dhec
Healthy People. Healthy Communities

JERRY AYCOCK
PLANTATION PIPE LINE
1000 WINDWARD CONCOURSE
SUITE 450
ALPHARETTA GA 30005

JAN 2 7 2017

Re: Corrective Action Plan Review
Plantation Pipe Line Lewis Drive Release, 112 Lewis Dr., Belton SC
Site #18693
Petroleum Pipeline Release December 8, 2014
Corrective Action Plan (9/1/16), received September 2, 2016
Agency Meeting with Plantation Pipe Line and ch2m November 4, 2016
Site Visit December 6, 2016 with Scott Powell and Patrick Ferringer with ch2m
Telephone Conversation with Scott Powell January 4, 2017
Anderson County

Dear Mr. Aycock,

The Underground Storage Tank (UST) Management Division of the South Carolina Department of Health and Environmental Control (Agency) has reviewed the Corrective Action Plan (CAP), in conjunction with public comments submitted during the public notice period from October 21, 2016 to December 6, 2016 of the Corrective Action Plan.

An addendum to the CAP, as discussed in the November 4, 2016 meeting is due within 30 days of the date stamped on this correspondence. The addendum should include, but not be limited to the following:

1) Case studies or information demonstrating that the proposed biosparging approach is appropriate for plumes where free product is present that is comparable to the referenced site.

2) A larger map of the proposed biosparging layout than was provided (Figure 9). The revised map will need to clearly illustrate the layout, all wells, trenches, sumps, and the creeks.

3) A strategy for biosparging technology in each remediation area in regard to duration, air injection rate, and interim remediation goals.

4) Section 7.2 (Initial System Operational Concepts) Provide more detailed information regarding what observations will be made and what measurements will be collected to determine if pulsing mode is used in the shallow bedrock zone, identifying specific wells and or points from which data will be collected.

5) Section 7.2 (Initial System Operational Concepts) Provide what specific data will be collected and the criteria that will be followed to determine changes to flow rates.

6) A tabulation of monitoring wells that will be used to monitor the effectiveness of the remedial strategy categorized by each of the five treatment areas. This should include wells outside the plume and wells within the plume, proposed parameters, and a proposed monitoring schedule.

7) A detailed effectiveness monitoring schedule. The Agency will consider a variable monitoring schedule; however, the plan should propose the specific criteria that will be used as a basis for determining the frequency of monitoring.

8) Continuation of free product and groundwater elevation gauging. Recharge rates for each recovery well, recovery sump, and recovery trench will need to be determined so that site specific data supports an appropriate product recovery schedule. As site conditions change, recharge rates will need to be evaluated to determine the most effective recovery rate.

9) Continuation of free product recovery as long as measureable levels of product exists.

10) Section 8.1.1 (Visual Observations) must state that visual inspections will be performed for evidence of petroleum sheen on surface waters, odors in the area, and / or distressed vegetation or biota on all areas of the site; including along Brown's Creek and Cupboard Creek. Provide a strategy to address any detected sheen, seeps, dead and/or distressed vegetation, distressed and /or dead biota, or out of the ordinary odors.

11) Installation of an additional permanent bedrock well down-gradient of MW-17B, located between the area of MW-17B and MW-21 along the pipeline. This well should be as close in proximity to the pipeline as is MW-17B.

12) Installation of permanent wells (shallow & bedrock) in the area between MW-1 and MW-22.

13) Installation of permanent wells (shallow & bedrock) in the area on the opposite side of Brown's Creek, across the creek from the location of SW-12.

14) A proposal to remediate the seep areas immediately up-gradient of Brown's Creek. In the November 4, 2016 meeting, Plantation Pipeline informed the Agency that the use of oxygen release compound or sodium persulfate would be evaluated.

15) A proposal to remediate all areas of bedrock with exceedances to risk based corrective action or details regarding how bedrock contamination will be addressed.

16) A proposal to install an additional well on the bank immediately opposite to the location of SW-1, as discussed in the November 4, 2016 meeting. It was noted during the December 6, 2016 site visit, that the well that was to be installed in the referenced area was relocated further to the southeast. When discussed during the December 6, 2016 site visit, Patrick Ferringer, with ch2m stated that the drill rig was not able to reach the proposed area. This possibility was discussed during the November 4, 2016 meeting and the Agency stated that if a drill rig was not able to access the discussed location, installation of a hand augured well would be acceptable as long as the well was installed in compliance with the South Carolina Well Standards (R. 61-71).

17) A routine petroleum absorbent boom inspection and replacement strategy, as discussed during the December 6, 2016 site visit.

18) Clarification regarding the use of diffusion aerators in Brown's Creek. It is the Agency's understanding, based upon information shared during the November 4, 2016 meeting and author's conversation with Scott Powell January 4, 2017, that the diffusion aerators in Brown's Creek will be used to treat the contamination already present in the creek. Further, the diffusion aerators are not proposed as a continuing remediation measure as the vertical sparging wells and the remediation method discussed in item 14 are intended to treat the contamination prior to reaching the creek.

19) In the event contamination continues to impact Brown's Creek after implementation of the biosparging system, a plan to implement immediate measures that will prevent discharge of petroleum constituents (free phase and dissolved phase) from reaching Brown's Creek should be proposed. The plan should include a monitoring system to monitor the effectiveness of proposed method. Data collected from the monitoring wells located closest to Brown's Creek will assist with this evaluation.

In excess of 100 comments to the Public Notice to the CAP were received. The following items paraphrase, the majority of the comments submitted, requesting that the CAP ensure the following:

1) Surface water is returned to its natural state prior to the pipeline release.

2) Free phase product is evacuated from existing recovery wells as long as product is measured and additional recovery wells are installed so that as much product as possible can be recovered.

3) Additional biosparging is conducted.

4) A pore water study is conducted.

5) Clear deadlines / goals are provided in regard to the remediation and frequent monitoring is conducted to ensure deadlines / goals are met.

Please provide the Agency with Plantation Pipeline's responses to the public comments above and to the attached comments (Attachment A) from the Southern Environmental Law Center for the Agency's consideration within 30 days of the date stamped on this correspondence.

Finally, the Agency will defer final review and comments on the Bioscreen Modeling efforts. For the results from the Bioscreen Model to be considered valid, the plume being modeled must be stable or decreasing. Since the referenced plume is neither stable nor decreasing, any site specific target levels (SSTLs) that were calculated would be invalid. However, the following questions and/or comments did arise from the initial review of the provided modeling effort:

a) There is an order of magnitude variation between the hydraulic conductivity reported from the falling head and rising head slug tests at MW-2 and MW-15 used in the model. Due to the large variation; rather than use the average of the two tests, additional tests to produce a more accurate estimate must be conducted and provided.

b) There appears to be a conversion calculation error for the hydraulic conductivity used for the "South to Cupboard Creek" estimate.

c) Simulation time should be increased until steady state is reached.

d) Upon validation that the referenced plume is stable or concentrations of petroleum constituents are decreasing, SSTLs will need to be re-evaluated. Reassessment will need to continue with time, as site conditions change.

Documents should continue to be provided in paper format and pdf via a disk with Site ID # 18693 and Plantation Pipeline Lewis Drive Release noted in a prominent location. Should you have any questions, I can be reached at (803) 898-0628 or colemabj@dhec.sc.gov. Faxes can be sent to (803) 898-0673.

Sincerely,

B. Coleman

Bobbi Coleman, Hydrogeologist
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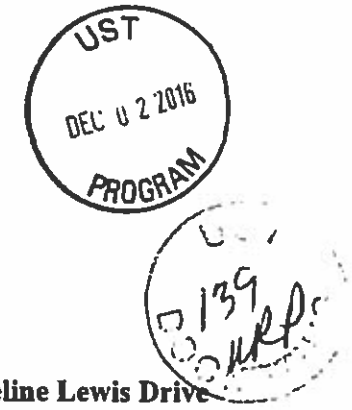

Via First Class Mail & E-mail

Ms. Bobbi Coleman
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Underground Storage Tank Management Division
2600 Bull Street
Columbia, SC 29201
colemabj@dhec.sc.gov

Re: Proposed Corrective Action Plan for the Plantation Pipeline Lewis Drive Release - Site # 18693

Dear Ms. Coleman:

The Southern Environmental Law Center submits these comments on the proposed Corrective Action Plan for the Lewis Drive release site on behalf of Upstate Forever and Savannah Riverkeeper.

Two years after one of the largest petroleum spills in South Carolina history, more than 160,000 gallons of gasoline remain in the creeks, wetlands, and groundwater in the Savannah River watershed in Belton, South Carolina. Kinder Morgan and the Plantation Pipe Line Company's recovery efforts have lagged considerably in the last year. The companies report that they have collected only 150 gallons of product since January 2016. In addition, the companies continue to delay or refuse to complete testing to determine how much petroleum remains at the site and how it has and will continue to impact ground and surface water at the site. Only in August of 2016 did the companies test the Browns Creek tributary in the location most likely to be contaminated—where they found pollution over 200 times more severe than they have previously reported—and they have not yet completed pore water sampling.

Now, Kinder Morgan and Plantation Pipe Line have proposed a Corrective Action Plan ("CAP") that relies heavily on biosparging and appears to halt more aggressive efforts to pump gasoline out of recovery wells. The Southern Environmental Law Center, Upstate Forever, and Savannah Riverkeeper submit these comments to strongly urge the South Carolina Department of Health and Environmental Control ("DHEC") to require the companies to fully clean up and remediate their pollution of Anderson County and the Savannah River watershed, to improve the CAP, and to conduct additional sampling. The CAP must be revised to include objectives that ensure that ground and surface waters are as clean as they were before the rupture, and that pollution of Anderson County's waters and the Savannah Watershed completely ceases. If biosparging is still found to be the appropriate remedy after developing adequate objectives and properly characterizing the extent of pollution, the CAP should be revised to continue free product recovery, install additional biosparging wells near the spill site, and prepare for contingencies like heavy rains. Finally, the CAP should include milestone deadlines and an

appropriate monitoring plan to ensure that biosparging is effective and cleanup proceeds at an acceptable pace.

I. The Corrective Action Plan Objectives Must Be Revised.

The objectives set out in the CAP are to "abate surface water impacts to maintain [South Carolina and EPA] surface water criteria," and to "reduce concentrations of dissolved hydrocarbons in groundwater" enough so that contamination will "naturally attenuate" to surface water standards by the time it reaches Cupboard and Browns Creeks.[1] While it is essential that pollution concentrations do not exceed the standards meant to protect human and environmental health, these objectives do not go far enough.

First, Kinder Morgan and Plantation Pipe Line should be required to stop their pollution of Anderson County waters and the Savannah Watershed and to ensure that these waters are returned to the clean state that existed prior to this illegal pollution. In other words, the standards for surface water should be the background concentrations present before the pipeline rupture—determined by taking a sample upstream from the spill, or using the method detection limit for each contaminant.

This last point is important because Kinder Morgan and Plantation Pipe Line propose to use their consultant's created detection limit to determine whether objectives have been met. The method detection limit ("MDL") is <u>not</u> the same as the laboratory reporting / quantitation limit the companies' consultant has used in its reports. The MDL is the lowest level of contamination that a laboratory can detect using a specific method. The reporting / quantitation limit is generally much higher than the MDL and may therefore underreport contamination.

Polluting up to the surface water standards is unacceptable. Belton residents and wildlife previously enjoyed unpolluted water and should not be forced to swim, fish, or play in waters that continue to have gasoline constituents in them or to have their livestock drink such polluted water. These companies have no right to, in effect, use up the ability of these waterways to absorb and deal with this pollution. Furthermore, the Clean Water Act does not make allowances for pollution up to a specified level; it prohibits "*any* addition of *any* pollutant to navigable waters from any point source."[2] This spill is illegal pollution of Anderson County waters, and the illegal pollution should not be permitted to continue up to a certain level.

Second, the objectives still allow pollution in groundwater to remain above protective standards. According to Kinder Morgan, heavy rains in the area have previously led to surface water contamination spikes. If groundwater remains polluted, future storms can cause enhanced discharge of uncontrolled hydrocarbon product into surface waters, potentially resulting in further fish kills. Natural attenuation may not be a viable solution even in normal conditions if soil adsorbtion rates are low and contaminants readily transfer into ground and surface water[3]—circumstances pore water sampling might help to identify. The groundwater objectives must be revised to be background concentrations present before the rupture.

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[1] ch2m Hill Engineers, Inc., Corrective Action Plan 4-1 (Sept. 1, 2016).
[2] 33 U.S.C. § 1362(12)(A).
[3] National Research Council, Natural Attenuation for Groundwater Remediation 201-02 (National Academy Press 2000).

II. The Site Must Be Adequately Surveyed and Sampled.

Each petroleum spill incident is unique in terms of the type and volume of substances released and the complexity of the spill site. Corrective Action Plans should be equally unique—remedial measures must be tailored to adequately protect human health and mitigate environmental damage.[4] In this case, the Corrective Action Plan was developed without first adequately characterizing the extent of damage, calling the selected measures into question.

Kinder Morgan and Plantation Pipe Line records indicate that at least 160,000 gallons of gasoline or more remain in the environment in Belton, SC,[5] but this may be a significant underestimate given the companies' failure to satisfactorily survey the quantity of gasoline released. The precise date of the failure is unknown, and the pipeline may have leaked for an extended period of time before the rupture was discovered. Plantation's regular method of pipeline inspection proved ineffective for detecting this leak,[6] so the companies first learned of the rupture when residents reported dead vegetation, a petroleum odor, and pooling around the pipeline in December 2014. Since the release, the estimated amount of product released into the environment has been revised from "unknown,"[7] to 8,000 barrels (about 252,000 gallons),[8] to 8,800 barrels (about 369,600 gallons).[9] The latest estimate may still be a significant underestimate, as it was apparently made based on product thicknesses measured in temporary monitoring wells installed at the site just a month after the leak was discovered.[10] Those temporary monitoring wells were installed before the Initial Site Assessment Work Plan and Quality Assurance Protection Plan had been approved, and before the companies had complied with DHEC's repeated directives to install additional monitoring wells.[11]

Kinder Morgan and Plantation Pipe Line have also failed to adequately sample ground and surface waters for contamination. The companies did not sample the section of the Browns Creek tributary most likely to be contaminated until late August, 2016—over a year and a half

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[4] *See* New York Dep't of Envtl Quality, Technical Field Guidance: Corrective Action, 1.6-2 http://www.dec.ny.gov/docs/remediation_hudson_pdf/1x61.pdf (last visited Nov. 8, 2016).

[5] ch2m Hill Engineers, Inc., Comprehensive Site Assessment Report ES-1 (July 2016) (reporting that 369,600 gallons were released); ch2m Hill Engineers, Inc., August 2016 Monthly Report (Aug. 2016) (reporting that about 209,100 gallons have been recovered at the site).

[6] The pilot conducting a visual inspection of the pipeline by aircraft on the same day that the leak was reported by citizens did not observe any leak. ch2m Hill Engineers, Inc., Response to Comments in Request for Revisions, Plans, and Reports, SCDHEC letter stamped October 19, 2015 (Oct. 26, 2015).

[7] Incident Report # 1102947, December 8, 2014.

[8] Michael Eads, *Kinder Morgan: Company Eyes New Pipeline for Belton While Still Cleaning Its Gas Spill There*, Independent Mail, Apr. 29, 2015 (reporting that the leak was 8,000 barrels).

[9] ch2m Hill Engineers, Inc., Revised Comprehensive Site Assessment Report 2-2 (Sept. 26, 2016).

[10] *Id.* ("Plantation submitted a Form 7000.1 to the DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) on January 7, 2015, which estimates that approximately 8,800 barrels (369,600 gallons) of gasoline were released. This estimate was made by adding the volume of product recovered at the time to the estimated in situ volume, which was calculated from product thicknesses measured in temporary monitoring wells installed at the time."; ch2m Hill Engineers, Inc., Response to Comments in Request for Revisions, Plans, and Reports, SCDHEC letter stamped October 19, 2015 (Oct. 26, 2015) (responding to DHEC's October 19, 2015 request to estimate the release quantity "based on the flow rate and length of release").

[11] *See, e.g.*, ch2m Hill Engineers, Inc., Initial Site Assessment Work Plan (Feb. 13, 2015) (proposing additional monitoring wells); S.C. Dep't of Health & Envtl Control, Request for Revisions, Plans, and Reports (Nov. 19, 2015) (requiring proposal for additional monitoring wells); S.C. Dep't of Health & Envtl Control, Assessment & Corrective Action Plan Directive (Mar. 21, 2016) (requiring more sampling sites).

after the spill was discovered, and almost five months after DHEC specifically asked that this section of the stream be sampled.[12] Benzene, toluene and other chemicals were detected at the new sampling location in concentrations far higher than Kinder Morgan had previously reported, and many times higher than state and federal standards. Benzene, for example, was almost 3,000 times higher than the state standard for human health. Kinder Morgan reported even worse contamination in its latest monthly report in September, 2016. DHEC has also repeatedly asked the companies to perform pore water sampling at the site since February 2016, and they have so far refused. Most recently, in April 2016, the companies' consultant defied a mandate in a Notice of Alleged Violation to complete the sampling, declaring that a pore water study would not "significantly broaden the current understanding of the site conceptual model . . . [or] provide useful information for the design or implementation of the proposed biosparging remedy."[13] Biosparging was apparently selected as a remedy before the Comprehensive Site Assessment Report or the Corrective Action Plan was submitted to DHEC.

The companies have so far allowed the proposed remedy to dictate the sampling plan, rather than let the results of a thorough sampling plan dictate the remedy. DHEC should require the companies to complete pore water sampling and continue current surface and groundwater monitoring efforts. And, if sampling indicates that more contaminants are in ground and surface water than previously detected—or, in the case of pore water sampling, more likely than previously suspected to move into ground and surface water—the Corrective Action Plan should be revised to incorporate more aggressive measures.

III. The Corrective Action Plan Must Include a Discussion of Other Feasible Remedial Technologies.

The CAP does not present any discussion of a feasibility study process that was used to select site remediation technologies; it simply declares that biosparging was selected.[14] A feasibility study process would identify a range of expedient and effective technologies for elimination of free product, contaminants of concern, and return of soil, groundwater, and surface water conditions to their pre-spill condition. Such a study is essential to help DHEC evaluate whether the biosparging technologies selected are most appropriate for the site, and to identify more aggressive technologies—including thermal enhancement, use of steam, bioenhancement, vacuum extraction, pump and treat, and other alternatives—that can be implemented if the selected approach proves ineffective. The CAP should be revised to include a comparison of remedial technologies that can be used at the site to meet the revised CAP objectives. If biosparging remains the selected remediation strategy, the CAP should also include an explanation of why biosparging was chosen.

IV. Gasoline Recovery Efforts Must Continue.

Free product removal through recovery wells, sumps, trenches, and booms should continue until the revised objectives are met. The CAP does not currently specify that this will occur. In fact, in the second revision to their Free Product Recovery Plan, the companies proposed to scale back free product evacuation efforts and indicated that they will only "carry

[12] S.C. Dep't of Health & Envtl Control, Assessment & Corrective Action Plan Directive (Mar. 21, 2016).
[13] ch2m Hill Engineers, Inc., Response to Request for Pore Water Sampling Plan (Apr. 21, 2016).
[14] ch2m Hill Engineers, Inc., Corrective Action Plan 5-1 (Sept. 1, 2016).

out [free and passive product recovery in wells, sumps, trenches, canisters, and absorbent socks] until the Corrective Action Plan is developed and approved."[15] In addition, the CAP indicates that product recovered from the existing recovery system has decreased since December 2015 due to a rise in the water table caused by large volumes of precipitation in October and November 2015.[16] The companies' consultant claims that the decrease in recovered product suggests that the majority of recoverable product has been collected.

Contrary to what is described in the CAP, decreased product recovery caused by rising groundwater elevations indicates that the recovery system needs modification rather than abandonment. Groundwater elevation increases can reduce product recovery if the well screened interval becomes submerged below the bottom of the product layer. Product cannot enter the well if the screened interval is below the elevation of the product. If submerged screen intervals are a persistent problem, the recovery system could be modified to include additional or longer screened intervals to collect product under higher water conditions.

Alternatively, the product recovery system could be changed to a dual-pump system. In this type of recovery system, a lower elevation pump is used to depress groundwater and create a cone of depression in the water table to draw product from the surrounding vicinity toward the well. A second well is set near the water table to recover product drawn in by the well.

Figure 7 in the CAP and Figure 2 in the August 2016 Monthly Status Report depict several locations where substantial product thicknesses are present, even though no product recovery has been reported. Examples of such locations are provided in Table 1. This Table shows that recoverable product remains at the site and also indicates that product thicknesses are variable.

Table 1: Reported Product Thickness (feet)

Well #	May 2016 (CAP Figure 7)	August 2016 (Monthly Report Figure 2)
MW-02	NP	0.15
MW- 9	0.65	1.59
MW-11	NP	0.68
MW- 12	0.68	1.15
MW-16	0.98	0.86
MW-18	3.11	1.83
MW-20	2.20	1.85
Piezometer 42	2.12	NM
Piezometer 45	1.10	NM
Piezometer 94	0.68	2.80

The reported thicknesses of product that remain in these wells represent recoverable source materials that will continue to add contaminants to the groundwater unless or until it is

[15] ch2m Hill Engineers, Inc., Interim Free Product Recovery Plan – Revision 2 (June 23, 2016).
[16] ch2m Hill Engineers, Inc., Corrective Action Plan 2-3 (Sept. 1, 2016).

removed. Continued source removal is necessary to decrease the volume and concentrations of contaminants that are migrating toward discharge areas in adjacent surface waters. In fact, the EPA specifically notes that "[b]iosparging should not be used if . . . [f]ree product is present."[17] When free product is still in the environment, biosparging can "create groundwater mounding which could cause free product to migrate and contamination to spread."[18] Continued recovery of free product concurrent with air sparging to promote bioremediation of the dissolved product plume would also minimize the duration required for remediation of this product release.

V. More Biosparging Wells Must Be Installed.

The current Corrective Action Plan relies on biosparging in three site "zones," with different measures in each zone based on their unique hydrogeology. In the "surface water protection zone," a total of 46 vertical sparging wells will be installed in rows at the ground to surface water interface adjacent to Cupboard Creek and the Browns Creek tributary, and diffusion aerators will be installed in the Browns Creek tributary. In the "hayfield zone" north of Lewis Drive, three horizontal sparging wells will be installed. And in the "shallow bedrock zone" surrounding the spill site south of Lewis Drive, 13 vertical sparging wells will be installed in phases into fractured bedrock.

If biosparging remains the chosen remediation technology, more sparging wells must be installed where free product remains and is likely to enter surface waters. Under the current plan, the most aggressive remediation happens at the edge of Cupboard Creek and the Browns Creek tributary. The CAP even goes so far as to use the Browns Creek tributary as part of its remediation system—a clear violation of the Clean Water Act—with its proposal to install diffusion aerators. The CAP must be revised to eliminate contamination before it reaches the surface water interface zones, otherwise contamination will remain in the environment traveling hundreds of feet toward the creeks for years and possibly decades to come.

The companies' consultants have defined a plume of free product in the overlying residuum and in the bedrock aquifer,[19] but have not proposed biosparging in several portions of the plume. Figure 7 of the CAP shows product extending in the overlying residuum in four directions: 1) about 1,000 feet to the east-northeast from the spill site along and south of Lewis Drive toward the Browns Creek tributary, 2) about 1,000 feet to the north-northwest into the hayfield zone, 3) about 300 feet to the east, adjacent to a former residence, and 4) about 300 feet to the south-southwest toward Calhoun Road and Cupboard Creek. These areas are identified in the map included as Attachment 1.

Additional biosparging should occur in each of these areas. Only the second area in the hayfield zone is currently addressed in the CAP. The horizontal well biosparging solution

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[17] U.S. Envtl Protection Agency, How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers VIII-7 (Oct. 1994), https://www.epa.gov/sites/production/files/2014-03/documents/tum_ch8.pdf.

[18] *Id.*

[19] ch2m Hill Engineers, Inc., Corrective Action Plan 3-1 (Sept. 1, 2016) ("The vertical extent of impacts at the site are defined by bedrock monitoring wells located to the north, south, east, and west. Due to the low porosity of bedrock at the site, there is little infiltration of hydrocarbons into bedrock, except through fractures. The majority of hydrocarbon impacts occur in the overlying residuum.").

proposed in that area may be effective in breaking-down constituents to the north, but a final array of intercept biosparging wells should also be deployed at the northern end of this plume, between the current monitoring wells MW-30 and MW33T. This array is necessary to prevent contaminants from continuing to release to the north and northeast. The plumes extending east-northeast toward the Browns Creek tributary and south-southwest toward Cupboard Creek (areas 1 and 4) are not addressed until the biosparging arrays at the distal ends of the plume in the surface water protection zone. Additional wells should be installed in the center of these portions of the plume, especially along Lewis Drive. In addition, given the trajectory of these portions of the plume, the arrays in the surface water protection zone should be extended so that they are also on the north side of Lewis Drive along the Browns Creek tributary, and on the other side of Lewis Drive from Cupboard Creek toward MW-36. The portion of the plume extending east toward the former residence (area 3) is not addressed at all. Vertical or horizontal biosparging wells should be installed in that area.

In the bedrock aquifer, the companies' consultants have reported contamination detections or exceedances of state and EPA standards in ten different bedrock monitoring wells.[20] Looking at the wells that recorded exceedances, free product in the fractured bedrock aquifer appears to extend in at least three directions: 1) about 200 feet in the southwest direction, north of Lewis Drive (MW-17B), 2) about 600 to 800 feet in the northeast direction, north of Lewis Drive (MW-13B and MW-14B), and 3) about 1,000 feet in the east-northeast direction, south of Lewis Drive and along the tributary of Browns Creek (MW-12B). These areas are identified in the map in Attachment 2. None of these areas are addressed in the CAP, as the proposed bedrock biosparging wells will be closer to the spill than any of these bedrock monitoring wells. The proposed wells are also currently very ill-defined—the CAP only states that thirteen biosparging wells will be installed at locations to be determined based on results from three initial wells somewhere below Lewis Drive. Furthermore, bedrock biosparging is not proposed at all in the area above Lewis Drive and toward Cupboard Creek (area 1). The CAP must also be revised to address area 2, both through bedrock biosparging wells and through an extension of the biosparging array in the surface water protection zone to the north side of Lewis Drive where the bedrock aquifer discharges to the Browns Creek tributary.

Finally, the CAP should specify that if the biosparging currently proposed in the overlying residuum aquifer and the bedrock aquifer does not begin to show results within some specified period of time (e.g. six months to a year), the companies must attempt to increase the efficacy of their system by adding more wells or using steam- or heat-enhanced sparging.

VI. Measures Must be Developed to Protect Surface Waters in Rain Events.

The CAP should include additional measures that the companies can readily deploy in times of greater precipitation. During the last heavy rain event, a large fish kill resulted. While the companies dispute that this fish kill was the result of petroleum impacts,[21] it is clear that the rain caused elevated contaminant concentrations in the Browns Creek tributary and that the companies were unprepared to control the additional contamination. When questioned in April 2016 about documented petroleum seeps, a company representative "stated that there had been a

[20] ch2m Hill Engineers, Inc., Revised Comprehensive Site Assessment Report Table 11 (Sept. 26, 2016).
[21] ch2m Hill Engineers, Inc., Response to Request for Pore Water Sampling Plan 4 (Apr. 21, 2016).

lot of rain and that they could not control the rain."[22] This is unacceptable. There is a severe drought in the Belton area, and without additional planning there is a high probability that future rains will lead to seeps and contamination spikes.

VII. The Corrective Action Plan Must Include Adequate Monitoring and Reporting, As Well As a More Detailed Schedule.

The Corrective Action Plan does not currently include an adequate monitoring proposal. The surface water monitoring section of the CAP indicates that surface water will be collected quarterly for the first year of operations and semiannually thereafter.[23] Semiannual sampling is insufficient to capture water quality data from the full range of flow conditions that can be anticipated. Given the extraordinarily high contamination levels noted in the Browns Creek tributary in August and increased levels in September, this section should be modified to require monthly sampling for a full year, then quarterly sampling until such time that product-related contaminants have not been detected above the method detection limit in surface water at any sampling station for at least two years. It must also specify that surface water samples be collected under baseline flow conditions (no sampling immediately after a rainfall event), and that any diffusion aerators installed at the site be turned off two weeks prior to collecting samples, so that impacts from discharging groundwater are more detectable. At the same time, separate samples should be taken after rainfall events to measure the impact of rain events upon the flow of pollution into the waterways.

Figure 13 in the CAP shows the recommended surface water sampling locations for the monitoring program. Of interest in this figure are the locations of sampling points SW-01, SW-02, and SW-04. Each of these locations is on the far side of a wetland and across the channel of the Browns Creek tributary from the plume discharge area. In fact, 3 of 5 sample points located in the wetlands on either side of Lewis Drive are located on the far side of the channel from the product release. Browns Creek tributary is likely a groundwater divide that could prevent migration of contaminants to the far side of the wetlands. Care should be taken to assure that impacts to the wetlands near the contaminant plumes are not underestimated due to poor sample location placement. New sampling points SW-12 and SW-13 should be added as sampling locations in the CAP.

The groundwater monitoring section of the CAP indicates that the existing 53 groundwater monitoring wells will be sampled quarterly for one year and then sampled either annually or semiannually.[24] Quarterly and semiannual monitoring is insufficient to ensure that biosparging and natural attenuation are proceeding effectively. It is impossible to evaluate the first phase of shallow bedrock zone vertical drilling for three months (as the schedule sets out) if monitoring occurs only once every three months. In addition, such long monitoring intervals will allow many months, and in some cases a full year, to pass before the sufficiency of each measure proposed in the CAP can be assessed and problems can be detected and addressed. This section should be modified so that monitoring occurs monthly for the first full year of operations, followed by quarterly monitoring of all wells. The companies should propose a protocol that gives DHEC the discretion to increase monitoring frequency as necessary, or reduce monitoring

[22] S.C. Dep't of Health & Envtl Control, April 5, 2016 Site Visit (Apr. 11, 2016).
[23] ch2m Hill Engineers, Inc., Corrective Action Plan 8-2 (Sept. 1, 2016).
[24] *Id.* at 8-1–8-2.

at particular wells to semiannually or annually if DHEC is satisfied that additional measures do not need to be installed in the zone where the wells are located.

Monitoring results will be included in reports, which the CAP currently states will be submitted quarterly for the first year, then semiannually.[25] This is not sufficient to convey the results of the more frequent monitoring DHEC should require. Reporting should continue on a monthly basis for the first year of operations, and quarterly reporting should occur thereafter.

The CAP also suggests that reports will be submitted 60 to 90 days following the end of each reporting period. This delay is too long. If monitoring reveals an issue with the remedial system or a surface water contamination spike, that issue or contamination should be reported and resolved as soon as possible. A reporting delay of two to three months is especially problematic for keeping the public—which has to go through the DHEC FOIA office—fully apprised of what is happening at the site. Reports should be submitted 30 days or less after the last day of the reporting period.

Once an effective monitoring and reporting system is developed, it should be used in service of ensuring compliance with a more detailed remediation timeline. A June 29, 2016 letter from DHEC asked that the companies "ensure that a projected timeline in regard to contaminant clean-up goals is provided in the Corrective Action Plan." The companies have not done so. The schedule in the CAP states that performance time frames cannot be projected until system performance is evaluated, and that sparging is likely to be operated "up to or beyond 10 years."[26] In any Corrective Action Plan, it is important to build in some flexibility so that additional measures can be implemented if the initial proposal is less effective than hoped. But without any interim deadlines, it is much easier to stall and drag out the remediation process. A timeline tied to specific clean-up goals must be provided for each site zone, with the understanding that the timeline should also be adaptive and subject to change depending on performance. Building out the timeline for the bedrock zone is especially important. The CAP should include a timeline for completing all vertical drilling in this area, with interim deadlines for the each "phase" of installation and monitoring. In addition, for all zones, the CAP should include guidelines for how long the companies may take to submit revisions or propose new measures if remediation deadlines are missed, as well as for how long the companies may take to seek permits. A detailed timeline is the best way to ensure that the companies are held accountable and can be required to implement additional cleanup actions if biosparging is ineffective.

VIII. Continued Transparency and Public Participation is Essential.

DHEC should continue to keep the public informed about this environmental catastrophe and build in opportunities for public review and participation. Documents obtained through a public records request indicate that Kinder Morgan and Plantation settled on biosparging as the proposed remedy at the spill site over a year ago.[27] The companies have spent their time since

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[25] *Id.* at 8-2.

[26] *Id.* at 10-1.

[27] Site Review and Planning Meeting (Oct. 26, 2015) (meeting between ch2m, Plantation, and DHEC where figures were presented displaying a proposed air sparging / soil vapor extraction ("SVE") system with a hybrid of horizontal and vertical SVE wells to extract soil vapor: "[e]xact configuration [of the SVE wells] will depend on diagnostic

reaching that decision trying to persuade DHEC that biosparging is the best remedy, rather than adequately monitoring the site. In a private meeting between ch2m, Kinder Morgan, and DHEC six months ago, Kinder Morgan provided a chart touting the success of bio- and air-sparging at other spill sites.[28] It has been challenging for the conservation groups to fully evaluate the companies' proposed biosparging plan without more information about the scope of those conversations and which other potential remedies were considered and dismissed in private meetings. Moving forward, DHEC and the companies should make it easier for the public to stay informed about this site. Many of the comments the conservation groups have made on the current Corrective Action Plan encourage disclosure of sampling results to evaluate biosparging efficacy. Those results should be made available to the public, as should the monthly monitoring reports and other documents prepared by the companies' consultant. The companies can facilitate this process by sharing these documents with the Southern Environmental Law Center, Upstate Forever, and Savannah Riverkeeper at the same time they are shared with DHEC so that we do not have to continue to rely on DHEC's FOIA office for access.

We appreciate the opportunity to comment on the Corrective Action Plan. Please do not hesitate to contact us with any questions or if you wish to discuss this matter with us.

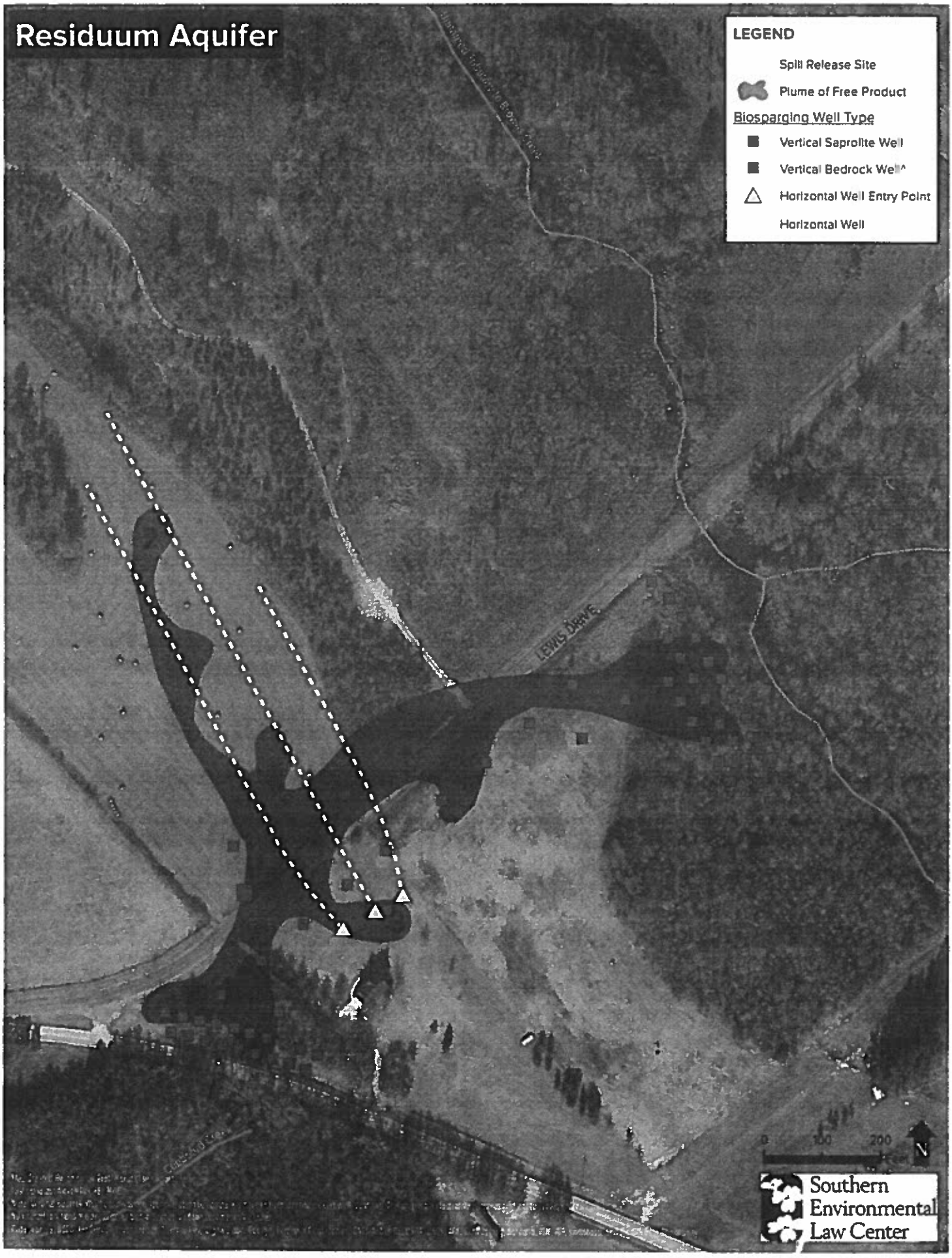
Sincerely,

Christopher K. DeScherer
Frank S. Holleman, III
Elizabeth A. Jones

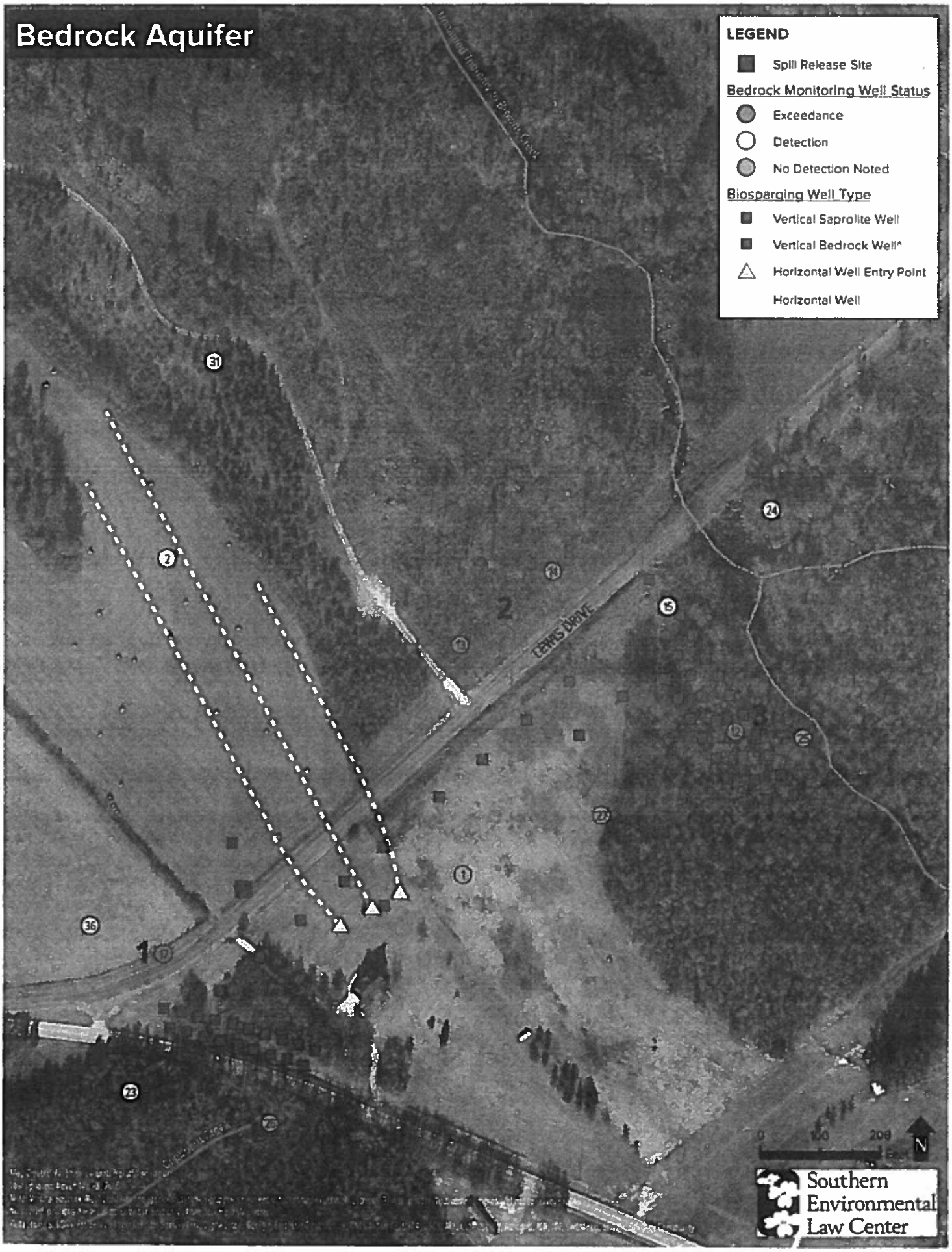
Enclosures
cc: Marshall Taylor, Jr., Esq., S.C. Department of Health and Environmental Control
Shelley Robbins, Upstate Forever
Tonya Bonitatibus, Savannah Riverkeeper

testing, vadose zone delineation, seasonal groundwater changes, etc." and "[f]inal layout [of the air sparging / soil vapor extraction system] is subject to change based on diagnostic testing, further investigations, etc.").
[28] Lewis Drive Proposed Project Plan (May 2, 2016).

ATTACHMENT 1


Residuum Aquifer
LEGEND
Spill Release Site
Plume of Free Product
Biosparging Well Type
Vertical Saprolite Well
Vertical Bedrock Well
Horizontal Well Entry Point
Horizontal Well
LEWIS DRIVE
0
100
200
N
Southern Environmental Law Center

ATTACHMENT 2


Bedrock Aquifer
LEGEND
Spill Release Site
Bedrock Monitoring Well Status
Exceedance
Detection
No Detection Noted
Biosparging Well Type
Vertical Saprolite Well
Vertical Bedrock Well^
Horizontal Well Entry Point
Horizontal Well
Lewis Drive
0
100
200
N
Southern Environmental Law Center