TOWN OF WILLSBORO
BLACK ASH POND
ENVIRONMENTAL RESTORATION PROJECT
REMEDIAL ALTERNATIVES REPORT

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Prepared for:

NYSDEC
Division of Environmental Remediation
625 Broadway, 11th Floor
Albany, N.Y. 12233-7015

Prepared by:

Earth Science Engineering, P.C.
3721 Main Street
P.O. Box 398
Willsboro, NY 12996

BLACK ASH POND SITE – REMEDIAL ALTERNATIVES REPORT

SECTION 1: INTRODUCTION

1.1 Purpose and Organization of Report

The Town of Willsboro Black Ash Pond encompasses approximately 25 acres and is located at the terminus of School Street in the Town of Willsboro (hereinafter "Town"), Essex County, New York. The site is a former industrial property bounded to the north and west by the Boquet River, to the east by lands owned by the Adirondack Nature Conservancy (ANC), and to the south by additional lands owned by the ANC and Town. The site was deeded to the Town in 1966 by Georgia-Pacific Corporation. There are no buildings or structures present on the site. The site was previously used for deposition and settling of combustion residue slurry (black ash). Phase I Environmental Site (ESA) Assessments for the parent parcel performed in 2001 and 2003, and a limited Phase II ESA conducted on the parent parcel in 2003, examined the black ash and discovered metals exceeding NYSDEC guidelines.

The purpose of this Remedial Alternative Report is to identify and screen remedial technologies such that a range of remedial alternatives that protect human health and the environment are developed. A range of remedial alternatives is developed to attain site or project specific remedial response objectives, considering the objectives listed in 6NYCRR Part 375-1.10 (Inactive Hazardous Waste Disposal Sites: General Provisions – Remedy Selection), the goals of the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) Number 4030 "Selection of Remedial Actions at Inactive Hazardous Waste Sites" (NYSDEC, May 1990) and the NYSDEC expectations to address the principal threats (i.e., liquids and highly toxic and/or highly mobile wastes) through treatment, and considering engineering controls (e.g., containment) to address low level contaminated material and wastes for which treatment is not practical. Institutional controls are typically considered primarily as supplements to engineering controls.

Section 2, Development of General Response Actions, identifies contaminated media/volumes, areas of concern, future potential impacts, outlines the remedial action objectives, and describes general response actions. The first step in developing remedial alternatives is to identify areas or volumes of media to which general response actions might be applied. These areas or volumes are identified considering acceptable exposure levels, potential exposure routes, the nature and extent of contamination, and other site conditions.

Site specific areas/volumes of contaminated media, areas of concern, and future potential impacts associated with different levels of contamination are identified in Section 2.1. The second step is to establish remedial action objectives. The remedial action objectives specify the contaminants and media of concern, potential exposure pathways, and remediation goals. The remedial action objectives general describe the intention of the remedial action. Remediation goals are a subset of the remedial action objectives and consist of acceptable contaminant levels or a range of levels for each exposure route. The goals specify both a contaminant level and an exposure route, rather than contaminant levels alone, because protectiveness may be achieved by reducing exposure (such as capping an area or limiting access) as well as by reducing contaminant levels. The Remedial Action Objectives are outlined in Section 2.2. After the remedial action objectives have been established, general response actions for each medium of interest are developed. General response actions include treatment, containment, excavation, or other actions that may be taken to satisfy the remedial action objectives for the site. General response actions are identified in Section 2.3.

Section 3 includes an identification of available remedial technologies, including technology types and technology process options associated with each general response action. Technology types refer to general categories of technologies, and technology process options refer to specific processes within each specific technology type. Potential technologies and process options available for the remediation of the site are then described in detail. Technology types such as capping, disposal, immobilization and thermal treatment are among those described. Process options available for each of the technologies are then described. Technologies and process options are identified in Section 3.

After the technologies and associated process options are identified, the next step is to screen out remedial technologies and process options that cannot be implemented, or are deemed not viable or impractical. At this stage of the evaluation, specific process options or entire technology types may be eliminated. Technologies and process options are evaluated and screened using the criteria of implementability and effectiveness. The implementability screening considers the technical feasibility of implementing the technology and is used to eliminate technologies or process options that are clearly ineffective or unworkable considering the site specific conditions and the remedial response objectives. The effectiveness screening considers the effectiveness of the specific technology or process option and is used to eliminate technologies that are not effective in handling the site specific contaminants or areas and volumes of waste considering the remediation goals, the potential impacts to human health and the environment while implementing the technologies, and the reliability of the process with respect to the contaminants and conditions at the site. Screening of the project specific technologies is delineated in Section 4.

Remedial alternatives are then developed by combining the various technologies that passed the technology screening into alternatives to achieve the remedial response objectives. Only a limited number of remedial alternatives that represent the most viable remedial actions and have a significant potential of being implemented will be developed. A range of remedial alternatives is developed with the primary goal to reduce the toxicity, mobility, or volume of the hazardous substances. Other alternatives are developed to treat the principal threats posed by the site, but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed. Additionally, an alternative is developed that involves little or no treatment but provides protection of human health and the environment primarily by preventing or controlling exposure to hazardous substances through engineering controls, and finally, a no action alternative is developed for comparison with other alternatives. The development of project specific remedial alternatives is outlined in Section 5.

These remedial alternatives then undergo a detailed analysis consisting of an assessment of each individual alternative against seven (7) evaluation criteria. A comparative analysis is then conducted that focuses on the relative performance of each alternative against those criteria. The criteria are: 1) Short-term impacts and effectiveness; 2) Long-term effectiveness and performance; 3) Reduction of toxicity, mobility, or volume; 4) Implementability; 5) Compliance with Applicable or Relevant and

Appropriate Requirements (ARARs); 6) Overall protection of human health and the environment; and 7) Cost. Each of the evaluation criteria is further divided into specific factors and a relative weight is assigned to each factor to allow a thorough analysis of the alternatives. A detailed analysis of the designated remedial alternatives for the site is included in Section 6.

1.2 Site Background Information

1.2.1 Site History

Prior to the initiation of active SI efforts, existing data were assembled and evaluated, as appropriate, to develop an understanding of the site history and characteristics. As part of this effort, existing files were obtained from sources within the Town and personal interviews were conducted with numerous residents.

The project site consists of a 25± acre parcel of land owned by the Town adjacent to the Boquet River, a designated Wild Scenic and Recreational River. The property was acquired by the Town on December 20, 1966, from Georgia-Pacific Corporation (GPC) at a time when GPC was liquidating real property assets in the community. The project area includes a pulp mill waste deposition lagoon constructed along the Boquet River, consisting of a large dike and decantation basin. Residual black ash was deposited to a depth of up to 20 ft in the basin over a large area of the property. A 2400 linear-ft containment dike constructed along the riverbank perimeter is extremely unstable, allowing black ash, sand and dike construction material to discharge into the river.

The project site was used as a deposition area for spent black liquor used in the making of paper pulp. The Champlain Fibre Company later known as the Willsboro Pulp Mill and most recently owned by GPC operated a pulp mill on the opposite side of the Boquet River from the black ash location from 1884 to 1965. The black liquor was a combination of soda ash, chemical lime, wood fiber and soft coal. The black ash is the residue of spent black liquor combustion dumped in a basin area approximately 900 ft long and 400 ft wide.

The deposition lagoons were formed by constructing a crescent shaped, 12 to 15-ft-high dike along the course of the riverbank. Concrete pavement is still evident on portions of the dike that have not eroded into the Boquet River indicating the use of the berm as a wheeled vehicle access. A large pipe formerly protruded through the remainder of the structure into the river. The pipe, due to dike erosion, has since toppled into the river. Construction material for the dike appears to have been onsite material from the riverbank, black ash, logs, bricks and other available materials.

1.2.2 Site Physical Characteristics

The site lies at an elevation of approximately 50 ft above mean sea level contiguous to the Boquet River in the Town approximately two (2) miles west of Lake Champlain. Although a portion of the southern end of the parcel is fenced from the adjacent Town Wastewater Treatment Plant, access can be obtained directly from a NYSDEC fishermen parking area. The surface of the site is flat, with the topography slightly climbing to the south and west. No permanent structures exist on the property, however a municipal wastewater treatment plant occupies a contiguous 2.7 acre parcel along the southern border. The majority of the parcel is covered by black ash and a thin layer of topsoil at some locations. Topographically, the site is located within the Boquet River floodplain, with elevated uplands to the south and east of the site.

Consistent with the topography of the area, storm water runoff percolates through the permeable black ash overburden and seeps into the Boquet River through a former dike/berm and eventually into Lake Champlain. According to US Department of Agriculture-Soil Conservation Service Soil Survey mapping for Essex County, the soils in the vicinity of the site are comprised primarily of mine spoil and urban fill. Review of surficial geologic mapping indicates that the unconsolidated soils in the vicinity of the site consist of a thin layer of lacustrine silt and clay, likely laminated and calcareous, overlain by riverine sandy loam, sands and gravels. The unconsolidated soils are probably underlain by glacial till.

The thickness of these types of unconsolidated deposits is typically variable in the immediate vicinity of the Boquet River. Regional bedrock geologic mapping indicates that bedrock underlying the site consists of Potsdam sandstone from the Pre-Cambrian Era. Consistent with the topographic setting of the site and reported observation of seeps from the Black Ash Pond into the river, shallow groundwater flow in the area of the site would be perceived to generally flow across the site from south to north.

Groundwater within the deeper bedrock generally occurs within fractures, joints, and bedding planes commonly enlarged due to dissolution of carbonates and evaporates. There are reportedly no private or municipal groundwater wells used to supply potable water within a two (2) mile radius of the site. The residents within a ¼ mile radius of the site receive their domestic water from municipal service connections supplied by the Town. The Town receives raw water from Lake Champlain via an intake within Willsboro Bay approximately two (2) miles north of the project site.

1.2.3 Records Search and Review of Existing Data

Prior to the initiation of active SI efforts, existing data was assembled and evaluated, as appropriate, to develop an understanding of the site history and characteristics. As part of this effort, existing files were obtained from sources within the Town and personal interviews were conducted with numerous residents.

In general, the review of records and existing data pertaining to the site revealed that surface samples of the black ash (c. 1988) analyzed by the New York State Department of Health characterized the ash as 98 percent carbon with small quantities of lime. However, in 2003 additional scrutiny of the ash revealed it may contain metals exceeding the New York State Department of Environmental Conservation (NYSDEC) TAGM 4046 guidelines.

The recent testing of black ash material on adjacent properties indicating heavy metal contamination, combined with the fact that NYSDEC permits the Town to dump black ash into the Boquet River to facilitate the reduction of ice jams, has caused NYSDEC to desire a more comprehensive evaluation of the Black Ash Pond and related pulp mill waste deposits.

The Boquet River is a major component of a NYSDEC salmonid restoration program in Lake Champlain and contains a fish ladder immediately upstream of the project site. The Willsboro Black Ash Pond Property contains a public access site for fishermen that routinely traverse the Black Ash Pond and riverbanks to access this extremely important recreational resource. The site includes access to a large crib structure and fishing platform adjacent to a fishing pool at the base of the dam where migrating salmon congregate. In addition, the meandering bend of the river and islands provide excellent wading and shore fishing opportunities. Unfortunately, a large portion of the riverbank is inaccessible due to severe erosion with steep slopes and dike instability. The erosion also contributes to sedimentation within the river. A small boat launch is also located on the property near the downstream portion of the site. The property is adjacent to property occupied by the Town's secondary wastewater treatment plant. The treatment plant discharge pipe follows the existing access road to a surface discharge site between the boat launch and eastern limits of the Black Ash Pond. The Town intends to improve this property with a tertiary-wastewater treatment system.

Moreover, the Town is committed to utilizing the property as a public recreational resource incorporating fishermen, boater access and ecological education. Wastewater treatment system expansion and storage of equipment and supplies relating to public utility functions are also contemplated.

1.2.4 Previous Investigations

Surface samples of the black ash earlier (c. 1988) analyzed by the New York State Department of Health characterized the black ash as 98 percent carbon and small quantities of lime. However, in 2003 additional scrutiny of the black ash revealed the ash may contain metals exceeding the New York State Department of Environmental Conservation (NYSDEC) TAGM 4046 guidelines.

1.3 Nature and Extent of Contamination

The nature and extent of contamination at the site is listed in the following summary of the interpretations and conclusions of the Site Investigation (SI) Report.

1.3.1 Black Ash Waste Media

As part of the SI, the horizontal extent of black ash deposition within the Black Ash Pond was field surveyed to include approximately 13 acres, generally encompassing the area bounded by the Boquet River to the north, and the boat launch access road to the south. In general, the thickness of black ash media within the Black Ash Pond varied from 4 to 20 ft. During the completion of subsurface investigations along the central area of the Black Ash Pond, a layer of apparent historical industrial (paper mill) sludge was typically encountered (below the ash) at depths ranging between 4 to 12 ft below existing grade (BEG). It is estimated that the volume of black ash present at the site ranges between 200,000 to 300,000 cubic yards.

During the SI, ash media was discovered in an adjacent off-site area owned by the ANC. From the limited investigation efforts completed within the ANC area, coupled with research of previous studies, it appears that the horizontal extent of black ash deposition in the ANC property area ranges between 1 to 2 acres, while the thickness of ash media in this area is estimated to reach 9 ft. It is estimated that the volume of black ash present at the ANC property site ranges between 10,000 to 20,000 cubic yards. In order to determine the horizontal and vertical extent of black ash existing within the ANC property, supplemental subsurface investigations are needed.

The predominant contaminants identified within the soil samples collected from the majority of test trenches and soil borings included numerous heavy metals, including antimony (5.2 to 21.1 mg/kg), barium (15.7 to 85.2 mg/kg), cadmium (not detected to 0.43 mg/kg), calcium (1,940 to 353,000 mg/kg), chromium (2 to 21.2 mg/kg), copper (1.6 to 15.5 mg/kg), iron (749 to 70,400 mg/kg), lead (1.1 to 11.5 mg/kg), magnesium (158 to 3,790 mg/kg), potassium (159 to 3,120 mg/kg), sodium (159 to 3,120 mg/kg), vanadium (3.6 to 76.3 mg/kg), and zinc (6.3 to 217 mg/kg). These metals were consistently identified within the test trench and boring soil samples at concentrations exceeding metal specific NYSDEC TAGM 4046 recommended soil cleanup objectives and/or site background conditions.

Overall, from the results of metals analysis of the solid media samples collected from various test trenches and soil borings, it has been documented that the black ash deposited in the subject area exhibits significantly elevated concentrations of specific non-native heavy metals, some exceeding applicable NYSDEC TAGM 4046 recommended soil cleanup objectives. Considering the significant volume of black ash present at the site, and since the ash exists in direct contact with the ground surface, local hydrologic regime (Boquet River) and local shallow groundwater regime, it is concluded that associated risks to both human health and the local environment persist at the subject site. Consistent with the fine grain size of the ash, potential risks to human health and the adjacent hydrologic environment (i.e., ash erosion and transport) are likely variable (based on seasonal weather conditions) and persistent.

1.3.2 Groundwater Impacts

From the results of subsurface borings and monitoring wells completed as part of the SI, wet soils (indicative of the local water table) were encountered within the black ash media, at depths typically ranging from 4 to 10 ft BEG. Shallow groundwater flow at the site was calculated to trend toward the Boquet River (from the south and southwest to the northeast).

Although an intermixed layer of black ash and pulp mill sludge was encountered within MW-1, MW-3, MW-4, and MW-6 borings (extending from 8 to 16 ft BEG), this layer of ash/sludge was not identified during the completion of MW-2, MW-5, and MW-7 borings. The presence of apparent native soils, primarily riverine sediments, was identified within each well boring at depths ranging from 4 ft BEG (MW-7) to 16 ft BEG (MW-4). Although wet soils (ash) were often first encountered at depths ranging between 4 to 10 ft BEG in the well borings, the most saturated soil (ash) conditions were typically identified at the black ash/sludge interface.

Although an intensive effort was implemented to develop each of the monitoring wells using low-flow over pumping techniques, the extract groundwaters were characterized by significant quantities of black ash, which was reduced over 30-60 minutes of development to a dull-black tint. Accordingly, and consistent with the fine grained characteristics of the black ash media, it appears that some fractions of the black ash media exhibit the characteristic of solubility when immersed.

Although estimated or trace levels of various pesticides and semi-volatile organic compounds (including; 4,4-DDE, diethylphthalate, di-n-butylphthalate, and butylbenzylphthalate) were detected in the groundwater samples collected from MW-1 and/or MW-2, the elevated presence of volatile organic, semi-volatile organic, PCB or pesticide compounds was not detected within any of the seven groundwater samples.

Similar to the soil samples collected at the site, each of the seven monitoring well groundwater samples exhibited elevated concentrations of aluminum, Barium, calcium, potassium and zinc. Consistent with the metals detected within the soil/ash media samples and the apparent partial solubility of specific black ash media fractions, the majority of well groundwater samples also exhibited elevated concentrations of antimony, magnesium, iron, manganese, sodium, and thallium exceeding applicable Class GA Groundwater Quality Standards or Guidance Values. The groundwater samples collected from MW-3, MW-4, and MW-5 also exhibited Class GA Groundwater Quality exceedances for arsenic, while the groundwater samples collected from MW-1 and MW-6 also exhibited Class GA Groundwater Quality exceedances for chromium.

Comparison of the upgradient (MW-2) with downgradient groundwater quality metals data (wells MW-1, MW-3, MW-4, MW-5, MW-6, and MW-7) generally revealed that average downgradient concentrations of aluminum, Barium, calcium, chromium, cobalt, copper, iron, lead, nickel, potassium, vanadium and zinc were all significantly higher (double or greater) than the corresponding concentrations metals exhibited by the sample collected from upgradient monitoring well MW-2. In addition, comparison of upgradient vs. downgradient average metals data revealed that antimony, arsenic, Barium, beryllium, calcium, and magnesium concentrations were slightly higher (less than 1 order of magnitude) in the downgradient monitoring well samples.

Based on comparison of the upgradient vs. downgradient groundwater sample data and comparison of the groundwater data with black ash (solid) sample results, it was documented that elevated concentrations of the same non-native metals that persist within the black ash media (including antimony, Barium, cadmium, chromium, cobalt, copper, iron, lead, nickel, vanadium and zinc) are leaching to the local shallow groundwater regime. Since the majority of these metals were identified within a number of the downgradient groundwater samples at concentrations exceeding the respective Class GA Groundwater Quality Standards or Guidance Values, it is apparent that the leaching of specific metals to the local shallow groundwaters has resulted in metals contamination of the shallow groundwater regime proximate to the site.

Since the results of groundwater flow calculations indicate that the Boquet River is a "gaining stream" (receiving local shallow groundwaters discharge), it also can be interpreted that such elevated metals concentrations are discharging to the river. It can be concluded that such contaminant transport and migration will continue to occur because the majority of the Black Ash Pond is open to the surface environment (where erosion is ongoing) and also exists in direct contact with both the local shallow groundwaters and the adjacent river.

1.3.3 River Sediment Impacts

During the completion of the Boquet River sediment sampling significant erosion of black ash and cinders were observed along the majority of the southern bank of the Boquet River. The most significant areas of ash-cinder erosion were observed in the vicinity of MW-5 eastward to the boat launch, where layers of black ash (ranging in thickness from 8 to 12 ft) immediately border the river and are steadily eroding and collapsing into the river.

Although estimated or trace levels of various semi-VOCs (including; dimethylphthalate, 2,6-

dinitrotoluene, and pyrene) were detected in two (2) of the sediment samples, the presence of these compounds was not detected in the sediment samples consistently. The elevated presence of volatile organic, semi-volatile organic, PCB or pesticide compounds was not detected within any of the twelve (12) sediment samples collected as part of the project.

Metals analysis of the sediments collected from the Boquet River generally revealed elevated concentrations of aluminum, antimony, Barium, calcium, iron, magnesium, manganese, potassium, sodium, and zinc. Comparison of the upstream sediment metals data (samples SD-1 and SD-2) with the downstream sediment metals data (samples SD-3, SD-4, SD-5, and SD-6) revealed that the average downstream concentrations of antimony, chromium, copper, lead, magnesium, nickel, and sodium were slightly to significantly higher (ten times or greater) than the corresponding average concentrations of metals exhibited by the upstream sediment samples. Of these metals, downstream sediment average copper and lead concentrations were ten times greater or higher than the corresponding upstream sediment average copper and lead concentrations. Comparison of the sediment sample data collected from shallow depth (6-inches) and intermediate depth (18 inches) revealed that aluminum, antimony, Barium, calcium, chromium, copper, iron, magnesium, manganese, nickel, sodium, and zinc concentrations were generally more elevated within the intermediate depth samples.

As previously detailed, comparison of the parameters detected within the sediment samples with the criterion for those parameters listed within the Technical Guidance for Screening Contaminated Sediment (NYSDEC – Division of Fish and Wildlife Document dated November 1993, Reprinted January 1999), revealed two downstream samples that exceeded the Lowest Effect Level Guidance Value for antimony, one downstream samples that exceeded the Severe Effect Level Guidance Value for antimony, and one downstream sample that exceeded the Lowest Effect Level Guidance Value for nickel.

Although antimony was detected in the off-site background soil sample and one of four upstream sediment samples, the presence of this metal was identified at more elevated concentrations within the majority of black ash media samples, downgradient groundwater samples, and downstream sediment samples. Consistent with the presence of antimony in the majority of soil and groundwater samples collected as part of the investigation, it appears possible that the elevated presence of antimony in the river sediments could have occurred from erosion and deposition of the black ash media in the river. In order to fully assess the presence of antimony within the river sediments, supplemental sediment sampling along the black ash pond river bank and along the cross-section of the river bottom would likely be needed via a barge mounted drill rig. Considering the complexity of apparent sediment contamination and the potential impacts that may be occurring from the black ash pond site to the adjacent river environment, subsequent consultation with specific NYSDEC Fish and Wildlife personnel has resulted in their input on this issue as documented in Appendix F of the SI Report.

SECTION 2: DEVELOPMENT OF GENERAL RESPONSE ACTIONS

2.1 Remedial Action Objectives

In order to develop the remedial action objectives for the Black Ash Pond site, the following factors were considered to address human health and environmental concerns:

- Contaminants of concern: specific (non-native) heavy metals, including: antimony, arsenic, cadmium, chromium, copper, iron, lead, magnesium, vanadium, and zinc as identified during the SI;
- Exposure route(s) and receptor(s): direct contact and ingestion by humans; and
- Acceptable contaminant level or range of levels for each exposure route: risk range or specific contaminant level range to levels within the same order of magnitude as native background soil concentrations.

The following remedial action objectives are established:

- Remediate the human health exposure (via ingestion and direct contact) to contaminated waste media related heavy metal concentrations exceeding NYSDEC TAGM 4046 recommended soil cleanup objectives and background soil conditions; and
- Reduce the potential for migration and leaching of contaminated waste media and dissolved heavy metals to the adjacent river and groundwater environment.

2.2 Identification of Contaminated Media, Volume and/or Potential Future Impacts

2.2.1 Black Ash Media

As part of the SI, the black ash media was identified to exhibit elevated concentrations of various heavy metals (including antimony, arsenic, cadmium, chromium, copper, iron, lead, magnesium, vanadium, and zinc) that exceeded metal specific TAGM 4046 recommended soil cleanup objectives and/or site background conditions. The horizontal extent of black ash deposition within the Black Ash Pond was field surveyed to include approximately 13 acres, generally encompassing the area bounded by the Boquet River to the north and the boat launch access road to the south. In general, the thickness of black ash media within the Black Ash Pond varied between 4 to 20 ft, with the majority of ash media encountered at grade or shallow depths immediately below the ground surface. During the completion of subsurface investigations along the central area of the Black Ash Pond, a layer of apparent historical industrial (paper mill) sludge was typically encountered (below the ash) at depths ranging between 4 to 12 ft BEG. It is estimated that the volume of black ash present at the site ranges between 200,000 to 300,000 cubic yards. The volume of industrial sludge media present below the central area of the Black Ash Pond is estimated to range from 50,000 to 150,000 cubic yards.

In addition to the ash media present in the Black Ash Pond area, ash media also exists in an adjacent off-site area owned by the ANC. From the limited investigation efforts completed within the ANC area coupled with research of previous studies, it appears that the horizontal extent of black ash deposition in the ANC property area ranges between 1 to 2 acres, while the thickness of ash media in this area is estimated reach 9 ft. It is estimated that the volume of black ash present at the ANC property site ranges between 10,000 to 20,000 cubic yards. In order to determine the horizontal and vertical extent of black ash material existing within the ANC property, supplemental subsurface investigations are needed.

2.2.2 Groundwater Contamination Originating from Heavy Metals Leaching

Based on comparison of the upgradient vs. downgradient groundwater sample data and comparison of the groundwater data with black ash (solid) sample results, it was documented that elevated concentrations of the same non-native metals that persist within the black ash media (including antimony, Barium, cadmium, chromium, cobalt, copper, iron, lead, nickel, vanadium, and zinc) are leaching to the local shallow groundwater regime. Since the majority of these metals were identified within a number of the downgradient groundwater samples at concentrations exceeding the respective Class GA Groundwater Quality Standards or Guidance Values, it is apparent that the leaching of specific metals to the local shallow groundwaters has resulted in metals contamination of the shallow groundwater regime proximate to the site. It was also that such heavy metal transport and migration will continue to occur because the majority of the Black Ash Pond material is open to the surface environment (where erosion is ongoing) and also exists in direct contact with both the local shallow groundwaters and the adjacent river.

Although the volume of contaminated groundwater impacted on a time specific basis is difficult to quantify, assuming an average saturated media depth of 4 ft and a hydraulic conductivity of 10 to 100 gallons/day/square foot, it can be estimated that approximately 90,000 to 900,000 gallons of groundwater discharge through the Black Ash Pond daily to the Boquet River boundary. Accordingly, this same volume of groundwater discharged from the Black Ash Pond site experiences an undetermined level of heavy metals leaching daily, as well.

2.2.3 Contaminated River Sediments

During completion of the Boquet River sediment sampling effort, evidence of significant erosion of black ash and cinders was observed along the majority of the southern bank of the Boquet River. The most significant areas of ash-cinder erosion were observed in the vicinity of monitoring wells MW-5 to MW-7, west to east, where layers of black ash 12 ft thick immediately border the river. Consistent with observations that indicate erosion of the black ash media has occurred, the results of sediment sampling and analysis completed as part of the SI appear to indicate that black ash media has been deposited into the river bottom sediments. Since the results of groundwater flow calculations indicate that the Boquet River is a "gaining stream" (receiving local shallow groundwaters discharge), it can also be interpreted that elevated (dissolved) metals concentrations are also discharging to the river.

It can be concluded that contaminant transport and migration will continue to occur because the majority of the Black Ash Pond material is open to the surface environment (where erosion is ongoing) and also exists in direct contact with both the local shallow groundwaters and the adjacent river.

Although the presence of black ash related heavy metals was identified within the majority of river sediment samples collected, the horizontal extent of such impacts was not fully quantified as part of the SI. In order to fully assess the presence of heavy metals within the river sediments, supplemental sediment sampling along the Black Ash Pond riverbank and along the cross-section of the river bottom would likely be needed. Considering the complexity of apparent sediment contamination and the potential impacts that may be occurring from the Black Ash Pond site to the adjacent river environment, consultation with specific NYSDEC Fish and Wildlife personnel occurred during the SI and their comments are included in Appendix F of the SI Report.

2.3 General Response Actions

General Response Actions were developed to satisfy the remedial action objectives. General Response Actions were developed specifically for each contaminated medium of concern identified during the SI. The contaminated media of concern for the Black Ash Pond include heavy metal contaminated black ash media (including adjacent soils), heavy metals leaching to shallow groundwater, and ash deposition into the river sediments.

For each media, general response actions developed included: no action(s), accumulated waste removal, institutional actions, access restrictions, monitoring, containment, disposal, and treatment of the contaminated materials. Each general response action is further developed in Section 3, identifying technologies and process options available. The following sections describe general response actions for this site. Each option is defined and is not contaminant-specific.

2.3.1 No Action

The "No Action" response includes continuing to operate the site as it is currently operated without implementing specific source control, management of migration, or monitoring measures. This response action is included because it provides a baseline with which to compare active alternatives.

2.3.2 Institutional Controls

Institutional controls are often necessary to supplement remedial actions where waste and/or contamination is left in place. It may also be necessary in circumstances where the balancing of trade-offs among alternatives during the selection of a remedy process indicates no other practical way to actively remediate a site. Examples of institutional controls that limit the activity at or near the site are land and resource use restrictions, deed restrictions or notices, well drilling prohibitions, or building permit restrictions.

An example of institutional controls that physically limit the access to a site is perimeter fencing with appropriate signage. Where institutional controls are used as the sole remedy, special precautions must be made to ensure that the controls are reliable and will remain in place after initiation of operation and maintenance. Other activities that may be considered institutional controls are periodic monitoring such as groundwater monitoring or periodic inspections.

2.3.3 Containment

Isolation/containment processes involve isolating the contaminated soil from the surrounding environment. Containment can be accomplished by installing a surface barrier (i.e., engineered cap or other cover system) and/or a subsurface barrier containment system (i.e., a liner).

Isolation/containment devices do not destroy contaminants, but prevent their migration to groundwater and/or the atmosphere. Containment also reduces the likelihood of exposure to contaminants.

2.3.4 Disposal

Excavation and removal of the contaminated soils for disposal is a means to remove contaminated materials. The disposal process includes excavating the contaminated soil from its current location and disposing it elsewhere on site or transporting it to an appropriate off-site facility for disposal. The contaminated material may be treated prior to disposal, or it may be disposed of (with restrictions) without treatment. Typically, standard earthmoving equipment is used to excavate the contaminated material.

2.3.5 Immobilization Treatment

The immobilization of contaminants involves processes that reduce the leachate production potential by binding contaminant(s) through a physical (solidification) and/or a chemical (stabilization) process. Immobilization technologies typically involve combining specific contaminated media with various reagents or absorbents to produce a substance, usually a hardened mass or soil-like material that effectively contains the contaminants.

2.3.6 Physical/Chemical Treatment

Physical/chemical treatment technologies entail a combination of physical and chemical treatment processes. Physical treatment refers to processes that, through concentration or phase change, alter the hazardous constituents of waste to a more convenient form for further processing or disposal. Typically, physical treatment methods are used to reduce the volume of hazardous materials and produce a concentrated residue that is further treated. Chemical treatment refers to processes in which the hazardous constituents are altered by chemical reactions. The goal of chemical treatment is to either destroy the hazardous constituents in the waste or to convert the contaminants to a more convenient form for further treatment or disposal.

2.3.7 Biological Treatment

Biological treatment is a set of technologies that implement the use of microorganisms, such as bacteria or fungi, to mediate the degradation of hazardous materials. These technologies utilize the natural abilities of bacteria and fungi to degrade hazardous contaminants, generally organic materials. Each bioremediation process is distinctly different, requiring an evaluation of different process options to determine their implementability. Biodegradation of contaminated material may result in the detoxification or destruction of the hazardous constituents, which would reduce the potential of adverse health and ecological effects.

2.3.8 Thermal Treatment

Thermal treatment refers to processes that use high temperature as the principal mechanism for hazardous waste destruction or detoxification. It is the controlled high-temperature oxidation of primarily organic compounds in which carbon dioxide and water are produced. Thermal treatment processes, such as incineration, are highly complex and require sophisticated systems to conduct.

SECTION 3: IDENTIFICATION OF TECHNOLOGIES

3.1 No Action

Under the "No Action" response, the present conditions at the site would be continued without implementing specific source control, migration management, or monitoring measures.

3.2 Institutional Controls

Institutional controls are often necessary to supplement remedial actions where waste is left in place. It may also be necessary in circumstances where the balancing of trade offs among alternatives during the selection of the remedy process reveals limited means of actively remediating a site. Examples of institutional controls that limit the activity at or near the site are land and resource use restrictions, deed restrictions or notices, well drilling prohibitions, or building permit restrictions. Where institutional controls are used as the sole remedy, special precautions must be made to ensure that the controls are reliable and will remain in place after initiation of operation and maintenance.

A key aspect of institutional controls is the identification of the particular authority to implement and enforce institutional controls. Other activities that may be considered institutional controls are periodic monitoring such as groundwater monitoring, periodic inspections and access restrictions. Access restrictions would limit access to the site by unauthorized personnel, or warn persons approaching the site of potential hazards at the site. Access restrictions may consist of constructing a fence around the perimeter of the site to limit access or by posting warning signs. It would be the responsibility of the Town of Willsboro to ensure that the controls are enforced and maintained.

3.3 Containment

Capping and covering are containment technologies typically used to seal or cover waste materials, thus preventing their contact with the land surface and groundwater. In general, caps are designed to meet the following performance standards: 1) minimum liquid migration through the wastes; 2) low maintenance requirements; 3) efficient site drainage; 4) high resistance to damage by settling or subsidence; and 5) reduction or elimination of vertical infiltration. The majority of cap system designs are engineered caps designed to conform with the previously mentioned design criteria, however, cover designs are used for specific purposes. The design of a cap system is influenced by specific factors such as: 1) availability of cover materials; 2) costs of cover materials; 3) desired functions of cover materials; 4) the nature of the wastes being covered; 5) local climate and hydrogeology; and 6) projected future site usage.

Capping or covering is utilized when contaminated materials are to be left in place at the site. In general, capping is performed when the volume or nature of the waste at a site precludes excavation and removal of wastes because of potential hazards and/or unrealistic costs.

Capping may be performed with groundwater extraction and remediation to prevent, or significantly reduce further plume development. Groundwater monitoring wells are often used in conjunction with caps to detect unexpected migration of the capped wastes. Surface water control technologies such as ditches, dikes, and berms may also be integrated with caps to accept rainwater/runoff discharge from the cap. Grading and re-vegetation should also be incorporated into cap systems to reduce the potential for precipitation and runoff infiltration and ponding.

The two basic cap/cover design applications include engineered caps and covers. Engineered caps include composite impermeable layer caps and single impermeable layer caps. The primary performance requirement of an engineered cap is to prevent the infiltration of precipitation and runoff water to the waste, thus preventing the generation of contaminant leachate. In order to meet the performance requirements, engineered caps are typically designed with vegetative, drainage, low permeability and foundation layers. The low permeability layer(s) are the most important components within the composite design. The vegetative drainage and foundation layers are designed to maintain the integrity of the low permeability layer. The primary difference between composite and single impermeable layer caps is the number and type of low permeability components utilized. Composite impermeable layer caps typically include a combination, or more than one type, of impermeable layers incorporating low permeability soils, synthetic liners or both. Single impermeable layer caps incorporate either low permeability soils or a synthetic liner as the impermeable layer.

The primary performance requirement of a cover is to prevent physical contact with the waste being covered. Covers may be an acceptable remedy when response objectives include the mitigation of exposure to contaminants via direct contact, inhalation, or ingestion. Additionally, covers may be applicable when a site is being temporarily covered; in an area where evapo-transpiration far exceeds rainfall; there is little or no groundwater in contact with the contaminants; or when there is certainty that the integrity of a cover will be continually maintained. The remedial technology types included for purposes of the containment technology include: 1) covers; 2) engineered caps; 3) composite impermeable layer caps; and 4) single impermeable layer caps.

For specific cases when engineered caps or covers are planned, there is often a need to incorporate supplemental (ancillary) structural components, i.e.; retaining walls, cofferdams, cribbing, sheet piling, and slurry trenches in order to maintain slope stability and minimize contact with the capped or covered media, especially in close proximity to steep slopes, riverbanks, or civil infrastructure. For engineered caps or covers being considered in such cases, it is often desired that soil or solids media be excavated from the periphery slope and placed or re-consolidated at more stable site locations. Alternatives including geotextiles, geonets, and/or heavy rock agglomerate can be also installed independently or in addition to the above-listed engineered cap or cover components to provide improved slope stability and containment along the periphery of the waste mass.

3.4 Disposal

The disposal process consists of excavating the contaminated soil from its current location and transporting it to an appropriate off-site facility for disposal. The contaminated material may be treated prior to disposal, or it may be disposed of (with restrictions) without being treated. Typically, standard earthmoving equipment is used to excavate the contaminated material. The off-site facilities considered are a Solid Waste Disposal Facility, a RCRA Hazardous Waste Facility, or a

TSCA Chemical Landfill. Any facility selected must be in full compliance with their respective operating permits. The Solid Waste Disposal Facility would be a 6 NYCRR Part 360 Landfill, a secure landfill permitted to accept solid waste. Acceptance of waste from the site would depend on the nature of the waste. Other options for disposal locations are a RCRA or TSCA secure landfill. These two types are landfills are operated in accordance with stricter regulations than 6NYCRR Part 360. Off-site disposal consists of the following general activities: 1) excavation of contaminated soils; 2) placement of contaminated soils into containers or trucks; and 3) transportation to the designated disposal location.

Excavation is typically conducted using standard construction equipment, i.e., backhoes and front-end loaders. Stockpiling of soils would be limited as much as practical to minimize handling. If large open containers, i.e., trailer bodies or roll off containers are used, soils could be loaded directly to avoid the need to stockpile. Transportation of contaminated soils is typically conducted by tractor trailer or dump truck to the designated disposal location. Waste haulers would be licensed and in compliance with state and federal regulations applicable to waste transportation.

3.5 Immobilization Treatment

Immobilization methods are designed to render contaminants insoluble, to prevent leaching of the contaminants from the soil matrix, and to prevent the movement of the contaminants from the area of contamination. Immobilization technologies involve binding the contaminant(s) in the soil through a physical and/or a chemical process that will stabilize and solidify the contaminants in a matrix, thus reducing their mobility. Types of immobilization technologies include Solidification/Stabilization and *in situ* Vitrification.

Solidification and stabilization processes convert liquids or semi-solids into solid forms by immobilizing contaminants in the soil. In the solidification and stabilization treatment process, contaminated material is stabilized, fixated, solidified or encapsulated into a solid material by adding a resin or other chemical, such as cements or pozzolans to the contaminated media. This process is designed to reduce leachate generation. Solidification is a treatment process that results primarily, but not exclusively, in the production of a solid block of waste material that has a high structural integrity; often referred to as a monolith. Stabilization usually involves adding materials that ensure that the hazardous constituents are maintained in their least mobile or toxic form. The final treatment goal of most solidification and stabilization processes is to reduce the solubility of contaminants to levels so that the material produced can be returned to its original location or disposal at an approved landfill off-site.

In situ vitrification is a process in which contaminated soil is treated in place and is converted into a stable, glass-like material. Electrical current is used to melt the area of contamination at high temperatures, binding the contaminants in the resulting vitrified matrix. The *in situ* vitrification process eliminates the void space in the treated soil, reducing the soil volume by 20 percent to 40 percent for typical soils. This will result in subsidence of the treated area, that will require backfilling with clean fill to level. The product that remains after treatment is a high integrity glass-like monolith.

3.6 Physical/Chemical Treatment

Physical treatment processes may be described as processes that separate the waste stream by either applying physical force or changing the physical form of the waste. Chemical treatment processes alter the chemical structure of the contaminants to produce a waste residue less hazardous than the original contaminated material. Physical treatment processes produce residuals that must be disposed of in an environmentally safe manner. Material such as sludge may require additional treatment, either on-site or off-site, prior to disposal. Treatment that may be needed includes dewatering and immobilization. Note that immobilization technologies are discussed under the Immobilization section. Requirements for further treatment of concentrated liquids, solids and sludge depend upon the type and level of contamination present in the material. Processes that utilize physical and chemical treatment include: Soil Washing, *In situ* Soil Flushing, Dechlorination, Low Temperature Thermal Stripping. Although dechlorination is a type of chemical remediation technology, this method is not effective in removing polyaromatic hydrocarbons from contaminated soil.

Soil washing treats contaminated soil by separating the contaminants from the soil by physical and/or chemical separation. The washing fluid may then be treated to remove the extracted contaminants. *In situ* soil flushing involves injecting or flushing contaminated soils in place with water to leach contaminants into the groundwater. Non-toxic or biodegradable surfactants may be added to the water to improve the solubility and recovery of the contaminants. The groundwater carrying the flushed contaminants is collected downstream and is treated prior to disposal. Low temperature thermal stripping involves heating excavated soil in a closed chamber to temperatures ranging from approximately 400 deg. F to 500 deg. F. The temperature serves to enhance the volatilization of organic constituents present in soil. Off-gases produced in the operation are collected and passed through air pollution control equipment or a recovery system. Treated soils may then be returned to the location of excavation.

3.7 Biological Treatment

Bioremediation is a process for treating contaminated material by utilizing microorganisms for degradation of contaminants. The concept of biological treatment involves altering environmental conditions to enhance microbial breakdown and detoxification of contaminants. Research has confirmed that microorganisms are capable of breaking down numerous environmentally hazardous organic compounds in contaminated soil. Bioremediation processes have been used in the treatment of sludges and soils.

Biodegradation can be classified into three main categories: aerobic respiration, anaerobic respiration, and fermentation. Microorganisms utilized to mediate the degradation of hazardous contaminants in soil may consist of indigenous bacteria and fungi or include the addition of specially cultured microorganisms. To create an environment beneficial to the growth of the bacteria and fungi, conditions such as pH, temperature, moisture, etc. are required to be in a range favorable for growth. Biological treatment is a scientifically intensive treatment technology. Some contaminants are not biodegradable. With biological remedial processes, treatability studies and pilot-scale testing are essential in determining the primary process controls needed for a particular contaminant, the treatment technique to be used, and the treatment by-products generated, if any.

Additionally, treatability studies are necessary to determine if the concentration of any of the soil contaminants will inhibit bacterial growth. Biological treatment of contaminated soil may be performed either *ex situ* or *in situ*. *Ex situ* bioremediation is a process where the contaminated material is excavated from the site and treated. *In situ* bioremediation is a process where the contaminated material is treated in-place. Biological treatment processes may be coupled with other treatment techniques. The feasibility of bioremediation as a treatment technique is dependent upon the contaminant type and site characteristics. Factors that determine whether biological treatment is applicable include: biodegradability of the contaminant(s), environmental factors that affect microbial activity, and site hydrogeology. Biological treatment processes include: Land Farming, Slurry Phase Bioremediation, Composting, and *In situ* Bioremediation.

3.8 Thermal Treatment

Thermal treatment technologies utilize high temperatures to destroy or detoxify contaminated wastes. There are several thermal treatment processes available, including: 1) Rotary kiln incineration; 2) Fluidized bed incineration; and 3) Infrared incineration. Incineration is the controlled high temperature oxidation of predominately organic compounds, with end-products of carbon dioxide and water. Additionally, inorganic substances, i.e., acids, salts and metallic compounds will be produced from incineration of waste materials. The key variables with an incineration process are the temperature, duration of exposure of the contaminants to the high temperatures, and degree of mixing between the waste and the combustion air. Residence times vary between minutes to hours, depending upon the nature and degree of the contaminants in the soil and the type of incineration. Near complete destruction of hazardous organic wastes is feasible with thermal treatment technologies. If an incineration process is calibrated correctly, destruction and removal efficiencies exceeding 99.99 percent may be achieved.

Incineration of wastes is accomplished by heating the soil to temperatures generally ranging from 1500 ° F to 2200 ° F. During incineration, soil particles remain in continuous motion to prevent vitrification of the soil particles from occurring. Process residuals include decontaminated ash, treated combustion gases, and wet scrubber water (if a wet scrubber is used in the process). The ash produced from the process may be considered a hazardous waste, and if so, must be managed as such.

SECTION 4: SCREENING OF TECHNOLOGIES

The purpose of the screening of technologies is to evaluate each of the individual technologies or process options and determine the ability of the technology or process option to achieve the remedial response objectives. In the initial screening, the remedial technologies are discussed generally in terms of their ability to meet their medium specific remedial action objectives and evaluated specifically in terms of their implementability and their short-term and long-term effectiveness. From this analysis, inappropriate or ineffective technologies can be removed from further discussion and technologies which exhibit promise as effective means of remediation can be retained for use in the development of site-wide remedial alternatives. 6NYCRR Part 375-1.10 and NYSDEC TAGM 4030 defines specific analysis factors used to screen remedial alternatives. The approach defined in these regulations/guidance documents, however, are well suited for the screening of technologies also. As such, those analysis factors are considered during the screening of technologies.

Effectiveness: Effectiveness screening focuses on the ability of the technology to attain the remedial response objectives through the reduction in toxicity, mobility or volume of the specific waste present at the site. Such screening considers the technology's effectiveness to: 1) Meet remedial objectives; 2) Protect human health and the environment during and after implementation; 3) Accommodate the estimated quantities of contaminated materials and waste residues; and 4) Be proven reliable with respect to the contaminants and site conditions

Implementability: Implementability screening focuses on the technical and administrative feasibility of implementing the technology. Factors to be considered include: 1) The ease or difficulty associated with constructing the technology (e.g. the use of conventional equipment and procedures vs. the use of experts, intensive operator attention and process monitoring); 2) The reliability of the technology; 3) Availability of equipment, labor, treatment and disposal resources; 4) Requirements for on-site and off-site permits

4.1 No Action

Although the "No Action" alternative does not attain the remedial action objectives or site specific clean-up goals, the "No Action" alternative will be retained as an alternative primarily for comparison purposes.

4.2 Institutional Controls

Institutional controls are actions that limit the activities at or in the vicinity of the site. Examples of institutional controls include: land and resource use restrictions, deed restrictions or notices, well drilling restrictions or construction restrictions. Other types of institutional controls are those which specifically limit access to the site. Access restriction may consist of fencing of the property perimeter and posting appropriate "No Trespass" or "No Entry" signs.

Screening

All of the institutional controls previously mentioned are implementable at the site. However, if implemented as the sole alternative, institutional controls are not effective in attaining the remedial objectives or the site specific clean-up goals. If implemented as a supplement to other remedial actions, institutional controls are effective in contributing to a sound remedial alternative. All the institutional control technologies previously mentioned, will be retained for development into remedial alternatives.

4.3 Containment (Horizontal)

As previously discussed, engineered caps and covers are containment technologies typically used to seal, isolate or cover waste materials, thus preventing their contact with the surface environment. In general, capping is performed when the response objective or performance requirement is to isolate the waste and minimize the infiltration of precipitation and runoff water into the wastes thus reducing the generation of leachate, and when extensive subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards and or unrealistic costs. Covering is performed when the primary response objective or performance requirement is to isolate waste materials from the surface environment. Covers can also be designed to divert some precipitation and runoff water away from the waste materials.

As part of the containment (engineered cap or cover) technology design and construction, grading is utilized to reshape the surface over and adjacent to the waste mass in such a way to manage surface water to control infiltration and erosion. Surface grading serves to; 1) reduce the potential for ponding which in turn minimizes infiltration; 2) reduces runoff velocities which in turn minimizes erosion, and; 3) prepares the surface for the final vegetative cover layer. In addition to grading, surface controls such as dikes, berms, channels, and other waterways are used to prevent excessive erosion and control run-off. Grading and surface controls on a covered waste mass (i.e., landfill) when properly designed are effective in controlling infiltration, diverting run-off, and minimizing infiltration. Accordingly, grading and surface controls will be considered to be inherent tasks as part of both the engineered cap and cover technologies.

4.3.1 Engineered Caps

The primary performance requirement of an engineered cap is to prevent the infiltration of precipitation and runoff water into the waste, thus reducing the potential for leachate generation. The primary difference between composite and single impermeable layer caps is the number and type of low permeability components utilized. Composite impermeable layer caps typically include a combination, or more than one type, of impermeable layers incorporating low permeability soils, synthetic liners or both, while single impermeable layer caps incorporate either low permeability soil or a synthetic liner as the impermeable layer. In order to meet performance requirements, engineered caps are designed with multiple layers including; vegetative, drainage, low permeability and foundation layers. The low permeability layer is the most important component within the composite design. The vegetative drainage and foundation layers are designed to maintain the integrity of the low permeability layer.

Engineered cap options are designed with a composite impermeable layer or a single impermeable layer. Composite impermeable layer caps serve as the most advanced capping technology available for sealing off contamination from the aboveground environment and reducing the potential for leachate generation. The low permeability layers of a composite impermeable layer cap typically include a low permeability soil overlain by a synthetic liner. Single impermeable layer caps typically consist of a vegetative layer served by a topsoil layer, overlying a drainage layer, composed of coarse sand, and a low permeability layer incorporating a synthetic liner or a layer of low permeability soil. Natural materials required for the low permeability components of various caps are readily available and synthetic materials are widely manufactured and distributed. Although contaminants remain in-place, composite and single impermeable layer capping serves to seal contaminants from surface exposure that consequently reduces associated contaminant risks to human health.

Engineered Cap Screening Summary

The advantages of utilizing the engineered cap technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following;

Effectiveness: Engineered caps are extremely effective in isolating contaminants from the surface environment, thus reducing risks associated with human contact. Engineered caps are also extremely effective in reducing the precipitation and surface water infiltration, thus reducing the potential for leachate generation. Engineered caps typically have a design life of 20 years (single impermeable layer) to 50 years (composite impermeable layer). The impermeable layer materials (impermeable clay and/or synthetic liners) of engineered caps are compatible with the site specific contaminants.

Implementability: Engineered cap construction requires a modest working/mobilization space/area. Engineered cap construction may require only site specific building or construction permits.

The disadvantages associated with the effectiveness and implementability of the engineered cap technology include the following:

Effectiveness: Engineered caps represent the maximum type of containment technology, and as such there are no disadvantages regarding the effectiveness of engineered caps.

Implementability: Project specific engineered capping must meet detailed and complex design, construction, quality assurance criteria. An engineered cap requires routine operation, maintenance, and monitoring. The period of time required for design, construction and quality control tasks may be moderate to extensive.

The future use of areas that incorporate an engineered cap would need to be limited or include cap modifications, such that damage to the cap layers could be minimized.

4.3.2 Covers

The primary performance requirement of a cover is to prevent physical (open environment) contact with the waste being covered. Covers are an acceptable remedy when response objectives include the mitigation of exposure to contaminants via direct contact or ingestion. Additionally, covers may be applicable when a site is being temporarily covered, in an area where evapotranspiration far exceeds rainfall, there is little or no groundwater in contact with the contaminants, or when there is certainty that the integrity of a cover will be continually maintained. In specific instances where cap performance standards are not necessary, a cover may be constructed over an area of known contamination to reduce the potential for human contact with the contaminants as well as serve to divert surface water infiltration from the wastes of concern. The most typical covers are composed of concrete, bituminous asphalt, or clay materials.

Cover Screening Summary

The advantages of utilizing the cover technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following;

Effectiveness: Covers are an effective means in isolating subgrade contaminants from the surface environment, thus reducing the risks associated with human contact. Covers can provide some diversion of precipitation and surface waters away from waste media of concern.

Implementability: The types of monitoring, inspection, and maintenance for covers may be considered moderate or limited. Cover design/construction and quality assurance require criteria typically incorporated for typical fill placement and/or concrete/asphalt applications. The equipment required for cover construction is limited to that required for typical fill placement and/or concrete/asphalt applications. The boundary/working/mobilization area required for cover construction is modest-reasonable.

The disadvantages associated with the effectiveness and implementability of the cover technology include the following:

Effectiveness: A cover system is only slightly to moderately effective in reducing precipitation/ surface water infiltration to reduce the potential for leachate generation. The design life of an effective cover system varies on a site specific basis and is less than that of an engineered cap.

Implementability: Covers require consistent and periodic inspection/monitoring /maintenance. Future use over an area which incorporates a cover is very limited.

Cover Screening Conclusion

Since the risks associated with direct contact exposure to contaminated soils/ash media would be reduced to about equal degrees for the clay, concrete and bituminous asphalt cover, the clay cover has been selected as the primary cover technology to be incorporated for future remedial alternatives. As such, the concrete and asphalt covers have been screened out of future remedial considerations.

Horizontal Containment Screening Summary and Conclusions

The remedial action objectives for the site focus on reducing direct contact (and associated exposure risks) with contaminated media AND reducing precipitation/stormwater infiltration such that the potential for leachate generation is reduced. The following paragraphs summarize the effectiveness and implementability for engineered caps and covers:

Engineered caps are extremely effective in reducing precipitation and surface water infiltration (thus reducing the potential for leachate generation) and are extremely effective in isolating contaminants from the surface environment (thus reducing risks associated with human contact). The materials and equipment necessary for constructing an engineered cap are readily available. Engineered cap construction requires a modest working/mobilization space/area, however, it is anticipated that adequate working area exists at the subject site. Long-term operation, maintenance, and monitoring of an engineered cap will be necessary. Since the engineered cap technology can achieve the remedial action objectives for this site, with exceptional satisfactory effectiveness and implementability, the engineered cap technology will be retained for development into remedial alternatives.

A soil cover is implementible at the site utilizing readily available equipment and personnel. A properly graded soil cover is an effective means of isolating subgrade contaminants from the surface environment, reducing the potential for human contact, and serving to divert some of the precipitation/runoff surface waters away from wastes of concern. Since the cover technology can achieve the remedial action objectives for this site, with satisfactory effectiveness and implementability, the soil cover technology will be retained for further evaluation in the development into of remedial alternatives.

4.4 Vertical Containment - Subsurface Vertical Barriers and Groundwater Diversion

Vertical waste mass containment, groundwater and/or leachate diversion may be accomplished through the installation of subsurface vertical barriers and complimented through the installation of groundwater diversion technologies. Subsurface vertical barriers include various methods in which low permeability cut-off walls or diversions are installed below grade to contain, capture, or redirect groundwater flow in the vicinity of a site. Different types of subsurface barriers include: 1) slurry walls; 2) grout curtains; 3) steel or synthetic sheeting cut-off walls, and 4) Subsurface Diversion Trenches.

4.4.1 Slurry Walls

Slurry walls are one of the most common types of subsurface barrier. A slurry wall is a subsurface barrier that may be used to prevent the horizontal subsurface movement of leachate from a site, or to divert non-contaminated groundwater from migrating into the contaminated area. The term "slurry wall" applies to various barriers having a common trait, the characteristic being that they are all constructed in a vertical trench that is excavated under a slurry. The slurry, which is generally a mixture of bentonite clay and water, acts to hydraulically shore the trench to prevent its collapse.

Effectiveness: The slurry wall technology has been proven effective at numerous sites where groundwater diversion was required. Slurry walls are most effective in cases where a shallow groundwater table exists and where impermeable soil or bedrock is available for contact with the subsurface barrier wall. Although the shallow groundwater elevations at the site generally exist between 4 to 15 feet below grade, the local bedrock surface near the upgradient proximity of the landfill is estimated to exist at subsurface depths ranging from 0 to 25 feet below grade. Under these conditions, a slurry wall would be an effective measure for groundwater diversion at the site, a significant degree of labor and materials is typically required to complete installation.

Implementation: A slurry wall is technically feasible and implementable at the site. An advantage of the slurry wall is that this subsurface barrier type utilizes mostly conventional construction methods with equipment and personnel readily available.

4.4.2 Grout Curtains

A grout curtain functions in a similar manner to the slurry wall by providing a vertical barrier to divert groundwater flow around an area of concern, such as a fill area, and/or to prevent the flow of leachate from the site to the non-contaminated groundwater. A grout curtain is created by injecting a grout solution into the soil. The material fills the voids in the soil that minimizes the migration of leachate and/or groundwater. Grout materials include substances such as cement, bentonite, epoxy resins, lime, and fly ash. Soil grain size analysis is utilized to determine which grout material to use.

Effectiveness: Grouting is a well developed technology and is applicable to a wide variety of soil type. However, the generally low permeability of the soils in the vicinity of the site may inhibit the distribution of the grout and require closely spaced injection points.

Implementation: Installing a grout curtain is feasible at the site and site conditions appear suitable for such use. Grout curtains are also generally more difficult to implement than slurry walls because grout curtains utilize specialized equipment and personnel, the availability of which is less certain.

4.4.3 Sheet Piling Cut-Off Walls

Two types of sheet piling cut-off walls that may be applicable for use at the site include steel and polyethylene sheet piling. Sheet piling cut-off walls may be utilized to reduce the flow of groundwater under and through a specific waste mass. Sheet piling cut-off walls consist of lengths of sheet piling driven into the ground. The edges of individual sheet piles interlock with adjacent sheets to create the cut-off wall.

Effectiveness: Because of mill tolerances in the interlocking edges of steel sheet piles, a steel sheet pile wall is not likely to be watertight, but would slow down lateral groundwater flow. In addition, steel sheet piling material is subject to corrosion and consequently may not be an effective long-term option unless cathodic protection is utilized to potentially extend the life of the wall material. Polyethylene sheet piles consist of a high-density polyethylene (HDPE) membrane that is flexible, chemical resistant, and is not subject to corrosion. In addition, the interlocking pieces in polyethylene sheet piling are noted to create an effective watertight seal that creates an impermeable barrier against lateral contaminant migration below ground. These can also be bonded to various synthetic capping materials as part of an integrated containment system.

Implementation: Sheet piling cut-off walls are feasible at the site, however specialized equipment and personnel are required. The presence of glacial till, boulders, and/or weathered bedrock could make driving of sheet piles difficult or impossible and could result in damage to the pile or the interlocking joints that would reduce their effectiveness as a barrier.

4.4.4 Subsurface Collection Trenches

The collection trench would consist of a buried conduit to collect and convey, divert, or re-direct groundwater using gravity flow. Subsurface collection trenches create a continuous zone of influence in which water within that zone flows toward the drain. The components of the collection trench include: the drain pipe that collects and diverts groundwater away from the waste mass, the trench envelope that coveys flow from the groundwater to the drain pipe, a filter to prevent fine particles from clogging the system, manholes, and (in some cases) pumping stations to convey the water to remote or elevated location.

Effectiveness: Collection trenches are effective in collecting groundwater flow when appropriately placed and properly designed and constructed. They are most effective where the depth to a low permeability layer is shallow and the drain can be installed just above that barrier. Consistent with the location of glacial till and/or bedrock at shallow depths, conditions at the site can accommodate the installation of subsurface collection trenches.

Implementation: Effective subsurface collection trenches can be implemented at the site and constructed during engineered cap or cover construction using standard excavation equipment and piping and site conditions (working area and a shallow water table) appear to be favorable to the installation of such infrastructure. As such this technology is considered feasible for the subject site.

Conclusion: Subsurface collection trenches are an effective and feasible means of collecting surface and shallow subsurface groundwater flow proximate to the waste mass. Since the diversion of groundwater into the waste mass is important to achieving site-specific remedial action objectives, this technology will be retained for development into remedial alternatives.

4.4.5 Retaining Walls

Retaining walls are structures that confine earth, thereby stabilizing soil and rock from downward movement or erosion and providing support for vertical or near-vertical grade changes. Cofferdams and bulkheads, structures to confine water, are sometimes also considered retaining walls. Retaining walls are generally made of masonry, stone, concrete, steel or timber. Segmental retaining walls are generally preferred to cast-in-place concrete or treated-timber walls, as they are more economical, easier to install and environmentally friendly. The most important consideration in proper design and installation of retaining walls is that the retained material is attempting to move forward and downward due to gravity, thus creating a soil pressure behind the wall. This pressure is smallest at the top and increases toward the bottom and will ultimately push the wall forward or overturn if not properly addressed. Any groundwater behind the wall that is not dissipated by a drainage system causes additional hydraulic pressure on the wall. There are three common types of retaining structures: gravity, cantilevered and sheet piling walls.

Gravity walls are made from a large mass of stone, concrete or composite material. Gravity walls depend on the size and weight of the wall mass to resist horizontal pressures. Gravity walls often have a slight setback, or batter, to improve wall stability by leaning into the retained soil. For short landscaping walls, gravity walls made from dry-masonry stone or segmented concrete units (masonry units) are commonly used. Dry-masonry gravity walls are somewhat flexible and do not require a rigid footing below frost. Presently, taller retaining walls are increasingly built as composite gravity walls, i.e., geosynthetic or steel-reinforced backfill with pre-cast facing; gabions (stacked steel wire baskets filled with rocks), crib walls (cells built log cabin style from pre-cast concrete or timber and filled with soil) or soil-nailed walls (soil reinforced with steel and concrete). For reinforced-soil gravity walls, the soil reinforcement is layered horizontally throughout the height of the wall. Common soil reinforcement materials include steel straps and geogrid, a high-strength polymer mesh. The wall face is often of pre-cast, segmental concrete units that can tolerate some differential movement. The reinforced soil mass, along with the facing, becomes the gravity wall. The reinforced mass must be built large enough to withstand horizontal pressures.

Cantilevered walls are made from a relatively thin stem of steel-reinforced, cast-in-place concrete or masonry (often in the shape of an inverted T). These walls transfer loads to a footing converting horizontal pressures to vertical pressures on the ground below. Sometimes cantilevered walls are buttressed on the front, or include a counterfort on the back to improve stability against high loads. Buttresses are short wing walls at right angles to the main trend of the wall. These walls require rigid concrete footings below frost depth. This type of wall uses less material than a traditional gravity wall.

Sheet pile walls are often used in soft soils and tight spaces. Sheet pile walls are made of steel, vinyl, fiberglass or plastic sheet piles or timber planks driven into the ground. Structural design methods for this type of wall exist but these methods are more complex than for a gravity wall. As a rule of thumb; 1/3 third above ground, 2/3 below ground. Taller sheet pile walls usually require tieback anchor "dead-men" placed in the soil some distance behind the wall face. Anchors must be placed behind the potential failure plane in the soil, and proper drainage behind the wall is critical to the performance of retaining walls.

Effectiveness: Retaining walls can effectively stabilize soil, rock and upslope materials from downward movement or erosion and provide support for vertical or near-vertical grade changes. They are most effective when steep grades exist adjacent to surface water bodies, i.e., streams, rivers and lakes, when efforts such as soil relocation and re-grading adjacent to the waterways is impractical. Consistent with the location of black ash immediately adjacent to the Boquet River, it is anticipated that the use of retaining walls for this project would serve as an effective means to minimize erosion/transport of ash to the Boquet River.

Implementation: Although the retaining wall technology is somewhat difficult immediately adjacent to the Boquet River, engineering controls (i.e., cofferdams) can be utilized during wall construction to minimize ash transport to the river. The construction of retaining walls employs workers and equipment (excavators, cranes, rigging) that are readily available and utilized locally and regionally. Therefore, with appropriate engineering controls, the retaining wall technology is considered feasible for the subject site.

Vertical Containment (Subsurface Barriers) Screening Summary and Conclusions

The slurry wall or synthetic piling is expected to be more effective in diverting groundwater flow around the landfill than steel sheet piling or a grout curtain. The slurry wall may be implemented utilizing mostly conventional construction equipment, whereas synthetic sheet piling would require specialized equipment and personnel to construct, and may be difficult or impossible to install due to the presence of boulders in the glacial till. Therefore, the slurry wall technology will be retained for development into alternatives and the grout curtain and sheet piling will be screened out.

Since subsurface collection trenches are an effective groundwater diversion method and feasible at the site, this technology will be retained for development into remedial alternatives. Since the site is located immediately adjacent to the Boquet River and site-specific waste debris immediately borders the adjacent river and/or thin riverbanks, the retaining wall technology will be retained for future consideration to provide riverbank stabilization as a component for one or more site-specific remedial alternatives.

4.5 Disposal

The disposal process consists of excavating the contaminated soil from its current location and transporting it to an appropriate off-site facility for disposal. The contaminated material may be treated prior to disposal, or it may be disposed of (with restrictions) without being treated. Typically, standard earth moving equipment is used to excavate the contaminated material. The off-site facilities considered are a Solid Waste Disposal Facility, a RCRA Hazardous Waste Facility, or a TSCA Chemical Landfill. Any facility selected must be in full compliance with their respective operating permits.

The Solid Waste Disposal Facility would be a 6 NYCRR Part 360 Landfill. As such, it will be a secure landfill permitted to accept solid waste. Acceptance of waste from the site at such a facility would depend on the nature of the waste removed from the site. Other options for disposal locations are a RCRA or TSCA secure landfill. These two types are landfills are operated in accordance with the stricter of regulations than a 6NYCRR Part 360 landfill. Off-site disposal consists of the following general activities:

- Excavation of contaminated soils
- Placement of contaminated soils into containers or trucks
- Transportation to the designated disposal location

Excavation: Excavation would be completed using standard construction equipment such as backhoes, and front-end loaders. Stockpiling of soils would be limited as much as practical so as to minimize the number of times the waste is handled. If large open containers such as trailer bodies or roll off containers are used, soils could be loaded directly to avoid the need to stockpile.

Transportation: Transportation of contaminated soils would be completed by truck to the designated disposal location. Waste haulers would be licensed and in compliance with state and federal regulations applicable to waste transportation.

Effectiveness: Off-site disposal is an effective means to attain the remedial response objectives. Contaminated materials would be removed from their present open environment and river bordering location, to a secure, more controlled location. Potential impacts associated with waste removal will be limited to the immediate vicinity of the excavation area and may be easily controlled and monitored. Although an effective technology, off-site disposal is the least preferred alternative according to NYSDEC TAGM 4030.

Implementation: Although typically easy to implement for small to moderate waste media volumes, excavation and disposal of significant volumes of waste media is very difficult to implement. An additional consideration of the implementability evaluation is the potential environmental impact at the final disposal site. Consistent with the location of the site adjacent to the river environment, excavation of contaminated media proximate to the river would be complex. A significant degree of ambient air monitoring would be required during the implementation of contaminated media excavation. The contaminated media must be hauled by a licensed or permitted transport company and disposed at a permitted disposal facility subject to the approval by the State in which the facility is located.

Disposal Screening Summary and Conclusions

The three off-site disposal technologies (6NYCRR Part 360 Landfill, RCRA Landfill, and TSCA Landfill) are effective disposal methods, but are very difficult to implement due to the significant volume of waste media under consideration. As such, the excavation and disposal technology will not be retained for development into alternatives.

4.6 Immobilization Treatment

As previously discussed, immobilization treatment methods are designed to render contaminants insoluble, prevent leaching, and prevent the movement of the contaminants from the area of contamination. Physical and/or chemical processes act to stabilize and solidify the contaminants within a matrix, thus reducing their mobility. Types of immobilization technologies include: Solidification/Stabilization and *In Situ* Vitrification.

4.6.1 Solidification/Stabilization

The primary goal of solidification and stabilization processes is to reduce the solubility of contaminants to levels which will allow the material produced to be returned to its original location or disposed at an approved landfill off-site. The planned future use of the site on which the material is disposed is an important consideration for this process. Various solidification and stabilization treatment processes include: Portland cement; Lime-fly ash pozzolan; Thermoplastic micro-encapsulation; and Macro-encapsulation systems.

Screening

The advantages of utilizing solidification/stabilization technologies, with respect to an effective and feasible means of attaining the remedial action objectives, include the following:

Effectiveness: In the cement-based processes, metals in the soil are bound due to the high ph of binding materials. With the thermoplastic process, the mobility of metals and organic compounds may be limited since they are encapsulated within the solid matrix.

Implementation: Cement based solidification/stabilization processes use conventional equipment readily available. As compared to other immobilization technologies, the period of time required for implementation of the solidification/stabilization option is short term.

The disadvantages associated with the effectiveness and feasibility of the solidification/ stabilization processes include the following:

Effectiveness: Organic contaminants may interfere with the binding of a cement-based matrix. Organics in the soil are generally not stabilized in the solidified matrix since they do not take part in the reactions of the process. Gravelly soils may not be treatable by a cement-based process. Fine soil particles that pass a No. 200 sieve size (0.075 mm) tend to weaken cement bonds.

Implementation: Thermoplastic encapsulation requires specialized equipment not readily available. Energy is required to dry the soil prior to treatment in the thermoplastic encapsulation process. In general, the solidification/stabilization treatment technology is relatively new and may not be widely accepted. Implementation of this technology would be very difficulty to implement due to the significant volume of ash and contaminated soil media that would need to be excavated/treated and a significant working treatment/staging area would be needed to implement this technology.

4.6.2 *In Situ* Vitrification

In situ vitrification is an innovative technology that has had limited field applications. The process has been performed on over 30 different soil types and on a variety of contaminants. Destruction and removal efficiencies (DREs) for organics such as semi-volatile organics and PCBs have been reported to be greater than 99.99 percent. Existing equipment is capable of treating soil with a total organic content in the range of 5 to 10 percent by weight. This limitation is associated with off-gas equipment constraints. Although most inorganics are immobilized in the resultant glass-like material produced by *in situ* vitrification, some metals have the potential to volatilize at the temperatures which are achieved in the melt. Mobilization and installation of the equipment required for an *in situ* vitrification system requires approximately one week. In order to meet the permitting requirements for an *in situ* vitrification treatment system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation i.e., (water discharge and air emissions.)

Screening

The advantages of utilizing the *in situ* vitrification technology, with respect to an effective and feasible means of attaining the remedial action objectives, include the following:

Effectiveness: Destruction and removal efficiencies of greater than 99.99% are possible for organic materials. *In situ* vitrification forms a solid matrix that is very stable. Site-specific metal concentrations are less than 16 percent of the soil weight, and therefore the soil is treatable by this method.

Implementation: *In situ* vitrification treatment is completed for in-place contaminated soil/media and soil removal is not necessary to implement this technology.

The disadvantages associated with the effectiveness and implementability of the *in situ* vitrification process includes the following:

Effectiveness: Field applications of this technology have been very limited. Volatile metals (i.e., lead and mercury) present in the waste media will likely be volatilized in the process. The resulting vaporized metals may be difficult to treat with the air pollution control equipment.

Implementation: The equipment required for this system may not be readily available. Treatment by *in situ* vitrification may be difficult to implement and permit. An extended period of time to treat the entire site may be required.

Immobilization Treatment Screening Summary and Conclusions

Although solidification/stabilization and *in situ* vitrification treatment technologies are effective methods of treating the contaminated media/soil at the site, several implementability factors tend to deter the recommendation for their use. It may be more difficult to permit these technologies with regulatory agencies because of the level of environmental invasion required (as compared with other less invasive technologies) and because of the limited number of field applications that have taken place. More importantly, these technologies would be very difficulty to implement due to the significant volume of ash and contaminated soil media that would need to be excavated and treated. In addition, to treat the entire site using these methods would be time extensive and probably not economical. Accordingly, the above listed solidification/stabilization and *in situ* vitrification technologies have been screened out from further consideration.

4.7 Physical/Chemical Treatment

As discussed previously, physical treatment processes act to separate the waste stream by either applying a physical force or by changing the physical form of the waste. Chemical treatment processes act to alter the chemical structure of the contaminants in order to produce a waste residue that is less hazardous than the original contaminated material. Processes that utilize physical and chemical treatment include: Soil Washing, *In Situ* Soil Flushing, and Low Temperature Thermal Stripping. Although de-chlorination is a type of chemical remediation technology, this method is not effective in removing heavy metals or poly-aromatic hydrocarbons from contaminated soil.

4.7.1 *Ex Situ* Soil Washing

Soil washing is primarily a volume reduction process that does not reduce the toxicity of the contaminant, but removes the contaminant from the soil and concentrates it into a washing agent that is more easily treated than soil. With water washing, a strong basic or surfactant solution is effective in extracting organics, while a strong acidic or chelating agent solution is effective in extracting metals. Both hydrophobic organics (organics which have an aversion for water) and hydrophilic organics (organics having an affinity for water) are treatable with water washing. Solvent extraction with organic solvents may be used to clean soils contaminated with high concentrations of non-volatile hydrophobic organics. Hydrophilic organics may be removed by the solvent extraction process, but are most effectively removed by water washing. Soil washing has the potential to treat contaminants such as heavy metals, aromatics, polychlorinated biphenyls (PCBs), and chlorinated phenols. Factors that can limit the effectiveness of soil washing include: media with significant clay or humus content and complex waste mixtures.

Mobilization and installation of a soil washing system is site specific. If a portable unit is used, set up time may range approximately 1 week, for a small unit, to 2 months for a large skid-mounted system. Soil washing treatment systems vary both in design and size. Portable models of the system, mounted on 40 ft trailer beds, have been developed. Portable units may generally process a few tons of contaminated soil per hour, while large commercial units are capable of processing greater than 10 tons of contaminated soil per hour. In order to meet the permitting requirements for soil washing system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., water discharge, air emissions, backfilling treated soil).

Screening

The advantages of utilizing the soil washing technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness: The process can effectively treat (remove) elevated heavy metals concentrations from contaminated solid media.

Implementation: The soil washing process is relatively simple, using readily available equipment and materials. As compared with other physical/chemical treatment technologies the period of time required for implementation of the soil washing process option is short term.

The disadvantages associated with the effectiveness and implementability of the soil washing process include the following:

Effectiveness: The process is primarily a volume reduction process where contaminants are transferred from the soil to the washing media. It may be difficult to formulate a washing fluid that will be effective in washing heavy metals from both contaminated black ash and adjacent contaminated soil at the same time.

Implementation: A great deal of equipment and area for treatment may be required. Of particular difficulty, implementation of this technology would require the excavation and treatment of a significant volume of ash and contaminated soil media. The complex contaminant characteristics of the ash media and contaminated soil may require additional steps to implement treatment. The washing media must be treated or disposed.

4.7.2 *In Situ* Soil Flushing

In situ soil flushing has remained in the experimental stages, mainly due to the fact that regulatory agencies are reluctant to recommend processes that involve injecting or flushing chemical additives into the groundwater. In addition, there have been difficulties in the treatment of the extracted wastewater, with separating surfactants from petroleum products flushed from the soil. Consequently, surfactants used for treating contaminated soils may not be recyclable. *In situ* soil flushing may be utilized to treat soil/solid media contaminated with heavy metals, depending on the type of leaching additives used. This process is most applicable when contamination has extended to the groundwater table, and is of sufficient volume or depth to exclude an alternative *ex situ* soil washing method. Factors which dictate which system, either forced or gravity delivery, is appropriate for a site include: the extent and nature of the contaminated soil, soil characteristics, such as porosity, permeability, stratigraphy, sorption potential, mineralogy and soil type(s), surface drainage patterns and surface infiltration rates; and groundwater elevations and flow directions. Pilot studies of the *in situ* soil flushing process have been shown to be most effective on soils contaminated with only a few different chemicals, particularly petroleum hydrocarbons. For soils containing a complex mixture of contaminant types, the effectiveness of treatment may be limited and pretreatment or post-treatment may be necessary to attain the desired results. Mobilization and installation of an *in situ* soil flushing system may take approximately 1 to 2 months. In order to meet the permitting requirements for an *in situ* soil flushing system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., water discharge and air emissions)

Screening

The advantages of utilizing the *in situ* soil flushing technology, with respect to an effective and feasible means of attaining the remedial action objectives, include the following:

Effectiveness: The process can be used to treat soils contaminated waste media/soil that exhibit both elevated metals and organic compound concentrations.

Implementation: Soil is not excavated from the site, and manpower requirements are minimal.

The disadvantages associated with the effectiveness and implementability of the *in situ* soil flushing process includes the following:

Effectiveness: It is necessary to use the groundwater to retrieve washing agents that have leached through the waste media and adjacent contaminated soil.

The method is not widely accepted because of the potential of washing agents lingering in the soil matrix, some of which can be considered to be hazardous chemicals. Pretreatment and post-treatment of the soil may be necessary.

It is necessary to have a well-defined groundwater flow pattern to ensure proper treatment of the soil and removal of the contaminants and washing agents.

Implementation: The complex characteristics of the waste media and adjacent contaminated soil may require additional treatment steps. The groundwater extracted from the recovery wells must be treated or disposed. As compared with other physical/chemical treatment technologies, the period of time required for implementation of the *in situ* soil flushing process may be extensive.

4.7.3 Low Temperature Thermal Stripping

Low temperature thermal stripping does not destroy contaminants, but are transfers the contaminants from one waste stream to another. The process is applicable to volatile organics. The different low temperature thermal stripping technologies are most effective in treating soils contaminated with lighter petroleum hydrocarbons. Removal efficiencies for low temperature thermal treatment systems range from 55 percent to 99 percent. Some processes are effective only for highly volatile organics. Low temperature thermal stripping requires relatively expensive and specialized equipment. Therefore, there are a limited number of remediation contractors that have the equipment for this process.

Screening

Although feasible, low temperature thermal stripping is most applicable for elevated volatile organic compound contaminants, and only partially effective in the treatment of heavier semi-volatile organic compounds. The disadvantages associated with the effectiveness and implementability of the low temperature thermal stripping process include the following:

Effectiveness: Low temperature thermal stripping is not an effective method to treat heavy metal contaminated soil media. Mercury and lead (volatile metals) in the contaminated solids will tend to have a negative impact on the system.

Implementation: Excavation of the soil is required and as such this technology would require a large area for setup. The equipment needed to implement Low Temperature Thermal Stripping may not be readily available.

Physical/Chemical Treatment Technology Screening Summary and Conclusions

Although *ex situ* soil washing is a potential method of treating the contaminated media/soil at the site, this technology would be very difficulty to implement due to the significant volume of ash and contaminated soil media that would need to be excavated and treated. Accordingly, *ex situ* soil washing has been screened out from further consideration. The *in* *situ* soil flushing process option is screened out of the list of possible treatment technology process options. The shallow depth of the contaminants in relation to the groundwater depth and the uncertainty of collecting the washing agent make this process option undesirable.

Low temperature thermal stripping does not appear to be effective in treating heavy metal contaminated solid media. The low temperature thermal stripping process does not appear to be an effective method for treating the metal contaminants present at the site and is therefore screened out. Accordingly, all of the above listed physical treatment technologies have been screened out from further consideration.

4.8 Biological Treatment

As previously discussed, bioremediation utilizes indigenous or cultured microorganisms to mediate the degradation of contaminants in soil. Biological treatment involves altering environmental conditions to enhance the growth of microorganisms and the breakdown of contaminants. Creating the proper environment is essential in the bioremediation process. Pilot studies are necessary factors for determining the indigenous microorganisms available in the soil, the primary controls needed to create the proper environment for optimal growth of the microorganisms, the treatment process to be used, and by-products that will be generated by the process. The study is also necessary to determine if the concentrations of any of the contaminants in the soil are such that they will inhibit the growth of the microorganisms. Overall, bioremediation options are becoming a more and more popular option to treating contaminated soils, primarily because, that it is a natural remediation process that can be very cost-effective to implement. However, conditions existing at the site make bio-treatment treatment difficult to implement and not effective. The most common types of biological treatment technologies include: Land Farming, Slurry Phase Bioremediation, Composting, and *In Situ* Bioremediation.

In general, although each of these four technologies have been found to be effective for the treatment of soils/solid media contaminated with volatile organic compounds, semi-volatile organic compounds, and petroleum hydrocarbons, these technologies are not effective in the treatment of heavy metal contaminated media. More specifically, the presence of heavy metals in the contaminated soil/media often limit the effectiveness of this process to treat organic contaminants, because heavy metals can inhibit bacterial growth if the respective metal concentrations in the soil are significantly elevated. In addition, the effectiveness of biological treatment technologies depends upon optimum weather conditions, including temperature and precipitation, and requires an extended period of time to attain contaminant reduction. Because of the above listed disadvantage reasons, biological treatment technologies do not appear to be a viable remediation method for treating the contaminated media/soil at the subject site and all biological treatment technologies have been screened out from further consideration.

4.9 Thermal Treatment

As previously discussed, thermal treatment technologies utilize high temperatures as the primary means of detoxifying contaminated materials. Incineration oxidizes primarily organic compounds under controlled high temperatures, with end products of carbon dioxide and water.

By-products such as acids, salts and metallic compounds will be produced from incinerating waste materials containing inorganic substances. The key variables with an incineration process include temperature, the duration of exposure of the contaminants to the high temperatures, and the degree of mixing between the waste and the combustion air. If an incineration process is correctly calibrated, destruction and organic compound removal efficiencies (DREs) of greater than 99.99 percent may be achieved. The most common types of thermal treatment technologies include: rotary kiln incineration, fluidized bed incineration, and infrared incineration.

In general, although each of the three thermal treatment technologies have been found to be effective for the treatment of soils/solid media contaminated with volatile organic compounds, semi-volatile organic compounds, and petroleum hydrocarbons, these technologies are not effective in the treatment of heavy metal contaminated media. More specifically, elevated metals concentrations can be detrimental to the effectiveness of this process to treat organic contaminants. Volatile metals that may be present in the contaminated solid media can also have a negative impact on the incinerator air emission equipment. Because of the above listed disadvantage reasons, thermal treatment technologies do not appear to be a viable remediation method for treating the contaminated media/soil at the subject site and all thermal treatment technologies have been screened out from further consideration.

SECTION 5: DETAILED ANALYSIS OF ALTERNATIVES

The purpose of this detailed analysis of alternatives is to analyze and present relevant information to select a site remedial alternative. The methodology utilized herein is in accordance with the Revised May 15, 1990 Technical and Administrative Guidance Memorandum (TAGM) HWR-90-4030 for the Selection of Remedial Actions at Inactive Hazardous Waste Sites. The detailed analysis of alternatives follows the development of alternatives. The evaluations conducted herein build on the evaluations completed in previous sections. The results of the detailed analysis serve to document the evaluation of alternatives and provide the basis and rationale for a remedy selection. The basis for a remedy selection is that the selected alternative must meet the following criteria:

- Protect human health and the environment;
- Attain New York State Standards, Criteria and Guidelines (SCGs);
- Satisfy the preference for treatment as a principal element that significantly and permanently reduces toxicity, mobility, or volume of hazardous wastes;
- Prove cost-effective.

5.1 Evaluation Criteria

Seven evaluation criteria have been developed to address the requirements and considerations listed above. These seven evaluation criteria listed below encompass technical, cost, and institutional considerations in addition to compliance with specific statutory requirements. These evaluation criteria serve as the basis for conducting the detailed analyses and for subsequently selecting an appropriate remedial action. The evaluation criteria are:

1. Compliance with SCGs;
2. Short-term impacts and effectiveness;
3. Long-term effectiveness and performance;
4. Reduction of toxicity, mobility, or volume;
5. Implementability;
6. Overall protection of human health and the environment; and
7. Cost.

The level of detail necessary to analyze each alternative against these evaluation criteria has been based on the type of technologies and alternatives being evaluated considering the complexity of the site and other project-specific considerations. The analysis has been conducted in sufficient detail such that decision-makers can understand the significant aspects of each alternative and the uncertainties associated with their evaluation.

Each of the seven (7) evaluation criteria has been further divided into specific factors to allow a thorough analysis of the alternatives. These factors are shown in tables at the end of each detailed analysis. The purpose of these tables is to provide a numerical basis to evaluate each alternative with respect to the listed factors. The weight for each factor and criteria is also noted in the tables. The following is a description of each criterion.

(i) Compliance with Applicable New York State SCGs (Relative Weight = 10)

Remedial actions taken at listed hazardous waste sites must comply with New York State environmental SCGs. For purposes of evaluation, SCGs are divided into three (3) categories: (1) Action Specific, (2) Chemical Specific, and (3) Location Specific. Action specific SCGs are usually activity based requirements or limitations on actions taken. These requirements generally set performance or design standards for specific remedial activities such as closure requirements. Chemical specific SCGs are usually risk based or health based numerical limitations that, when applied to the specific site conditions, result in the establishment of acceptable concentrations of a chemical that may be found in, or discharged to, the environment. Location specific SCGs are usually restrictions placed on the conduct of activities because they occur in special locations. These requirements relate to the location of the site and may place limitations on the remedial action or place additional constraints on the remedy. The final determination of which requirements are applicable or relevant and appropriate will be made by NYSDEC. If an alternative complies with all SCGs, it has been assigned a full score of 10. If an alternative complies with none of the above-mentioned four specific aspects of the SCGs, it has received a score of 0. Definitions of each SCG and the associated requirements are provided in Appendix A.

(ii) Short-term Impacts and Effectiveness (Relative Weight = 10)

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial response objectives are met. Under this criterion, alternatives have been evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The following factors of this analysis criterion are addressed for each alternative.

(a) Protection of the community during remedial actions - This aspect of short-term effectiveness addresses any risk that results from implementation of the proposed remedial action.

(b) Environmental impacts - This factor addresses the potential adverse environmental impacts that may result from the implementation of an alternative and evaluates how effective available mitigation measures would be in preventing or reducing the impacts.

(c) Time until remedial response objectives are achieved - This factor includes an estimate of time required to achieve protection for either the entire site or individual elements associated with specific site areas or threats.

(d) Protection of workers during remedial actions - This factor assesses threats that may be posed to workers and the effectiveness and reliability of protective measures that could be taken.

(iii) Long-Term Effectiveness and Performance (Relative Weight = 15)
This evaluation criterion addresses the results of a remedial action in terms of its performance and quantity/nature of waste or residual remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the waste or residual remaining at the site and operation and maintenance necessary for the remedy to remain effective. The following components of this criterion may be addressed for each alternative:

(a) Remedial Permanence
Permanence of the remedial alternative.

(b) Quantity and Nature of Wastes Remaining On-Site After Remediation
The potential remaining risk may be expressed quantitatively such as by cancer risk levels, or margins of safety over NOELs (No Observed Effect Level) for non-carcinogenic effects, or by the volume or concentration of contaminants in waste, media or treatment residuals remaining at the site.

(c) Long Term Reliability and Adequacy of Remedy
This factor assesses the adequacy and suitability of control, if any, that are used to manage treatment residuals or untreated wastes that remain at the site. It includes an assessment of containment systems and institutional controls to determine if they are sufficient to ensure that any exposure to human and environmental receptors is within protective levels.

(d) Long Term Monitoring/Maintenance
This factor assesses the long-term reliability of management controls for providing continued protection.

(iv) Reduction of Toxicity, Mobility and Volume (Relative Weight = 15)
This evaluation criterion assesses the remedial alternative's use of treatment as a principal

element that permanently and significantly reduces the toxicity, mobility, or volume of the hazardous wastes present. This evaluation focuses on the following specific factors for a particular remedial alternative:

(a) Volume of Waste Reduction
Amount of hazardous materials that will be destroyed or treated, including how the principal threat(s) will be addressed.

(b) Degree of Expected Waste Reduction
Degree of expected reduction in toxicity, mobility, or volume measured as a percentage of reduction (or order of magnitude); type and quantity of treatment residuals that will remain following treatment.

(c) Irreversibility of the Remedy
Describes the degree to which the treatment will be irreversible.

(v) Implementability (Relative Weight = 15)
The implementability criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. This criterion involves analysis of the following factors:

(a) Technical Feasibility

- Construction and operation - This relates to the technical difficulties and unknowns associated with the ability to construct the alternative.

- Reliability of technology - This focuses on the ability of a technology to meet specified process efficiencies or performance goals and the likelihood that technical problems will lead to schedule delays.

- Ease of undertaking additional remedial action - This includes a discussion of what, if any, future remedial actions may need to be undertaken and how difficult it would be to implement such additional actions.

- Monitoring considerations - This addresses the ability to monitor the effectiveness of the remedy.

(b) Administrative Feasibility
This criterion addresses the extent of coordination with other agencies.

(c) Availability of Personnel and Materials
Availability of adequate off-site treatment, storage capacity, disposal services, necessary equipment, specialists and skilled operators, plus the potential for obtaining competitive bids, which may be particularly important for alternative remedial technologies.

Of the total weight of 15, the technical feasibility shall receive a maximum score of 10 while administrative feasibility and availability of services and materials shall be assigned a combined maximum score of 5.

(vi) Protection of Human Health and the Environment (Relative Weight =20)
This evaluation criterion provides a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under other evaluation criteria, especially long-term effectiveness and performance, short-term effectiveness, and compliance with SCGs. Evaluation of the overall protectiveness of an alternative during the remedial alternative evaluation focuses on how a specific alternative achieves protection over time and how site risks are reduced.

(vii) Cost (Relative Weight = 15)
The application of cost estimates to evaluation of alternatives is discussed in the following paragraphs.

(1) Capital Costs: Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor and materials necessary to install remedial actions. Indirect costs include expenditures for engineering and other services that are not part of actual installation activities but are required to complete the installation of remedial alternatives.

(2) Operation and Maintenance Costs. Annual costs such as post-construction costs necessary to maintain the continued effectiveness of the remedial action are considered.

(3) Future Capital Costs: The costs of potential future remedial actions are included if there is a reasonable expectation that a major component of the remedial alternative will fail and require replacement to prevent significant exposure of contaminants.

The alternative with the lowest present worth shall be assigned the highest score of 15. The alternative with the highest present worth shall be assigned the lowest score of 0. Other alternatives shall be assigned the cost score similarly proportional to their present worth.

5.2 Individual Analysis of Alternatives

The analysis of individual alternatives against the seven (7) criteria is presented in this section as a narrative discussion accompanied by a numerical summary table. This information will be used to compare the alternatives and support a subsequent analysis of the alternatives by the NYSDEC during their remedy selection process. The narrative discussion for each alternative provides a description of the alternative and an assessment of the alternative based on each of the seven (7) criteria.

5.2.1 Alternative 1 - No Action

The No-Action Alternative (Alternative 1), which consists of maintaining the current conditions at the site, will be evaluated as a means of comparison with the Action Alternatives. The Development of

Alternatives section will focus on the areas and volumes for alternative consideration and alternative process descriptions. The no action alternative does not comply with the SCGs listed in Appendix A.

5.2.2 Alternative 2 - Limited Actions

Alternative 2 consists of implementing the limited action items. The limited action items consist of constructing a perimeter fence around the Black Ash Pond, posting warning signs, implementing property use/deed restrictions, conducting groundwater and/or leachate monitoring, and conducting a review of the site every five (5) years to evaluate current conditions.

(i) Compliance with Applicable or Relevant and Appropriate New York State SCGs

The remedial action implemented at the site must comply with New York State environmental SCGs. The SCGs pertaining to this alternative are summarized in Appendix B. Although limited actions would serve to minimize or reduce human contact with the black ash, this alternative will not likely serve to minimize environmental (and subsequent human) impacts resulting from the erosion (wind, rain, storm water) of all the waste media. Accordingly, it is unlikely that the limited action alternative will comply with all of the SCGs listed.

(ii) Short Term Effectiveness

(a) Protection of Community During Remedial Action

The Limited Action alternative incorporates only the completion of minor remedial activities and institution of deed restrictions. The only activity of an intrusive nature is the construction of the perimeter fence. It is not anticipated that this activity would increase the potential for exposure or impact the community during implementation. There are no short-term risks to the community attributable to implementation of this remedial action.

(b) Environmental Impacts During Remedial Action

The Limited Action alternative incorporates the completion of minor remedial activities and institution of deed restrictions. The only activity of an intrusive nature is the construction of the perimeter fence. However, this construction would be conducted outside the limits of waste, and it is not anticipated to have any impact on the environment as it would not disturb or release contaminants during implementation.

(c) Timetable for Achieving Remedial Objectives

Under the limited action alternative, the remedial action objectives are not achieved because this alternative does not prevent direct contact with black ash waste media, or minimize infiltration and resulting contaminant leaching to groundwater, or control surface water runoff and erosion.

(d) Protection of Workers During Remedial Actions

A project specific Remedial Action Health and Safety Plan will be prepared by a Certified Industrial Hygienist prior to the initiation of remedial activities. Contractors or other workers that enter the site and perform remedial activities shall demonstrate compliance with 29 CFR 1910.120. A project health and safety officer will be present on-site while activities are being conducted to evaluate compliance with the project Health and Safety Plan.

(iii) Long Term Effectiveness and Permanence

(a) Remedial Permanence
The NYSDEC, through TAGM 4030, considers only on-site/off-site destruction, or separation/treatment, or solidification/chemical fixation (of inorganics) as permanent remedies. As such, the limited action alternative is not considered a permanent remedy as that term is defined in the TAGM.

(b) Quantity and Nature of Wastes Remaining On-Site After Remediation
The quantity and nature of waste remaining on-site is not affected by implementing the limited action alternative. As such, the quantity of waste present may be considered to be the entire Black Ash Pond.

(c) Long Term Reliability and Adequacy of Remedy
The intent of the limited action alternative is to consider the minimal actions that may be undertaken to reduce the potential for exposure to trespassers and monitor environmental conditions. Institution of deed restrictions and the installation of perimeter fencing and signs are reliable to warn trespassers and deter their entrance to the area. With proper maintenance of the fence and signs, the limited action alternative is a reliable measure. Additionally, the monitoring activities are very reliable to detect and track contamination from the Black Ash Pond. However, erosion of the existing cover and stream banks along the Boquet River is likely to occur with the continued occurrence of leachate seeps and the potential of exposure of black ash waste material.

(d) Long Term Monitoring/Maintenance
Long term monitoring and maintenance is required under Alternative 2. It is anticipated to be necessary to monitor the Black Ash Pond site and conduct maintenance of the fence and signs for over 30 years.

(iv) Reduction of Mobility, Toxicity or Volume

(a) Volume of Waste Reduction
Under Alternative 2, treatment is not used to reduce the volume or toxicity of waste at the site.

(b) Degree of Expected Waste Reduction
Under Alternative 2, the mobility of the waste is not reduced.

(c) Irreversibility of the Remedy
This alternative does not include specific actions that address the waste present at the site. Therefore this criterion is not applicable for analysis.

(v) Implementation

(a) Technical Feasibility

Institution of deed restriction, installation of perimeter fencing, and conducting monitoring activities are easily implemented and technically feasible utilizing conventional equipment and services.

(b) Administrative Feasibility

If this alternative is accepted as the remedial action, administrative problems are not anticipated. For the limited action alternative, a minimal degree of administrative preparation efforts (related to instituting deed restrictions) and communication will be necessary.

(c) Availability of Personnel and Materials

Legal and construction personnel capable of performing the tasks associated with the limited action alternative components are readily available and minimal technical specialists will be required. More than one vendor is expected to be available for the completion of the associated construction efforts. The materials required to complete the components of this alternative are available locally.

(vi) Protection of Human Health and the Environment

(a) Future Site Use

Under Alternative 2, it will be necessary to restrict future uses of the site. It is not appropriate to allow for unlimited use as potential exposure would exist if individuals were allowed on the site. Additionally, if there is planned a physical alteration or construction activities constituting a substantial change of use of the site, written notice thereof will be given in accordance with 6 NYCRR Part 375-1.6.

(b) Protection of Human Health After Remediation

Although implementation of the limited action items will reduce the potential for direct contact with the waste material at the site by restricting access and site use, the open black ash material and/or existing thin soil cover (in some areas) and stream banks may be prone to wind and storm water runoff erosion and future leachate outbreaks. More importantly, precipitation may continue to infiltrate into the waste, increasing the potential for future impacts to groundwater, surface water and sediment.

(c) Magnitude of Risks After Remediation

Under the limited action alternative, trespassers may disregard the warning signs and trespass on the site. Trespassers may be exposed to risks including exposure to leachate, fugitive dust emissions, or partially buried waste debris. Thus, the potential magnitude of risks remaining after implementation of Alternative 2 Limited Actions, would not be significantly different from existing conditions. Although the potential for trespassing will always exist, construction of a perimeter (industrial) fence, as part of the limited actions, would restrict site access and reduce both the number of potential risk exposure occurrences as well as the degree or magnitude of direct exposure to the risks previously listed. Considering neighboring site residences and routine passers-by, it is generally expected that the openness and rural setting of the site would lend to quick dispersion of ash dust emissions, which as indicated by the results of the Site Investigation, consist primarily of heavy metal ash particulates. Under the scenario of a secured site, the magnitude of risks to ash dust emissions after remediation would be considered minimal to moderate. As previously noted, however, since the open ash media stream banks, and/or soil cover would be prone to storm water runoff erosion and future leachate outbreaks, precipitation will continue to infiltrate into the waste, increasing the potential for future impacts to groundwater, river surface water and sediment.

(vii) Cost

The estimated cost of Alternative 2 is contained in the following table.

Alternative 2: Limited Actions

Item	Units	Unit Price	Estimated Quantity	Estimated Cost
1. Deed Restrictions	Estimate			$5,000
2. Fence and Signs				
6-foot Chain Link Fence	LF	$15	4,200	$63,000
20-foot Roller Gate	Ea.	$2,500	2	$5,000
10-foot Swinging Gate	Ea.	$1,500	2	$3,000
Signs	Ea.	$75	10	$750
Subtotal				$76,750
3. Monitoring & Maintenance (Annually)Annual Media Sampling				
Sampling Effort				$2,000
Sample Analysis (TCL Parameters)	Ea.	$700	7	$4,900
Engineering/Reporting	Yr.	$6,000	1	$6,000
Subtotal (annual cost)				$12,900
Item 3 Present Worth (8%, 30-years, 11.2578)				$145,230
Total Alternative 2 Present Worth Costs				**$221,980**

5.2.3 Alternative 3 – Clay Soil Cover (Including Waste Consolidation, Grading, Surface Controls) and Limited Action Items

Alternative 3 includes covering the Black Ash Pond with a layer (18-inches) of general fill and/or soil (preferably with a high clay content). As part of this alternative, tasks including waste consolidation (excavation of ash from the riverbank and ANC property), site grading, grubbing of miscellaneous vegetation, construction of diversion berms and lined drainage ways, and re-vegetating the new soil cover will be considered inherent Alternative 3 tasks. The primary purpose of this alternative is to isolate the black ash waste media from the surface environment. Secondary benefits of this alternative include minimizing erosion of the ash, re-directing surface runoff over and around the waste mass, and minimizing ash contact/transport to the river environment.

Additionally, a host of limited action items (signage, perimeter fencing, and deed restrictions) will be implemented as part of this alternative to help maintain the integrity of the soil cover by restricting access.

(i) Compliance with Applicable or Relevant and Appropriate New York SCG
The remedial action implemented at the site must comply with New York State SCGs. The SCGs pertaining to this alternative are summarized in Appendix B. From review of the SCGs for this project, it appears that Alternative 3 will comply with the SCGs listed.

(ii) Short Term Effectiveness

(a) Protection of Community During Remedial Action
For the soil cover alternative, on-site remedial tasks will include grubbing of some native trees, the consolidation of black ash (from the ANC property and exterior/periphery locations), grading of the black ash and soil cover and the completion of the limited action items. Although residential and commercial properties are located some distance from the Black Ash Pond, increased dust and noise associated with construction traffic could impact neighbors. Traffic control will be implemented during construction activities to maintain safety. The grading activities will result in the disturbance of soils that may create airborne particulates. To suppress the potential for airborne particulate migration, dust control measures such as water application may be utilized to maintain satisfactory moisture content within surface ash/soils, thus minimizing airborne dust transport. Periodic air testing will be performed to monitor air quality during remedial activities.

(b) Environmental Impacts During Remedial Action
During grading and soil cover placement, there is increased potential for exposure to ash waste and runoff to the surrounding area, this potential impact may be reduced by minimizing surface excavation and applying fill material to obtain necessary slope and grade. This potential impact is not considered significant and may be managed utilizing engineering controls. Engineering controls will be consistent with a Storm Water Pollution Prevention Plan developed for the site during design. The plan will include a description of the appropriate erosion and sediment control measures that will be implemented based on the sequence of anticipated activities that may disturb soils over most of the site area. Furthermore, since it is anticipated that there will be common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary sediment basin may be constructed.

(c) Timetable for Achieving Remedial Objectives
Although grading the site and applying a soil cover and drainage features would reduce direct contact with the ash and help control and manage surface waters, this alternative would only slightly reduce the percolation of surface water through the ash and is not consistent with minimizing infiltration and resulting contaminant leaching to groundwater. Therefore, this alternative will not achieve the remedial objectives in a reasonable time frame.

(d) Protection of Workers During Remedial Actions

As part of this alternative, a project specific Remedial Action Health and Safety Plan will be prepared by a Certified Industrial Hygienist prior to the initiation of remedial activities. Contractors or other workers that enter the site and perform remedial activities shall demonstrate compliance with 29 CFR 1910.120. A project health and safety officer will be present on-site while activities are being conducted to evaluate compliance with the project Health and Safety Plan. Potential risks to workers through potential inhalation or direct contact during grading activities exist. Proper dust control and other health and safety measures such as utilizing personal protective equipment will be implemented consistent with the Health and Safety Plan.

(iii) Long Term Effectiveness and Permanence

(a) Remedial Permanence

The NYSDEC, through TAGM 4030, considers only on-site/off-site destruction, or separation/treatment, or solidification/chemical fixation (of inorganics) as permanent remedies. Therefore, the soil cover alternative is not considered a permanent remedy as by the TAGM.

(b) Quantity and Nature of Wastes Remaining On-Site After Remediation

The quantity and nature of waste remaining on-site is not affected by implementing the limited action alternative. Thus, the quantity of waste present may be considered to be the entire mass of ash waste media.

(c) Long Term Reliability and Adequacy of Remedy

For the soil cover alternative to remain reliable and adequate for the purpose intended, it is necessary to conduct proper long term monitoring and maintenance of the soil cover. Additionally, with proper maintenance of the limited action items, this alternative is a reliable measure to reduce the potential for exposure to the landfill contents.

(d) Long Term Monitoring/Maintenance

Long term monitoring and maintenance is required under Alternative 3. It is anticipated that it will be necessary to monitor the site and conduct maintenance activities for at least thirty (30) years.

(iv) Reduction of Mobility, Toxicity or Volume

(a) Volume of Waste Reduction

Under Alternative 3, treatment is not used to reduce the volume or toxicity of waste at the site.

(b) Degree of Expected Waste Reduction

Under Alternative 3, the mobility of the waste is reduced slightly. This reduction of mobility is associated with application of a soil cover and associated grading anticipated to increase the surface runoff to a small degree thereby reducing the amount of ash waste related leachate generated. Overall, it is expected that Alternative 3 would only slightly reduce the mobility of ash related wastes.

(c) Irreversibility of the Remedy
This remedial action is reversible to the extent that if the soil cover is not properly maintained, then site conditions are likely to revert back to near pre-remediation conditions.

(v) Implementation

(a) Technical Feasibility
Constructing the soil cover and conducting the limited action items is technically feasible. Implementation of this alternative uses conventional construction equipment or other services for the construction of the soil cover and limited action items.

(b) Administrative Feasibility
If this alternative is accepted as the remedial action, administrative problems are not anticipated. Under this alternative, all activities of the remedial action will take place on the site. Therefore, consistent with TAGM 4040 and 6 NYCRR Part 375-1.7, NYSDEC and local permits will not be required. However, depending on the source of off-site soils for the cover, it may be necessary to obtain a mining permit. A certain degree of administrative communication including the completion of status reports and annual monitoring reports may be necessary.

(c) Availability of Personnel and Materials
Personnel capable of performing the tasks associated with constructing the soil cover are readily available and minimal technical specialists will be required. Also, the materials and services necessary for the limited action items are readily available locally. More than one vendor is available.

(vi) Protection of Human Health and the Environment

(a) Future Site Use
It will be necessary to significantly limit future use of the site in such a manner to maintain the integrity of the soil cover. The nature of these limitations will be described in covenants on the deed which would restrict property use for as long as necessary. Additionally, if there is planned a physical alteration or construction activities constituting a substantial change of use of the site, written notice will be given in accordance with 6 NYCRR Part 375-1.6.

(b) Protection of Human Health After Remediation
The completion of this remedial action provides a significant level of human health protection. In general, as defined in the risk assessment section of SI Report, the exposure pathways that were functional and complete for humans included dermal exposure to ash, dermal exposure to leachate seeps, and inhalation of ash dusts. Implementation of a soil cover removes the dermal exposure pathway and reduces the associated potential risks for contact with ash related leachate seeps.

(c) Magnitude of Risks After Remediation

The construction of a perimeter (industrial) fence, as part of the limited actions, would be expected to restrict site access. As such both the number of potential risk exposure occurrences at the site as well as the degree or magnitude of direct exposure to risks including leachate seeps and uncovered ash should to be reduced. Although, as previously mentioned, the potential for unwanted trespassing at the site will always exist, since Alternative 3 includes the application of a soil cover to the site, the potential for contact or exposure to leachate seeps or waste debris would be reduced. Under Alternative 3, the magnitude of risks after remediation would be significantly less than that of the sole implementation of limited actions.

(vii) Cost

The estimated cost of Alternative 3 is contained in the following table.

Alternative 3: Soil Cover (Including Grading and Surface Controls) with Limited Actions

Item	Units	Unit Price	Estimated Quantity	Estimated Cost
1. Deed Restrictions	Estimate			$5,000
2. Fence and Signs				
6-foot Chain Link Fence	LF	$15	4,200	$63,000
20-foot Roller Gate	Ea.	$2,500	2	$5,000
10-foot Swinging Gate	Ea.	$1,500	2	$3,000
Signs	Ea.	$75	10	$750
Subtotal				$76,750
3. Monitoring & Maintenance (Annually)Annual Media Sampling				
Sampling Effort				$2,000
Sample Analysis (TCL Parameters)	Ea.	$700	7	$4,900
Engineering/Reporting	Yr.	$6,000	1	$6,000
Subtotal (annual cost)				$12,900
Item 3 Present Worth (8%, 30-years, 11.2578)				$145,230
4. Soil Cover				
Survey and Stakeout	LS	$7,500	1	$7,500
Mobilization	LS	$15,000	1	$15,000
Engineer's Field Office	MO	$250	12	$3,000
Temporary Erosion Control	LS	$12,500	1	$12,500
Stripping and Tree Grubbing	AC	$1,500	17.5	$26,250
Ash Waste Consolidation	CY	$2	43,000	$86,000
Ash Waste Re-grading	LS	$25,000	1	$25,000
Soil Cover (18")	CY	$12	2,800	$33.600
Topsoil (6)	CY	$25	1,800	$45,000
Seeding	AC	$2,500	17.5	$43,750

Subtotal	$297,600
5. Engineering and Contingencies (25% of Items 2+4)	$93,590
Total Alternative 3 Present Worth Cost	**$618,170**

5.2.4 Alternative 4 – Soil Cover, Upgradient Groundwater Collection/Diversion Trench, Riverbank Stabilization, and Limited Action Items

Alternative 4 includes construction of an soil cover over the ash. As part of this alternative, tasks including waste consolidation (excavation of ash from the riverbank and ANC property), tree/vegetation stripping and grubbing, site grading, riverbank stabilization, diversion berms, lined drainage paths, and sedimentation basin will be considered Alternative 4 tasks. The dual purpose of this alternative is to isolate the black ash from the surface environment and minimize the generation of ash related leachate and transport of thereof to shallow groundwater and the near river environment. Secondary benefits of this alternative include minimizing the erosion of the ash, re-directing surface runoff over and around the waste mass, and minimizing ash contact/transport to the river. Additionally, a host of limited action items (signage and deed restrictions) will be implemented to help maintain the integrity of the engineered cap by restricting access.

(i) Compliance with Applicable or Relevant and Appropriate New York State SCGs
The remedial action implemented at the site must comply with New York State SCGs. The SCGs pertaining to this alternative are summarized in Appendix B. Alternative 4 would attain the SCGs listed.

(ii) Short Term Effectiveness

(a) Protection of Community During Remedial Action
For the engineered cap alternative, on-site remedial tasks will include ash consolidation, grubbing of existing grade, construction, up-gradient groundwater diversion trench, riverbank stabilization and completion of the limited action items. Although residential and community properties are located distant from the site, the community may be impacted through increased dust and noise associated with construction traffic. Traffic control will be implemented to maintain safety. Cap construction activities will result in the disturbance of soils that may create airborne particulates. To suppress the potential for airborne particulate migration, dust control measures such as water application may be utilized to maintain elevated moisture content within surface soils, thus inhibiting airborne transport. Periodic air testing will be performed to monitor the air quality during on-site remedial activities.

(b) Environmental Impacts During Remedial Action
During grading, soil cover placement, and riverbank stabilization construction activities, there is increased potential for exposure to ash waste and runoff to the surrounding area, this potential impact may be reduced by minimizing surface excavation and applying fill material to obtain necessary slope and grade. This potential impact is not considered significant and may be managed utilizing engineering controls. Engineering controls will be consistent with a Storm Water Pollution Prevention Plan developed for the site during design. The plan will

include a description of the appropriate erosion and sediment control measures that will be implemented based on the sequence of anticipated activities that may disturb soils/debris over most of the site area and adjacent to the river. Furthermore, since it is anticipated that there will be common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary sediment basin may be constructed.

(c) Timetable for Achieving Remedial Objectives
Grading the site, applying a soil cover and drainage features, and the construction of riverbank stabilization features would reduce direct contact with the ash and help control and mange erosion of waste media to the nearby surface waters. This alternative would also slightly reduce the percolation of surface water through the waste ash material and would retard infiltration and resulting contaminant leaching to groundwater.

(d) Protection of Workers During Remedial Actions
A project specific Remedial Action Health and Safety Plan will be prepared by a Certified Industrial Hygienist prior to the initiation of remedial activities. Contractors or other workers that enter the site and perform remedial activities shall demonstrate compliance with 29 CFR 1910.120. A project health and safety officer will be present on-site while activities are being conducted to evaluate compliance with the project Health and Safety Plan. Potential risks to workers through potential inhalation or direct contact during construction activities exist. Proper dust control measures and other health and safety measures such as utilizing personal protective equipment will be implemented consistent with the Health and Safety Plan.

(iii) Long Term Effectiveness and Permanence

(a) Remedial Permanence
The NYSDEC, through TAGM 4030, considers only on-site/off-site destruction, or separation/treatment, or solidification/chemical fixation (of inorganics) as permanent remedies. Therefore, construction of a soil cover and riverbank stabilization features is not considered a permanent remedy as by the TAGM.

(b) Quantity and Nature of Wastes Remaining On-Site After Remediation
This alternative would not reduce the quantity or nature of waste remaining at the Black Ash Pond after the completion of the remedial action.

(c) Long Term Reliability and Adequacy of Remedy
For the soil cover and riverbank stabilization features to remain reliable and adequate for the purpose intended, it is necessary to conduct proper long term monitoring and maintenance for the cover system and riverbank stabilization component. Additionally, with proper maintenance of the cover and riverbank stabilization components, this alternative is a reliable measure to reduce the potential for exposure to the waste media.

(d) Long Term Monitoring/Maintenance
Long term monitoring and maintenance is required under Alternative 3. It is anticipated that it will be necessary to monitor the site and conduct maintenance activities for over thirty (30)

years.

(iv) Reduction of Mobility, Toxicity or Volume

(a) Volume of Waste Reduction
Under Alternative 4, treatment is not used to reduce the volume or toxicity of waste at the site.

(b) Degree of Expected Waste Reduction
Under Alternative 4, the mobility of the waste is significantly reduced. This reduction of mobility is associated with application of a soil cover and associated grading, which is anticipated to increase the surface runoff to a small degree, and implementation of riverbank stabilization components, thereby reducing the amount of ash leachate generated. Overall, it is expected that Alternative 4 would moderately reduce the mobility of ash related wastes.

(c) Irreversibility of the Remedy
This remedial action is reversible to the extent that if the soil cover and riverbank stabilization Features are not properly maintained, then site conditions are likely to revert back to near rep-remediation conditions.

(v) Implementation

(a) Technical Feasibility
Constructing the soil cover, riverbank stabilization features (retaining wall) and conducting the limited action items is technically feasible. Implementation of this alternative requires conventional construction equipment or services.

(b) Administrative Feasibility
If this alternative is accepted as the remedial action, administrative problems are not anticipated. Under this alternative, all activities of the remedial action will take place on the site. Therefore, consistent with TAGM 4040 and 6 NYCRR Part 375-1.7, NYDEC and local permits will not be required. However, depending on the source of off-site soils for the cover, it may be necessary to obtain a mining permit. A certain degree of administrative communication including the completion of status reports and annual monitoring reports may be necessary.

(c) Availability of Personnel and Materials
Personnel capable of performing the tasks associated with constructing the soil cover and riverbank stabilization features are readily available and minimal technical specialists will be required. Also, the materials and services necessary for the limited action items are readily available locally. More than one vendor is available.

(vi) Protection of Human Health and the Environment

(a) Future Site Use
It will be necessary to significantly limit future use of the site in such a manner to maintain

the integrity of the soil cover and riverbank stabilization features. The nature of these limitations will be described in covenants on the deed which would restrict property use for as long as necessary. Additionally, if there is planned a physical alteration or construction activities constituting a substantial change of use of the site, written notice will be given in accordance with 6 NYCRR Part 375-1.6.

(b) Protection of Human Health After Remediation

The completion of this remedial action provides a significant level of human health protection. In general, as defined in the risk assessment section of SI Report, the exposure pathways that were functional and complete for humans included dermal exposure to ash, dermal exposure to leachate seeps, and inhalation of ash dusts. Implementation of a soil cover, supplemented by riverbank stabilization features, essentially removes the dermal exposure pathway and associated potential risks for contact with ash related leachate seeps.

(c) Magnitude of Risks After Remediation

As previously mentioned, the construction of a perimeter (industrial) fence, as part of the limited actions, would be expected to restrict site access. Both the number of potential risk exposure occurrences at the site, as well as the degree or magnitude of direct exposure to risks including, leachate seeps, and uncovered ash, should be reduced. Although the potential for unwanted trespassing at the site will always exist, since Alternative 4 includes the application of an engineered cap to the site, the potential for contact or exposure to leachate seeps or black ash would be significantly reduced. Under Alternative 4, the magnitude of risks after remediation would be significantly less than that of the sole implementation of limited actions.

(vii) Cost

The cost of Alternative 4 is presented in the following table.

Alternative 4: Soil Cover (Including Grading and Surface Controls), Riverbank Stabilization Features with Limited Actions

Item	Units	Unit Price	Estimated Quantity	Estimated Cost
1. Deed Restrictions	Estimate			$5,000
2. Signs	Ea.	$75	10	$750
3. Monitoring & Maintenance (Annually)				
Engineering/Reporting	Yr.	$6,000	1	$6,000
Item 3 Present Worth (8%, 30-years, 11.2578)				$67,550
4. Soil Cover				
River Bank Stabilization	LF	$625	4500	$2,812,500
Survey and Stakeout	LS	$7,500	1	$7,500
Mobilization	LS	$15,000	1	$15,000
Engineer's Field Office	MO	$250	12	$3,000
Temporary Erosion Control	LS	$12,500	1	$12,500
Stripping and Tree Grubbing	AC	$1,500	17.5	$26,250
Ash Waste Consolidation	CY	$2	43,000	$86,000

Ash Waste Re-grading	LS	$25,000	1	$25,000
Soil Cover (18")	CY	$12	2,800	$33.600
Topsoil (6)	CY	$25	1,800	$45,000
Seeding	AC	$2,500	17.5	$43,750
Subtotal				$3,110,100
6. Engineering and Contingencies (25% of Items 2+4)				$777,710
Total Alternative 4 Present Worth Cost				**$3,961,110**

5.2.5 Alternative 5 - Engineered Cap, Upgradient Groundwater Collection/Diversion Trench, Riverbank Stabilization and Limited Action Items

Alternative 5 includes construction of an engineered cap over the ash waste debris, generally consistent with 6 NYCRR Part 360 regulations. As part of this alternative, tasks including waste consolidation (excavation of ash from the riverbank and ANC property), tree/vegetation stripping and grubbing, site grading, riverbank stabilization, diversion berms, lined drainage paths, and sedimentation basin will be considered Alternative 5 tasks. The dual purpose of this alternative is to isolate the black ash from the surface environment and minimize the generation of ash related leachate and transport of thereof to shallow groundwater and the near river environment. Secondary benefits of this alternative include minimizing the erosion of the ash, re-directing surface runoff over and around the waste mass, and minimizing ash contact/transport to the river. Additionally, a host of limited action items (signage and deed restrictions) will be implemented to help maintain the integrity of the engineered cap by restricting access.

(i) <u>Compliance with Applicable or Relevant and Appropriate New York State SCGs</u>
The remedial action implemented at the site must comply with New York State SCGs. The SCGs pertaining to this alternative are summarized. From review of the SCGs for this project, it appears that Alternative 5 will comply with the SCGs listed.

(ii) <u>Short Term Effectiveness</u>

(a) <u>Protection of Community During Remedial Action</u>
For the engineered cap alternative, on-site remedial tasks will include ash consolidation, grubbing of existing grade, construction, up-gradient groundwater diversion trench, riverbank stabilization and completion of the limited action items. Although residential and community properties are located distant from the site, the community may be impacted through increased dust and noise associated with construction traffic. Traffic control will be implemented to maintain safety. Cap construction activities will result in the disturbance of soils that may create airborne particulates. To suppress the potential for airborne particulate migration, dust control measures such as water application may be utilized to maintain elevated moisture content within surface soils, thus inhibiting airborne transport. Periodic air testing will be performed to monitor the air quality during on-site remedial activities.

(b) Environmental Impacts During Remedial Action

During waste consolidation and the construction of the engineered cap and up-gradient groundwater diversion trench, there is increased potential for exposure of the waste and surface water runoff to the surrounding area. However, these potential impacts are not considered significant and may be controlled utilizing engineering controls. Engineering controls will be consistent with a Storm Water Pollution Prevention Plan to be developed for the site during design. The plan will include a description of erosion and sediment control measures to be implemented based on the sequence of anticipated activities that may disturb soils on major portions of the site. Furthermore, since it is anticipated that there will be common drainage locations that serve an area with ten (10) or more disturbed acres at one time, a temporary sediment basin (that may also serve as the long-term sediment basin) will be constructed.

(c) Timetable for Achieving Remedial Objectives

Implementation of this alternative will achieve the remedial action objectives of preventing direct contact with the ash, minimizing infiltration and resulting contaminant leaching to groundwater, and controlling surface water runoff. These objectives will be achieved in the time necessary to construct the engineered cap system, in conjunction with the riverbank stabilization features, which is anticipated to be less than one (1) year. Although the results of previous site investigations and the SI revealed that constant shallow groundwater recharge occurs through the waste mass from areas up-gradient of the site, it is estimated that application of an engineered cap and an up-gradient groundwater diversion trench would serve to eliminate 80 to 95 percent of the precipitation, runoff waters, and shallow groundwater flow that infiltrates through the Black Ash Pond. Subsequently, the volume of leachate generated at the site should be significantly reduced. Thus, under this alternative, it is estimated that within 2 to 3 years of engineered cap and groundwater diversion trench construction, the river environment and shallow groundwater down grade of the Black Ash Pond would be receiving a substantially reduced quantity of the metal contaminants currently contributed by the ash waste leachate. With the additional construction of riverbank stabilization features, implementation of this alternative would ultimately serve to improve the quality of river surface waters and groundwater down grade of the site.

(d) Protection of Workers During Remedial Actions

A project specific Remedial Action Health and Safety Plan will be prepared by a Certified Industrial Hygienist prior to the initiation of remedial activities. Contractors or other workers that enter the site and perform remedial activities shall demonstrate compliance with 29 CFR 1910.120. A project health and safety officer will be present on-site while activities are being conducted to evaluate compliance with the project Health and Safety Plan. Potential risks to workers through potential inhalation or direct contact during construction activities exist. Proper dust control measures and other health and safety measures such as utilizing personal protective equipment will be implemented consistent with the Health and Safety Plan.

(iii) Long Term Effectiveness and Permanence

(a) Remedial Permanence
The NYSDEC, through TAGM 4030, considers only on-site/off-site destruction, or separation/treatment, or solidification/chemical fixation (of inorganics) as permanent remedies. However, this same TAGM also recognizes instances where a permanent remedy is not practical and specifically cites that isolation and control technologies (such as capping) may be selected as an appropriate remedial action for large waste disposal sites. Therefore, Alternative 5 may be considered permanent to the maximum extent practical as applied to a remedial control technology.

(b) Quantity and Nature of Wastes Remaining On-Site After Remediation
This alternative would not reduce the quantity or nature of waste remaining at the Black Ash Pond after the completion of the remedial action.

(c) Long Term Reliability and Adequacy of Remedy
The engineered cap proposed under this alternative is consistent with the cap system required for waste disposal sites (i.e., NYCRR Part 360 a major element of the required closure procedures for municipal waste landfills). A cap of this type is established as a reliable and adequate remedial action for a large waste disposal site such as the Black Ash Pond.

(d) Long Term Monitoring/Maintenance
To be successful, long-term maintenance of the cap and riverbank stabilization features is necessary to maintain the integrity of the cap and riverbank stabilization components. This includes grading portions of the cap and surrounding areas when necessary to control erosion and maintain surface water/runoff control as well as scheduled monitoring, inspection, mowing, and repair of the system as a whole. Groundwater monitoring will accompany the capping alternative as a means to track the operating efficiency of the cap system and provide information for tracking the natural attenuation of the contaminants in the groundwater.

(iv) Reduction of Mobility, Toxicity or Volume

(a) Volume of Waste Reduction
Under this alternative there is not a reduction in volume or toxicity of the waste present at the site. However, there is significant reduction in mobility of the waste present utilizing containment as discussed below.

(b) Degree of Expected Waste Reduction
Under Alternative 5, the mobility of the waste is significantly reduced. This reduction of mobility is associated with application of the engineered cap system and an up-gradient groundwater diversion trench. Capping, as a remedial technology, is an effective method of eliminating the percolation of rainfall through the contaminated wastes, thus reducing the downward migration (mobility) of contaminants into the groundwater. Riverbank stabilization measures (i.e., construction of a retaining wall along the riverbank) are an effective method for reducing erosion and collapse of waste debris into the adjacent river. Up-gradient groundwater diversion is considered an effective technology of reducing

(although not entirely eliminating) the horizontal flow of shallow groundwater through waste media. The engineered cap will also cover the black ash thereby eliminating the potential for direct physical contact. The up-gradient groundwater diversion trench will also minimize the additional volume and/or concentration of leachate generated from the black ash.

(c) Irreversibility of the Remedy
With proper operation and maintenance, this alternative may be considered irreversible.

(v) Implementation

(a) Technical Feasibility
The processes of engineered capping, riverbank stabilization, and groundwater diversion are common practices. These technologies are well developed and reliably prevent rainfall/storm water from percolating through, and minimize shallow groundwater flow through the waste mass and minimizing the direct transport of waste solids to the adjacent river.

(b) Administrative Feasibility
It is unlikely that state or local permits will be required to implement Alternative 5 because the capping activities will be conducted entirely on-site. It is anticipated that elements of the remediation will satisfy performance standards applicable to like activity conducted pursuant to a permit. The remediation will be a component of a program selected by a process affording public participation that is substantially equivalent to that afforded by the permit process, and the project is being conducted under order of the NYSDEC. However, depending on the source of off-site soils for the cover, it may be necessary to obtain a mining permit.

(c) Availability of Personnel and Materials
Conventional construction equipment and techniques would be used to construct the engineered cap, groundwater diversion trench, and riverbank stabilization features. Impermeable membranes and geotextile materials can be supplied by a number of manufacturers, and the contractors and earthmoving equipment necessary for cap construction are readily available. The time required for capping is primarily dependent upon the acquisition of materials and the scheduling of construction activities. Capping of the site could be accomplished in one construction season.

(vi) Protection of Human Health and the Environment

(a) Future Site Use
It will be necessary to limit future use of the site in such a manner to maintain the integrity of the capping system and riverbank stabilization features. The nature of these limitations will be described in covenants on the deed which would restrict use for as long as necessary. Additionally, if physical alteration or construction activities constituting a substantial change of use of the site are planned, written notice will be provided in accordance with 6 NYCRR Part 375-1.6.

(b) Protection of Human Health After Remediation

The completion of this remedial action provides protection of human health. In general, the primary functional and complete pathways for human exposure at the site include dermal exposure to exposed wastes, dermal exposure to leachate seeps, and inhalation of landfill gases. Implementation of the capping system removes the dermal exposure pathway and associated potential risks for contact with soils and leachate seeps. With respect to the environment, implementation of the engineered cap, riverbank stabilization features and up-gradient groundwater diversion system will serve to significantly reduce the potential for future leachate outbreaks, while also significantly minimizing the potential for precipitation infiltration, thus minimizing future potential impacts to groundwater, surface water, and sediment.

(c) Magnitude of Risks After Remediation

As previously mentioned, the construction of a perimeter (industrial) fence, as part of the limited actions, would be expected to restrict site access. Both the number of potential risk exposure occurrences at the site as well as the degree or magnitude of direct exposure to risks including, leachate seeps, and uncovered ash should be reduced. Although the potential for unwanted trespassing at the site will always exist, since Alternative 5 includes the construction of an engineered cap and riverbank stabilization features, the potential for contact or exposure to leachate seeps or black ash would be significantly reduced. Under Alternative 5, the magnitude of risks after remediation would be significantly less than that of the sole implementation of limited actions.

(vii) Cost

The cost of Alternative 5 is presented in the following table.

Alternative 5: Engineered Cap, Riverbank Stabilization, Upgradient Groundwater Diversion and Limited Actions

Item	Units	Unit Price	Estimated Quantity	Estimated Cost
1. Deed Restrictions	Estimate			$5,000
2. Signs	Ea.	$75	10	$750
3. Monitoring & Maintenance (Annually)				
Engineering/Reporting	Yr.	$6,000	1	$6,000
Item 3 Present Worth (8%, 30-years, 11.2578)				$67,550
4. Engineered Cap - Essential Items				
River Bank Stabilization	LF	$625	4500	$2,812,500
Survey and Stakeout	LS	$7,500	1	$7,500
Mobilization	LS	$25,000	1	$25,000
Engineer's Field Office	MO	$250	12	$3,000
Temporary Erosion Control	LS	$12,500	1	$12,500
Stripping and Tree Grubbing	AC	$1,175	17.5	$20,560
Ash Waste Consolidation	CY	$2	43,000	$86,000
Ash Waste Re-grading	LS	$25,000	1	$25,000

Embankment	CY	$15	450	$6,750
Partial Perimeter Road	LF	$25	750	$18,750
Stone Lining	CY	$45	250	$11,250
Synthetic Erosion Mat	SY	$5	1,200	$6,000
Culverts	LS	$2,000	1	$2,000
Temporary Erosion Control	LS	$25,000	1	$25,000
Topsoil (6")	CY	$25	1833	$45,820
Seeding	AC	$2,500	17.5	$43,750
Subtotal				$3,151,380
5a. Engineered Cap Option "A" - Low Permeability Soil				
Low Permeability Barrier Soil (18")	CY	$25	5,500	$137,500
Barrier Protection Layer (36")	CY	$15	16,500	$247,500
Soil Gas Venting Layer (6")	CY	$17	2,500	$42,500
Geotextile Filter Fabric (2-layers)SY	$2		169,481	$338,960
Subtotal				$766,460
5b. Engineered Cap Option "B" - Geosynthetic				
Geosynthetic Liner (40-mil LLDPE)	SY	$5.50	84,741	$466,070
Barrier Protection Layer (24"-Screened)	CY	$15	11,000	$247,500
Geocomposite Gas Venting Layer	SY	$2.5	84,741	$211,850
Geotextile Filter Fabric (1-layer)	SY	$3	84,741	$254,220
Subtotal				$1,097,140
6. Upgradient Groundwater Diversion/Interception				
Excavation (Manhole, Pipe, Connection)	CY	$8	3,600	$28,800
Manhole (4' x 4' x 12')	EA	$4,500	1	$4,500
PVC Pipe (4-in. lat. collection/conn.)	LF	$8	2000	$16,000
Backfill Bedding (crushed stone)	CY	$26	1,800	$46,800
Subtotal				$96,100
7a. Engineering and Contingencies (25% of Item 2+4+5a+6) Alternative 5a				$1,003,670
7b. Engineering and Contingencies (25% of Item 2+4+5b+6) Alternative 5b				$1,086,340
Total Alternative 5a Present Worth Cost				**$5,090,910**
Total Alternative 5b Present Worth Cost				**$5,504,260**

5.2.6 Alternative 6 - Engineered Cap, Riverbank Stabilization Features, Upgradient Groundwater Cutoff/Diversion Wall, Limited Action Items, and Supplemental Remedial Measures

Alternative 6 consists of constructing an engineered cap over the Black Ash Pond, riverbank stabilization components (i.e., retaining wall), an up-gradient slurry wall to minimize (almost eliminate) the flow of groundwater through the black ash, and limited action items. Tasks include waste consolidation (excavation of ash from the riverbank and ANC property), grubbing/stripping of existing vegetation, site grading, and construction of diversion berms and lined drainage ways. The dual primary purpose of this alternative is to isolate the black ash from the surface environment and minimize the transport of ash related leachate to the local shallow groundwater and the Boquet River. Secondary benefits of this alternative include minimizing erosion of the ash waste, directing surface runoff over and around the Black Ash Pond, and minimizing black ash contact/transport to the river environment. Additionally, a host of limited action items (signage and deed restrictions) will be implemented to help maintain the integrity of the engineered cap by restricting access.

(i) Compliance with Applicable or Relevant and Appropriate New York State SCGs
The remedial action implemented at the site must comply with New York State SCGs. The SCGs pertaining to this alternative are summarized in Appendix B. . From review of the SCGs for this project, it appears that Alternative 6 will comply with the SCGs listed.

(ii) Short Term Effectiveness

(a) Protection of Community During Remedial Action
For this alternative, on-site remedial tasks will include the construction of an engineered cap, construction of riverbank stabilization features (i.e., retaining wall) for the waste debris bordering the adjacent river, the construction of a groundwater diversion wall, and the completion of the limited action items. Although residential and commercial properties are located remotely from the site, some increased dust and noise impacts associated with construction traffic may occur. Traffic control will be implemented during construction to maintain safety. The cap and groundwater diversion wall construction activities will result in the disturbance of soils that may create airborne particulates. To suppress the potential for airborne particulate migration, dust control measures, i.e., water application may be utilized to maintain elevated moisture contents within surface soils, thus inhibiting airborne transport. Periodic air testing will be performed to monitor the air quality during remedial activities.

(b) Environmental Impacts During Remedial Action
During construction of the engineered cap, riverbank stabilization features and groundwater diversion wall, there is increased potential for exposure of the black ash and surface water runoff to the surrounding area. These potential impacts are not considered significant and may be controlled with engineering controls. Engineering controls will be consistent with the Storm Water Pollution Prevention Plan developed for the site. The plan will include a description of the appropriate erosion and sediment control measures to be implemented based on the sequence of anticipated activities that may disturb waste media/soils on major portions of the site. Furthermore, since it is anticipated there will be common drainage locations serving an area with ten (10) or more disturbed acres at one time, a temporary sediment basin will be constructed.

(c) Timetable for Achieving Remedial Objectives
Implementation of this alternative will achieve the remedial action objectives of preventing direct contact with the black ash, minimizing infiltration and resulting contaminant leaching to groundwater, controlling surface water runoff and erosion, and minimizing the potential for ash related leachate generation by diverting the flow of groundwater through the Black Ash Pond. These objectives will be achieved in the time necessary to construct the landfill cap system and is anticipated to be less than two (2) years. Although, as previously mentioned, the results of previous site investigations revealed that constant shallow groundwater recharge occurs through the Black Ash Pond from areas up-gradient of the site, it is estimated that application of an engineered cap and groundwater diversion (slurry) wall

would serve to eliminate 90 to 95 percent of the precipitation, runoff waters, and shallow groundwater traveling through the waste mass. Subsequently, the volume of leachate generated should be reduced. Under this alternative, it is estimated that within one to two years of engineered cap construction, the shallow groundwater and river surface water downstream of the site would be receiving a substantially reduced quantity and concentration of the contaminants currently contributed by the waste mass leachate. The additional implementation of a groundwater diversion wall would serve to significantly minimize the flow of up-gradient groundwater through the waste mass thus significantly reducing the migration of the secondary leachate contamination to the shallow groundwater and river surface water downstream of the site. Implementation of Alternative 6 would ultimately serve to re-establish the natural quality of the groundwater and river surface water downstream of the site.

(d) Protection of Workers During Remedial Actions

A project specific Remedial Action Health and Safety Plan will be prepared by a Certified Industrial Hygienist prior to the initiation of remedial activities. Contractors or other workers that enter the site and perform remedial activities shall demonstrate compliance with 29 CFR 1910.120. A project health and safety officer will be present on-site while activities are being conducted to evaluate compliance with project Health and Safety Plan. Potential risks to workers through potential inhalation or direct contact during construction activities exist. Proper dust control measures and other health and safety measures such as utilizing personal protective equipment will be implemented consistent with the Health and Safety Plan.

(iii) Long Term Effectiveness and Permanence

(a) Remedial Permanence

The NYSDEC, through TAGM 4030, considers only on-site/off-site destruction, or separation/treatment, or solidification/chemical fixation (of inorganics) as permanent remedies. However, this same TAGM also recognizes that there are instances where a permanent remedy is not practical and specifically cites that isolation and control technologies (i.e., a cap and groundwater diversion) may be selected as an appropriate remedial action. Therefore, Alternative 6 may be considered permanent to the maximum extent practical.

(b) Quantity and Nature of Wastes Remaining On-Site After Remediation

This alternative would not reduce the amount of black ash remaining at the site. However, by diverting groundwater flow through the ash waste mass, this alternative would reduce the volume of potentially mobile leachate from the site.

(c) Long Term Reliability and Adequacy of Remedy

The engineered cap proposed under this alternative is consistent with the cap system required under NYCRR Part 360, a major element of the required closure procedures for waste disposal sites, i.e., municipal waste landfills. A cap of this type, combined with riverbank stabilization features, is a reliable and adequate remedial action for the Black Ash Pond.

The groundwater diversion wall is expected to be a reliable and adequate method for minimizing the potential for additional leachate generation and will further minimize the impact of leachate migration on down-gradient groundwater.

(d) Long Term Monitoring/Maintenance
Long-term maintenance of the engineered cap is necessary to ensure the integrity of the cover system. This includes grading the cap and surrounding areas when necessary to provide surface water runoff control as well as monitoring, inspection and repair of the cap/cover system as a whole. Groundwater monitoring will accompany the capping and groundwater diversion alternative to assess the operating efficiency of the system and provide information for tracking the natural attenuation of the contaminants in the groundwater. Periodic water level elevation and groundwater quality monitoring will be required to document the effectiveness of the engineered cap and groundwater diversion wall.

(iv) Reduction of Mobility, Toxicity or Volume

(a) Volume of Waste Reduction
Although the volume or toxicity of the black ash is not reduced under Alternative 6, it is anticipated that construction of an engineered cap and groundwater diversion wall will significantly reduce the volume of ash related leachate generated at the site. It is estimated that leachate generation at the site should be reduced 50 to 90-percent through the implementation of Alternative 6.

(b) Degree of Expected Waste Reduction
Under Alternative 6, the mobility of the waste is significantly reduced. This reduction of mobility is associated with the engineered cap system. Capping, as a remedial technology, is an effective method of eliminating the percolation of rainfall through the contaminated wastes, thus reducing the downward migration (mobility) of contaminants into the groundwater. The engineered cap and riverbank stabilization features will also cover/contain the black ash thereby eliminating the potential for direct physical contact. Furthermore, with the construction of the up-gradient groundwater diversion wall, the generation of leachate and potential migration of black ash leachate from the site will be further reduced by diverting the flow of shallow groundwater away from the Black Ash Pond.

(c) Irreversibility of the Remedy
With proper operation and maintenance, this alternative may be considered irreversible.

(v) Implementation

(a) Technical Feasibility
The capping process and construction of riverbank stabilization features are common practices in the field of waste remediation. These technologies have been well developed and are a reliable means of preventing rainfall from percolating through the waste mass and preventing wasting/erosion of waste media into nearby surface waters. Although less common, the techniques employed in the construction of a groundwater diversion wall have

been developed, refined, and are a generally reliable means of minimizing the flow of groundwater through the landfill waste mass. The technologies incorporated within Alternative 6 may be considered technically feasible.

(b) Administrative Feasibility

It is unlikely that state or local permits will be required to implement Alternative 6 because entirely on-site. It is anticipated that elements of the remediation will satisfy performance standards applicable to like activity conducted pursuant to a permit. The remediation will be a component of a remedial program selected by a process affording an opportunity for public participation substantially equivalent to that afforded by the permit process, and the project is being conducted under the jurisdiction of the NYSDEC.

(c) Availability of Personnel and Materials

Conventional construction equipment and techniques would be used to construct the landfill cap and riverbank stabilization features. Impermeable membranes and geotextile materials can be supplied by a number of manufacturers, and the contractors and earthmoving equipment necessary for cap construction are readily available. The time required for capping is primarily dependent upon the acquisition of materials and the scheduling of construction activities. Construction of an engineered cap and riverbank stabilization features could be accomplished in one construction season. Specialized equipment would be required for construction of the groundwater diversion wall and contractors with experience in the construction of groundwater diversion walls are available within the northeastern United States. Similar to construction of a landfill cap, the time required for construction of the groundwater diversion wall is primarily dependent upon the acquisition of materials and the scheduling of construction activities. Construction of the groundwater diversion wall could conceivably be accomplished in one construction season if completed concurrently with the construction of the engineered cap. It is possible that two construction seasons would be required to implement Alternative 6.

(vi) Protection of Human Health and the Environment

(a) Future Site Use

It will be necessary to limit future use of the site to maintain the integrity of the remedial components, primarily the capping system. The nature of these limitations will be described in covenants on the deed that would restrict use for as long as necessary. Additionally, if there is planned a physical alteration or construction activity constituting a substantial change of use of the site, written notice must be given in accordance with 6 NYCRR Part 375-1.6.

(b) Protection of Human Health After Remediation

The completion of this engineered cap and riverbank stabilization components will provide significant protection of human health. Implementation of these remedial action components removes the dermal exposure pathway and associated potential risks for contact with black ash and associated leachate seeps. By significantly reducing the generation of ash related leachate from groundwater flow through the Black Ash Pond, implementation of the groundwater diversion wall will serve to further reduce leachate migration to shallow groundwater and adjacent river water downgradient of the site. Therefore, the potential for exposure to leachate-impacted groundwater is reduced.

(c) Magnitude of Risks After Remediation
The construction of a perimeter (industrial) fence, as part of the limited actions, would be expected to restrict site access, therefore such both the number of potential risk exposure occurrences and the degree or magnitude of direct exposure to risks including, leachate seeps, and uncovered ash are expected to be reduced. Although the potential for unwanted trespassing at the site will always exist, since Alternative 6 includes the application of an engineered cap, the potential for contact or exposure to black ash and associated leachate seeps would be significantly reduced. Under Alternative 6, the magnitude of risks after remediation would be significantly less than that of the sole implementation of limited actions. As previously mentioned, although the subject site is generally considered a groundwater discharge zone and appears to recharge the Boquet River, implementation of an up-gradient groundwater diversion wall will serve to further reduce the generation and subsequent migration of leachate from the Black Ash Pond, while riverbank stabilization features will significantly reduce potential erosion/transport of ash waste media to the adjacent river. Accordingly, the magnitude of risks to down-gradient groundwater and river surface water would also be minimized as part of this alternative.

(vii) Cost
The estimated costs for Alternative 6 are presented in the following table.

Alternative 6: Engineered Cap with Riverbank Stabilization Features, Upgradient Groundwater Cutoff/Diversion, and Limited Actions

Item	Units	Price	Quantity	Cost
1. Deed Restrictions	Estimate			$5,000
2. Signs	Ea.	$75	10	$750
3. Monitoring & Maintenance (Annually)				
Engineering/Reporting	Yr.	$6,000	1	$6,000
Item 3 Present Worth (8%, 30-years, 11.2578)				$67,550
4. Engineered Cap - Essential Items				
River Bank Stabilization	LF	$625	4500	$2,812,500
Survey and Stakeout	LS	$7,500	1	$7,500
Mobilization	LS	$25,000	1	$25,000
Engineer's Field Office	MO	$250	12	$3,000
Temporary Erosion Control	LS	$12,500	1	$12,500
Stripping and Tree Grubbing	AC	$1,175	17.5	$20,560
Ash Waste Consolidation	CY	$2	43,000	$86,000
Ash Waste Re-grading	LS	$25,000	1	$25,000
Embankment	CY	$15	450	$6,750
Partial Perimeter Road	LF	$25	750	$18,750
Stone Lining	CY	$45	250	$11,250
Synthetic Erosion Mat	SY	$5	1,200	$6,000
Culverts	LS	$2,000	1	$2,000

Temporary Erosion Control	LS	$25,000	1	$25,000
Topsoil (6")	CY	$25	1833	$45,820
Seeding	AC	$2,500	17.5	$43,750
Subtotal				3,151,380
5a. Engineered Cap Option "A" - Low Permeability Soil				
Low Permeability Barrier Soil (18")	CY	$25	5,500	$137,500
Barrier Protection Layer (36")	CY	$15	16,500	$247,500
Soil Gas Venting Layer (6")	CY	$17	2,500	$42,500
Geotextile Filter Fabric (2-layers)	SY	$2	169,481	$338,960
Subtotal				$766,460
5b. Engineered Cap Option "B" - Geosynthetic				
Geosynthetic Liner (40-mil LLDPE)	SY	$5.50	84,741	$466,080
Barrier Protection Layer (24"-Screened)	CY	$15	11,000	$165,000
Geocomposite Gas Venting Layer	SY	$2.5	84,741	$211,850
Geotextile Filter Fabric (1-layer)	SY	$3	84,741	$254,220
Subtotal				$1,097,150
6. Groundwater Diversion (Cutoff) Wall				
Mobilization and Site Preparation	LS	$10,000	1	$10,000
Consolidate waste along ledge	CY	$5.50	30,000	$165,000
Cutoff Wall (South and West)	LF	$60	1,800	$108,000
Subtotal				$283,000

7a. Engineering, Legal, and Contingencies (25% of Items 2+4+5a+6) Alternative 4a $1,050,400
7b. Engineering, Legal, and Contingencies (25% of Items 2+4+5b+6) Alternative 4b $1,133,070

Total Alternative 6a Present Worth Cost	**$5,324,580**
Total Alternative 6b Present Worth Cost	**$5,737,900**

SECTION 6: COMPARATIVE ANALYSIS OF ALTERNATIVES

6.1 Comparative Analysis of Alternatives

Once the alternatives have been individually assessed against the seven criteria, a quantitative comparative analysis is conducted to evaluate the relative performance of each alternative in relation to each specific evaluation criterion. This analysis is in contrast to the preceding analysis in which each alternative was analyzed independently. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another.

6.1.1 NYSDEC TAGM 4030 Comparative Analysis

The comparative analysis is presented in a tabled format, within Appendix C, in accordance with NYSDEC TAGM 4030.

6.1.2 Comparative Analysis Results Summary

As shown in Appendix C, the results of the Remedial Alternative Comparative Analysis (completed in accordance with NYSDEC TAGM 4030) identified the following total scores for each of the six alternatives:

Remedial Alternative		Total Score
Alternative 1:	No Action	29
Alternative 2:	Limited Actions	42
Alternative 3:	Soil Cover w/ Limited Actions	48
Alternative 4:	Soil Cover, Riverbank Stabilization, w/ Limited Actions	55
Alternative 5:	Engineered Cap, Groundwater Collection, Riverbank Stabilization w/ Limited Actions	62
Alternative 6:	Engineered Cap, Groundwater Diversion, Riverbank Stabilization w/ Limited Actions	60

In general, although Alternative 2 (Limited Actions) ranked highest for categories including short-term effectiveness, implementation, and cost, this alternative ranked poorly for compliance with SCGs, protection of human health/environment, long term effectiveness/permanence, and reduction of toxicity/mobility/volume. Alternative 5 (Engineered Cap, Groundwater Collection, Riverbank Stabilization, w/Limited Actions) and 6 (Engineered Cap, Groundwater Diversion, Riverbank Stabilization, w/Limited Actions) ranked highest for compliance with SCGs, protection of human health/environment, long-term effectiveness, and reduction of toxicity/mobility/volume, they scored lowest for implementation and cost.

With the exception of Alternative 2 (Limited Actions), each of the other alternatives scored relatively equal for the category short-term effectiveness. Although Alternative 4 (Soil Cover, Riverbank Stabilization with Limited Actions) scored slightly lower in compliance with SCGs, protection of human health/environment (as compared to Alternatives 5 and 6), Alternative 4 scored equal to or higher than the Alternatives 5 and 6 for short-term effectiveness, reduction of toxicity/mobility/volume, implementation, and cost.

Although not specifically reflected by the total scoring results, overall, for the scoring evaluation completed on the multiple alternatives included as part of this Remedial Alternatives Report, it appears that Alternative 4 offers the most satisfactory *combined* ranking for all categories evaluated.

6.2 Recommended Alternative

Based on the preceding detailed analysis of alternatives and comparative analysis, it is proposed that the most appropriate remedial alternative for the site is Alternative 4: Soil Cover, Riverbank Stabilization, and Limited Actions. The identification of the most preferred (appropriate) alternative is derived from the consideration of the seven (7) evaluation criteria, the scores each alternative received on their respective scoring sheets, and the approach described below. The 7-point remedy selection criteria previously discussed was utilized in conjunction with the remedy scoring sheets and proposes a remedy that:

- Is protective of human health and the environment;
- To the extent practicable attains State and Federal public health and environmental standards;
- Is cost effective providing that it first satisfies the above two threshold criteria; and
- Satisfies the preference to the extent practical for selecting a remedy that significantly and permanently reduces the mobility, toxicity, or volume of the hazardous wastes at the site.

An analysis of the scoring sheets reviewing the total scores for each alternative indicates that Alternative 5 and 6 are virtually identical with respect to the total scores received. Clearly, Alternative 1 (No Action) and Alternative 2 - Limited Actions are not appropriate as sole remedial action alternatives because these are not nearly as protective of human health and the environment as the others and these alternatives do not fully attain the SCGs. Alternatives 3, 4, 5 and 6 provide significant levels of human health and environment protection and do attain SCGs, and therefore are appropriate remedial actions. In order to determine the most appropriate alternative the following was utilized:

The 7 evaluation criteria are separated into two categories: (1) Threshold Criteria and (2) Balancing Criteria. A description of each criterion has been presented previously in this report. Threshold criteria relate to requirements that each alternative must satisfy in order to be eligible for selection as the remedy. The threshold criteria are:

- Overall Protection of Human Health and the Environment, and
- Compliance with SCGs

Balancing Criteria are used to identify major trade-offs between remedial alternatives. The five (5) balancing criteria are:

- Long Term Effectiveness and Permanence,
- Reduction of Mobility, Toxicity, or Volume Through Treatment,
- Short Term Effectiveness,
- Implementation, and
- Cost

A remedy that does not attain the threshold criteria of protection of human health and the environment and attaining SCGs will not be preferred. Overall effectiveness was determined by evaluating the three (3) primary balancing criteria: long term effectiveness and permanence; reduction of mobility, toxicity or volume through treatment; and short term effectiveness. The overall effectiveness is then evaluated for cost effectiveness. A remedy is cost effective provided that the remedy is protective and attains SCGs, and if the associated costs are proportionate to the overall effectiveness of the alternative. The preferred remedy reflects the scope and purpose of the actions being undertaken and how the action relates to the long term plans for the site.

The rationale for choosing Alternative 4 – Soil Cover, Riverbank Stabilization, and Limited Actions, is based on the assessment of each of the criteria listed in the evaluation of alternatives section of this document. In accordance with NYSDEC TAGM 4030, to be the selected remedial alternative, the alternative must be protective of human health and the environment and able to attain SCGs unless a waiver is granted. In assessing the alternatives that met these requirements, a comparison was focused on the remaining evaluation criteria, including, short-term effectiveness, long-term effectiveness and permanence, implementability, permanent reduction of the mobility, toxicity and volume, and cost. Based upon this assessment, Alternative 4 is proposed as the preferred remedial approach for the Black Ash Pond.

Alternative 4 – Soil Cover, Riverbank Stabilization, and Limited Actions provides a satisfactory and appropriate combination of measures to address the Black Ash Pond. This alternative will provide overall protectiveness of human health and the environment, potential contact with site contaminants will be reduced, and engineering controls will be utilized for short-term protection of site workers during the completion of remedial construction efforts. Alternative 4 is readily implementable and will attain SCGs. Finally, the preferred remedy achieves all of the required response objectives.

Other alternatives evaluated in detail were considered less acceptable. As previously noted, Alternative 2 - Limited Actions was not selected as the sole remedy because this alternative does not fully meet the threshold criteria, it is not nearly as protective of human health or the environment as the other three (active) alternatives, does not fully attain SCGs, and does not achieve the remedial objectives. It should, however, be noted that the Limited Action components will ultimately be incorporated as auxiliary tasks within the selected remedy.

The Balancing Criteria were used to evaluate the remaining alternatives, as compared to preferred Alternative 4. Although more implementable and less costly than Alternatives 4, 5, and 6, Alternative 3: Soil Cover with Limited Actions, was not selected because this alternative: 1) is less protective of human health and the environment and 2) has a limited ability to reduce contaminant mobility, toxicity, or volume, as compared to Alternatives 4, 5 and 6.

Although Alternatives 5 and 6 (Engineered Cap Alternatives) offer a slightly increased degree of protection, with respect to reducing the mobility or toxicity of contaminants as compared to Alternative 4, the additional costs for Alternatives 5 and 6 are disproportionate to the incremental degree of protection offered, while being somewhat less implementable. Therefore, Alternatives 5 and 6 were determined to be less practical than Alternative 4. In summary, Alternative 4 – Soil Cover, Riverbank Stabilization, and Limited Actions, was determined to be protective of human health and the environment, SCG compliant, cost effective, and overall, is consistent with NYSDEC TAGM 4030, CERCLA and, to the extent practicable, the NCP.

APPENDIX A

POTENTIAL ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs)

POTENTIAL ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Part 750-757 State Pollution Discharge Elimination System (SPDES)	This Part prescribes procedures and substantive rules concerning the SPDES program. It regulates certain discharges to State waters. It includes administrative provisions requiring an application for a permit and a public comment process; technical requirements requiring compliance with specified standards and limitations; and discharge monitoring, record keeping, and reporting requirements.	As part of the ERP, the substantive requirements of the SPDES Program should be met for all dewatering wastewater discharges, however, a formal permit will not be required during remediation.
NYSDEC SPDES General Permit for Storm Water Discharges from Construction Activities	The General Permit describes the requirements for a SPDES Permit associated with storm water discharges from construction activities.	The substantive portion of the general permit is the development of a Storm Water Pollution Prevention Plan. A Plan will be developed which will include a description of the appropriate erosion and sediment control measures that will be implemented based on the sequence of anticipated activities which may disturb soils on major portions of the site. Furthermore, since it is anticipated that there will be common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary sediment basin will be constructed.

POTENTIAL ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs)
FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS (cont.)

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Section 375-1.6 New Use of Sites	This section includes requirements for submitting a written notice to the NYSDEC at least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site.	At least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site, the Town will submit written notice of such activities to the NYSDEC. The notice will include an identification of the site an identification of the person giving notice, and a brief description of the proposed substantial change of use.
NYSDEC Guidelines NYSDEC Analytical Services Protocols (NYSDEC ASP)	This document includes the State procedures and protocols for media-sample analysis.	During implementation of a remedial action, periodic environmental monitoring may be conducted. Selected samples collected and analyzed will follow ASP (and/or applicable EPA-CLP) procedures. Furthermore, samples collected will be appropriately validated (via data usability review), if required.
6NYCRR Part 621 Uniform Procedures	This Part describes general requirements for applications for permits. This procedure will be followed for a permit application if a permit is necessary.	If required, the Town will submit a properly completed NYSDEC application form, supporting documentation which may include a location map or plan at an appropriate scale showing the point of discharge into the receiving waters, and other supplemental information which NYSDEC notifies the Town is necessary to review the application.
6NYCRR Part 624 Permit Hearing Procedures	This Part applies to hearings conducted by the NYSDEC on applications for permits or on denials of permits.	If a hearing is conducted for the purpose of issuing a Permit, the Town will participate in the hearing and follow the procedures associated with this Part.

POTENTIAL ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

LOCAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Rules and Regulations Relating to the Use of the Public Sewer System	These Rules and Regulations set uniform requirements for the discharges into the wastewater collection and treatment system of the Town of Willsboro and provides a means for determining wastewater volume, constituents and characteristics, the setting of industrial waste surcharges and fines, and the issuance of permits to certain users.	If remediation wastewaters are conveyed or discharged into the Town of Willsboro Wastewater Treatment Facility, the Town will follow the conditions for waste discharge in accordance with these Rules and Regulations.

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section pertains to remedial activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. The requirements of these sections include, among other aspects, development of a Safety and Health Program and a Site Control Program including engineering controls and safe work practices.	Site work will be conducted under an approved site specific Health and Safety Plan (HASP). Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances, including aspects such as engineering controls, safe work practices, and personal protective equipment.

POTENTIAL CHEMICAL SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs)
FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Guidelines for the Control of Toxic Ambient Air Contaminants, Air Guide-1, Draft 1991 Edition, Revised Appendix B (10/16/95).	Air Guide-1 provides guidance for the control of toxic ambient air contaminants in New York State. The purpose of this requirement is to describe the NYSDEC Division of Air Resources basic guidelines for permitting. In accordance with Air Guide-1, a source is evaluated regarding an individual contaminant basis, where the total impact of each chemical contaminants from a source is individually assessed and either compared to the ambient air quality standard or guidance value to determine the appropriate regulatory action.	During remedial activities, ambient air quality monitoring may be conducted where appropriate.
Technical Guidance for Screening Contaminated Sediments; (1993); NYSDEC Division of Fish and Wildlife; Division of Marine Resources	This Guidance includes criteria, standards and guidance values which are the maximum allowable concentration for applicable stream/surface water body sediments.	Dependent upon the specific media monitoring requirements mandated for Post-Closure Monitoring, sediment sampling locations may be regularly scheduled for monitoring to determine if the applicable sediment criteria, standards or guidance values are being attained.
NYSDEC (6NYCRR Part 703) Surface Water and Groundwater Quality Standards	This Part includes standards and guidance values which are the maximum allowable concentration for applicable water classes.	Monitoring wells and surface water sampling locations will be regularly scheduled for monitoring to determine if the applicable groundwater or surface water standards or guidance values are being attained.

POTENTIAL LOCATION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Clean Water Act Part 404 CFR Part 230	CWA Part 404 includes guidance which has been promulgated as regulations in 40CFR 230.10. Part 230 includes regulations indicating that the degradation or destruction of wetlands and other special aquatic sites should be avoided to the extent possible.	In the event remedial actions impose a potential to impact the wetland or surface water areas proximate to the site, proper notification and permitting procedures will be followed and appropriate actions will be completed to minimize adverse effects as described in 40CFR Part 330 Subpart H.

APPENDIX B

SPECIFIC ALTERNATIVES' SCGs

ALTERNATIVE #2 - LIMITED ACTION
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs)
FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Section 375-1.6 New use of Sites	This section includes requirements for submitting a written notice to the NYSDEC at least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site.	At least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site, the Town will submit written notice of such activities to the NYSDEC. The notice will include an identification of the site, an identification of the person giving notice, and a brief description of the proposed substantial change of use.

ALTERNATIVE #2 - LIMITED ACTION
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs)
FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS (cont.)

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
NYSDEC Guidelines NYSDEC Analytical Services Protocols (NYSDEC ASP)	This document includes the State procedures and protocols for media-sample analysis.	During implementation of a remedial action, periodic environmental monitoring may be conducted. Selected samples collected and analyzed will follow ASP (and/or applicable EPA-CLP) procedures. Furthermore, samples collected will be appropriately validated (via data usability review), if required.

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section pertains to remedial activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. The requirements of these sections include, among other aspects, development of a Safety and Health Program and a Site Control Program including engineering controls and safe work practices.	Site work will be conducted under an approved site specific Health and Safety Plan (HASP). Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances, including aspects such as engineering controls, safe work practices, and personal protective equipment.

ALTERNATIVE #2 - LIMITED ACTION
CHEMICAL SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs)
FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Guidelines for the Control of Toxic Ambient Air Contaminants, Air Guide-1, Draft 1991 Edition, Revised Appendix B (10/16/95).	Air Guide-1 provides guidance for the control of toxic ambient air contaminants in New York State. The purpose of this requirement is to describe the NYSDEC Division of Air Resources basic guidelines for permitting. In accordance with Air Guide-1, a source is evaluated regarding an individual contaminant basis, where the total impact of each chemical contaminants from a source is individually assessed and either compared to the ambient air quality standard or guidance value to determine the appropriate regulatory action.	During remedial activities, ambient air quality monitoring may be conducted where appropriate.
Technical Guidance for Screening Contaminated Sediments; (1993); NYSDEC Division of Fish and Wildlife; Division of Marine Resources	This Guidance includes criteria, standards and guidance values which are the maximum allowable concentration for applicable stream/surface water body sediments.	Dependent upon the specific media monitoring requirements mandated for Post-Closure Monitoring, sediment sampling locations may be regularly scheduled for monitoring to determine if the applicable sediment criteria, standards or guidance values are being attained.
6NYCRR Part 703 Surface Water and Groundwater Quality Standards	This Part includes standards and guidance values which are the maximum allowable concentration for applicable water classes.	Monitoring wells and surface water sampling locations will be regularly scheduled for monitoring to determine if the applicable groundwater or surface water standards or guidance values are being attained.

ALTERNATIVE #2 - LIMITED ACTION
LOCATION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs)
FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Clean Water Act Part 404 CFR Part 230	CWA Part 404 includes guidance which has been promulgated as regulations in 40CFR 230.10. Part 230 includes regulations indicating that the degradation or destruction of wetlands and other special aquatic sites should be avoided to the extent possible.	In the event remedial actions impose a potential to impact the wetland or surface water areas proximate to the site, proper notification and permitting procedures will be followed and appropriate actions will be completed to minimize adverse effects as described in 40CFR Part 330 Subpart H.

ALTERNATIVE #3 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS) WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Part 750-757 State Pollution Discharge Elimination System (SPDES)	This Part prescribes procedures and substantive rules concerning the SPDES program. It regulates certain discharges to State waters. It includes administrative provisions requiring an application for a permit and a public comment process; technical requirements requiring compliance with specified standards and limitations; and discharge monitoring, record keeping, and reporting requirements.	As part of the ERP, the substantive requirements of the SPDES Program must be met for all dewatering wastewater discharges, however, a formal permit will not be required during remediation.
NYSDEC SPDES General Permit for Storm Water Discharges from Construction Activities	The General Permit describes the requirements for a SPDES Permit associated with storm water discharges from construction activities.	The substantive portion of the general permit is the development of a Storm Water Pollution Prevention Plan. A Plan will be developed which will include a description of the appropriate erosion and sediment control measures that will be implemented based on the sequence of anticipated activities which may disturb soils on major portions of the site. Furthermore, since it is anticipated that there will be common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary sediment basin may be constructed. The Contractor will be required to comply with the requirements of the SWPP.

ALTERNATIVE #3 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS) WITH LIMITED ACTION ITEMS

ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS (cont.)

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Section 375-1.6 New Use of Sites	This section includes requirements for submitting a written notice to the NYSDEC at least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site.	At least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site, the Town will submit written notice of such activities to the NYSDEC. The notice will include an identification of the site (Name and Registry Number), an identification of the person giving notice, and a brief description of the proposed substantial change of use.
NYSDEC Guidelines NYSDEC Analytical Services Protocols (NYSDEC ASP)	This document includes the State procedures and protocols for media-sample analysis.	During implementation of a remedial action, periodic environmental monitoring may be conducted. Selected samples collected and analyzed will follow ASP (and/or applicable EPA-CLP) procedures. Furthermore, samples collected will be appropriately validated (via data usability review), if required.
6NYCRR Part 621 Uniform Procedures	This Part describes general requirements for applications for permits. This procedure will be followed for a permit application if a permit is necessary.	If required, the Town will submit a properly completed NYSDEC application form, supporting documentation which may include a location map or plan at an appropriate scale showing the point of discharge into the receiving waters, and other supplemental information which NYSDEC notifies the Town is necessary to review the application.
6NYCRR Part 624 Permit Hearing Procedures	This Part applies to hearings conducted by the NYSDEC on applications for permits or on denials of permits.	If a hearing is conducted for the purpose of issuing a Permit, the Town will participate in the hearing and follow the procedures associated with this Part.

ALTERNATIVE #3 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS) WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section pertains to remedial activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. The requirements of these sections include, among other aspects, development of a Safety and Health Program and a Site Control Program including engineering controls and safe work practices.	Site work will be conducted under an approved site specific Health and Safety Plan (HASP). Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances, including aspects such as engineering controls, safe work practices, and personal protective equipment.

ALTERNATIVE #3 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS) WITH LIMITED ACTION ITEMS
CHEMICAL SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Guidelines for the Control of Toxic Ambient Air Contaminants, Air Guide-1, Draft 1991 Edition, Revised Appendix B (10/16/95).	Air Guide-1 provides guidance for the control of toxic ambient air contaminants in New York State. The purpose of this requirement is to describe the NYSDEC Division of Air Resources basic guidelines for permitting. In accordance with Air Guide-1, a source is evaluated regarding an individual contaminant basis, where the total impact of each chemical contaminants from a source is individually assessed and either compared to the ambient air quality standard or guidance value to determine the appropriate regulatory action.	During remedial activities, ambient air quality monitoring may be conducted where appropriate.
Technical Guidance for Screening Contaminated Sediments; (1993); NYSDEC Division of Fish and Wildlife; Division of Marine Resources	This Guidance includes criteria, standards and guidance values which are the maximum allowable concentration for applicable stream/surface water body sediments.	Dependent upon the specific media monitoring requirements mandated for Post-Closure Monitoring, sediment sampling locations may be regularly scheduled for monitoring to determine if the applicable sediment criteria, standards or guidance values are being attained.
6NYCRR Part 703 Surface Water and Groundwater Quality Standards	This Part includes standards and guidance values which are the maximum allowable concentration for applicable water classes.	Monitoring wells and surface water sampling locations will be regularly scheduled for monitoring to determine if the applicable groundwater or surface water standards or guidance values are being attained.

ALTERNATIVE #3 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS) WITH LIMITED ACTION ITEMS
LOCATION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Clean Water Act Part 404 CFR Part 230	CWA Part 404 includes guidance which has been promulgated as regulations in 40CFR 230.10. Part 230 includes regulations indicating that the degradation or destruction of wetlands and other special aquatic sites should be avoided to the extent possible.	In the event remedial actions impose a potential to impact the wetland or surface water areas proximate to the site, proper notification and permitting procedures will be followed and appropriate actions will be completed to minimize adverse effects as described in 40CFR Part 330 Subpart H.

ALTERNATIVE #4 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS), RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Part 750-757 State Pollution Discharge Elimination System (SPDES)	This Part prescribes procedures and substantive rules concerning the SPDES program. It regulates certain discharges to State waters. It includes administrative provisions requiring an application for a permit and a public comment process; technical requirements requiring compliance with specified standards and limitations; and discharge monitoring, record keeping, and reporting requirements.	As part of the ERP, the substantive requirements of the SPDES Program must be met for all dewatering wastewater discharges, however, a formal permit will not be required during remediation.
NYSDEC SPDES General Permit for Storm Water Discharges from Construction Activities	The General Permit describes the requirements for a SPDES Permit associated with storm water discharges from construction activities.	The substantive portion of the general permit is the development of a Storm Water Pollution Prevention Plan. A Plan will be developed which will include a description of the appropriate erosion and sediment control measures that will be implemented based on the sequence of anticipated activities that may disturb soils on major portions of the site. Furthermore, since it is anticipated that there will be common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary sediment basin may be constructed. The Contractor will be required to comply with the requirements of the SWPP.

ALTERNATIVE #4 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS), RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS (cont.)

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Section 375-1.6 New Use of Sites	This section includes requirements for submitting a written notice to the NYSDEC at least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site.	At least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site, the Town will submit written notice of such activities to the NYSDEC. The notice will include an identification of the site (Name and Registry Number), an identification of the person giving notice, and a brief description of the proposed substantial change of use.
NYSDEC Guidelines NYSDEC Analytical Services Protocols (NYSDEC ASP)	This document includes the State procedures and protocols for media-sample analysis.	During implementation of a remedial action, periodic environmental monitoring may be conducted. Selected samples collected and analyzed will follow ASP (and/or applicable EPA-CLP) procedures. Furthermore, samples collected will be appropriately validated (via data usability review), if required.
6NYCRR Part 621 Uniform Procedures	This Part describes general requirements for applications for permits. This procedure will be followed for a permit application if a permit is necessary.	If required, the Town will submit a properly completed NYSDEC application form, supporting documentation which may include a location map or plan at an appropriate scale showing the point of discharge into the receiving waters, and other supplemental information which NYSDEC notifies the Town is necessary to review the application.
6NYCRR Part 624 Permit Hearing Procedures	This Part applies to hearings conducted by the NYSDEC on applications for permits or on denials of permits.	If a hearing is conducted for the purpose of issuing a Permit, the Town will participate in the hearing and follow the procedures associated with this Part.

ALTERNATIVE #4 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS), RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section pertains to remedial activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. The requirements of these sections include, among other aspects, development of a Safety and Health Program and a Site Control Program including engineering controls and safe work practices.	Site work will be conducted under an approved site specific Health and Safety Plan (HASP). Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances, including aspects such as engineering controls, safe work practices, and personal protective equipment.

ALTERNATIVE #4 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS), RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
CHEMICAL SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Guidelines for the Control of Toxic Ambient Air Contaminants, Air Guide-1, Draft 1991 Edition, Revised Appendix B (10/16/95).	Air Guide-1 provides guidance for the control of toxic ambient air contaminants in New York State. The purpose of this requirement is to describe the NYSDEC Division of Air Resources basic guidelines for permitting. In accordance with Air Guide-1, a source is evaluated regarding an individual contaminant basis, where the total impact of each chemical contaminants from a source is individually assessed and either compared to the ambient air quality standard or guidance value to determine the appropriate regulatory action.	During remedial activities, ambient air quality monitoring may be conducted where appropriate.
Technical Guidance for Screening Contaminated Sediments; (1993); NYSDEC Division of Fish and Wildlife; Division of Marine Resources	This Guidance includes criteria, standards and guidance values that are the maximum allowable concentration for applicable stream/surface water body sediments.	Dependent upon the specific media monitoring requirements mandated for Post-Closure Monitoring, sediment sampling locations may be regularly scheduled for monitoring to determine if the applicable sediment criteria, standards or guidance values are being attained.
6NYCRR Part 703 Surface Water and Groundwater Quality Standards	This Part includes standards and guidance values that are the maximum allowable concentration for applicable water classes.	Monitoring wells and surface water sampling locations will be regularly scheduled for monitoring to determine if the applicable groundwater or surface water standards or guidance values are being attained.

ALTERNATIVE #4 – SOIL COVER (INCLUDING WASTE CONSOLIDATION, GRADING AND SURFACE CONTROLS), RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
LOCATION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Clean Water Act Part 404 CFR Part 230	CWA Part 404 includes guidance which has been promulgated as regulations in 40CFR 230.10. Part 230 includes regulations indicating that the degradation or destruction of wetlands and other special aquatic sites should be avoided to the extent possible.	In the event remedial actions impose a potential to impact the wetland or surface water areas proximate to the site, proper notification and permitting procedures will be followed and appropriate actions will be completed to minimize adverse effects as described in 40CFR Part 330 Subpart H.

ALTERNATIVE #5 - ENGINEERED CAP, UPGRADIENT GROUNDWATER COLLECTION/DIVERSION TRENCH, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Part 750-757 State Pollution Discharge Elimination System (SPDES)	This Part prescribes procedures and substantive rules concerning the SPDES program. It regulates certain discharges to State waters. It includes administrative provisions requiring an application for a permit and a public comment process; technical requirements requiring compliance with specified standards and limitations; and discharge monitoring, record keeping, and reporting requirements.	As part of the ERP, the substantive requirements of the SPDES Program must be met for all dewatering wastewater discharges, however, a formal permit will not be required during remediation.
NYSDEC SPDES General Permit for Storm Water Discharges from Construction Activities	The General Permit describes the requirements for a SPDES Permit associated with storm water discharges from construction activities.	The substantive portion of the general permit is the development of a Storm Water Pollution Prevention Plan. A Plan will be developed which will include a description of the appropriate erosion and sediment control measures that will be implemented based on the sequence of anticipated activities which may disturb soils on major portions of the site. Furthermore, since it is anticipated that there will be common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary sediment basin may be constructed. The Contractor will be required to comply with the requirements of the SWPP.

ALTERNATIVE #5 - ENGINEERED CAP, UPGRADIENT GROUNDWATER COLLECTION/DIVERSION TRENCH, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS (cont.)

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Section 375-1.6 New Use of Sites	This section includes requirements for submitting a written notice to the NYSDEC at least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site.	At least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site, the Town will submit written notice of such activities to the NYSDEC. The notice will include an identification of the site (Name and Registry Number), an identification of the person giving notice, and a brief description of the proposed substantial change of use.
NYSDEC Guidelines NYSDEC Analytical Services Protocols (NYSDEC ASP)	This document includes the State procedures and protocols for media-sample analysis.	During implementation of a remedial action, periodic environmental monitoring may be conducted. Selected samples collected and analyzed will follow ASP (and/or applicable EPA-CLP) procedures. Furthermore, samples collected will be appropriately validated, if required.
6NYCRR Part 621 Uniform Procedures	This Part describes general requirements for applications for permits. This procedure will be followed for a permit application if a permit is necessary.	The Town will submit a properly completed NYSDEC application form, supporting documentation which may include a location map or plan at an appropriate scale showing the point of discharge into the receiving waters, and other supplemental information which NYSDEC notifies the Town is necessary to review the application.
6NYCRR Part 624 Permit Hearing Procedures	This Part applies to hearings conducted by the NYSDEC on applications for permits or on denials of permits.	If a hearing is conducted for the purpose of issuing a Permit, the Town will participate in the hearing and follow the procedures associated with this Part.

ALTERNATIVE #5 - ENGINEERED CAP, UPGRADIENT GROUNDWATER COLLECTION/DIVERSION TRENCH, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section pertains to remedial activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. The requirements of these sections include, among other aspects, development of a Safety and Health Program and a Site Control Program including engineering controls and safe work practices.	Site work will be conducted under an approved site specific Health and Safety Plan (HASP). Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances, including aspects such as engineering controls, safe work practices, and personal protective equipment.

ALTERNATIVE #5 - ENGINEERED CAP, UPGRADIENT GROUNDWATER COLLECTION/DIVERSION TRENCH, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
CHEMICAL SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Guidelines for the Control of Toxic Ambient Air Contaminants, Air Guide-1, Draft 1991 Edition, Revised Appendix B (10/16/95).	Air Guide-1 provides guidance for the control of toxic ambient air contaminants in New York State. The purpose of this requirement is to describe the NYSDEC Division of Air Resources basic guidelines for permitting. In accordance with Air Guide-1, a source is evaluated regarding an individual contaminant basis, where the total impact of each chemical contaminants from a source is individually assessed and either compared to the ambient air quality standard or guidance value to determine the appropriate regulatory action.	During remedial activities, ambient air quality monitoring may be conducted where appropriate.
Technical Guidance for Screening Contaminated Sediments; (1993); NYSDEC Division of Fish and Wildlife; Division of Marine Resources	This Guidance includes criteria, standards and guidance values which are the maximum allowable concentration for applicable stream/surface water body sediments.	Dependent upon the specific media monitoring requirements mandated for Post-Closure Monitoring, sediment sampling locations may be regularly scheduled for monitoring to determine if the applicable sediment criteria, standards or guidance values are being attained.
6NYCRR Part 703 Surface Water and Groundwater Quality Standards	This Part includes standards and guidance values which are the maximum allowable concentration for applicable water classes.	Monitoring wells and surface water sampling locations will be regularly scheduled for monitoring to determine if the applicable groundwater or surface water standards or guidance values are being attained.

ALTERNATIVE #5 - ENGINEERED CAP, UPGRADIENT GROUNDWATER COLLECTION/DIVERSION TRENCH, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
LOCATION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Clean Water Act Part 404 CFR Part 230	CWA Part 404 includes guidance which has been promulgated as regulations in 40CFR 230.10. Part 230 includes regulations indicating that the degradation or destruction of wetlands and other special aquatic sites should be avoided to the extent possible.	In the event remedial actions impose a potential to impact the wetland or surface water areas proximate to the site, proper notification and permitting procedures will be followed and appropriate actions will be completed to minimize adverse effects as described in 40CFR Part 330 Subpart H.

ALTERNATIVE #6 - ENGINEERED CAP, UPGRADIENT GROUNDWATER DIVERSION/CUTOFF WALL, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Part 750-757 State Pollution Discharge Elimination System (SPDES)	This Part prescribes procedures and substantive rules concerning the SPDES program. It regulates certain discharges to State waters. It includes administrative provisions requiring an application for a permit and a public comment process; technical requirements requiring compliance with specified standards and limitations; and discharge monitoring, record keeping, and reporting requirements.	As part of the ERP, the substantive requirements of the SPDES Program must be met for all dewatering wastewater discharges, however, a formal permit will not be required during remediation.
NYSDEC SPDES General Permit for Storm Water Discharges from Construction Activities	The General Permit describes the requirements for a SPDES Permit associated with storm water discharges from construction activities.	The substantive portion of the general permit is the development of a Storm Water Pollution Prevention Plan. A Plan will be developed which will include a description of the appropriate erosion and sediment control measures that will be implemented based on the sequence of anticipated activities which may disturb soils on major portions of the site. Furthermore, since it is anticipated that there will be common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary sediment basin may be constructed. The Contractor will be required to comply with the requirements of the SWPP.

ALTERNATIVE #6 - ENGINEERED CAP, UPGRADIENT GROUNDWATER DIVERSION/CUTOFF WALL, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS (cont.)

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
6NYCRR Section 375-1.6 New Use of Sites	This section includes requirements for submitting a written notice to the NYSDEC at least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site.	At least 60 days before the start of physical alteration or construction constituting a substantial change of use of the site, the Town will submit written notice of such activities to the NYSDEC. The notice will include an identification of the site, an identification of the person giving notice, and a brief description of the proposed substantial change of use.
NYSDEC Guidelines NYSDEC Analytical Services Protocols (NYSDEC ASP)	This document includes the State procedures and protocols for media-sample analysis.	During implementation of a remedial action, periodic environmental monitoring may be conducted. Selected samples collected and analyzed will follow ASP (and/or applicable EPA-CLP) procedures. Furthermore, samples collected will be appropriately validated, if required.
6NYCRR Part 621 Uniform Procedures	This Part describes general requirements for applications for permits. This procedure will be followed for a permit application if a permit is necessary.	If required, the Town will submit a properly completed NYSDEC application form, supporting documentation which may include a location map or plan at an appropriate scale showing the point of discharge into the receiving waters, and other supplemental information which NYSDEC notifies the Town is necessary to review the application.
6NYCRR Part 624 Permit Hearing Procedures	This Part applies to hearings conducted by the NYSDEC on applications for permits or on denials of permits.	If a hearing is conducted for the purpose of issuing a Permit, the Town will participate in the hearing and follow the procedures associated with this Part.

ALTERNATIVE #6 - ENGINEERED CAP, UPGRADIENT GROUNDWATER DIVERSION/CUTOFF WALL, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
ACTION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section pertains to remedial activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. The requirements of these sections include, among other aspects, development of a Safety and Health Program and a Site Control Program including engineering controls and safe work practices.	Site work will be conducted under an approved site specific Health and Safety Plan (HASP). Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances, including aspects such as engineering controls, safe work practices, and personal protective equipment.

ALTERNATIVE #6 - ENGINEERED CAP, UPGRADIENT GROUNDWATER DIVERSION/CUTOFF WALL, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
CHEMICAL SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

STATE REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Guidelines for the Control of Toxic Ambient Air Contaminants, Air Guide-1, Draft 1991 Edition, Revised Appendix B (10/16/95).	Air Guide-1 provides guidance for the control of toxic ambient air contaminants in New York State. The purpose of this requirement is to describe the NYSDEC Division of Air Resources basic guidelines for permitting. In accordance with Air Guide-1, a source is evaluated regarding an individual contaminant basis, where the total impact of each chemical contaminants from a source is individually assessed and either compared to the ambient air quality standard or guidance value to determine the appropriate regulatory action.	During remedial activities, ambient air quality monitoring may be conducted where appropriate.
Technical Guidance for Screening Contaminated Sediments; (1993); NYSDEC Division of Fish and Wildlife; Division of Marine Resources	This Guidance includes criteria, standards and guidance values which are the maximum allowable concentration for applicable stream/surface water body sediments.	Dependent upon the specific media monitoring requirements mandated for Post-Closure Monitoring, sediment sampling locations may be regularly scheduled for monitoring to determine if the applicable sediment criteria, standards or guidance values are being attained.
6NYCRR Part 703 Surface Water and Groundwater Quality Standards	This Part includes standards and guidance values which are the maximum allowable concentration for applicable water classes.	Monitoring wells and surface water sampling locations will be regularly scheduled for monitoring to determine if the applicable groundwater or surface water standards or guidance values are being attained.

ALTERNATIVE #6 - ENGINEERED CAP, UPGRADIENT GROUNDWATER DIVERSION/CUTOFF WALL, RIVERBANK STABILIZATION WITH LIMITED ACTION ITEMS
LOCATION SPECIFIC STANDARDS, CRITERIA, GUIDELINES (SCGs) FOR THE BLACK ASH POND SITE

FEDERAL REQUIREMENTS

SCG	SCG SYNOPSIS	CONSIDERATION TO ATTAIN SCG
Clean Water Act Part 404 CFR Part 230	CWA Part 404 includes guidance which has been promulgated as regulations in 40CFR 230.10. Part 230 includes regulations indicating that the degradation or destruction of wetlands and other special aquatic sites should be avoided to the extent possible.	In the event remedial actions impose a potential to impact the wetland or surface water areas proximate to the site, proper notification and permitting procedures will be followed and appropriate actions will be completed to minimize adverse effects as described in 40CFR Part 330 Subpart H.

APPENDIX C

DETAILED ANALYSIS OF ALTERNATIVES

BLACK ASH POND ERP: RA REPORT DETAILED ANALYSIS OF ALTERNATIVES
SUMMARY OF DETAILED ANALYSIS OF ALTERNATIVES SCORING

Scoring/Evaluation Criteria	Maximum Score	Alternative #1 No Action*[1]	Alternative #2 Limited Actions	Alternative #3 Soil Cover w/ Limited Actions	Alternative #4 Soil Cover, River-Bank Stabilization w/ Limited Actions	Alternative #5 Eng. Cap, Ground-Water Collection, Riverbank Stabilization w/ Limited Actions	Alternative #6 Eng. Cap, Ground-Water Diversion, Riverbank Stabilization w/ Limited Actions
1. Compliance w/ SCGs	10	0	0	0	6	10	10
2. Protection of Human Health and the Environment	20	2	2	8	13	20	20
3. Short-Term Effectiveness	10	4	10	8	8	8	8
4. Long-Term Effectiveness and Permanence	15	1	3	5	6	8	8
5. Reduction of Toxicity, Mobility or Volume	15	0	0	3	5	5	5
6. Implementability	15	6	12	11	11	10	9
7. Cost	15	16	15	13	6	1	0
TOTAL SCORE	100	29	42	48	55	62	60

NOTE: *[1] No-Action Alternative is not applicable for scoring

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Compliance with New York State Standards
Criteria and Guidelines (SCGs)
(Relative Weight = 10)

ALTERNATIVE # 1: NO ACTION

	Analysis Factor	**Basis for Evaluation**		**Score**	
1.	Compliance with chemical specific SCGs	Meets chemical specific SCGs such as groundwater standards.	Yes	___	4
			No	X	0
2.	Compliance with action specific SCGs	Meets action specific SCGs such as technology standards for incineration or landfill.	Yes	___	3
			No	X	0
3.	Compliance with location specific SCGs	Meets location specific SCGs such as Freshwater Wetlands Act.	Yes	___	3
			No	X	0

TOTAL (MAXIMUM = 10) 0

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Protection of Human Health and the Environment
(Relative Weight = 20)

ALTERNATIVE # 1: NO ACTION

	Analysis Factor	**Basis for Evaluation**			**Score**	
1.	Use of site after remediation	Unrestricted use of the land and water (If yes, go to the end of the table.)		Yes	___	20
				No	X	0
	TOTAL (Maximum = 20)				0	
2.	Human health and the environment exposure after remediation.	i) is the exposure to contaminants via air route acceptable ?		Yes	___	3
				No	X	0
		ii) is the exposure to contaminants via groundwater/ surface water acceptable ?		Yes	___	4
				No	X	0
		iii) is the exposure to contaminants via sediments/ soil acceptable ?		Yes	___	3
				No	X	0
	Subtotal (Maximum = 10)				0	
3.	Magnitude of residual public health risks after remediation.	i) Health risk	<= 1 in 1,000,000		___	5
		ii) Health risk	<= 1 in 100,000		X	2
	Subtotal (Maximum = 5)				2	
4.	Magnitude of residual environmental risks after remediation.	i) Less than acceptable			___	5
		ii) Slightly greater than acceptable			___	3
		iii)Significant risk still exists			X	0
	Subtotal (Maximum = 5)				0	
	TOTAL (MAXIMUM = 20)				2	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Short Term Effectiveness
(Relative Weight = 10)

ALTERNATIVE # 1: NO ACTION

Analysis Factor	Basis for Evaluation		Score	
1. Protection of community during remedial actions.	i) Are there significant short-term risks to the community that must be addressed? (if no, go to Factor 2)	Yes	X	0
		No	___	4
	ii) Can the short term risk be easily controlled?	Yes	___	1
		No	X	0
	iii) Does the mitigative effort to control short term risk impact the community lifestyle?	Yes	___	0
		No	X	2
Subtotal (Maximum = 4)			2	
2. Environmental Impacts	i) Are there significant short term risks to the environment that must be addressed? (if no, go to Factor 3)	Yes	X	0
		No	___	4
	ii) Are the available mitigative measures reliable to minimize potential impacts?	Yes	___	3
		No	X	0
Subtotal (Maximum = 4)			0	
3. Time to implement the remedy.	i) What is the required time to implement the remedy?	<2yrs	X	1
		>2yrs	___	0
	ii) Requires duration of the mitigative effort to control short term risk.	<2yrs	X	1
		>2yrs	___	0
Subtotal (Maximum = 2)			2	
TOTAL (MAXIMUM = 10)			4	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 1: NO ACTION

Analysis Factor	Basis for Evaluation		Score	
1. On-site or off-site treatment or land disposal.	i) On-site treatment		___	3
	ii) Off-site treatment.		___	1
	iii) On-site or off-site land disposal		X	0
Subtotal (Maximum = 3)			0	NA
2. Permanence of the remedy	i) Will the remedy be classified as permanent in accordance with TAGM 4030 Sect. 2.1? (If yes, go to Factor 4)	Yes	___	3
		No	X	0
Subtotal (Maximum = 3)			0	
3. Lifetime of remedial actions.	i) Expected lifetime or duration of the effectiveness of the remedy.	25-30 years	___	3
		20-25 years	___	2
		15-20 years	___	1
		<15 years	X	0
Subtotal (Maximum = 3)			0	
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None	___	3
		<25%	___	2
		25-50%	___	1
		>50%	X	0
	ii) Is there treated residual left at the site? (If no, go to Factor 5)	Yes	X	0
		No	___	2
	iii) Is the treated residual toxic ?	Yes	X	0
		No	___	1
	iv) Is the treated residual mobile ?	Yes	X	0
		No	___	1
Subtotal (Maximum = 5)			0	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 1: NO ACTION

Analysis Factor	Basis for Evaluation		Score		
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of;	<5 yr	___	1	
		>5 yr	X	0	NA
	ii)Are environmental controls required as part of the remedy to handle potential problems? (If no, go to "iv")	Yes	X	0	
		No	___	1	NA
	iii)Degree of confidence that controls can handle potential problems.	Moderate to very confident	___	1	
		Somewhat to not confident	X	0	
	iv)relative degree of long-term monitoring required, as compared to other alternatives.	Minimum	___	2	
		Moderate	X	1	
		Extensive	___	0	
Subtotal (Maximum = 5)			1		

TOTAL (MAXIMUM = 15) 1

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 1: NO ACTION

Analysis Factor	Basis for Evaluation	Score	
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or Immobilization technologies do not score under Factor 1.	99-100%___	8
		90-99%___	7
		80-90%___	6
		60-80%___	4
		40-60%___	3
		20-40%___	1
		<20% X	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? If no, go to Factor 2.	Yes ___	0
		No ___	2
	iii) After remediation, how is the untreated, residual hazardous material disposed?	Off-site land disposal___	0
		On-site land disposal___	1
		Off-site destruction or treatment___	2
Subtotal (Maximum = 10) If subtotal = 10, go to Factor 3.		NA	
2. Reduction in mobility of hazardous waste.	i) Quality of available wastes immobilized after destruction/treatment.	90-100%___	2
		60-90%___	1
		<60% X	0
	ii) Method of immobilization		
	Reduced mobility by containment (in-place)	X	0 NA
	Reduced mobility by alternative treatment technology	___	3
Subtotal (Maximum =5)		0	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 1: NO ACTION

Analysis Factor	Basis for Evaluation	Score	
3. Irreversibility of the destruction or treatment or immobilization of the hazardous waste.	i) Completely irreversible	___	5
	ii) Irreversible for most of the hazardous waste constituents	___	3
	iii) Irreversible for only some of the hazardous waste constituents	___	2
	iv) Reversible for most of the hazardous waste constituents	X	0
Subtotal (Maximum = 5)		0	
TOTAL (MAXIMUM = 15)		0	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 1: NO ACTION

Analysis Factor	**Basis for Evaluation**	**Score**		
1. Technical Feasibility				
a. Ability to Construct Technology	i) Not difficult to construct. No uncertainties in construction.	X	3	
	ii) Somewhat difficult to construct. No uncertainties in construction.	___	2	
	iii) Very difficult to construct and/or significant uncertainties in construction.	___	1	
b. Reliability of Technology	i) Very reliable in meeting the specified process efficiencies or performance goals.	___	3	
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.	X	2	NA
c. Schedule of Delays Due to Technical Problems	i) Unlikely	X	2	
	ii) Somewhat likely	___	1	
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	___	2	
	ii) Some future remedial actions may be necessary.	X	1	
Subtotal (Maximum = 10)		1		
2. Administrative Feasibility				
a. Coordination with other Agencies	i) Minimal Coordination is required.	X	2	NA
	ii) Required Coordination is normal.	___	1	
	iii) Extensive Coordination is required.	___	0	
Subtotal (Maximum = 2)		2		

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 1: NO ACTION

Analysis Factor	Basis for Evaluation		Score	
3. Availability of Services and Materials				
a. Available of Prospect Technologies	i) Are technologies under consideration generally commercially available for the site specific application ?	Yes No	X ___	1 0
	ii) Will more than one vendor be available to provide a competitive bid ?	Yes No	X ___	1 0
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes No	X ___	1 0

NA

Subtotal (Maximum = 3) 3

TOTAL (MAXIMUM = 15) 6

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COST SCORE 16*

* No-action not necc. applicable for scorin

TOTAL SCORE - ALTERNATIVE # 1 ___

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Compliance with New York State Standards
Criteria and Guidelines (SCGs)
(Relative Weight = 10)

ALTERNATIVE # 2: LIMITED ACTIONS

	Analysis Factor	Basis for Evaluation		Score	
1.	Compliance with chemical specific SCGs	Meets chemical specific SCGs such as groundwater standards.	Yes No	___ X	4 0
2.	Compliance with action specific SCGs	Meets action specific SCGs such as technology standards for incineration or landfill.	Yes No	___ X	3 0
3.	Compliance with location specific SCGs	Meets location specific SCGs such as Freshwater Wetlands Act.	Yes No	___ X	3 0

TOTAL (MAXIMUM = 10) 0

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Protection of Human Health and the Environment
(Relative Weight = 20)

ALTERNATIVE # 2: LIMITED ACTIONS

Analysis Factor	Basis for Evaluation			Score	
1. Use of site after remediation	Unrestricted use of the land and water (If yes, go to the end of the table.)		Yes	___	20
			No	X	0
TOTAL (Maximum = 20)				0	
2. Human health and the environment exposure after remediation.	i) is the exposure to contaminants via air route acceptable ?		Yes	___	3
			No	X	0
	ii) is the exposure to contaminants via groundwater/ surface water acceptable ?		Yes	___	4
			No	X	0
	iii) is the exposure to contaminants via sediments/ soil acceptable ?		Yes	___	3
			No	X	0
Subtotal (Maximum = 10)				0	
3. Magnitude of residual public health risks after remediation.	i) Health risk	< = 1 in 1,000,000		___	5
	ii) Health risk	< = 1 in 100,000		X	2
Subtotal (Maximum = 5)				2	
4. Magnitude of residual environmental risks after remediation.	i) Less than acceptable			___	5
	ii) Slightly greater than acceptable			___	3
	iii) Significant risk still exists			X	0
Subtotal (Maximum = 5)				0	
TOTAL (MAXIMUM = 20)				2	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Short Term Effectiveness
(Relative Weight = 10)

ALTERNATIVE # 2: LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
1. Protection of community during remedial actions.	i) Are there significant short-term risks to the community that must be addressed? (if no, go to Factor 2)*	Yes		0
		No	X	4
	ii) Can the short term risk be easily controlled?	Yes		1
		No		0
	iii)Does the mitigative effort to control short term risk impact the community lifestyle?	Yes		0
		No		2
Subtotal (Maximum = 4)			4	
2. Environmental Impacts	i) Are there significant short term risks to the environment that must be addressed? (if no, go to Factor 3)*	Yes		0
		No	X	4
	ii) Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)			4	
3. Time to implement the remedy.	i) What is the required time to implement the remedy?	<2yrs	X	1
		>2yrs		0
	ii)Requires duration of the mitigative effort to control short term risk.	<2yrs	X	1
		>2yrs		0
Subtotal (Maximum = 2)			2	
TOTAL (MAXIMUM = 10)			10	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 2: LIMITED ACTIONS

	Analysis Factor	Basis for Evaluation		Score	
1.	On-site or off-site treatment or land disposal.	i) On-site treatment		___	3
		ii) Off-site treatment		___	1
		iii)On-site or off-site land disposal		X	0
	Subtotal (Maximum = 3)			0	
2.	Permanence of the remedy	i) Will the remedy be classified as permanent in accordance with TAGM 4030 Sect. 2.1? (If yes, go to Factor 4)	Yes	___	3
			No	X	0
	Subtotal (Maximum = 3)			0	
3.	Lifetime of remedial actions.	i) Expected lifetime or duration of the effectiveness of the remedy.	25-30 years	___	3
			20-25 years	___	2
			15-20 years	___	1
			<15 years	X	0
	Subtotal (Maximum = 3)			0	
4.	Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None	___	3
			<25%	___	2
			25-50%	___	1
			>50%	X	0
		ii)Is there treated residual left at the site? (If no, go to Factor 5)	Yes	X	0
			No	___	2
		iii)Is the treated residual toxic ?	Yes	X	0
			No	___	1
		iv) Is the treated residual mobile ?	Yes	X	0
			No	___	1
	Subtotal (Maximum = 5)			0	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 2: LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of;	<5 yr	___	1
		>5 yr	X	0
	ii)Are environmental controls required as part of the remedy to handle potential problems? (If no, go to "iv")	Yes	___	0
		No	X	1
	iii)Degree of confidence that controls can handle potential problems.	Moderate to very confident	___	1
		Somewhat to not confident	___	0
	iv)relative degree of long-term monitoring required, as compared to other alternatives.	Minimum	X	2
		Moderate	___	1
		Extensive	___	0
Subtotal (Maximum = 5)			3	
TOTAL (MAXIMUM = 15)			3	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 2: LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**	**Score**	
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or Immobilization technologies do not score under Factor 1. *	99-100%___	8
		90-99%___	7
		80-90%___	6
		60-80%___	4
		40-60%___	3
		20-40%___	1
		<20% ___	0
	ii)Are there untreated or concentrated hazardous waste produced as a result of (i)? If no, go to Factor 2.	Yes ___	0
		No ___	2
	iii)After remediation, how is the untreated, residual hazardous material disposed?	Off-site land disposal___	0
		On-site land disposal___	1
		Off-site destruction or treatment___	2
Subtotal (Maximum = 10) If subtotal = 10, go to Factor 3.		NA	
2. Reduction in mobility of hazardous waste.	i) Quality of available wastes immobilized after destruction/treatment.	90-100%___	2
		60-90%___	1
		<60% X	0
	ii)Method of immobilization Reduced mobility by containment	X	0 NA
	Reduced mobility by alternative treatment technology	___	3
Subtotal (Maximum =5)		0	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 2: LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**	**Score**	
3.Irreversibility of the destruction or treatment or immobilization of the hazardous waste.	i) Completely irreversible	___	5
	ii)Irreversible for most of the hazardous waste constituents	___	3
	iii)Irreversible for only some of the hazardous waste constituents	___	2
	iv)Reversible for most of the hazardous waste constituents	X	0
Subtotal (Maximum = 5)		0	
TOTAL (MAXIMUM = 15)		0	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 2: LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Technical Feasibility			
a. Ability to Construct Technology	i) Not difficult to construct. No uncertainties in construction.	X	3
	ii) Somewhat difficult to construct. No uncertainties in construction.	___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of Technology	i) Very reliable in meeting the specified process efficiencies or performance goals.	___	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.	X	2
c. Schedule of Delays Due to Technical Problems	i) Unlikely	X	2
	ii) Somewhat likely	___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	___	2
	ii) Some future remedial actions may be necessary.	___	1
Subtotal (Maximum = 10)		7	
2. Administrative Feasibility			
a. Coordination with other Agencies	i) Minimal Coordination is required.	X	2
	ii) Required Coordination is normal.	___	1
	iii) Extensive Coordination is required.	___	0
Subtotal (Maximum = 2)		2	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 2: LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**		**Score**	
3. Availability of Services and Materials				
a. Available of Prospect Technologies	i) Are technologies under consideration generally commercially available for the site specific application ?	Yes No	X __	1 0
	ii)Will more than one vendor be available to provide a competitive bid ?	Yes No	X __	1 0
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes No	X __	1 0
Subtotal (Maximum = 3)			3	
TOTAL (MAXIMUM = 15)			12	
COST SCORE			15	

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TOTAL SCORE - ALTERNATIVE # 2 42

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Compliance with New York State Standards
Criteria and Guidelines (SCGs)
(Relative Weight = 10)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

	Analysis Factor	Basis for Evaluation		Score	
1.	Compliance with chemical specific SCGs	Meets chemical specific SCGs such as groundwater standards.	Yes No	___ X	4 0
2.	Compliance with action specific SCGs	Meets action specific SCGs such as technology standards for incineration or landfill.	Yes No	___ X	3 0
3.	Compliance with location specific SCGs	Meets location specific SCGs such as Freshwater Wetlands Act.	Yes No	___ X	3 0

TOTAL (MAXIMUM = 10) 0

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Protection of Human Health and the Environment
(Relative Weight = 20)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

	Analysis Factor	**Basis for Evaluation**			**Score**	
1.	Use of site after remediation	Unrestricted use of the land and water (If yes, go to the end of the table.)		Yes		20
				No	X	0
	TOTAL (Maximum = 20)				0	
2.	Human health and the environment exposure after remediation.	i) is the exposure to contaminants via air route acceptable ?		Yes	X	3
				No		0
		ii) is the exposure to contaminants via groundwater/ surface water acceptable ?		Yes		4
				No	X	0
		iii) is the exposure to contaminants via sediments/ soil acceptable ?		Yes		3
				No	X	0
	Subtotal (Maximum = 10)				3	
3.	Magnitude of residual public health risks after remediation.	i) Health risk	< = 1 in 1,000,000			5
		ii) Health risk	< = 1 in 100,000		X	2
	Subtotal (Maximum = 5)				2	
4.	Magnitude of residual environmental risks after remediation.	i) Less than acceptable				5
		ii) Slightly greater than acceptable			X	3
		iii) Significant risk still exists				0
	Subtotal (Maximum = 5)				3	

TOTAL (MAXIMUM = 20) 8

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Short Term Effectiveness
(Relative Weight = 10)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
1. Protection of community during remedial actions.	i) Are there significant short-term risks to the community that must be addressed? (if no, go to Factor 2)	Yes	X	0
		No		4
	ii) Can the short term risk be easily controlled?	Yes	X	1
		No		0
	iii) Does the mitigative effort to control short term risk impact the community lifestyle?	Yes		0
		No	X	2
Subtotal (Maximum = 4)			3	
2. Environmental Impacts	i) Are there significant short term risks to the environment that must be addressed? (if no, go to Factor 3)	Yes	X	0
		No		4
	ii) Are the available mitigative measures reliable to minimize potential impacts?	Yes	X	3
		No		0
Subtotal (Maximum = 4)			3	
3. Time to implement the remedy.	i) What is the required time to implement the remedy?	<2yrs	X	1
		>2yrs		0
	ii) Requires duration of the mitigative effort to control short term risk.	<2yrs	X	1
		>2yrs		0
Subtotal (Maximum = 2)			2	
TOTAL (MAXIMUM = 10)			8	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
1. On-site or off-site treatment or land disposal.	i) On-site treatment		___	3
	ii) Off-site treatment		___	1
	iii)On-site or off-site land disposal		X	0
Subtotal (Maximum = 3)			0	
2. Permanence of the remedy	i) Will the remedy be classified as permanent in accordance with TAGM 4030 Sect. 2.1? (If yes, go to Factor 4)	Yes	___	3
		No	X	0
Subtotal (Maximum = 3)			0	
3. Lifetime of remedial actions.	i) Expected lifetime or duration of the effectiveness of the remedy.	25-30 years	___	3
		20-25 years	___	2
		15-20 years	X	1
		<15 years	___	0
Subtotal (Maximum = 3)			1	
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None	___	3
		<25%	X	2
		25-50%	___	1
		>50%	___	0
	ii)Is there treated residual left at the site? (If no, go to Factor 5)	Yes	X	0
		No	___	2
	iii)Is the treated residual toxic ?	Yes	X	0
		No	___	1
	iv) Is the treated residual mobile ?	Yes	X	0
		No	___	1
Subtotal (Maximum = 5)			2	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of;	<5 yr	___	1
		>5 yr	X	0
	ii)Are environmental controls required as part of the remedy to handle potential problems? (If no, go to "iv")	Yes	X	0
		No	___	1
	iii)Degree of confidence that controls can handle potential problems.	Moderate to very confident	X	1
		Somewhat to not confident	___	0
	iv)relative degree of long-term monitoring required, as compared to other alternatives.	Minimum	___	2
		Moderate	X	1
		Extensive	___	0
Subtotal (Maximum = 5)			2	
TOTAL (MAXIMUM = 15)			5	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or Immobilization technologies do not score under Factor 1.* NA	99-100%___	8
		90-99%___	7
		80-90%___	6
		60-80%___	4
		40-60%___	3
		20-40%___	1
		<20% ___	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? If no, go to Factor 2.	Yes ___	0
		No ___	2
	iii) After remediation, how is the untreated, residual hazardous material disposed?	Off-site land disposal___	0
		On-site land disposal___	1
		Off-site destruction or treatment___	2
Subtotal (Maximum = 10) If subtotal = 10, go to Factor 3.		NA	
2. Reduction in mobility of hazardous waste.	i) Quality of available wastes immobilized after destruction/treatment.	90-100%___	2
		60-90% X	1
		<60% ___	0
	ii) Method of immobilization		
	Reduced mobility by containment	X	0
	Reduced mobility by alternative treatment technology	___	3
Subtotal (Maximum =5)		1	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**	**Score**	
3. Irreversibility of the destruction or treatment or immobilization of the hazardous waste.	i) Completely irreversible	___	5
	ii) Irreversible for most of the hazardous waste constituents	___	3
	iii) Irreversible for only some of the hazardous waste constituents	X	2
	iv) Reversible for most of the hazardous waste constituents	___	0
Subtotal (Maximum = 5)		2	
TOTAL (MAXIMUM = 15)		3	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Technical Feasibility			
a. Ability to Construct Technology	i) Not difficult to construct. No uncertainties in construction.	___	3
	ii)Somewhat difficult to construct. No uncertainties in construction.	X	2
	iii)Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of Technology	i) Very reliable in meeting the specified process efficiencies or performance goals.	___	3
	ii)Somewhat reliable in meeting the specified process efficiencies or performance goals.	X	2
c. Schedule of Delays Due to Technical Problems	i) Unlikely	X	2
	ii)Somewhat likely	___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	___	2
	ii)Some future remedial actions may be necessary.	X	1
Subtotal (Maximum = 10)		7	
2. Administrative Feasibility			
a. Coordination with other Agencies	i) Minimal Coordination is required.	___	2
	ii)Required Coordination is normal.	X	1
	iii)Extensive Coordination is required.	___	0
Subtotal (Maximum = 2)		1	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 3: SOIL COVER w/ LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**		**Score**	
3. Availability of Services and Materials				
a. Available of Prospect Technologies	i) Are technologies under consideration generally commercially available for the site specific application ?	Yes No	X __	1 0
	ii)Will more than one vendor be available to provide a competitive bid ?	Yes No	X __	1 0
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes No	X __	1 0
Subtotal (Maximum = 3)			3	
TOTAL (MAXIMUM = 15)			11	
				35
COST SCORE			13	

TOTAL SCORE - ALTERNATIVE # 3 48

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Compliance with New York State Standards
Criteria and Guidelines (SCGs)
(Relative Weight = 10)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

	Analysis Factor	Basis for Evaluation		Score	
1.	Compliance with chemical specific SCGs	Meets chemical specific SCGs such as groundwater standards.	Yes No	___ X	4 0
2.	Compliance with action specific SCGs	Meets action specific SCGs such as technology standards for incineration or landfill.	Yes No	X ___	3 0
3.	Compliance with location specific SCGs	Meets location specific SCGs such as Freshwater Wetlands Act.	Yes No	X ___	3 0

TOTAL (MAXIMUM = 10) 6

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Protection of Human Health and the Environment
(Relative Weight = 20)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation			Score	
1. Use of site after remediation	Unrestricted use of the land and water (If yes, go to the end of the table.)		Yes	___	20
			No	X	0
TOTAL (Maximum = 20)				0	
2. Human health and the environment exposure after remediation.	i) is the exposure to contaminants via air route acceptable ?		Yes	X	3
			No	___	0
	ii) is the exposure to contaminants via groundwater/ surface water acceptable ?		Yes	___	4
			No	X	0
	iii) is the exposure to contaminants via sediments/ soil acceptable ?		Yes	X	3
			No	___	0
Subtotal (Maximum = 10)				6	
3. Magnitude of residual public health risks after remediation.	i) Health risk	<= 1 in 1,000,000		___	5
	ii) Health risk	<= 1 in 100,000		X	2
Subtotal (Maximum = 5)				2	
4. Magnitude of residual environmental risks after remediation.	i) Less than acceptable			X	5
	ii) Slightly greater than acceptable			___	3
	iii)Significant risk still exists			___	0
Subtotal (Maximum = 5)				5	
TOTAL (MAXIMUM = 20)				13	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Short Term Effectiveness
(Relative Weight = 10)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
1. Protection of community during remedial actions.	i) Are there significant short-term risks to the community that must be addressed? (if no, go to Factor 2)	Yes	X	0
		No		4
	ii) Can the short term risk be easily controlled?	Yes	X	1
		No		0
	iii)Does the mitigative effort to control short term risk impact the community lifestyle?	Yes		0
		No	X	2
Subtotal (Maximum = 4)			3	
2. Environmental Impacts	i) Are there significant short term risks to the environment that must be addressed? (if no, go to Factor 3)	Yes	X	0
		No		4
	ii) Are the available mitigative measures reliable to minimize potential impacts?	Yes	X	3
		No		0
Subtotal (Maximum = 4)			3	
3. Time to implement the remedy.	i) What is the required time to implement the remedy?	<2yrs	X	1
		>2yrs		0
	ii)Requires duration of the mitigative effort to control short term risk.	<2yrs	X	1
		>2yrs		0
Subtotal (Maximum = 2)			2	
TOTAL (MAXIMUM = 10)			8	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
1. On-site or off-site treatment or land disposal.	i) On-site treatment		___	3
	ii) Off-site treatment		___	1
	iii)On-site or off-site land disposal		X	0
Subtotal (Maximum = 3)			0	
2. Permanence of the remedy	i) Will the remedy be classified as permanent in accordance with TAGM 4030 Sect. 2.1? (If yes, go to Factor 4)	Yes	___	3
		No	X	0
Subtotal (Maximum = 3)			0	
3. Lifetime of remedial actions.	i) Expected lifetime or duration of the effectiveness of the remedy.	25-30 years	___	3
		20-25 years	X	2
		15-20 years	___	1
		<15 years	___	0
Subtotal (Maximum = 3)			2	
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None	___	3
		<25%	X	2
		25-50%	___	1
		>50%	___	0
	ii)Is there treated residual left at the site? (If no, go to Factor 5)	Yes	X	0
		No	___	2
	iii)Is the treated residual toxic ?	Yes	X	0
		No	___	1
	iv) Is the treated residual mobile ?	Yes	X	0
		No	___	1
Subtotal (Maximum = 5)			2	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**		**Score**	
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of;	<5 yr	___	1
		>5 yr	X	0
	ii)Are environmental controls required as part of the remedy to handle potential problems? (If no, go to "iv")	Yes	X	0
		No	___	1
	iii)Degree of confidence that controls can handle potential problems.	Moderate to very confident	X	1
		Somewhat to not confident	___	0
	iv)relative degree of long-term monitoring required, as compared to other alternatives.	Minimum	___	2
		Moderate	X	1
		Extensive	___	0
Subtotal (Maximum = 5)			2	

TOTAL (MAXIMUM = 15) 6

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or Immobilization technologies do not score under Factor 1.* NA	99-100%___	8
		90-99%___	7
		80-90%___	6
		60-80%___	4
		40-60%___	3
		20-40%___	1
		<20% ___	0
	ii)Are there untreated or concentrated hazardous waste produced as a result of (i)? If no, go to Factor 2.	Yes ___	0
		No ___	2
	iii)After remediation, how is the untreated, residual hazardous material disposed?	Off-site land disposal___	0
		On-site land disposal___	1
		Off-site destruction or treatment___	2
Subtotal (Maximum = 10) If subtotal = 10, go to Factor 3.		NA	
2. Reduction in mobility of hazardous waste.	i) Quality of available wastes immobilized after destruction/treatment.	90-100% X	2
		60-90%___	1
		<60% ___	0
	ii)Method of immobilization		
	Reduced mobility by containment	X	0
	Reduced mobility by alternative treatment technology	___	3
Subtotal (Maximum =5)		2	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**	**Score**	
3. Irreversibility of the destruction or treatment or immobilization of the hazardous waste.	i) Completely irreversible	___	5
	ii) Irreversible for most of the hazardous waste constituents	X	3
	iii) Irreversible for only some of the hazardous waste constituents	___	2
	iv) Reversible for most of the hazardous waste constituents	___	0
Subtotal (Maximum = 5)		3	
TOTAL (MAXIMUM = 15)		5	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Technical Feasibility			
a. Ability to Construct Technology	i) Not difficult to construct. No uncertainties in construction.	___	3
	ii) Somewhat difficult to construct. No uncertainties in construction.	X	2
	iii) Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of Technology	i) Very reliable in meeting the specified process efficiencies or performance goals.	___	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.	X	2
c. Schedule of Delays Due to Technical Problems	i) Unlikely	X	2
	ii) Somewhat likely	___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	___	2
	ii) Some future remedial actions may be necessary.	X	1
Subtotal (Maximum = 10)		7	
2. Administrative Feasibility			
a. Coordination with other Agencies	i) Minimal Coordination is required.	___	2
	ii) Required Coordination is normal.	X	1
	iii) Extensive Coordination is required.	___	0
Subtotal (Maximum = 2)		1	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 4: SOIL COVER, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**		**Score**	
3. Availability of Services and Materials				
a. Available of Prospect Technologies	i) Are technologies under consideration generally commercially available for the site specific application ?	Yes No	X ___	1 0
	ii)Will more than one vendor be available to provide a competitive bid ?	Yes No	X ___	1 0
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes No	X ___	1 0

Subtotal (Maximum = 3) 3

TOTAL (MAXIMUM = 15) 11

49

COST SCORE 6

TOTAL SCORE - ALTERNATIVE # 4 55

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Compliance with New York State Standards
Criteria and Guidelines (SCGs)
(Relative Weight = 10)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

	Analysis Factor	Basis for Evaluation		Score	
1.	Compliance with chemical specific SCGs	Meets chemical specific SCGs such as groundwater standards.	Yes	X	4
			No	___	0
2.	Compliance with action specific SCGs	Meets action specific SCGs such as technology standards for incineration or landfill.	Yes	X	3
			No	___	0
3.	Compliance with location specific SCGs	Meets location specific SCGs such as Freshwater Wetlands Act.	Yes	X	3
			No	___	0

TOTAL (MAXIMUM = 10) 10

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Protection of Human Health and the Environment
(Relative Weight = 20)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**		**Score**	
1. Use of site after remediation	Unrestricted use of the land and water (If yes, go to the end of the table.)	Yes	___	20
		No	X	0
TOTAL (Maximum = 20)			0	
2. Human health and the environment exposure after remediation.	i) is the exposure to contaminants via air route acceptable ?	Yes	X	3
		No	___	0
	ii) is the exposure to contaminants via groundwater/ surface water acceptable ?	Yes	X	4
		No	___	0
	iii) is the exposure to contaminants via sediments/ soil acceptable ?	Yes	X	3
		No	___	0
Subtotal (Maximum = 10)			10	
3. Magnitude of residual public health risks after remediation.	i) Health risk <= 1 in 1,000,000		X	5
	ii) Health risk <= 1 in 100,000		___	2
Subtotal (Maximum = 5)			5	
4. Magnitude of residual environmental risks after remediation.	i) Less than acceptable		X	5
	ii) Slightly greater than acceptable		___	3
	iii)Significant risk still exists		___	0
Subtotal (Maximum = 5)			5	
TOTAL (MAXIMUM = 20)			20	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Short Term Effectiveness
(Relative Weight = 10)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**		**Score**	
1. Protection of community during remedial actions.	i) Are there significant short-term risks to the community that must be addressed? (if no, go to Factor 2)	Yes	X	0
		No		4
	ii) Can the short term risk be easily controlled?	Yes	X	1
		No		0
	iii)Does the mitigative effort to control short term risk impact the community lifestyle?	Yes		0
		No	X	2
Subtotal (Maximum = 4)			3	
2. Environmental Impacts	i) Are there significant short term risks to the environment that must be addressed? (if no, go to Factor 3)	Yes	X	0
		No		4
	ii) Are the available mitigative measures reliable to minimize potential impacts?	Yes	X	3
		No		0
Subtotal (Maximum = 4)			3	
3. Time to implement the remedy.	i) What is the required time to implement the remedy?	<2yrs	X	1
		>2yrs		0
	ii)Requires duration of the mitigative effort to control short term risk.	<2yrs	X	1
		>2yrs		0
Subtotal (Maximum = 2)			2	
TOTAL (MAXIMUM = 10)			8	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

	Analysis Factor	Basis for Evaluation		Score	
1.	On-site or off-site treatment or land disposal.	i) On-site treatment		___	3
		ii) Off-site treatment			1
		iii)On-site or off-site land disposal		X	0
	Subtotal (Maximum = 3)			0	
2.	Permanence of the remedy	i) Will the remedy be classified as permanent in accordance with TAGM 4030 Sect. 2.1? (If yes, go to Factor 4)	Yes		3
			No	X	0
	Subtotal (Maximum = 3)			0	
3.	Lifetime of remedial actions.	i) Expected lifetime or duration of the effectiveness of the remedy.	25-30 years	X	3
			20-25 years	___	2
			15-20 years	___	1
			<15 years	___	0
	Subtotal (Maximum = 3)			3	
4.	Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None	___	3
			<25%	X	2
			25-50%	___	1
			>50%	___	0
		ii)Is there treated residual left at the site? (If no, go to Factor 5)	Yes	X	0
			No	___	2
		iii)Is the treated residual toxic ?	Yes	X	0
			No	___	1
		iv) Is the treated residual mobile ?	Yes		0
			No	X	1
	Subtotal (Maximum = 5)			3	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of;	<5 yr	___	1
		>5 yr	X	0
	ii) Are environmental controls required as part of the remedy to handle potential problems? (If no, go to "iv")	Yes	X	0
		No	___	1
	iii) Degree of confidence that controls can handle potential problems.	Moderate to very confident	X	1
		Somewhat to not confident	___	0
	iv) relative degree of long-term monitoring required, as compared to other alternatives.	Minimum	___	2
		Moderate	X	1
		Extensive	___	0

Subtotal (Maximum = 5) 2

TOTAL (MAXIMUM = 15) 8

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or Immobilization technologies do not score under Factor 1. *NA	99-100%___	8
		90-99%___	7
		80-90%___	6
		60-80%___	4
		40-60%___	3
		20-40%___	1
		<20% ___	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? If no, go to Factor 2.	Yes ___	0
		No ___	2
	iii) After remediation, how is the untreated, residual hazardous material disposed?	Off-site land disposal___	0
		On-site land disposal___	1
		Off-site destruction or treatment___	2
Subtotal (Maximum = 10) If subtotal = 10, go to Factor 3.		NA	
2. Reduction in mobility of hazardous waste.	i) Quality of available wastes immobilized after destruction/treatment.	90-100% X	2
		60-90%___	1
		<60% ___	0
	ii) Method of immobilization		
	Reduced mobility by containment	X	0
	Reduced mobility by alternative treatment technology	___	3
Subtotal (Maximum =5)		2	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
3. Irreversibility of the destruction or treatment or immobilization of the hazardous waste.	i) Completely irreversible	___	5
	ii) Irreversible for most of the hazardous waste constituents	X	3
	iii) Irreversible for only some of the hazardous waste constituents	___	2
	iv) Reversible for most of the hazardous waste constituents	___	0
Subtotal (Maximum = 5)		3	
TOTAL (MAXIMUM = 15)		5	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Technical Feasibility			
a. Ability to Construct Technology	i) Not difficult to construct. No uncertainties in construction.	___	3
	ii)Somewhat difficult to construct. No uncertainties in construction.	X	2
	iii)Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of Technology	i) Very reliable in meeting the specified process efficiencies or performance goals.	X	3
	ii)Somewhat reliable in meeting the specified process efficiencies or performance goals.	___	2
c. Schedule of Delays Due to Technical Problems	i) Unlikely	___	2
	ii)Somewhat likely	X	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	___	2
	ii)Some future remedial actions may be necessary.	X	1
Subtotal (Maximum = 10)		7	
2. Administrative Feasibility			
a. Coordination with other Agencies	i) Minimal Coordination is required.	___	2
	ii)Required Coordination is normal.	___	1
	iii)Extensive Coordination is required.	X	0
Subtotal (Maximum = 2)		0	

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Implementability
(Relative Weight = 15)

ALTERNATIVE # 5: ENGINEERED CAP, GROUNDWATER COLLECTION TRENCH, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
3. Availability of Services and Materials				
a. Available of Prospect Technologies	i) Are technologies under consideration generally commercially available for the site specific application ?	Yes No	X ___	1 0
	ii)Will more than one vendor be available to provide a competitive bid ?	Yes No	X ___	1 0
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes No	X ___	1 0
Subtotal (Maximum = 3)			3	
TOTAL (MAXIMUM = 15)			10	
				61
COST SCORE			1	

TOTAL SCORE - ALTERNATIVE # 5 62

Black Ash Pond ERP
Remedial Alternatives Assessment
Detailed Analysis of Alternatives

Compliance with New York State Standards
Criteria and Guidelines (SCGs)
(Relative Weight = 10)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

	Analysis Factor	Basis for Evaluation		Score	
1.	Compliance with chemical specific SCGs	Meets chemical specific SCGs such as groundwater standards.	Yes No	X ___	4 0
2.	Compliance with action specific SCGs	Meets action specific SCGs such as technology standards for incineration or landfill.	Yes No	X ___	3 0
3.	Compliance with location specific SCGs	Meets location specific SCGs such as Freshwater Wetlands Act.	Yes No	X ___	3 0

TOTAL (MAXIMUM = 10) 10

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Protection of Human Health and the Environment
(Relative Weight = 20)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

	Analysis Factor	Basis for Evaluation			Score	
1.	Use of site after remediation	Unrestricted use of the land and water (If yes, go to the end of the table.)		Yes	___	20
				No	X	0
	TOTAL (Maximum = 20)				0	
2.	Human health and the environment exposure after remediation.	i) is the exposure to contaminants via air route acceptable ?		Yes	X	3
				No	___	0
		ii) is the exposure to contaminants via groundwater/ surface water acceptable ?		Yes	X	4
				No	___	0
		iii) is the exposure to contaminants via sediments/ soil acceptable ?		Yes	X	3
				No	___	0
	Subtotal (Maximum = 10)				10	
3.	Magnitude of residual public health risks after remediation.	i) Health risk	< = 1 in 1,000,000		X	5
		ii) Health risk	< = 1 in 100,000		___	2
	Subtotal (Maximum = 5)				5	
4.	Magnitude of residual environmental risks after remediation.	i) Less than acceptable			X	5
		ii) Slightly greater than acceptable			___	3
		iii)Significant risk still exists			___	0
	Subtotal (Maximum = 5)				5	
	TOTAL (MAXIMUM = 20)				20	

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Short Term Effectiveness
(Relative Weight = 10)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
1. Protection of community during remedial actions.	i) Are there significant short-term risks to the community that must be addressed? (if no, go to Factor 2)	Yes	X	0
		No	___	4
	ii) Can the short term risk be easily controlled?	Yes	X	1
		No	___	0
	iii)Does the mitigative effort to control short term risk impact the community lifestyle?	Yes	___	0
		No	X	2
Subtotal (Maximum = 4)			3	
2. Environmental Impacts	i) Are there significant short term risks to the environment that must be addressed? (if no, go to Factor 3)	Yes	X	0
		No	___	4
	ii) Are the available mitigative measures reliable to minimize potential impacts?	Yes	X	3
		No	___	0
Subtotal (Maximum = 4)			3	
3. Time to implement the remedy.	i) What is the required time to implement the remedy?	<2yrs	X	1
		>2yrs	___	0
	ii)Requires duration of the mitigative effort to control short term risk.	<2yrs	X	1
		>2yrs	___	0
Subtotal (Maximum = 2)			2	
TOTAL (MAXIMUM = 10)			8	

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Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
1. On-site or off-site treatment or land disposal.	i) On-site treatment		___	3
	ii) Off-site treatment		___	1
	iii)On-site or off-site land disposal		X	0
Subtotal (Maximum = 3)			0	
2. Permanence of the remedy	i) Will the remedy be classified as permanent in accordance with TAGM 4030 Sect. 2.1? (If yes, go to Factor 4)	Yes	___	3
		No	X	0
Subtotal (Maximum = 3)			0	
3. Lifetime of remedial actions.	i) Expected lifetime or duration of the effectiveness of the remedy.	25-30 years	X	3
		20-25 years	___	2
		15-20 years	___	1
		<15 years	___	0
Subtotal (Maximum = 3)			3	
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None	___	3
		<25%	X	2
		25-50%	___	1
		>50%	___	0
	ii)Is there treated residual left at the site? (If no, go to Factor 5)	Yes	X	0
		No	___	2
	iii)Is the treated residual toxic ?	Yes	X	0
		No	___	1
	iv) Is the treated residual mobile ?	Yes	___	0
		No	X	1
Subtotal (Maximum = 5)			3	

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Long-Term Effectiveness and Permanence
(Relative Weight = 15)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	**Basis for Evaluation**		**Score**	
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of;	<5 yr	___	1
		>5 yr	X	0
	ii)Are environmental controls required as part of the remedy to handle potential problems? (If no, go to "iv")	Yes	X	0
		No	___	1
	iii)Degree of confidence that controls can handle potential problems.	Moderate to very confident	X	1
		Somewhat to not confident	___	0
	iv)relative degree of long-term monitoring required, as compared to other alternatives.	Minimum	___	2
		Moderate	X	1
		Extensive	___	0
Subtotal (Maximum = 5)			2	

TOTAL (MAXIMUM = 15) 8

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Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or Immobilization technologies do not score under Factor 1.* NA	99-100%___	8
		90-99%___	7
		80-90%___	6
		60-80%___	4
		40-60%___	3
		20-40%___	1
		<20% ___	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? If no, go to Factor 2.	Yes ___	0
		No ___	2
	iii) After remediation, how is the untreated, residual hazardous material disposed?	Off-site land disposal___	0
		On-site land disposal___	1
		Off-site destruction or treatment___	2
Subtotal (Maximum = 10) If subtotal = 10, go to Factor 3.		NA	
2. Reduction in mobility of hazardous waste.	i) Quality of available wastes immobilized after destruction/treatment.	90-100% X	2
		60-90%___	1
		<60% ___	0
	ii) Method of immobilization Reduced mobility by containment	X	0
	Reduced mobility by alternative treatment technology	___	3
Subtotal (Maximum =5)		2	

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Reduction of Toxicity, Mobility, or Volume
(Relative Weight = 15)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
3. Irreversibility of the destruction or treatment or immobilization of the hazardous waste.	i) Completely irreversible	___	5
	ii) Irreversible for most of the hazardous waste constituents	X	3
	iii) Irreversible for only some of the hazardous waste constituents	___	2
	iv) Reversible for most of the hazardous waste constituents	___	0
Subtotal (Maximum = 5)		3	
TOTAL (MAXIMUM = 15)		5	

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Implementability
(Relative Weight = 15)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation	Score	
1. Technical Feasibility			
a. Ability to Construct Technology	i) Not difficult to construct. No uncertainties in construction.	___	3
	ii)Somewhat difficult to construct. No uncertainties in construction.	___	2
	iii)Very difficult to construct and/or significant uncertainties in construction.	X	1
b. Reliability of Technology	i) Very reliable in meeting the specified process efficiencies or performance goals.	X	3
	ii)Somewhat reliable in meeting the specified process efficiencies or performance goals.	___	2
c. Schedule of Delays Due to Technical Problems	i) Unlikely	___	2
	ii)Somewhat likely	X	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	___	2
	ii)Some future remedial actions may be necessary.	X	1
Subtotal (Maximum = 10)		6	
2. Administrative Feasibility			
a. Coordination with other Agencies	i) Minimal Coordination is required.	___	2
	ii)Required Coordination is normal.	___	1
	iii)Extensive Coordination is required.	X	0
Subtotal (Maximum = 2)		0	

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Implementability
(Relative Weight = 15)

ALTERNATIVE # 6: ENGINEERED CAP, GROUNDWATER DIVERSION WALL, RIVERBANK STABILIZATION w/ LIMITED ACTIONS

Analysis Factor	Basis for Evaluation		Score	
3. Availability of Services and Materials				
a. Available of Prospect Technologies	i) Are technologies under consideration generally commercially available for the site specific application ?	Yes	X	1
		No	___	0
	ii)Will more than one vendor be available to provide a competitive bid ?	Yes	X	1
		No	___	0
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes	X	1
		No	___	0
Subtotal (Maximum = 3)			3	
TOTAL (MAXIMUM = 15)			9	
COST SCORE			0	

60

TOTAL SCORE - ALTERNATIVE # 6 60