EastStar Environmental Group, Inc.
Consulting and Field Services

August 15, 2013

Mr. Matthew Turner
Bureau of Inspection and Review
Site Remediation Program
New Jersey Department of Environmental Protection
401 East State Street
P.O. Box 420
Trenton, New Jersey 08625

RE: Addendum to the Final Remedial Action Workplan for the Rahway Arch Properties Site, PI Number G000007844

Dear Mr. Turner:

On behalf of Rahway Arch Properties, LLC, EastStar Environmental Group, Inc. is submitting this Addendum to our July 16, 2013 Final Remedial Action Workplan[1] (RAW) for remediation of the Rahway Arch Properties Site, PI Number G000007844.

This Addendum to the RAW addresses comments provided by SRP from its component review. The information contained in this Addendum clarifies these issues through expanded discussion and supplemental site-specific information.

At our meeting on August 14, 2013, the Department confirmed that it has spent an exceptional amount of time on the component review due to the sensitivities surrounding the project and described the complexities involved with the component review process. Yesterday, the Department stated that there are only three remaining questions that require resolution.

The purpose of this Addendum is to address these three remaining questions. After the initial Background statement, each of these questions is listed followed by the clarification.

Background

As a threshold matter to understanding the complexities of the remedial effort required for the Rahway Arch Properties site, the myriad of engineering criteria incorporated in this cap system design must be referenced. The background for these criteria is restated here in context with the remedial design. Due to the unique geotechnical and environmental conditions on this site, a multitude of performance-based components have to be addressed. The design criteria for the cap system include, but are not limited to, these primary considerations:

- Hydraulic Barrier – The permeability of the cap must be less than underlying alum-YPS sludge and subsurface soils. Otherwise, the cap system will fail to eliminate the current site conditions and continue what is referred to by U.S. EPA as the "bathtub effect."

[1] EastStar Environmental Group, Inc., *Final Remedial Action Workplan for the Rahway Arch Properties Site*, July 16, 2013

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- Geotechnical Stability – The cap system must have adequate thickness and shear strength to bridge the soft soil substrata, stabilize the berms, allow for appropriate compaction to meet the hydraulic barrier requirements and meet the performance-based criteria detailed in the Geotechnical Report.

- Stormwater Management – Surface water runoff from the cover system must be managed to prevent ponding on the cap, eliminate side slope erosion and provide quantity control at the discharge locations that could otherwise impact environmentally sensitive wetland areas.

- Erosion Control – The cap system design must address considerations related to soil component performance including resistance to tractive forces that will create stormwater erosion, rill and interrill erosion, gully formation and wind erosion.

- Physical Criteria – The cap system must incorporate appropriate consideration of freeze-thaw and wet-dry cycles, bio-intrusion resistance, pest penetration and other physically related features.

- Ecological, Aesthetic and Land Use – The cap system must be designed to meet the proposed plan for use of the site that includes creation of approximately 65 acres of habitat in remediated transition and upland areas.

- ARARs – The cap system must be designed to remediate the site in accordance with all applicable, relevant and appropriate requirements (ARARs), starting with ARRCS and the Tech Rule, but also including all of the requirements necessary to meet of the above criteria as set forth in other Federal, State and local regulations.

- Constructability and Performance – A cap system that meets all of the above criteria must still be able to be constructed using available materials within a reasonable time frame and existing economic constraints.

- Long-Term Effectiveness and Permanence - The constructed cap system must provide long-term performance of the remediation objectives through design life considerations of various geologic, chemical, physical and climatic criteria.

Inadequate design can be a significant contributing factor to ultimate cap failure. Design inadequacies often result from a lack of consideration of all design criteria. In this sense, a complete cap design represents a "cap system" that accounts for all applicable design criteria. This site contains unique geotechnical considerations that must be incorporated into a systematic design that address all criteria to ensure the long-term performance of the capping system.

Each of these criteria is included in the context of the overall remedial design. The cap system design takes all these requirements into account and optimizes individual criteria to maximize the cap system's performance and compliance.

Question 1 - Conceptual Plan for Groundwater Monitoring

Ongoing groundwater monitoring will be performed on the site throughout the remediation process. Eight existing groundwater monitoring well clusters are located on the site. Each cluster consists of a shallow (surface aquifer) well and a deep (Brunswick Formation) well. These wells were sampled as part of the RI and will be sampled every six months as described in the RAW.

In addition to the monitoring wells, short term and interim groundwater monitoring will be performed during the construction to monitor for the effects of release of the pore water as the alum-YPS sludge and underlying materials consolidate. Approximately 70,000 gallons of pore water will be released during the first year of construction. This contrasts with the approximately 25,000,000 gallons per year of water that currently infiltrates through the un-remediated site into the groundwater. In other words, even though the anticipated volume of pore water released by the cap system construction is only 0.28% of the annual volume of water that migrates through the site into the groundwater today; this small volume of pore water will be actively monitored during construction. Upon completion of the remedial action, the pore water release and the volume of water released due to infiltration will be reduced to near zero.

The RAW states that a Monitoring Plan to sample and analyze this pore water discharge will be developed and implemented before the start of construction of the cap, and complies with the previous comments received from the Department. The Department has requested that a concept plan for this monitoring be provided as part of this RAW Addendum to describe the general approach for this monitoring by addressing the following topics:

Sampling Points: The number of sampling points will be a function of the area to be filled for cap construction. The cap construction will be performed in sequences, based upon the geotechnical considerations, recommendations and real-time instrumentation data. In general, 10 to 15 acres will be filled with 3-5 feet of engineered fill material during each sequence step in the construction.

Six to 10 temporary sampling points will be installed for each sequence based upon the surface area of the sequence. Each sampling point will consist of a temporary piezometer installed using a track mounted geoprobe or similar low ground contact equipment. The temporary sampling points will surround the fill sequence area. The sampling points will be screened in the peat layer directly below the alum-YPS sludge. The temporary sampling points will be abandoned once the majority of settlement has occurred in the sequence area. Settlement will be monitored using the geotechnical instrumentation described in Section 6 of the RAW.

Analytes: Samples collected from the pore water sampling points will be analyzed for metals, PAHs and cyanide using the appropriate analytical methods.

Methodology: The samples will be collected using low flow sampling techniques following the requirements in the Field Sampling Procedures Manual.

Sampling Frequency: The sampling frequency will be a function of the settlement rate, which is directly proportional to the volume of pore water release. Samples will be collected prior to the start of the engineered fill placement and at 25%, 50% and 90% consolidation. Consolidation will be monitored as described in the RAW and the Geotechnical Report[2].

Analysis of Data: The analytical results from each sampling round will be compared to the results from the samples collected prior to the start of the construction sequence. If analyte concentrations show a statistically significant increase, fill in that construction sequence will be stopped and an analysis will be performed regarding the impact of the pore water on the overall groundwater on the site. Samples will also be collected from the permanent monitoring wells nearest the sequence area to determine if there has been any impact to the groundwater.

All of the details necessary to implement this pore water groundwater monitoring program will be developed and documented in the Monitoring Plan. As is described in Section 6.3 of the RAW, this Monitoring Plan will be developed prior to the start of the construction of the cap. The plan will also comply with the component review comments prepared by Mr. Gregory Giles of the Bureau of Water Pollution Abatement.

Question 2 - Variance Justification

The Department requested clarification regarding the potential variance discussed in Sections 7.4 and 7.5 of the RAW. The variance allows certain PAH compounds that currently exist on the site to be measured in samples collected of the engineered fill at concentrations slightly higher than the 75th percentile of the existing on-site concentration. The Tech Rule requires the following information be provided to justify a variance:

1. Regulation Citation – The Tech Rule citation for the 75th percentile rule is NJAC 26:E-5.2 B 2.

2. Difference from the Regulatory Requirement - The variance will differ from the Tech Rule because the maximum concentration of the 6 PAH compounds in a sample of the engineered fill, sampled as described in Section 7.4.9 of the RAW, will not exceed the mean of the existing contamination of these compounds on the site. The mean is slightly higher than the 75th percentile of the existing conditions.

3. Rationale:

   i. Results are verifiable and reproducible – As is described in Section 7.4.9 of the RAW; the concentration of PAHs in the engineered fill will be measured by collecting and analyzing a sample for every 1,000 yd^3 of engineered fill in accordance with the Alternate and Clean Fill

[2] Michael Baker, Jr., Inc., Geotechnical Engineering Report n- Rahway Arch Property, Carteret, New Jersey, November 2012.

Guidance[3]. The samples will be analyzed by a New Jersey certified laboratory and will be reviewed by the LSRP before the engineered fill is placed in the cap.

ii. The objectives of the Tech Rule will still be achieved because the concentration of PAHs in the engineered fill will generally be less than the existing concentration on the site. This variance is speculative in nature because the actual PAH concentrations in the engineered fill are not known at this time. Sample and analysis data from Soil Safe's other remediation projects in New Jersey have shown that the PAH concentrations in the majority of its engineered fill product are less than the 75th percentile of the existing conditions on the Rahway Arch site. However, an occasional sample is encountered where the concentration of a PAH compound is between the 75th percentile and the mean value.

This variance would allow a 1,000 yd^3 batch of engineered fill product to still be used in the cap if the PAH concentration exceeded the 75th percentile, provided the concentration is less than the existing site mean concentration. Because the majority of batches will have concentrations less than the 75th percentile, the overall impact on the PAH concentration in the cap will be negligible. Approximately 1,600 samples will be collected and analyzed to characterize the cap. Having a few samples that are between the 75th percentile and the mean of the existing site concentrations will not have an adverse impact on the quality of the remediation, and the cap will be protective of human health and the environment.

Also note that, as described in Section 7 of the RAW, the engineered fill product is treated with pozzlonic additives in a solidification/stabilization (S/S) process. Solidification/stabilization is considered by U.S. EPA as a Best Demonstrated Available Technology (BDAT) for treatment of soils. The impact of the S/S treatment is to immobilize these analytes in the soil matrix and prevent them from leaching. In addition, these PAH compounds are relatively insoluble and immobile, making their presence in the engineered fill, at these concentrations, insignificant.

The LSRP has performed numerous bench scale and treatability tests on the Soil Safe engineered fill product. In each case, the test results have shown that the S/S treatment used in manufacture of the engineered fill is effective in immobilizing contaminants, including specifically PAHs.

The engineered fill will be placed and compacted to meet the geotechnical specifications. One of the design criteria for the cap system is that the engineered fill must have a low permeability. The cap system is designed to promote stormwater runoff rather than infiltration. As a result, only minimal amounts of water will ever infiltrate into the engineered fill, further isolating any PAHs.

The Soil Safe engineered fill product has also been tested and classified as a Green Approved Product for National Green Building Certification by the NAHB Research Center.

[3] NJDEP, *Alternative and Clean Fill Guidance for SRP Sites*, Version 2.0, Updated November 29, 2011.

iii. This variance will further the attainment of the purpose of the remediation by allowing significantly more sources of soil for the feedstock to the Class B recycling facility. This will help expedite, within the geotechnical constraints, the construction of the cap and the final remediation of the site.

Question 3 - Distribution of Existing Contamination

The Department has questioned the distribution and representativeness of the sampling and analysis from the various site investigations in characterizing the conditions on the site. A reduced sampling frequency was implemented in the remedial investigation (RI) because the previous data and the history of the site has shown that the entire area within the limit of remediation has received waste streams from the former Warners Plant and undocumented fill from multiple sources. The limit of this contamination is well defined by the physical constraints created by the berms that form the six impoundments. Based on this information, highlighting the need to cap all 85 acres of the impacted site; the RI was designed to confirm the presence of the contamination throughout the site.

The initial contamination on the site was the 2,000,000 tons of alum-YPS sludge that were pumped into the impoundments by American Cyanamide (Cytec) from 1937 through 1974. However, documents reviewed for the Preliminary Assessment[4] (PA) of the site indicated that other waste streams from the Warners Plant (a RCRA Corrective Action site) and other potential contamination sources may have been placed on this site[5].

In 1978, American Cyanamid entered into an Amended ACO to vegetate the site in order to control alum-YPS sludge dust blowing from the impoundments onto adjoining areas, including the N.J. Turnpike. In 1987 to 1989, composted sewage sludge from Philadelphia and Camden was spread over all of the impoundments to provide growth media for vegetation. The sludge was placed in two 6 inch lifts. The first lift was disced to blend it into the upper surface of the alum-YPS sludge, and the second lift was placed on the surface[6]. This sludge was not tested for potential contamination (undocumented fill).

As part of the sludge spreading operation and to construct and access the groundwater monitoring wells, Cytec built roads on the site during the 1980s. Demolition debris from the Warners Plant and other undocumented fill were brought to the site to construct the roads. From the 1980s until it sold the site to the current owners in 2010, Cytec brought additional undocumented fill onto the site. This fill was used to maintain and repair the berms, expand

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[4] EastStar Environmental Group, Inc., Preliminary Assessment of the Rahway Arch Properties Site, August 7, 2012.

[5] NJDEP, *Case Transfer Memorandum, ACO Negotiation Case, American Cyanamid Landfill*, undated.

[6] American Cyanamid Company, *Soil Erosion and Sediment Control Plan for Vegetation and Maintenance of the Containment Berms at the American Cyanamid, Carteret Facility – Phase III, 1989*, January 10, 1989.

and maintain the roads, cover Impound 2 to allow operation of a wood waste recycling operation, bulk up soft areas of Impounds 5 and 6 in conjunction with a failed berm and maintain the vegetative cover. Some of these maintenance activities are documented in Cytec's biennial certifications prepared subsequent to the 2002 NFA.

Historic evidence has also shown that wastes have been moved around the site in order to increase capacity while the impoundments were being used, widen and stabilize the roadways and maintain the site following its closure. This led to further spreading of the contaminants and the undocumented fill throughout the site.

Over the years, the vegetative cover has deteriorated in spots leaving areas of exposed alum-YPS sludge. However, the undocumented fill remains throughout the site, blended into the alum-YPS sludge, accumulated in the impoundments and in the roads and berms.

EastStar's comprehensive investigation of the undocumented fill in 2011[7] determined that the undocumented fill contains PAHs in excess of the Non-residential Remediation Standards. The concentrations of one or more PAHs exceeded the Standards in 14 of the 20 samples collected during that investigation. That investigation, coupled with more data obtained from NJDEP (1991)[8] and the N.J. Turnpike Authority (2005)[9] that also showed PAH concentrations in excess of the remediation standards; led EastStar to conclude that the undocumented fill is contaminated with PAHs.

Since the site information made it clear that the contaminated undocumented fill had been spread throughout the entire 85 acre area of the impoundments, EastStar concluded that the PAH contamination is widespread and ubiquitous throughout the site. The LSRP determined, in his professional judgment, that since the entire 85 acre contaminated area needed to be capped for numerous geotechnical, environmental and health and safety concerns; further delineation of the PAH contamination on the site was considered unnecessary.

The existing PAH contamination on the site was not unexpected. In addition to the undocumented fill, the site is located in a long standing industrial area. The site has long been located adjacent to a fuel terminal with a large tank farm and some of the highest concentrations of PAHs were measured near that property. PAH contamination is generally expected in similar industrial settings in this area of New Jersey. The undocumented fill has the characteristics of historic fill, which is assumed to contain PAH contamination.

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[7] EastStar Environmental Group, Inc., Environmental Investigation of Fill Material at the Rahway Arch (Old Cytec Landfill) Site, October 17, 2011.

[8] NJDEP, Letter from Kenneth Kloo to Angela Dohl, American Cyanamid Company, with attachments, December 6, 1991

[9] New Jersey Turnpike Authority, Letter from Kathy Critchley to Thomas J. Irwin, Cytec Industries, with attachments, July 15, 2010

In summary, the current and historic sample data from multiple sources, the condition of the site, the importation of undocumented fill, the historical records and sources of contamination, the decades of mixing and spreading of materials throughout the site, the industrial region where the site is located and the operating history of the site all support this conclusion.

Based on my engineering evaluation of the site and my experience working with the engineered fill material that will be used to construct the cap system and no other viable alternative, my professional judgment is that the spatial distribution of the existing PAHs on the site does not impact the remedial design. The remedial action described in the RAW reduces the risk of exposure to PAH for both human health and the environment.

Requirement to Cap the Entire Site

The RAW, supplemented by this Addendum, documents the existing conditions on the site. These existing conditions pose direct contact and impact to surface and groundwater environmental hazards, health and safety hazards to anyone entering the site and the potential for significant damage to the surrounding wetlands and the Rahway River should there be a catastrophic failure of the berms.

A systematic, site-wide design is necessary to provide a remedy that meets all of remedial objectives listed in the RAW and the design criteria described in the background paragraphs to this RAW Addendum.

The plan to construct a cap system over the entire 85 acre contaminated area, defined by the six impoundments, is the only viable alternative to meet these requirements. The feasibility study, performed in January 2013 as part of the Land Use permit application, verifies this conclusion. This feasibility study was supplemented in June 2013 to clarify that the planned remedial action was the only feasible alternative. It is the only alternative that will be effective in addressing the myriad of design criteria and all of the remedial objectives necessary to remediate the site. The feasibility study and the supplemental information letter are contained in Attachment 1 to this RAW Addendum.

In addition to capping the site, administrative controls will be implemented. The site currently has a Declaration of Environmental Restrictions, recorded by Cytec in 1995. As is described in the RAW, a deed restriction, limiting the site to non-residential use, will be recorded as part of this remedial action.

The cap system described in the RAW will address all of the geotechnical, environmental and public health and safety issues necessary to successfully remediate this site. This must be a comprehensive site-wide systematic remedy. Not implementing this entire cap system over the entire remediation area will likely result in an eventual failure of the remediation resulting in the need for further remedial action in the future.

I believe this RAW Addendum addresses all of the Department's questions from the component review. We look forward to the successful completion of the component review in the very near

future so that we may proceed with the remedial action. If you have any questions regarding this RAW Addendum, please call me at (410) 290-8777.

Sincerely,
EastStar Environmental Group, Inc.

Albert P. Free, P.E., CSP, LSRP
President

cc: Chet Pucillo – Rahway Arch Properties, LLC
Bill Roberts – Soil Safe
Mark Smith – Soil Safe

Mr. Turner
August 15, 2013

ATTACHMENT 1 – FEASIBILITY STUDY AND SUPPLEMENTAL LETTER

EastStar Environmental Group, Inc.
Consulting and Field Services

January 17, 2013

Mr. Chet Pucillo
Manager
Rahway Arch Properties, LLC
7 Nottingham Drive
Florham Park, New Jersey 07932

RE: Rahway Arch Site Remediation – Detailed Alternatives Analysis

Dear Chet:

On November 27, 2012, I prepared and approved the Remedial Action Workplan[1] (RAW) for remediation of the Rahway Arch Site in Carteret, New Jersey. This RAW was prepared following my ongoing evaluation of this site since June 2010 including an initial fill material investigation[2], a preliminary assessment[3] (PA) and remedial investigation (RI)[4]. All of the work has been performed in accordance with the requirements of the NJDEP – Site Remediation Program, including the Administrative Requirements for Remediation of Contaminated Sites (ARRCS – NJAC 7:26C) and the Technical Requirements for Site Remediation (Tech Rule – NJAC 7:26E).

The reports have been submitted to SRP. According to the DataMiner on-line database, initial inspections of the reports were completed by SRP on December 11, 2012 and component reviews of the reports were completed by SRP on December 14, 2012. We are proceeding with the site remediation as required by SRP regulations. An application has been made to the NJDEP - Land Use Regulation Program (LURP) for Coastal, Wetland and Flood Hazard Area Permits[5] for the site remediation. In its December 28, 2012 Notice of Deficiency[6] (NOD) to the permit applications, LURP requested a detailed alternatives analysis of the remedial action.

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[1] EastStar Environmental Group, Inc., *Remedial Action Workplan for the Rahway Arch Properties Site*, November 27, 2012.

[2] EastStar Environmental Group, Inc., *Environmental Investigation of Fill Material at the Rahway Arch (old Cytec Landfill) Site*, October 17, 2011.

[3] EastStar Environmental Group, Inc., *Preliminary Assessment at the Rahway Arch Properties Site*, August 7, 2012.

[4] EastStar Environmental Group, Inc., *Remedial Investigation Report for the Rahway Arch Properties Site*, November 15, 2012.

[5] J. Timothy Kernan, Inc., *Application for: Coastal General Permit #15; Freshwater Wetlands General Permit #4 and #11; Flood Hazard Area Verification; Flood Hazard Area Individual Permit and Flood Hazard Area-Hardship Exception for Rahway Arch Properties – Site Remediation*, November 2012.

[6] NJDEP, Office of Dredging and Sediment Technology, *Letter Regarding Flood Hazard Area Individual Permit/Verification, Freshwater Wetlands General Permit #4 and #11, CAFRA General Permit #15 Application No(s): 1201-03-0003.3 FWW 120001, FWW 120002, FHA 120001, FHA 120001, CAF 120001*, December 28, 2012.

A detailed alternatives analysis is not required by the Tech Rule. However, in response to the NOD letter, I have performed the analysis. This was done using the guidelines contained in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP – 40 CFR 300.430). These guidelines involve analyzing the remedial alternatives for a site relative to effectiveness, implementation and cost. Alternatives that meet these requirements are further evaluated based on nine criteria mandated by CERCLA and SARA, consisting of:

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
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance.

The results of this requested detailed alternatives analysis are contained in this letter.

It is important to note that this analysis is performed retrospectively to where we are today in the remedial design and engineering process. I understand that in years past you have canvassed the industry in search of various remedial alternatives that are applicable to your site. Likewise, for years the prior site owners explored many potential solutions to remediate and even develop the site with little success. In that regard, the fundamental content of the enclosed alternatives analysis has been addressed for some time, simply never documented in this specific format. Further, I am aware of your repeated efforts to incorporate a wide range of potential capping materials including dredge materials; only to find each of those solutions unfeasible for a variety of reasons. The selection of the current process and remedy was after all of this consideration and effort.

The purpose of this analysis is not to contest the remedy selection, rather to underscore the rationale and fundamental underpinning of that selection in the requested format. To that end, while this analysis may appear largely contemplative of past decisions and situations, it was requested by NJDEP as part of their current review.

As a final preface note, cost is presented in this alternatives analysis absent of any consideration for recovery, offset or costs paid by others. Clearly, given that the remediation is self-funded, that concept was integrated into the original analysis. However, the cost analysis presented herein follows a commonly used format for public or PRP-funded projects. While this may not seem relevant to your privately funded project, it is inherent to this presentation format. You should also note that the costs associated with each task under the various alternatives are predicated on the alternative meeting the site engineering specifications, including without exception, the geotechnical and LSRP requirements.

Site Description

The Rahway Arch site is a 124.7 acre property located at the terminus of Salt Meadow Road (formerly Driftway Street) in Carteret, New Jersey. It is more precisely defined as Block 602, Lot 1; Block 603, Lot 1and Block 705, Lot 18. This property was formerly defined as Block 9.03, Lot 21; Block 10, Lots 8-10 and 12-21 and Block 11.01, Lots 8, 10-14 and 28. The remediation project site also includes portions of two properties owned by the Borough of Carteret, Block 602, Lot 8 (formerly defined as Block 10, Lot 11) and Block 705, Lot 17 (formerly defined as Block 11.01, Lot 9).

The project site is the old Cytec Impoundments site, a former industrial waste disposal facility operated by American Cyanamid Company (now Cytec Incorporated) from the mid-1930s through 1974 to dispose of a mixture of acidic sludge from an alum manufacturing process and alkaline sludge from a yellow prussiate of soda (YPS) manufacturing process, along with other wastes generated by American Cyanamid at its Warner Plant, located at Tremley Point in Linden, New Jersey

The site contains six impoundments, encompassing approximately 85 acres. The impoundments were constructed above existing grade with wooden and earthen dikes. They currently contain approximately 2,000,000 tons of the cyanide containing alum-YPS sludge. The size and capacity of each of the impoundments varies, as does the thickness of the sludge, which ranges from 5 to 20 feet.

Undocumented fill material was imported and used on the site over the years to maintain the dikes and to stabilize the surface in several of the impoundments. This fill material was imported from various sites, including the Warners Plant, over the years for operations and maintenance of the disposal areas.

The site is currently unusable. Most of Impoundments 1 and 6 are filled with standing water. Vegetative cover is either sparse or non-existent over most of the area of the remaining impoundments, with the exception of Impoundment 1 and the low areas of Impoundment 3. A 12 inch cover of soil and sewage sludge had been placed over the impoundments from 1986 through 1989 to promote vegetative growth. This cover has been eroded away in most locations leaving exposed alum-YPS sludge. Phragmites have grown in the soil on the berms and the roadways surrounding the impoundments.

The impoundments are impassable and are unsafe for foot or vehicular traffic because the sludge has no strength and cannot bear any weight. A pole or rod can be pushed by hand its full length into the sludge with minimal effort. This creates a dangerous condition for persons, vehicles and wildlife on the site and makes the site, in its current condition, unusable.

Fourteen areas of concern (AOCs) were identified in the PA and were investigated for remediation. The RI determined that 10 of the AOCs were contaminated and required remediation. Refer to the previously referenced PA, RIR and RAW reports for additional details on the site and the AOCs.

Remedial Objectives

The RI confirmed that the alum-YPS sludge in the impoundments and the undocumented fill material in the impoundments and on the berms contain metals, cyanide and PAHs above non-residential soil direct contact remediation criteria and soil impact to groundwater screening levels. The groundwater on the site, sampled through the sixteen existing groundwater monitoring wells, is also contaminated with metals and cyanide.

Additionally, the site in its current condition is unusable and poses a safety risk to the public. Geotechnical data showed that the alum-YPS sludge in the impoundments and the underlying peat and clay layers have minimal undrained strength. In their current state, these layers cannot support a load that would allow the site to be usable.

Based upon these results, the following remedial objectives were developed in order to properly remediate the site as required under the SRP regulations and guidelines. The remediation objectives are:

- Eliminate direct contact hazards with contaminated surface fill and alum-YPS sludge
- Prevent precipitation from coming in contact with the contaminated materials and discharging to groundwater or surface water
- Eliminate the bathtub-like impoundments that trap precipitation against the contaminated materials and perpetuate the saturated weakness of the underlying layers
- Promote runoff and evapotranspiration of precipitation rather than infiltration
- Ensure the long term integrity of the berms
- Eliminate site safety hazards posed by soft soils and sludge and ponded water in the impoundments
- Raise the entire site above the 100-year floodplain and prevent inundation by the Rahway River
- Allow safe passive uses, including habitat, and possible future development on a portion of the site by the property owners, making at least a portion of the site usable.

The remedial action necessary to meet these objectives will consist of a combination of engineering and administrative controls.

Remediation Alternatives

EastStar reviewed a number of alternatives for site remediation. Alternatives were initially screened for technical feasibility and use of available technology. Alternatives that were determined to not be technically feasible or that required the use of unproven or unreliable

technologies were immediately screened from the list and were not given any further evaluation.

The remaining alternatives, described below, were then evaluated using the remediation objectives and the evaluation criteria from the NCP that were developed by the U.S. EPA for evaluation of remediation alternatives at Superfund sites. These evaluation criteria are described in the next section of this letter report.

Alternative 1 – Do Nothing

This alternative is required by the NCP as the baseline for evaluation of the other alternatives. This alternative consists of leaving the site in its present condition and not performing any remedial action on the site. This alternative does not provide any engineering or administrative controls and does not meet any of the remediation objectives.

Alternative 2 – Removal and Replace with Clean Fill

This alternative consists of removing all of the contaminated materials, consisting of approximately 2,000,000 tons of alum-YPS sludge and an unknown quantity of contaminated undocumented fill, to an off-site location for disposal. The site would then be restored by backfilling with clean fill. A grading plan would need to be developed to determine the configuration of the restored site.

This option would eliminate all of the existing site hazards and would comply with all of the remediation criteria. However, this alternative is complicated by the fact that a significant portion of the contaminated materials is below the groundwater table on the site. Installation of sheeting and shoring and dewatering of the excavation will be required in order to provide access. The contractor's ability to compact the backfill below the water table will be questionable, likely limiting this portion of the backfill to coarse materials that will not require compactive effort when placed.

Alternative 3 – In-situ Stabilization and Fill

This alternative consists of performing in-situ stabilization of the existing surface materials, primarily the alum-YPS sludge and undocumented fill materials. Following stabilization, the site would then be filled with clean fill. The fill will be placed in accordance with an approved grading plan that will raise the elevation above the flood level, provide positive drainage and provide for future site development.

The fill will likely be more permeable than the underlying alum-YPS sludge, resulting in water being trapped inside the impoundments. This water will eventually result in soft conditions at the base of the fill, potentially undermining the long-term stability of the site and limiting the potential for future development. This water will also percolate through the contaminated alum-YPS sludge and undocumented fill, continuing the existing groundwater and surface water concerns. This fill will not provide structural stabilization of the existing perimeter berms.

Alternative 4 – Fill with Alternative Fill

This alternative consists of filling the site with alternative fill that meets the guidelines contained in the RAW and is approved by the LSRP. The alternative fill will be placed and compacted as received and will not be screened or processed. The fill will be placed in accordance with an approved grading plan that will raise the elevation above the flood level, provide positive drainage and provide for future site development.

The fill will likely be more permeable than the underlying alum-YPS sludge, resulting in water being trapped inside the impoundments. This water will eventually result in soft conditions at the base of the fill, potentially undermining the long-term stability of the site and limiting the potential for future development. This water will also percolate through the contaminated alum-YPS sludge and undocumented fill, continuing the existing groundwater and surface water concerns. This fill will not provide structural stabilization of the existing perimeter berms.

Alternative 5 – Fill with Alternative Fill and Install a Geomembrane Cap

This alternative consists of filling the site with alternative fill that meets the guidelines contained in the RAW and is approved by the LSRP. The alternative fill will be placed and compacted as received and will not be screened or processed. The fill will be placed in accordance with an approved grading plan that will raise the elevation above the flood level, provide positive drainage and provide for future site development. The fill will not provide structural stabilization of the existing perimeter berms.

A geomembrane cap layer will be placed over the alternative fill to provide a low permeability surface. This will eliminate the problem of water from being trapped in the impoundments identified with Alternatives 3 and 4. This option will require use of screened, select fill one foot below and one foot above the geomembrane. A drainage layer will also be required above the geomembrane. A settlement period will be required between placement of the fill and installation of the geomembrane to allow the soft soils on the site to consolidate to minimize potential damage to the geomembrane. Repair and maintenance of the geomembrane in settlement areas will be necessary.

Alternative 6 – Fill with Processed Dredge Material

This alternative consists of filling the site with processed dredge material (PDM) that meets the guidelines contained in the RAW, has received an Acceptable Use Determination (AUD) and has been approved by the LSRP. The PDM will be placed in accordance with an approved grading plan that will raise the elevation above the flood level, provide positive drainage and provide for future site development. PDM will provide some structural stabilization of the existing perimeter berms.

The permeability of properly placed, fresh PDM is likely to be on the same order of magnitude or slightly less permeable than the underlying alum-YPS sludge, promoting more runoff and preventing trapping of water inside the impoundments, eliminating the problems identified in

Alternatives 3 and 4. Older PDM, not processed on site is likely to be more permeable than the underlying alum-YPS sludge. Logistics issues may preclude our ability to obtain and place fresh PDM as the primary remediation material.

Disadvantages with the use of PDM are the reliability of the supply, the lack of homogeneity among the various PDM sources and the need to obtain a site specific AUD from each PDM processor/generator/supplier. These uncertainties will likely extend the time required to complete the remediation and make it questionable if a sufficient volume of PDM can be obtained to complete the site remediation. Variation in the material characteristics will also require additional engineering during the remediation to ensure that the cap is stable and is consistent enough to meet the remediation goals.

Alternative 7 – Cap Site with Processed Class B Recyclable Soil (Preferred Alternative)

This alternative consists of capping the site with engineered fill soil manufactured at a temporary, dedicated Class B recycling facility. The dedicated facility would be located on a portion of the site to minimize double-handling and transportation costs and to control processed product consistency. The facility would be removed from the site upon completion of the remediation.

The engineered fill soil would be alternative fill soil that has been blended, screened and processed into a soil-cement product. This product will then be used as structural fill to form the cap. The product will meet the guidelines established in the RAW and will be approved by the LSRP. Because of the recycling process, the product will have consistent engineering properties. The product can be placed, spread and compacted to a close tolerance of engineering specifications.

The cap will be placed in accordance with an approved grading plan that will raise the elevation above the flood level, provide positive drainage and provide for future site development. The engineered fill product is a soil-cement that exhibits higher strength than unprocessed soil and will provide structural stabilization of the existing perimeter berms. The engineered fill will have lower permeability than the underlying alum-YPS sludge, eliminating the infiltration problems identified with Alternatives 3 and 4. This strength will also result in a more stable site following remediation, reducing maintenance costs and providing a broader range of future re-development options.

Comparison to Remediation Goals and Other Considerations

Before performing the detailed alternatives analysis as described by the NCP, EastStar evaluated each of the alternatives to the previously described remediation goals for the site. The alternatives were also compared for other considerations including compliance with SRRA, the extent of wetlands disturbance, time required for remediation, requirements for remedial action permits and administrative controls and the relative effort required for post remediation maintenance.

Achievement of the remediation goals for each alternative was judged to be very effective, effective, marginally effective or not effective. The other considerations were given qualitative results based upon the alternative.

The results of this comparison are summarized in Table 1. In general, all of the alternatives except for the Do Nothing alternative provide some benefit in achieving the remediation goals. Alternatives 3 and 4 provide the least benefit in achieving these goals because these alternatives do not control infiltration. Alternative 7 provides the most benefit for all of the alternatives.

In reviewing the other considerations, all of the alternatives, except for the Do Nothing alternative comply with SRRA. All of the other six alternatives disturb the same 85 acre contaminated area; and therefore they all result in the same extent of wetlands transition area and riparian buffer area disturbance.

Cost Analysis

Industry cost estimates were made for each of the alternatives based upon the scopes of work of the alternatives, the estimated quantities for remediation and typical unit prices for the work in the Carteret area. The cost estimates are provided in Table 2.

As can be seen from the cost estimates, Alternatives 2 and 3 are an order of magnitude higher in cost than the other alternatives. Alternatives 4 and 5 are estimated to be somewhat higher cost than Alternatives 6 and 7 but are not so high to preclude them from consideration. Alternatives 6 and 7 are estimated to be approximately the same cost, although Alternative 7 is estimated to be slightly higher cost because of the cost of permitting, constructing and operating the Class B facility.

Evaluation Criteria

The NCP lists nine criteria, contained in three groups, to be used to evaluate remediation alternatives:

- Threshold Criteria Group – Any alternative must meet all Threshold Criteria to be given further consideration
    - Overall protection of human health and the environment
    - Compliance with applicable or relevant and appropriate requirements (ARARs)
- Primary Balancing Criteria Group – This group consists of the main criteria used to evaluate and rank alternatives
    - Long term effectiveness and permanence
    - Reduction of toxicity, mobility or volume through treatment
    - Short term effectiveness

- Implementability
- Cost

- Modifying Criteria – This group includes additional criteria to be considered in remedy selection

  - State acceptance
  - Community acceptance

These criteria were used to evaluate the potential remediation alternatives for the Rahway Arch site. The extent that each alternative met each of the evaluation criterion was determined as:

- Satisfies the evaluation criterion to a high degree
- Satisfies the evaluation criterion
- Marginally meets the evaluation criterion
- Does not meet the evaluation criterion

The results of this evaluation are summarized in Table 3. Alternatives 1, 2, 3 and 4 were determined to be unsatisfactory. Alternative 1 is the Do Nothing alternative and does not provide any site remediation. The high cost of Alternatives 2 and 3 make them infeasible. Alternatives 3 and 4 do not control infiltration making them problematic on a long term basis.

Alternatives 5 and 6 were determined to be satisfactory options. They were not determined to be the preferred alternative because of the long term effectiveness concern and cost considerations for Alternative 5 and short term effectiveness and implementability considerations for the uncertain PDM supply for Alternative 6.

Alternative 7 was determined to be the preferred alternative. It provides the highest degree of compliance with all of the evaluation criteria. It is a proven technology that has been used successfully elsewhere in the State under similar geotechnical conditions. A viable design, construction sequence and monitoring program have been developed for construction of the cap for the existing site conditions using this material by the geotechnical engineer. Its short-term and long-term effectiveness are well demonstrated. It is fully protective of human health and the environment and complies with SRRA and all of the ARARs. Fundamental to this alternative are the ability to meet the project schedule and on-site control of the manufactured soil product to meet the necessary material properties required for cap construction.

The Borough of Carteret and Middlesex County are in support of this alternative. It complies with all of the remediation goals. Alternative 7 has a slightly higher cost than Alternative 6. However, the technical considerations outweigh the relatively small difference in cost, making it the preferred alternative.

Note that Alternative 7 does not preclude the use of acceptable PDM or possibly some unprocessed dredge material for specific applications as part of the site remediation. Use of

these alternate materials for specific construction applications on the site that do not require the engineered fill product has been considered and is addressed in the RAW.

Based upon the results of this detailed alternatives analysis, the preferred alternative for site remediation is to cap the site with reduced permeability engineered fill manufactured by a temporary on-site Class B recycling facility. This alternative and the planned remedial action are fully described in the RAW.

If you have any questions regarding this analysis or would like to discuss this topic further, please call me at (410) 290-8777.

Sincerely,
EastStar Environmental Group, Inc.

Albert P. Free, P.E., CSP, LSRP
President

EVALUATION TABLES

EastStar

Rahway Arch Properties, LLC
Remediation of the Rahway Arch Site

Table 1 - Comparison to Remediation Goals and Other Considerations

Evaluation Criteria	Alternative						
	1 Do Nothing	2 Excavate and Off-Site Disposal	3 In-situ Stabiliztion and Fill	4 Alternative Fill	5 Alternative Fill Geomembrane Cap	6 Processed Dredge Material	7 Processed Class B Soil Cap
Remediation Objectives							
Eliminate direct contact hazards	⊗	●	●	●	●	●	●
Prevent precipitation from contact with contaminated materials	⊗	●	○	○	●	⊙	●
Eliminate bathtub-like effect in impoundments	⊗	●	⊗	⊗	●	⊙	●
Promote stormwater runoff and evapotranspitation over infiltration	⊗	○	○	○	⊙	⊙	●
Ensure longterm stability of the containment berms	⊗	○	○	○	○	●	●
Eliminate site safety hazards	⊗	⊙	⊙	⊙	⊙	●	●
Raise site above floodplain	⊗	●	●	●	●	●	●
Allow safe passive uses and allow for possible future development	⊗	●	○	○	⊙	●	●
Other Considerations							
Compliance with SRRA	No	Yes	Yes	Yes	Yes	Yes	Yes
Extent of disturbance	none	85 acres	85 acres	85 acres	85 acres	85 acres	85 acres
Transition area disturbance	none	inside impounds	inside impounds	inside impounds	inside impounds	inside impounds	inside impounds
Time required for remediation	not applicable	long	moderate	moderate	moderate	long	moderate
Remedial action permit required	Yes	No	Yes	Yes	Yes	Yes	Yes
Administrative controls required	Yes	No	Yes	Yes	Yes	Yes	Yes
Level of ongoing maintenance required	High	Low	High	High	High	Moderate	Moderate

Evaluation key:

- ● - Very effective
- ⊙ - Effective
- ○ - Marginally effective
- ⊗ - Not effective

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Rahway Arch Properties, LLC
Remediation of the Rahway Arch Site

Table 2 - Relative Cost Analysis

Cost Item	Alternative						
	1 Do Nothing	2 Excavate and Off-Site Disposal	3 In-situ Stabiliztion and Clean Fill	4 Alternative Fill	5 Alternative Fill Geomembrane Cap	6 Processed Dredge Material	7 Processed Class B Soil Cap
Site Investigation	$0	$600	$600	$600	$600	$600	$600
Engineering	$0	$500	$500	$300	$400	$300	$300
Permitting	$0	$200	$500	$500	$600	$500	$700
Costs During Remedial Activities							
Mobilization and SESC	$0	$360	$360	$360	$360	$360	$560
Trenching, shoring and dewatering	$0	$85	$0	$0	$0	$0	$0
Excavation	$0	$10,000	$0	$0	$0	$0	$0
Disposal	$0	$160,000	$0	$9,200	$9,200	$0	$42
Fill material purchase	$0	$71,700	$23,000	$0	$0	$0	$0
Fill material handling & placement	$0	$20,100	$10,700	$10,700	$10,700	$10,700	$11,500
In-situ stabilization	$0	$0	$267,000	$0	$0	$0	$0
Geomembrane	$0	$0	$0	$0	$4,250	$0	$0
Stormwater management	$0	$500	$500	$500	$500	$500	$500
Geotechnical engineering	$0	$1,000	$1,000	$750	$1,000	$750	$500
LSRP	$0	$100	$100	$250	$250	$400	$250
Total Estimated Cost (1)	$0	$265,000	$304,000	$23,200	$27,900	$14,100	$15,000
Relative Maintenance Costs	High	Low	High	High	Moderate	Low	Low

Costs are in $1,000.

(1) - Alternative cost is exclusive of any contractural or lease finance considerations

Estimated quantities **Unit Costs**

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Rahway Arch Properties, LLC
Remediation of the Rahway Arch Site

Table 3 - Detailed Alternatives Analysis

Evaluation Criteria	Alternative						
	1 Do Nothing	2 Excavate and Off-Site Disposal	3 In-situ Stabiliztion and Fill	4 Alternative Fill	5 Alternative Fill Geomembrane Cap	6 Processed Dredge Material	7 Processed Class B Soil Cap
Threshold Criteria							
Overall protection of human health and the environment	⊗	⦿	○	○	⦿	●	●
Compliance with ARARs	⊗	⦿	○	○	●	●	●
Primary Balancing Criteria							
Long-term effectiveness and permanence	⊗	●	⊗	⊗	○	⦿	●
Reduction of toxicity, mobility or volume through treatment	⊗	●	○	○	⦿	⦿	⦿
Short-term effectiveness	⊗	○	⦿	⦿	●	○	●
Implementability	⊗	○	○	●	●	○	●
Cost ($1,000)	$0	$265,000	$304,000	$23,200	$27,900	$14,100	$15,000
Modifying Criteria							
State acceptance	⊗	⦿	⦿	⦿	⦿	⦿	⦿
Community acceptance	⊗	○	○	⦿	⦿	⦿	●
Overall Evaluation	**unsatisfactory**	**unsatisfactory**	**unsatisfactory**	**unsatisfactory**	**satisfactory**	**satisfactory**	**preferred**

Evaluation key:

- ● - Satisfies the evaluation criterion to a high degree
- ⦿ - Satisfies the evaluation criterion
- ○ - Marginally meets the evaluation criterion
- ⊗ - Does not meet evaluation criterion

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EastStar Environmental Group, Inc.
Consulting and Field Services

June 18, 2013

Ms. Lloyd H. Tubman, Esq.
Archer & Greiner, P.C.
Plaza One
1 State Route 12
Suite 201
Flemington, New Jersey 08822

RE: Alternatives Analysis to Remediate the Rahway Arch Site

Dear Lloyd:

In response to your request, I have reviewed Items 1, 2and 3 of the Engineer's Report attached to the Land Use Permits for remediation of the Rahway Arch Properties site. I am providing the following response to correct the misstatements contained in that report regarding the Alternatives Analysis Report and the Remedial Action Workplan.

In preparing these responses, I have provided the reviewer's comment in italics for reference and followed it with my response to the comment.

Introductory Remarks

In reviewing the Alternatives Analysis Report, the reviewer appears to have looked at the technical feasibility of the alternatives however, he/she does not appear to understand the evaluation of the alternatives and why the alternatives must be evaluated. The reviewer used the concept that if an alternative could potentially be built, it is feasible. This is not the correct way to determine feasibility of remediation alternatives. Not only must an alternative be buildable but it must be effective in accomplishing the remediation goals to be feasible. An ineffective remedial action is worse than the "do nothing" option.

Under the alternatives analysis requirements in the National Contingency Plan (NCP – 40 CFR 300.430), the alternatives must be evaluated using Threshold Criteria, Primary Balancing Criteria and Modifying Criteria. The selected alternative must, at a minimum be able to achieve the Threshold Criteria and the Primary Balancing Criteria. Simply because an alternative can theoretically be constructed does not mean it is feasible for remediation of the site. An alternative that is not protective of the environment is not a feasible alternative, regardless of whether it can be built or not.

Please note that the alternatives are incorrectly numbered in the engineer's report. Alternative 1 in the Alternatives Analysis Report is the "do nothing" alternative. Under the NCP requirements for an alternatives analysis, the "do nothing" alternative must be considered. The reviewer ignored this alternative in his analysis and therefore has mis-numbered the alternatives. What is identified in the engineer's report as the first alternative is actually Alternative 2 from the Alternatives Analysis Report, and so on.

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Response to Engineer's Report Regarding Alternatives

The first alternate method would be to completely excavate all contaminated soils on-site and to replace with clean fill. The analysis states, "This option would eliminate all of the existing site hazards and would comply with all of the remediation criteria." The analysis does state that due to the high groundwater the applicant would likely need to limit the backfill to coarse materials that would not require compaction. However, the analysis does not rule this alternative out as infeasible.

The engineering requirements to excavate the 2,000,000 tons of alum-YPS sludge and the contaminated, undocumented fill in the berms and on the surface of the site make it an infeasible option. The alum-YPS sludge is saturated and has negligible shear strength. Conventional excavating equipment and haul trucks cannot be brought onto the impoundments to excavate. Excavation could potentially be performed from the berms using a dragline, but there would be no place to stage the excavated material.

In addition, the alum-YPS sludge is saturated. The groundwater table is near the ground surface and well within the thickness of the sludge. A drying area would be needed to allow the excess water to drain from the alum-YPS sludge before it could be hauled from the site. An appropriate area does not exist on the site. The contaminated water draining from the sludge would then need to be contained and treated.

Finally would be the technical problems associated with locating a landfill that is permitted to take this material and has the capacity to accept the more than 2,000,000 tons that would need to be removed. If a landfill could be located, we would be transferring the same geotechnical problems that exist on this site to the landfill. The landfill would not be able to compact the alum-YPS sludge and the lack of strength of the sludge would make it difficult to place any additional waste materials over the sludge. The sludge could also not be placed above grade where the lack of shear strength would cause a slope failure.

The second alternative proposed is to stabilize the existing material and then fill on top of it. The applicant states that this alternative would limit the potential for future development of the site, but does not substantiate this claim with any other information. It is noted that the Site Remediation Reform Act would require the site to be left in a developable state, but the applicant does not state that this would be infeasible with this alternative.

The substantiation of the determination that this alternative would limit future development of the site is contained in the second paragraph of the alternative description:

> "The fill will likely be more permeable than the underlying alum-YPS sludge, resulting in water being trapped inside the impoundments. This water will eventually result in soft conditions at the base of the fill, potentially undermining the long-term stability of the site and limiting the potential for future development. This water will also percolate through the contaminated alum-YPS sludge and undocumented fill, continuing the existing groundwater and surface water concerns. This fill will not provide structural stabilization of the existing perimeter berms."

To clarify for the reviewer, the impoundments currently retain water like bathtubs. The alum-YPS sludge is relatively low permeability so water is trapped in the impoundments until it eventually percolates through the sludge into the groundwater or through the berms into the river. Placing a material that is more permeable than the sludge over the sludge will do nothing to eliminate the bathtub effect. Water will percolate through the fill material and be trapped by the lower permeability sludge. The water will continue to accumulate in the fill until the fill also becomes saturated. Saturating the fill material will reduce its shear strength, making it incapable of supporting a load and therefore preventing development. In fact, saturated fill over the alum-YPS sludge will exacerbate the impact to surface and groundwater because the water in the fill will increase the hydrostatic head. As Darcy's Law states, the flow rate of water through a granular material is directly proportional to the hydrostatic head.

One of the primary rules in designing a cap is that the permeability of the cap material must be less than the permeability of the underlying materials. The sole purpose of this rule is to prevent water from accumulating under the cap inside the waste material and increasing the hydrostatic head driving the water into the groundwater.

The third alternative the applicant proposed is to fill with an alternate fill material. The conclusions on this alternative are essentially identical to those of the second alternative.

Please see the discussion above regarding why a higher permeability material is not suitable for a cap. In addition, this alternative uses unscreened and unprocessed alternative fill rather than clean fill. The geotechnical properties of the unprocessed material would be even more inconstant that in the previous alternative, making the problem worse. The fill will likely contain oversized materials and waste asphalt, concrete, brick and block (ACBB), making it difficult, if not impossible to properly place and compact this material.

Unprocessed material with oversized, inconsistent gradation and inconsistent geotechnical properties cannot be used as a cap where percolation and groundwater infiltration must be controlled. These materials cannot be placed in a manner that will prevent infiltration and trapping water in the impoundments.

The fourth alternate design is to fill with an alternate fill and stabilize with a geomembrane cap. The analysis does not state that this method would be infeasible. It does not mention any negatives to this method.

This alternative is not technically infeasible; however it is not a prudent alternative for this site. Also, as shown in the evaluation of the Threshold and Balancing criteria, the long term effectiveness of this alternative is marginal.

Prior to placement of the geomembrane, the site must be filled and graded to control stormwater. After the geomembrane is placed it must be covered with a drainage layer and a topsoil layer to provide UV protection, drainage and a growing media.

As with all of the alternatives that require filling, extensive settlement of the alum-YPS sludge and the underlying peat layer will occur under the load of the fill. With the soil cap options, settlement is easily addressed by placing additional fill and regrading. However, with this option, settlement will result in failure of either the geomembrane fabric or the seams. Every failure will result in stormwater entering the underlying fill and alum-YPS sludge, eliminating the protectiveness of this alternative.

A brief description of the effort required to repair of the geomembrane entails excavation of the surface layers to determine the extent of the failure, removing the damaged geomembrane, cleaning the undamaged area so it can be seamed, replacing the damaged area with new geomembrane, seaming the materials together and performing the mandatory 100% QC test of the seams, replacing the drainage material and topsoil and re-seeding.

Given the size of the site and the extent of settlement that will occur, it is not feasible to assume that this can be performed on an ongoing basis. Also, geomembrane failures may not be detectable from the surface, resulting in a reduced effectiveness of this alternative over the long term. This alternative is less protective than the other options, and is therefore not a feasible alternative for the Alternatives Analysis.

The fifth alternative discussed is to use processed dredged material. The applicant states that the disadvantages to this method are "the reliability of the supply, the lack of homogeneity among the various PDM sources and the need to obtain a site specific AUD from each PDM processor/generator/supplier. These uncertainties will likely extend the time required to complete the remediation and make it questionable if a sufficient volume of PDM can be obtained to complete the site remediation." However, the analysis does not discuss any infeasibility with this method. While it may be undesirable to use PDM as additional permitting and longer time frames are involved, it does not appear to be infeasible.

As is discussed in the report, PDM had technical and operational shortcomings that made it an infeasible for this site remediation and not the preferred option. These include:

- A reliable supply of PDM could not be obtained and there is a lack of homogeneity among the various PDM sources. In addition, a site specific AUD would be required from each PDM processor, generator and supplier that would need to comply with the Fill Use Plan in the RAW. The lack of reliable supply would extend the time required to complete the remediation and make it questionable if a sufficient volume of PDM could be obtained to complete the site remediation. (implementability and short term effectiveness)

- Variation in the material characteristics will also require additional engineering during the remediation to ensure that the cap is stable and is consistent enough to meet the remediation goals. (implementability and short term effectiveness)

- The permeability of the available PDM would likely be higher than the underlying alum-YPS sludge, resulting in eventual cap failure (long term effectiveness)

Also refer to the previous discussions on why a material that has a higher permeability than the underlying alum-YPS sludge is not a technically feasible option.

The short term effectiveness, implementability long term effectiveness of PDM were judged to be marginal. The preferred alternative is to be superior to PDM for all three criteria.

Comment Regarding Alternatives Analysis Conclusion

The alternatives analysis concludes that (including cost) only the methods using the geomembrane, the PDM, and proposed method are acceptable. Since the applicant's own analysis concludes that these methods are acceptable, and that PDM method actually has lower cost than the proposed alternative, the Department cannot conclude that the cost of compliance is too high. As such, a hardship exception cannot be accepted under this provision.

The reviewer has incorrectly quoted the Alternatives Analysis report. The report does not indicate that either geomembrane or PDM would be acceptable. In fact, the report rejects these alternatives. As described above, the geomembrane option was rejected because of the long term effectiveness concerns that make it unfeasible. This alternative was also rejected because its cost was nearly twice that of the preferred alternative. The PDM alternative was rejected because of the uncertain supply, short term effectiveness, long term effectiveness and implementability considerations described above, despite the fact that it was a lower cost alternative than the preferred alternative. Again, the reviewer must recognize that an alternative that does not accomplish the remediation goals is not a feasible alternative.

Comment Regarding Department Agreement

The Department has not agreed to any alternate requirements. As such, a hardship exception cannot be accepted under this provision.

The Remedial Action Workplan, prepared by the Applicant's LSRP complies with the requirements of the Tech Rule and ARRCS. It has undergone a six month long component review by SRP. All of the changes to the RAW mandated by SRP have been accepted and the LSRP has submitted a Revised RAW that meets all of SRP requirements. Therefore, the Department has agreed to the site remediation as described by the Applicant in the permit application documents using the preferred, and only technically feasible, alternative from the Alternatives Analysis.

If you have any questions or need any additional clarification, please call me at (410) 290-8777.

Sincerely,
EastStar Environmental Group, Inc.

Albert P. Free, P.E., CSP, LSRP
President