC	volatile organic compounds

1.0 INTRODUCTION

AECOM Technical Services, Inc. (AECOM) has prepared this *Revised Sampling and Analysis Plan (SAP)* for the Delavan Spray Technologies Site (the Site). This SAP is an update of the previous plan submitted with the *Remedial Investigation Work Plan* (Hart & Hickman, 2013) approved by SCDHEC October 22, 2013. It is intended to describe field sampling procedures for activities conducted under the on-going monitoring requirements of Voluntary Cleanup Contract (VCC) (VCC 13-4762-RP) that was signed between South Carolina Department of Health and Environmental Control (SCDHEC) and Delavan Spray, LLC (Delavan; SCDHEC, 2013).

2.0 FIELD SAMPLING AND ANALYSIS

2.1 Proposed Field Activities

Soil, sub-slab vapor, vapor from soil vapor extraction (SVE) system, surface water, and groundwater samples will be collected and analyzed during assessment activities. Specific sampling locations are identified in the associated work plan Work Plan. Groundwater sampling will include sampling the existing permanent monitoring wells and sampling of additional wells to be installed during the assessment activities.

Field procedures will be consistent with the Environmental Protection Agency's (EPA's) Science and Ecosystem Support Division (SESD) Field Branches Quality System and Technical Procedures document (http://www.epa.gov/region4/sesd/fbqstp/) (or most recent version).

2.2 Sample Designation, Field Records, and Photographs

2.2.1 Sample Designation

A sample identification (ID) system has been developed for the project. Samples will be assigned a unique alpha-numeric sample descriptor that identifies the sample type, sample site number, and sample interval. Sample designation types may include surface soil (SS), groundwater monitor well samples (MW), soil boring samples (DPT), investigation-derived wastewater (IW), sub-slab vapor (SSV), SVE system influent and effluent vapor (SVE-INF and SVE-EFF, respectively), and investigation-derived soil (IS). The first letters specify the sample or media type, followed by the sample number, and other descriptive data where appropriate. For example, the soil sample from soil boring DPT-3 at a depth of 3 to 5 feet (ft) would be labeled DPT-3 (3-5).

Surface water samples will be designated with the prefix SW, followed by the sample identifying number, and then a multi-letter suffix identifying the surface water body. Samples from Lemon Creek will be designated with "LC", from Half-Moon Branch designated "HMB", and the unnamed tributary to Lemon Creek designated "TLC".

Sample ID numbers will be included on chain-of-custody forms and sample containers. Duplicate samples will be given unique sample ID numbers (i.e. not similar to the "parent" sample number) and the "parent" sample will be noted in the field book.

2.2.2 Field Records

The purpose and procedures for field records are provided below.

2.2.2.1 *Purpose*

This section describes requirements and procedures for documentation of field activities. It is essential field documentation provide a clear picture of field activities. Field documentation procedures will generally follow the EPA Region 4 SESD Logbook Operating Procedure.

During the course of the investigation, additional field data will be generated which may not be directly entered into the field log book, but will eventually become an integral part of the project files. The additional information and data will include, but are not limited to, the following:

- Test Boring Report
- Groundwater Monitoring Well Installation Detail
- Chain-of-Custody Record
- Monitoring Well Development Log
- Field Data Information Log for Groundwater Sampling
- Water Level Data Summary

2.2.2.2 *Procedure*

Bound, serially-numbered field notebooks will be used on work assignments requiring field activities. Entries into field notebooks will be legibly written with indelible ink and provide a clear record of field activities.

The following information will be provided on the inside front cover or first page of the field notes:

- Project name;
- Site location; and
- Consultant information including job number.

Instructions for documenting field activities are provided below. These instructions are organized as follows:

The first set of instructions and procedures, entitled “Format”, provides general guidance relating to the format and technique in which notebook entries are to be made.

The second set of instructions, entitled “Content”, provides guidance on information to be recorded when documenting field activities.

<u>Format</u>

Instructions and procedures relating to the format and technique in which notebook entries are made are as follows:

- If photographs are taken as part of the field investigation, a brief photo description will be made in the notes at the time the photograph is taken. Photograph descriptions will be numbered sequentially in the notes.
- Entries will be made with indelible ink.
- Entries will be made in language that is objective, factual, and free of personal feelings or other terminology, which might prove unclear or inappropriate.
- Entries will be printed as neatly as possible.

- Entries will be logged using a 24-hour system.
- Errors in the field notes will be indicated by drawing a single line through the text. The stricken text must remain legible. Errors will be initialed and dated.
- A new page will be started at the beginning of each day's field activities, and the remaining clear page at day's end will be filled with a single initialed diagonal line at the day's end.
- The person taking notes will sign, number, and date each page.
- Later additions, clarifications, or corrections must be dated and signed.

Content

Instructions and procedures providing guidance on the information to be recorded concerning field activities are provided below:

- Personnel will identify the date, time, job number, location on-site, field personnel, and observed weather conditions. Changes in weather will be noted when they occur.
- Sketches or maps of the site will be included and used to identify photograph and/or sample locations. Landmarks will be noted; north will be indicated; and if possible, an approximate scale will be included. As many sketches and maps as needed will be included.
- Field personnel responsible for note-taking will log photographs in the field notebook. When appropriate, the photograph locations will be referenced to a site sketch or map. Photograph information will include the date, sample number (if appropriate), and a description or ID of the subject in the photograph.
- Use of on-site health and safety equipment will be recorded. Observed potential hazards to health and safety will be described. The level of personnel protection used, and decontamination procedure used will be documented.
- As part of the chain-of-custody procedure, sampling information will include sample number, date, time, sampling personnel, sample type, designation of sample as a grab or composite, and preservative used. Sample locations should be referenced to sample numbers on a site sketch or map.
- When sampling is complete, the field notes should include date, time, sample numbers, and description. Also, to be indicated is whether or not the sample was a split or duplicate and who received the split or duplicate sample.
- Information for in-situ measurements will include a sample ID number, the date, time, and personnel taking measurements. If in-field calculations are necessary, they will be checked in the field by a second team member, whenever possible.
- If visitors arrive on-site, relevant discussions will be recorded. To be included is the name of conversation participants, the interest group represented (if applicable), address, and phone number.

Other relevant information will be recorded.

2.2.3 Photographs

Photographs taken with a digital camera will be documented in the field notebook. After the photographs have been downloaded, photographs will be labeled with the following information:

- job ID number;
- date;
- location; and
- sample number (if appropriate).

Photographs will be logged in general accordance with the EPA Region 4 SESD Sample and Evidence Management Operating Procedure.

2.3 Field Analytical Techniques

With any field analytical measurement, the equipment used must be suitable for the analytical measurement to be made and properly calibrated. In addition to being accurate, field analysis must be conducted on a sample representative of the source from which it was collected.

During well purging field measurements of potential of hydrogen (pH), conductivity, temperature, dissolved oxygen (DO), and oxidation reduction potential (ORP) will be collected with a flow through cell. A QED MP20 or equivalent flow through cell measurement device will be used for field measurements. The instrument will be calibrated at least once daily in accordance with the manufacturer's specifications. pH will be calibrated against two pH buffer standards which are anticipated to bracket the pH of the groundwater (generally 4 and 7 pH buffers). Alternatively, during the installation of passive groundwater sampling devices, an in-well water quality probe may be utilized as described in Section 1.4.7.

Soil samples and ambient air during drilling will be screened for volatile vapors using a photo-ionization detector (PID). The PID will be calibrated at least once daily in accordance with the manufacturer's specifications. The PID will be calibrated with zero air and an isobutylene standard of 100 parts per million (ppm).

2.4 Environmental Sampling Procedures

Samples are collected to obtain a representative portion of the material or medium being sampled. Valid results depend on the following:

- Obtaining samples that are as representative as possible of the material or medium being sampled;
- Using proper sampling, handling, and preservation techniques;
- Identifying the collected samples and documenting their collection in permanent field records;
- Maintaining sample chain-of-custody procedures; and

- Protecting the collected samples by properly packing and transporting them to a laboratory for analysis.

2.4.1 General Considerations

The following factors and procedures will be considered in view of the specific objectives and scope of the field investigation as presented in the work plan:

- Safety of personnel;
- Selection of representative sampling sites;
- Selection and proper preparation of sampling equipment;
- Selection of parameters to be measured and evaluation of sample fractions to be analyzed (e.g., dissolved, suspended or total fractions for water samples);
- Required sample volumes;
- Selection and proper preparation of sample containers;
- Sample preservation;
- Sample holding times;
- Sample handling and mixing;
- Special precautions for trace constituent sampling;
- Sample ID;
- Procedures for identifying potentially hazardous samples;
- Collection of auxiliary data;
- Transportation and shipping of samples; and
- Sample chain-of-custody.

2.4.2 Terminology

Sampling terminology is defined as follows:

- Grab Sample - a grab sample is an individual sample taken from one point in space at essentially one point in time.
- Composite Sample - a sample composited from individual grab samples collected over an area or in a cross-section. The grab samples will be of equal volume and shall be collected in an identical manner.
- Split Sample - a split sample is divided into two or more samples. Adequate mixing will be performed such that the two portions of a split sample are, as much as possible, identical.

- Control or Background Sample - background or control samples are collected in an area known or thought to be free from the constituents of concern.
- Sample Aliquot - a sample aliquot is a portion of a sample that is representative of the entire sample.

2.4.3 Decontamination Procedures

Proper decontamination of sampling equipment is essential to minimize the possibility of cross contamination of samples. Sampling equipment will be decontaminated before sampling and between the collection of each sample (unless samples are to be composited), and between sampling points. Sampling equipment will be decontaminated generally following the EPA Region 4 SESD Field Equipment Cleaning and Decontamination Operating Procedure.

Larger equipment such as drilling and/or backhoe equipment that may contact the samples will be steam cleaned prior to initiating the field investigation. During the field investigation, drilling equipment such as drill augers, bits, and tools, and sampling equipment such as split barrel samplers and drill rods will be decontaminated by steam cleaning. As an alternative to steam cleaning, smaller sampling tools, such as split barrel samplers, may be decontaminated using the procedures for sampling equipment provided in the EPA Region 4 SESD guidance. Following decontamination, drilling augers, bits, split barrel samplers and rods will be wrapped in plastic or foil between borings. This includes transport from the decontamination area and temporary storage while awaiting use.

Water used for steam cleaning and drilling will be obtained from the Delavan facility which is connected to the local municipal supply water system. Laboratory supplied de-ionized water used for decontamination of small hand tools and sampling devices will not be analyzed. Decontamination of equipment will take place in a dedicated decontamination area located in an appropriate site area.

2.4.4 Drilling Procedures

The various drilling procedures which may be employed at the Site are discussed below.

2.4.4.1 *Documentation*

Field activities involving drilling will be observed and documented by field personnel. Field observations will be documented chronologically in a bound field book, as described above. Soil lithology, headspace readings, sample intervals and related information, and other data collected from the borehole will be recorded by a geologist on a Boring Log form as described in Section 1.4.5.2.

2.4.4.2 *Drilling Methods*

The primary drilling methods at site will be direct-push technology (DPT), hollow stem auger, mud rotary, and sonic; however, other methods may be utilized as needed. Permanent monitoring wells will be installed using either DPT, hollow stem auger, mud rotary, and/or sonic drilling methods depending upon the drilling location and/or drill rig accessibility issues. Penetrations through the interior concrete slab for soil sampling and interior SSV monitoring points will be made using a concrete corer.

Direct Push Technology Borings

Soil borings can be advanced and samples collected using DPT sampling tools attached to steel rods. In this method, sampling tools are pushed into the subsurface without the need to drill boreholes. Soil samples can be collected from a sampler lined with acetate sleeves from such DPT borings. DPT boring locations will be abandoned using bentonite pellets, bentonite chips, or grout when the sample point is no longer needed. Additional details regarding borehole abandonment are provided in the Section 1.4.9.

Hollow Stem Auger

Permanent monitoring wells installed in the shallow zone may be installed using continuous flight hollow stem augers (8 1/2-inch outside diameter (O.D.) and 4 1/4-inch I.D. or other diameters as appropriate). In general, soil samples are collected for screening purposes at 5-foot intervals beginning at the land surface. Actual sample intervals, if proposed, will be determined in the field.

Mud Rotary

Drilling may be done using mud rotary with a bit if drilling into rock is warranted. Water mixed with a thickener, commonly bentonite, is used to remove borehole material and maintain the boring integrity during advancement. Typical boring diameters range from approximately 4-inches to 12-inches; however, other diameters may be required depending on work activities and site conditions.

Air Rotary

Drilling may be done using air rotary with a hammering bit if drilling into rock is warranted. Filtered air from an air compressor is used to remove borehole material during advancement. Prior to contact with drilling equipment or soils, the air passes through a filter or filters to remove particulates and lubricants. Typical boring diameters range from approximately 4-inches to 12-inches; however, other diameters may be required depending on work activities and site conditions.

Sonic Drilling

Drilling may be done using sonic drilling techniques. Sonic drilling rigs use a combination of mechanically generated vibrations and limited rotary power to penetrate the soil. The drill head, which is attached to the drill pipe, consists of two counter rotating, out-of-balance rollers which cause the drill pipe to vibrate. Resonance occurs when the frequency of the vibrations equals the natural frequency of the drill pipe. The resonance and weight of the drill pipe along with the downward thrust of the drill head permit easier penetration of the formation, without adding drilling muds or lubricating fluids.

2.4.5 Well Construction

Permits will be obtained from South Carolina (SC) Department of Health and Environmental Control (DHEC) for permanent monitoring well installations. Monitoring wells will be installed generally following the EPA Region 4 SESD Design and Installation of Monitoring Wells Guidance document (most current version) and the SC DHEC R.61-71 SC Well Standards (SCDHEC, June 2016).

Grouting will be done with a Portland cement slurry. The grout slurry will be mixed by pump recirculation or other acceptable methods. When thoroughly mixed, the slurry will be pumped into the borehole or annulus via a rigid tremie for larger bore wells.

2.4.6 Soil Sampling

Procedures for field screening and sample collection and preparation of soil samples are provided below.

2.4.6.1 *Field Screening*

Field screening methods for soils will include use of a PID to screen for organic vapors, visual inspection for evidence of staining, discoloration, and/or debris, and olfactory methods to detect usual or offensive odors.

Field staff will use the above methods in addition to knowledge of the source area being assessed in order to select sample locations as detailed in the Work Plan.

2.4.6.2 *Sample Collection and Preparation*

The equipment or sampling techniques listed below serve to maintain the integrity of the sample and will provide a sample representative of the matrix being sampled. Soil sample collection will generally following the EPA Region 4 SESD Soil Sampling Operating Procedure document.

DPT soil samples will be collected with an acetate lined Macrocore® sampler which will be four ft or five ft in length. Samples collected by hollow stem auger will be obtained using a slide hammer and 2-ft long split spoon sampler.

Surficial soil samples will be collected using a decontaminated stainless steel scoop, spoon, or hand auger as needed.

2.4.6.3 *Boring Logs*

The following procedures will be used to log soil borings:

- Logs will be prepared in the field, as borings are drilled, by a qualified, experienced geologist or engineer. Each log will be signed by the preparer.
- All log entries will be printed.
- Borehole depth information will be from direct measurements accurate to 0.25 ft.
- Logs will be prepared on standard drilling log forms.
- Relevant information blanks in the log heading shall be completed. If surveyed horizontal control is not available at the time of drilling, location sketches referenced by measured distances to prominent surface features, shall be shown on, or attached to, the log. Borings shall be flagged in the field to assist in additional sample collection should it be required.
- Borehole log scale shall be dependent upon the anticipated total borehole depth. Typical scales include 1-inch = 1-foot; 1-inch = 5 ft; 1-inch = 10 ft.

- Each material type encountered shall be described in the log form column.
- Unconsolidated materials shall be described as follows:
  - descriptive Unified Soil Classification System classification.
  - consistency of cohesive materials or apparent density of non-cohesive materials;
  - moisture content assessment, i.e., moist, wet, saturated, etc.;
  - color;
  - other descriptive features (bedding characteristics, organic materials, macrostructure of fine-grained soils; i.e., root holes, fractures, etc.); and
  - depositional type (alluvium, till, loess, etc.).
- Rock materials shall be described in accordance with standard geologic nomenclature, including:
  - rock type;
  - relative hardness;
  - density;
  - texture;
  - color;
  - weathering;
  - bedding;
  - fracture, joints, bedding planes, and cavities, including filling material and whether open or closed; and
  - other descriptive features (fossils, pits, crystals, etc.).
- Stratigraphic/lithologic changes shall be identified by a solid horizontal line at the appropriate scale depth on the log, which corresponds to measured borehole depth at which changes occur, measured and recorded to the nearest 0.25 foot. Gradational transitions, changes identified from cuttings or methods other than direct observation and measurement shall be identified by a horizontal dashed line at the appropriate scale depth based upon the best judgment of the logger.
- Logs shall clearly show the depth intervals from which samples are retained.
- Logs shall identify the depth at which water is first encountered, the depth to water at the completion of drilling and the stabilized depth to water. The absence of water in borings shall also be indicated. Stabilized water level data shall include time allowed for levels to equilibrate.
- Logs shall show borehole and sample diameters and depths at which drilling, or sampling methods or equipment change.
- Logs shall show total depth of penetration and sampling. The bottom of the hole shall be so identified on the log by solid double lines from margin to margin with the notation “bottom of hole”.
- Logs shall identify intervals of borehole instability, voids, and type and size of debris.

2.4.7 Groundwater Sampling

Table 1 presents the current schedule for monitoring well sampling. Sampling methodologies are discussed in the sections below.

2.4.7.1 *Purging and Sampling Methods*

Groundwater samples will be collected using low flow/low stress sampling methods using a peristaltic pump or similar low flow pump and flow through cell for field parameter measurement. The sampling will be conducted in accordance with EPA's Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures (EPA/540/S-95/504 dated April 1996). The procedure will generally be performed in the following manner:

1. Measure the water level in the well as described in Section 1.4.6.2 below.
2. Place the tube connected to the pump into the well so that the bottom of the tube is in the approximate center of the saturated portion of the well screen interval.
3. Connect the pump to the well tubing and begin to pump water through the flow through cell.
4. The pump rate should generally be in the range of 0.1 to 0.5 liters per minute (L/min). The flow rate should be adjusted such that the drawdown in the well is generally less than 0.3 ft, if possible. Depth to water measurements should be completed during the pumping to verify that the drawdown conditions are met. This drawdown goal may be difficult to achieve in certain formations and may be adjusted based upon site-specific conditions.
5. Record pH, conductivity, temperature, dissolved oxygen, and oxidation-reduction potential approximately every five minutes from the flow through cell. Purging will be considered complete when there are three consecutive measurements that meet the following stabilization criteria:
    i. pH - ± 0.2
    ii. DO - ±10 percent (%)
    iii. Conductivity - ±5%
    iv. ORP - ±20 millivolts (mV)
6. Once the field parameters have stabilized, a sample will be collected. For non-volatile analysis, the samples can be collected from the discharge of the pump head (before the flow through cell). For volatile organic carbon (VOC) analysis, the samples can be collected using the peristaltic pump "soda straw" method.

Purge water will be collected and containerized while the appropriate volume is being removed from the well. Containerized purge water will be stored on-site until it can be profiled and shipped off-site for disposal.

2.4.7.2 *Passive Diffusion Bag Sampler Collection Procedures*

Groundwater samples may be collected using polyethylene passive diffusion bags (PDBs) or Hydrasleeve® for analysis of VOCs at specified depths. The procedure is outlined below.

1. Don nitrile gloves and open the well casing. If surface water is in the well head, remove the water and discharge it to the ground surface (at a sufficient distance so the water does not run back into the well head).

2. Remove the inner cap of the well and measure the static water level from the top of the well casing using a clean electronic water level indicator and record the water level, date, and time in the field book.

3. Place a clean sheet of plastic sheeting on the ground surface around the well casing or on other working surfaces (e.g., work bench or bed of pickup truck) to prevent contamination of the PDBs or Hydrasleeve®.

4. Lower the probe of the calibrated water quality multi-meter to the top of the well screen interval. After allowing adequate time for the parameters to stabilize, record temperature, pH, dissolved oxygen, specific conductance, and redox potential. Repeat measurements at two-foot intervals to the bottom of the well. Record all field parameter measurements (by depth) in the field book and sample data sheet. For bedrock wells where water bearing fracture intervals were previously identified from borehole geophysical logs/cores, readings should be taken at fracture intervals, and more frequent measurements are not required. For some very deep wells, it may not be possible to obtain a probe with a cable of sufficient length to reach the bottom of the well. In these instances, samples should be collected from the midpoint of the screen using a bailer for field parameter measurement following retrieval of the PDBs or Hydrasleeve®.

5. Connect the PDB or Hydrasleeve® to a 1/8-inch nylon or polyethylene rope (or equivalent) with a stainless steel weight (note: weight should be heavy enough to deploy PDBs into the selected zone of well) and lower the PDB or Hydrasleeve® to the desired depth corresponding (corresponding to the lowest redox potential and/or dissolved oxygen levels). Measure the rope using a measuring tape to allow placement of the PDBs or Hydrasleeve® at the desired depth. If redox and dissolved oxygen values do not significantly vary (redox by more than + 5 mV and dissolved oxygen by + 0.5 milligrams per liter), deploy the PDBs or Hydrasleeve® approximately 1 to 2 ft from the bottom of the well.

6. PDBs should remain within the well for a minimum of two weeks prior to collection. This will allow equilibration of the water within the PDBs with the surrounding groundwater. Hydrasleeves® should be deployed a minimum of 48 hours prior to sample collection. This will minimize the potential for sediment entrainment and will allow water in the well that was disturbed during deployment to re-equilibrate.

7. Once the equilibration period has elapsed, remove the PDB or Hydrasleeve®.

8. Examine the surface of the sampler for evidence of algae/iron/other coatings and for tears in the membrane. Note any observations in the field logbook, and if tears are present, the sample should be rejected.

9. Remove the sampler from the weighted line. Remove any excess liquid from the exterior of the device in order to minimize the potential for cross-contamination.

10. The sample should be extruded from the PDB soon after removal [the PDB and/or Hydrasleeve® should not be exposed to heat (i.e., avoid prolonged exposure to sun)]. If dedicated discharge devices are provided with PDBs, insert into the PDBs to collect the VOC in laboratory provided containers. The discharge hole will be no larger than 0.15-inches in order to reduce volatilization loss. Alternatively, make a small incision in the top of the PDB or Hydrasleeve® with a clean retractable safety knife/scissors then transfer contents into the appropriate, properly labeled/preserved sample containers. Samples will be collected in the following order: VOCs, metals, and anions, then any other analytes. In general, PDBs are used only for sampling VOCs, where Hydrasleeves® may be used for obtaining samples for organic or inorganic analyses.

11. Following collection, each sample will be handled in accordance with the procedures described below. Further instructions can be found in the USEPA SESD Operating Procedure for Groundwater Sampling, Sections 3.6.2 and 3.6.3 (USEPA, April 2017).

2.4.7.3 *Water Level Measurements*

Water level measurements are used to determine the hydraulic head in monitoring wells. The depth of well measurement is used to calculate the volume of standing water in the well and to determine if the well is obstructed. These measurements will be performed in all site monitoring wells prior to groundwater sampling activities in order to provide an assessment of groundwater levels and flow direction at the site. Water level measurements will be collected in general accordance with the EPA Region 4 SESD Groundwater Level and Well Depth Measurement Operating Procedure.

An electric water level indicator will be used to collect water level measurements. Total depths of wells are measured by lowering the measuring device to the bottom of the well.

Procedures for cleaning water level measuring equipment are as follows:

Step	Procedure
1.	Wash with laboratory detergent and tap water.
2.	Rinse with tap water.
3.	Rinse with de-ionized water.
4.	Equipment should be placed in a polyethylene bag or wrapped with polyethylene film to prevent contamination during storage or transit.

2.4.8 Surface Water Sampling

Surface water samples will be collected directly into the sample container. The sampler will wade into the stream, facing upstream (if there is a current), and collect the sample without disturbing the bottom sediment. When multiple samples are collected from the same stream, the sampler will begin downstream and move upstream. During sample collection, the sampler will be careful not to displace the preservative from a pre-preserved sample container, such as the 40 milliliter (mL) VOC vial.

2.4.9 SSV Sampling

2.4.9.1 *Permanent SSV Monitoring Point Installation*

SSV monitoring points will be installed by first drilling a boring through the concrete slab at the SSV location using a concrete corer. The boring will be advanced to approximately 6-inches below the base of the concrete slab using a hammer drill. To construct the SSV sample point, a dedicated stainless steel vapor sample point fitted with a length of 0.25-inch diameter Teflon™ tubing will be inserted through the borehole and seated in the soil at the bottom of the boring. Filter sand will then be poured through the borehole around the vapor tip to approximately 4 to 5-inches below the top surface of the slab. Each SSV sample point will be completed by installing hydrated bentonite in the annular space around the sample tubing from the top of the sand to the approximate top surface of the concrete slab.

The vapor sample point will be completed to be permanent, unless site conditions limit the completion of a permanent sampling point. A Swagelok® tubing union will be permanently connected to the top of the SSV sample point so that the top of the union sits approximately 0.5-inches below ground surface (bgs). A bentonite and grout mixture will be placed around the SSV sample point to approximately 2-inches bgs. The permanent SSV sample points will be completed flush with the floor surface with a manhole cover set in concrete.

2.4.9.2 *Leak Check of SSV Points*

Following installation and prior to collection of the vapor samples, a leak check of each SSV monitoring point will be conducted. The leak check will be performed by first placing a shroud over each sample point, filling the shroud with helium gas, and using a helium gas detector to verify that the shroud is saturated with helium gas. Then, the sample points will be purged using a syringe and a three-way valve to collect purged vapor into a Tedlar® bag. The purged vapor will subsequently be analyzed using the helium gas detector to ensure that helium concentrations are less than 10% of the helium concentrations in the shroud. These leak checks will be completed prior to each sampling event (if the SSV Points are permanent).

2.4.9.3 *SSV Sampling*

Following a successful leak check, the SSV samples will be collected using laboratory-supplied sampling equipment including individually certified clean one-liter Summa canisters connected to flow regulators. The Summa canisters will be allowed to fill slowly using an airflow regulator over a period of approximately one-half hour at each location. The intake orifice of the flow regulator will be connected directly to the SSV sample point tubing using a ferrule nut to form an air-tight seal with the tubing. Vacuum readings will be recorded prior to and following the one-half hour sampling period to ensure adequate sample volume is collected.

As part of the sampling effort meteorological parameters will also be recorded at the beginning and end of sampling including:

- Ambient temperature (degrees Fahrenheit)
- Ambient pressure (in-Hg)

- Wind direction
- Wind speed

2.4.10 SVE System Sampling

2.4.10.1 *Influent Vapor Monitoring*

The influent vapor streams will be monitored at each SVE leg to evaluate total VOC concentrations entering the SVE system. Vapor samples will be temporarily collected into a one-liter Tedlar® bag utilizing a syringe and a three-way valve or a vacuum box sampler. The syringe or vacuum box sampler will be connected to the barbed brass sample port located on each SVE leg, upstream of the brass-control valve, utilizing ¼-inch Teflon tubing and 3/8-inch silicon tubing. Note that the sample ports and SVE legs do not need to be purged as they are under constant flow and vacuum during SVE system operation. Once the Tedlar® bag and all associated tubing is connected, all valves will be opened prior to filling the bag utilizing the system vacuum to evacuate any residual air within the tubing, bag, and fittings. The bag will then be filled using the syringe or vapor box sampler. After the Tedlar® bag is filled, the vapor inside the bag will be measured for total VOCs (ppm) by connecting directly to a PID where the peak measurement will be recorded on the SVE system inspection form. After PID measurement is recorded, the vapor inside the bag will be evacuated utilizing the system vacuum. These steps will be repeated for each SVE leg beginning with the leg which historically exhibits lowest concentrations and ending with the leg which historically exhibits the highest concentrations to minimize potential of cross-contamination.

2.4.10.2 *Effluent Vapor Sampling*

Analytical samples will be collected from the effluent stream to evaluate the concentrations and mass of site-specific VOCs being removed by the SVE system. The effluent samples will be collected from a barbed brass sample port located on the SVE blower exhaust (immediately downstream of the SVE blower). The samples will be collected using laboratory-supplied sampling equipment including individually certified clean 1.4-liter Summa canisters and airflow regulators. The Summa canisters will be allowed to fill at a rate not exceeding 200 ml/min using an airflow regulator over a period of approximately five minutes (5-min controller). The intake orifice of the airflow regulator will be connected directly to the effluent sample port using ¼-inch Teflon tubing, 3/8-inch silicone tubing, and a ferrule nut to form an air-tight seal with the tubing. The Summa canister vacuum gauge readings will be recorded at the beginning of sampling and at the end of the five-minute sampling period to ensure adequate sample volume is collected. Sampling will be stopped when the vacuum gauge reads -5 inches of mercury (in-Hg) to ensure the sample remains under vacuum during shipment to the laboratory. The sample ID, date, and collection time will be recorded on the SVE system inspection form along with system parameters such as discharge temperature and flowrate.

As part of the sampling effort meteorological parameters will also be recorded at the beginning and end of sampling including:

- Ambient temperature (degrees Fahrenheit)
- Ambient pressure (in-Hg)
- Wind direction

- Wind speed

2.4.11 Abandonment

Soil borings or other temporary sample points will generally be abandoned with bentonite and/or grout. Then surface conditions will be patched to match the surrounding area (e.g. concrete or asphalt).

Should monitoring wells need to be abandoned, the abandonment procedures will be conducted in accordance with the SCDHEC R.61-71 SC Well Standards (SC DHEC, June 2016).

2.4.12 Investigation Derived Waste

Soil cuttings generated during the site assessment activities will be containerized in either 55-gallon steel drums or lined roll-off containers and staged on-site. A composite sample will be collected from the drums and/or roll-off containers and sent for laboratory analysis of toxicity characteristic leaching procedure (TCLP) VOCs and TCLP Metals. Upon receipt of the analytical results, the waste will be characterized for proper off-site disposal. Decontamination water generated during the RI activities will be containerized, sampled, and disposed off-site. Prior to off-site disposal, the decontamination water will be analyzed for total VOCs. Well development/purge water will be characterized using sampling results from the monitoring wells, if acceptable by the disposal facility.

Management of investigation-derived waste (IDW) and sampling of the IDW will be handled in general accordance with the EPA Region 4 SESD Management of Investigation Derived Waste and Waste Sampling Operating Procedure.

2.5 Sample Handling and Analysis

This section presents general sample handling and analysis methods.

2.5.1 Sample Containers and Shipping

Sample containers, preservation methods, and holding times that meet EPA standards will be used. New containers will be used in collection of samples, with the exception of laboratory supplied individually certified clean Summa Canisters in Section 1.4.9 and 1.4.10. Water samples for VOC analyses will be acidified prior to sample collection.

Sample container requirements of solid and liquid samples intended for chemical analyses will be in accordance with laboratory protocols. The sample container will be filled completely to minimize air space.

For delivery of samples to the laboratory, the following procedure will be implemented and will generally follow the EPA Region 4 SESD Packing, Marking, Labeling, and Shipping of Environmental and Waste Samples Operating Procedures.

1. Collect and preserve the samples as outlined herein.

2. Place sample containers in laboratory shipping container(s). Samples will be packed securely in a cooler with packing material and ice to protect sample containers from accidental breakage during shipment and so that the samples do not leak or spill.
3. If samples must be chilled, fill watertight bags supplied by lab with enough ice to last the trip and place bags on top of sample bottles.
4. Complete the chain-of-custody forms.
5. Tape chain-of-custody form to the inside of the shipping container lid.
6. Seal shipping container.
7. Deliver or ship to the laboratory. Fastest available shipping methods will be used whenever required by short holding times or project schedules.
8. Responsibility for proper use of containers and preservatives is the duty of the On-Site Coordinator and the Project Laboratory Coordinator.

2.5.2 Analytical Methods

The analytical procedures utilized in soil, groundwater, surface water, and vapor monitoring at the Site will conform to the protocols as follows:

- VOCs by EPA Method 8260D/TO-15
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270E
- Select Metals (including cadmium, total chromium, copper, lead, nickel, silver, and zinc) by EPA Method 6010D
- Resource Conservation and Recovery Act (RCRA)S Metals (including arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury) by EPA Method 6010D/7470A/7471B
- Total organic carbon (TOC) by EPA Method 9060A
- Nitrate, Sulfate, and Chloride by EPA Method 9056A
- Methane, Ethene, and Ethane by Method RSK-175
- Hexavalent chromium by EPA Method 7199A
- pH by EPA Method 9045D

The analytical parameters including holding times, preservatives, and container types for each parameter are as specified in the specific analytical method.

2.6 Sample Custody

The Field Sampling Technician performing sample collection activities will be responsible for sample custody in the field. The Laboratory Sample Custodian and analysts will be responsible for custody of the sample at the laboratory. Sample custody including chain-of-custody and transfer of custody will generally follow the EPA Region 4 SESD Sample and Evidence Management Operating Procedure.

2.6.1 Field Chain-of-Custody

Prior to collecting samples in the field, the Field Sampling Technicians will obtain the sample bottles necessary for the field operation. Field samplers will label each sample collected, filling in the appropriate information in waterproof ink. The field sampler will be responsible for collecting the samples and for logging the samples into assigned field notebooks. Chain-of-Custody forms will accompany sample containers to document the transfer of the containers from field collection through shipping to the laboratory and receipt by the laboratory. A sample container is under custody in the field if one of the following conditions exist:

- It is in the field investigator's actual possession;
- It is in the field investigator's view after being in his/her physical possession;
- It was in the field investigator's physical possession and then he/she secured it to prevent tampering; or
- It is in a secure area restricted to authorized personnel only.

The field sampling technicians will complete and verify the Chain-of-Custody. A copy of the Chain-of-Custody will be placed in the project files and the original will accompany the shipped samples. Overnight carrier shipping label numbers will be included on the Chain-of-Custody form at the bottom along with the company name of the carrier. The identity of field duplicate samples will not be disclosed to the Analytical Laboratory.

2.6.2 Transfer of Custody

Shipping containers will be sealed and accompanied by the Chain-of-Custody record, with appropriate signatures. The transfer of custody is the responsibility of the Field Sampling Technicians and the laboratory.

2.6.3 Laboratory Custody Procedures

In the laboratory, a sample custodian will be assigned to receive the samples. Upon receipt of a sample, the custodian will inspect the condition of the samples, reconcile the sample(s) received against the Chain-of-Custody record, log in the sample(s) in the laboratory log book, and store the sample(s) in a secured sample storage room or cabinet until assigned to an analyst for analysis.

The sample custodian will inspect the sample for leakage from the container. A leaky multi-phase sample will not be accepted for analysis as this sample would no longer be a representative sample. The custodian will examine whether the sample bottle seal is intact or broken, since a broken seal may mean sample tampering and may make analytical results inadmissible in court as evidence. The Laboratory Coordinator will be promptly notified of broken seals so that appropriate action may be taken (e.g., collect another sample).

Discrepancies observed between the samples received, the information on the Chain-of-Custody record, and the sample analysis request sheet will be resolved before the sample is assigned for analysis. The Laboratory Coordinator will be informed of any such discrepancy as well as its resolution. Results of the inspection will be documented in the laboratory sample log book. Discrepancies will be documented in the analytical case narrative, as appropriate.

2.6.4 Sample Labels and Seals

A self-adhesive sample label will be affixed to each sample bottle before sample collection. At a minimum, the sample label will contain the following:

- Client - job name/project number;
- Sample ID;
- Date and time collected (except for duplicate samples);
- Sampler's initials; and
- Preservatives added.

If coolers of samples are shipped to a laboratory, a Custody Seal will be placed on the cooler after it is sealed with tape.

3.0 FIELD QUALITY ASSURANCE SAMPLES

Field quality control (QC) checks will be utilized during sample collection through the use of the following:

Trip Blanks - These blanks consist of ultra-pure/laboratory grade water supplied by the laboratory contained in VOC sample containers and preserved similar to VOC samples. These samples serve as a QC check on potential external contamination and/or cross-contamination between VOC samples during shipping and storage. A trip blank will accompany the sampling team during sample collection and the samples during shipment for each cooler of VOC water samples sent to the laboratory. A trip blank will also be analyzed as part of the SSV and SVE sampling. The trip blank consists of a Summa canister prepared by the laboratory which will accompany the sampling containers during shipment and sampling but will not be opened. This will evaluate if compounds of concern may have been introduced at the laboratory.

Rinseate Blanks - These are samples of ultra-pure/laboratory grade water supplied by the laboratory which have been in contact with decontaminated sampling and/or drilling equipment. These samples serve as a QC check on the decontamination procedure. One rinseate blank will be collected for every 20 samples, per sample equipment type, per matrix.

Field Duplicate Samples - Duplicate samples will be collected to allow determination of analytical repeatability. At a minimum, one duplicate sample for every 10 groundwater samples and for every 10 soil samples will be collected and submitted for analysis for the same parameters as specified for the parent sample. The duplicate sample for the SSV sample will be collected simultaneously with one of the SSV samples utilizing a “T”.

Matrix Spike Sample - A matrix spike sample will be submitted as a further QC check. The matrix spike sample is actually a laboratory analytical QC item which is discussed here because sufficient sample must be collected in the field in order to perform these analyses. One matrix spike and one matrix spike duplicate sample will be collected for every 20 samples for soil, groundwater, and surface water matrix. These samples will allow the amount of recovery of spike compounds (the spike compounds are defined in the analytical protocols, where applicable) to be determined for matrix effects specific to the study site, through the addition of known concentrations of compounds into the sample at the laboratory and then performing the analysis. The level of added constituent incorporated into QC samples will also be consistent with appropriate analytical protocol. The matrix spike samples will be collected from areas of suspected low compound concentrations.

Duplicate and matrix spike samples will be acquired from groundwater by collecting grab samples concurrent with the collection of the actual sample. Soil samples will be homogenized prior to placement into a clean sample container. Homogenization will be performed by mixing a soil aliquot large enough to fill the sample container (and duplicate and matrix spike containers, if applicable) in a stainless steel or glass bowl. This homogenization procedure is performed due to the tendency of soil samples to be non-homogeneous with respect to contaminant levels. Samples collected for volatile organic compound analyses will not be homogenized because of potential loss of analytes due to volatilization during the homogenization process.

4.0 LABORATORY CALIBRATION PROCEDURES

4.1 Laboratory Calibration

The calibration procedures to be used for this project are summarized below will generally follow the analytical protocols to be utilized as noted in each laboratory's Quality Assurance Manual and Standard Operating Procedures.

4.2 Instrument Performance and Tune

Prior to analysis of each set of samples and on a daily basis during the analysis (or as otherwise required), it will be demonstrated that the instrument meets the operating performance standards established in the appropriate analytical protocol. If an instrument does not meet the performance standards, it will be tuned until the performance criteria are achieved.

4.3 Calibration Curve

For analyses of VOCs, SVOCs, and metals will be calibrated prior to the analysis of each batch of samples by analyzing known mixtures of the group of compounds metals, anion analytes, or other appropriate calibration material as required by the applicable protocols. Instrument calibration will be verified daily, or as required in each analytical protocol. A new calibration curve will be established if the response observed in the analysis of the continuing calibration check standard varies outside of prescribed protocol limits.

5.0 PREVENTIVE MAINTENANCE

The maintenance procedures discussed in the following subsections will be performed to maximize efficiency and minimize downtime in the laboratory and while working on the site.

5.1 Field Instrument Preventive Maintenance

The equipment used in the field for measurements for this project may include a pH meter, conductivity meter, DO meter, redox potential meter, turbidity meter, water level indicator, and organic vapor analyzer. Specific preventive maintenance procedures to be followed for field equipment are those recommended by the manufacturer or the rental supplier.

Routine daily maintenance procedures conducted in the field will include the following:

- Removal of surface dirt and debris from exposed surfaces of the sampling equipment measurement systems.
- Storage of equipment away from the elements.
- Daily inspections of sampling equipment and measurement systems for possible problems (e.g., cracked or clogged lines or tubing; weak batteries).

5.2 Laboratory Instrument Preventive Maintenance

As part of its Quality Assurance/Quality Control (QA/QC) program, a routine preventive maintenance program will be conducted by the contract laboratory to minimize the occurrence of instrument failure and other system malfunctions. The program should include an internal group to perform routine scheduled maintenance, and to repair or to coordinate with the vendor for the repair of all instruments. All laboratory instruments are maintained in accordance with manufacturer's specifications under service contracts.

Specific routine maintenance procedures, preventive maintenance procedures, and maintenance logs for all analytical instruments used to analyze samples for this project will be documented/maintained by the laboratory. This documentation will be available for review if requested by the project staff. Additional details of laboratory instrument preventative maintenance are provided in the Laboratory Quality Assurance Manual.

6.0 QUALITY CONTROL DATA CHECKS

6.1 Field Data Quality Control

At the end of each field event, the Project Manager or designee will review the field logbooks used by project personnel to check that tasks were performed as specified herein. Specific items to be reviewed include:

- Samples collected in proper locations;
- Field equipment calibration procedures documented in field book and in accordance with acceptance criteria;
- Proper sampling techniques used;
- Field QA/QC requirements followed; and
- Samples analyzed for correct parameters.

6.2 Laboratory Data Quality Control

Upon receipt of laboratory analytical reports, the Project Manager or designee will review the chain-of-custody and analytical data to ensure proper analytical methods were requested and analyzed by the laboratory. Additionally, the Project Manager will check the laboratory QC data to ensure accuracy of the data. Specific items to be reviewed include:

- Chain of Custody
- Sample receipt
- Holding times
- Blanks
- Laboratory control samples
- Field Duplicates
- Surrogate recoveries
- Matrix Spike/Matrix Spike Duplicates
- Initial and continuing calibration
- Data assessment/data usability

Field and laboratory data will be reviewed, verified and validated to ensure that the information collected is of sufficient quantity and quality to support the project-specific objectives. Raw data and data-entry errors will be detected by standard QA/QC review consisting of 1) an initial review by the technician generating the report or spreadsheet; 2) a second review conducted by project or senior level personnel; and 3) a final review by the Project Manager. Reduced data will be checked by manual calculations on a spot-check basis in a like manner. In general, data validation for solid and aqueous samples will be conducted in accordance with the United States Environmental Protection Agency (USEPA) National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, January 2017), USEPA National Functional Guidelines for Organic Superfund Methods Data Review (USEPA, January 2017), and Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium (USEPA, July 2014) and in accordance with the provided laboratory limits for vapor samples. .

Equations, calculations, data transfers, consistent units, and significant figures will be subject to the quality assurance review.

7.0 SURVEYING

Following installation of new monitoring wells at the site, the top of casing elevations and the horizontal locations of the new wells will be surveyed. Additionally, the ground surface elevations and horizontal position of soil borings and sub-slab vapor sample locations will be surveyed. All surveying will be performed by a Professional Surveyor licensed in SC. Horizontal locations will be referenced to the SC State Plane coordinate system North American Datum of 1983 (NAD83). Vertical positions will be referenced to the North American Vertical Datum of 1988 (NAVD 88).

8.0 REFERENCES

South Carolina Department of Health and Environmental Control (SC DHEC), June 2016. R.61-71 South Carolina Well Standards. Publication R. 61-71, Document 4571, Volume 40, Issue 6.

United States Environmental Protection Agency (USEPA) Science and Ecosystem Support Division (SESD) Field Branches Quality System and Technical Procedures document (http://www.epa.gov/region4/sesd/fbqstp/).

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United States Environmental Protection Agency (USEPA), January 2017. USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review. Publication #EPA-540-R-2017-001.

United States Environmental Protection Agency (USEPA), January 2017. USEPA National Functional Guidelines for Organic Superfund Methods Data Review. Publication #EPA-540-R-2017-002.

United States Environmental Protection Agency (USEPA), July 2014. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium (SW-846), Update V.

United States Environmental Protection Agency (USEPA) Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, April 1996. Publication # EPA/540/S-95/504.

Table 1
Monitoring Well Sampling Schedule
Revised Sampling and Analyses Plan
Delavan Spray Technologies Site
Bamberg, South Carolina

Well Number	Well Diameter (Inches)	Depth Zone	Screen Interval (ft bgs)	Field Water Quality Indicator Parameters	VOCs[1]	Passive Sampler Dimensions	Proposed Sampling Frequency
Off-Site Background Areas							
MW-17	2	Shallow	13-28	X	X	1.5x30HS	Biennial
MW-18	2	Shallow	11-26	X	X	1.5x30HS	Annual
On-Site Background Areas							
MW-4	2	Shallow	4-14	X	X	1.5x30HS	Biennial
Wooded Areas of Interest							
MW-9	2	Shallow	5-20	X	X	1.5x30HS	Semi-Annual
MW-9D	2	Deep	44-49	X	X	1.5x30HS	Biennial
MW-10	2	Shallow	3-18	X	X	1.5x30HS	Semi-Annual
MW-10D	2	Deep	43-48	X	X	1.5x30HS	Semi-Annual
MW-11	2	Shallow	3-18	X	X	1.5x30HS	Biennial
Manufacturing Areas							
MW-1	2	Shallow	3-18	X	X	1.5x30HS	Semi-Annual
MW-2	2	Shallow	3-18	X	X	1.5x30HS	Semi-Annual
MW-3	2	Shallow	3-18	X	X	1.5x30HS	Semi-Annual
MW-3D	2	Deep	44-49	X	X	1.5x30HS	Semi-Annual
MW-3D1	2	Deep	75-85	X	X	1.5x30HS	Biennial
MW-5	2	Shallow	4-14	X	X	1.5x30HS	Annual
MW-6	2	Shallow	4-14	X	X	1.5x30HS	Biennial
MW-7	2	Shallow	5-20	X	X	1.5x30HS	Annual
MW-8	2	Shallow	5-20	X	X	1.5x30HS	Semi-Annual
MW-12D	2	Deep	40-50	X	X	1.5x30HS	Semi-Annual
MW-13D	2	Deep	40-50	X	X	1.5x30HS	Semi-Annual
MW-19	1	Shallow	5-20	X	X	1.5x30HS	Semi-Annual
MW-20	1	Shallow	5-15	X	X	0.75x30PDB	Semi-Annual
MW-21	2	Shallow	19-34	X	X	0.75x42PDB	Semi-Annual
MW-21D	2	Deep	43-53	X	X	1.5x30HS	Semi-Annual
MW-24	2	Shallow	6-21	X	X	1.5x30HS	Semi-Annual
MW-37	1.25	Shallow	11.8 - 21.8	X	X	0.75x42PDB	Semi-Annual
Downgradient Off-Site Areas							
MW-14	2	Shallow	5-20	X	X	1.5x30HS	Annual
MW-14D	2	Deep	40-50	X	X	1.5x30HS	Semi-Annual
MW-15	2	Shallow	4-19	X	X	1.5x30HS	Biennial
MW-15D	2	Deep	35-45	X	X	1.5x30HS	Biennial
MW-15D1	2	Deep	75-85	X	X	1.5x30HS	Biennial
MW-16	2	Shallow	4-19	X	X	1.5x30HS	Biennial
MW-16D	2	Deep	35-45	X	X	1.5x30HS	Biennial
MW-22D	2	Deep	38-48	X	X	1.5x30HS	Annual
MW-23D	2	Deep	40-50	X	X	1.5x30HS	Biennial
MW-25D	2	Deep	52-62	X	X	1.5x30HS	Semi-Annual
MW-26D	2	Deep	38-48	X	X	1.5x30HS	Annual
MW-27	2	Shallow	19 - 29	X	X	1.5x30HS	Annual
MW-28	2	Shallow	19 - 29	X	X	1.5x30HS	Annual
MW-29	2	Shallow	19 - 29	X	X	1.5x30HS	Biennial
MW-30D	2	Deep	50 - 60	X	X	1.5x30HS	Semi-Annual
MW-31D	2	Deep	50 - 60	X	X	1.5x30HS	Semi-Annual
MW-32DR	2	Deep	50 - 60	X	X	1.5x30HS	Semi-Annual
MW-33D	2	Deep	64 - 74	X	X	1.5x30HS	Semi-Annual
MW-34D	2	Deep	69.4 - 79.4	X	X	1.5x30HS	Semi-Annual
MW-35D	2	Deep	64.2 - 74.2	X	X	1.5x30HS	Semi-Annual
MW-36D	2	Deep	53.9 - 63.9	X	X	1.5x30HS	Semi-Annual

Table 1
Monitoring Well Sampling Schedule
Revised Sampling and Analyses Plan
Delavan Spray Technologies Site
Bamberg, South Carolina

Well Number	Well Diameter (Inches)	Depth Zone	Screen Interval (ft bgs)	Field Water Quality Indicator Parameters	VOCs[1]	Passive Sampler Dimensions	Proposed Sampling Frequency
Surface Water Samples							
SW-01-LC	Lemon Creek at intersection with Broxton Bridge Rd (US Hwy 601)						
SW-02-LC	Lemon Creek at intersection with Main Hwy (US Hwy 301)						
SW-03-HMB	Halfmoon Branch at intersection with Main Hwy (US Hwy 301)						
SW-04-TLC	Tributary to Lemon Creek at intersection the powerline right-of-way						
SW-05-LC	Lemon Creek Downstream						
Total Count							
Totals for all analytes							
Investigation Derived Waste Samples							
IDW-1	Composite sample from drums for waste profiling[2]						

Notes:

bgs - below ground surface
IDW - investigation-derived waste
MNA - monitored natural attenuation
MS - matrix spike
MSD - matrix spike duplicate
QA/QC - quality assurance / quality control
[1] - TCL VOCs by Method 8260D.
[2] - of TCL VOCs (8260D), TCL SVOCs (8270E) and Priority Pollutant Metals (6010D/7470A)
[3] - rinseate blanks are not expected since all downhole sampling equipment is disposable.

Passive Sampler Unit Dimensions:

1.5x30HS - Hydrasleeve 1.5" Diameter and 30" Long
0.75x30PDB - Passive Diffusion Bag 0.75" Diameter and 30" Long
0.75x42PDB - Passive Diffusion Bag 0.75" Diameter and 42" Long

Table 2
Residential Well Sampling Schedule
Revised Sampling and Analyses Plan
Delavan Spray Technologies Site
Bamberg, South Carolina

Well Number	Northing	Easting	Most Recent Date Sampled	Field Water Quality Indicator Parameters	Select VOCs[1]
Off-Site Downgradient Residential Wells					
13 LCT	521,777.44	1,980,979.28	11/11/2021	X	X[2]
343 LCR	521,781.76	1,983,136.63	10/21/2020	X	X[2]
410 LCR	522,190.29	1,982,839.98	11/11/2021	X	X[2]
448 LCR	522,812.26	1,982,941.79	11/11/2021	X	X[2]
546 LRC-A	522,763.93	1,982,312.22	11/11/2021	X	X[2]
546 LRC-B	522,749.18	1,982,009.42	11/11/2021	X	X[2]
684 LCR	522,330.63	1,981,464.80	11/11/2021	X	X[2]
689 LCR	521,999.66	1,981,367.01	11/11/2021	X	X[2]
698 LCR	522,126.61	1,981,350.46	4/19/2018	X	X[2]
715 LCR	521,988.89	1,981,329.98	11/11/2021	X	X[2]
743 LCR	521,785.78	1,981,156.32	11/11/2021	X	X[2]
Totals					
Totals for all analytes				11	22
QA/QC Samples					
Trip Blank	one per cooler per shipment			-	1

Notes:

GAC - granular activated carbon

QA/QC - quality assurance / quality control

VOCs - volatile organic compounds

[1] - PCE, TCE, cis-1,2-DCE and vinyl chloride by Method 524.2

[2] - This well has a GAC treatment unit installed. Samples will be collected both pre- and post-treatment.