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South Carolina Department of Health and Environmental Control

Proposed Plan for Site Remediation

Operable Unit 2 – Off-Property Groundwater

Tegrant Alloyd Brands, Inc. (Tegrant) Facility

201 West Lanford Street, Spartanburg, South Carolina

November 2015

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 groundwater contamination migrating beyond the property boundary of the Tegrant Alloyd Brands, Inc. (Tegrant) Facility. This Proposed Plan identifies DHEC's Preferred Alternative for cleaning up the contaminated areas and provides the reasoning for this preference. 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 Groundwater Monitoring, Assessment and Corrective Action Report Summary (September 2009), the Focused Feasibility Study (March 2015), and other documents contained in the Administrative Record file. The Department encourages the public to review these documents to gain an understanding of the activities that have been completed.

The Department will select a 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.

Preferred Cleanup Summary

DHEC has identified Alternative 2, Pump and Treat, as the preferred remedial alternative to address the off-property groundwater contamination. The remedy will include installation of a groundwater extraction and treatment system, which will pump and treat contaminated groundwater.

The remaining pages provide additional details of the Proposed Plan.

MARK YOUR CALENDAR

❑ PUBLIC MEETING:

When: **Monday, December 7, 2015 at 6:30pm**
Where: **Pine Street Elementary School**
500 South Pine Street
Spartanburg, SC 29302

DHEC will hold a meeting to explain the Proposed Plan and all of the alternatives presented in the Focused Feasibility Study. After the Proposed Plan presentation, DHEC will respond to your questions. Oral and written comments will be accepted at the meeting.

❑ PUBLIC COMMENT PERIOD:

December 8, 2015 through January 7, 2016

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

Lauran Ortman, Project Manager
DHEC's Bureau of Land & Waste Management
2600 Bull Street
Columbia, SC 29201
Email: ortmanlm@dhec.sc.gov

❑ FOR MORE INFORMATION:

Call: Lauran Ortman, Project Manager, (803) 898-0757

See: DHEC's website at:
http://www.scdhec.gov/Apps/Environment/Publicnotices

View: The Administrative Record at the following locations:

Spartanburg County Public Library
151 South Church Street, Spartanburg, SC 29306
(864) 596-3503
Hours: Monday – Friday: 9:00 am – 9:00 pm
Saturday: 9:00 am – 6:00 pm
Sunday: 1:30 – 6:00 pm

DHEC Freedom of Information Office
2600 Bull Street, Columbia, SC 29201
(803) 898-3817
Hours: Monday – Friday: 8:30 am – 5:00 pm

SITE HISTORY

The Tegrant facility is located on a 16.46-acre parcel at 201 West Lanford Street, approximately 3 miles southeast of downtown Spartanburg, South Carolina (Figure 1). The area surrounding the property is a mix of industrial, commercial, and residential properties.

The facility was initially developed in the 1950's for the fabrication of painted metal office furniture. From 1972 to 1987, operations at the facility involved various textile and industrial manufacturing processes. Since 1987, facility operators have been manufacturing thermoformed blister packaging materials from rolled polyvinyl chloride (PVC) sheets. Chemicals previously used in the Tegrant facility include: hydraulic oils, petroleum based cleaners, lubricants, paints, and various solvents.

Initial assessment activities performed by Tegrant included the completion of Phase I and II Environmental Site Assessments, conducted between August and September 2003. Results of the initial assessment revealed volatile organic compounds (VOCs) were present in groundwater above the South Carolina Maximum Contaminant Levels (MCLs) for public drinking water. Investigation and assessment activities were conducted by Tegrant between May 2004 and June 2009 to determine the source, nature, and extent of contamination.

Tegrant conducted additional assessment at the facility in an effort to locate the potential source of VOCs detected in groundwater at the property. VOC contamination was identified in the following four (4) locations:

- The former degreaser area
- Maintenance shop area
- Western parking lot; still bottoms release area
- Septic tank area

The potential source areas investigated at the facility are illustrated on Figure 2.

Additional investigation and assessment activities were conducted by Tegrant between December 2007 and October 2010 to evaluate the extent of contamination migrating off the property. The investigations confirmed that groundwater flow direction is from the Tegrant property towards an unnamed tributary of Fairforest Creek.

Tegrant conducted pilot tests of specific technologies to evaluate potential remedial options. Pursuant to Voluntary Cleanup Contract 13-6011-RP, dated January 31, 2014, between Tegrant and the Department, a *Focused Feasibility Study (ERM, 2015)* was conducted to evaluate potential cleanup alternatives. The areal extent of the contaminated groundwater and surface water is depicted on Figure 3.

AREAS OF CONCERN

"The Site" refers to all areas where contamination is located. The Department has divided the Site into two Operable Units for the purpose of remediation. Operable Unit 1 (OU1) consists of the Tegrant facility and all contamination existing within the property boundary. Operable Unit 2 (OU2) consists of contaminated groundwater that has migrated beyond the Tegrant property.

An On-Site Corrective Action Plan (ONSCAP) was developed for the remediation of VOC source areas and impacted groundwater within OU1. The Department approved the ONSCAP on July 15, 2008 and in-situ chemical oxidation (ISCO) remediation was initiated on the Tegrant property in the fall of 2008. A second ISCO injection was conducted beginning in June 2013. The Department continues to monitor the effectiveness of the remediation through annual monitoring of the groundwater.

OU2 consists of contaminated groundwater that has migrated beyond the Tegrant property boundary. The primary constituents of concern (COCs) are trichloroethene, tetrachloroethene, cis-1,2-dichloroethene and 1,1-dichloroethene. Groundwater contamination is migrating from the Tegrant property towards an unnamed tributary of Fairforest Creek. Contaminated groundwater has impacted the tributary above surface water standards.

The purpose of this proposed plan is to identify a proposed remedial alternative for addressing OU2.

SUMMARY OF SITE RISKS

Source area releases appear to have migrated into the water table. As a result, VOC contaminated groundwater currently extends from the source areas to approximately one-half mile downgradient of the Tegrant property boundary.

The area adjacent to the Site is zoned for industrial, commercial, and residential usage. The affected aquifer is not currently used for drinking purposes; however, it is considered a potential underground drinking water source. The primary exposure route would be contact or ingestion of affected groundwater containing contamination, or contact with impacted surface water. VOC concentrations are found from a range of approximately 180 to 3,300 micrograms per liter (µg/L) across the groundwater plume. Public water service is available in this area. There are several properties in the vicinity of the Site with private wells; however, none of the private wells identified are currently being used as water supply wells.

Surface water samples contain trichloroethene at concentrations ranging from 5 to 210 µg/L, which is above the surface water standard of 2.5 µg/L, set forth in R.61-68, Water Classifications and Standards.

The Department's current judgment is that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or the environment from actual or threatened releases of hazardous substances into 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 OU2:

1. Prevent current and future exposure to VOCs in groundwater at levels in excess of federal and state MCLs or other applicable or relevant and appropriate risk-based human health criteria;

2. Protect downgradient surface waters by preventing further migration of VOC contaminated groundwater via hydraulic containment and mitigation; and

3. Restore groundwater concentrations to MCL standards.

The primary COCs at the Site are VOCs, particularly trichloroethene, tetrachloroethene, cis-1,2-dichloroethene and 1,1-dichloroethene.

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). The Site groundwater contaminant concentrations, included in Table 1, list the promulgated MCLs for the Site COCs.

SCOPE AND ROLE OF THE ACTION

The proposed action in this plan will be the final cleanup action for OU2 of the Site. The RAOs include preventing exposure to contaminated media through the treatment of groundwater in OU2.

SUMMARY OF REMEDIAL ALTERNATIVES

Based on information collected during the previous investigations, a Focused Feasibility Study (FFS) was conducted to identify, develop, and evaluate cleanup options and remedial alternatives. The FFS process used the information gathered during the Remedial Investigation and other assessments to develop and evaluate potential remedial alternatives. Off-property groundwater (OU2) was considered in the FFS analysis. 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	
Alternative	**Description**
1: No Action	• OU2 left in current condition. • Discontinuation of groundwater and surface water monitoring. • Net present worth: $0.
2: Pump and Treat	• Installation of a groundwater pump and treat system: remediation building housing and associated equipment, extraction wells, and underground piping and electrical lines. • Treatment system requires routine O&M and effectiveness monitoring. • Likely take longer than 30 years to achieve the RAOs. • Net present worth: Approximately $644,361 first year installation (including O&M) and an estimated $3.7M total cost over 30 years.
3: In-Situ Chemical Oxidation (ISCO)	• Treatment method involves injecting sodium permanganate ($NaMnO_4$) at discrete vertical intervals within the aquifer utilizing Direct Push Technology® (DPT) injection points. • Up to 10 injections over 30 years, to account for contaminated groundwater that migrates from the untreated areas located between OU1 and the proposed treatment area, would likely be necessary to achieve the RAOs. • Net present worth: Approximately $3.6M total cost for 10 injections over 30 years.

DESCRIPTION OF ALTERNATIVES

Alternative 1 – No Action

The No Action alternative is required by the National Contingency Plan, as it serves as a baseline for comparison to the other remedial action alternatives. Under this alternative, there would be no action taken to prevent exposure to the groundwater and surface water contamination. No institutional controls or active remediation would be implemented under this alternative. No costs would be associated with this alternative.

Alternative 2 – Pump and Treat

Pump and Treat systems include the installation of multiple groundwater extraction wells allowing for capture of groundwater from the subsurface over a specified design area. The groundwater capture accomplishes two goals:

1) Contaminated groundwater is transferred to the surface where the contaminant mass is removed from the groundwater; and

2) The groundwater plume is contained, eliminating continued contaminant migration and mobilization.

Extracted groundwater is collected in an aboveground treatment building, where the contamination is removed from the groundwater. The extracted groundwater could be treated through the use of air stripping as the primary treatment technology, and possibly activated carbon as secondary treatment. The specific types of treatment would be determined in the remedial design phase.

Periodic monitoring of the extraction wells, monitoring wells, and surface water locations would be implemented to determine the effectiveness of the Pump and Treat system and to monitor natural attenuation processes. This alternative also requires routine operation and maintenance of the treatment system. The Site monitoring program would be determined during the remedial design process.

For the purpose of this evaluation, the cost of the Pump and Treat alternative has been determined over a 30-year period for comparison and estimation purposes only. The cost (net present value) of Alternative 2, for 30 years of operation, is estimated to be $3,719,790. Under this alternative, it is anticipated that it would take longer than 30 years to achieve RAOs.

Alternative 3 – In-Situ Chemical Oxidation (ISCO)

An ISCO treatment for the downgradient portion of the contaminated groundwater plume would include the injection of an oxidant solution into the aquifer using DPT. ISCO would result in the chemical destruction of contaminants in groundwater in the immediate treatment area and downgradient from the treatment zone. ISCO would also reduce the risk to human health and the environment, eliminate exposure pathways, and reduce the potential for migration of contamination to Fairforest Creek.

Chemical oxidation would result in immediate reduction of COC concentrations in groundwater, thereby not requiring a long treatment time to achieve MCLs. However, a significant portion of the groundwater VOC plume upgradient from the planned injection area is not planned to receive treatment. This impacted groundwater would require treatment as it enters the injection area, which is expected to last up to 30 years.

The net present value of this alternative is $3,673,999 and is based on 10 injections over 30 years and associated monitoring.

EVALUATION OF ALTERNATIVES

The National Contingency Plan requires the Department 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. Implementability;
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; implementability; 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. The comparative analysis of alternatives is summarized on Table 2.

Note: Although Alternative 1 (No Action) does not meet the threshold criteria, it is retained for discussion because it provides a baseline for comparing the other alternatives to the criteria outlined above.

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 degree to which site-related risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Alternative 1 offers the least protection to human health and the environment. This alternative provides no active treatment, no elimination of further migration of contamination, and no restriction to future use of contaminated groundwater and surface water. The No Action alternative would provide no protection against exposure to contaminated groundwater.

Alternative 2 is highly effective in reducing the spread of COC concentrations downgradient (toward the stream). This technology is easily implemented and would treat groundwater shown to be impacted with COCs. Thus, Pump and Treat would provide a high degree of protection by reducing the concentration of COCs in groundwater and containing the contaminant plume.

Alternative 3 would provide a moderate degree of protection. ISCO would be protective of human health and the environment by reducing contaminant mass discharge through the chemical destruction of COCs in groundwater. Multiple injections of oxidants would be required to sustain reduction in mass due to reloading of the treatment area with impacted groundwater flowing from untreated upgradient areas. This alternative has the potential for undesirable daylighting or overland flow of oxidant.

Compliance with ARARs

This factor 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.

Table 3 summarizes the alternatives' compliance with the ARARs and other potentially applicable regulations or issues to be considered (TBCs).

Alternative 1 consists of leaving OU2 in its current condition. The current routine monitoring program at the Site would cease. No remedial activities would be implemented, and the current long-term human health and environmental risk would exist indefinitely into the future. Because the concentrations of contaminants exceed human health and environmental risk assessment levels, pose a threat to water quality, and/or exceed water quality standards, the No Action alternative does not comply with applicable ARARs.

Alternative 2 is expected to be the most effective in terms of meeting ARARs. Pump and Treat is expected to limit the migration of contaminated groundwater to surface water. The surface water would meet Surface Water Quality Standards as groundwater concentrations are reduced to MCLs.

Alternative 3 would comply with ARARs, however there is potential for daylighting of injected material in the nearby surface waters.

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.

Alternative 1 would not provide long-term effectiveness and permanence because no action would be taken. Contaminants would persist and continue to migrate into the environment. No controls would be implemented to prevent future exposure.

Alternative 2 would provide a moderate degree of long-term effectiveness and permanence by removing and treating contaminated groundwater. By the creation of a hydraulic barrier through containment in OU2, Pump and Treat would reduce contaminant mass discharge from downgradient areas and receptors (Fairforest Creek). While this alternative would not result in complete removal of contaminant mass from the aquifer, it would reduce contaminant concentrations below applicable water quality standards. Pump and Treat would likely take longer than 30 years to achieve the RAOs.

Alternative 3 would provide a high level of long-term effectiveness and permanence by destroying contaminants in groundwater and reducing concentrations. ISCO would have some density-driven affect, allowing for limited treatment of deeper impacted groundwater. Because injected oxidant breaks down rather quickly, multiple injections over long treatment timeframes (several years to decades) would likely be required for effective treatment of OU2. Additionally, success is dependent on adequate distribution of oxidants in the subsurface. The Site conditions could lead to areas of untreated groundwater. Under this alternative, it is anticipated that it would take at least 30 years to achieve RAOs.

Reduction of Toxicity, Mobility, or 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.

Alternative 1 would not provide a reduction of toxicity, mobility, or volume since treatment is not part of the No Action alternative.

Alternative 2 is anticipated to have the greatest reduction of toxicity, mobility, and volume through treatment. This alternative relies on physical removal processes, requiring above ground treatment of contaminated groundwater, and disposal (discharge) of treated groundwater. Pump and Treat can be implemented to act as a hydraulic barrier that reduces the mobility of the plume, preventing continued impact to the downgradient receptors. While this alternative would not result in complete removal of contaminant mass from the aquifer, it would reduce contaminant concentrations below applicable water quality standards.

Alternative 3 would provide a moderate reduction of toxicity and volume of impacted groundwater through in-situ treatment of groundwater. ISCO directly degrades contaminants to harmless byproducts, significantly decreasing toxicity and lowering contaminant concentrations in the groundwater. Mobility of impacted groundwater may be locally increased during the injection process due to the use of high-pressure injection to emplace oxidant. This mobilization also increases the potential for daylighting to occur in the nearby surface waters and potentially in the vicinity of the wetlands.

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.

For Alternative 1, construction activities would not be performed, therefore no risks to remediation workers or the community would occur. However, contamination is not addressed and the surface water RAO would not be met.

Both Alternative 2 and Alternative 3 would provide a moderate to high level of short-term effectiveness. Potential short-term risks to the community and to Site workers would be mitigated through Site control and traffic control measures. Remediation workers would not be subject to risks from direct contact with contaminated materials, and potential risks would be mitigated through the use of personal protective equipment and standard health and safety practices.

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.

Alternative 1 is the easiest to implement. However, the No Action Alternative provides no reduction in contamination.

Alternative 2 is technically and administratively implementable using readily available conventional construction equipment. Pump and Treat is well established and would be readily implementable in OU2. Additional extraction wells, vaults, subsurface piping, and electrical lines could be installed using standard drilling and construction equipment. State and local regulatory coordination is required for implementation to provide construction and operating permits. Additional modeling would be required during the engineering design phase to assess the expected capture zone and confirm the adequacy of the proposed well network.

Alternative 3 is technically and administratively implementable, is accepted, and can be implemented at OU2. Chemical oxidants would be delivered to the subsurface using standard DPT equipment. A pilot test would be required to determine the exact dose of oxidant required in OU2 prior to full-scale implementation. However, due to the aquifer characteristics of OU2, oxidant could potentially be discharged to surface water in an active state and change the color and chemistry of the groundwater discharging into the tributary to Fairforest Creek.

Other than Alternative 1, Alternative 2 would be the easiest alternative to implement due to the existing extraction well and observation wells located in the target treatment area of OU2. A pilot pumping test was also performed to determine the effectiveness of the technology and to provide design parameters for a full-scale system. Results from this test were favorable. However, this alternative would likely be required to be implemented indefinitely.

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 a 30-year period for comparison and estimation purposes only. This time period allows for a reasonable estimation of potential costs, the development of prospective new technologies, and/or additional risk based cleanup goals which may be adopted within that period. Actual remediation and time-to-closure will be dependent on long-term effectiveness of the treatment and attainment of the RAOs.

Alternative 1 (No Action): $0
Alternative 2 (Pump and Treat): $3,719,790
Alternative 3 (ISCO): $3,673,999

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

The Department has identified a preferred alternative to address the off-property portion of the groundwater and surface water contamination at the Site (OU2). This preferred remedial alternative, Pump and Treat (Alternative 2), consists of the following components:

Pump and Treat systems include the installation of multiple groundwater extraction wells, allowing for capture of groundwater from the subsurface over a specified design area. The groundwater capture accomplishes two goals:

1) Contaminated groundwater is pumped to the surface where the contaminant mass is removed from the groundwater; and

2) The groundwater plume is contained, eliminating continued contaminant migration and mobilization.

Extracted groundwater is collected in an aboveground treatment building, where the contamination is removed from the groundwater. Groundwater could be treated through the use of air stripping as the primary treatment technology, and possibly activated carbon as secondary treatment. The specific types of treatment would be determined in the remedial design phase.

Periodic monitoring of the extraction wells, monitoring wells, and surface water locations would be implemented to determine the effectiveness of the Pump and Treat system and to monitor natural

attenuation processes. The Site monitoring program would be determined during the remedial design process.

The long-term effectiveness of the Pump and Treat alternative is contingent upon proper maintenance and the effectiveness of upgradient remediation being conducted in OU1. This alternative also requires routine O&M of the treatment system, effectiveness monitoring, and groundwater monitoring until the RAOs are achieved. For the purpose of this evaluation, the cost of the Pump and Treat alternative has been determined over a 30-year period. This time period allows for a reasonable estimation of potential costs, the development of prospective new technologies, and/or additional risk based cleanup goals which may be adopted within that period. The cost (net present value) of this alternative, for 30 years of operation, is estimated to be $3,719,790. Under this alternative, it is anticipated that it would take longer than 30 years to achieve RAOs.

The Pump and Treat alternative would provide an immediate reduction in risk through containment and treatment of contaminated groundwater. The potential for short-term risks to the community would be mitigated through the implementation of Site and traffic control measures during construction of the system.

This alternative is easily implemented due to the conventional equipment and materials required to construct it. While the Pump and Treat alternative would entail a significant effort by qualified remediation contractors in the short term (designing and installation of the system), the methodologies and procedures to implement the alternative are well understood and should not provide any barriers to the effective completion of the alternative.

DHEC's current judgment is the Preferred Alternative identified in this Proposed Plan is necessary to protect public health and the environment.