S.C. Department of Health and Environmental Control

Proposed Plan for Site Remediation
Laurens CeramTec Site

1 and 2 Technology Place Laurens, South Carolina 29360

January 2018

ANNOUNCEMENT OF PROPOSED PLAN

The South Carolina Department of Health and Environmental Control (DHEC or the Department) has completed an evaluation of cleanup alternatives to address contamination at the Laurens CeramTec. Site and ACI Industries LLC located at 1 and 2 Technology Place, Laurens, South Carolina (the Site). This proposed plan identifies DHEC's Preferred Alternatives for cleaning up the contaminated areas at Plant 1 (presently housing ACI Industries LLC) and Plant 2 (presently housing CeramTec) and provides the reasoning for these preferences. In addition, this plan includes summaries of the other cleanup alternatives evaluated.

The Department is presenting this proposed plan to inform the public of our activities, gain public input, and fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This proposed plan summarizes information that can be found in greater detail in the Focused Feasibility Study (July 2017), and other documents contained in the administrative record. The Department encourages the public to review these documents to gain an understanding of the Site and the activities that have been completed.

The Department will select the final cleanup remedy after reviewing and considering comments submitted during the 30-day public comment period. The Department may modify the preferred alternative or select another response action presented in this proposed plan based on new information, or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this proposed plan.

DHEC's Preferred Cleanup Summary

Plant 1 (ACI Industries)

Alternative 3: Enhanced Reductive Dechlorination for the Source Area Groundwater and Monitored Natural Attenuation (MNA).

Plant 2 (CeramTec Industries)

Alternative 4: Source Area Soil Vapor Extraction, Enhanced Reductive Dechlorination in the Entire Plume and a Biosparge

The remaining pages provide additional details of the selected cleanup remedies.

MARK YOUR CALENDAR

❑ PUBLIC MEETING:

When: Tuesday, February 6, 2018 at 6:00 pm

Where: Laurens Elementary School
301 Henry Street
Laurens, South Carolina

DHEC will hold a meeting to explain the Proposed Plan and all of the Alternatives presented in the Focused Feasibility Report. After the Proposed Plan presentation, DHEC will respond to your questions. Oral and written comments will be accepted at the meeting and during the Public Comment Period.

❑ PUBLIC COMMENT PERIOD:

February 6, 2018 – March 9, 2018

DHEC will accept written comments on the Proposed Plan during the public comment period. Please submit your written comments to:

Addie Walker, Project Manager
DHEC, Bureau of Land & Waste Management
2600 Bull Street
Columbia, SC 29201
walkeras@dhec.sc.gov

❑ FOR MORE INFORMATION:

Call: Addie Walker, 803-898-0722

See: DHEC's website at:
www.scdhec.gov/publicnotices

View: The Administrative Record at the following locations:

Laurens County Public Library

1017 W Main St., Laurens, SC 29360
Hours: Monday-Wednesday 9:00 am – 6:00 pm
Tuesday-Thursday 9:00 am – 8:00 pm
Friday 9:00 am - 5:00 pm
Saturday 9:00 am - 1:00 pm
Sunday Closed

DHEC Freedom of Information Office
2600 Bull Street, Columbia, SC
(803) 898-3817
Hours: Monday - Friday: 8:30 am - 5:00 pm

SITE HISTORY

The Site is located at 1 and 2 Technology Place in Laurens South Carolina (Figure 1) and consists of Plants 1 and 2. The facility was constructed in 1960 by American Lava Company, a subsidiary of 3M, and primarily produced textile guides, wear products, ceramic substrates used in electric circuitry, microprocessors, wrist watches and computers out of the two plants. In 1983, GE purchased the property and sold it in 1988 to Great American Industrial Group who then transferred the facility to Eagle Industries. In 1996, Eagle Industries sold the facility to AlSiMag Technical Ceramics (now known as CeramTec) and in 2006; CeramTec sold the Plant 1 building and associated grounds to ACI Industries, LLC. Presently, ACI Industries owns and operates Plant 1 (24.38 acres) and CeramTec owns and operates Plant 2 and the associated property (32 acres). The total site size is 298 acres.

The site has been investigated through multiple phases of work, including a Preliminary Investigation in 1988, more assessment from 1988 – 2002, remedial actions in 1999 and 2005- 2017 and ongoing monitoring. A Consent Order (97-029-W) was executed between GE, 3m and the Department in 1997, which required additional assessment, source control alternative analysis, landfill closure and assessment and remediation at Plant 2 and further assessment and remedial measures at Plant 1. Some past remediation activities were performed at plants 1 and 2. However, in 2016, because the contamination was still at excessive levels, a data gap investigation was performed which defined the extent of the remaining contamination.

There are several areas of concern at the site where past remedial actions have taken place. In 2005, an Easement Agreement was recorded on the deed, which restricts the use of ground water, surface water and restricts disturbance of the closed areas.

Plant 1 had one wastewater pond and Plant 2 had two wastewater ponds. In 1995, all three ponds were closed out. The ponds at Plant 2 were drained, the solids removed and the holes backfilled with clean soil. The solids from those ponds were moved to the pond at Plant 1 where they were combined, stabilized in place and covered. Land use controls have been placed on this area so that neither the cover nor the contents can be disturbed. These areas no longer appear to be an ongoing source of contamination.

The materials handling area located at Plant 1 is a source of contamination in the soil and the groundwater. In 2006, contaminated soil was excavated from a concrete structure discovered under the asphalt and the hole was backfilled with gravel and the surface was repaved. A locking chain link fence protects this area.

A landfill operated near Plant 1 from 1961 to 1983 and was closed when plant operations ceased. The cover of the landfill was improved in 1998 with a DHEC approved geosynthetic clay liner cap with six vents underneath to prevent gas buildup. This area is surrounded by a locked chain link fence and is not a current source of contamination.

A pilot study to evaluate in-situ chemical oxidation was conducted in 1999 in the Plant 2 area to determine whether this would be an appropriate technology for groundwater cleanup in this area. A mixture of acetic acid, ferrous sulfate and hydrogen peroxide was injected into the subsurface and the groundwater was sampled to monitor the effectiveness of the injections. The contaminant reduction was minimal so the system was not expanded.

An air biosparge system was installed in 2002 at Plant 2 beneath the ground surface at the head of the creek to prevent the migration of contamination to the creek. A creek diffuser was also installed to volatilize any contaminants discharging in this area. These two systems are still in operation.

AREAS OF CONCERN

Currently, there are two existing groundwater contamination plumes. One is originating from the materials handling area at Plant 1 and contains tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis1,2-DCE), vinyl chloride (VC), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene (1,1-DCE) and 1,1-dichloroethane (1,1-DCA). The second plume originates from the soil near the side of Plant 2. This plume consists of almost the same contaminants the plume at Plant 1.

SUMMARY OF SITE RISKS

Contaminants have migrated into the water table at Plant 1 and into the water table to the creek downgradient of Plant 2. The latest sampling results indicate volatile organic compounds (VOCS) above the maximum contaminant levels.

The primary risk to the public and the environment is from direct ingestion or exposure to the creek. The groundwater plumes are contained on the Plant property and there are currently no direct receptors. A restriction is currently in place on the deed which restricts the use of ground water, the use of surface water and restricts interference and disturbance of the closed areas. The Department's current judgment is that the Preferred Alternatives identified in this Proposed Plan are necessary to protect public health or the environment from actual or threatened releases of hazardous substances to the environment.

CLEANUP GOALS

Remedial Action Objectives (RAOs) are developed in order to set goals for protecting human health and the environment. The goals should be as specific as possible, but should not unduly limit the range of Alternatives that can be developed. Accordingly, the following RAOs were developed for the Site:

1. Prevent human ingestion of groundwater with COCs greater than MCLs (or regional screening levels (RSLs) for tap water where an MCL does not exist); and
2. Minimize the time required for groundwater COC concentrations to reduce below MCLs and restore groundwater to drinking water standards.
3. Decrease surface water contaminants at Plant 2 to meet the criteria found in the "SC Water Classifications and Standards (R.61-68) Appendix: Water Quality Numeric

Criteria for the Protection of Aquatic Life and Human Health".

4. Decrease soil contaminants to levels below the risk to groundwater screening levels at Plant 2.

The remediation goals for VOC-affected groundwater are the state MCLs, as specified in the South Carolina Maximum Contaminant Levels in Drinking Water at S.C. Code Ann. R.61-58.5.N(2), or the Tap water Screening Levels in EPA's Regional Screening Level tables if an MCL does not exist (see Table 1). The remedial goals for the surface water are specified in the SC Water Classifications and Standards (R.61-68) Appendix: Water Quality Numeric Criteria for the Protection of Aquatic Life and Human Health. The remediation goals for soil are the Risk to Groundwater levels also found in EPA's Regional Screening Level tables.

SCOPE AND ROLE OF THE ACTION

The proposed actions in this plan will be the final cleanup action for the Site. The remedial action objectives for these proposed actions include preventing human ingestion of groundwater, minimizing the time required for groundwater COC concentrations to reduce below MCLs, reducing the soil contaminants and restoring groundwater to drinking water standards, and restoring the surface water to the standards.

SUMMARY OF REMEDIAL ALTERNATIVES

Based on information collected during site investigations, a Focused Feasibility Study (FFS) was conducted to identify, develop, and evaluate cleanup options and remedial alternatives. The FFS process uses the information gathered during the Remedial Investigation and other assessments to develop and evaluate potential remedial alternatives. Each remedial alternative evaluated by the Department is described briefly below. Note: A final Remedial Design will be developed prior to implementation.

SUMMARY OF REMEDIAL ALTERNATIVES	
Plant 1	
Alternative	**Description**
1: No Action	• Site is left in its current condition • Discontinuation of groundwater and surface water monitoring • Institutional controls are already implemented to restrict groundwater use • Cost: $0
2: Monitored Natural Attenuation (MNA)	• Relies on monitoring the natural degradation processes that reduce contaminant concentrations • Long-term groundwater monitoring program for 30 years • Institutional controls are already implemented to restrict groundwater use • Cost: $600,000
3: Enhanced Reductive Dechlorination (ERD) Source Treatment and MNA for the plume	• ERD for Saturated Zone of Source Area for 2 years • Institutional controls are already implemented to restrict groundwater use • Long-term groundwater monitoring for 20 years • Cost: $800,000
4: Soil Vapor Extraction (SVE) and ERD source Treatment and MNA for the plume	• Vadose Zone SVE for 12 months and Saturated Zone ERD for 2 years for the Source Area • MNA for the downgraident plume • Institutional controls to prevent exposure (already in place) • Short-Term and Long-term monitoring to evaluate treatment effectiveness • Cost: $1,000,000

SUMMARY OF REMEDIAL ALTERNATIVES	
Plant 2	
Alternative	**Description**
1: No Action	• Site is left in its current condition • Institutional controls are already implemented to restrict groundwater use • Discontinuation of groundwater and surface water monitoring • Discontinuation of the Biosparge System • Cost: $0
2: Biosparge Operation and MNA	• Continue operation of the Biosparge system at the head of the creek • Institutional controls are already implemented to restrict groundwater use • Long-Term Monitoring of the plume for 50 years • Cost: $1,200,000
3: Source Air Sparging (AS) and SVE, Dissolved Plume ERD and Biosparge Barrier	• Installation of an AS/SVE System in Source Area and operation for 24 months • Operation of existing Biosparge System in the plume for 5 years • Institutional controls are already implemented to restrict groundwater use • ERD for 5 years in the plume • Short-Term and Long-Term Monitoring for 10 years • Cost: $1,300,000
4: Source Area SVE and ERD, Dissolved Plume ERD and Biosparge Barrier	• Installation and Operation of an SVE system for 12 months and an ERD injection network for saprolite treatment in the Source Area for 5 years • ERD injection, biosparging and diffusing in the plume for 5 years • Institutional controls are already implemented to restrict groundwater use • Short-term and Long-Term Monitoring • Cost: $1,600,000
5: Thermal Source Treatment, Dissolved Plume ERD and Biosparge Barrier	• In-situ Thermal Treatment in Source Area for 6 months • Institutional controls are already implemented to restrict groundwater use • ERD Injections for the plume for 2 years • Operation of existing Biosparge System for 2 years • Short-term and Long-Term Monitoring for 10 years • Cost: $4,400,000

DESCRIPTION OF ALTERNATIVES

Plant 1

Alternative 1 - No Action

No action is included as a baseline for comparison with other alternatives. Under this alternative, no additional action is taken to treat or prevent potential exposure to contaminated groundwater, or reduce volume, toxicity, or mobility of contaminants. This action would rely on natural attenuation processes to reduce contaminant concentrations over time. This action does not include any monitoring to evaluate natural attenuation or COC extent. Institutional controls are already implemented to restrict groundwater and surface water use. This alternative would not be protective of the environment and could take more than 100 years to achieve the RAOs. The cost for this alternative would be $0.

Alternative 2 – Monitored Natural Attenuation (MNA)

MNA has been identified as the reliance on natural attenuation processes, within the context of a controlled and monitored site cleanup approach, to achieve site-specific remediation objectives within a timeframe that is reasonable compared to that of other more active remedial methods. The natural processes at work include a variety of physical, chemical and/or biological processes that, under favorable conditions, act to reduce the mass, toxicity, mobility, volume or concentration of the contaminants of concern (COCs) in soil and/or groundwater. This technology is applicable to all impacted media at the site. This process is already on going and is estimated to take more than 30 years to reach remedial goals. Institutional controls are already implemented to restrict groundwater and surface water use. The cost for this alternative would be approximately $600,000

Alternative 3 – ERD Source Treatment and MNA

Enhanced Reductive Dechlorination (ERD) is a process in which microorganisms (i.e. fungi, bacteria and other microbes) degrade organic contaminants found in soil and/or groundwater. A carbon substrate is typically injected periodically through an injection well network into the soil and groundwater in the source area. The injections will stimulate microbial activity and create an environment favorable for biological reductive dechlorination, thus treating the source areas and reducing the plume size. Eight injection wells will be installed. The source treatment would take 2 years and the

monitoring would continue for 20 years. Institutional controls are already implemented to restrict groundwater and surface water use. The cost of this alternative would be around $800,000.

Alternative 4 – SVE and ERD source Treatment, MNA

ERD is described above and would be implemented along with Soil Vapor Extraction (SVE) in the source area. Monitoring would continue in the plume. The soil vapor extraction would continue for 12 months. The ERD would be implemented for 2 years and monitoring is estimated to continue for 15 years. Eight injection wells and three soil vapor extraction wells would be installed. Institutional controls are already implemented to restrict groundwater and surface water use. The cost of this alternative would be approximately $1,000,000.

Plant 2

Alternative 1 - No Action

No action is included as a baseline for comparison with other alternatives. Under this alternative, no additional action is taken to treat or prevent potential exposure to contaminated groundwater, or reduce volume, toxicity, or mobility of contaminants. This action would rely on natural attenuation processes to reduce contaminant concentrations over time. This action does not include any monitoring to evaluate natural attenuation or COC extent. Institutional controls are already implemented to restrict groundwater and surface water use. This alternative would not be protective of the environment because it could take more than 100 years to achieve the RAOs. The cost would be $0.

Alternative 2 – Biosparge Operation and Monitored Natural Attenuation (MNA)

The existing biosparge system would be modified to be more efficient and operations would continue. This system would encourage breakdown and volatilization of the contaminants in groundwater and surface water. MNA would consist of a long-term groundwater monitoring to assess contaminant trends. Existing institutional controls are used to prevent groundwater and surface water use and to maintain the current site use. The net present worth for this remedial Alternative through 50 years is approximately $1,200,000.

Alternative 3 – AS/SVE in the Source Area, Dissolved-Plume ERD, Biosparge Barrier System, MNA

These combined remedial technologies provide contaminant removal from the vadose zone soil and groundwater in the source area, and the groundwater along the length of the plume. Installation of a nine air sparge wells, five SVE recovery wells, five injections wells for ERD, an on-site mobile treatment unit (air stripper) and a mobile ERD unit are proposed for the source area. Seven injection wells are proposed for the ERD treatment program down gradient of the source area. The existing biosparge system would remain in operation and monitoring would be conducted to assess the performance of this combination alternative. Institutional controls are already implemented to restrict groundwater and surface water use.

The net present worth, for this remedial alternative, based on 10 years of operation, is approximately $1,300,000. This technology will likely reduce COCs to the RAOs in approximately 10 or more years.

Alternative 4 – SVE and ERD in the Source Area, Dissolved-Plume ERD and Biosparge Barrier system.

Soil Vapor Extraction and Enhanced Reductive Dechlorination (ERD) are proposed in this alternative for the source area, which would address the contamination in the soil and the groundwater. Fifteen injection wells and three SVE wells in addition to an on-site mobile treatment unit are proposed for this area. ERD is proposed to address the dissolved plume down gradient with the installation and operation of seven injection wells. The ERD is to be performed using a phased approach with injecting the source area first and using data generated after injection in this area to determine additional injection locations. The operation of the existing biosparge system and air diffuser in the creek will continue (or be upgraded) to volatilize contaminants entering the stream at the headwaters and to prevent any by-products of the ERD from entering the stream. Institutional controls are already implemented to restrict groundwater and surface water use.

This alternative should reduce the timeframe of achieving the RAOs to within 10 years. The net present worth for this remedial action, through 10 years, is approximately $1,600,000.

Alternative 5 – ISTT Source Treatment, Dissolved Plume ERD and Biosparge Barrier System

This alternative consists of In-Situ Thermal Treatment in the source area. This system would require the installation of a below ground heating element with an above ground vapor recovery well system covering the entire source area. A vapor treatment system and a dissolved phase groundwater treatment system would also be utilized. Twelve injection wells would be installed for the ERD and due to the high temperatures created by the ISTT, the dissolved plume ERD would be implemented during the cool down times of the Thermal Treatment System. The ERD injections would also be performed using a phased approach. The operation of the existing biosparge system and creek diffuser will continue (or be upgraded) to treat contaminants entering the stream. Institutional controls are already implemented to restrict groundwater and surface water use. The cost for this alternative is estimated to be over 4,400,000 for 10 years.

EVALUATION OF ALTERNATIVES

The National Contingency Plan requires the Department to use specific criteria to evaluate and compare, the different remediation alternatives in order to select a remedy. The criteria are:

1. Overall protection of human health and the environment;
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs);
3. Long-term effectiveness and permanence;
4. Reduction of toxicity, mobility, or volume through treatment;
5. Short-term effectiveness;
6. Implement ability;
7. Cost; and
8. Community acceptance

The main objectives for the preferred remedial action are to be protective of human health and the environment and to comply with state and federal regulations. These two objectives are considered *threshold criteria*. For an alternative to be considered as final, these two threshold criteria must be met.

The following measures are considered *balancing criteria*: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implement ability; and cost. These criteria are used to weigh the major technical feasibility and cost advantages and disadvantages.

Community response to the preferred alternative and the other considered alternatives is a *modifying criterion* that will be carefully considered by the Department prior to final remedy selection.

COMPARATIVE ANALYSIS OF ALTERNATIVES

A comparative analysis of each alternative was performed. In this type of analysis, the alternatives were evaluated in relation to one another for each of the evaluation criteria. The purpose of the analysis is to identify the relative advantages and disadvantages of each Alternative. An Easement Agreement is currently in place on the deeds, which restricts the use of ground water, the use of surface water, and restricts interference and disturbance of the closed areas.

Overall Protection of Human Health and the Environment

When evaluating alternatives in terms of overall protection of human health and the environment, consideration is given to the manner in which Site-related risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Plant 1

No additional remedial actions would be performed as part of Alternative 1 or Alternative 2. These alternatives will not provide any increased protection to human health or the environment. Alternative 3 and 4 will remediate the source area and are more protective than Alternatives 1, and 2.

Plant 2

Alternative 1 offers the least protection of human health and the environment because no action is proposed for this Alternative. Alternative 2 is currently operating but is not adequately treating the contaminants in the stream and is not protective of the environment. Alternative 3, Alternative 4 and Alternative 5 would all remediate the contamination in a reduced amount of time and therefore, would be the equally protective of human health and the environment.

Compliance with ARARs

This criteria evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Plant 1

Alternative 1 and Alternative 2 would not meet the groundwater and soil RAOs in an acceptable time frame, since no active cleanup would be conducted. Alternatives 3 and 4 would comply with RAOs associated with groundwater and soil. It would eliminate the source mass, which would expedite the dissolved plume remediation.

Plant 2

Alternative 1 and Alternative 2 would not comply with soil, groundwater and surface water RAOs. Successful implementation of Alternative 3, Alternative 4, or Alternative 5 would all comply with the RAOs for soil and groundwater and would prevent the source from contributing to the dissolved plume.

Long-Term Effectiveness and Permanence

Evaluation of long-term effectiveness and permanence considers the ability of an Alternative to maintain protection of human health and the environment over time.

Plant 1

Alternative 1 will allow ongoing attenuation mechanisms to reduce contamination but does not provide a method to measure the progress, and therefore ranks low in long-term effectiveness. Alternative 2 is more effective than Alternative 1 in the long term as monitoring will be required but it will take an increased time for the site to actually meet remedial goals, since active treatment is not required. Alternatives 3 and 4 are effective remedies for reduction of dissolved phase impacts. Alternative 4 would provide slightly more immediate source treatment and a slightly faster time to meet RAOs.

Plant 2

Alternative 1 would provide minimal long-term protection due to the fact that there are no monitoring requirements to track progress. Alternative 2 would be somewhat effective long term in controlling the VOC transport but would still rank low for long-term effectiveness, as it does not directly address treatment of the source of contamination.

Alternatives 3, 4, and 5 would all be highly effective in addressing the VOC mass in all site media thereby reducing contaminant concentrations in the source area, dissolved plume and surface water and therefore all score high for this criteria.

Reduction of Toxicity, Mobility, and Volume through Treatment

This factor evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Plant 1

Alternative 1 would rely on existing mechanisms to provide natural breakdown of contamination. However, by not actively treating the groundwater or monitoring this alternative ranks low for this criteria. Alternative 2 MNA is slightly better than Alternative 1 as it monitors the site conditions and tracts the natural breakdown of contamination. However, it still ranks low for this criteria due to the fact that active treatment is not a part of the remedy. Alternatives 3 and 4 would be highly effective remedies for reduction of toxicity, mobility and volume of the contamination.

Plant 2

Alternative 1 would rely on existing mechanisms to provide natural breakdown of contamination. However, by not actively treating the groundwater or monitoring this alternative ranks low for this criteria. Alternative 2 would provide some reduction in the toxicity, mobility and volume but would take 50 years or more to reach RAOs. In Alternative 3, Source AS/VE would reduce the toxicity and volume in the source area and the plume ERD would further reduce contaminants discharging to the surface water. The Biosparge Barrier would reduce the contaminant concentrations and the mobility of the contamination. Alternative 4 would also reduce the toxicity, mobility, and volume as VOCs are directly removed or degraded in the source area and along the plume. Alternative 5 would be the most aggressive means to eliminate the source area and groundwater contaminants, which translates, to the fastest reductions in overall plume volume and mobility.

Short-Term Effectiveness

The short-term effectiveness evaluation takes into consideration short-term risks that might be posed to on-site workers, the surrounding community, or the environment during implementation of the remedy, as well as the time until protection is achieved.

Plant 1

Alternatives 1 and 2 would rank high in this category because no active remediation is occurring and therefore risk to site workers is low. In Alternative3, ERD and MNA would accelerate the degradation of the site contaminants and would cause low risk to the community, workers or environment. Alternative 4 would accelerate the degradation of the site contaminants through ERD and SVE would have a slightly higher risk to site workers than Alternatives 1-3.

Plant 2

Alternative 1 and Alternative 2 would rank high in this category, because no active remediation is occurring outside of what is currently in place; and therefore the risk to site workers is low. Alternative 3 would pose low short-term risk to the contractors working on the system during construction activities. Alternative 4 would pose low short-term risk to the contractors working on the system during construction activities. Alternative 5 would pose moderate to high short-term risk to the contractors working on the system during construction activities.

Implementability

The analysis of implementability considers the technical feasibility and administrative feasibility of remedy implementation, as well as the availability of required materials and services.

Plant 1

Alternative 1 and 2 would be highly implementable, as no active remediation would be taken. Alternative 3 would be moderately implementable as this injection area is easy to access and the geology at the site should allow for easy injection of the carbon substrate. The area where the system for Alternative 4 would be installed is easily accessible and a mobile ERD system would be brought to the site when needed, however the design and implementation of the SVE system would make this alternative slightly more difficult to implement than Alternative 3.

Plant 2

Alternative 1 and 2 would be highly implementable, as no active remediation would be taken outside of existing operating systems. Alternative 3 is moderately implementable. The AS/VE would require construction/rental and operation of a treatment system. The injection area for the ERD is easy to access and the geology at the site should allow for easy injection of the carbon substrate. Alternative 4 has high implementability due to the construction of a standalone SVE requiring some construction. ERD is highly implementable with the installation of injection wells. Alternative 5 has a low implementability designation due to site logistics and location of the treatment area. The heating system may interfere with the existing operations and could have an adverse affect to site utilities.

Cost

The cost analysis evaluated both capital and annual operation and maintenance (O&M) costs. The net present value of an alternative is the sum of initial capital costs and the discounted value of O&M costs over the lifespan of the remedy. For the purpose of this evaluation, cost has been determined over the time it is projected to take to reach the remedial goals.

Plant 1

Alternative 1	$0
Alternative 2	$ 600,000

Alternative 3	$ 800,000
Alternative 4	$ 1,000,000

Plant 2

Alternative 1	$ 0
Alternative 2	$ 1,200,000
Alternative 3	$ 1,300,000
Alternative 4	$ 1,600,000
Alternative 5	$ 4,400,000

Community Acceptance

Community acceptance of the preferred remedy will be evaluated after the public comment period. Public comments will be summarized and responses provided in the Responsiveness Summary Section of the Record of Decision document that will present the Department's final Alternative selection. The Department may choose to modify the preferred Alternative or select another remedy based on public comments or new information.

SUMMARY OF THE DEPARTMENT'S PREFERRED ALTERNATIVE

Plant 1: The Department has identified Alternative 3, (ERD source treatment for the groundwater and MNA for the dissolved plume with the deed restrictions already in place) as the preferred remedy.

Plant 1 - Emulsified vegetable oil will be injected into 8 injection wells at the source area during two separate events over 2 years. The vegetable oil will provide food for the microorganisms that break down the contaminants. The injections will stimulate microbial activity and create an environment favorable for biological reductive dechlorination, thus treating the source areas and reducing the plume size.

The entire area will be monitored for a period of 20 years, which is when the contaminant levels are projected to reach the remedial goals. This Alternative protects human health and the environment by reducing contamination in the source area, which will then reduce the contamination in the dissolved plume. It can be implemented easily and in a reasonable time frame at a reasonable cost with low risk. Human health and the environment is further protected by the deed restrictions for ground and surface water usage currently placed on the property and controlling the access to the former landfill and pond areas with the locked fencing. The cost of this alternative would be around $800,000 over 20 years.

Plant 2: Alternative 4 (Source SVE and ERD, Plume ERD and Biopsarge Barrier) was chosen as the preferred remedy.

Plant 2 - Soil Vapor extraction and Enhanced Reductive Dechlorination will be implemented in the source area, which would address the contamination in the soil and the groundwater. Fifteen injection wells and three SVE wells in addition to an on-site mobile treatment unit are proposed for this area. ERD is proposed to address the dissolved plume down gradient with the installation and operation of seven injection wells. The ERD is to be performed using a phased approach with injecting the source area first and using data generated after injection in this area to determine additional injection locations. The operation of the existing biosparge system will continue (or be upgraded) to volatilize contaminants entering the stream at the headwaters and to prevent any by-products of the ERD from entering the stream and the diffuser in the stream will continue to volatilize the contaminants. Although this alternative has a higher cost than alternatives 1-3, it is easily implementable, would be highly effective and reduces the timeframe of cleanup to within 10 years

The net present worth, adjusted for inflation, for this remedial action, through Year 10, is approximately $1,600,000.

Table 1		
Constituent of Concern	**MCL** (ug/L)	**Highest On-Site Concentration** (ug/L)
Plant 1		
Tetrachloroethene (PCE)	5	840
Trichloroethene (TCE)	5	130
1,1,1–Trichloroethane (1,1,1–TCA)	200	52
1,1–Dichloroethane (1,1–DCA)	2.7*	1,800
1,1–Dichloroethene (1,1–DCE)	7	390
cis–1,2–Dichloroethene (cis–1,2–DCE)	70	230
Vinyl Chloride (VC)	2	4.7
Plant 2		
Tetrachloroethene (PCE)	5	9,000
Trichloroethene (TCE)	5	500
1,1–Dichloroethane (1,1–DCA)	2.7*	41
1,1–Dichloroethene (1,1–DCE)	7	347
cis–1,2–Dichloroethene (cis–1,2–DCE)	70	2,200
Vinyl Chloride (VC)	2	37

*Tapwater Value-EPA RSL Table

FIGURE 1

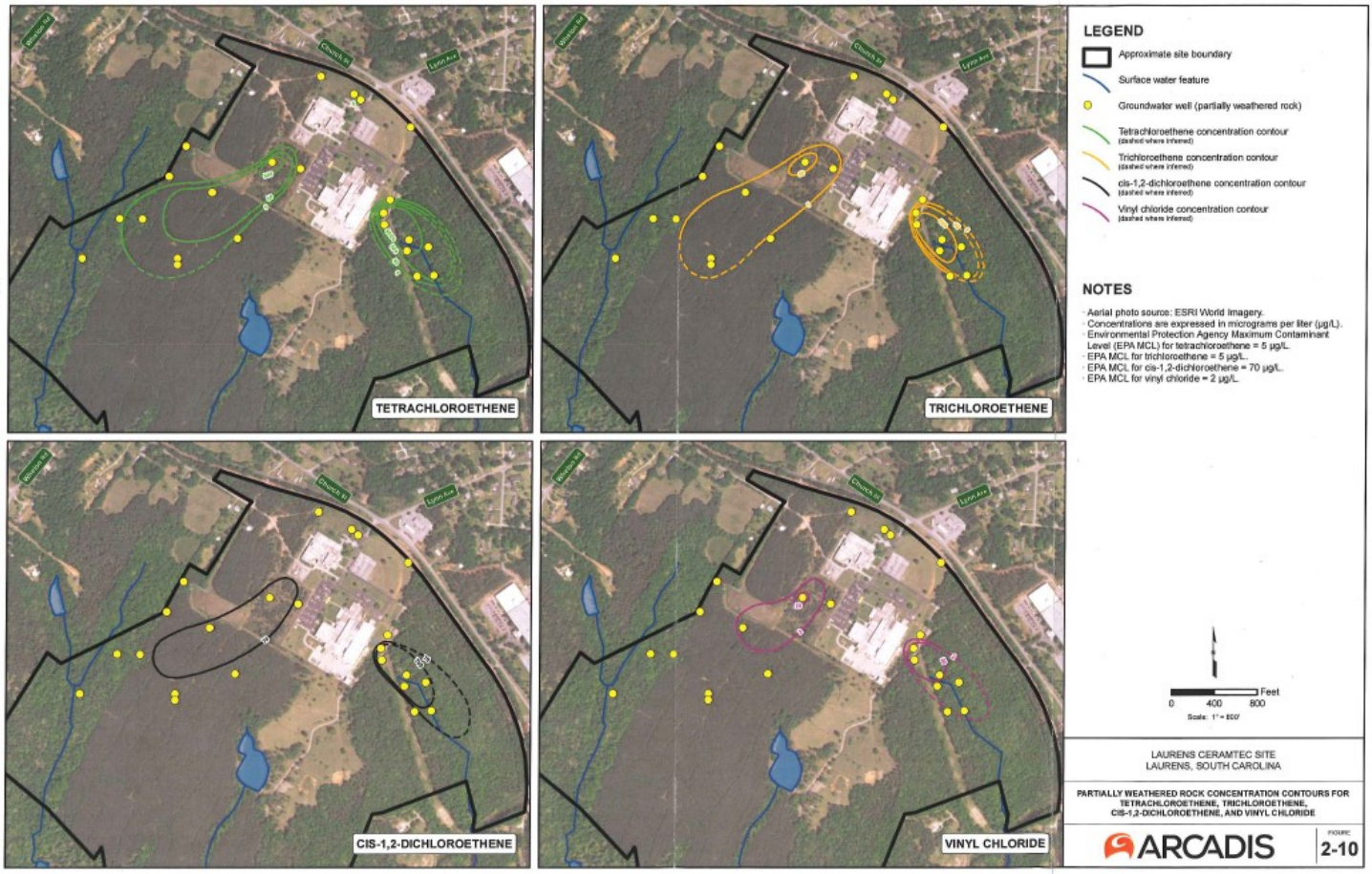

TETRACHLOROETHENE
TRICHLOROETHENE
CIS-1,2-DICHLOROETHENE
VINYL CHLORIDE
LEGEND
Approximate site boundary
Surface water feature
Groundwater well (partially weathered rock)
Tetrachloroethene concentration contour (dashed where inferred)
Trichloroethene concentration contour (dashed where inferred)
cis-1,2-dichloroethene concentration contour (dashed where inferred)
Vinyl chloride concentration contour (dashed where inferred)
NOTES
· Aerial photo source: ESRI World Imagery.
· Concentrations are expressed in micrograms per liter (µg/L).
· Environmental Protection Agency Maximum Contaminant Level (EPA MCL) for tetrachloroethene = 5 µg/L.
· EPA MCL for trichloroethene = 5 µg/L.
· EPA MCL for cis-1,2-dichloroethene = 70 µg/L.
· EPA MCL for vinyl chloride = 2 µg/L.
0 400 800 Feet
LAURENS CERAMTEC SITE
LAURENS, SOUTH CAROLINA
PARTIALLY WEATHERED ROCK CONCENTRATION CONTOURS FOR TETRACHLOROETHENE, TRICHLOROETHENE, CIS-1,2-DICHLOROETHENE, AND VINYL CHLORIDE
ARCADIS
FIGURE
2-10

FIGURE 2

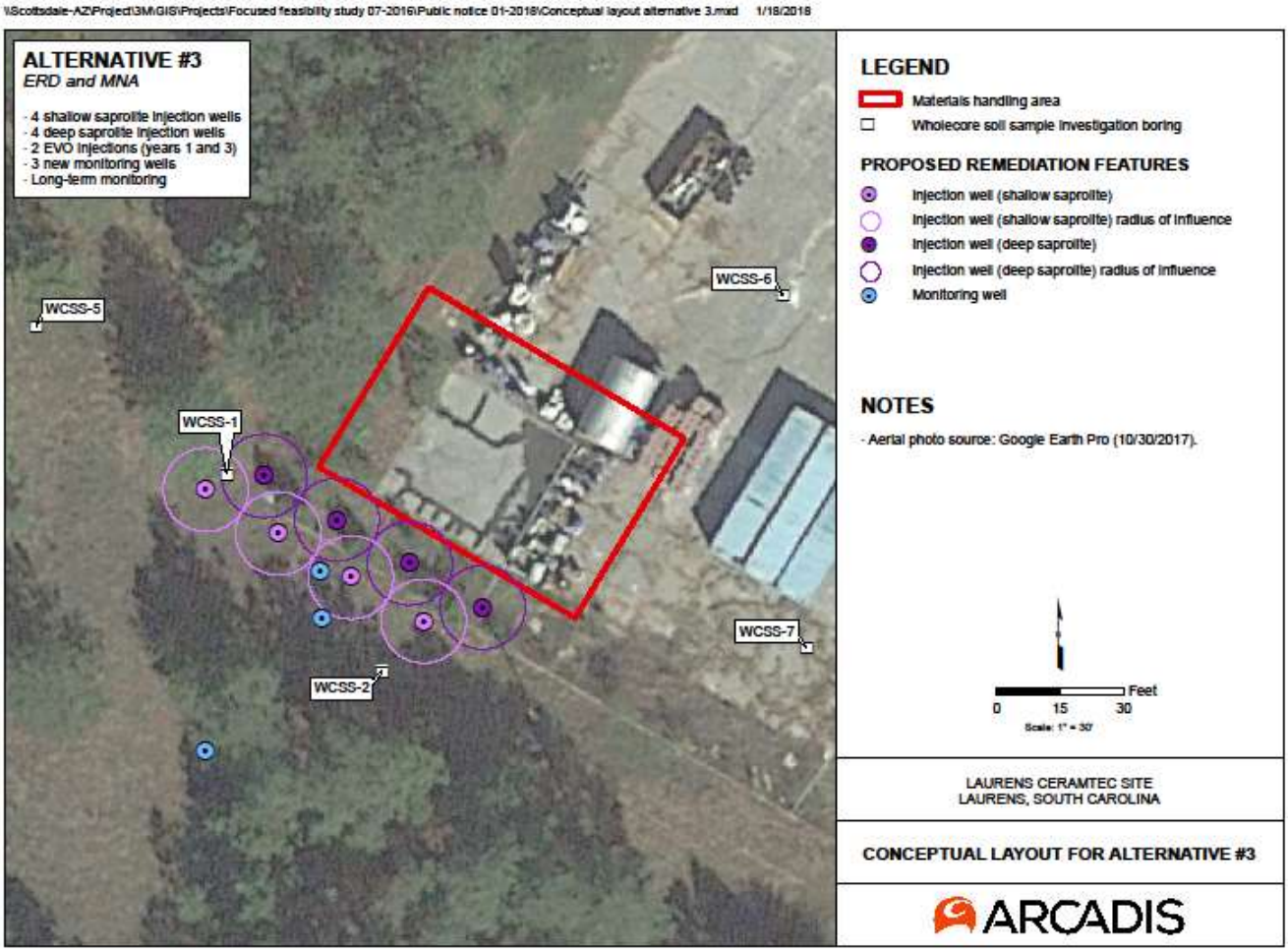
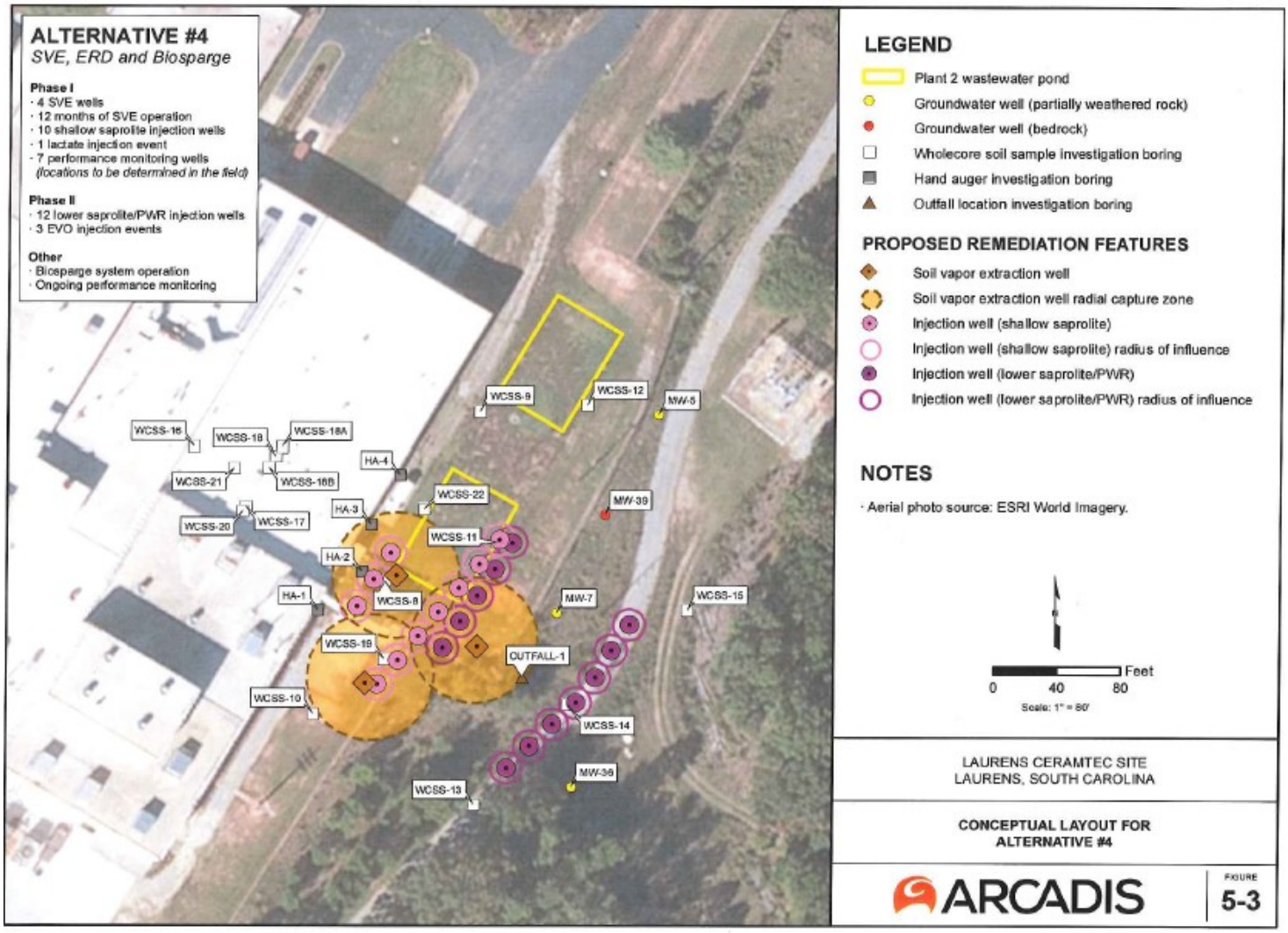

\\Scottsdale-AZ\Project\3M\GIS\Projects\Focused feasibility study 07-2016\Public notice 01-2018\Conceptual layout alternative 3.mxd 1/18/2018
ALTERNATIVE #3
ERD and MNA
- 4 shallow saprolite injection wells
- 4 deep saprolite injection wells
- 2 EVO injections (years 1 and 3)
- 3 new monitoring wells
- Long-term monitoring
WCSS-5
WCSS-6
WCSS-1
WCSS-7
WCSS-2
LEGEND
Materials handling area
Wholecore soil sample investigation boring
PROPOSED REMEDIATION FEATURES
Injection well (shallow saprolite)
Injection well (shallow saprolite) radius of influence
Injection well (deep saprolite)
Injection well (deep saprolite) radius of influence
Monitoring well
NOTES
- Aerial photo source: Google Earth Pro (10/30/2017).
Feet
0 15 30
Scale: 1" = 30'
LAURENS CERAMTEC SITE
LAURENS, SOUTH CAROLINA
CONCEPTUAL LAYOUT FOR ALTERNATIVE #3
ARCADIS

FIGURE 3


ALTERNATIVE #4
SVE, ERD and Biosparge
Phase I
· 4 SVE wells
· 12 months of SVE operation
· 10 shallow saprolite injection wells
· 1 lactate injection event
· 7 performance monitoring wells
(locations to be determined in the field)
Phase II
· 12 lower saprolite/PWR injection wells
· 3 EVO injection events
Other
· Biosparge system operation
· Ongoing performance monitoring
WCSS-9
WCSS-12
MW-5
WCSS-16
WCSS-18
WCSS-18A
HA-4
WCSS-21
WCSS-18B
WCSS-22
MW-39
HA-3
WCSS-20
WCSS-17
WCSS-11
HA-2
HA-1
WCSS-8
MW-7
WCSS-15
WCSS-19
OUTFALL-1
WCSS-10
WCSS-14
MW-36
WCSS-13
LEGEND
Plant 2 wastewater pond
Groundwater well (partially weathered rock)
Groundwater well (bedrock)
Wholecore soil sample investigation boring
Hand auger investigation boring
Outfall location investigation boring
PROPOSED REMEDIATION FEATURES
Soil vapor extraction well
Soil vapor extraction well radial capture zone
Injection well (shallow saprolite)
Injection well (shallow saprolite) radius of influence
Injection well (lower saprolite/PWR)
Injection well (lower saprolite/PWR) radius of influence
NOTES
· Aerial photo source: ESRI World Imagery.
Feet
0
40
80
Scale: 1" = 80'
LAURENS CERAMTEC SITE
LAURENS, SOUTH CAROLINA
CONCEPTUAL LAYOUT FOR
ALTERNATIVE #4
ARCADIS
FIGURE
5-3