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Quality Assurance Project Plan (Revision ~~3~~4)

Section A: Project Management

A1 Title and Approval Page

Quality Assurance Project Plan
Addendum to the SCDHEC UST Programmatic QAPP
For
Plantation Pipe Line Company/Site ID No. 18693

Lewis Drive, Belton, Anderson County, South Carolina

Prepared by: CH2M HILL Engineers, Inc. (CH2M)

Date: February 9, 2015
Revised: February 8, 2018
CH2M HILL Engineers, Inc. (CH2M)

Approvals

Bobbi Coleman
SCDHEC Project Manager
_____ Date_____
Signature

Jonathan Grimes
Contractor QA Manager
_____ Date 2/9/2018
Signature

William Waldron
Contractor Project Manager
_____ Date 2/9/2018
Signature

Tom Wiley
Plan Preparer
_____ Date 2/9/2018
Signature

Other signatures may be required and should be added as directed by SCDHEC UST Management Division.

A2 Table of Contents

A3 Distribution and Project Organization List

Name	Title/Role from UST Master QAPP	License/ Number/ Exp. date	Organization/Address	Telephone Number	Email Address
Bobbi Coleman	SCDHEC Technical Project Manager		SCDHEC, UST Management Division, 2600 Bull St., Columbia, SC, 29201	803-898-0673	colemabj@shec.sc.gov
Jonathan Grimes~~Thomas Kessler~~	Senior Technical Consultant/Lead Hydrologist	PG/ 2235/6/30/ 19	CH2M Embassy Row 400 6600 Peachtree Dunwoody Road NE, Suite 600 Atlanta, GA 30328	678-530-4146~~678-530-4197~~	jgrimes@ch2m.com~~Thomas.Kessler@CH2M.com~~
William Waldron	Contractor Project/Site Manager		CH2M 3120 Highwoods Blvd Suite 214 Raleigh, NC 27604	919-760-1777	wwaldron@ch2m.com
Tom Wiley	Site Assessment Manager		CH2M Embassy Row 400 6600 Peachtree Dunwoody Road NE, Suite 600 Atlanta, GA 30328	678-530-4388	twiley@ch2m.com
~~Jonathan Grimes~~	~~Lead Hydrologist~~	~~PG/ 2235/6/30/ 19~~	~~CH2M Embassy Row 400 6600 Peachtree Dunwoody Road NE, Suite 600 Atlanta, GA 30328~~	~~678-530-4146~~	~~jgrimes@ch2m.com~~
Gerald Couch	Contractor Field Team Leader		CH2M Embassy Row 400 6600 Peachtree Dunwoody Road NE, Suite 600 Atlanta, GA 30328	678-488-8837	Gerald.Couch@ch2m.com
Chris McCord	Laboratory Manager		ESC Lab Sciences 12065 Lebanon Rd Mt. Juliet, TN	704-614-2660	bkroll@esclabsciences.com
Bill Barnes	Drilling Manager	Driller/ 562-A/ 6/30/17	AE Drilling 2 United Way Greenville, SC 29607	864-288-1986	mjohnson@aedrilling.com
James Pearsall	Surveyor	Surveyor/ 27458/ 6/30/18	Taylor Wiseman & Taylor 700 Forest Point Circle Suite 166 Charlotte, NC 28273	704-527-2535	pearsall@taylorwiseman.com
~~Justine McCann~~	~~Geologist~~		~~CH2M Embassy Row 400 6600 Peachtree Dunwoody Road NE, Suite 600 Atlanta, GA 30328~~	~~678-530-4347~~	~~Justine.McCann@ch2m.com~~

Name	Title/Role from UST Master QAPP	License/ Number/ Exp. date	Organization/Address	Telephone Number	Email Address
Melissa Warren	Biologist		CH2M Embassy Row 400 6600 Peachtree Dunwoody Road NE, Suite 600 Atlanta, GA 30328	678-530-4316	Melissa.Warren@ch2m.com
Ryan Brown	Engineer		CH2M Embassy Row 400 6600 Peachtree Dunwoody Road NE, Suite 600 Atlanta, GA 30328	678-530-4055	Ryan.Brown2@CH2M.com
Paula Kramer	Engineer		CH2M 3120 Highwoods Blvd Suite 214 Raleigh, NC 27604	919-760-1754	Paula.Kramer@ch2m.com
Micheal Tekle	Geologist		CH2M Cullman Building 14120 Ballantyne Corporate Place Suite 200 Charlotte, NC	704-544-4028	Micheal.Tekle@ch2m.com
Matthew Sumner	Geologist		CH2M Cullman Building 14120 Ballantyne Corporate Place Suite 200 Charlotte, NC	517-515-9358	Matt.Sumner@ch2m.com

It is understood that certification records must be produced if requested by SCDHEC. All personnel listed on the Distribution and Project Organization List in Section A3 have received the most recent version of the Site-Specific Quality Assurance Project Plan for the Plantation Pipe Line Lewis Drive Release and the UST Management Division Quality Assurance Program Plan (QAPP).

A4 Problem Definition/Background

Discuss the background (as much as is known) of the site and appropriate historical information, and why this site is being assessed.

- Plantation Pipe Line Company (Plantation) operates a 26-inch fuel transmission line that passes along the western edge of Lewis Drive near Belton, Anderson County, South Carolina. On December 8, 2014, a fuel release occurred on the 26-inch the line approximately 600 feet north of the intersection of Lewis Drive and W Calhoun Road (State RD S-4 205) (Figure 1). Between December 8, 2014 and February 2, 2015, Plantation determined the release to be gasoline with a minor amount of diesel, Plantation and its contractors repaired the pipeline, installed product recovery sumps, product recovery wells, temporary wells, and product interceptor trenches upgradient of Brown's Creek (Figure 1). Between December 2014 and February ~~2017~~2018, Plantation and its contractors have installed ~~60~~ 70 monitoring wells, 36 piezometers, and a sparging remediation system consisting of 45 vertical wells and 3 horizontal wells. Figure 1 also illustrates the extent of product as of ~~May~~ December ~~2016~~2017.
- Impacts to groundwater have been contained, with the exception of a small area where impacted groundwater flows to Brown's Creek. Through the groundwater monitoring network at the site, the vertical and horizontal extents of petroleum hydrocarbons in soil and groundwater have been

sufficiently defined such that a corrective action plan can be developed. The lateral extent of impacts to groundwater extend in three directions from the release point: to the north approximately 900 feet into an adjacent hay field; to the northeast approximately 1,000 feet to Brown's Creek; and to the south approximately 300 feet to Calhoun Road. The vertical extent of impacts outside the plume boundaries are defined by bedrock monitoring wells located to the north, south, east, and west.

- The results of a local well survey performed in December 2014 indicate no public or private water wells are being used within a 1,000-foot radius of the edge of the dissolved plume. Potable water is supplied to the surrounding area by the City of Belton. A 10-inch water supply main runs along West Calhoun Road.
- Minor impacts to surface water in Brown's Creek have occurred in the area where impacted groundwater discharges to Brown's Creek. Surface water analytical data indicate that benzene is the only compound present at a concentration exceeding DHEC water quality standards. These exceedances are currently limited to location SW-12. Numerous downstream sampling locations have not had hydrocarbon detections since the discovery of the release.

Please answer the following: Does this project fall under UST or Brownfields area?

- The site has never operated USTs, but this release will be regulated by rules promulgated under the SCDHEC UST Management Division.

A5 Project/Task Description

1. Summarize what is known about the work to be done. This can be a short sentence indicating what the Scope of this project is (see Master QAPP Section A6).
   - The work proposed includes: 1) the installation of additional overburden monitoring wells and bedrock monitoring wells to evaluate the distribution of dissolved hydrocarbons in groundwater along the periphery of the product body area, 2) the establishment of additional surface water sampling stations to monitor surface water quality in Cupboard Creek and Browns Creek and wetland area that borders the southern edge of the site; 3) the installation of up to 16 vertical bedrock sparging wells within the shallow bedrock layer to allow the injected air to be distributed via the same fracture network that transmitted impacts to groundwater in this zone.

2. Are there any time or resource constraints? Include those factors that may interfere with the tentative schedule.
   - Constraints may include weather, equipment failure/availability, subcontractor availability, and property access.

A6 Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs)

Detail the geographical area that is to be part of the project. Maps should be included to show not only the topography and the geographical area of the State, but also to show more detail of the site itself including property lines.

- Figure 2 shows the locations of existing ~~and proposed~~ monitoring wells and sparging wells. Figure 3 shows the locations of surface water sampling points.

Monitoring Well Installation and Development

Regolith Monitoring Well Construction

The regolith monitoring wells will be constructed as Type III 2-inch diameter monitoring wells, and will be constructed in accordance with SCDHEC Well Standards R.61-71 and SOP A1 of Appendix A. All wells will be drilled and constructed by a South Carolina certified well driller in accordance with 40-23-10 seq. The wells will be drilled using hollow-stem auger (HSA). The wells will be constructed using 10 to 15 feet of 2-inch inside diameter (ID) Schedule 40 polyvinyl chloride (PVC) well screen and a variable amount of 2-inch ID Schedule 40 PVC riser. The screen will have a slot size of 0.010-inches, and the screen will be positioned to straddle the water table to allow product (if present) to enter the well, and to account for seasonal fluctuations of the water table. Sand pack will be placed in the annular space between the borehole and well screen and will be brought to a height 2-feet above the top of the well screen. A 2-foot bentonite seal will be placed above the sand pack and will be hydrated. The seal will be allowed to hydrate for a minimum of 1-hour before placing grout above the seal. A grout seal containing Portland cement mixed with 3 to 5 percent bentonite will be placed above the grout seal by forced injection via tremie pipe and will be brought to within 1-foot of ground surface.

Hand Installation of Regolith Monitoring Well

At one location near Brown's Creek, it was determined that installing a well was not feasible using a mechanical drill rig, due to steep slopes and ditches and unstable ground surface (super saturated soils). Therefore, the well (MW-34) will be installed using a hand auger due to site access issues.

The borehole will be advanced to a target depth of approximately 5 feet using a hand auger to create a nominal 4-inch diameter borehole. During borehole advancement, soil samples will be field screened for VOCs using a photoionization detector and characterized for lithology using the soil cuttings collected from the auger bucket.

The well will be constructed using 2.5-feet of schedule 40 PVC 2-inch prepacked internal diameter (ID) by 2.8-inch OD well screen and a variable amount of 2-inch ID Schedule 40 PVC riser. The screen will have a slot size of 0.010-inches. Additional sand pack shall be placed in the annular space between the borehole and prepacked well screen and shall be brought to a height 0.5-foot above the top of the well screen. A bentonite seal with a minimum thickness of 12-inches shall be placed above the sand pack and shall be hydrated. The seal shall be allowed to hydrate for a minimum of 1-hour before placing grout above the seal. A grout seal of at least 1-foot length, containing Portland cement mixed with 3 to 5 percent bentonite shall be placed above the grout seal and shall be brought to within 1-foot of ground surface.

The aboveground completion will be constructed above grade using a 6-inch diameter, approximately 3-feet high, locking anodized aluminum protective well casing set in a cylindrical concrete pad. The concrete pad will extend 1 ft above and 1 ft below the ground surface to ensure a better surface seal and protect the well from flooding. A weep hole will be drilled in the protective casing.

Bedrock Monitoring Wells

The five bedrock wells will be constructed as Type I wells (open hole in bedrock aquifer). The wells will be constructed in accordance with SCDHEC Well Standards R.61-71 and SOPs A2 and A3 of Appendix A. All wells will be drilled and constructed by a South Carolina certified well driller in accordance with 40-23-10 seq. The wells will be drilled using a combination of HSA, rock coring, and air rotary or hammer. In each case, HSA drilling techniques will be used to drill through the regolith until auger refusal is encountered. A temporary casing will be installed and NQ-sized rock coring advanced until competent bedrock is encountered, as defined by a rock quality designation of 75% or greater. Following completion of rock coring, a nominal 10-inch borehole will be advanced 5 to 10 feet into competent bedrock. A six-inch steel casing will be installed in the borehole and grouted in place using by a forced-injection method via tremie pipe. Once the grout has cured for a minimum of 24 hours, a nominal 6-inch borehole will be advanced using air rotary or air hammer techniques approximately 10 to 20 feet or until the first water bearing fracture is encountered.

Well Completions (Regolith and Bedrock)

The wells will be finished as either flush-mount completions, or aboveground locations depending on specific well location requirements and installed in accordance with SOPs A1 and A2 of Appendix A Flush-mount wells will be installed in areas that are subject to vehicle and/or equipment traffic (roads, lawns), and while aboveground completions will be installed in areas not subject to vehicle/equipment traffic (peripheral edge of field), or in areas where a flush-mount well would be difficult to locate (woods). The flush-mount wells will be constructed using a watertight 8-inch diameter well vault set in a 2-foot square concrete pad recessed to surrounding grade. The aboveground completions will be constructed using a locking well vault set in a 2-foot square concrete pad that is surrounded by four, steel bollards.

Each well will be secured with a locking well cap. In addition, a durable, weatherproof, rustproof, name plate that contains the following information will be affixed to the well vault:

- Company name and certification number of the driller who installed the well
- Date the well was completed
- Total depth (feet bTOC)
- Casing depth (feet bTOC)
- Screen interval (feet bTOC)
- Well identification

Well Development

The wells will be developed by the well driller using a one or more of the following techniques:

- Airlift
- Surge block and well pump

The wells will be developed until the water produced is clear and free of sediment in accordance with SOPs A1 and A2 of Appendix A

A7 Certification

The following laboratory will be used for this project:

Commercial Lab(s)

Full Name of the Laboratory: ESC Lab Sciences
Name of Lab Director: Eric Johnson
SCDHEC Certification Number: 84004002

Please note: SCDHEC may require that the contractor submit some or all of the Laboratory's SOPs as part of this QAPP.

A8 Documents and Records

Personnel will receive the most current version of the QAPP Contractor Addendum and UST QAPP via:

(Check all that apply)

_X_ US Mail __Courier _X_ Hand delivered

Other (please specify):_____

Table 2A

Record Identification, Storage, and Disposal

Record	Produced By	Hardcopy/ Electronic	Storage Location For how long?	Archival
Monitoring Report	CH2M	Hardcopy and electronic copies to be provided to SCDHEC	Five years from date of report	Electronic copy is stored on CH2M and PLANTATION network

Section B Measurement/Data Acquisition

B1 Sampling Process/Experimental Design

Table 3A
Sampling Activities

Task	Start Date	End Date	Comments
QAPP revision preparation and submittal	~~May 8~~December 18, 2017	~~May 26, 2017~~February 9, 2018	
QAPP approval		June 9, 2017	
Monitoring well and bedrock sparging well installation and development	July 10, 2017	July 21, 2017	
Surface water sampling and analysis	June 26, 2017	Upon approval by DHEC or project completion	
Groundwater Sampling and analysis	June 27, 2017	Upon approval by DHEC or project completion	
Surveying	July 20, 2017	July 21, 2017	

Note: This schedule assumes regulatory approval by June 9, 2017

B2 Sampling Methods

Please note: The contractor must follow sampling protocols as given in the UST QAPP.

Estimate the number of samples of each matrix that are expected to be collected:

Matrix	Number of Samples (per event)
Groundwater from monitoring wells	26
From surface water	~~16~~17
Duplicate samples	3
Field blanks	5
Trip blanks	6
Total number of samples	~~56~~57

The samples will be (check all that apply): _x_Grab ___Homogenized _x_Split

- Sample collection will be performed in accordance with the media specific requirements and techniques outlined in the SCDHEC UST Division Programmatic QAPP (~~May 2015~~February 2016).
- HydraSleeve™ sampling techniques, in accordance with SOP A4 of Appendix A, will be used to collect groundwater samples from the monitoring wells for laboratory analysis. If there is not a sufficient water column in a well to fully submerge the HydraSleeve™ then low-flow purging and sampling techniques will be used to collect the groundwater samples, as described below.
- Low flow purging techniques, in accordance with SOP A5 of Appendix A, will be used to collect groundwater samples from the monitoring wells for laboratory analysis, when HydraSleeve™ sampling techniques are not feasible. During purging and sampling drawdown will be no greater than 4-inches, and the tubing will be placed ~~as close to the top of the water column as possible~~within the screened interval of the well. Groundwater samples will be collected from the monitoring wells using low-flow purging and sampling techniques no earlier than seven days after well development to ensure that the aquifer is fully recovered.
- If HydraSleeve™ or low flow sampling techniques with peristaltic, submersible, or bladder pumps are not feasible (possibly due to a limited water column and/or a water level depth exceeding 25 feet [typical peristaltic pump limitation]), then multi-volume purge techniques, using a bailer or submersible pump will be considered. If the well is purged to dryness, sampling will occur as soon as adequate volume has recovered.
- The surface water samples will be collected in accordance with SOP A6 of Appendix A, by dipping the sample bottles into the creek at each sampling station to fill the bottles. Sampling will begin at the most downstream location and proceed to the most upstream location to eliminate the effects of streambed disturbance on sample integrity.

If homogenized or split are checked please indicate how will it be done and the equipment needed.

- Duplicate samples of groundwater will be collected by dividing the bailer volumes or pumped water volumes (if low-flow sampling techniques used) into separate container sets.

If decontamination procedures differ from Appendix H, please provide details.

- Decontamination procedures will be performed in accordance with the procedures described in Appendix H.

Identify any equipment and support facilities needed. This may include such things as Fed-ex® to ship the samples, a Geoprobe®, field analysis done by another contractor (who must be certified), or electricity to run sampling equipment.

- CH2M field staff will transport samples directly to the shipping carrier (i.e., FedEx®) following standard chain-of-custody (CoC) procedures.

Address the actions to be taken when problems occur in the field, and the person responsible for taking corrective action and how the corrective action will be documented.

Table 4A
Field Corrective Action

Failure	Response	Documentation	Individual Responsible
PID does not calibrate or malfunctions	Re-calibrate. Follow trouble-shooting guide in manual and contact rental company. If unable to calibrate and/or instrument functions erratically return meter and obtain replacement meter.	Document in Field Notebook	Field personnel
Groundwater multi-meter (pH, temperature, conductivity, redox)	Re-calibrate. Follow trouble-shooting guide in manual and contact rental company. If unable to calibrate and/or instrument functions erratically return meter and obtain replacement meter.	Document in Field Notebook	Field personnel
Interface Probe does not function properly	Following trouble-shooting guide in manual and contact rental company. If instrument functions erratically return meter and obtain replacement meter.	Document in Field Notebook	Field personnel
All remaining equipment	Re-calibrate. Follow trouble-shooting guide in manual and contact rental company. If unable to calibrate and/or instrument functions erratically return meter and obtain replacement meter.	Document in Field Notebook	Field personnel

B3 Sample Handling and Custody

1. How will the samples get from the Site to the Lab to ensure holding requirements are met?
   - FedEx® or other overnight courier. Additionally, field staff may hand deliver samples to laboratory.

2. If sample preservation procedures differ from the UST Programmatic QAPP, please provide details.
   - No deviation from UST Programmatic QAPP.

3. If chain of custody procedures differ from the UST Programmatic QAPP, please provide details.
   - No deviation from UST Programmatic QAPP.

B4 Analytical Methods

1. Identify the SOPs which will be used to analyze the samples, the method which the SOP references and the equipment or instrumentation that is needed:

Table 5A
Analytical SOPs and Referenced Methods

Parameter	Method Referenced	Comments/SOP
Soils		
BTEX, naphthalene	EPA Method 8260B	Volatile Organic Compounds by GC/MS (EPA 8260B, 8260C, 624 and SM6200B) Rev. 23, 10/18/2016*
Groundwater		
BTEX Naphthalene MTBE 1,2-DCA	EPA Method 8260B	Volatile Organic Compounds by GC/MS (EPA 8260B, 8260C, 624 and SM6200B) Rev. 23, 10/18/2016*
Surface Water		
BTEX, naphthalene	EPA Method 8260B	Volatile Organic Compounds by GC/MS (EPA 8260B, 8260C, 624 and SM6200B) Rev. 23, 10/18/2016*
Water Quality Parameters		
Turbidity Dissolved Oxygen Specific Conductance Temperature pH		Parameters collected using a YSI 6920 multimeter or equivalent. DO measurements also collected using a YSI- Pro ODO meter**

*Included as SOP A7 in Attachment A

**Included as SOP A8 in Attachment A

2. Provide SOPs for the Kerr Method or the Ferrous Iron Method if these are parameters for this study. This can be attached or written here. If attached please note that it is an attachment and where it is located (if applicable).
   - Not applicable.

B5 Quality Control Requirements:

All QC will follow the requirements laid out in Section B5 of the UST Programmatic QAPP. If procedures for QC differ from the UST Programmatic QAPP, please provide details.

B6 Field Instrument and Equipment Testing, Inspection and Maintenance

1. Identify all field equipment needing periodic maintenance, the schedule for this, and the person responsible.

Table 6A
Instrument and Equipment Maintenance

Instrument	Serial Number	Type of Maintenance	Frequency	Person responsible
YSI 6920 v2 Multi-meter or equivalent	TBD as equipment is rented	Ensure instrument is able to accurately correlate with calibration standards	Monthly	Vendor Equipment Manager (i.e., Pine Environmental)
Solinst Model 122 Oil Water Interface Probe or equivalent	TBD as equipment is rented	Ensure instrument is able to accurately correlate with calibration standards	Monthly	Vendor Equipment Manager (i.e., Pine Environmental)
MiniRAE 3000 PID PGM 7320 or equivalent	TBD as equipment is rented	Ensure instrument is able to accurately correlate with calibration standards	Monthly	Vendor Equipment Manager (i.e., Pine Environmental)
MultiRAE +4 gas meter PGM 66228 or equivalent	TBD as equipment is rented	Ensure instrument is able to accurately correlate with calibration standards	Monthly	Vendor Equipment Manager (i.e., Pine Environmental)
GeoPump™ Peristaltic Pump Series II	TBD as equipment is rented	Ensure pump suction and battery voltage	Monthly	Vendor Equipment Manager (i.e., Pine Environmental)
QED 1.75 Bladder Pump	TBD as equipment is rented	Control box pressure check, leakage check, and cycle check	Monthly	Vendor Equipment Manager (i.e., Pine Environmental)
In-Situ Rugged TROLL 100	TBD as equipment is rented	Battery check	Yearly	Vendor Equipment Manager (i.e., Pine Environmental)

B7 Instrument Calibration and Frequency

1. Identify equipment, tools, and instruments for field or lab work that should be calibrated and the frequency.
2. Describe how the calibrations should be performed and documented, indicating test criteria and standards or certified equipment.
3. Identify how deficiencies should be resolved and documented. Identify the person responsible for corrective action.

Table 7A

Instrument Calibration Criteria and Corrective Action

Instrument	Serial Number	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA
YSI 6920 v2 Multi-meter or equivalent	TBD as equipment is rented	Procedures adheres to standards outlined in manual for instrument	Daily	Within 0.01 of calibration standard	Re-calibrate; then replace probes or instrument	Field personnel
Solinst Model 122 Oil Water Interface Probe or equivalent	TBD as equipment is rented	Procedures adheres to standards outlined in manual for instrument	Manufacturer calibration	Manufacturer calibration – accurate to 0.01-feet	Return to vendor than obtain replacement	Field personnel
MiniRAE 3000 PID PGM 7320 or equivalent	TBD as equipment is rented	Procedures adheres to standards outlined in manual for instrument	TBD per manufacturer recommendations	0.5 ppm	Re-calibrate; then replace lamp, filters or instrument	Field personnel
MultiRAE +4 gas meter PGM 66228 or equivalent	TBD as equipment is rented	Procedures adheres to standards outlined in manual for instrument	TBD per manufacturer recommendations	0.5 ppm	Re-calibrate; then replace lamp, filters or instrument	Field personnel

* This can be a full name of a SOP, an abbreviation, or a number. In the latter two cases, the abbreviation or number must be associated with the full name of the SOP.

B8 Inspection/Acceptance Requirements for Supplies and Consumables

1. If procedures for storage, handling or transport of supplies/consumables differ from the UST Programmatic QAPP, please provide details.
   - No deviation from SCDHEC UST Programmatic QAPP.

B9 Data Acquisition Requirements (Non-Direct Measurements)

1. Identify data sources, for example, computer databases or literature files, or models that should be accessed or used.
2. Describe the intended use of this information and the rationale for their selection, i.e.,
3. Provide its relevance to the project.
4. Indicate the justification criteria for use of these data sources and/or models.

Table 8A
Non-Direct Measurements

Data Source	Used for	Relevance	Justification for use in this project	Comments
Tax Map and utility maps	Determine/verify property ownership and utility locations	Used to ensure contact property owners and obtain access to property – determine locations and depths of utilities	Site access and evaluate depth of utility with respect to hydrocarbons	
USGS and SCDHEC Databases	Obtain geologic information and water resource information	Understanding of site stratigraphy and well records	Evaluate local stratigraphy beneath site and obtain well construction details	

5. Identify key resources/support facilities needed.
   - Not applicable.

B10 Data Management

1. Describe the data management scheme from field to final use and storage.

   - The samples collected will be recorded on the laboratory Chain-of-Custody (CoC) form as well as documented in the field logbook by the sample collection team. The samples and CoC will be relinquished to the laboratory following standard CoC methodology. Following analysis, the laboratory will perform internal data validation. The laboratory will issue a written report and submit an electronic copy to via email. The electronic copy will be stored on CH2M's computer network in a file dedicated to the Lewis Drive project.

2. How does the lab and field staff ensure that no unauthorized changes are made to the chain of custody, sampling notebooks, laboratory notebooks and computer records?

   - Documents will be noted with written or electronic signature and date/time stamp. A review of all written and electronic documents by a project team member who has been assigned this task by a project leadership member to ensure integrity of the project documents.

3. CoC forms, sampling notebooks and sample collection summary sheets will be completed in the field with indelible ink. Any changes to the CoC that is not marked through and initialed will be flagged by the laboratory and an inquiry will be made. The procedures for laboratory record keeping are included in the laboratory QAM which can be provided upon request.

   - Paper copies generated during field activities will be scanned and stored electronically on CH2M's networks that are backed up each day on to an off-site tape drive. All paper copies will be maintained in project files in a secure building with 24-hour, restricted access.

4. How does the lab ensure that there are no errors in samples records including times when sample information is compiled, data calculated and/or transmitted?

   - When the laboratory receives samples for analysis, a "Review of Sample Login" report is created by the sample custodian and is reviewed by the laboratory project manager (PM) for errors. If problems are encountered, the laboratory PM contacts the CH2M PM and a corrective action is agreed upon and then corrected by the laboratory PM.

5. How will the data be archived once the report is produced? How can it be retrieved? (This applies to both electronic and hard copies).

   - The laboratory will store readily available electronic copies online for two years through the laboratory's "My ESC" web link. After two years, the reports will be archived electronically on-site or off-site for an additional eight years. The archived reports can be retrieved by the laboratory through an IT request. Each project is given a unique number and is entered into an archive log to allow for retrieval. Hard copies are scanned in .pdf format and are stored electronically on the CH2M server with the same unique number as the hard copy.
   - CH2M assigns a unique project number to each project which is stored in sequential order by project number at the branch and are stored at a secure, restricted access location for a minimum of 5-years.

Section C Assessment and Oversight

C1 Assessment and Response Actions

1. The Contractor is supposed to observe field personnel daily during sampling activities to ensure samples are collected and handled properly and report problems to DHEC within 24 hours. Please state who is responsible for doing this, what observations will be made, and how those observations will be made. Will this person have the authority to stop work if severe problems are seen?

   - All CH2M employees working on this project will verify that the samples are collected and handled properly. Additionally, all CH2M employees working on this project have the authority to stop work, report the problem and effect a correction that is agreed upon by the CH2M PM.

2. The SCDHEC UST QAPP states that the Laboratory will receive an Offsite Technical System Audit. For this project, what assessments will be done by the Contractor on the Commercial Lab(s) that are being used—other than their certification audit? When or how often are these done? Who will the results be given to and who has the ability to stop work if problems are severe?

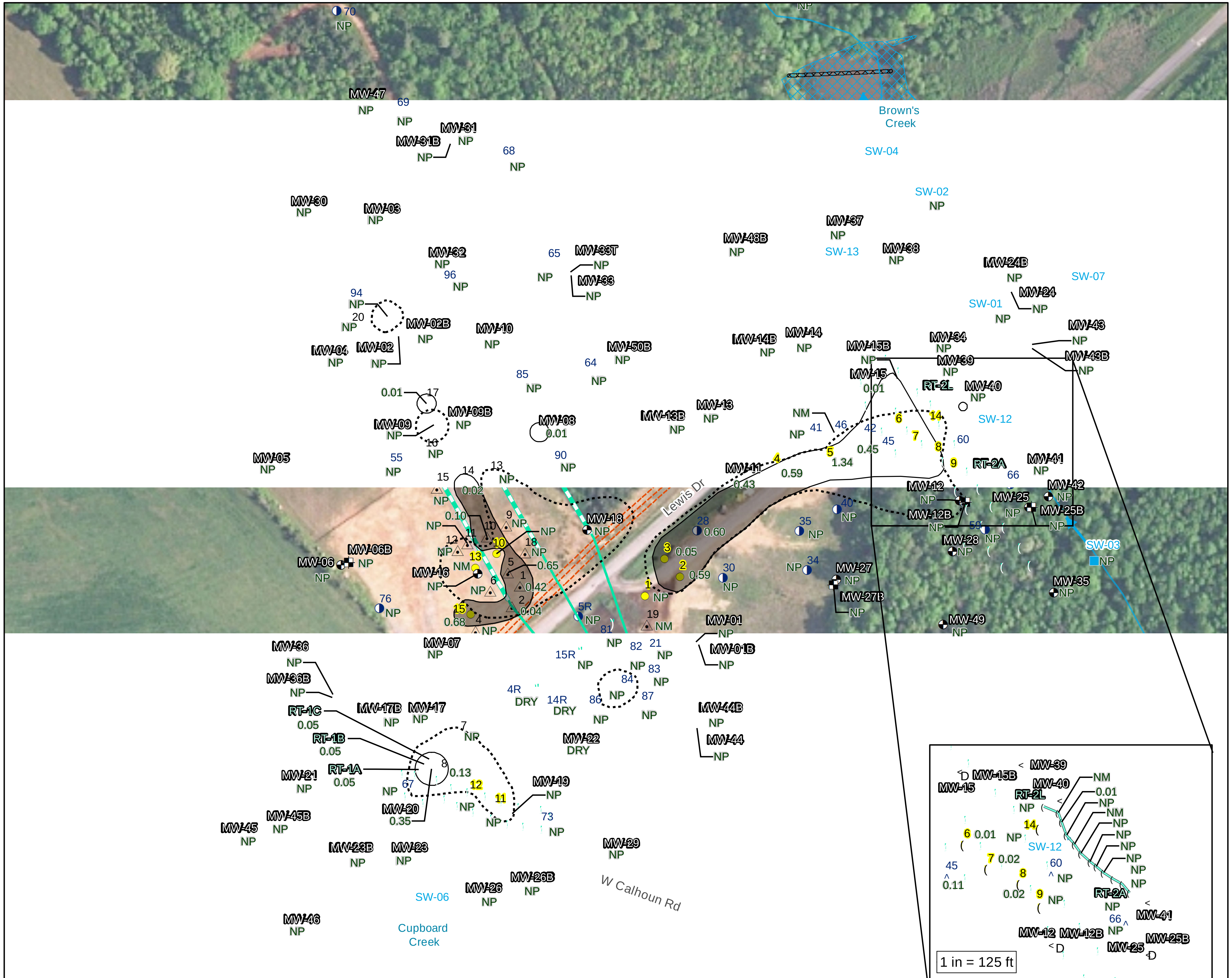
   - The laboratory participates in semi-annual proficiency testing through an approved vendor, Phenova. The results of this proficiency testing are provided to the SCDHEC Office of Environmental Laboratory Certification. The laboratory is accredited by the SCDHEC Office of Environmental Laboratory Certification, and performs internal audits annually for each department in compliance with the laboratory's quality program.

C2 Reports to Management

See the SCDHEC UST Programmatic QAPP (UST Master QAPP).

Section D Data Validation and Usability

See the SCDHEC UST Programmatic QAPP (UST Master QAPP).



LEGEND

- Release Point
- Monitoring Well
- Bedrock Monitoring Well
- Seep Location
- Recovery Sump
- Piezometer ("R" indicates Replacement)
- Recovery Well (4-inch diameter)
- Vertical Bedrock Sparging Well
- Vertical Saprolite Sparging Well
- Surface Water Sampling Location
- Septic Tank
- Recovery Trench Extraction Point
- Recovery Trench
- Surface Water Flow Direction
- Horizontal Sparging Well Riser
- Horizontal Sparging Well Screen
- Pipeline
- National Hydrography Dataset Stream
- Delineated Wetland
- Beaver Dam
- Detail Area
- Approximate Extent of Product > 0.01' Thickness based on 6/10/2016 data (data not shown)
- Approximate Extent of Product > 0.01' Thickness base on 12/21/17 and 12/27/17 data

0.32 Product thickness in feet as of 12/21/2017 and 12/27/2017

NP No product detected

NM Not measured

Base Map Sources:
*USDA, Farm Service Agency (FSA), National Agriculture Imagery Program (NAIP), Published 8/19/ 2015
*United States Geological Survey (USGS) National Hydrography Dataset (NHD)

0 175 350
Scale in Feet

Figure í. Product Thickness Map u Œ îìíó
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Belton, South Carolina
Site ID #18693 "Kinder Morgan Belton Pipeline Release"

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