Proposed Plan

Duke Power – Spartanburg MGP Site

684 North Pine Street, Spartanburg, South Carolina 29303

February 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 Duke Power-Spartanburg MGP Site, Spartanburg, South Carolina (the Site). 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 Phase II Interim Removal Work Plan (April 2003), Risk Assessment (February 2006), iSOC Pilot Test (June 2006), Restrictive Covenant (December 2006), Remedial Alternatives Focused Feasibility Study, June 2008), Chemical Oxidation Pilot Test Report (November 2013), Chemical Oxidation Pilot Test Report (October 2014), Feasibility Study Investigation Work Plan (February 2016), and 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 <u>all</u> the Alternatives presented in this Proposed Plan.

DHEC's Preferred Cleanup Summary
Alternative 3: Targeted Excavation with Monitored Natural Attenuation and Land Use Controls

DHEC's preferred remedial option includes:

- Targeted Excavation of 1-3 feet of tar-like material (TLM) that lies beneath a non-impacted area of soil.
- Excavation will be backfilled with clean soil that has been mixed with amendments, oxygen releasing solids, nutrients, and an active carbon media to treat groundwater.
- Monitored Natural Attenuation and Land Use Controls will be utilized to monitor that remedial goals are met.

MARK YOUR CALENDAR

- **PUBLIC MEETING:**

When: February 27, 2018 6:00 PM

Where: Spartanburg County Public Library (151 S Church St)

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:**

February 27, 2018 – March 29, 2018

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

Greg Cassidy, Project Manager
DHEC's Bureau of Land & Waste Management
2600 Bull Street
Columbia, SC 29201
cassidga@dhec.sc.gov

- **FOR MORE INFORMATION:**

Call: Greg Cassidy, 803-898-0910

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

View: The Administrative Record at the following locations:

<u>Spartanburg County Public Library</u>
151 S Church St, Spartanburg, SC 29306
Hours: Monday-Friday 9:00 AM – 9:00 PM
Saturday 9:00 AM – 6:00 PM
Sunday 1:30 PM - 6:00 PM

<u>DHEC Freedom of Information Office</u>
2600 Bull Street, Columbia, SC
(803) 898-3817
Hours: Monday - Friday: 8:30 AM - 5:00 PM

SITE HISTORY

The Site is located in a predominately commercial and industrial section of Spartanburg, South Carolina, consisting of approximately 7.4 acres that are bounded by North Pine Street (US Highway 176) to the west, Southern Railway System mainline tracks to the north, additional commercial/industrial property to the east, and Linder Road to the south. PNG, a subsidiary of Duke, presently owns the majority of the property, and Duke owns an electrical substation situated near the center of the property. There are no occupied structures within the footprint of known impacts to groundwater. Chinquapin Creek originates off-site and generally flows west to east through the center of the Site, eventually converging with Lawson Fork Creek approximately 3,600 feet east of the Site. Extensive surface water sampling of the creek, performed routinely from 2011 to 2015, has demonstrated that it is not impacted by COCs.

Soil was extensively characterized by grid sampling for volatile organic compounds (VOCs) and semi- volatile organic compounds (SVOCs) to support remedial excavation in 2003 and 2004. The excavation was performed in three phases, from February 2003 to March 2004, and 67,596 tons of TLM-impacted soil and debris were removed. However, not all impacted material was removed from depths greater than 8-13 feet below ground surface.

A groundwater monitoring network was installed following completion of the excavation work, consisting of shallow (water table) wells and deep (shallow bedrock) wells. A routine groundwater monitoring program was implemented to evaluate post-remediation groundwater quality. Naphthalene and benzene are the primary constituents of concern (COCs) in groundwater. The COCs are present in localized areas at varying concentrations above their respective United States Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs), or the SCDHEC risk-based screening level (RBSL) in the absence of an established MCL.

In 2006, an oxygen diffusion curtain pilot study was initiated in monitoring well MW-13D and subsequently in well MW-13iSOC for treatment of groundwater. The pilot study concluded that the direct delivery of oxygen to groundwater through diffusers resulted in the reduction of benzene and naphthalene in the groundwater. The operation of the diffusion units was later discontinued due to persistent fouling of the delivery system.

A pilot study of in situ chemical oxidation (ISCO) technology was conducted to address COCs in groundwater in 2012 and 2013. The pilot study consisted of injecting approximately 12,360 gallons of activated persulfate compound into the subsurface. These activities resulted in the initial reduction of dissolved phase concentrations of benzene and naphthalene by approximately 50 to 99 percent. Longer term groundwater monitoring data, however, has indicated that benzene/naphthalene concentrations have rebounded. ISCO was not implemented at full scale following the pilot study, as the study concluded that oxidant solution volumes of up to 1 million gallons would be required via 40-70 injection events.

AREAS OF CONCERN

Based on the chemical oxidant volumes recommended in the ISCO pilot study report, Duke performed additional subsurface investigation work to delineate potential source areas to make a remedial alternative selection. Investigation work was performed in 2016 and consisted of delineating TLM not removed during the 2003-2004 excavation.

TLM was identified by TarGOST® (Tar Specific Green Optical Screening Tool) within a confined area west of the substation. The area coincides with monitoring wells that have exhibited groundwater impacts. The TLM is generally located within a relatively narrow zone (1-3 feet thick) just above or into the uppermost zone of partially weathered rock. Saturated soil samples indicated the TLM contains residual naphthalene and benzene within narrow bands in isolated areas. The current groundwater plume(s) occurs in two apparently isolated areas and exhibit both benzene and naphthalene above their respective remedial goals. These two areas appear co-located with areas indicated to contain TLM during the investigation.

The trends of benzene and naphthalene in individual wells are either decreasing or stable and the bulk plume mass of benzene and naphthalene is decreasing. The center of mass of these plumes is not migrating toward Chinquapin Creek, and monitoring data have demonstrated COCs are not reaching the creek. Horizontal migration of the plume has not occurred at a significant rate and would not be expected to migrate significantly further horizontally based on historical trends. The benzene and naphthalene plumes are shrinking and the risk of COC migration is minimal. However, the remaining TLM will likely continue to release benzene and naphthalene into the adjacent groundwater.

SUMMARY OF SITE RISKS

The primary risk is the exposure of humans to these localized areas of groundwater. This risk is administratively mitigated through the Declaration of Covenants and Restrictions that was executed by Piedmont Natural Gas (PNG) in 2006, prohibiting the use of groundwater for drinking or irrigation without the approval of SCDHEC and restricting property use against residential, agricultural, recreational, child care and elderly care facilities, and schools. The potential for human receptors to be in contact with COCs is unlikely based on the depth at which groundwater is present. A *Trespasser Focused Risk Evaluation Report* concluded that conditions do not present unacceptable risks for industrial/commercial use scenarios.

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:

- **RAO 1:** Prevent ingestion of groundwater containing COCs in excess of applicable drinking water standards.

- **RAO 2:** Restore groundwater concentrations below Maximum Contaminant Levels.
- **RAO 3:** Prevent or confirm that groundwater containing COCs does not impact on-site surface water above South Carolina surface water standards

Groundwater at the Site is impacted primarily by benzene and naphthalene. The remedial goal for benzene is the EPA Maximum Contaminant Level (MCL) of 5 micrograms per liter. The remedial goal for naphthalene is the SCDHEC risk based screening level of 25 micrograms per liter.

SCOPE AND ROLE OF THE ACTION

The proposed action in this plan will be the final cleanup action for the Site. The remedial action objectives for this proposed action include preventing human ingestion of groundwater, minimizing the time required for groundwater COC concentrations to reduce below MCLs, and restoring groundwater to drinking water 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 used the information gathered during the previous investigations 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

Alternative	Description
1: No Action	• Site is left in its current condition • Discontinuation of groundwater and surface water monitoring • Net present worth: $0
2: Monitored Natural Attenuation (MNA) and Land Use Controls (LUCs)	• Relies on monitoring the natural degradation processes that reduce contaminant concentrations • Long-term groundwater monitoring program for 50 years • Institutional controls would be implemented to restrict groundwater use • Net present worth: $509,000
3: Targeted Excavation with MNA/LUCs	• Excavation of TLM-impacted material in the subsurface • Institutional controls would be implemented to restrict groundwater use • Long-term groundwater monitoring for approximately 8 years • Net present worth: $966,000
4: In Situ Stabilization /Solidification with MNA/LUCs	• TLM-impacted material would be stabilized in place to prevent the emission of COCs into groundwater • Institutional controls to restrict groundwater use • Long-term groundwater monitoring for approximately 8 years • Net present worth: $884,000
5. In Situ Chemical Oxidation with MNA/LUCs	• Process that reduces the mass of organic COCs by injecting an oxidizing agent into the subsurface. • Modified Fenton's reagent would be injected using a direct mixing delivery • Institutional Controls would be implemented to restrict groundwater use • Long-term groundwater monitoring for approximately 8 years • Net present worth: $1,267,000
6. In Situ Bioremediation with MNA/LUCs	• Process that amplifies biological processes within the subsurface to remove target COCs • Aerobic biodegradation by the application of solid calcium peroxide is proposed • Institutional Controls and long-term groundwater monitoring for approximately 8 years

DESCRIPTION OF ALTERNATIVES

Alternative1 - No Action

No action is included as a baseline for comparison with other Alternatives. Under this Alternative, no 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 institutional controls (e.g., deed restrictions) or monitoring to evaluate natural attenuation or COC extent and the Site would be uncontrolled. This Alternative would not be protective of human health or the environment and could take more than 100 years to achieve the RAOs.

Alternative 2 –Monitored Natural Attenuation (MNA) and Land Use Controls (LUCs)

MNA is a passive approach that monitors the natural degradation or reductions of COCs in groundwater. A typical MNA approach centers on monitoring groundwater regularly to evaluate and confirm that site conditions are supportive of COC degradation. Additionally, land use controls would be implemented to protect human health and the environment by restricting development and groundwater use. MNA would be expected to take approximately 50 years with a cost of $509,000.

Alternative 3–Targeted Excavation with MNA and Land Use Controls

Under this Alternative, a targeted excavation of subsurface TLM would be performed in two areas. Then, once the presumed residual source material was removed, non-impacted amended fill would be used for backfilling. Once the emission of COCs into the groundwater is mitigated, COC biodegradation through the documented natural attenuation processes should treat the dissolved phase concentrations. MNA and Land Use Controls would then be instituted for up to 8 years.

This Alternative is expected to reduce site COCs to the RAOs in approximately 8 years. The net present worth is expected to be $966,000.

Alternative 4 – In Situ Stabilization/Solidification with MNA and Land Use Controls

Under this Alternative, the remaining TLM would be stabilized in place through the use of a binding agent such as cement or fly ash to limit the continued emission of COCs from the TLM into the groundwater. Once the emission of COCs into the groundwater is mitigated, COC biodegradation through natural attenuation processes should treat the dissolved phase concentrations. MNA and Land Use Controls would then be instituted for up to 8 years.

This Alternative is expected to reduce site COCs to the RAOs in approximately 8 years. The net present worth is expected to be $884,000.

Alternative 5 – In Situ Chemical Oxidation with MNA and Land Use Controls

In Situ Chemical Oxidation is a process that reduces the mass of organic COCs through the direct injection or direct mixing of a strong oxidizing agent into the subsurface. This approach would involve mixing Modified Fenton's reagent (hydrogen peroxide with an iron-based catalyst) with the TLM material and then backfilling this material in place. Natural attenuation would be used to address any residual remaining constituents. Land Use Controls would be utilized to restrict development and the use of groundwater at the site.

This Alternative is expected to reduce site COCs to the RAOs in approximately 8 years. The net present worth is expected to be $1,267,000.

Alternative 6 – In Situ Bioremediation with MNA and Land Use Controls

In situ bioremediation involves the amplification of biological processes within the subsurface for the removal of target COCs from soil and groundwater. Aerobic biodegradation would be utilized through the application of solid calcium peroxide to the TLM and then backfilled in place. The solid calcium peroxide would provide oxygen to the groundwater for approximately 12 months. Natural attenuation would be used to address any residual remaining constituents. Land Use Controls would be utilized to restrict development and the use of groundwater at the site.

This Alternative is expected to reduce site COCs to the RAOs in approximately 8 years. The net present worth is expected to be $1,185,000.

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.

Overall Protection of Human Health and the Environment

The six alternatives provide varying levels of human health protection. Alternative 1, no action, does not achieve the RAOs and provides the least protection of all the alternatives; it provides no reduction in risks to human health and the environment because no measures would be implemented to eliminate potential pathways for human exposure to COCs in groundwater. All five remaining alternatives protect human health and the environment as long as appropriate measures are implemented to prevent exposure to COCs from groundwater until the RGs are met. Alternative 2 relies upon continued performance of the current MNA program. Alternatives 3 and 4 rely upon physical processes to either remove mass or reduce the mobility of current mass and the propensity of that mass to be emitted into the groundwater. Alternatives 5 and 6 use chemical or biological processes to convert mass of COCs into innocuous compounds. In terms of overall protection of human health and the environment, the alternatives ranked from highest to lowest: Alternative 3, Alternatives 4, Alternative 5, Alternative 6, Alternative 2, and Alternative 1.

Compliance with ARARs

Alternative 1 does not comply with chemical-specific ARARs for groundwater because no remedial measures would be implemented. All remaining treatment alternatives are expected to return the groundwater to meet the chemical-specific ARARs although they would require different time frames to achieve the RGs. Alternative 2 continues the current MNA program and while it is anticipated to take a comparatively long time (i.e., 50 years or more), it will eventually meet the chemical and action-specific ARARs. Alternative 3 relies upon removal of mass and represents the shortest time to achieve the RAOs. Alternative 4 relies upon the immobilization of any remaining mass to limit or stop the emission of the mass into the groundwater thereby achieving the groundwater RGs. Alternative 5 and Alternative 6 comply with the chemical-specific ARARs for groundwater because they would convert the current existing mass into innocuous compounds and would eventually result in groundwater concentrations to less than RGs. In terms of meeting compliance with ARARs, the alternatives ranked from most to least: Alternative 3, Alternative 4, Alternative 5, Alternative 6, and Alternative 2. All of the active treatment alternatives would comply with the location-specific and action-specific ARARs.

Long-Term Effectiveness and Permanence

Alternative 1 would not be very effective or permanent in the long term because no COC removal or treatment would take place and no measures would be implemented to control exposure to risks posed by affected groundwater or the potential for groundwater to migrate to downgradient receptors. Alternative 2 would be slightly more effective than Alternative 1 since it provides additional risk mitigation through periodic verification that the assumptions made in the performance of the risk evaluation are still relevant. Residual risk for the remaining active alternatives is expected to be minimal as long as the integrity of institutional and engineered controls is maintained. Alternatives 3 and 4 exhibit the most permanence and long-term effectiveness of all the alternatives either by removal of COC mass or by complete immobilization. While stabilization of TLM is considered permanent, there is risk that TLM mass could "break free" over time. Alternatives 5 and 6 run recurring risks of COC rebound in groundwater either by ineffective contact with the amendments, COC mass heterogeneities, or through altering of the groundwater geochemistry and mobilizing additional mass. In terms of long-term effectiveness, the alternatives ranked from most permanent to least: Alternative 3, Alternative 4, Alternative 5, and Alternative 6. All four active alternatives (Alternatives 3 through 6) would require some level of long-term management until RAOs are achieved.

Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative 1 does not employ treatment of groundwater and would not result in a reduction of toxicity, mobility, or volume of COCs, other than that which occurs naturally. Alternative 2 provides monitoring of reductions in toxicity and volume via continued performance of the current MNA Program. The active alternatives are expected to reduce toxicity, mobility, and volume through removal, immobilization and/or in situ treatment. Alternative 3 provides a reduction of mass volume and through that reduction a decline in overall toxicity. Alternative 4 provides significant reduction in mobility by binding the remaining mass within the soil. Alternative 5 and 6 reduce both the volume and toxicity of COCs by degrading the COCs to innocuous compounds. However, Alternatives 5 and 6 have a higher likelihood of having elevated COC mass remain after active remediation. In terms of reducing toxicity, mobility, and volume, the alternatives ranked most to least: Alternative 3, Alternative 4, Alternative 5, Alternative 6, and Alternative 2.

Short-Term Effectiveness

Risk to workers during implementation of the four active groundwater alternatives includes exposure to dissolved phase plume or vapor; however, this risk would be minimized when proper health and safety procedures are used. Each of the alternatives present on site physical risks due to the use of heavy equipment. Proper safety measures are required to ensure potential chemical hazards associated with the use of cement for Alternative 4, sodium persulfate and sodium hydroxide for Alternative 5 and calcium peroxide for Alternative 6. Engineering controls would significantly minimize exposure to COCs. MNA would be required for all active alternatives to demonstrate meeting groundwater RGs. In terms of short-term effectiveness, the Alternatives ranked from most to least: Alternative 3, Alternative 4, Alternative 6, Alternative 5, and Alternative 2.

Implementability

Administratively, all of the action alternatives are implementable. The four action alternatives (Alternatives 3 through 6) are all technically implementable with varying degrees of difficulty. In the order of increasing difficulty, the Alternatives are ranked: Alternative 3, Alternative 5, Alternative 6, and Alternative 4. Each of the alternatives discussed are common applications, have been historically used in the environmental industry, and have specifically been used at former MGP sites.

Cost

The following table presents the probable cost for each alternative:

Alternative	Cost
1. No Action	$0
2. MNA and LUCs	$509,000
3. Excavation with MNA/LUCs	$966,000
4. Stabilization / Solidification with MNA/LUCs	$884,000
5. ISCO with MNA/LUCs	$1,267,000
6. In-Situ Bioremediation with MNA/LUCs	$1,185,000

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

The Department has identified Alternative 3 (Targeted Excavation with Monitored Natural Attenuation and Land Use Controls) as the preferred remedy for the Site.

This Alternative would require the non-impacted fill or overburden soil to be removed from the upper 10 feet to expose the potential tar-like material. The tar-like material would then be excavated and is expected to range from 1 to 3 feet in thickness across the excavation area. It is expected that around 1,150 cubic yards of tar-like material would be excavated and transported as a non-hazardous waste to a local sanitary landfill for disposal.

The excavation would be backfilled with clean backfill that would be mixed with amendments, including oxygen releasing solids, nutrients, and an activated carbon media to aid in cleaning the impacted groundwater beneath the site.

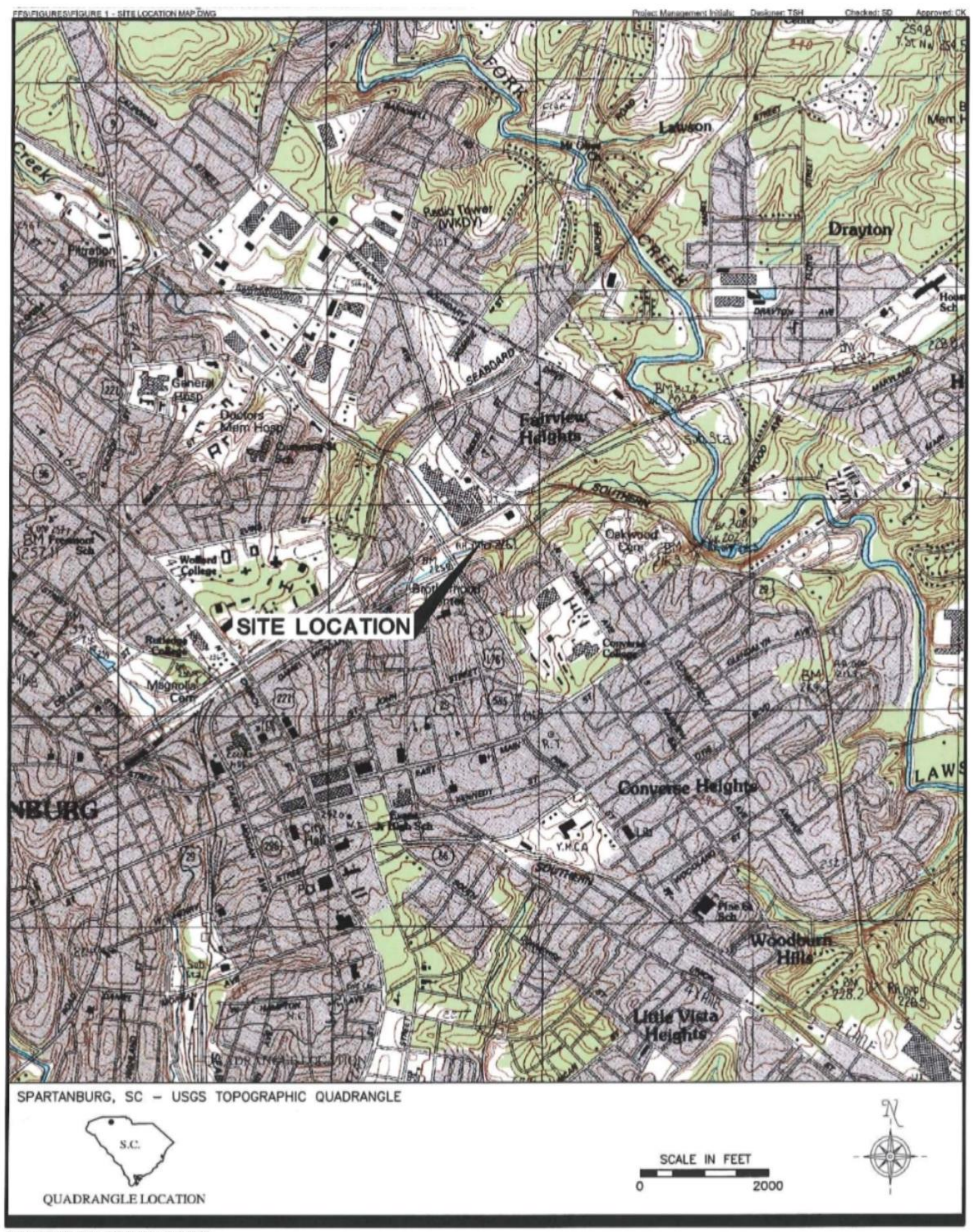
Once the excavation and backfill are complete, a series of performance monitoring events will occur to track the progress of groundwater concentration reduction. It is expected that COC biodegradation through natural attenuation processes will reduce COCs in groundwater through time below remedial goals. Along with land use controls which will limit groundwater use and site development, remedial goals are expected to be achieved in 8 years. Groundwater monitoring will continue until standards are met.

This Alternative protects human health and the environment by removing TLM that remains in the subsurface. This would eliminate the emittance of COCs into groundwater, creating a significant reduction in dissolved phase COC mass.

This Alternative is the best in terms of its long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; and in short-term effectiveness. Removing the tar-like material is permanent and mitigates further groundwater impact.

Excavation, transportation, and disposal has been successfully implemented to remediate other MGP Sites. There are many qualified contractors capable of performing the work.

The estimated net present worth for this remedial action through Year 8 is approximately $966,000.

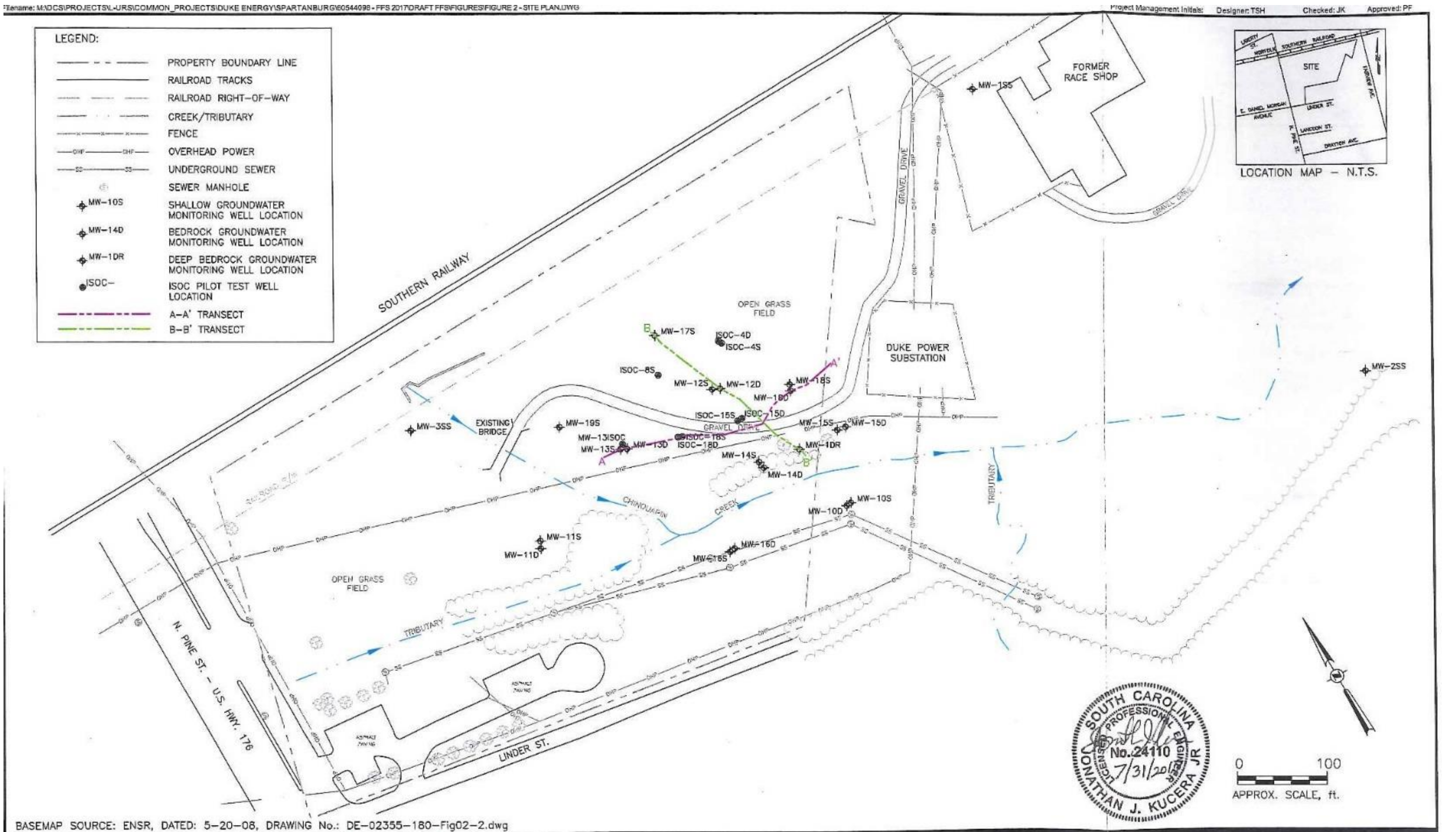


FOCUSED FEASIBILITY STUDY
DUKE ENERGY CORPORATION-FORMER MGP SITE
SPARTANBURG, SOUTH CAROLINA
Project No.: 60544098 Date: 2017-06-22

SITE LOCATION MAP

AECOM

Figure: 1



FOCUSED FEASIBILITY STUDY
DUKE ENERGY CORPORATION-FORMER MGP SITE
SPARTANBURG, SOUTH CAROLINA
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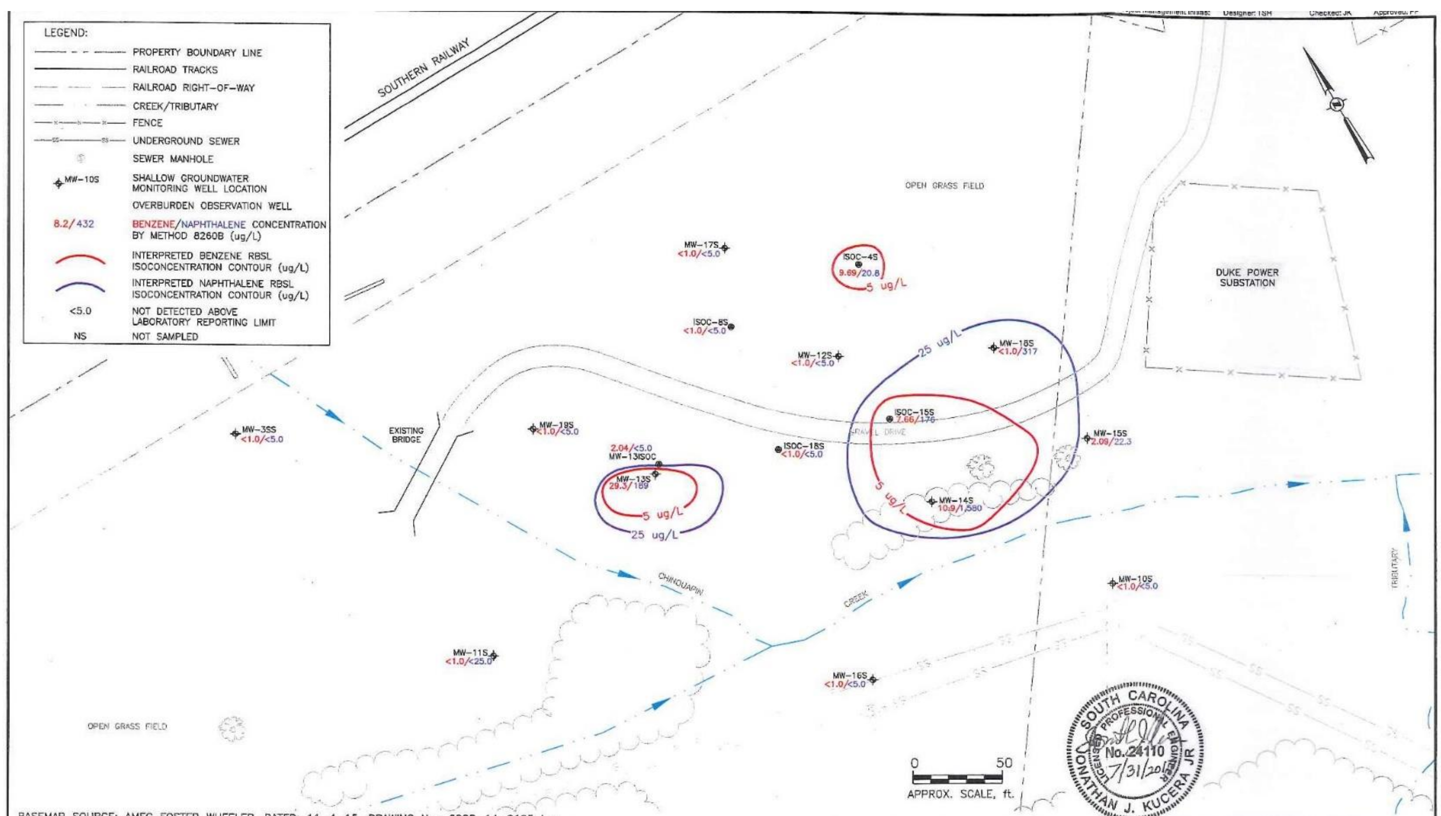
SITE PLAN

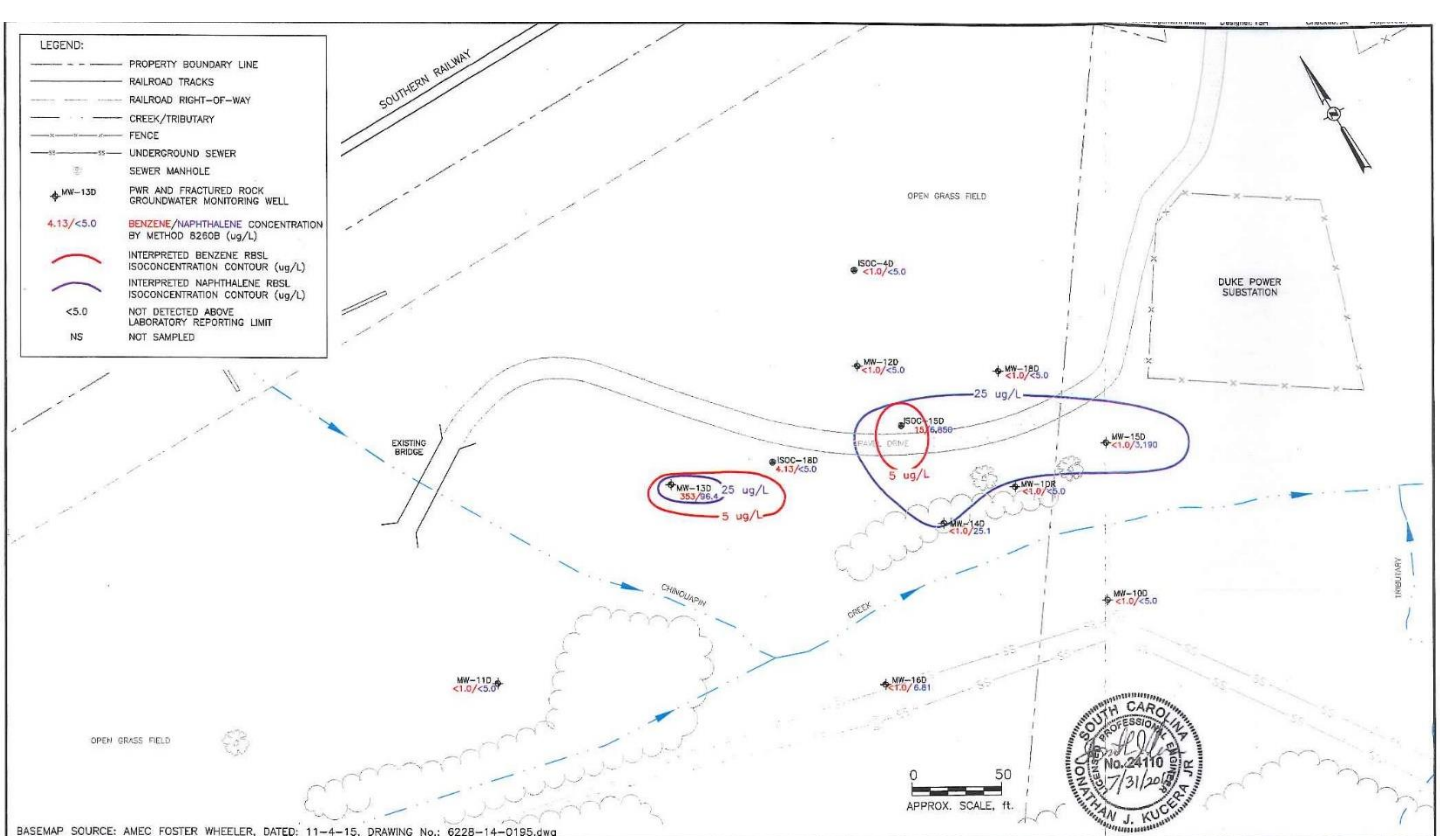
AECOM
Figure: 2



FOCUSED FEASIBILITY STUDY
DUKE ENERGY CORPORATION-FORMER MGP SITE
SPARTANBURG, SOUTH CAROLINA
Project No.: 60544098 Date: 2017-06-22

BENZENE/NAPHTHALENE CONCENTRATIONS IN SAPROLITE WELLS - OCTOBER 2016

AECOM
Figure: 3



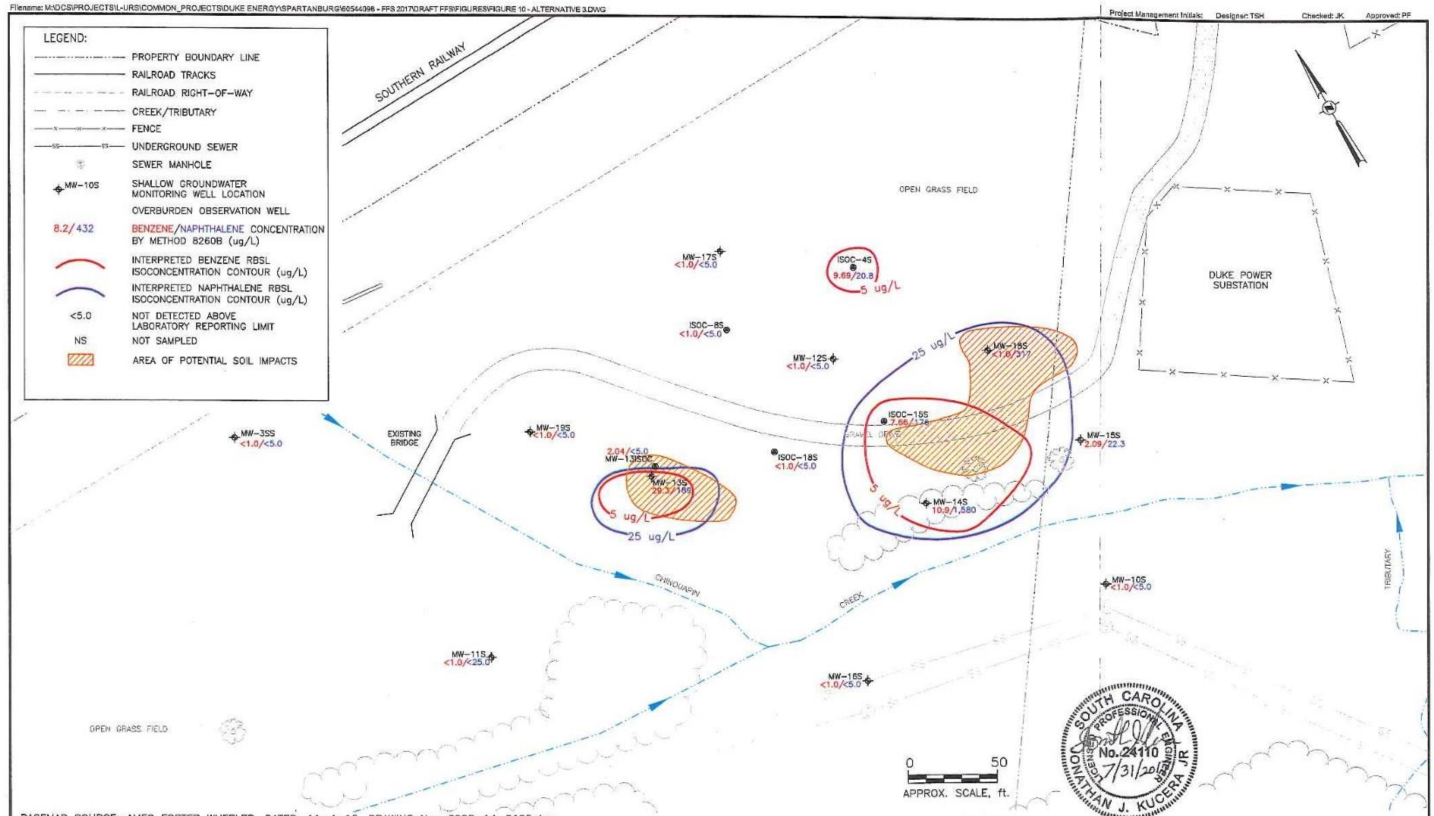
FOCUSED FEASIBILITY STUDY
DUKE ENERGY CORPORATION-FORMER MGP SITE
SPARTANBURG, SOUTH CAROLINA
Project No.: 60544098 Date: 2017-06-22

BENZENE/NAPHTHALENE CONCENTRATIONS IN PWR & FRACTURED ROCK WELLS - OCTOBER 2016

AECOM
Figure: 4

Filename: M:\DCS\PROJECTS\IL-URS\COMMON_PROJECTS\DUKE ENERGY\SPARTANBURG\60544098 - FFS 2017\DRAFT FFS\FIGURES\FIGURE 10 - ALTERNATIVE 3.DWG

Project Management Initials: Designer: TSH Checked: JK Approved: PF



FOCUSED FEASIBILITY STUDY
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SPARTANBURG, SOUTH CAROLINA
Project No.: 60544098 Date: 2017-06-22

ALTERNATIVE 3
TARGETED EXCAVATION AND MNA

AECOM
Figure: 5

Table 6
Comparison of Remedial Alternatives to Evaluation Criteria
Former Pine Street MGP
Spartanburg, South Carolina

	Remedial Alternatives					
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Alternative 6**
Criterion	**No Action**	**MNA and LUCs**	**Targeted Excavation with MNA/LUCs**	**In Situ Encapsulation with MNA/LUCs**	**ISCO with MNA/LUCs**	**In Situ Bioremediation with MNA/LUCs**
Overall protection of human health and the environment	2	3	5	4	4	4
Compliance with applicable federal, state and local regulations	1	2	5	5	4	4
Long-term effectiveness and permanence	3	3	6	4	3	3
Reduction of toxicity, mobility and volume	2	3	6	5	4	4
Short-term effectiveness	3	3	5	4	4	3
Implementability	6	5	4	4	3	4
Total Score	**17**	**19**	**31**	**26**	**22**	**22**
Cost	$0	$ 509,000	$ 966,000	$ 884,000	$ 1,267,000	$ 1,185,000
State and community acceptance	--	--	--	--	--	--

Notes:
ISCO - In Situ Chemical Oxidation
MNA - Monitored Natural Attenuation
LUCs - Land Use Controls
-- Not Ranked. State and community acceptance will be evaluated following approval.

Scoring:
1 = Unacceptable, does not meet the minimum requirements
2 = Alternative is on the **Low** end of the alternative criteria
3 = Alternative is **Fair** with respect to meeting the alternative criteria
4 = Alternative is **Good** with respect to meeting the alternative criteria
5 = Alternative is **Very Good** with respect to meeting the alternative criteria
6 = Alternative is **Excellent** with respect to meeting the alternative criteria