

Delivered via FedEx Overnight

Bruce Crawford
Underground Injection Control Program
2600 Bull Street
Columbia, SC 29201

June 3, 2019

**Subject: Submittal of UIC Permit Application for Direct-Push Injections
Lewis Drive Site, Plantation Pipe Line Company, Belton, Anderson County, South Carolina
Site ID #18693, "Kinder Morgan Belton Pipeline Release"**

Dear Mr. Crawford,

On behalf of Plantation Pipe Line Company, Jacobs Engineering Group Inc. (Jacobs) is submitting the enclosed materials to apply for an underground injection control (UIC) permit to conduct direct-push injections of Oxygen Biochem (OBC) at the Plantation site located at 112 Lewis Drive, Belton, Anderson County, South Carolina. The proposed injection event includes 64 direct-push technology injection locations in two areas of the site: 40 injection locations upgradient of Cupboard Creek and 24 injection locations upgradient of Brown's Creek. The enclosed materials (Attachments A through K) provide the necessary details related to implementing the proposed direct-push injection event.

If you have any questions or concerns regarding this application submittal, please contact me at (678) 530-4388.

Regards,


Tom Wiley
Site Manager

William M. Waldron
Program Manager

Enclosures:

- UIC Permit Application for Proposed Direct-Push Injection Event
- Attachments A-K for Proposed Direct-Push Injection Event

cc: Bobbi Coleman/South Carolina Department of Health and Environmental Control
Jerry Aycock/Plantation Pipe Line Company (via email at Jerry_Aycock@kindermorgan.com)

Form I UIC	 Underground Injection Control Permit Application Ground-Water Protection Division (Collected under the Authority of Title 48 Chapter I of the 1976 South Carolina Code of Laws)	I. EPA ID NUMBER		
			T/A	C
		U		

**Read attached instructions before starting.
For Official Use Only**

Application Approved month day year	Date Received month day year	Permit Well Number

Comments

II. Facility Name and Address			III. Owner/Operator and Address		
Facility Name Lewis Drive Release Site (Site ID #18693)			Owner/Operator Name Plantation Pipe Line Company		
Street Address 112 Lewis Drive			Street Address 1000 Windward Concourse, Suite 450		
City	State	Zip Code	City	State	Zip Code
Belton	South Carolina	29627	Alpharetta	Georgia	30005-5440

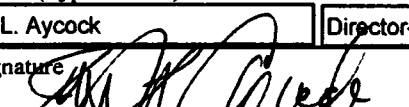
IV. Ownership Status (Select One)	V. SIC Codes
<input type="checkbox"/> A. Federal <input type="checkbox"/> B. State <input checked="" type="checkbox"/> C. Private <input type="checkbox"/> D. Public <input type="checkbox"/> E. Other (Explain)	4613

VI. Well Status (Select A, B or C)		
<input type="checkbox"/> A. Operating	Date Started (MM/DD/YYYY)	<input type="checkbox"/> B. Modification/Conversion <input checked="" type="checkbox"/> C. Proposed

VII. Type of Permit Requested - Class and Type of Well (see reverse)			
A. Class(es) enter code(s) V.A	B. Type(s) enter code(s) I	C. If class is "other" or type is code 'Y', explain	D. Number of Wells per type 64 DPT Injection locations

VIII. Location of Wells or Approximate Center of field or Project									
C	A. Latitude					B. Longitude			
1	Deg 34	Min 32	Sec 41.3 N			Deg 82	Min 30	Sec 24.9 W	

IX. Attachments
Complete the following questions on a separate sheet(s) and number accordingly; see instructions for Classes 11, 111, and V, complete and submit on a separate sheet(s) attachments A-U as appropriate. Attach maps where required. List attachments by letter which are applicable and include with your application.

X. Certification			
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment.			
A. Name (Type or Print) Jerry L. Aycock		Title Director-EHS	
B. Phone No. (770) 751-4165		C. Signature 	
D. Date Signed (MM/DD/YYYY) 05/31/2019			

Well Class and Type Codes

Class I Industrial, municipal, and other injection wells for the subsurface disposal of fluids. (Prohibited)

Class II Oil and gas production and storage related injection wells.

Type "D" Produced fluid disposal well
"R" Enhanced recovery well
"R" Hydrocarbon storage well (excluding natural gas)
"X" Other Class II wells

Class III Special process injection wells.

Type "G" Solution mining well
"S" Sulfur mining well by frasc process
"U" Uranium mining well (excluding solution mining of conventional mines)
"X" Other Class III wells

Class IV Hazardous or radioactive waste disposal injection wells. (Prohibited)

Class V.A Injection wells not included in Class I, II, III, IV or V.B

Type "A" Storm runoff drainage wells
"B" Aquifer recharge wells
"C" Salt-water intrusion barrier wells
"D" Subsidence control wells
"E" Backfill wells associated with subsurface mining
"F" Geothermal energy recovery wells
"G" Experimental technology well
"H" Natural gas storage wells
"I" Corrective action wells

Class V.B Non-contact return flow system wells

Type "A" Heat pump return flow wells
Type "B" Cooling water return flow wells

Instructions for Attachments to Form 1
Underground Injection Control
for Corrective Action Wells
(effective 01/91)

The following ATTACHMENTS should be submitted with an underground injection control (UIC) permit application for Class V.A. corrective action wells associated with aquifer remediation that are to be used to inject fluid whose chemical constituents are below all drinking water standards, as established under R.61-58.5.

Attachment A: Activity for Review

Submit a brief description of the activities to be conducted that require a UIC permit.

Attachment B: Well Construction Details

Submit schematic or other appropriate drawings of the surface and subsurface construction details of the recovery and injection wells.

Attachment C: Operating Data

Submit the following proposed operating data for each injection well:

- 1) Average and maximum daily rate and volume of fluid to be injected. In addition, indicate the average and maximum daily rate and volume of fluid to be withdrawn from each recovery well. Verification of the aquifer's hydraulic ability to produce and accept the quantities proposed should be presented.
- 2) Average and maximum injection pressure.
- 3) Pumping schedule (i.e. continuous, alternating cycles, etc.).
- 4) Proposed ranges in the concentration of all contaminant constituents within the injection fluid. Include comprehensive ground-water quality data from a "worst case" well sample.
- 5) Length of time the project is expected to require injection to complete remediation (to ensure the effective dates of the permit will allow sufficient time to complete the project).

Attachment D: Monitoring Program

Discuss the planned monitoring program in detail:

- 1) Include a discussion of monitoring devices, sampling frequency (sufficient to verify treatment system efficiency), sampling protocol, sampling location, parameters to be analyzed, and proposed method(s) of analysis.
- 2) This plan should indicate how, through monitoring, the proposed contaminant levels in the injectate will be verified.
- 3) This plan should also clearly illustrate exactly how hydraulic control of the contaminant plume (and injectate, where relevant) will be verified through monitoring (i.e., piezometers, quality analyses, etc.).

Attachment E: Existing or Pending State/Federal Permits

List the program and permit number of any existing State or Federal permits for the facility (i.e., NPDES, RCRA, UST, etc.).

Attachment F: Description of Business

Give a brief description of the nature of the business of the facility and any immediately adjacent facilities.

Attachment G: Area of Review

- 1) The area of review should be a fixed radius of 1/4 mile from the injection well, the outermost injection wells (if a wellfield).

- 2) If a fixed radius is not selected, the methods and the calculations used to determine the size of the area of review should be submitted.

Attachment H: Maps of Wells and Area of Review

- 1) Submit a topographic map of the area, extending one mile beyond the project property boundaries. This map should show all hazardous waste treatment, storage, or disposal facilities, and all intake and discharge structures associated with the project facility. Any known areas of soil and/or ground-water contamination within a one mile radius should be indicated. Also indicate all surface bodies of water, springs, mines (surface and subsurface), quarries, and other pertinent surface features such as residences, roads, and geologic faults (known or suspected).
- 2) A scaled map(s) should be included which shows the name and/or number and the location of **ALL** production, injection, monitoring, abandoned and dry wells within the area of review. This should be accomplished by file **and** field surveys. Information regarding the construction (i.e., total depth, diameter, casing/screened intervals, grouting, etc.) and the current status (i.e., actively used, temporarily abandoned, permanently abandoned) of **ALL** wells within the area of review should be submitted. If any wells have been abandoned, details on the method the wells were abandoned (i.e., cemented/grouted, filled with sand, etc.) should be included.
- 3) A potentiometric map of the project site should be submitted which accurately locates all monitoring wells and proposed recovery and injection wells and outlines the horizontal extent of both the free-phase contaminant (where applicable) and dissolved contaminant plumes. Include all water level and product thickness data. The date and time that water levels and product thicknesses were measured should be indicated.

Attachment I: Cross Sections/Diagrams

- 1) Geologic cross sections indicating the lithology and stratigraphy of the site and the horizontal and vertical extent of the contaminant plume, should be submitted. At least two stratigraphic cross sections, one parallel and one perpendicular to the horizontal ground-water flow direction, should be submitted. In areas where the site stratigraphy is complex, additional cross sections should be submitted to clearly illustrate the local conditions.
- 2) A schematic diagram, in the form of a cross section, showing the proposed remediation system with the components of flow (above and below ground) and all associated appurtenances (i.e., stripping tower, piping, wells, etc.).

Attachment J: Name and Depth of Underground Sources of Drinking Water (USDW's)

Identify and describe all aquifers which may be affected by the injection.

Attachment K: Hydraulic Control

- 1) Sufficient supporting data (i.e. time/drawdown data, Theis curves and methods, calculations, etc.), used to determine aquifer characteristics to verify **complete** hydraulic control over the contaminant plume (and injectate, if proposed injectate quality does not conform to classified ground-water standards) during injection should be submitted. At a minimum, values should be given for transmissivity, hydraulic conductivity, effective porosity and specific yield.
- 2) Demonstrate the presence and magnitude of, or the absence of, any vertical hydraulic gradient at the site. If a vertical hydraulic gradient exists, show how its direction and magnitude are incorporated in the calculations demonstrating hydraulic control.
- 3) Ground-water flow computer models (especially 2-D map view with potentiometric and flow lines) may be utilized and submitted. All calculations should be in English units. All model-derived data and maps should be properly labeled and keyed so as to be clearly understood.

Subsequent Action

After receipt of a complete Underground Injection Control Permit Application, the Department will make a determination to deny or issue a **Permit to Construct** the injection well(s). After the well(s) is/are constructed, the Department should be notified in writing of the well(s) completion and sent a copy of the completed well record form(s) signed by a South Carolina certified well driller which illustrates the "as built" well construction. If the system is in compliance with the approved application, the Department may then issue an **Approval to Operate**. This Approval to Operate is the final permission necessary prior to injection.

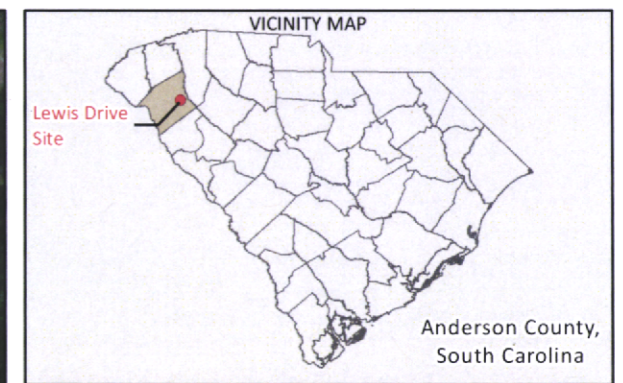
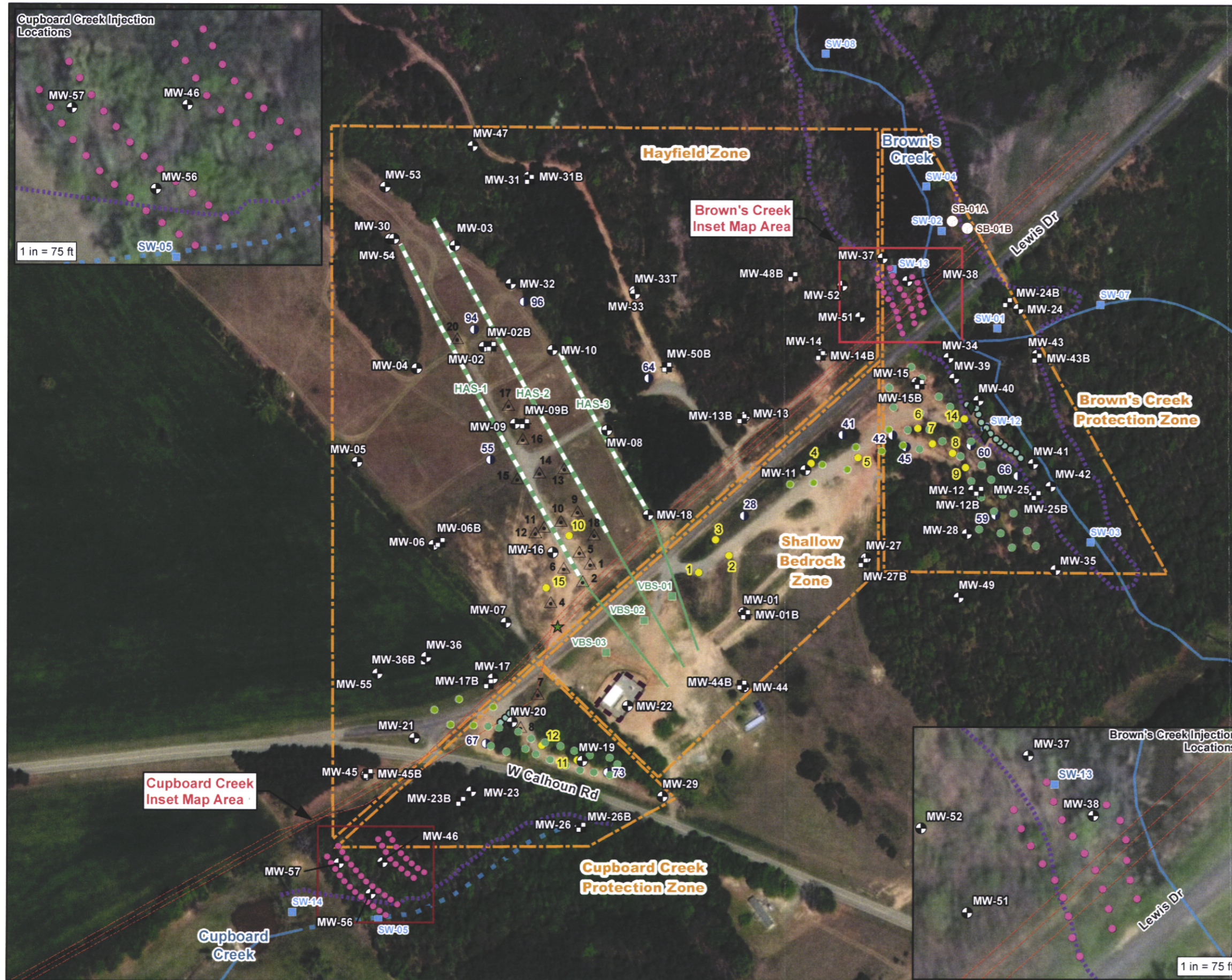
This underground injection control (UIC) permit is being submitted in regard to a proposed direct-push injection event at the Lewis Drive Release Site in Belton, South Carolina, referenced in South Carolina Department of Health and Environmental Control (DHEC) correspondence dated December 11, 2018 and January 22, 2019 which are included in this attachment. This injection event consists of injection locations near Brown's Creek and Cupboard Creek. During this injection event, Oxygen Biochem (OBC) will be delivered to the subsurface to prevent the migration of groundwater impacted by the Plantation Pipe Line release toward Brown's Creek and Cupboard Creek. The release occurred approximately 450 feet east of the intersection of Lewis Drive and West Calhoun Road, approximately 1- mile northwest of Belton, South Carolina.

The selected amendment is OBC™ supplied by Redox Tech, LLC. OBC is a mixture of sodium persulfate and calcium peroxide that supports a two-fold mechanism for treating petroleum hydrocarbons. OBC delivers a strong oxidant (sodium persulfate) in situ chemical oxidation in the short term as well as electron acceptors (oxygen and sulfate) for biological oxidation in the long term. The Safety Data Sheet for OBC is included within this attachment.

The proposed injection event includes a total of 64 direct-push technology (DPT) injection locations in two areas of the site. 40 injection locations upgradient of Cupboard Creek and 24 injection locations upgradient of Brown's Creek. Injection points will be spaced approximately 15 feet apart, perpendicular to groundwater flow. A Geoprobe direct-push drill rig will be used to deliver OBC solution from the top of bedrock (approximately 20 feet below ground surface [ft bgs]) to 5 ft bgs. Injection of OBC™ solution will be performed using a track-mounted Geoprobe direct-push drill rig. Proposed injection locations are included in **Figure A-1**.

At each injection location, approximately 600 pounds of OBC will be mixed with 360 gallons of potable water and delivered to the subsurface in 1- to 2-foot increments to ensure proper vertical distribution. Throughout the event, a total of 38,400 pound of OBC and 23,000 gallons of potable water will be delivered to the subsurface. Additional injection locations may be required to deliver the total quantity of OBC and water to the subsurface due to refusal or daylighting.

The nearest residence is currently about 1,300 feet southeast from the release point. The former residence at 112 Lewis Drive was 300 feet from the release point, but this property has been acquired by Plantation and is no longer occupied. No other facilities exist nearby, and, aside from the paved roads, the surrounding area is comprised of a mixture of pasture, forest, and wetlands. Baseline and performance monitoring will be performed with routine groundwater sampling events to evaluate the effectiveness of the system at reducing concentrations of the dissolved-phase hydrocarbons present in groundwater at the site.



LEGEND

- ★ Release Point
- Proposed Direct Push Injection Location
- ⊕ Residuum Monitoring Well
- ⊞ Bedrock Monitoring Well
- ⊙ Piezometer
- △ Recovery Sump
- Soil Boring Location
- Recovery Trench Point
- Recovery Well (4" diameter)
- Surface Water Sampling Location
- ◆ Seep Location
- Newly Installed Vertical Sparging Well
- Vertical Bedrock Sparging Well
- Vertical Saprolite Sparging Well
- Pipeline
- Horizontal Sparging Well Riser
- Horizontal Sparging Well Screen
- National Hydrography Dataset Stream
- Intermittent Stream
- Inspection Route for Sheen or Distressed Vegetation
- ⊞ AS System Compound
- ⊞ Remediation Zone

Base Map Sources:
 *Environmental Systems Research Institute (Esri)
 ArcMap World Imagery, 2017. Basemap features are approximate.
 *United States Geological Survey (USGS) National Hydrography Dataset (NHD)

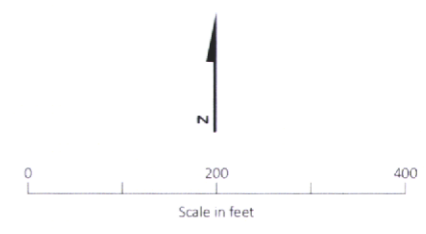


Figure A-1. Site Overview
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

REDOX TECH, LLC



"Providing Innovative In Situ Soil and Groundwater Treatment"

Material Safety Data Sheet – Oxygen BioChem

1. Identification

Product identifier	Oxygen Biochem (OBC)™
Other means of identification	Not available.
Recommended use	Oxygen Biochem (OBC)™ is used to promote chemical oxidation and aerobic bioremediation of petroleum compounds in groundwater.
Recommended restrictions	Use in accordance with supplier's recommendations.
Manufacturer/Importer/Supplier/Distributor information	
Manufacturer/Supplier	Redox Tech, LLC
Address	200 Quade Drive Cary NC 2751
Telephone	+1 919-6780140
E-mail	haselow@redox-tech.com
Contact person	Dr. John Haselowi
Emergency Telephone	For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531 CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards	Oxidizing solids	Category 3
Health hazards	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 2
	Sensitization, respiratory	Category 1
	Sensitization, skin	Category 1
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
OSHA defined hazards	Not classified.	
Label elements		



Signal word	Danger
Hazard statement	May intensify fire; oxidizer. Harmful if swallowed. Causes skin irritation. Causes serious eye irritation. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause an allergic skin reaction. May cause respiratory irritation.
Precautionary statement	
Prevention	Keep away from heat. Keep/Store away from clothing and other combustible materials. Take any precaution to avoid mixing with combustibles. Wear protective gloves/eye protection/face protection. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid breathing dust/fume. In case of inadequate ventilation wear respiratory protection. Contaminated work clothing must not be allowed out of the workplace. Use only outdoors or in a well-ventilated area.
Response	In case of fire: Use foam, carbon dioxide, dry powder or water fog for extinction. If swallowed: Call a poison center/doctor if you feel unwell. Rinse mouth. If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. If inhaled: If breathing is difficult, remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a poison center/doctor.

Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Sodium persulfate	7775-27-1	70 - 90
Calcium peroxide	1305-79-9	10 - 20

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation	Move to fresh air. Do not use mouth-to-mouth method if victim inhaled the substance. For breathing difficulties, oxygen may be necessary. Call a physician or poison control center immediately.
Skin contact	Remove and isolate contaminated clothing and shoes. For minor skin contact, avoid spreading material on unaffected skin. Wash clothing separately before reuse. If skin irritation or an allergic skin reaction develops, get medical attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Get medical attention if any discomfort continues.
Most important symptoms/effects, acute and delayed	May cause redness and pain. Symptoms may include coughing, difficulty breathing and shortness of breath.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂).
Unsuitable extinguishing media	None known.
Specific hazards arising from the chemical	Contact with combustible material may cause fire.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire-fighting equipment/instructions	In the event of fire, cool tanks with water spray.
General fire hazards	May intensify fire; oxidizer.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Avoid skin contact and inhalation of vapors during disposal of spills. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see Section 8 of the SDS.
Methods and materials for containment and cleaning up	Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water. For waste disposal, see Section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Avoid inhalation of vapors/dust and contact with skin and eyes. Wash thoroughly after handling. Keep away from clothing and other combustible materials. Use only with adequate ventilation. Do not taste or swallow. Wear appropriate personal protective equipment (See Section 8). Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store in original tightly closed container. Store away from incompatible materials (See Section 10). Keep locked up.

8. Exposure controls/personal protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Components	Type	Value
Sodium persulfate (CAS 7775-27-1)	TWA	0.1 mg/m ³

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Observe occupational exposure limits and minimize the risk of exposure. Ensure adequate ventilation, especially in confined areas.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection

Wear protective gloves.

Other

Neoprene or rubber gloves are recommended. Apron and long sleeves are recommended.

Respiratory protection

In the case of respirable dust, use self-contained breathing apparatus. Wear positive pressure self-contained breathing apparatus (SCBA).

Thermal hazards

Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations

Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Off-white, granular solid.

Physical state

Solid.

Form

Solid.

Color

Off-white.

Odor

Odorless.

Odor threshold

Not available.

pH

11.7±0.4 (1-40% solution, slurry)

Melting point/freezing point

Not available.

Initial boiling point and boiling range

Not applicable.

Flash point

Not available.

Evaporation rate

Not available.

Flammability (solid, gas)

Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%)

Not available.

Flammability limit - upper (%)

Not available.

Explosive limit - lower (%)

Not available.

Explosive limit - upper (%)

Not available.

Vapor pressure

Not applicable.

Vapor density

Not applicable.

Relative density

2.76±0.16 (25°C)

Solubility(ies)	
Solubility (water)	Soluble in water.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Oxidizing properties	Oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with combustibles.
Incompatible materials	Combustible material. Oxidizing material. Reducing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Harmful if swallowed.
Inhalation	May cause irritation to the respiratory system.
Skin contact	Causes skin irritation.
Eye contact	Causes serious eye irritation.

Symptoms related to the physical, chemical and toxicological characteristics May cause redness and pain. Exposed individuals may experience eye tearing, redness, and discomfort. Symptoms may include coughing, difficulty breathing and shortness of breath.

Information on toxicological effects

Acute toxicity	Harmful if swallowed.
Skin corrosion/irritation	Causes skin irritation.
Serious eye damage/eye irritation	Causes serious eye irritation.

Respiratory or skin sensitization

Respiratory sensitization	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Skin sensitization	May cause an allergic skin reaction.

Germ cell mutagenicity	No data available.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Reproductive toxicity	No data available.
Specific target organ toxicity - single exposure	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure	No data available.
Aspiration hazard	Not applicable.
Chronic effects	Prolonged exposure may cause chronic effects.
Further information	No data available.

12. Ecological information

Ecotoxicity	This product's components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	No data available for this product.

Mobility in soil Not available.
Other adverse effects No data available.

13. Disposal considerations

Disposal instructions Consult authorities before disposal. Dispose in accordance with all applicable regulations.
Hazardous waste code The Waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products Dispose of in accordance with local regulations.
Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

UN number UN1479
UN proper shipping name Oxidizing solid, n.o.s. (Sodium persulfate)
Transport hazard class(es)
Class 5.1
Subsidiary risk -
Packing group II
Environmental hazards
Marine pollutant No
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions 62, IB5, IP1
Packaging exceptions None
Packaging non bulk 211
Packaging bulk 242

IATA

UN number UN1479
UN proper shipping name Oxidizing solid, n.o.s. (Sodium persulfate, Calcium peroxide)
Transport hazard class(es)
Class 5.1
Subsidiary risk -
Label(s) 5.1
Packing group II
Environmental hazards No
ERG Code 5L
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number UN1479
UN proper shipping name OXIDIZING SOLID, N.O.S. (Sodium persulfate, Calcium peroxide)
Transport hazard class(es)
Class 5.1
Subsidiary risk -
Label(s) 5.1
Packing group II
Environmental hazards
Marine pollutant No
EmS F-A, S-Q
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code This product is not intended to be transported in bulk.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
 Immediate Hazard - Yes
 Delayed Hazard - Yes
 Fire Hazard - Yes
 Pressure Hazard - No
 Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations**Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Calcium peroxide (CAS 1305-79-9)
 Sodium persulfate (CAS 7775-27-1)

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65**US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance**

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 09-May-2014
Revision date -
Version # 01
Further information HMIS® is a registered trade and service mark of the NFPA.
NFPA Ratings



List of abbreviations

NFPA: National Fire Protection Association.

References

Registry of Toxic Effects of Chemical Substances (RTECS)
HSDB® - Hazardous Substances Data Bank

Disclaimer

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change and, therefore, holders and users should satisfy themselves that they are aware of all current data and regulations relevant to their particular use of product. CARUS CORPORATION DISCLAIMS ALL LIABILITY FOR RELIANCE ON THE COMPLETENESS OR ACCURACY OR THE INFORMATION INCLUDED HEREIN. CARUS CORPORATION MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR USE OR PURPOSE OF THE PRODUCT DESCRIBED HEREIN. All conditions relating to storage, handling, and use of the product are beyond the control of Carus Corporation, and shall be the sole responsibility of the holder or user of the product.

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The proposed injection event includes a total of 64 direct-push injection locations (24 in the Brown's Creek Protection Zone and 40 in the Cupboard Creek Protection Zone). Injection points will be spaced approximately 15 feet apart, perpendicular to groundwater flow. A Geoprobe direct-push drill rig will be used to deliver OBC solution from the top of bedrock (approximately 20 feet below ground surface (ft bgs) to 5 ft bgs). A figure demonstrating well construction details has not been prepared as these are direct push injection locations rather than permanent or temporary injection wells.

- 1) Average and maximum daily rate and volume of fluid to be injected. In addition, indicate the average and maximum daily rate and volume of fluid to be withdrawn from each recovery well. Verification of the aquifer's hydraulic ability to produce and accept the quantities proposed should be presented.

At 64 injection locations, approximately 600 pounds of OBC will be mixed with 360 gallons of potable water and delivered to the subsurface in 1- to 2-foot increments to ensure proper vertical distribution. Throughout the event, a total of 38,400 pound of OBC and 23,000 gallons of potable water will be delivered to the subsurface. Additional injection locations may be required to deliver the total quantity of OBC and water to the subsurface due to refusal or daylighting. Injection flow rates typically range from 2 to 10 gallons per minute. The injection solution will be mixed with potable water. No groundwater will be drawn from recovery wells for this injection event.

Average daily rate: 1800 gallons of injection solution
Maximum daily rate: 5400 gallons of injection solution.

- 2) Average and maximum injection pressure.
Average injection pressure: 50 psi
Maximum injection pressure: 110 psi
- 3) Pumping schedule (i.e. continuous, alternating cycles, etc.).
Pumping schedule: Injections will be completed on a continuous basis until the target injection volume is achieved at each injection location.
- 4) Proposed ranges in the concentration of all contaminant constituents within the injection fluid. Include comprehensive ground-water quality data from a "worst case" well sample.

The amount of sodium persulfate and calcium peroxide in OBC given in the SDS (included in Attachment A) is given below:

- 70-90% Sodium Persulfate
- 10-20% Calcium Peroxide

For each 600 lb of OBC delivered at each injection location, the following quantities of sodium persulfate and calcium peroxide will be delivered:

- Sodium Persulfate: 420 to 540 lb
- Calcium Peroxide: 60 to 120 lb

After 600 lb of OBC is mixed with 360 gallons of water, the concentrations ranges for sodium persulfate and calcium peroxide in the resulting injection solution are given below:

- Sodium Persulfate (1.8 to 2.3% by weight)
- Calcium Peroxide (0.25 to 0.51% by weight)

- 5) Length of time the project is expected to require injection to complete remediation (to ensure the effective dates of the permit will allow sufficient time to complete the project).
The work is expected to be completed within 3 weeks.

Baseline Monitoring

A baseline monitoring event will be performed prior to injection implementation to establish baseline conditions in monitoring wells located within the Brown's Creek and Cupboard Creek Protection Zones. The baseline monitoring program is summarized below:

- **Brown's Creek**
 - Water levels using an interface probe at monitoring wells (MW-37 and MW-38) and surface water sampling locations SW-01, SW-02, and SW-04.
 - Field parameter readings from monitoring wells (MW-37 and MW-38) and surface water sampling locations SW-01, SW-02, and SW-04. Field parameters include temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen [DO], and turbidity. Field parameters will be collected using a field multimeter, an optical DO probe, and a turbidimeter
 - Groundwater samples will be collected from monitoring wells MW-37 and MW-38 and surface water will be collected from SW-01, SW-02, and SW-04 for the following analyses:
 - Benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tertiary butyl ether (MTBE), and 1,2-dichloroethane (1,2-DCA) by USEPA Method 8260B
 - Sulfate by USEPA Method D516-9002
 - Persulfate, peroxide, and ferrous iron by field test kits
 - Field parameters using a field multimeter, an optical DO probe, and a turbidimeter
- **Cupboard Creek (MW-46, MW-56, MW-57)**
 - Water levels using an interface probe at monitoring wells (MW-47, MW-56, and MW-57) and surface water sampling locations (SW-05, SW-06, and SW-14)
 - Field parameters from monitoring wells (MW-47, MW-56, and MW-57) and surface water sampling locations (SW-05, SW-06, and SW-14)
 - Groundwater samples will be collected from monitoring wells (MW-47, MW-56, and MW-57) and surface water samples will be collected from (SW-05, SW-06, and SW-14) for the following analyses:
 - BTEX, MTBE, and 1,2-DCA by USEPA Method 8260B
 - Sulfate by USEPA Method D516-9002
 - Persulfate, peroxide, and ferrous iron by field test kits
 - Field parameters using a field multimeter, an optical DO probe, and a turbidimeter

The baseline monitoring event is given in **Table D-1**.

Operational Monitoring

During the injection event, monitoring wells located within the Brown's Creek (MW-37 and MW-38) and Cupboard Creek (MW-46, MW-56, and MW-57) Protection Zones will be gauged for water levels and monitored for field parameters at least once a day, and additionally as needed.

Surface water sampling locations near the Brown's Creek Protection Zone (SW-01, SW-02, and SW-04) and Cupboard Creek Protection Zone (SW-05, SW-06, and SW-14) will be evaluated at least once a day,

additionally as needed, for changes in water levels, field parameters, and visual signs of discharge to Brown's Creek and Cupboard Creek.

Monitoring for each Protection Zone will only be performed while injections are taking place in the Protection Zone. For example, monitoring wells and surface water monitoring locations will not be monitored in the Brown's Creek Protection Zone while injections are taking place in the Cupboard Creek Protection Zone.

The operational monitoring program is given in **Table D-2**.

End of Injection Monitoring

At the end of injection, monitoring wells located in the Brown's Creek Protection Zone (MW-37 and MW-38) and Cupboard Creek Protection Zone (MW-46, MW-56, and MW-57) will be gauged for water levels, monitored for field parameters, and sampled for the following analyses:

- Sulfate by USEPA Method D516-9002
- Persulfate, peroxide, and ferrous iron by field test kits

Performance Monitoring

For one year following the injection event, performance monitoring will be conducted on a quarterly basis to evaluate injection performance. The baseline monitoring event will be repeated during each quarterly monitoring event to evaluate treatment performance. The performance monitoring event is given in **Table D-1**.

Table D-1 Baseline and Quarterly Performance Monitoring Program
 UIC Permit Application
 Lewis Drive Release, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Groundwater

Analytes:	Select VOCs ^a	Sulfate ^b	Persulfate ^c	Peroxide ^d	Ferrous Iron ^e	Field Parameters ^f	Water Levels ^g
<i>Brown's Creek Protection Zone</i>							
MW-37	Y	Y	Y	Y	Y	Y	Y
MW-38	Y	Y	Y	Y	Y	Y	Y
Brown's Creek Subtotal:	2	2	2	2	2	2	2
<i>Cupboard Creek Protection Zone</i>							
MW-46	Y	Y	Y	Y	Y	Y	Y
MW-56	Y	Y	Y	Y	Y	Y	Y
MW-57	Y	Y	Y	Y	Y	Y	Y
Cupboard Creek Subtotal:	3	3	3	3	3	3	3
Grand Totals:	5	5	5	5	5	5	5

Surface Water

Analytes:	Select VOCs ^a	Sulfate ^b	Persulfate ^c	Peroxide ^d	Ferrous Iron ^e	Field Parameters ^f	Fluid Levels ^g
<i>Brown's Creek Protection Zone</i>							
SW-01	Y	Y	Y	Y	Y	Y	Y
SW-02	Y	Y	Y	Y	Y	Y	Y
SW-04	Y	Y	Y	Y	Y	Y	Y
Brown's Creek Subtotal:	3	3	3	3	3	3	3
<i>Cupboard Creek Protection Zone</i>							
SW-01	Y	Y	Y	Y	Y	Y	Y
SW-02	Y	Y	Y	Y	Y	Y	Y
SW-04	Y	Y	Y	Y	Y	Y	Y
Cupboard Creek Subtotal:	3	3	3	3	3	3	3
Grand Totals:	6	6	6	6	6	6	6

^a Select VOCs include benzene, toluene, ethylbenzene, total xylenes, MTBE, and 1,2-DCA by USEPA Method 8260B

^b Sulfate by USEPA Method D516-9002

^c Persulfate will be analyzed using a field test kit

^d Peroxide will be analyzed using a field test kit

^e Ferrous iron will be analyzed using a field test kit

^f Field parameters including temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity will be measured using a field multiprobe and a turbidimeter. Dissolved oxygen will be measured using an optical probe.

^g Water levels will be measured using an interface probe

USEPA = United States Environmental Protection Agency

MTBE = methyl tertiary butyl ether

1,2-DCA = 1,2-dichloroethane

Table D-2 Operational Monitoring Program
 UIC Permit Application
 Lewis Drive Release, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Groundwater

Analytes:	Daily ^a Monitoring	
	Field Parameters ^b	Water Levels ^c
<i>Brown's Creek Protection Zone</i>		
MW-37	Y	Y
MW-38	Y	Y
Brown's Creek Subtotal:	2	2
<i>Cupboard Creek Protection Zone</i>		
MW-46	Y	Y
MW-56	Y	Y
MW-57	Y	Y
Cupboard Creek Subtotal:	3	3
Grand Totals:	5	5

Surface Water

Analytes:	Daily ^a Monitoring	
	Field Parameters ^b	Water Levels ^c
<i>Brown's Creek Protection Zone</i>		
SW-01	Y	Y
SW-02	Y	Y
SW-04	Y	Y
Brown's Creek Subtotal:	3	3
<i>Cupboard Creek Protection Zone</i>		
SW-01	Y	Y
SW-02	Y	Y
SW-04	Y	Y
Cupboard Creek Subtotal:	3	3
Grand Totals:	6	6

^a Monitoring will take place at least once a day (additionally as needed) during active injection in each Protection Zone).

^b Field parameters including temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity will be measured using a field multiprobe and a turbidimeter. Dissolved oxygen will be measured using an optical probe.

^c Water levels will be measured using an interface probe

As discussed, the site is a pipeline release in a rural area of Anderson County, South Carolina. Prior to the release and Plantation ownership of 112 Lewis Drive, there were no state or federal permits for the site. The following were obtained after the release to permit certain aspects of the emergency response and investigation efforts, as well as the remedial design and construction phases:

- Stormwater Pollution Prevention Plan (SWPPP) permit #STW0315-09, dated June 16, 2015.
- Monitoring Well Permit Applications for drilling efforts at the site permitted under Site ID# 18693. Permits MW-09921, MW-09978, MW-10006, MW-10136, and MW-10460.
- Underground Injection Control Permit-to-Construct for vertical and horizontal air sparge wells under Site ID#18693. Permit #SCHE03020469. The Permit-to-Operate these wells was received November 16, 2016.
- Underground Injection Control Permit modification #SCHE03020469M was received on January 24, 2017 for installation of 13 bedrock sparging wells. However, per a meeting with South Carolina Department of Health and Environmental Control (SCDHEC) held on March 7, 2018, the bedrock sparging pilot study and installation of these wells is being deferred at this time.
- Underground Injection Control Permit modification #SCHE03020469M2 was received on June 26, 2018 for the installation of 20 vertical saprolite air sparge wells in the areas of Cupboard Creek and Brown's Creek.
- Minor Source Air Permit Exemption. A letter confirming that the proposed system was exempt from new permit requirements was received on April 28, 2016.
- Encroachment Permits. Encroachment permits from Anderson County were received (1) on June 2, 2016, for minor site work proposed near the Lewis Drive right-of-way (temporary construction entrance) and (2) on July 13, 2016, for horizontal drilling under Lewis Drive.
- U.S. Army Corps of Engineers – A letter confirming that no permit was required to install the surface water aerators in Brown's Creek was received from the U.S. Army Corps of Engineers on September 14, 2016.
- Anderson County Land Use and Building Permits – A land use plan was approved by Anderson County Development Services on August 23, 2016, to approve construction of the proposed treatment system building and associated site work. A building permit was approved by Anderson County Building and Codes Department on December 21, 2016.

The pipeline release occurred approximately 450 feet east of the intersection of Lewis Drive and West Calhoun Road on the north side of Lewis Drive approximately 1-mile northwest of Belton, South Carolina. The release of gasoline occurred from a failed sleeve on the Plantation 26-inch product pipeline. The site is located on the pipeline right-of-way between Lewis Drive, a rural two-lane undivided asphalt road to the east, and a hay field to the west.

A land use map of the site and adjacent boundaries, with an overlay of the proposed system layout, is provided in this attachment. As shown, the immediate surrounding properties are all agricultural. The nearest residence is about 1,300 feet southeast from the release point. A residence was formerly located at 112 Lewis Drive, but this property was acquired by Plantation and the residence has been moved to a location off of the property. System equipment (compressors, filters, controls, etc.) has been installed on the Plantation property. No other facilities exist nearby, and, aside from the paved roads, the surrounding area is comprised of a mixture of pasturelands and forests or wetlands. The city limit of Belton, South Carolina, is less than a mile to the south.



LEGEND:

- ★ Release Point
- Proposed Direct Push Injection Location
- ▨ Approximate Extent of Product > 0.01' thickness based on 8/7/2015 data
- 1,000 ft. Offset from Product Plume Extent
- ▭ Parcel Boundary
- Land Use:**
- Pasture
- Forested Land
- Developed/ Residential
- Open Water

Base Map Sources:
 *Environmental Systems Research Institute (Esri) ArcMap World Imagery, 2017. Basemap features are approximate.
 *United States Geological Survey (USGS) National Land Cover Dataset (NLCD)

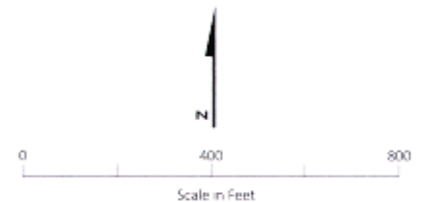


FIGURE F-1. Land Use Map of Lewis Drive Area
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"



- LEGEND**
- ★ Release Point
 - Proposed Direct Push Injection Location
 - Water Supply Well
 - City Water Tap
 - 10" City of Belton Water Main*
 - Topographic Contour (30' Interval)
 - National Hydrography Dataset Stream
 - Flow Direction of Creek
 - National Wetland Inventory Wetland
 - Delineated Wetland
 - Approximate Extent of Product > 0.01' thickness based on 8/7/2015 data
 - Location of Former Residence
 - Injection Area
 - Review Area
 - Parcel Boundary

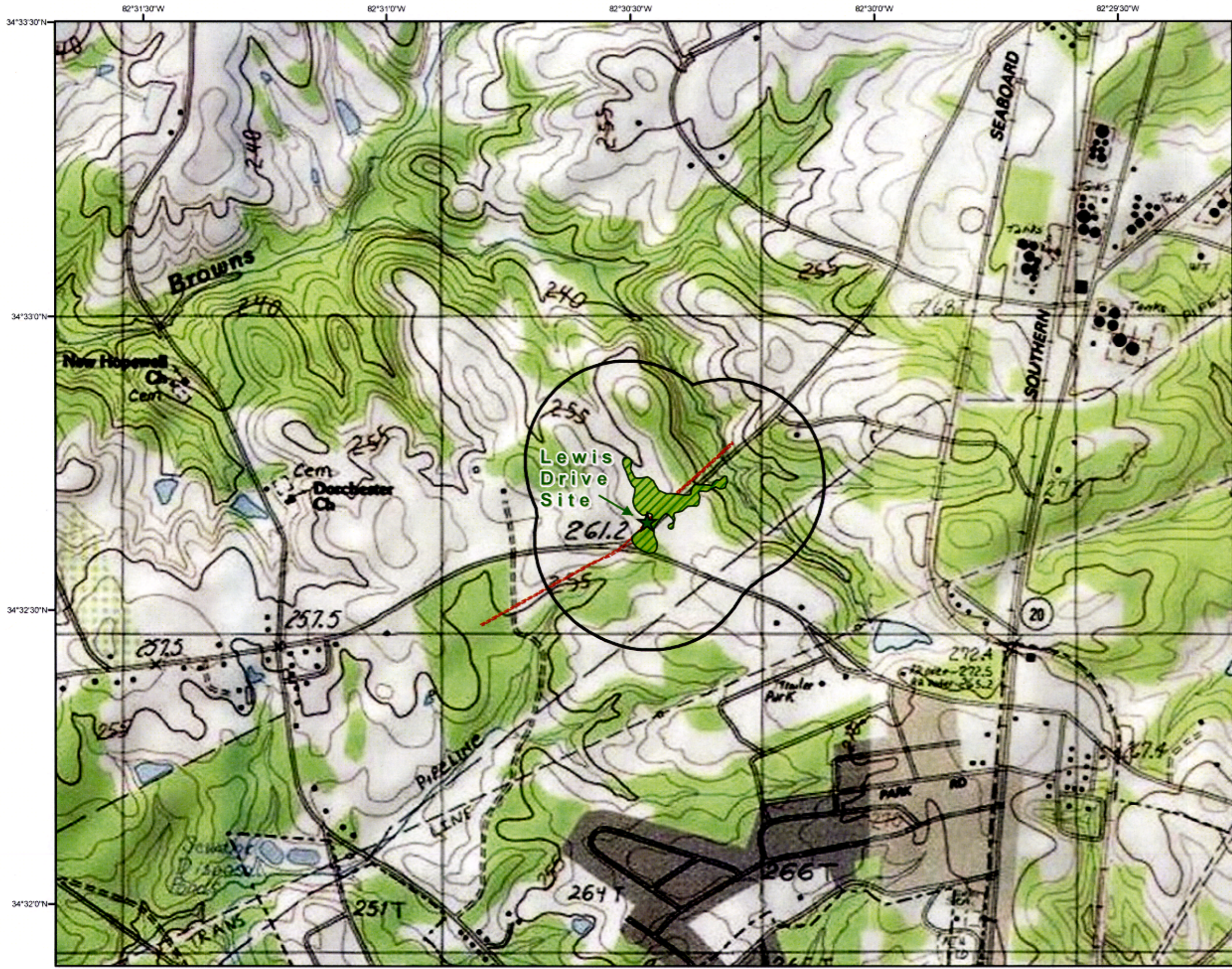
Notes:
 * Water Main not surveyed.
 No surface water intakes identified within 1 mile of site.

Source Data:
 Esri World Imagery Layer, 2017
 USGS, National Hydrography Dataset (NHD)
 USFWS, National Wetland Inventory (NWI)

Figure G-1. Area of Review
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

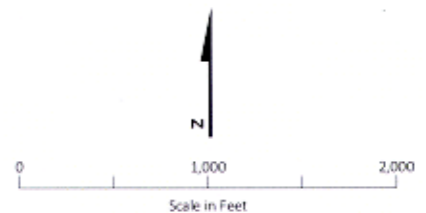
The following figures and tables are included in this attachment:

- A topographic map (**Figure H-1**)
- A receptor survey map with water supply wells, a water main, and surface water shown (**Figure H-2**)
- A table showing well construction details and well status (**Table H-1**)
- Potentiometric groundwater elevation maps and surface water elevation map from December 2018 (**Figure H-3**)
- A product thickness map from December 2018 (**Figure H-4**)
- A map showing dissolved contaminant plumes from December 2018 (**Figure H-5**)

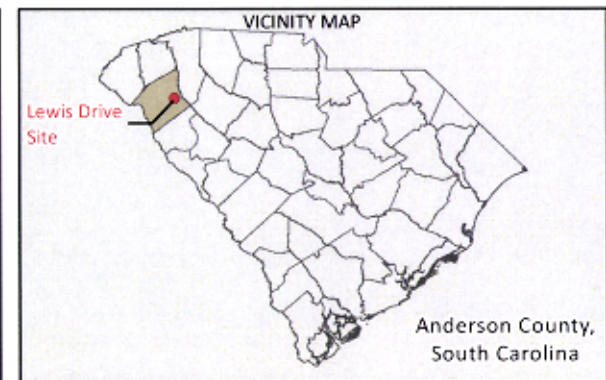


- LEGEND:**
- Release Point
 - Pipeline
 - Approximate Extent of Product >0.01' Thickness (base on 8/7/2015 data)
 - 1,000 ft. Offset from Product Plume Extent

Base Map Sources:
 *United States Geological Survey (USGS) 7.5-minute Topographic Quadrangle Belton East, SC (published 1984) and Belton West, SC (published 1984)
 Note: Contour interval in meters.



H- 1. Topography of Lewis Drive Area
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"



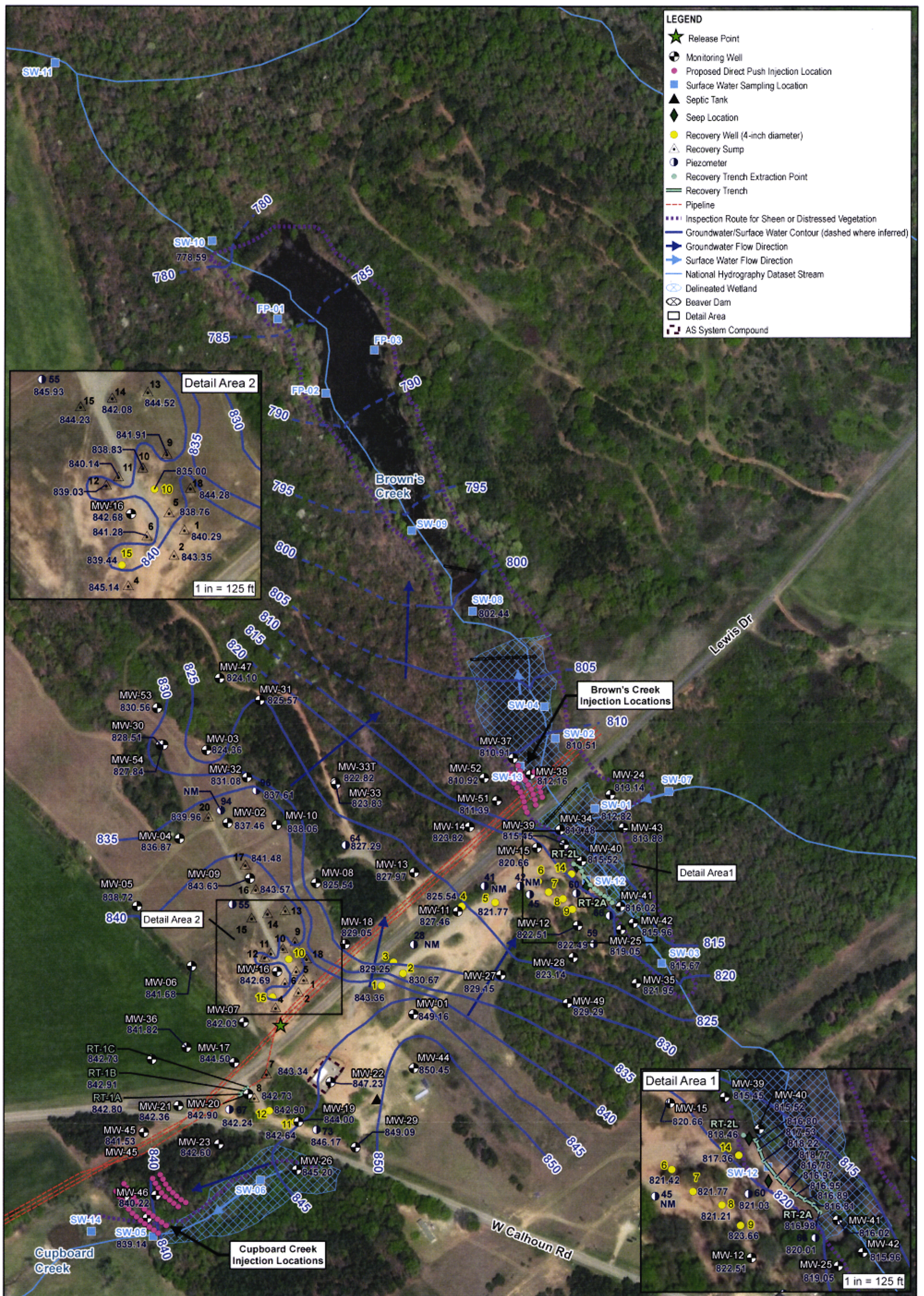
- LEGEND**
- ★ Release Point
 - Proposed Direct Push Injection Location
 - ⊕ Residuum Monitoring Well
 - ⊕ Bedrock Monitoring Well
 - Water Supply Well
 - ⊕ Piezometer
 - ⊕ Piezometer Abandoned 8/30/18 and 8/31/18
 - ⊕ Recovery Sump
 - ⊕ Abandoned Recovery Sumps
 - Soil Boring Location
 - Recovery Trench Point
 - Recovery Well (4" diameter)
 - ⊕ Recovery Well Abandoned 8/31/18
 - Surface Water Sampling Location
 - Newly Installed Vertical Sparging Well
 - Vertical Bedrock Sparging Well
 - Vertical Saprolite Sparging Well
 - City Water Tap
 - 10" City of Belton Water Main
 - National Hydrography Dataset Stream
 - Intermittent Stream
 - Topographic Contour (5' interval)
 - Review Area
 - Parcel Boundary

Base Map Sources:

- *Environmental Systems Research Institute (Esri) ArcMap World Imagery, 2017. Basemap features are approximate.
- *United States Geological Survey (USGS) National Hydrography Dataset (NHD)
- *United States Geological Survey (USGS) National Elevation Dataset (NED) n35w083 1/3 arc-second 2013 1 x 1 degree



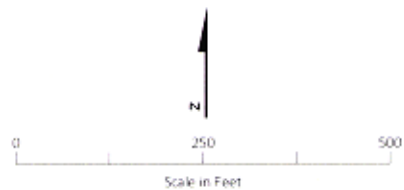
Figure H-2. Wells Located in Area of Review
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"



829.25 Corrected Groundwater Elevation as of 12/3/2018 in feet above mean sea level
NM Not Measured

Figure H-3. Residuum Groundwater and Surface Water Elevation Map
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Base Map Sources:
 *Environmental Systems Research Institute (ESRI)
 ArcMap World Imagery, 2017. Basemap features are approximate.
 *United States Geological Survey (USGS)
 National Hydrography Dataset (NHD)





LEGEND

- ★ Release Point
- Proposed Direct Push Injection Location
- ⊕ Monitoring Well
- ⊕ Bedrock Monitoring Well
- ◆ Seep Location
- △ Recovery Sump
- ⊖ Piezometer ("R" indicates Replacement)
- Recovery Well (4-inch diameter)
- Well Contains Product as of 3/4/19
- Newly Installed Vertical Sparging Well
- 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

0.03 Product thickness in feet as of 3/4/2019
 NP No product detected
 NM Not measured

Base Map Sources:
 *Environmental Systems Research Institute (Esri)
 ArcMap World Imagery, 2017. Basemap features are approximate.
 *United States Geological Survey (USGS) National Hydrography Dataset (NHD)

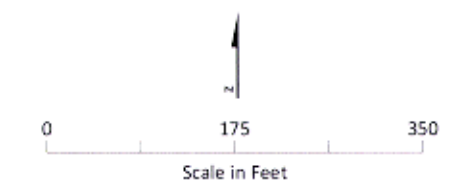
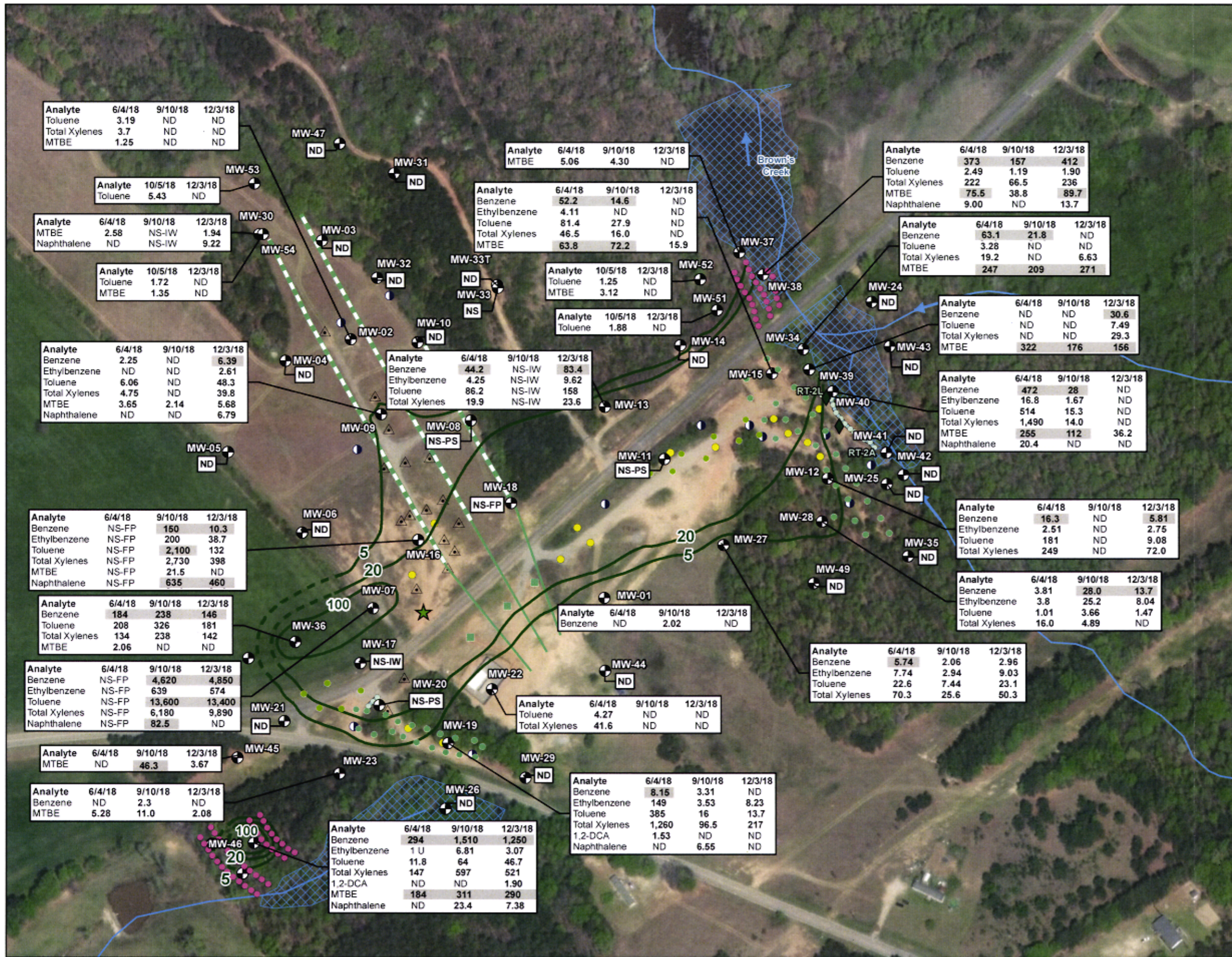


Figure H-4. Site Features with Measurable Product
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"



LEGEND

- ★ Release Point
- Proposed Direct Push Injection Location
- ⊕ Residuum Monitoring Well
- ⊖ Piezometer
- Newly Installed Vertical Sparging Well
- Vertical Bedrock Sparging Well
- Vertical Saprolite Sparging Well
- ◆ Seep Location
- Recovery Well (4" diameter)
- △ Recovery Sump
- Recovery Trench Point
- Recovery Trench
- Surface Water Flow Direction
- Horizontal Sparging Well Riser
- Horizontal Sparging Well Screen
- Dissolved Benzene Plume Extent (µg/L) (Dashed where inferred)
- National Hydrography Dataset Stream
- ▭ Delineated Wetland

- NOTES:**
1. Total Xylenes is the sum of m&p xylenes and o-xylene.
 2. MTBE = Methyl Tertiary Butyl Ether
 3. 1,2-DCA = 1,2-dichloroethane
 4. Analyte concentration in microgram(s) per liter (µg/L)
 5. Only detected analytes are shown on map.
 6. ND = Groundwater was collected and analyzed, but no analytes were detected above the reported sample quantitation limit.
 7. NS = Not scheduled to be sampled for this event
 8. NS-FP = Sample not collected due to the presence of free product in the well
 9. NS-PS = Sample not collected due product sheen observed in well
 10. NS-IW = Sample not collected due to insufficient volume of water in well

Gray shading indicates the analyte exceeded risk-based screening levels (RBSLs) identified in South Carolina Underground Storage Tank Management Division Programmatic Quality Assurance Program Plan Revision 3.1, Table D1 "RBSLs for Groundwater", February 2016.

Base Map Sources:
 *Environmental Systems Research Institute (Esri)
 ArcMap World Imagery, 2017. Basemap features are approximate.
 *United States Geological Survey (USGS) National Hydrography Dataset (NHD)

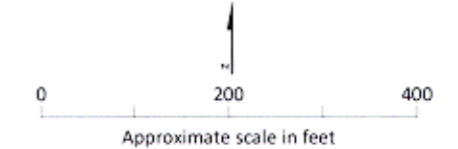
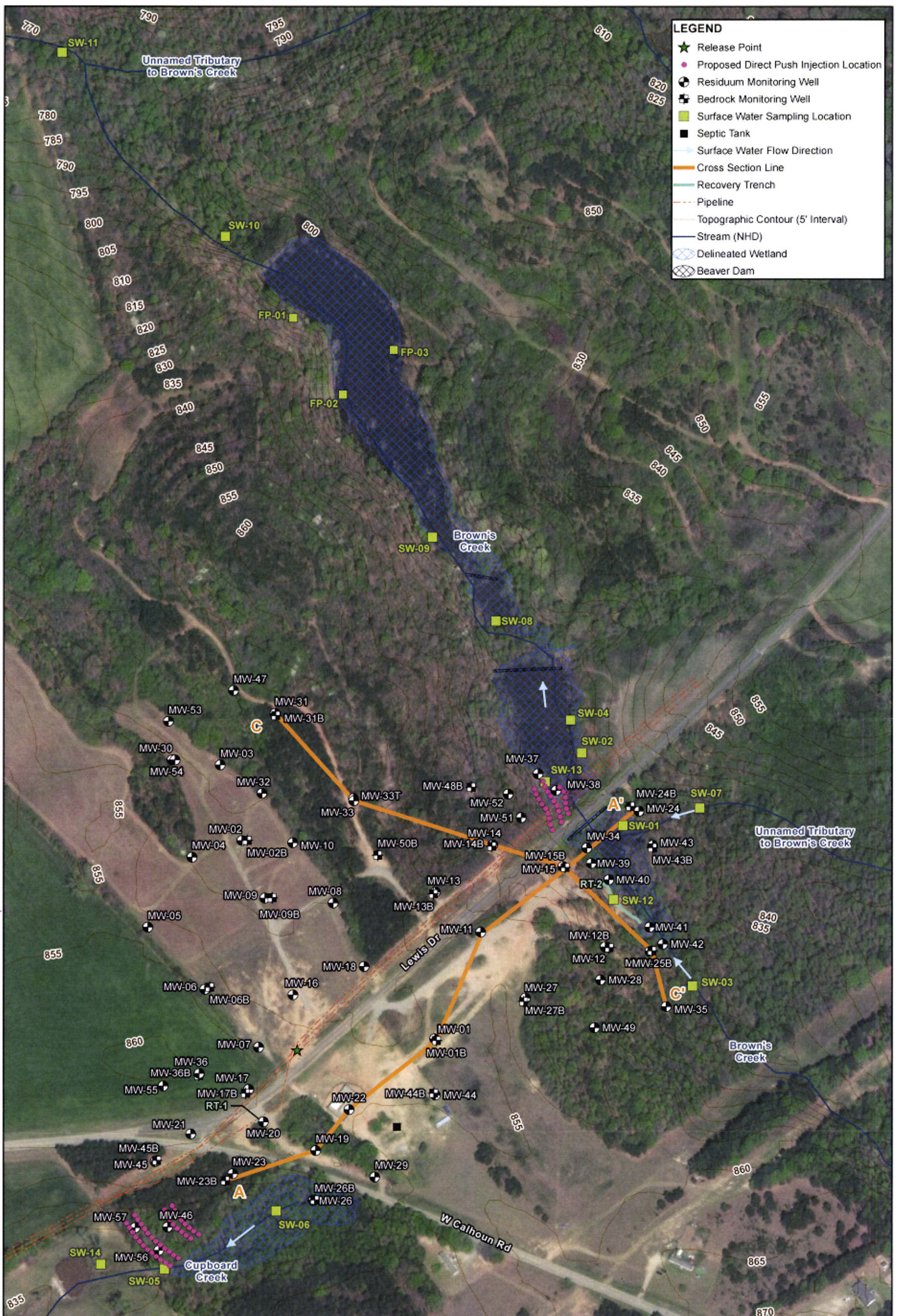


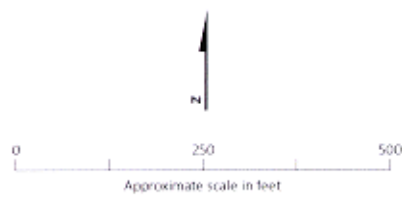
Figure H-5. Groundwater Analytical Results in Residuum Aquifer, June, September/October, and December 2018
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

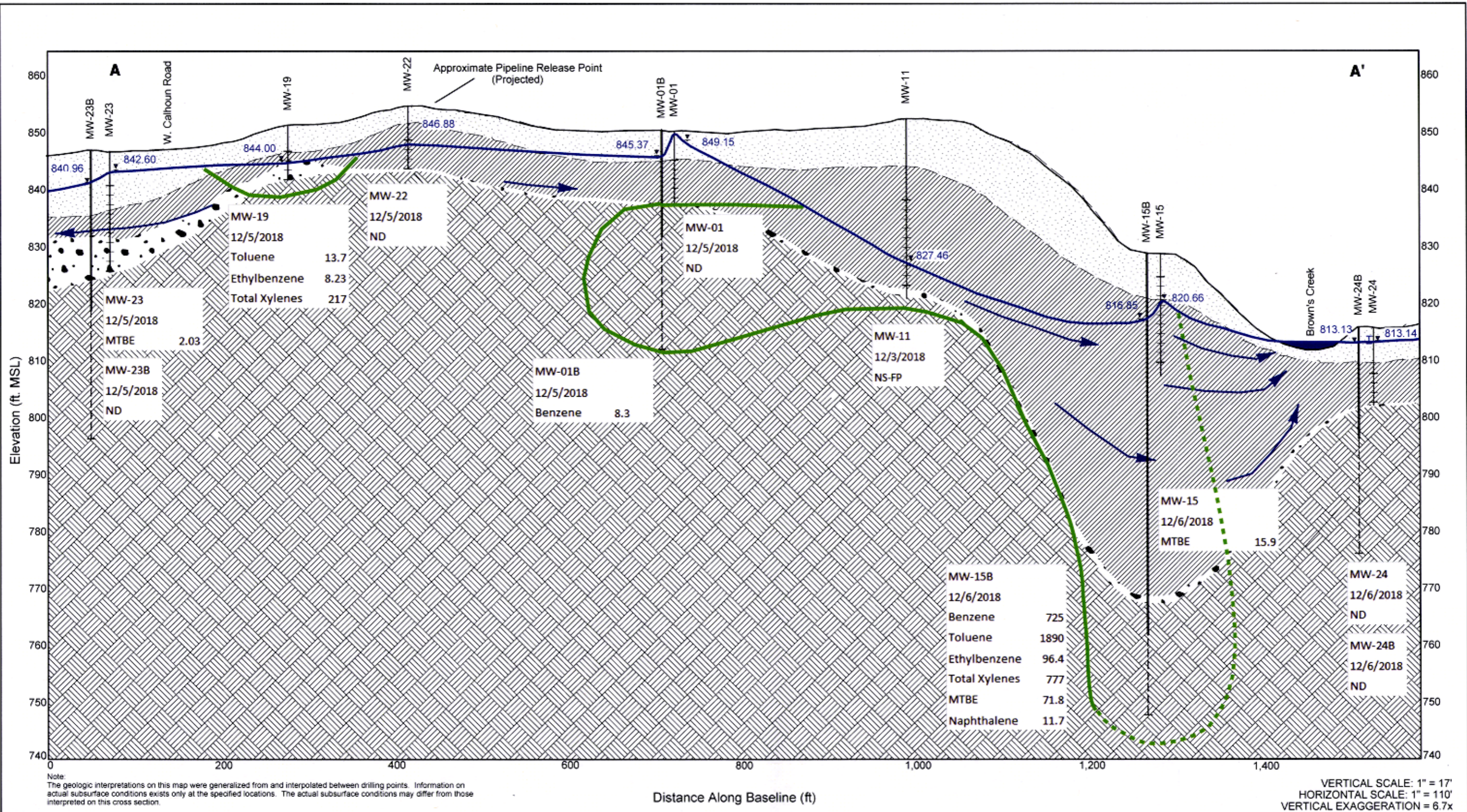


LEGEND	
★	Release Point
●	Proposed Direct Push Injection Location
⊙	Residuum Monitoring Well
⊠	Bedrock Monitoring Well
■	Surface Water Sampling Location
■	Septic Tank
→	Surface Water Flow Direction
—	Cross Section Line
—	Recovery Trench
- - -	Pipeline
—	Topographic Contour (5' Interval)
—	Stream (NHD)
▨	Delineated Wetland
▨	Beaver Dam

Figure I-1. Cross Section Locations
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Data Sources:
 Base Map: Esri World Imagery Layer, 2017;
 Hydrology: USGS National Hydrography Dataset (NHD)





LEWISDRIVEBASE LEWIS DRIVE ISA BORING LOGS.GPJ CH2M GEOTECH.GDT 8/18/15

Note: The geologic interpretations on this map were generalized from and interpolated between drilling points. Information on actual subsurface conditions exists only at the specified locations. The actual subsurface conditions may differ from those interpreted on this cross section.

LEGEND

- SOIL: Completely weathered; clayey.
- SAPROLITE: Completely weathered with relict rock structure visible.
- TRANSITION ZONE: Mixed soil and rock fragments.
- FRESH BEDROCK: Few open fractures may be weathered or fresh; high rock-quality designation (RQD); competent rock.

Monitoring Well: Well ID, Top of Screen, Bottom of Screen

Bedrock Monitoring Well: Well ID, Casing, Open Borehole

845.37 Groundwater Elevation (feet amsl)

Groundwater Flow Direction Water

Table (December 3, 2018)

Estimated Dissolved Benzene Plume Extent (5 µg/L) and other COCs. Concentrations are given in micrograms per liter (µg/L)

MTBE = methyl tertiary butyl ether

NS-FD = not sampled due to free product

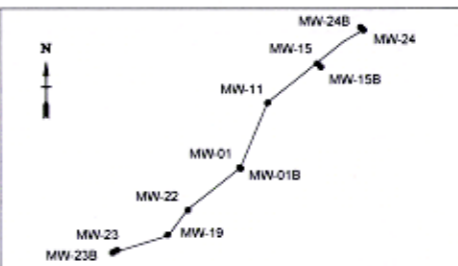
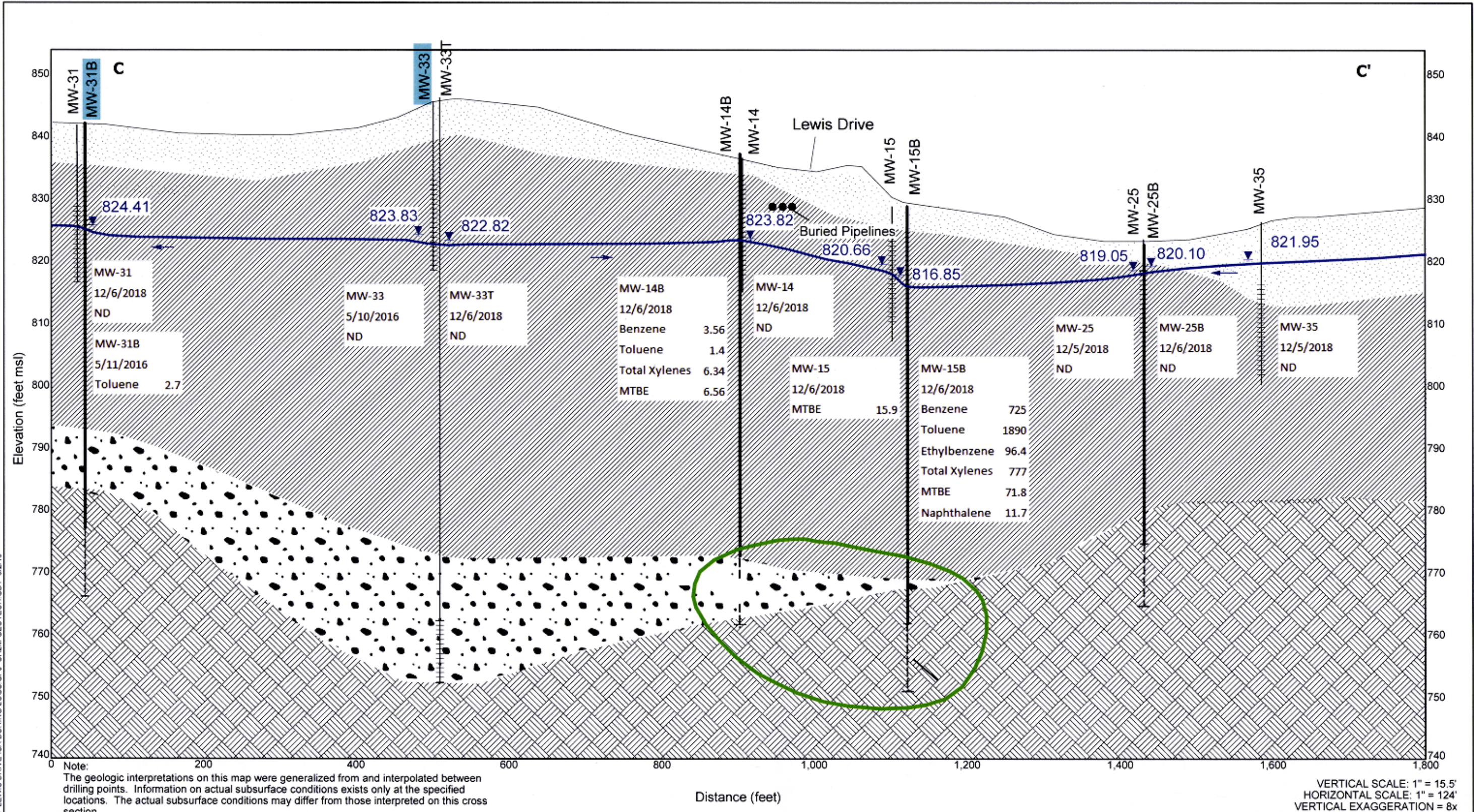


Figure I-2. Cross-Section A-A'
 Lewis Drive Remediation Site
 Belton, South Carolina
 Site ID #18693
 "Kinder Morgan Belton Pipeline Release"

JACOBS



Note:
The geologic interpretations on this map were generalized from and interpolated between drilling points. Information on actual subsurface conditions exists only at the specified locations. The actual subsurface conditions may differ from those interpreted on this cross section.

VERTICAL SCALE: 1" = 15.5'
HORIZONTAL SCALE: 1" = 124'
VERTICAL EXAGGERATION = 8x

LEGEND

- SOIL: Completely weathered; clayey.
- SAPROLITE: Completely weathered with relict rock structure visible.
- TRANSITION ZONE: Mixed soil and rock fragments.
- FRESH BEDROCK: Few open fractures may be weathered or fresh; high rock-quality designation (RQD); competent rock.

Monitoring Well: Well ID

Bedrock Monitoring Well: Well ID

Casing:

Open Borehole:

Top of Screen:

Bottom of Screen:

820.88 Groundwater Elevation (feet amsl)

Groundwater Flow Direction Water

Table (December 3, 2018)

Estimated Dissolved Benzene Plume Extent (5 µg/L)
Concentrations are given in micrograms per liter (µg/L)

Highlighted wells sampled during May 2016 event

MTBE = methyl tertiary butyl ether

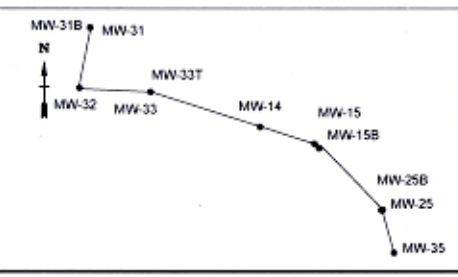


Figure I-3. Cross-Section C-C'
Lewis Drive Remediation Site
Belton, South Carolina
Site ID #18693 "Kinder Morgan Belton Pipeline Release"

GASTONIA_SUMP_HYDROSECTION_LEWIS_DRIVE_ISA_BORING_LOGS_GPJ_CH2M_GEO TECH_GDT_6/2/16

Aquifers Affected by Proposed Injection

The OBC direct-push injection event will be performed from the top of bedrock (approximately 20 feet below ground surface [bgs]) to 5 feet bgs in the Brown's Creek Protection Zone and Cupboard Creek Protection Zone. All injections will be completed within the surficial (water table) aquifer at the site.

Geologically, the Lewis Drive site is characterized by a residuum layer over bedrock. The top of the residuum is a thin zone of clay and silt soil with some sand. The upper residuum may include alluvium (sand) in the beds of nearby creeks. Beneath soil are layers of saprolite up to 50 feet thick and a very thin (less than 5 feet) transition zone of partially weathered rock. Both the saprolite and transition zone contain minerals from the host bedrock and may contain relict structural features of the bedrock. Groundwater occurs under water table conditions within the saprolite, transition zone, and bedrock portions of the aquifer and ranges in depth from approximately 10 to 15 feet bgs. Groundwater flows from the release point to the northeast toward Browns Creek. Because the release point occurs near the crest of the topographic ridge, there is also a slight groundwater gradient to the west-southwest. As indicated in the cross-sections, the water table discharges to Browns Creek, and dissolved contaminants are likely to move from the release point toward the northeast.

Water Supply Wells

On December 17, 2014, CH2M/Jacobs researched Anderson County tax records in person and through the Anderson County geographic information system (GIS) Web site to identify property owners in the vicinity of the release. Anderson County has zoned the properties along Lewis Drive and adjacent properties as "multi-use," allowing for agricultural, residential, commercial, and industrial development. CH2M/Jacobs personnel spoke with representatives from DHEC, Anderson County, the Broadway Water and Sewerage District, the Belton-Honea Path Water Authority, and the City of Belton Water Department to identify surface water intakes and wells near the site. CH2M/Jacobs personnel also conducted a windshield survey to identify potential water supply wells.

The water-well survey located five private wells near the release as shown in **Figure H-2**, but all are outside a 1,000-foot radius. The closest water-well is a 500-foot deep well approximately 1410 feet southwest of the release and 760 feet southwest of the outermost injection well in the Cupboard Creek Protection Zone. The well uses include irrigation. The nearest residence was formerly within 300 feet (southeast) of the release, but that home was vacated in January 2016 and has since been relocated. The nearest residence is now located about 690 feet southeast of the release and 650 feet east of the outermost injection well in the Cupboard Creek Protection Zone.

Table J-1. Well Construction Information
 Plantation Pipe Line Company
 Lewis Drive Remediation Site, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Location ID	Installation Method	Permit #	Date Installed	Date Abandoned	Purpose	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Measured Depth to Bottom (ft BTOC)	Bore Hole Diameter (in)	Well Dia (in)	Well Depth (ft bgs)	Bottom of Well (ft amsl)	Top of Screen or Open Borehole Interval (ft BTOC)	Bottom of Screen or Open Borehole Interval (ft BTOC)	Top of Screen or Open Borehole Interval (ft bgs)	Bottom of Screen or Open Borehole Interval (ft bgs)	Top of Screen or Open Borehole Interval (ft amsl)	Bottom of Screen or Open Borehole Interval (ft amsl)	Length of Screen or Open Borehole Interval (ft)
Monitoring Wells																			
MW-01	CME 550 HSA	MW-10136	6/26/2015	Still in use	Monitoring Well/Gauging	850.25	853.07	15.61	8	2	13.00	837.2	5.82	15.82	3.0	13.0	847.2	837.2	10.00
MW-01B	Schramm Air Rig	MW-10136	6/25/2015	Still in use	Monitoring Well/Gauging	850.45	852.99	45.26	10	6	38.50	812.0	21.03	41.03	18.5	38.5	832.0	812.0	20.00
MW-02	CME 750 HSA	MW-10136	6/25/2015	Still in use	Monitoring Well/Gauging	841.24	841.04	19.78	8	2	20.00	821.2	4.80	19.80	5.0	20.0	836.2	821.2	15.00
MW-02B	Schramm Air Rig/rehabbed (10/5/2017) with a Mobile Drill B57	MW-10136	6/24/2015	Still in use	Monitoring Well/Gauging	841.18	841.19	81.55	10	2	81.70	759.5	70.00	81.70	70.0	81.7	771.2	759.5	13.00
MW-03	CME 550 HSA	MW-10136	6/23/2015	Still in use	Monitoring Well/Gauging	838.38	838.36	22.19	8	2	20.00	818.4	4.98	19.98	5.0	20.0	833.4	818.4	15.00
MW-04	CME 550 HSA	MW-10136	6/23/2015	Still in use	Monitoring Well/Gauging	844.51	844.42	20.65	8	2	20.00	824.5	4.91	19.91	5.0	20.0	839.5	824.5	15.00
MW-05	CME 550 HSA	MW-10136	6/24/2015	Still in use	Monitoring Well/Gauging	851.15	851.11	19.89	8	2	20.00	831.1	4.96	19.96	5.0	20.0	846.1	831.1	15.00
MW-06	CME 550 HSA	MW-10136	6/24/2015	Still in use	Monitoring Well/Gauging	852.98	852.92	19.20	8	2	19.60	833.4	4.54	19.54	5.0	19.6	848.0	833.4	15.00
MW-06B	Mobile Drill B57	MW-11117	10/17/2017	Still in use	Monitoring Well/Gauging	852.42	852.57	85.65	13.75	4	85.20	767.2	65.50	85.50	65.5	85.5	786.9	766.9	20.00
MW-07	CME 550 HSA	MW-10136	6/25/2015	Still in use	Monitoring Well/Gauging	853.02	853.02	13.60	8	2	13.50	839.5	3.50	13.50	3.5	13.5	849.5	839.5	10.00
MW-08	CME 550 HSA	MW-10136	6/25/2015	Still in use	Monitoring Well/Gauging	844.75	844.72	19.80	8	2	19.70	825.1	4.67	19.67	4.7	19.7	840.1	825.1	15.00
MW-09	CME 550 HSA	MW-10136	6/25/2015	Still in use	Monitoring Well/Gauging	843.72	843.63	20.21	8	2	19.50	824.2	4.41	19.41	4.5	19.5	839.2	824.2	15.00
MW-09B	Mobile Drill B57	MW-11117	10/17/2017	Still in use	Monitoring Well/Gauging	843.71	843.92	151.00	13.75	4	151.00	692.7	132.20	151.00	132.2	151.0	711.5	692.7	20.00
MW-10	CME 550 HSA	MW-10136	6/25/2015	Still in use	Monitoring Well/Gauging	842.33	845.41	23.54	8	2	20.00	822.3	8.08	23.08	5.0	20.0	837.3	822.3	15.00
MW-11	CME 550 HSA	MW-10136	7/1/2015	Still in use	Monitoring Well/Gauging	852.36	855.63	32.50	8	2	25.20	827.2	13.27	28.27	14.2	25.0	838.2	827.4	15.00
MW-12	CME 550 HSA	MW-10136	6/25/2015	Still in use	Monitoring Well/Gauging	832.20	834.53	21.69	8	2	19.30	812.9	6.63	21.63	4.3	19.3	827.9	812.9	15.00
MW-12B	Geoprobe 3230 DT HSA	MW-10460	12/22/2015	Still in use	Monitoring Well/Gauging	832.26	834.98	45.81	10	6	43.00	789.3	35.72	45.72	33.0	43.0	799.3	789.3	10.00
MW-13	CME 550 HSA	MW-10136	6/26/2015	Still in use	Monitoring Well/Gauging	845.93	848.84	22.18	8	2	19.00	826.9	6.92	21.92	4.0	19.0	841.9	826.9	15.00
MW-13B	Geoprobe 3230 DT HSA	MW-10461	12/21/2015	Still in use	Monitoring Well/Gauging	847.19	849.82	55.36	10	6	58.00	789.2	50.64	60.64	48.0	58.0	799.2	789.2	10.00
MW-14	CME 550 HSA	MW-10136	6/26/2015	Still in use	Monitoring Well/Gauging	836.47	838.70	22.20	8	2	19.30	817.2	6.53	21.53	4.3	19.3	832.2	817.2	15.00
MW-14B	Mobile ST Schramm	MW-10578	5/3/2016	Still in use	Monitoring Well/Gauging	837.12	840.20	76.97	10	6	76.90	760.2	66.07	76.07	66.0	76.0	771.1	761.1	10.00
MW-15	CME 550 HSA	MW-10136	6/29/2015	Still in use	Monitoring Well/Gauging	828.68	831.03	21.22	8	2	19.00	809.7	6.35	21.35	4.0	19.0	824.7	809.7	15.00
MW-15B	CME 550 HSA	MW-10136	7/28/2015	Still in use	Monitoring Well/Gauging	828.66	831.29	74.41	10	6	77.85	750.8	70.48	80.48	67.9	77.9	760.8	750.8	10.00
MW-16	CME 750 HSA	MW-10136	6/26/2015	Still in use	Monitoring Well/Gauging	847.63	847.67	20.37	8	2	20.00	827.6	5.03	20.03	5.0	20.0	842.6	827.6	15.00
MW-17	CME 750 HSA	MW-10136	6/29/2015	Still in use	Monitoring Well/Gauging	855.32	855.35	15.30	8	2	11.00	844.3	6.03	11.03	6.0	11.0	849.3	844.3	5.00
MW-17B	Geoprobe 3230 DT HSA	MW-10462	1/7/2016	Still in use	Monitoring Well/Gauging	855.37	855.37	27.50	10	6	27.00	828.4	17.00	27.00	17.0	27.0	838.4	828.4	10.00
MW-18	CME 550 HSA	MW-10136	6/29/2015	Still in use	Monitoring Well/Gauging	846.82	846.89	19.75	8	2	20.00	826.8	5.06	20.06	5.0	20.0	841.8	826.8	15.00
MW-19	CME 750 HSA	MW-10136	6/29/2015	Still in use	Monitoring Well/Gauging	851.23	853.94	12.13	8	2	9.50	841.7	7.20	12.20	4.5	9.5	846.7	841.7	5.00
MW-20	CME 750 HSA	MW-10136	6/30/2015	Still in use	Monitoring Well/Gauging	853.07	852.89	19.45	8	2	19.00	834.1	3.81	18.81	4.0	19.0	849.1	834.1	15.00
MW-21	CME 750 HSA	MW-10136	6/30/2015	Still in use	Monitoring Well/Gauging	855.68	855.77	20.70	8	2	20.00	835.7	5.09	20.09	5.0	20.0	850.7	835.7	15.00
MW-22	CME 750 HSA	MW-10136	7/1/2015	Still in use	Monitoring Well/Gauging	854.62	854.60	10.30	8	2	11.00	843.6	5.98	10.98	6.0	11.0	848.6	843.6	5.00
MW-23	CME 750 HSA	MW-10136	7/1/2015	Still in use	Monitoring Well/Gauging	846.66	849.57	23.50	8	2	20.00	826.7	7.91	22.91	5.0	20.0	841.7	826.7	15.00
MW-23B	CME 550 HSA	MW-10136	7/22/2015	Still in use	Monitoring Well/Gauging	846.81	849.69	53.48	10	6	50.50	796.3	30.88	53.38	28.0	50.5	818.8	796.3	22.50
MW-24	CME 550 HSA	MW-10136	7/15/2015	Still in use	Monitoring Well/Gauging	815.72	817.92	15.30	8	2	13.00	802.7	10.20	15.20	8.0	13.0	807.7	802.7	5.00

Table J-1. Well Construction Information
 Plantation Pipe Line Company
 Lewis Drive Remediation Site, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Location ID	Installation Method	Permit #	Date Installed	Date Abandoned	Purpose	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Measured Depth to Bottom (ft BTOC)	Bore Hole Diameter (in)	Well Dia (in)	Well Depth (ft bgs)	Bottom of Well (ft amsl)	Top of Screen or Open Borehole Interval (ft BTOC)	Bottom of Screen or Open Borehole Interval (ft BTOC)	Top of Screen or Open Borehole Interval (ft bgs)	Bottom of Screen or Open Borehole Interval (ft bgs)	Top of Screen or Open Borehole Interval (ft amsl)	Bottom of Screen or Open Borehole Interval (ft amsl)	Length of Screen or Open Borehole Interval (ft)
MW-24B	CME 550 HSA	MW-10136	7/20/2015	Still in use	Monitoring Well/Gauging	815.83	818.72	45.10	10	6	39.50	776.3	22.39	42.39	19.5	39.5	796.3	776.3	20.00
MW-25	Geoprobe 3230 DT HSA	MW-10463	1/5/2016	Still in use	Monitoring Well/Gauging	823.46	826.18	18.07	8	2	15.00	808.5	8.04	18.04	5.0	15.0	818.5	808.5	10.00
MW-25B	Geoprobe 3230 DT HSA	MW-10464	1/5/2016	Still in use	Monitoring Well/Gauging	822.59	823.81	59.00	10	6	58.00	764.6	49.22	59.22	48.0	58.0	774.6	764.6	10.00
MW-26	Geoprobe 3230 DT HSA	MW-10465	1/4/2016	Still in use	Monitoring Well/Gauging	844.76	847.56	17.15	8	2	15.25	829.5	7.27	17.27	5.0	15.0	839.8	829.8	10.00
MW-26B	Geoprobe 3230 DT HSA	MW-10466	1/4/2016	Still in use	Monitoring Well/Gauging	844.81	847.81	43.84	10	6	38.00	806.8	29.00	41.00	26.0	38.0	818.8	806.8	12.00
MW-27	Geoprobe 3230 DT HSA	MW-10467	1/5/2016	Still in use	Monitoring Well/Gauging	854.22	854.11	29.51	8	2	30.25	824.0	15.11	30.11	15.0	30.0	839.2	824.2	15.00
MW-27B	CME 550 HSA / Schramm	MW-10578	4/26/2016	Still in use	Monitoring Well/Gauging	854.27	857.14	41.45	10	6	46.00	808.3	31.45	41.45	36.0	46.0	818.3	808.3	10.00
MW-28	Geoprobe 3230 DT HSA	MW-10468	1/5/2016	Still in use	Monitoring Well/Gauging	841.49	844.31	25.93	8	2	25.25	816.2	13.50	23.50	15.0	25.0	826.5	816.5	10.00
MW-29	Geoprobe 3230 DT HSA	MW-10469	1/4/2016	Still in use	Monitoring Well/Gauging	852.07	852.20	15.10	8	2	15.25	836.8	5.00	15.00	5.0	15.0	847.1	837.1	10.00
MW-30	Geoprobe 3230 DT HSA	MW-10470	1/6/2016	Still in use	Monitoring Well/Gauging	841.21	841.28	14.69	8	2	15.25	826.0	5.00	15.00	5.0	15.0	836.2	826.2	10.00
MW-31	CME 550 HSA	MW-10578	4/19/2016	Still in use	Monitoring Well/Gauging	842.26	845.04	28.20	8	2	25.00	817.3	13.20	28.20	10.0	25.0	832.3	817.3	15.00
MW-31B	CME 550 HSA / Schramm	MW-10578	4/22/2016	Still in use	Monitoring Well/Gauging	842.01	844.94	79.25	10	6	76.00	766.0	68.25	79.25	65.0	76.0	777.0	766.0	11.00
MW-32	CME 550 HSA	MW-10578	4/19/2016	Still in use	Monitoring Well/Gauging	839.81	842.93	29.09	8	2	26.00	813.8	13.09	28.09	10.0	25.0	829.8	814.8	15.00
MW-33	CME 550 HSA	MW-10578	4/15/2016	Still in use	Monitoring Well/Gauging	846.20	849.20	28.30	8	2	27.00	819.2	11.30	26.30	10.0	25.0	836.2	821.2	15.00
MW-33T	CME 550 HSA/Air Rotary	MW-10578	4/14/2016	Still in use	Monitoring Well/Gauging	846.15	849.11	100.35	8	2	96.50	749.7	87.85	97.85	84.0	94.0	762.2	752.2	10.00
MW-34	Hand Auger	MW-10994	3/16/2017	Still in use	Monitoring Well/Gauging	813.99	816.35	7.86	4	2	5.00	809.0	5.36	7.86	2.5	5.0	811.5	809.0	2.50
MW-35	CME 550 HSA	MW-10578	4/20/2016	Still in use	Monitoring Well/Gauging	826.22	829.40	28.42	8	2	26.00	800.2	12.42	27.42	10.0	25.0	816.2	801.2	15.00
MW-36	CME 550 HSA	MW-10578	4/22/2016	Still in use	Monitoring Well/Gauging	858.66	858.47	23.65	8	2	24.50	834.2	8.65	23.65	9.5	24.5	849.2	834.2	15.00
MW-36B	CME 550 HSA / Schramm	MW-10578	4/28/2016	Still in use	Monitoring Well/Gauging	858.49	858.15	47.54	10	6	54.90	803.6	36.64	46.64	44.0	54.0	814.5	804.5	10.00
MW-37	Geoprobe 8040 HSA	MW-10759	8/9/2016	Still in use	Monitoring Well/Gauging	810.93	813.92	18.11	6.25	2	16.00	794.9	7.11	17.11	5.0	15.0	805.9	795.9	10.00
MW-38	Geoprobe 8040 HSA	MW-10759	8/9/2016	Still in use	Monitoring Well/Gauging	810.49	813.28	11.61	6.25	2	9.10	801.4	6.41	11.41	3.9	8.9	806.6	801.6	5.00
MW-39	Geoprobe 8040 HSA	MW-10759	11/29/2016	Still in use	Monitoring Well/Gauging	816.92	819.90	13.01	6.25	2	11.00	805.9	7.01	12.01	5.0	10.0	811.9	806.9	5.00
MW-40	Geoprobe 8040 HSA	MW-10759	11/30/2016	Still in use	Monitoring Well/Gauging	814.75	817.79	13.18	6.25	2	11.00	803.8	7.18	12.18	5.0	10.0	809.8	804.8	5.00
MW-41	Geoprobe 8040 HSA	MW-10759	11/28/2016	Still in use	Monitoring Well/Gauging	816.67	819.68	13.20	6.25	2	11.00	805.7	7.20	12.20	5.0	10.0	811.7	806.7	5.00
MW-42	Geoprobe 8040 HSA	MW-10759	11/28/2016	Still in use	Monitoring Well/Gauging	817.31	820.33	13.40	6.25	2	11.00	806.3	7.40	12.40	5.0	10.0	812.3	807.3	5.00
MW-43	Mobile Drill B57	MW-10964	10/20/2017	Still in use	Monitoring Well/Gauging	815.92	818.12	10.30	8.5	2	7.50	808.42	5.30	10.30	2.5	7.5	813.42	808.42	5.00
MW-43B	Mobile Drill B57	MW-10964	10/20/2017	Still in use	Monitoring Well/Gauging	816.08	818.80	54.40	13.75	4	51.00	765.08	34.40	54.40	31.0	51.0	785.08	765.08	20.00
MW-44	Hollow Stem Auger	MW-10964	1/23/2017	Still in use	Monitoring Well/Gauging	853.82	853.67	9.82	6.25	2	10.00	843.8	4.82	9.82	5.0	10.0	848.8	843.8	5.00
MW-44B	Hollow Stem Auger/Wire Line/Air Rotary	MW-10964	1/23/2017	Still in use	Monitoring Well/Gauging	853.66	853.38	34.50	10.25	4	37.10	816.6	13.50	34.50	16.1	37.1	837.6	816.6	21.00
MW-45	Hollow Stem Auger	MW-10964	1/26/2017	Still in use	Monitoring Well/Gauging	852.39	852.47	14.42	6.25	2	14.00	838.4	4.42	14.42	4.0	14.0	848.4	838.4	10.00
MW-45B	Hollow Stem Auger/Wire Line/Air Rotary	MW-10964	1/25/2017	Still in use	Monitoring Well/Gauging	852.69	852.85	40.30	10.25	4	40.30	812.4	19.00	40.30	19.0	40.3	833.7	812.4	21.30
MW-46	Geoprobe 8040 DT	MW-11117	9/13/2017	Still in use	Monitoring Well/Gauging	842.43	845.47	17.05	8.5	2	14.00	828.4	12.05	17.05	9.0	14.0	833.4	828.4	5.00
MW-47	Geoprobe 8040 DT	MW-11117	9/14/2017	Still in use	Monitoring Well/Gauging	839.89	842.98	22.79	8.5	2	20.00	819.9	12.79	22.79	10.0	20.0	829.9	819.9	10.00

Table J-1. Well Construction Information
 Plantation Pipe Line Company
 Lewis Drive Remediation Site, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Location ID	Installation Method	Permit #	Date Installed	Date Abandoned	Purpose	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Measured Depth to Bottom (ft BTOC)	Bore Hole Diameter (in)	Well Dia (in)	Well Depth (ft bgs)	Bottom of Well (ft amsl)	Top of Screen or Open Borehole Interval (ft BTOC)	Bottom of Screen or Open Borehole Interval (ft BTOC)	Top of Screen or Open Borehole Interval (ft bgs)	Bottom of Screen or Open Borehole Interval (ft bgs)	Top of Screen or Open Borehole Interval (ft amsl)	Bottom of Screen or Open Borehole Interval (ft amsl)	Length of Screen or Open Borehole Interval (ft)
MW-48B	Mobile Drill B57	MW-11117	10/18/2017	Still in use	Monitoring Well/Gauging	829.53	832.34	94.50	13.75	4	91.00	738.5	74.50	94.50	71.0	91.0	758.5	738.5	20.00
MW-49	Geoprobe 8040 DT	MW-11117	9/14/2017	Still in use	Monitoring Well/Gauging	843.65	846.78	23.30	8.5	2	21.00	822.7	8.30	23.30	6.0	21.0	837.7	822.7	15.00
MW-50B	Mobile Drill B57	MW-11247	10/17/2017	Still in use	Monitoring Well/Gauging	847.11	850.34	109.60	13.75	4	106.00	741.1	89.60	109.60	96.0	106.0	751.1	741.1	20.00
MW-51	CME 750 HSA	MW-11508	9/5/2018	Still in use	Monitoring Well/Gauging	831.92	828.77	25.34	6.25	2	22.50	809.4	10.45	25.45	7.3	22.3	824.6	809.6	15.00
MW-52	CME 750 HSA	MW-11508	9/4/2018	Still in use	Monitoring Well/Gauging	830.09	826.72	33.43	6.25	2	28.50	801.6	16.37	31.37	13.0	28.0	817.1	802.1	15.00
MW-53	CME 750 HSA	MW-11508	8/28/2018	Still in use	Monitoring Well/Gauging	837.24	837.37	21.32	8.0	2	21.80	815.4	6.00	21.00	6.0	21.0	831.2	816.2	15.00
MW-54	CME 750 HSA	MW-11508	8/30/2018	Still in use	Monitoring Well/Gauging	840.83	840.79	25.58	8.0	2	25.20	815.6	9.80	24.80	9.8	24.8	831.0	816.0	15.00
MW-55	Geoprobe 8040 DT	MW-11667	3/13/2019	Still in use	Monitoring Well/Gauging	859.84	859.71	25.50	6.0	2	25.50	834.3	10.00	25.00	10.0	25.0	849.8	834.8	15.00
MW-56	Geoprobe 8040 DT	MW-11841	3/12/2019	Still in use	Monitoring Well/Gauging	840.71	843.94	14.30	6.0	2	14.80	825.9	7.30	17.30	4.3	14.3	836.4	826.4	10.00
MW-57	Geoprobe 8040 DT	MW-11841	3/12/2019	Still in use	Monitoring Well/Gauging	842.50	845.63	13.88	6.0	2	14.38	828.1	6.90	16.90	3.9	13.9	838.6	828.6	10.00
Recovery Wells																			
RW-01	HSA	MW-09978	1/28/2015	Still in use	Gauging/LNAPL Recovery	849.49	851.92	20.80	6.25	4	17	832.5	4.44	19.44	2.0	17.0	847.5	832.5	15.00
RW-02	HSA	MW-09978	1/29/2015	Still in use	Gauging/LNAPL Recovery	850.22	852.69	25.72	6.25	4	23	827.2	15.47	25.47	13.0	23.0	837.2	827.2	10.00
RW-03	HSA	MW-09978	1/29/2015	Still in use	Gauging/LNAPL Recovery	850.03	852.34	33.39	6.25	4	31.2	818.8	18.51	33.51	16.2	31.2	833.8	818.8	15.00
RW-04	HSA	MW-09978	1/29/2015	Still in use	Gauging/LNAPL Recovery	852.15	853.93	35.04	6.25	4	33	819.2	14.78	34.78	13.0	33.0	839.2	819.2	20.00
RW-05	HSA	MW-09978	1/30/2015	Still in use	Gauging/LNAPL Recovery	850.99	853.53	38.25	6.25	4	34.5	816.5	22.04	37.04	19.5	34.5	831.5	816.5	15.00
RW-06	HSA	MW-09978	1/30/2015	Still in use	Gauging/LNAPL Recovery	844.21	846.21	38.50	6.25	4	38.5	805.7	20.49	40.49	18.5	38.5	825.7	805.7	20.00
RW-07	HSA	MW-09978	2/2/2015	Still in use	Gauging/LNAPL Recovery	841.01	843.19	38.00	6.25	4	38	803.0	15.18	40.18	13.0	38.0	828.0	803.0	25.00
RW-08	HSA	MW-09978	2/2/2015	Still in use	Gauging/LNAPL Recovery	833.46	835.48	33.50	6.25	4	33.5	800.0	10.52	35.52	8.5	33.5	825.0	800.0	25.00
RW-09	HSA	MW-09978	2/3/2015	Still in use	Gauging/LNAPL Recovery	831.13	835.12	42.13	6.25	4	41.5	789.6	15.49	45.49	11.5	41.5	819.6	789.6	30.00
RW-10	HSA	MW-10006	2/4/2015	Still in use	Gauging/LNAPL Recovery	846.76	848.53	66.51	6.25	4	68.5	778.3	5.27	70.27	3.5	68.5	843.3	778.3	65.00
RW-11	HSA	MW-10006	2/4/2015	Still in use	Gauging/LNAPL Recovery	851.03	852.97	21.40	6.25	4	19.5	831.5	6.44	21.44	4.5	19.5	846.5	831.5	15.00
RW-12	HSA	MW-10006	2/5/2015	Still in use	Gauging/LNAPL Recovery	851.64	854.49	16.90	6.25	4	14	837.6	6.90	16.90	4.0	14.0	847.6	837.6	10.00
RW-14	HSA	MW-10006	2/6/2015	Still in use	Gauging/LNAPL Recovery	826.25	827.54	55.00	6.25	4	55	771.2	5.00	55.00	5.0	55.0	821.2	771.2	50.00
RW-15	HSA	MW-10006	2/10/2015	Still in use	Gauging/LNAPL Recovery	849.48	851.64	36.50	6.25	4	36.5	813.0	1.50	36.50	1.5	36.5	848.0	813.0	35.00
Recovery Sumps																			
RS-01	Trackhoe	MW-09978	12/29/2014	Still in use	Gauging/LNAPL Recovery	847.95	849.13	23.60	NA	4	22.42	825.5	3.18	23.60	2.0	22.4	845.9	825.5	20.42
RS-02	Trackhoe	MW-09978	12/29/2014	Still in use	Gauging/LNAPL Recovery	848.54	849.52	20.00	NA	4	19.02	829.5	2.98	20.00	2.0	19.0	846.5	829.5	17.02
RS-04	Trackhoe	MW-09978	12/30/2014	Still in use	Gauging/LNAPL Recovery	850.36	851.47	10.75	NA	4	9.64	840.7	3.11	10.75	2.0	9.6	848.4	840.7	7.64
RS-05	Trackhoe	MW-09978	12/31/2014	Still in use	Gauging/LNAPL Recovery	847.14	848.31	25.20	NA	4	24.03	823.1	3.17	25.20	2.0	24.0	845.1	823.1	22.03
RS-06	Trackhoe	MW-09978	12/31/2014	Still in use	Gauging/LNAPL Recovery	848.25	849.47	25.18	NA	4	23.96	824.3	3.22	25.18	2.0	24.0	846.2	824.3	21.96
RS-07	Trackhoe	MW-09978	12/31/2014	Still in use	Gauging/LNAPL Recovery	854.06	855.08	16.65	NA	4	15.63	838.4	3.02	16.65	2.0	15.6	852.1	838.4	13.63
RS-08	Trackhoe	MW-09978	12/31/2014	Still in use	Gauging/LNAPL Recovery	852.65	854.24	20.22	NA	4	18.63	834.0	3.59	20.22	2.0	18.6	850.7	834.0	16.63
RS-09	Trackhoe	MW-09978	1/7/2015	Still in use	Gauging/LNAPL Recovery	846.75	847.60	18.85	NA	4	18.00	828.8	2.85	18.85	2.0	18.0	844.8	828.8	16.00
RS-10	Trackhoe	MW-09978	1/7/2015	Still in use	Gauging/LNAPL Recovery	846.28	847.42	20.06	NA	4	18.92	827.4	3.14	20.06	2.0	18.9	844.3	827.4	16.92
RS-11	Trackhoe	MW-09978	1/7/2015	Still in use	Gauging/LNAPL Recovery	846.35	847.44	22.06	NA	4	20.97	825.4	3.09	22.06	2.0	21.0	844.3	825.4	18.97
RS-12	Trackhoe	MW-09978	1/7/2015	Still in use	Gauging/LNAPL Recovery	846.58	847.74	21.29	NA	4	20.13	826.5	3.16	21.29	2.0	20.1	844.6	826.5	18.13

Table J-1. Well Construction Information
 Plantation Pipe Line Company
 Lewis Drive Remediation Site, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Location ID	Installation Method	Permit #	Date Installed	Date Abandoned	Purpose	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Measured Depth to Bottom (ft BTOC)	Bore Hole Diameter (in)	Well Dia (in)	Well Depth (ft bgs)	Bottom of Well (ft amsl)	Top of Screen or Open Borehole Interval (ft BTOC)	Bottom of Screen or Open Borehole Interval (ft BTOC)	Top of Screen or Open Borehole Interval (ft bgs)	Bottom of Screen or Open Borehole Interval (ft bgs)	Top of Screen or Open Borehole Interval (ft amsl)	Bottom of Screen or Open Borehole Interval (ft amsl)	Length of Screen or Open Borehole Interval (ft)
RS-13	Trackhoe	MW-09978	1/8/2015	Still in use	Gauging/LNAPL Recovery	845.39	845.98	19.92	NA	4	19.33	826.1	1.96	19.92	1.4	19.3	844.0	826.1	17.96
RS-14	Trackhoe	MW-09978	1/8/2015	Still in use	Gauging/LNAPL Recovery	844.66	845.97	19.93	NA	4	18.62	826.0	3.31	19.93	2.0	18.6	842.7	826.0	16.62
RS-15	Trackhoe	MW-09978	1/8/2015	Still in use	Gauging/LNAPL Recovery	845.36	846.41	19.93	NA	4	18.88	826.5	3.05	19.93	2.0	18.9	843.4	826.5	16.88
RS-16	Trackhoe	MW-09978	1/8/2015	Still in use	Gauging/LNAPL Recovery	844.56	845.44	19.98	NA	4	19.10	825.5	2.88	19.98	2.0	19.1	842.6	825.5	17.10
RS-17	Trackhoe	MW-09978	1/8/2015	Still in use	Gauging/LNAPL Recovery	843.29	844.22	19.91	NA	4	18.98	824.3	2.93	19.91	2.0	19.0	841.3	824.3	16.98
RS-18	Trackhoe	MW-09978	1/8/2015	Still in use	Gauging/LNAPL Recovery	846.82	847.89	19.98	NA	4	18.91	827.9	3.07	19.98	2.0	18.9	844.8	827.9	16.91
RS-20	Trackhoe	MW-09978	3/19/2015	Still in use	Gauging/LNAPL Recovery	841.73	842.69	11.84	NA	4	9.91	831.8	3.93	11.84	2.0	9.9	839.7	831.8	7.91
Recovery Trench Sumps																			
RT-1A	Trackhoe	MW-09978	1/6/2015	Still in use	Gauging/LNAPL Recovery	852.86	854.06	20.89	NA	4	20.00	832.9	3.20	21.20	2.0	20.0	850.9	832.9	18.00
RT-1B	Trackhoe	MW-09978	1/6/2015	Still in use	Gauging/LNAPL Recovery	853.29	854.15	21.10	NA	4	20.00	833.3	2.86	20.86	2.0	20.0	851.3	833.3	18.00
RT-1C	Trackhoe	MW-09978	1/6/2015	Still in use	Gauging/LNAPL Recovery	853.55	854.55	21.27	NA	4	20.00	833.5	3.00	21.00	2.0	20.0	851.5	833.5	18.00
RT-2A	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	815.66	817.48	10.81	NA	4	10.00	805.7	3.82	11.82	2.0	10.0	813.7	805.7	8.00
RT-2B	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	816.72	817.61	10.82	NA	4	10.00	806.7	2.89	10.89	2.0	10.0	814.7	806.7	8.00
RT-2C	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	816.86	818.06	10.23	NA	4	10.00	806.9	3.20	11.20	2.0	10.0	814.9	806.9	8.00
RT-2D	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	817.11	818.12	10.21	NA	4	10.00	807.1	3.01	11.01	2.0	10.0	815.1	807.1	8.00
RT-2E	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	817.32	818.25	10.24	NA	4	10.00	807.3	2.93	10.93	2.0	10.0	815.3	807.3	8.00
RT-2F	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	817.74	818.57	10.23	NA	4	10.00	807.7	2.83	10.83	2.0	10.0	815.7	807.7	8.00
RT-2G	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	819.27	820.07	10.24	NA	4	10.00	809.3	2.80	10.80	2.0	10.0	817.3	809.3	8.00
RT-2I	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	819.23	819.51	10.20	NA	4	10.00	809.2	2.28	10.28	2.0	10.0	817.2	809.2	8.00
RT-2J	Trackhoe	MW-09978	1/22/2015	Still in use	Gauging/LNAPL Recovery	817.47	817.63	10.22	NA	4	10.00	807.5	2.16	10.16	2.0	10.0	815.5	807.5	8.00
RT-2K	Trackhoe	MW-09978	3/20/2015	Still in use	Gauging/LNAPL Recovery	816.11	817.40	4.14	NA	4	2.50	813.6	2.64	4.14	1.0	2.5	815.1	813.6	1.50
RT-2L	Trackhoe	MW-09978	3/20/2015	Still in use	Gauging/LNAPL Recovery	817.95	819.54	6.60	NA	4	3.71	814.2	3.89	6.60	1.0	3.7	816.9	814.2	2.71
Piezometers																			
TW-28	DPT	MW-09978	1/23/2015	Still in use	Gauging	851.57	851.42	31.84	2.2	1	30	821.6	11.84	31.84	10.0	32.0	841.6	819.6	20.00
TW-41	DPT	MW-09978	1/25/2015	Still in use	Gauging	849.38	849.38	32.15	2.2	1	34	815.4	7.15	32.15	9.0	32.1	840.4	817.2	25.00
TW-42	DPT	MW-09978	1/25/2015	Still in use	Gauging	847.02	846.84	27.50	2.2	1	29.5	817.5	7.50	27.50	9.5	27.7	837.5	819.3	20.00
TW-45	DPT	MW-09978	1/25/2015	Still in use	Gauging	848.26	848.31	36.86	2.2	1	37.5	810.8	11.86	36.86	12.5	36.8	835.8	811.4	25.00
TW-55	DPT	MW-10006	2/5/2015	Still in use	Gauging	846.00	845.93	41.50	2.7	1	43	803.0	11.50	41.50	13.0	41.6	833.0	804.4	30.00
TW-59	DPT	MW-09978	1/30/2015	Still in use	Gauging	834.84	834.78	21.15	2.7	1	22	812.8	6.15	21.15	7.0	21.2	827.8	813.6	15.00
TW-60	DPT	MW-09978	1/30/2015	Still in use	Gauging	828.00	828.03	37.20	2.7	1	41.5	786.5	2.20	37.20	6.5	37.2	821.5	790.8	35.00
TW-64	DPT	MW-09978	2/2/2015	Still in use	Gauging	845.89	845.88	52.85	2.2	1	55	790.9	2.85	52.85	5.0	52.9	840.9	793.0	50.00
TW-66	DPT	MW-09978	2/2/2015	Still in use	Gauging	820.18	820.31	23.81	2.7	1	24	796.2	3.81	23.81	4.0	23.7	816.2	796.5	20.00
TW-67	DPT	MW-09978	2/3/2015	Still in use	Gauging	852.88	852.71	26.47	2.7	1	27	825.9	6.47	26.47	7.0	26.6	845.9	826.2	20.00
TW-73	DPT	MW-09978	2/3/2015	Still in use	Gauging	850.60	850.53	16.00	2.7	1	16	834.6	6.00	16.00	6.0	16.1	844.6	834.5	10.00
TW-94	DPT	MW-10006	2/10/2015	Still in use	Gauging	840.75	840.58	40.00	2.7	1	40	800.8	5.00	40.00	5.0	40.2	835.8	800.6	35.00
TW-96	DPT	MW-10006	2/11/2015	Still in use	Gauging	840.52	840.40	28.76	2.7	1	30	810.5	3.76	28.76	5.0	28.9	835.5	811.6	25.00
Vertical Air Sparging Wells																			

Table J-1. Well Construction Information
 Plantation Pipe Line Company
 Lewis Drive Remediation Site, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Location ID	Installation Method	Permit #	Date Installed	Date Abandoned	Purpose	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Measured Depth to Bottom (ft BTOC)	Bore Hole Diameter (in)	Well Dia (in)	Well Depth (ft bgs)	Bottom of Well (ft amsl)	Top of Screen or Open Borehole Interval (ft BTOC)	Bottom of Screen or Open Borehole Interval (ft BTOC)	Top of Screen or Open Borehole Interval (ft bgs)	Bottom of Screen or Open Borehole Interval (ft bgs)	Top of Screen or Open Borehole Interval (ft amsl)	Bottom of Screen or Open Borehole Interval (ft amsl)	Length of Screen or Open Borehole Interval (ft)
VAS-01	Mobile B57 HSA	SCHE03020469	7/28/2016	Still in use	Cupboard Creek Protection	853.269	NS	NA	8.50	2.00	32.20	NA	NA	NA	28.70	31.20	NA	NA	2.50
VAS-02	Mobile B57 HSA	SCHE03020469	7/27/2016	Still in use	Cupboard Creek Protection	852.360	NS	NA	8.50	2.00	27.00	NA	NA	NA	23.50	26.00	NA	NA	2.50
VAS-03	Mobile B57 HSA	SCHE03020469	7/27/2016	Still in use	Cupboard Creek Protection	852.132	NS	NA	8.50	2.00	18.30	NA	NA	NA	14.80	17.30	NA	NA	2.50
VAS-04	Geoprobe 8040 HSA	SCHE03020469	8/4/2016	Still in use	Cupboard Creek Protection	852.056	NS	NA	8.50	2.00	16.70	NA	NA	NA	13.20	15.70	NA	NA	2.50
VAS-05	Mobile B57 HSA	SCHE03020469	7/27/2016	Still in use	Cupboard Creek Protection	851.559	NS	NA	8.50	2.00	13.00	NA	NA	NA	9.50	12.00	NA	NA	2.50
VAS-06	Mobile B57 HSA	SCHE03020469	7/26/2016	Still in use	Cupboard Creek Protection	851.612	NS	NA	8.50	2.00	14.40	NA	NA	NA	10.90	13.40	NA	NA	2.50
VAS-07	Mobile B57 HSA	SCHE03020469	7/26/2016	Still in use	Cupboard Creek Protection	851.603	NS	NA	8.50	2.00	19.40	NA	NA	NA	15.90	18.40	NA	NA	2.50
VAS-08	Mobile B57 HSA	SCHE03020469	7/25/2016	Still in use	Cupboard Creek Protection	851.583	NS	NA	8.50	2.00	22.00	NA	NA	NA	18.50	21.00	NA	NA	2.50
VAS-09	Mobile B57 HSA	SCHE03020469	7/25/2016	Still in use	Cupboard Creek Protection	851.607	NS	NA	8.50	2.00	14.00	NA	NA	NA	10.50	13.00	NA	NA	2.50
VAS-10	Mobile B57 HSA	SCHE03020469	7/25/2016	Still in use	Cupboard Creek Protection	851.411	NS	NA	8.50	2.00	16.10	NA	NA	NA	12.60	15.10	NA	NA	2.50
VAS-11	Mobile B57 HSA	SCHE03020469	7/28/2016	Still in use	Cupboard Creek Protection	852.476	NS	NA	8.50	2.00	25.30	NA	NA	NA	21.80	24.30	NA	NA	2.50
VAS-12	Geoprobe 8040 HSA	SCHE03020469	8/5/2016	Still in use	Cupboard Creek Protection	851.535	NS	NA	8.50	2.00	24.20	NA	NA	NA	20.70	23.20	NA	NA	2.50
VAS-13	Geoprobe 8040 HSA	SCHE03020469	8/5/2016	Still in use	Cupboard Creek Protection	851.701	NS	NA	8.50	2.00	19.60	NA	NA	NA	16.10	18.60	NA	NA	2.50
VAS-14	Geoprobe 8040 HSA	SCHE03020469	8/4/2016	Still in use	Cupboard Creek Protection	851.239	NS	NA	8.50	2.00	16.20	NA	NA	NA	12.70	15.20	NA	NA	2.50
VAS-15	Geoprobe 8040 HSA	SCHE03020469	8/4/2016	Still in use	Cupboard Creek Protection	850.732	NS	NA	8.50	2.00	15.50	NA	NA	NA	12.00	14.50	NA	NA	2.50
VAS-16	Geoprobe 8040 HSA	SCHE03020469	8/3/2016	Still in use	Cupboard Creek Protection	850.305	NS	NA	8.50	2.00	17.90	NA	NA	NA	14.40	16.90	NA	NA	2.50
VAS-17	Geoprobe 8040 HSA	SCHE03020469	8/3/2016	Still in use	Cupboard Creek Protection	849.842	NS	NA	8.50	2.00	19.30	NA	NA	NA	15.80	18.30	NA	NA	2.50
VAS-18	Geoprobe 8040 HSA	SCHE03020469	8/8/2016	Still in use	Cupboard Creek Protection	849.513	NS	NA	8.50	2.00	16.50	NA	NA	NA	13.00	15.50	NA	NA	2.50
VAS-19	Mobile B57 HSA	SCHE03020469	7/26/2016	Still in use	Cupboard Creek Protection	850.465	NS	NA	8.50	2.00	17.20	NA	NA	NA	13.60	16.10	NA	NA	2.50
VAS-20	Mobile B57 HSA	SCHE03020469	7/19/2016	Still in use	Brown's Creek Protection	827.789	NS	NA	8.50	2.00	47.60	NA	NA	NA	44.60	47.10	NA	NA	2.50
VAS-21	Mobile B57 HSA	SCHE03020469	7/19/2016	Still in use	Brown's Creek Protection	826.304	NS	NA	8.50	2.00	53.50	NA	NA	NA	50.00	52.50	NA	NA	2.50
VAS-22	Mobile B57 HSA	SCHE03020469	7/21/2016	Still in use	Brown's Creek Protection	827.394	NS	NA	8.50	2.00	57.00	NA	NA	NA	53.50	56.00	NA	NA	2.50
VAS-23	Mobile B57 HSA	SCHE03020469	7/22/2016	Still in use	Brown's Creek Protection	827.211	NS	NA	8.50	2.00	49.50	NA	NA	NA	46.00	48.50	NA	NA	2.50
VAS-24	Mobile B57 HSA	SCHE03020469	7/5/2016	Still in use	Brown's Creek Protection	826.803	NS	NA	8.50	2.00	58.50	NA	NA	NA	55.00	57.50	NA	NA	2.50
VAS-25	Mobile B57 HSA	SCHE03020469	7/11/2016	Still in use	Brown's Creek Protection	826.411	NS	NA	8.50	2.00	54.00	NA	NA	NA	50.50	53.00	NA	NA	2.50
VAS-26	Mobile B57 HSA	SCHE03020469	7/11/2016	Still in use	Brown's Creek Protection	825.180	NS	NA	8.50	2.00	55.00	NA	NA	NA	51.50	54.00	NA	NA	2.50
VAS-27	Mobile B57 HSA	SCHE03020469	7/8/2016	Still in use	Brown's Creek Protection	826.369	NS	NA	8.50	2.00	54.00	NA	NA	NA	50.50	53.00	NA	NA	2.50
VAS-28	Mobile B57 HSA	SCHE03020469	7/6/2016	Still in use	Brown's Creek Protection	828.930	NS	NA	8.50	2.00	23.10	NA	NA	NA	19.80	22.30	NA	NA	2.50
VAS-29	Mobile B57 HSA	SCHE03020469	7/6/2016	Still in use	Brown's Creek Protection	832.025	NS	NA	8.50	2.00	27.50	NA	NA	NA	24.00	26.50	NA	NA	2.50
VAS-30	Mobile B57 HSA	SCHE03020469	6/21/2016	Still in use	Brown's Creek Protection	831.485	NS	NA	8.50	2.00	52.90	NA	NA	NA	49.40	51.90	NA	NA	2.50
VAS-31	Mobile B57 HSA	SCHE03020469	6/21/2016	Still in use	Brown's Creek Protection	828.337	NS	NA	8.50	2.00	42.00	NA	NA	NA	38.50	41.00	NA	NA	2.50
VAS-32	Mobile B57 HSA	SCHE03020469	6/30/2016	Still in use	Brown's Creek Protection	836.257	NS	NA	8.50	2.00	43.00	NA	NA	NA	39.50	42.00	NA	NA	2.50
VAS-33	Mobile B57 HSA	SCHE03020469	6/29/2016	Still in use	Brown's Creek Protection	840.900	NS	NA	8.50	2.00	52.60	NA	NA	NA	49.10	51.60	NA	NA	2.50
VAS-34	Mobile B57 HSA	SCHE03020469	7/13/2016	Still in use	Brown's Creek Protection	836.585	NS	NA	8.50	2.00	53.50	NA	NA	NA	50.00	52.50	NA	NA	2.50
VAS-35	Mobile B57 HSA	SCHE03020469	7/13/2016	Still in use	Brown's Creek Protection	831.212	NS	NA	8.50	2.00	40.00	NA	NA	NA	36.50	39.00	NA	NA	2.50
VAS-36	Mobile B57 HSA	SCHE03020469	7/7/2016	Still in use	Brown's Creek Protection	831.361	NS	NA	8.50	2.00	33.20	NA	NA	NA	29.70	32.20	NA	NA	2.50
VAS-37	Mobile B57 HSA	SCHE03020469	7/7/2016	Still in use	Brown's Creek Protection	832.454	NS	NA	8.50	2.00	16.50	NA	NA	NA	13.00	15.50	NA	NA	2.50

Table J-1. Well Construction Information
 Plantation Pipe Line Company
 Lewis Drive Remediation Site, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Location ID	Installation Method	Permit #	Date Installed	Date Abandoned	Purpose	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Measured Depth to Bottom (ft BTOC)	Bore Hole Diameter (in)	Well Dia (in)	Well Depth (ft bgs)	Bottom of Well (ft amsl)	Top of Screen or Open Borehole Interval (ft BTOC)	Bottom of Screen or Open Borehole Interval (ft BTOC)	Top of Screen or Open Borehole Interval (ft bgs)	Bottom of Screen or Open Borehole Interval (ft bgs)	Top of Screen or Open Borehole Interval (ft amsl)	Bottom of Screen or Open Borehole Interval (ft amsl)	Length of Screen or Open Borehole Interval (ft)
VAS-38	Mobile B57 HSA	SCHE03020469	7/6/2016	Still in use	Brown's Creek Protection	834.566	NS	NA	8.50	2.00	21.10	NA	NA	NA	16.60	19.10	NA	NA	2.50
VAS-39	Mobile B57 HSA	SCHE03020469	6/22/2016	Still in use	Brown's Creek Protection	835.956	NS	NA	8.50	2.00	42.40	NA	NA	NA	38.90	41.40	NA	NA	2.50
VAS-40	Mobile B57 HSA	SCHE03020469	6/23/2016	Still in use	Brown's Creek Protection	833.753	NS	NA	8.50	2.00	40.00	NA	NA	NA	36.50	39.00	NA	NA	2.50
VAS-41	Mobile B57 HSA	SCHE03020469	6/28/2016	Still in use	Brown's Creek Protection	845.071	NS	NA	8.50	2.00	27.80	NA	NA	NA	24.30	26.80	NA	NA	2.50
VAS-42A	Mobile B57 HSA	SCHE03020469	7/14/2016	Still in use	Brown's Creek Protection	845.304	NS	NA	8.50	2.00	39.30	NA	NA	NA	35.80	38.30	NA	NA	2.50
VAS-43A	Mobile B57 HSA	SCHE03020469	7/15/2016	Still in use	Brown's Creek Protection	843.078	NS	NA	8.50	2.00	66.50	NA	NA	NA	63.00	65.50	NA	NA	2.50
VAS-44A	Mobile B57 HSA	SCHE03020469	7/18/2016	Still in use	Brown's Creek Protection	838.353	NS	NA	8.50	2.00	72.50	NA	NA	NA	69.00	71.50	NA	NA	2.50
VAS-46	Mobile B57 HSA	SCHE03020469	6/24/2016	Still in use	Brown's Creek Protection	839.503	NS	NA	8.50	2.00	20.80	NA	NA	NA	18.00	20.50	NA	NA	2.50
VAS-47	CME-750	SCHE03020469M2	8/27/2018	Still in use	Brown's Creek Protection	848.370	NS	NA	8.00	2.00	33.20	NA	NA	NA	30.20	32.20	NA	NA	2.00
VAS-48	CME-750	SCHE03020469M2	8/16/2018	Still in use	Brown's Creek Protection	846.580	NS	NA	8.00	2.00	35.70	NA	NA	NA	32.70	34.70	NA	NA	2.00
VAS-49	CME-750	SCHE03020469M2	8/28/2018	Still in use	Brown's Creek Protection	849.730	NS	NA	8.00	2.00	33.70	NA	NA	NA	30.70	32.70	NA	NA	2.00
VAS-50	CME-750	SCHE03020469M2	8/16/2018	Still in use	Brown's Creek Protection	850.110	NS	NA	8.00	2.00	27.80	NA	NA	NA	24.80	26.80	NA	NA	2.00
VAS-51	CME-750	SCHE03020469M2	8/15/2018	Still in use	Brown's Creek Protection	851.900	NS	NA	8.00	2.00	30.00	NA	NA	NA	27.00	29.00	NA	NA	2.00
VAS-52	CME-750	SCHE03020469M2	8/14/2018	Still in use	Brown's Creek Protection	851.970	NS	NA	8.00	2.00	34.50	NA	NA	NA	31.50	33.50	NA	NA	2.00
VAS-53	CME-750	SCHE03020469M2	8/14/2018	Still in use	Brown's Creek Protection	852.880	NS	NA	8.00	2.00	26.70	NA	NA	NA	23.70	25.70	NA	NA	2.00
VAS-54	Geoprobe 8040 HSA	SCHE03020469M2	8/13/2018	Still in use	Brown's Creek Protection	852.770	NS	NA	4.25	2.00	19.20	NA	NA	NA	16.20	18.20	NA	NA	2.00
VAS-55	CME-750	SCHE03020469M2	9/7/2018	Still in use	Cupboard Creek Protection	854.710	NS	NA	6.25	2.00	28.90	NA	NA	NA	25.90	27.90	NA	NA	2.00
VAS-56	CME-750	SCHE03020469M2	9/7/2018	Still in use	Cupboard Creek Protection	855.730	NS	NA	6.25	2.00	28.20	NA	NA	NA	25.20	27.20	NA	NA	2.00
VAS-57	CME-750	SCHE03020469M2	9/5/2018	Still in use	Cupboard Creek Protection	856.620	NS	NA	6.25	2.00	31.50	NA	NA	NA	28.50	30.50	NA	NA	2.00
VAS-58	CME-750	SCHE03020469M2	9/5/2018	Still in use	Cupboard Creek Protection	855.980	NS	NA	6.25	2.00	31.30	NA	NA	NA	28.30	30.30	NA	NA	2.00
VAS-59	CME-750	SCHE03020469M2	9/6/2018	Still in use	Cupboard Creek Protection	854.740	NS	NA	6.25	2.00	8.80	NA	NA	NA	6.80	8.80	NA	NA	2.00

Table J-1. Well Construction Information
 Plantation Pipe Line Company
 Lewis Drive Remediation Site, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Location ID	Installation Method	Permit #	Date Installed	Date Abandoned	Purpose	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Measured Depth to Bottom (ft BTOC)	Bore Hole Diameter (in)	Well Dia (in)	Well Depth (ft bgs)	Bottom of Well (ft amsl)	Top of Screen or Open Borehole Interval (ft BTOC)	Bottom of Screen or Open Borehole Interval (ft BTOC)	Top of Screen or Open Borehole Interval (ft bgs)	Bottom of Screen or Open Borehole Interval (ft bgs)	Top of Screen or Open Borehole Interval (ft amsl)	Bottom of Screen or Open Borehole Interval (ft amsl)	Length of Screen or Open Borehole Interval (ft)
Vertical Bedrock Sparging Wells																			
VBS-01	Hollow Stem Auger/Wire Line/Air Rotary	SCHE03020469M	1/28/2017	Still in use	Brown's Creek Protection	NS	NS	38.15	4.00	2.00	38.50	NA	NA	NA	34.50	38.50	NA	NA	2.00
VBS-02	Hollow Stem Auger/Wire Line/Air Rotary	SCHE03020469M	1/28/2017	Still in use	Brown's Creek Protection	NS	NS	31.05	4.00	2.00	31.00	NA	NA	NA	27.00	31.00	NA	NA	2.00
VBS-03	Hollow Stem Auger/Wire Line/Air Rotary	SCHE03020469M	1/27/2017	Still in use	Brown's Creek Protection	NS	NS	36.20	4.00	2.00	36.20	NA	NA	NA	32.20	36.20	NA	NA	2.00

Notes:
 amsl = above mean sea level relative to North American Vertical Datum of 1988 (NAVD88). Benchmark is 34.8289659 degrees north, 82.3710354 degrees west (NAD83, 2011), elevation 929.1 ft NAVD88.
 bgs = below ground surface in = inches ID = identification MW = monitoring well
 BTOC = below top of casing NA = not applicable RS = recovery sump VAS = vertical air sparging well
 DPT = direct push NS = location not surveyed RT = recovery trench VBS = vertical bedrock sparging well
 ft = feet RNE = Refusal not encountered RW = recovery well
 HSA = hollow-stem auger TOC = top of casing TW = temporary well

The direct-push injections will be performed in the saprolite layer which consists primarily of silty sand underlain by bedrock. The bedrock underlying the site is fairly competent, with little to no transition zone, and has a fairly low density of fractures, enough to transmit groundwater but insufficient to provide substantial yields for supply wells.

Groundwater recharge occurs near the center of the site, resulting in groundwater flow toward Brown's Creek and Cupboard Creek, representing discharge boundaries for the local groundwater flow system.

The horizontal groundwater velocity estimates are provided for the Brown's Creek and Cupboard Protection Zones in **Table K-1**. Groundwater velocities were calculated using Darcy's Law using gauging data from December 3, 2018 and slug test hydraulic conductivity results from the following wells: MW-15(Brown's Creek), MW-23 (Cupboard Creek), and MW-24 (Brown's Creek) using the following equation:

$$q = \frac{K \cdot i}{\eta}$$

Where,

q = groundwater seepage velocity

K = hydraulic conductivity (feet per day)

i = change in hydraulic head over distance (feet per foot)

η = effective porosity (dimensionless; estimated to be 0.2 for weathered saprolite formation)

The calculated horizontal groundwater velocities ranged from 2.4 to 17 ft/day and 1.2 to 2.8 ft/day in the Brown's Creek and Cupboard Protection Zones, respectively.

The vertical gradients for Brown's Creek and Cupboard Protection Zones were calculated using the Environmental Protection Agency online vertical gradient calculator and groundwater gauging data collected on December 3, 2018. The vertical gradients ranged from 0.059 ft/ft downward to 0.012 upward for the Brown's Creek Protection Area and 0.037 ft/ft downward to 0.035 ft/ft upward for the Cupboard Creek Protection Area. Although some downward gradients were observed, it is typical for Piedmont lithology to transition to upward gradients near a stream. Therefore, surface water monitoring is included in the performance monitoring program to monitor for changes in surface water quality. The vertical gradient calculations are provided in **Table K-2**.

Table K-1. Estimates of Groundwater Velocity
Lewis Drive Release, Belton, South Carolina
Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Location	Groundwater Elevation ^a (ft amsl)	Northing	Easting	Horizontal Distance (ft)	Calculated Gradient (ft/ft)	Estimated Hydraulic Conductivity (ft/day)	Estimated Effective Porosity (unitless)	Calculated Groundwater Velocity (ft/day)
	<i>z</i>	<i>x</i>	<i>y</i>	$r = \sqrt{\Delta x^2 + \Delta y^2}$	$i = \frac{z}{r}$	<i>K</i>	<i>η</i>	$q = \frac{K \cdot i}{\eta}$
Northwest of Release								
MW-16	842.69	989870.97	1546044.13					
MW-03	824.36	990483.34	1545849.41					
Delta:	18.33	-612.37	194.72	643	0.03	28	0.20	4.0
Brown's Creek Protection Zone (Low Estimate)								
MW-14	823.82	990266.96	1546576.41					
MW-38	812.16	990411.87	1546745.53					
Delta:	11.66	-144.91	-169.12	223	0.05	9	0.20	2.4
Brown's Creek Protection Zone (High Estimate)								
MW-14	823.82	990266.96	1546576.41					
MW-38	812.16	990411.87	1546745.53					
Delta:	11.66	-144.91	-169.12	223	0.05	65	0.20	17.0
Cupboard Creek (Low Estimate)								
MW-23	842.60	989386.57	1545882.88					
MW-46	837.59	989248.60	1545706.59					
Delta:	5.01	137.97	176.28	224	0.02	11	0.20	1.2
Cupboard Creek (High Estimate)								
MW-23	842.60	989386.57	1545882.88					
MW-46	837.59	989248.60	1545706.59					
Delta:	5.01	137.97	176.28	224	0.02	25	0.20	2.8

Notes:

^a Groundwater elevation measurements collected 12/3/2018.

cm/sec = centimeter per second

ft = feet

ft amsl = feet above mean sea level

ft/ft = feet per foot

ft/day = feet per day

Table K-2. Vertical Gradient Calculations
 Lewis Drive Release, Belton, South Carolina
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"

Row Labels	Location	Date Measured	Average of Corrected GW Elevation	Top of Casing Elevation (ft amsl)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Head Difference	Vertical Gradients ^a					Average Vertical Gradient ^b (ft/ft)
								L:H	H:H	M:M	L:L	H:L	
MW-14	Brown's Creek Protection Zone	12/3/2018	822.06	838.70	832.17	817.17	-	-	-	-	-	-	-
MW-14B		12/3/2018	822.61	840.20	771.12	761.12	0.55	0.01	0.01	0.01	0.01	0.010	Up
MW-15	Brown's Creek Protection Zone	12/3/2018	819.68	831.03	824.68	809.68	-	-	-	-	-	-	-
MW-15B		12/3/2018	816.10	831.29	760.81	750.81	(3.59)	(0.07)	(0.06)	(0.06)	(0.06)	(0.059)	Down
MW-24	Brown's Creek Protection Zone	12/3/2018	812.70	817.92	807.72	802.72	-	-	-	-	-	-	-
MW-24B		12/3/2018	812.87	818.72	796.33	776.33	0.16	0.03	0.01	0.01	0.01	0.012	Up
MW-23	Cupboard Creek Protection Zone	12/3/2018	843.63	849.57	841.66	826.66	-	-	-	-	-	-	-
MW-23B		12/3/2018	844.29	849.69	818.81	796.31	0.66	0.08	0.03	0.02	0.02	0.035	Up
MW-45	Cupboard Creek Protection Zone	12/3/2018	840.47	852.47	848.40	838.40	-	-	-	-	-	-	-
MW-45B		12/3/2018	840.01	852.85	833.70	812.40	(0.46)	(0.10)	(0.03)	(0.02)	(0.02)	(0.037)	Down

Notes:
^a Vertical gradients calculated using guidance from the Environmental Protection Agency online vertical gradient calculator:
<https://www3.epa.gov/ceampubl/learn2model/part-two/onsite/vgradient02.html>

^b Calculated using the average of low:high, high:high, midpoint:midpoint, low:low, and high:low head differences

^c Groundwater levels measured immediately after installing deep wells may not have stabilized, and vertical gradient calculations may not represent equilibrium conditions.

amsl = above mean sea level

d = depth to top of screen

dw = depth to water

ft = feet

L:H = low to high (bottom of shallow screen to top of deep screen)

L:L = low to low (bottom of screen to bottom of screen)

H:H = high to high (top of screen to top of screen)

M:M = mid-point of screen to mid-point of screen

H:L = high to low (top of shallow screen to bottom of deep screen)

