Stantec Consulting Services Inc.
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Stantec

Letter of Transmittal

To:	Ms. Julie Pfeffer TVA Kingston Fossil Ash Recovery Operations 1134 Swan Pond Road, Trailer Park KFP 1A-KST Harriman, Tennessee 37748	Date: 12/15/09	Project No. trn_004_175669014
Re:	Revised Summary Report Dredge Cell / Embayment Area Component Notebook Kingston Fossil Plant Harriman, Roane County, Tennessee		

We are sending you via: Email the following:

Copies	Date	No.	Description
1	12/15/09	---	Revised Summary Report via Email

These are transmitted as checked below:

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	For Review and Comment		Other:				

Remarks:

Copies to: Mr. Barry S. Snider, PE (TVA)

Signed:

Michael J. Steele, PE

rdr

Revised Summary Report

Dredge Cell / Embayment Area Component Notebook Kingston Fossil Plant Harriman, Roane County, Tennessee

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Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

December 15, 2009

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December 15, 2009

rpt_003_175669014

Ms. Julie Pfeffer
TVA Kingston Fossil Ash Recovery Operations
1134 Swan Pond Road, Trailer Park
KFP 1A-KST
Harriman, Tennessee 37748

Re: Revised Summary Report
Dredge Cell / Embayment Area Component Notebook
Kingston Fossil Plant
Harriman, Roane County, Tennessee

Dear Ms. Pfeffer:

As requested, Stantec Consulting Services Inc. (Stantec) has revised our initial summary report for the Dredge Cell / Embayment Area Component Notebook previously submitted to Jacobs Engineering Group, Inc. (Jacobs) on November 2, 2009. The current version incorporates defined modifications established by Jacobs on November 9, 2009. These services were performed under Purchase Order No. 15390 in accordance with the terms and provisions established in our System-Wide Services Agreement dated December 22, 2008.

Stantec appreciates the opportunity to provide these services and we look forward to continuing to work with you toward successful completion of the project. If you have any questions or need additional information, please call.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Kyle D. Lindquist, PE
Senior Project Engineer

Michael J. Steele, PE
Associate

/cmw/rdr

cc: Barry S. Snider, PE (TVA)

Revised Summary Report

Dredge Cell / Embayment Area Component Notebook Kingston Fossil Plant Harriman, Roane County, Tennessee

Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

December 15, 2009

Revised Summary Report

Dredge Cell / Embayment Area Component Notebook
Kingston Fossil Plant
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Harriman, Roane County, Tennessee

1. Background

As a result of the December 22, 2008 incident, a range of Dredge Cell / Embayment Area closure alternatives will be evaluated under the Comprehensive Environment Response, Compensation, and Liability Act (CERCLA) as a non-time critical removal action. Four initial conceptual alternatives under current consideration include the following:

- Alternative 1 – Grade Dredge Cell / Embayment Area;
- Alternative 2 – Grade Dredge Cell (with reconstructed Dike C) and Remove Ash from Embayment Area;
- Alternative 3 – Grade Dredge Cell (with central ditch) and Remove Ash from Embayment Area; and
- Alternative 4 – Stack Dredge Cell (with reconstructed Dike C) and Remove Ash from Embayment Area.

Details related to each of these alternatives were summarized in previous project correspondence prepared by Stantec Consulting Services Inc. (Stantec) on July 1, 2009. Requested copies of the plan view and section(s) developed for each alternative (Microsoft® Office Power Point® format) is provided in Appendix A.

The initial summary report submitted on November 2, 2009 was revised to include conceptual perimeter improvements and working platform construction over designated portions of the decommissioned Ash Pond for Alternatives 1 through 4. As directed by Jacobs Engineering Group, Inc. (Jacobs), requested plan views and sections were not updated to reflect the revised grading linework for the Ash Pond.

In addition to the above, this revised summary report includes consideration of conceptual Alternative 5 which consists of stacking the Dredge Cell and designated portions of the decommissioned Ash Pond using material from the Embayment Area. A plan view and sections developed for Alternative 5 (Microsoft® Office Power Point® format) are provided in Appendix A.

The above revisions are described in further detail in Section 3.2.1.

2. Objective

The project objective is to prepare requested component notebook elements relative to conceptual perimeter improvements and working platform construction as defined in our revised work plan dated August 21, 2009 along with additional directives received from Jacobs during the course of the work. To accomplish this objective, the following work tasks were performed.

- Task 1 – Alternatives 1 through 5 Base Grade / Working Platform Construction and Conceptual Perimeter Improvements;
- Task 2 – Deliverables (includes draft and final summary reports); and
- Task 3 – Site Meetings.

As part of Task 1, specific component elements included the following:

- Description of Problem and End-Point – Description of current site conditions, completed (or constructed) conditions, construction feasibility, affected areas and quantity of ash to be handled;
- Conceptual Design – Preparation of conceptual design/layout elements including specifications to the extent necessary to support material quantity, schedule and cost projections;
- Method of Accomplishment – Description of methodology or path forward (i.e. describe critical path elements and what processes are required) and identification of anticipated specialty contractors and/or equipment;
- Equipment, Labor and Material Quantities – Identification of equipment, labor and material requirements (primarily based on current concepts or anticipated path forward);
- Schedule – Description of schedule, assumed productivity and critical path elements; and
- Cost Opinion – Preparation of capital cost projections (with approximate +50/-30% accuracy) which include field management, procurement and project management but not program management, documentation, permitting, etc.

As part of this work, Stantec performed preliminary engineering assessments of the conceptual perimeter improvements. It is noted that these assessments will be expanded in association with the ongoing numerical seismic analysis, which is being conducted under separate work order. Results will be used to modify current concepts in future project phases. Information presented herein should be used to facilitate additional design/planning/decision activities only.

3. Component Notebook Elements

3.1. Current Site Conditions

Current site conditions consist of hydraulically placed ash deposits, displaced materials resulting from the December 22, 2008 incident and relatively unaffected relics. Based on available site-specific geotechnical data/information, these are underlain by foundation clays, silts and sands as described in AECOM's root cause analysis report dated June 25, 2009. The Dredge Cell has an approximate footprint of 140 acres, of which roughly 45 acres consist of undisturbed relics. The Embayment Area has an approximate footprint of 110 acres. Elevations within impacted portions of the Dredge Cell and Embayment Area range from approximately 740 feet to 790 feet. The relic area is located within the southern portion of the Dredge Cell and has an approximate peak elevation of 815 feet. A series of ditches have been excavated within portions of the impacted Dredge Cell area in an attempt to divert surface drainage into sediment ponds, which are located within the Embayment Area. These ditches vary in grade and dimension.

The Swan Pond Road corridor borders the Dredge Cell to the west and contains a publicly accessed county road and the primary rail line into the plant. The surface elevation for this corridor is approximately 765 feet.

The Ball Field corridor borders the Dredge Cell to the south and separates the relic area from the initial ash disposal area. The surface elevations for this corridor range from approximately 765 feet to 770 feet.

Dike D borders the Dredge Cell to the east and separates the Dredge Cell from the main ash pond. The geometry consists of an approximate 2,800-foot long structure with a crest elevation ranging from 774 feet along the northern 800-foot long segment to 780 feet along remaining portions toward the south. Dike D outslopes range from roughly 2(H):1(V) to 4(H):1(V). A review of subsurface boring logs and laboratory test data from the referenced AECOM root cause analysis report and subsequent discussions with Tennessee Valley Authority (TVA) personnel indicate that Dike D was constructed from various ash materials placed using both hydraulic and mechanical methods. As part of the initial response to the referenced incident, an approximate 700-foot long buttress was constructed along the northern segment of Dike D near its confluence with Dike C. This buttress was constructed from limestone aggregate and geotextile base / working platform, bottom ash and clay soil cover materials.

Dike 2 has a general north-south alignment between Swan Pond Circle Road and Dike D. The geometry consists of an approximate 1,400-foot long structure with a crest elevation of roughly 750 feet. Dike 2 outslopes are approximately 3(H):1(V) with portions located around truck access ramps at 1.5(H):1(V). A review of information provided in Jacob's Dike 2 summary report dated August 2009 indicates that most of the dike was founded across foundation silts and sands following removal of displaced ash materials. The exception being a 500-foot segment located along the northern portion of the dike where complete removal of displaced ash materials was reportedly not performed. Results of the review also indicated the dike was constructed using shot rock materials with its upstream face lined with a 12-inch thick crushed stone filter.

The portion of the Ash Pond designated for closure is bounded by Dike D, Ash Pond North Dike C, Ash Pond East Divider Dike and Ash Pond South Dike C. This portion of the Ash Pond has an approximate footprint of 85 acres. Based on provided hydrographic and lidar survey data, elevations within the designated Ash Pond area currently range from approximately 740 feet to 765 feet.

The Ash Pond North Dike C and Ash Pond South Dike C consist of approximate 2,100-foot and 1,200-foot long structures, respectively, with crest elevations of 765 feet and outslopes that range from roughly 1.5(H):1(V) to 3(H):1(V). A review of information provided in Stantec's Report of Geotechnical Exploration and Slope Stability for Dike C dated August 3, 2009 indicates that the Ash Pond North Dike C and Ash Pond South Dike C consist of an initial clay starter dike to approximate elevation 750 feet and a clay raised dike to approximate elevation 765 feet.

The Ash Pond East Divider Dike consists of an approximate 2,200-foot long structure with a crest elevation of 765 feet and outslopes that range from roughly 1.5(H):1(V) to 3(H):1(V). A review of subsurface boring information from the referenced Stantec Dike C report indicate that the Ash Pond East Divider Dike was constructed from various ash materials placed using both hydraulic and mechanical methods.

3.2. Completed (or Constructed) Site Conditions

3.2.1. Conceptual Closure Alternatives

Conceptual constructed site conditions for Alternative 1 provide for graded slopes to facilitate drainage within the Dredge Cell, Embayment Area and Ash Pond. The Dredge Cell and Embayment Area will be regraded with two percent maximum slopes to a peak elevation of 780 feet. The Ash Pond will be regraded with one percent minimum slopes to an approximate peak elevation of 770 feet. Alternative 1 requires base grade / working platform construction across the site and perimeter improvements. These improvements are anticipated to consist of deep soil mixing and rock buttress construction along Dike 2 and Dike D (in association with main ash pond closure); deep soil mixing and outslope armoring along the upstream face of Ash Pond North Dike C and Ash Pond South Dike C; deep soil mixing along the Ash Pond East Divider Dike; and may also require deep soil mixing along portions of the Swan Pond Road and Ball Field corridors.

Conceptual constructed site conditions for Alternative 2 consist of graded slopes to facilitate drainage within the Dredge Cell and Ash Pond and ash removal within the Embayment Area (to off-site location(s)). The Dredge Cell will be regraded with five percent outslopes and a maximum two percent crest slope to a peak elevation of 790 feet. The Ash Pond will be regraded with one percent minimum slopes to an approximate peak elevation of 770 feet. Alternative 2 requires base grade / working platform construction across the site and perimeter improvements. These improvements are anticipated to consist of deep soil mixing and rock buttress construction along Dike D (in association with main ash pond closure); deep soil mixing and outslope armoring along the upstream face of Ash Pond North Dike C and Ash Pond South Dike C; deep soil mixing along the Ash Pond East Divider Dike; and may also require deep soil mixing along portions of the Swan Pond Road and Ball Field corridors. Alternative 2 also requires Dike C reconstruction along its previous alignment, which includes deep soil mixing, earthen berm construction and outslope armoring along the constructed upstream face.

Conceptual constructed site conditions for Alternative 3 include graded slopes to facilitate drainage within the Dredge Cell (with a central ditch) and Ash Pond and ash removal within the Embayment Area (to off-site location(s)). The Dredge Cell will be regraded with one to three percent slopes from the existing Dike D crest elevation (maximum elevation 780 feet) and the Swan Pond Road corridor (elevation 765 feet) to a central ditch. The central ditch will be constructed with a one percent slope from the Ball Field corridor (maximum elevation 770 feet) to the Embayment Area (elevation 736 feet following ash removal). The Ash Pond will be regraded with one percent minimum slopes to an approximate peak elevation of 770 feet. Alternative 3 requires base grade / working platform construction across the site and perimeter improvements. These improvements are anticipated to consist of deep soil mixing and rock buttress construction along Dike D (in association with main ash pond closure); deep soil mixing and outslope armoring along the upstream face of Ash Pond North Dike C and Ash Pond South Dike C; and deep soil mixing along the Ash Pond East Divider Dike.

Conceptual constructed site conditions for Alternative 4 provide for ash storage within the Dredge Cell using material from the Embayment Area and graded slopes to facilitate drainage within the Ash Pond. The Dredge Cell will be regraded with 4(H):1(V) outslopes with a maximum two percent crest slope to a peak elevation of 805 feet. The Ash Pond will be regraded with one percent minimum slopes to an approximate peak elevation of 770 feet. Alternative 4 requires base grade / working platform construction across the site and perimeter improvements. These improvements are anticipated to consist of deep soil mixing and rock buttress construction along Dike D (in association with main ash pond closure); deep soil mixing and outslope armoring along the upstream face of Ash Pond North Dike C and Ash Pond South Dike C; deep soil mixing along the Ash Pond East Divider Dike; and deep soil mixing along the Swan Pond Road and Ball Field corridors. Alternative 4 also requires Dike C reconstruction along its previous alignment, which includes deep soil mixing, earthen berm construction and outslope armoring along the constructed upstream face.

Conceptual constructed site conditions for Alternative 5 provide for ash storage within the Dredge Cell and designated portions of the Ash Pond using material from the Embayment Area. This area will be regraded with five percent outslopes along the reconstructed Dike C, Ash Pond North Dike C, Ash Pond East Divider Dike and Ash Pond South Dike C with a maximum two percent crest slope to a peak elevation of 790 feet. In addition, this area will be regraded with 4(H):1(V) outslopes along the Swan Pond Road and Ball Field corridors with a maximum two percent crest slope to a peak elevation of 790 feet. Alternative 5 requires base grade / working platform construction across the site and perimeter improvements. These perimeter improvements are anticipated to consist of deep soil mixing along the Swan Pond Road corridor and Ash Pond East Divider Dike; deep soil mixing and rock buttress construction along the Ball Field corridor; and deep soil mixing and outslope armoring along the Ash Pond North Dike C and Ash Pond South Dike C. Alternative 5 also requires Dike C reconstruction along its previous alignment, which includes deep soil mixing, earthen berm construction and outslope armoring along the constructed upstream face.

3.2.2. Preliminary Engineering Assessment

As stated above, preliminary engineering assessments of the conceptual perimeter improvements was performed. Results will be used in combination with the ongoing numerical seismic analysis to modify current concepts in future project phases.

3.2.2.1. Methodology

Site-specific geotechnical explorations conducted within the Dredge Cell in association with AECOM's root cause analysis, and along the perimeter of the Ash Pond and Stilling Basin in association with Stantec's Dike C report, have typically encountered saturated ash materials and native foundation clays, silts and sands underlain by bedrock. These foundation layers along with the conceptual perimeter improvements outlined above were incorporated into the preliminary stability model. This model was intended to represent generalized site conditions for the sole purpose of assessing subject improvements along various perimeter alignments.

Preliminary results from a liquefaction potential analysis conducted under separate work order indicate that the foundation ash and native silt/sand layers will liquefy under design earthquake loads. It is anticipated that the post-earthquake condition with predominantly liquefied foundation conditions will control the design; therefore, only a preliminary post-earthquake slope stability assessment was performed for the conceptual notebook. Residual and dynamic, undrained shear strengths were assigned to various foundation and constructed layers to represent liquefied and non-liquefied conditions, respectively. Published correlations were used to estimate residual strengths for liquefied foundation layers and were based on in-situ penetration resistance (established from both standard and cone penetration tests). For foundation (or other constructed) layers that are not anticipated to liquefy, static, undrained shear strengths were reduced by 20 percent to account for potential excess pore water pressures that may be generated during the design earthquake.

For liquefied soils, residual strengths were developed from the Standard Penetration Test (SPT) and Cone Penetration Test (CPT) data provided by AECOM and correlations proposed by Olson and Starks (2002) and Idriss and Boulanger (2007). For non-liquefied soils, dynamic, undrained shear strengths were estimated at 80 percent of static, undrained strengths to account for potential excess pore water pressures that may be generated during the design earthquake. This was based on the findings by Makdisi and Seed (1978), which stated that non-liquefied soils will generally retain at least 80 percent of their pre-earthquake undrained shear strengths. Pre-earthquake undrained shear strengths of non-liquefied soils were determined based on the results of laboratory and field testing. Typically published values were used for soil layers without available testing data. For more details, refer to our draft material properties narrative issued to the design team on September 3, 2009, which describes the development of material properties associated with various analyses for modeled soil layers. A final version of this narrative will be published in future project documentation.

Slope stability calculations were performed using SLOPE/W (GEO-SLOPE International Ltd.). The Spencer method was used to compute the factor of safety for modeled failure surfaces. Stability analyses were initially performed along the reconstructed Dike C alignment (Alternative 4), which represents the controlling condition for required foundation improvements. It was assumed that foundation improvements would be required within the entire footprint of Dike C. The strength of soilcrete columns and the area replacement ratio were adjusted for a target factor of safety greater than 1.1. The weighted average method was used to estimate strength parameters within the improved zone.

We discussed our preliminary stability results with Hayward Baker, Inc. (Hayward Baker), a specialty contractor experienced with deep soil mixing techniques in similar applications. Hayward Baker indicated that typical design unconfined compressive strength of soilcrete columns ranges from 100 to 150 pounds per square inch (psi) and typical area replacement

ratio ranges from 20 to 25 percent for liquefaction remediation projects using deep soil mixing techniques. Accordingly, the soilcrete column shear strength and area replacement ratio were selected at 75 psi and 20 percent, respectively. Additional stability analyses resulted in a factor of safety of 1.29 as shown in Figure 25. It is noted that these strength parameters will also be considered in initial stability models for use in the ongoing numerical seismic analysis, which is scheduled to be completed in January 2009, to further refine the concepts presented herein.

Foundation improvements along other alignments were assumed to use similar soilcrete strength parameters and area replacement ratios as Dike C. The exception was the Ash Pond South Dike C which was assigned an area replacement ratio of 25 percent due to improvement zone width restrictions. The width of the improvement zone (15-foot minimum) was adjusted for a target factor of safety greater than 1.1. A rock buttress was added when shallow surface failures with factors of safety less than 1.1 occurred.

3.2.2.2. Results

The results of the slope stability calculations are provided with the computer output presented in Appendix A. As shown, embankment outslopes constructed to grades of five percent or less (without improvements) results in factors of safety greater than the defined target of 1.1. Steeper slopes modeled herein (i.e. 4(H):1(V)) result in factors of safety less than 0.5 without improvements. It is noted that physical evidence exists indicating that displaced ash surfaces from the December 22, 2008 incident resulted in average slopes estimated to be on the order of one percent. This evidence along with recognized uncertainties with estimating material properties (particularly residual strengths), suggested that some degree of perimeter improvements may be required along embankment outslopes constructed to grades of five percent or less (i.e. Swan Pond Road and Ball Field corridors for Alternatives 1 and 2). In consideration of the overall cost opinion objectives for the conceptual notebook, it is assumed that one-half of the length along these alignments will require foundation improvements.

A summary of conceptual perimeter improvements and estimated affected areas (in square feet) is provided in Table 1 below. Graphical sections and details along with specifications are provided as Appendices B and C, respectively.

Table 1. Summary of Conceptual Perimeter Improvements

Conceptual Closure Alternative	Perimeter Alignment	Conceptual Perimeter Improvement		
		Deep Soil Mixing	Rock Buttress and Outslope Armoring	Affected Area (ft^2)
Alternative 1	Dike 2	40-ft-wide deep soil mixing zone at dike toe, about 30-ft-deep	5(H):1(V) rock buttress	56,000
	Dike D	35-ft-wide deep soil mixing zone at dike toe, about 60-ft-deep	5(H):1(V) rock buttress	105,000
	Ball Field Corridor	35-ft-wide deep soil mixing zone for 50% of the corridor length, about 60-ft-deep	N/A	84,000
	Swan Pond Road Corridor	35-ft-wide deep soil mixing zone for 50% of the corridor length, about 60-ft-deep	N/A	
	Ash Pond North Dike C	25-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 25-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	Outslope armoring along upstream face	105,000
	Ash Pond East Divider Dike	15-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 15-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	N/A	66,000
	Ash Pond South Dike C	25-ft-wide deep soil mixing zone at dike crest, about 30-ft-deep	Outslope armoring along upstream face	30,000
Alternative 2	Dike D	35-ft-wide deep soil mixing zone at dike toe, about 60-ft-deep	5(H):1(V) rock buttress, about 40 ft at the base	105,000
	Ball Field Corridor	35-ft-wide deep soil mixing zone for 50% of the corridor length, about 60-ft-deep	N/A	84,000
	Swan Pond Road Corridor	35-ft-wide deep soil mixing zone for 50% of the corridor length, about 60-ft-deep	N/A	
	Dike C	130-ft-wide deep soil mixing zone beneath the proposed earthen berm, about 40-ft-deep	Outslope armoring along upstream face	260,000
	Ash Pond North Dike C	25-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 25-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	Outslope armoring along upstream face	105,000
	Ash Pond East Divider Dike	15-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 15-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	N/A	66,000

Table 1. Summary of Conceptual Perimeter Improvements

Conceptual Closure Alternative	Perimeter Alignment	Conceptual Perimeter Improvement		
		Deep Soil Mixing	Rock Buttress and Outslope Armoring	Affected Area (ft^2)
	Ash Pond South Dike C	25-ft-wide deep soil mixing zone at dike crest, about 30-ft-deep	Outslope armoring along upstream face	30,000
Alternative 3	Dike D	35-ft-wide deep soil mixing zone at dike toe, about 60-ft-deep	5(H):1(V) rock buttress, about 40 ft at the base	105,000
	Ash Pond North Dike C	25-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 25-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	Outslope armoring along upstream face	105,000
	Ash Pond East Divider Dike	15-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 15-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	N/A	66,000
	Ash Pond South Dike C	25-ft-wide deep soil mixing zone at dike crest, about 30-ft-deep	Outslope armoring along upstream face	30,000
Alternative 4	Dike D	50-ft-wide deep soil mixing zone at dike crest, about 80-ft-deep 50-ft-wide deep soil mixing zone at dike toe, about 60-ft-deep	5(H):1(V) rock buttress, about 40 ft at the base	300,000
	Ball Field Corridor	100-ft-wide deep soil mixing zone, about 60-ft-deep	N/A	480,000
	Swan Pond Road Corridor	100-ft-wide deep soil mixing zone, about 60-ft-deep	N/A	
	Dike C	130-ft-wide deep soil mixing zone beneath the proposed earthen berm, about 40-ft-deep	Outslope armoring along upstream face	260,000
	Ash Pond North Dike C	25-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 25-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	Outslope armoring along upstream face	105,000
	Ash Pond East Divider Dike	15-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 15-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	N/A	66,000
	Ash Pond South Dike C	25-ft-wide deep soil mixing zone at dike crest, about 30-ft-deep	Outslope armoring along upstream face	30,000

Table 1. Summary of Conceptual Perimeter Improvements

Conceptual Closure Alternative	Perimeter Alignment	Conceptual Perimeter Improvement		
		Deep Soil Mixing	Rock Buttress and Outslope Armoring	Affected Area (ft^2)
Alternative 5	Ball Field Corridor	25-ft-wide deep soil mixing zone, about 60-ft-deep	4(H):1(V) rock buttress, about 50 ft wide and 15 ft tall; 6(H):1(V) to top of slope	120,000
	Swan Pond Road Corridor	25-ft-wide deep soil mixing zone, about 60-ft-deep	N/A	
	Dike C	130-ft-wide deep soil mixing zone beneath the proposed earthen berm, about 40-ft-deep	Outslope armoring along upstream face	260,000
	Ash Pond North Dike C	25-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 25-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	Outslope armoring along upstream face	105,000
	Ash Pond East Divider Dike	15-ft-wide deep soil mixing zone at dike crest, about 60-ft-deep 15-ft-wide deep soil mixing zone at dike toe, about 50-ft-deep	N/A	66,000
	Ash Pond South Dike C	25-ft-wide deep soil mixing zone at dike crest, about 30-ft-deep	Outslope armoring along upstream face	30,000

3.3. Construction Feasibility

The foundation improvements described herein are currently defined as deep soil mixing. In the United States, this technique was first developed in the 1950s as intrusion grout mixed-in-place piles. Significant refinement has been made since its full-scale applications became feasible in the 1970s. Although the initial intent of deep soil mixing was relatively large-area soil treatment for soft ground stabilization, its applications have been expanded to include hydraulic cutoff and excavation support walls, slope stabilization, liquefaction mitigation, environmental remediation, etc.

Typically, deep soil mixing may be more attractive than other improvement techniques where the foundation to be treated does not contain boulders or other obstructions; treatment depth is less than 100 feet; significant amounts of spoil can be tolerated; treated foundation volumes are relatively large; and resulting strength gains need to be closely engineered. Site conditions are anticipated to meet these criteria, making deep soil mixing a viable foundation improvement technique.

Major factors that influence the engineering properties of treated foundation zones include soil type, amount of cement or other admixtures used, water/cement ratio, degree of soil-cement mixing, curing environment and age. Different installation patterns may be used to meet the defined design criteria. For liquefaction mitigation, research indicates that with similar ground treatment ratios, the grid pattern is most effective, followed by the wall type, and then the column type. Currently, a grid pattern is proposed for the project.

Stantec presented the conceptual foundation improvement layout and target strength objectives to a specialty contractor (Hayward Baker Inc.) to receive initial feedback relative to feasibility. The contractor indicated that the initial layout was constructible and that the target strength objectives were achievable. Stantec will continue to network with a contractor to review modified concepts developed in future project phases.

3.4. Construction Sequence

For the purposes of the conceptual notebook, anticipated generalized construction sequence (in order presented) for the primary capital construction elements are provided below.

- Reconstructed Dike C (for Alternatives 2, 4 and 5)
    - Site Preparation (includes regrading to design subgrade elevation);
    - Working platform construction;
    - Foundation improvements (deep soil mixing techniques; requires specialty contractor and equipment);
    - Earthen berm construction;
    - Vegetative soil cover placement;
    - Outslope armoring placement; and
    - Perimeter ditch construction.

- Dike 2 (for Alternative 1):
    - Regrade truck access ramps;
    - Working platform construction;
    - Foundation improvements (deep soil mixing techniques; requires specialty contractor and equipment);
    - Rock buttress construction;
    - Vegetative soil cover placement; and
    - Perimeter ditch construction.
- Dike D (for Alternatives 1 though 4)
    - Working platform construction;
    - Foundation improvements (deep soil mixing techniques; requires specialty contractor and equipment);
    - Rock buttress construction;
    - Vegetative soil cover placement; and
    - Perimeter ditch construction.
- Swan Pond Road and Ball Field Corridors (for Alternatives 1 through 5)
    - Working platform construction, if necessary;
    - Foundation improvements, if necessary (deep soil mixing techniques; requires specialty contractor and equipment);
    - Rock buttress construction, if necessary; and
    - Perimeter ditch construction.
- Ash Pond North Dike C, Ash Pond East Divider Dike and Ash Pond South Dike C (for Alternatives 1 through 5)
    - Working platform construction, if necessary;
    - Foundation improvements (deep soil mixing techniques; requires specialty contractor and equipment);
    - Outslope armoring placement, if necessary; and
    - Perimeter ditch construction.

3.5. Equipment, Labor and Material Quantities

The specialty contractor estimates that typical production rates for deep soil mixing may be on the order of 450 cubic yards of treated foundation materials per individual crew per day. Typical earthwork (constructed as engineered fill) production rates are estimated to be on the order of 2,500 cubic yards per individual crew per day using minimal equipment. It is noted that these rates may be increased if additional crews/equipment are applied. A summary of anticipated equipment and labor is provided below.

- Excavators and Operators;
- Loaders and Operators;
- Articulated Trucks and Operators;
- Dozers and Operators;
- Sheepsfoot Rollers and Operators;
- Smooth Drum Rollers and Operators;
- Graders and Operators;
- Deep Soil Mixing; and
    - Drilling/Mixing Rigs and Crews;
    - High Volume Colloidal Mixer and Operators; and
    - Bulk Material Silos and Operators.
- Water Trucks and Operators.

Material quantities for primary capital construction elements are presented in the cost opinion (discussed below) provided as Appendix D.

3.6. Capital Cost Opinion

A capital cost opinion for base grade / working platform construction across the site and implementation of the conceptual perimeter improvements for each defined alternative as outlined herein is presented as Appendix D. Costs were derived in (current) 2009 dollars and were based on available data/information from a published source (RS Means, 2009) along with various manufacturer's and specialty contractor's cost data along with our experience with similar projects. No adjustments were made to these costs to account for inflation.

The cost opinion is intended to represent the target +50/-30% degree of accuracy and does not consider program management, documentation and permitting (including related activities such as final drilling, testing, engineering analysis and design, etc.).

4. Closure

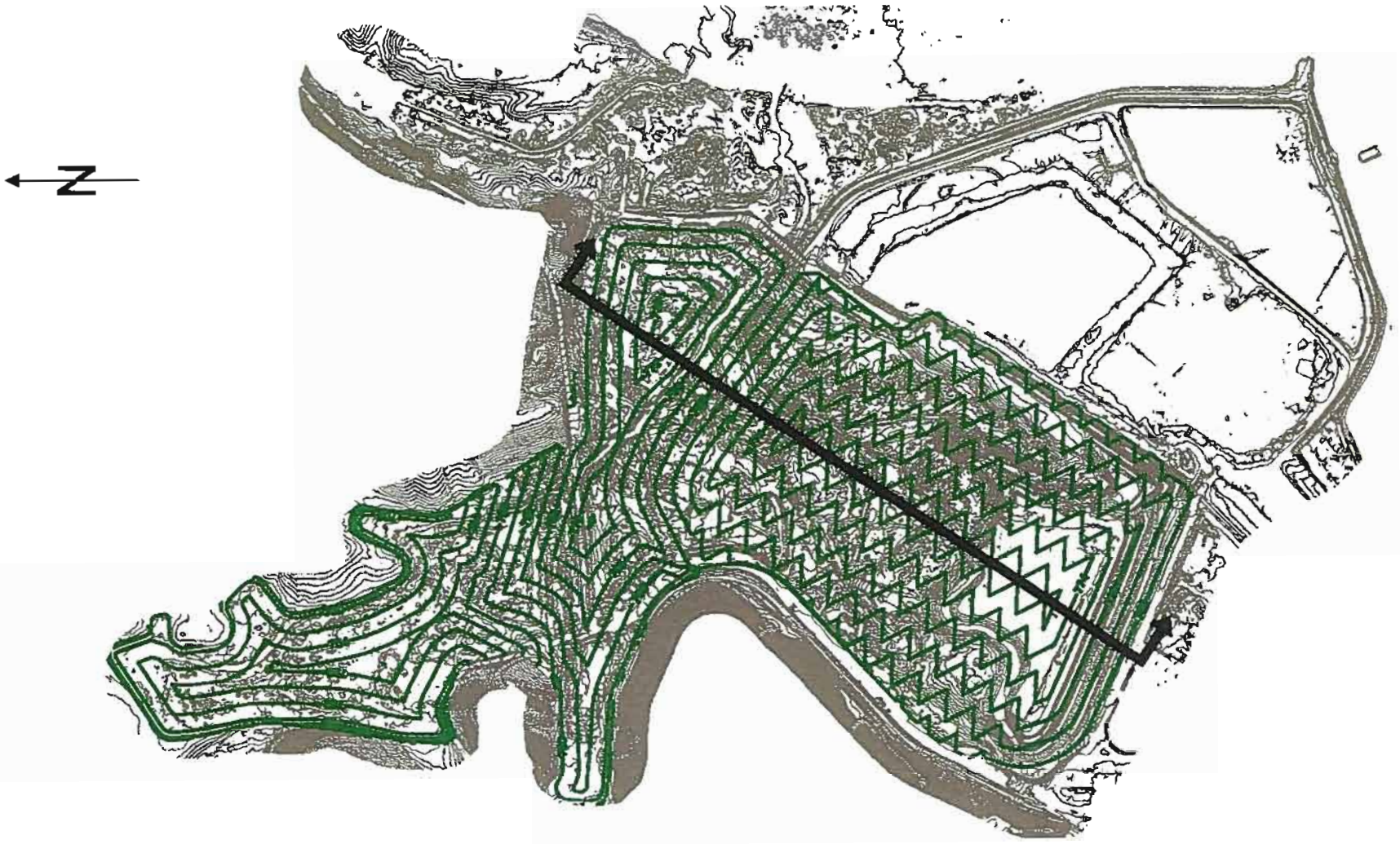
The conceptual component notebook elements presented herein are based on requested activities as defined in our revised work plan dated August 21, 2009 along with additional directions received from Jacobs during the course of the work, using that degree of care and skill ordinarily exercised under similar circumstances by respectable members of the engineered profession. No warranties, whether expressed or implied, can be provided to the accuracy of information supplied by others.

Appendix A

Conceptual Closure Alternatives and Preliminary Engineering Assessments

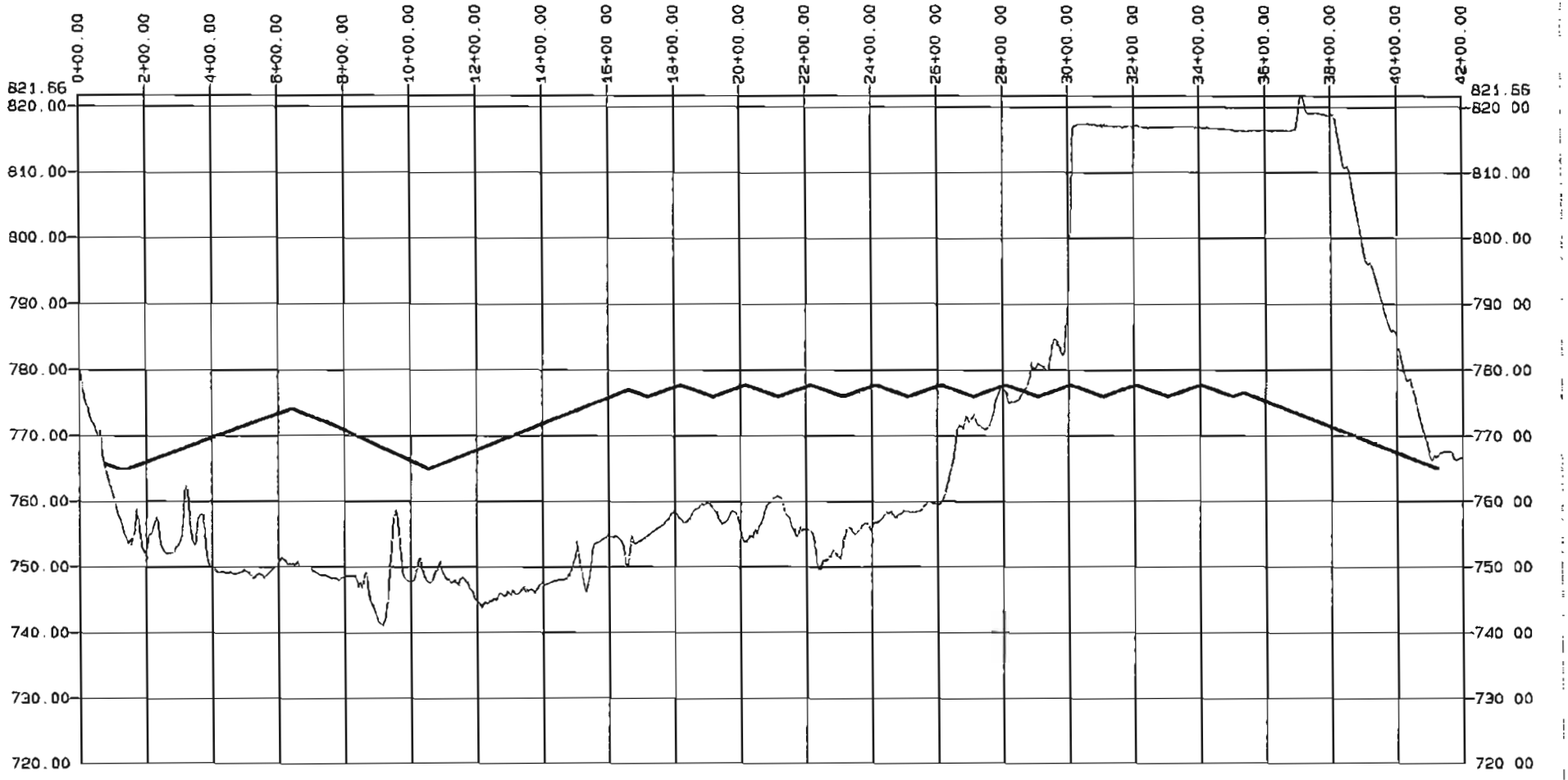
Conceptual Closure Alternatives

Alternative 1 – Grade Dredge Cell / Embayment Area



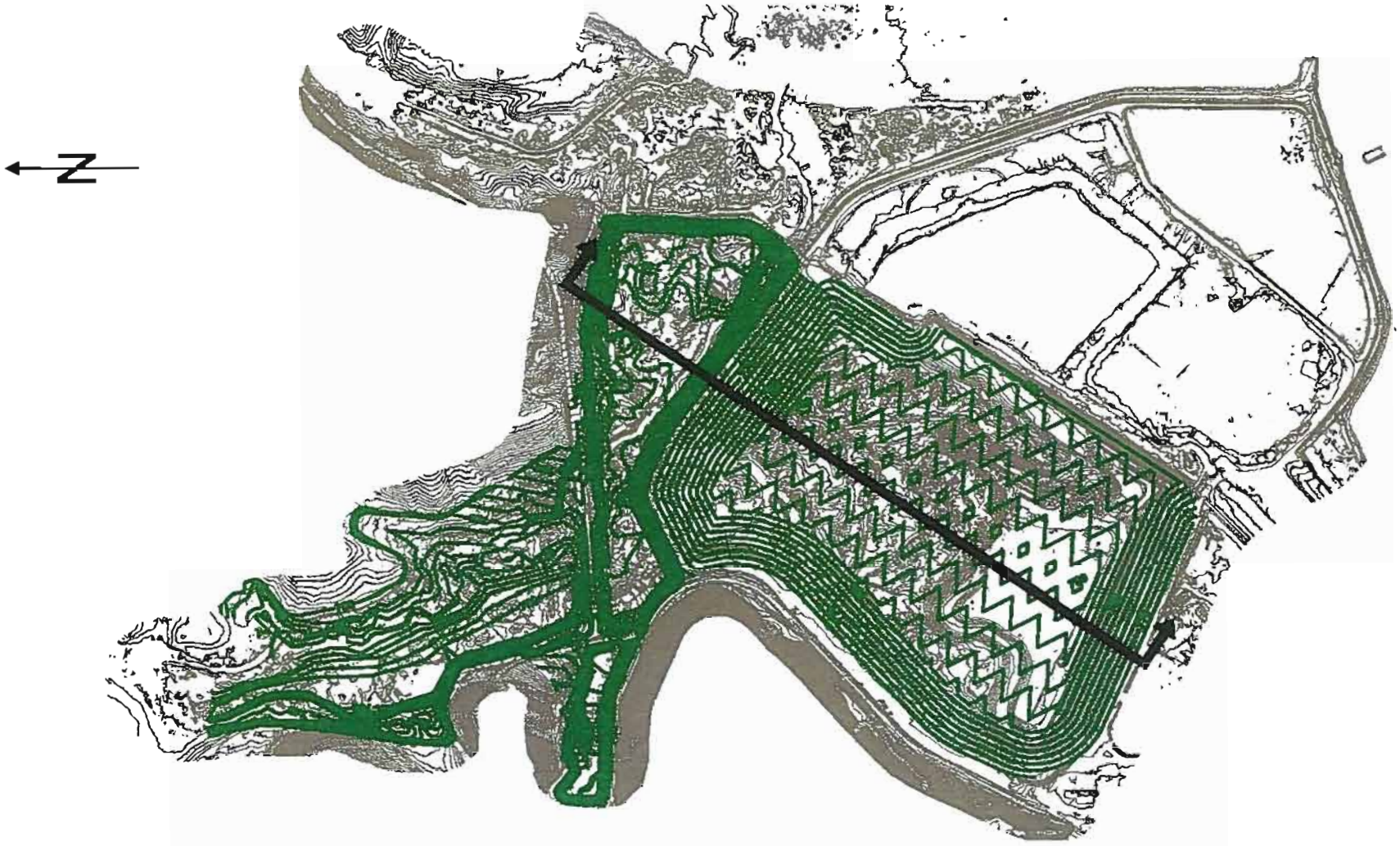
Mapping Dated February 25, 2009

Alternative 1 – Grade Dredge Cell / Embayment Area



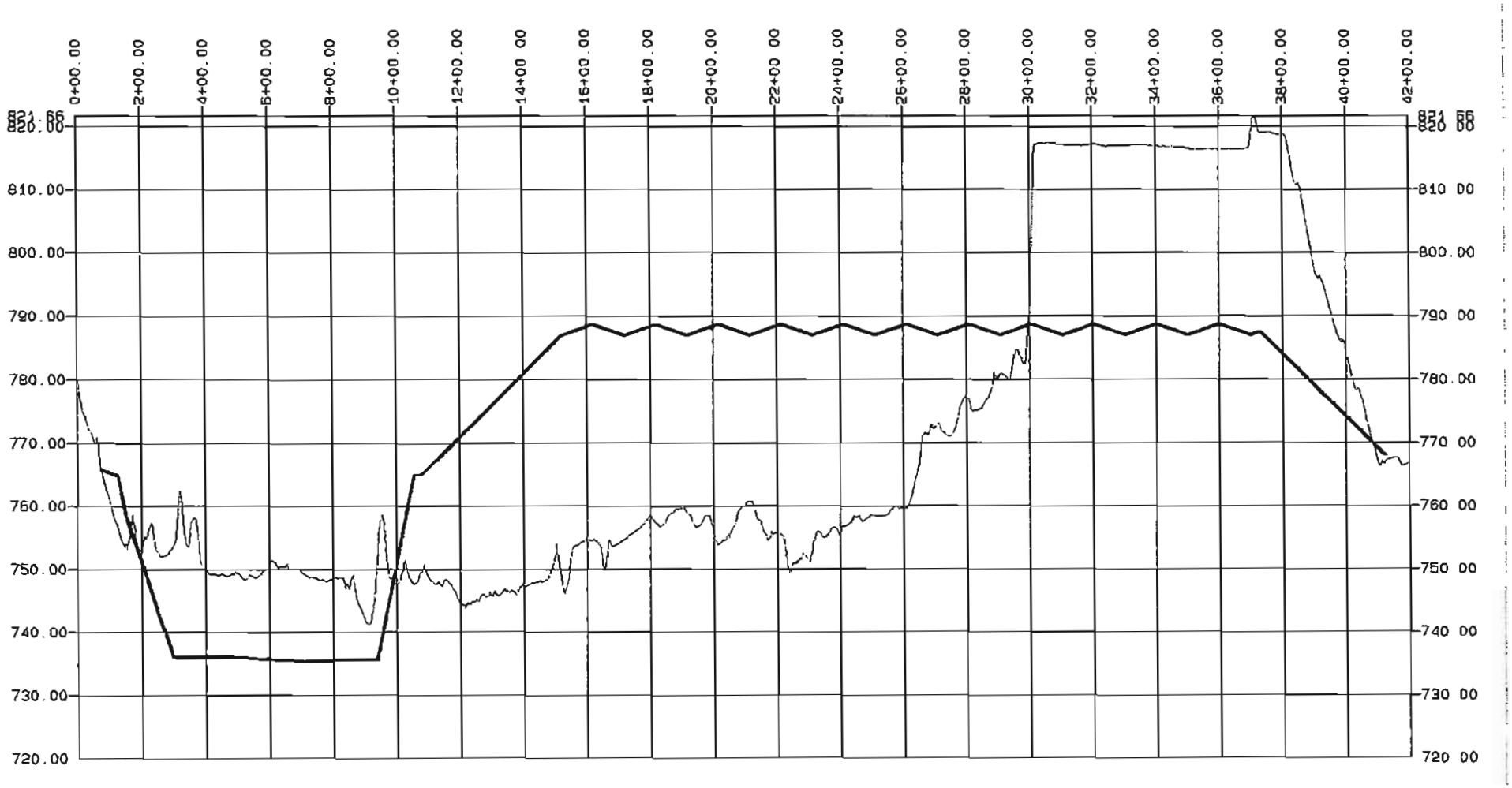
Mapping Dated February 25, 2009

Alternative 2 – Grade Dredge Cell (with reconstructed Dike C) and Remove Ash from Embayment Area



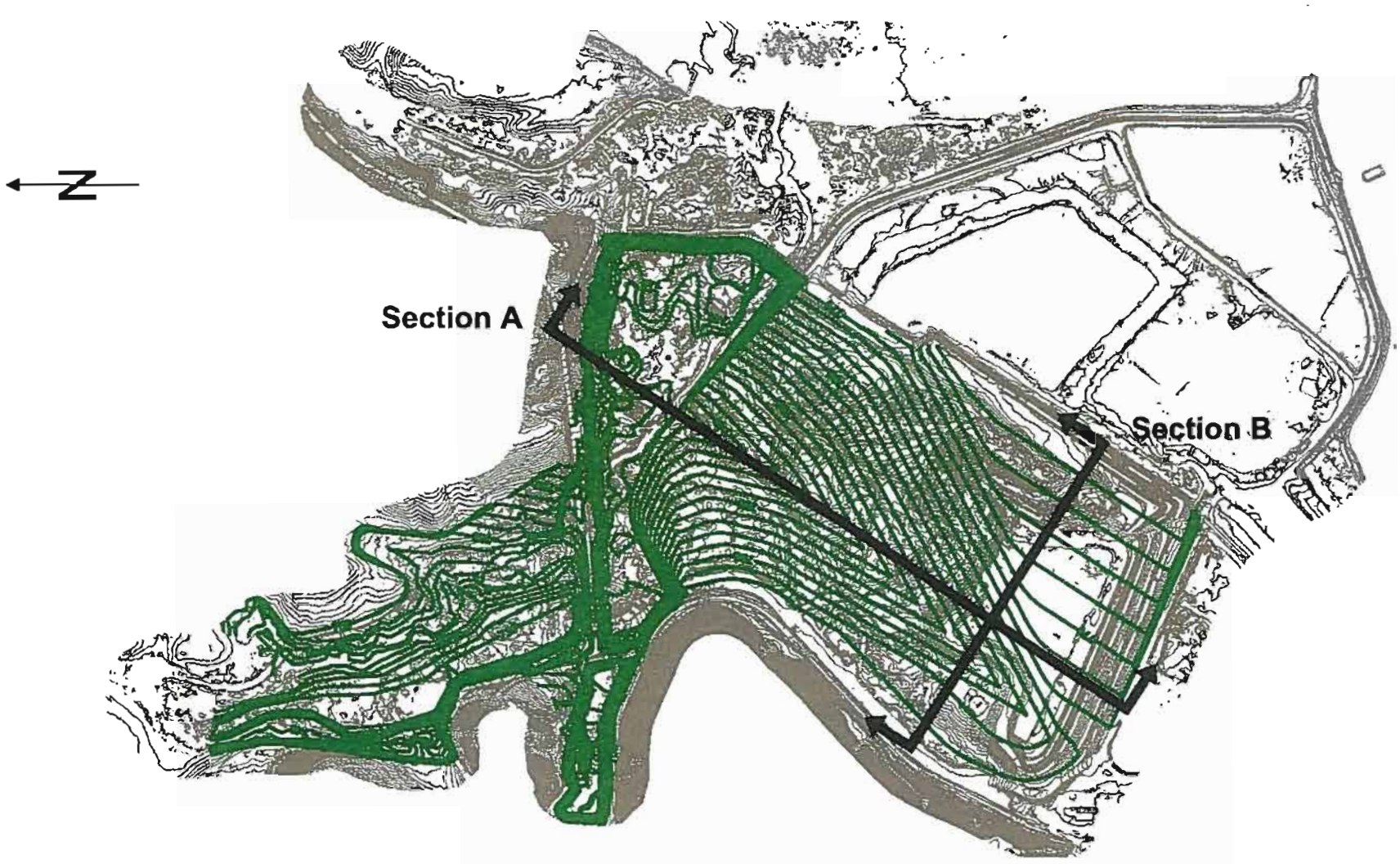
Mapping Dated February 25, 2009

Alternative 2 – Grade Dredge Cell (with reconstructed Dike C) and Remove Ash from Embayment Area



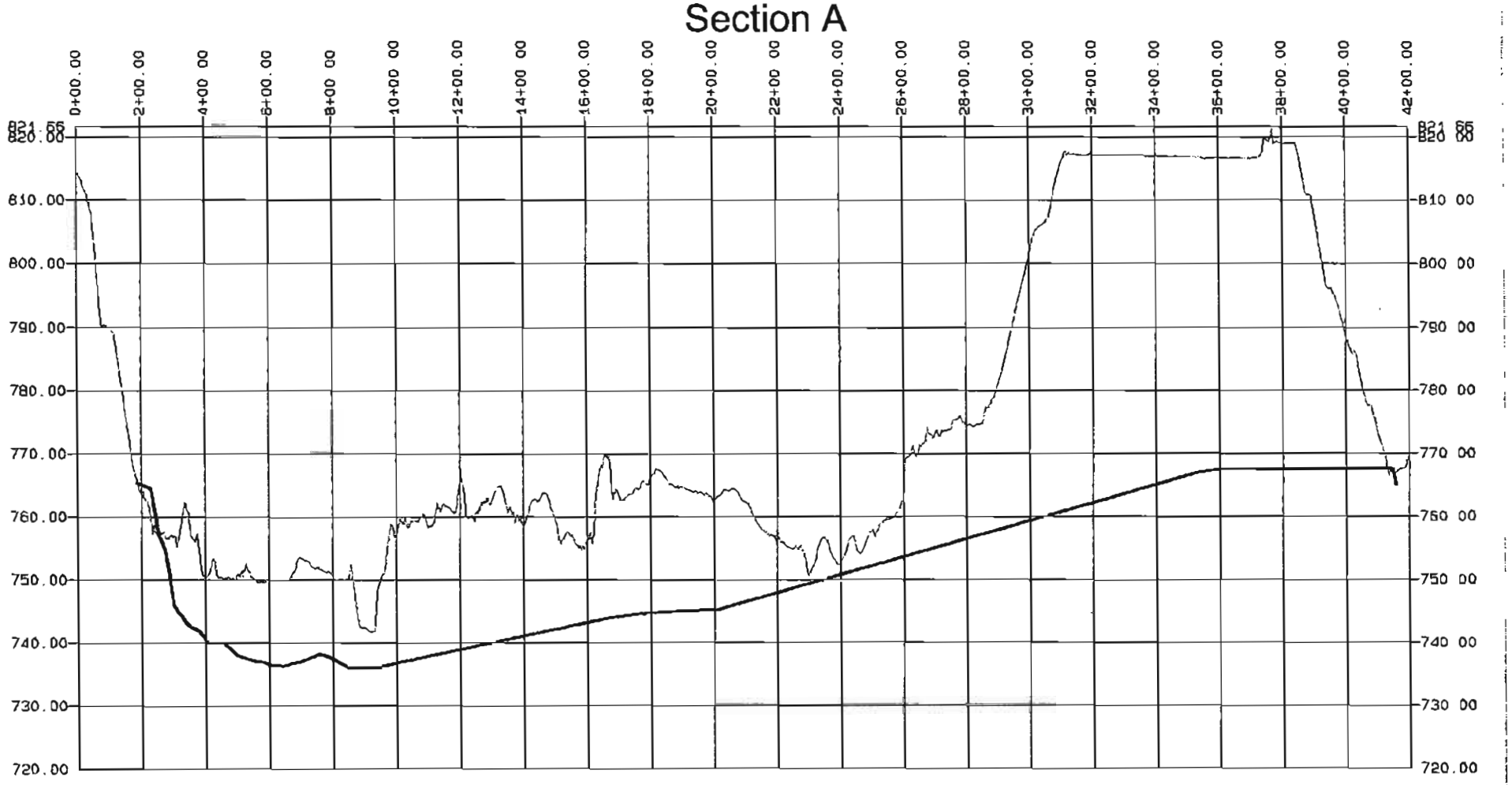
Mapping Dated February 25, 2009

Alternative 3 – Grade Dredge Cell (with central ditch) and Remove Ash from Embayment Area



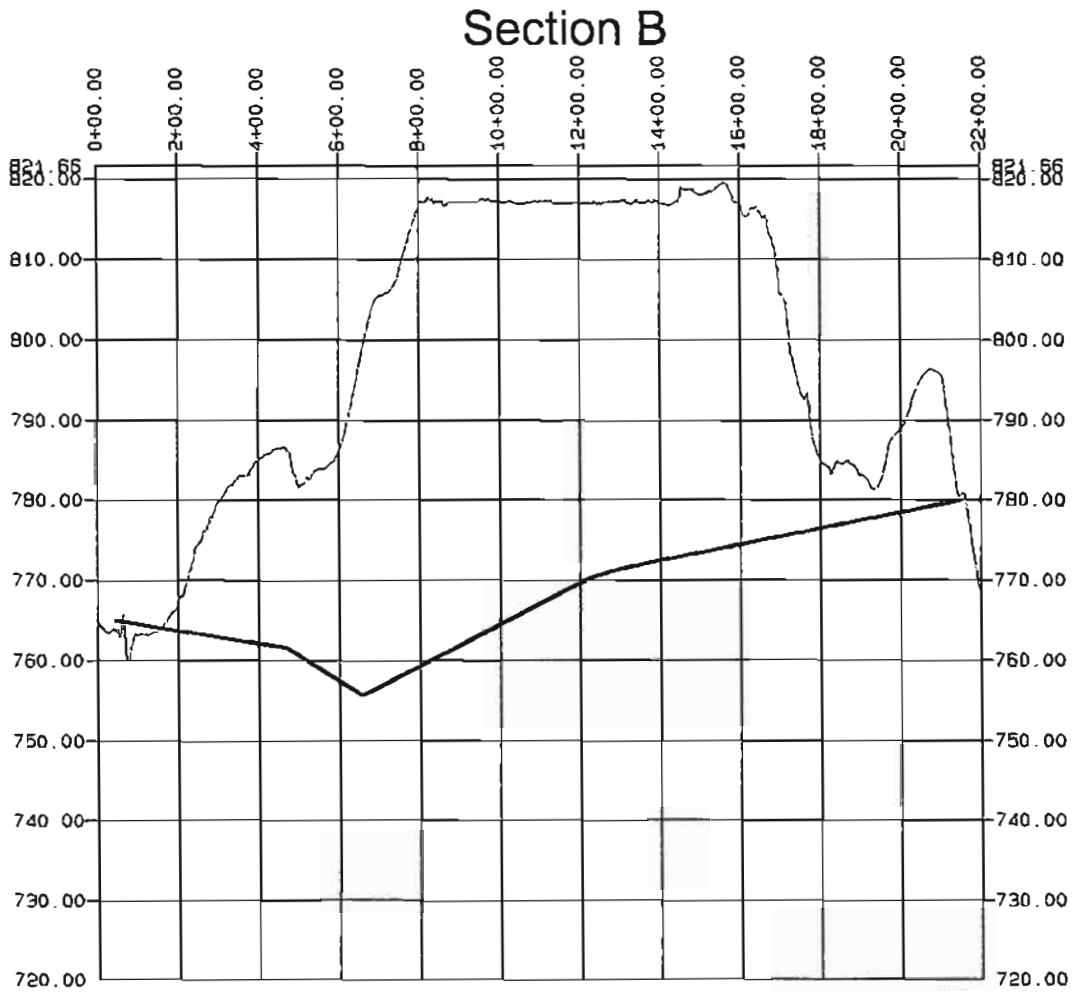
Mapping Dated February 25, 2009

Alternative 3 – Grade Dredge Cell (with central ditch) and Remove Ash from Embayment Area



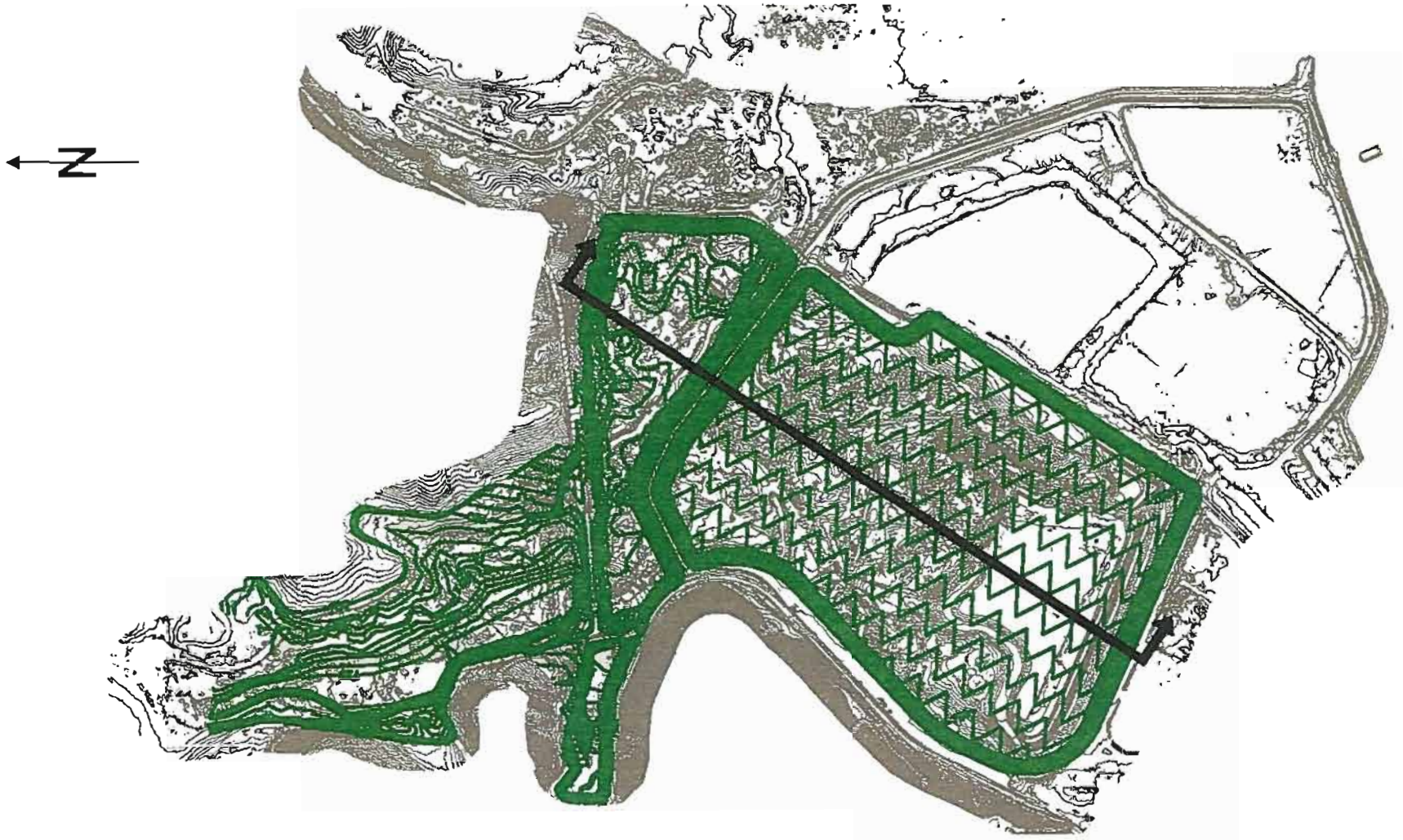
Mapping Dated February 25, 2009

Alternative 3 – Grade Dredge Cell (with central ditch) and Remove Ash from Embayment Area



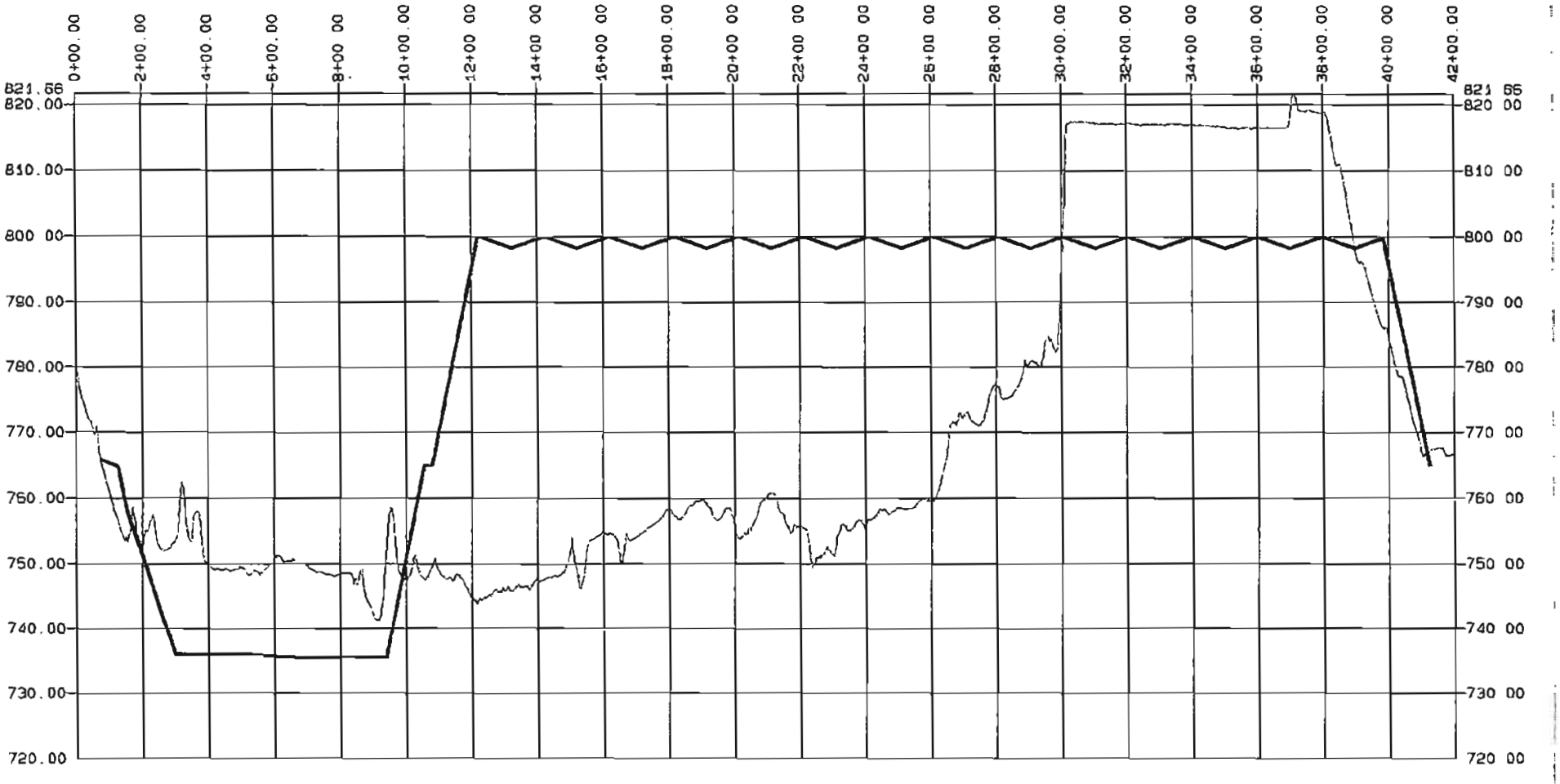
Mapping Dated February 25, 2009

Alternative 4 – Stack Dredge Cell (with reconstructed Dike C) and Remove Ash from Embayment Area



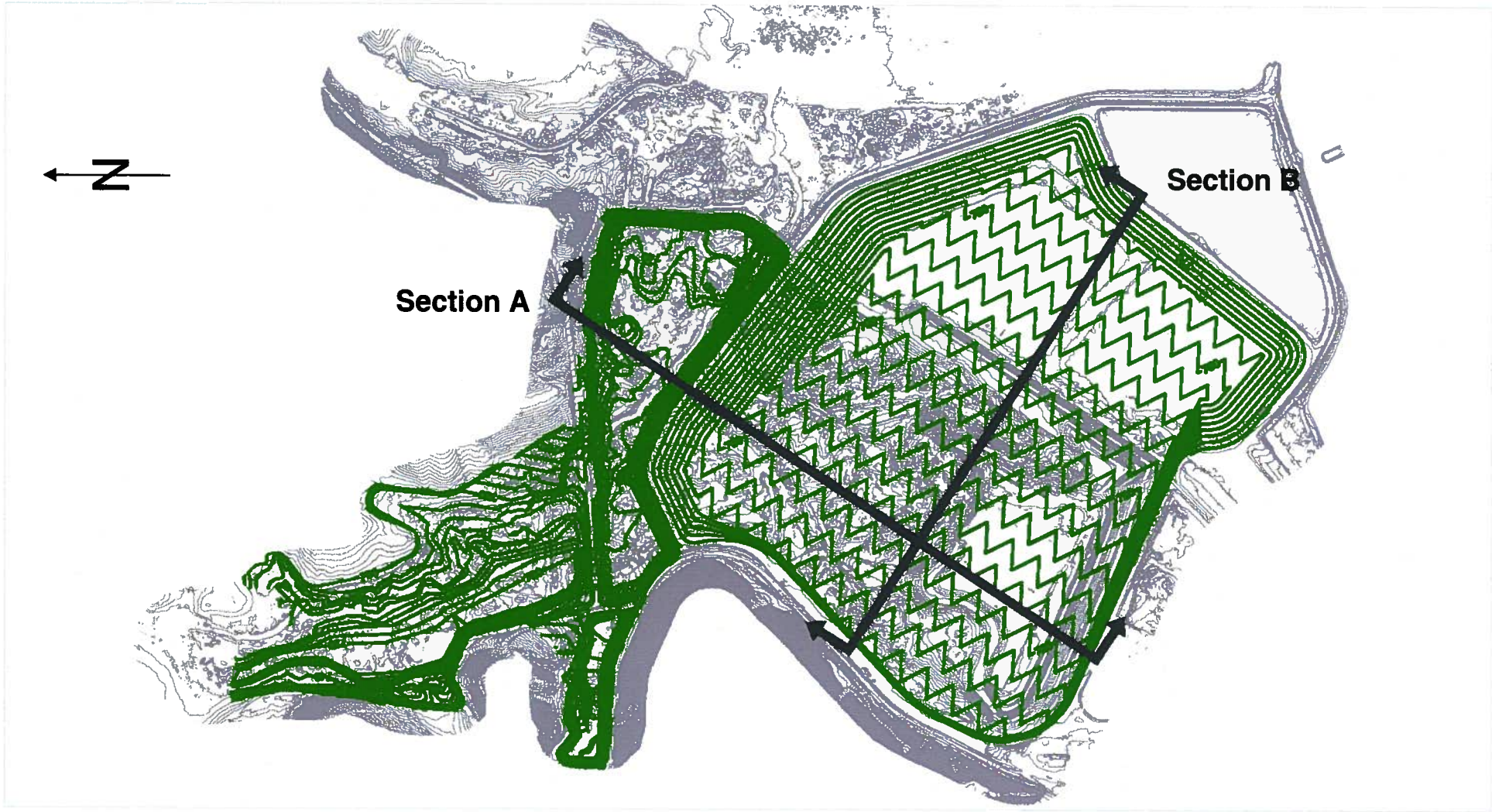
Mapping Dated February 25, 2009

Alternative 4 – Stack Dredge Cell (with reconstructed Dike C) and Remove Ash from Embayment Area



Mapping Dated February 25, 2009

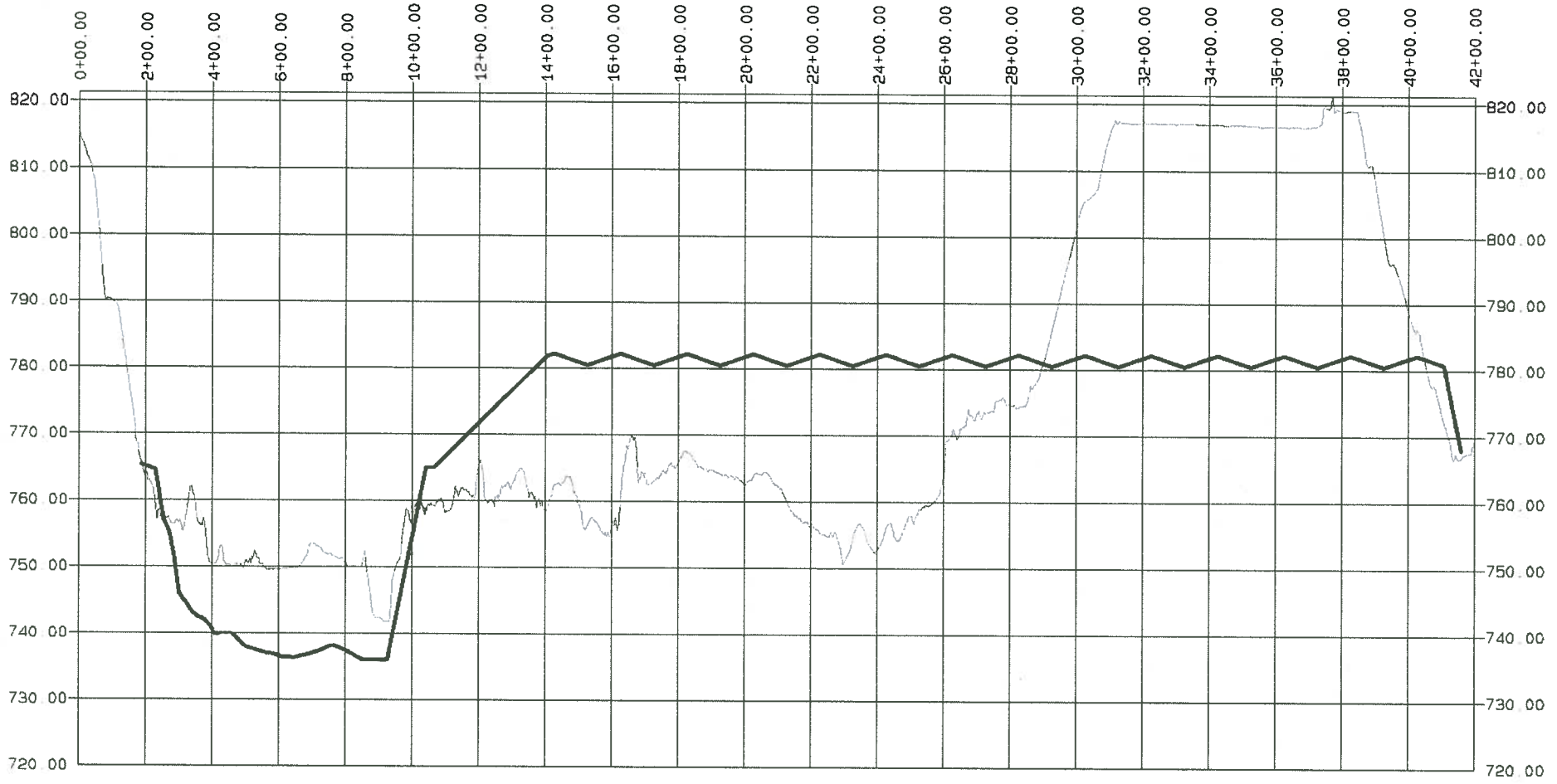
Alternative 5 – Stack Dredge Cell (with reconstructed Dike C) and Ash Pond, Remove Ash from Embayment Area



Mapping Dated February 25, 2009

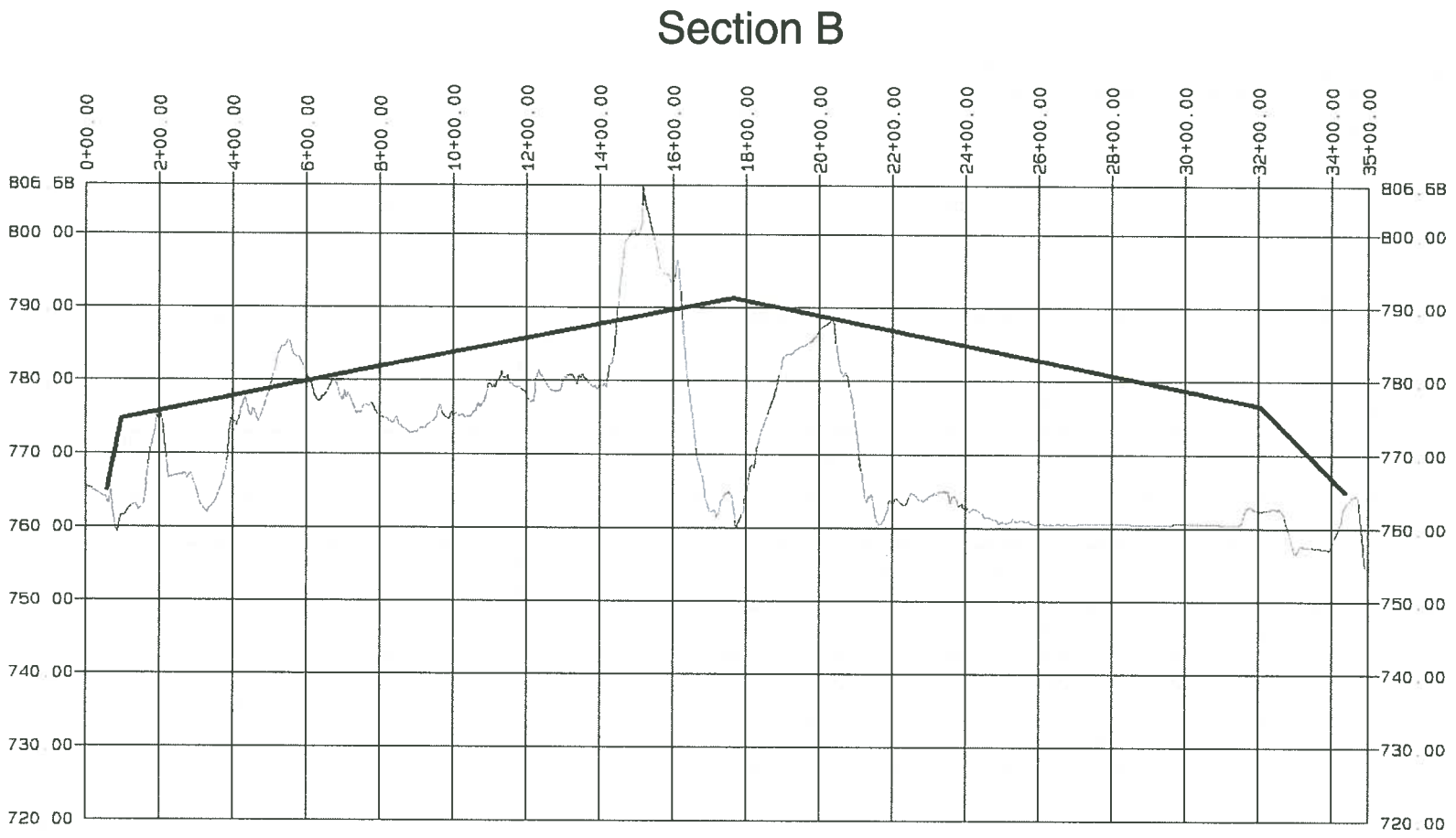
Alternative 5 – Stack Dredge Cell (with reconstructed Dike C) and Ash Pond, Remove Ash from Embayment Area

Section A



Mapping Dated February 25, 2009

Alternative 5 – Stack Dredge Cell (with reconstructed Dike C) and Ash Pond, Remove Ash from Embayment Area



Mapping Dated February 25, 2009

Preliminary Engineering Assessments

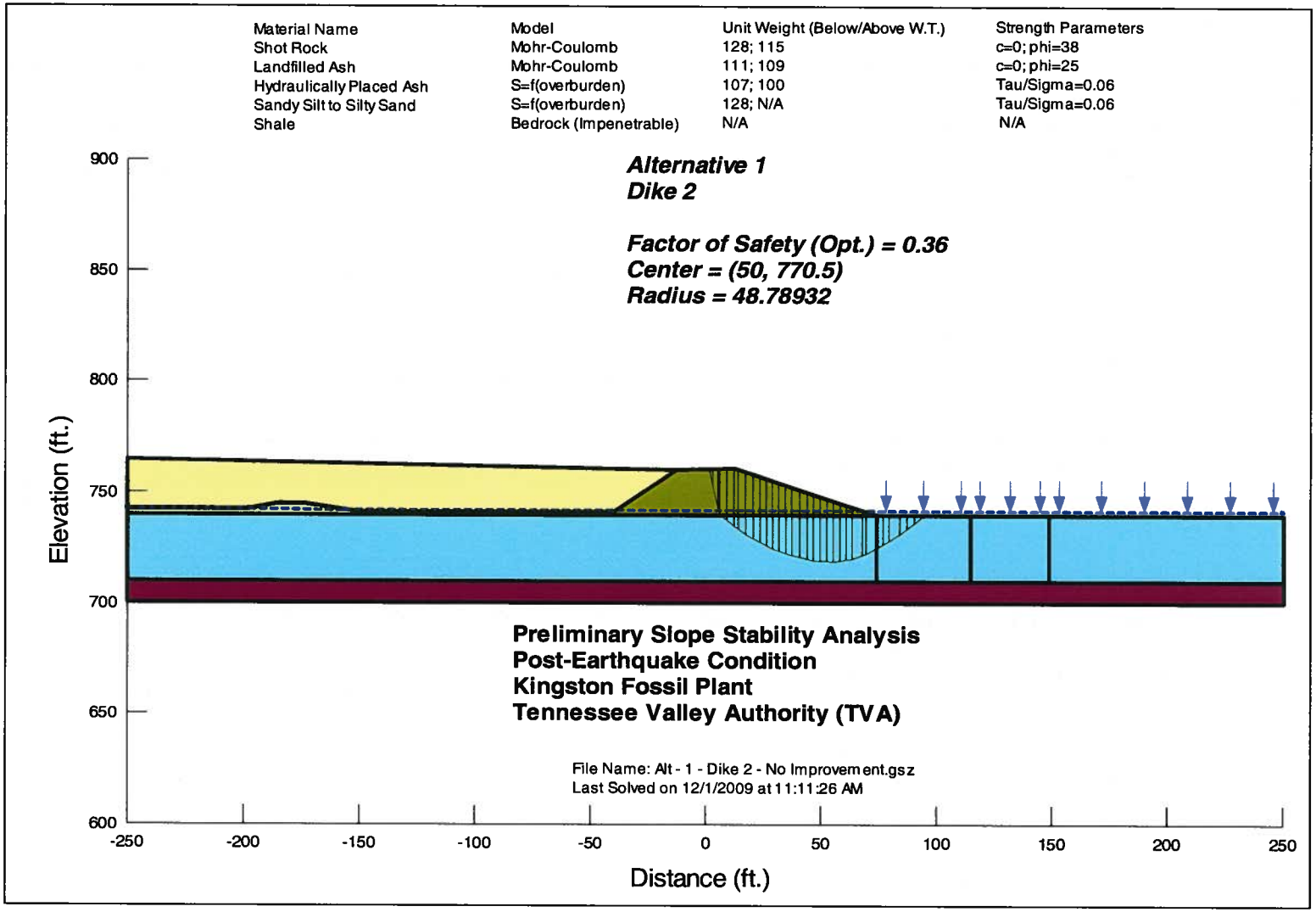


Figure 1: Alternative 1, Dike 2, Without Improvement

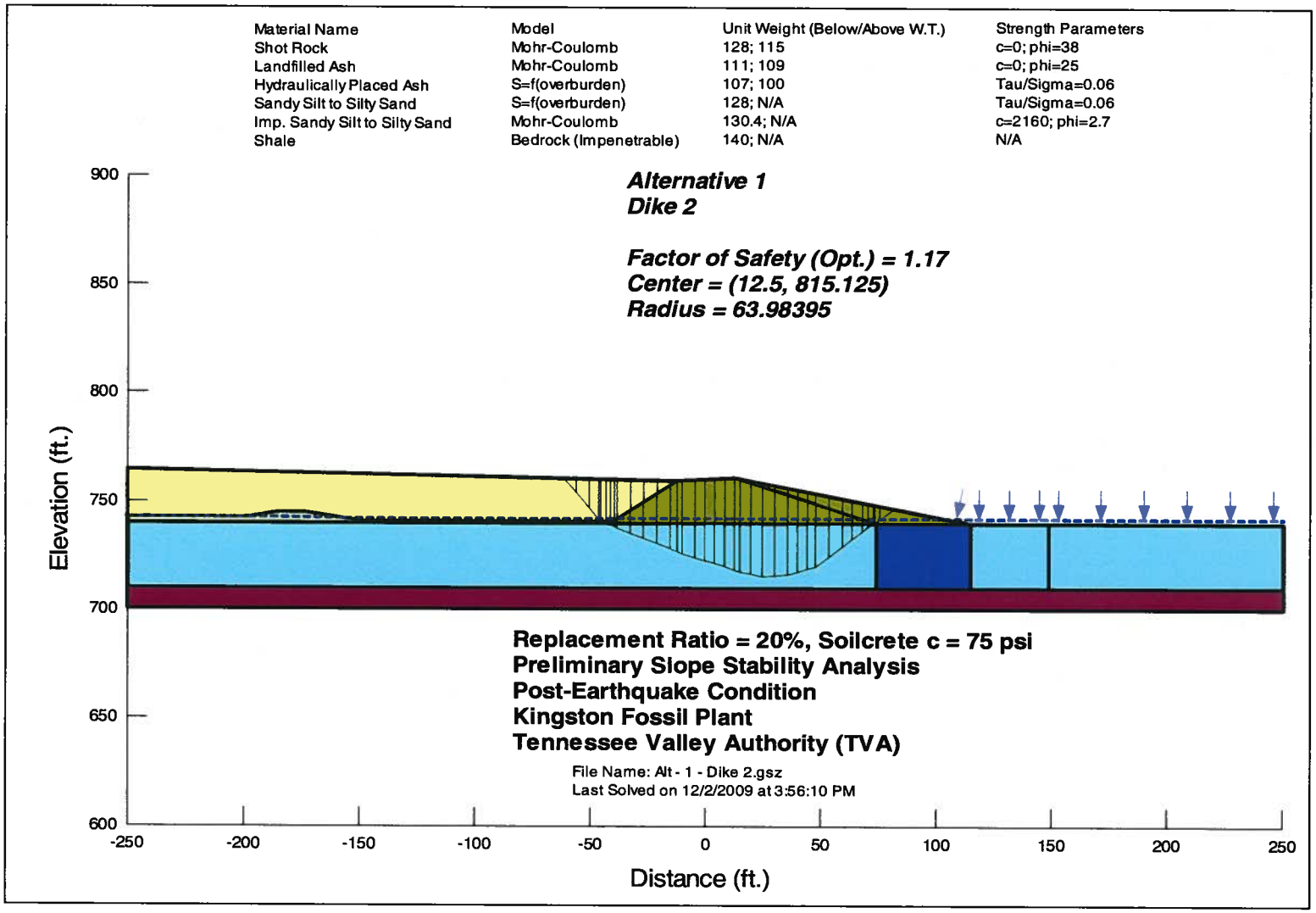


Figure 2: Alternative 1, Dike 2, With Improvement

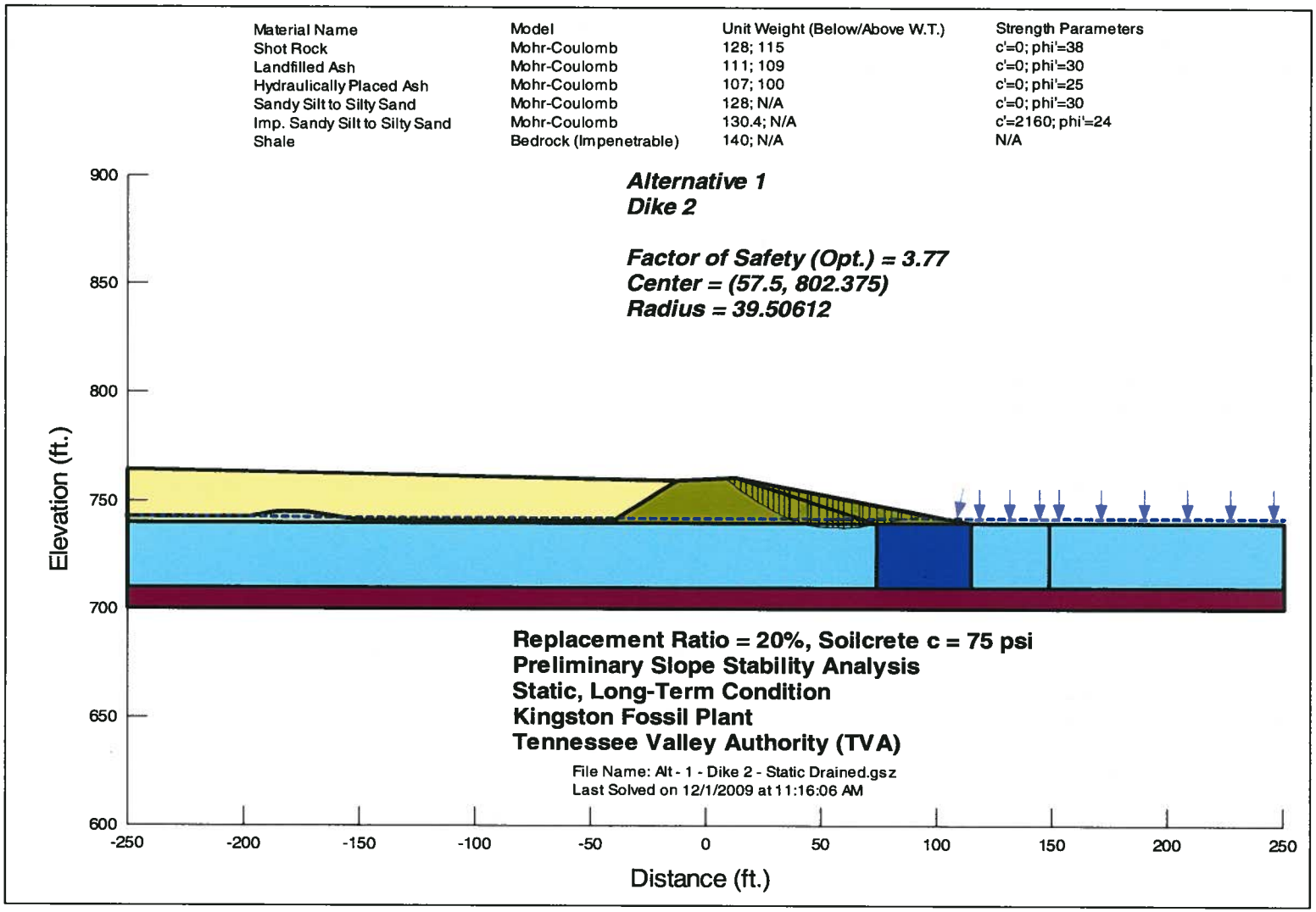


Figure 3: Alternative 1, Dike 2, With Improvement, Static Drained Condition

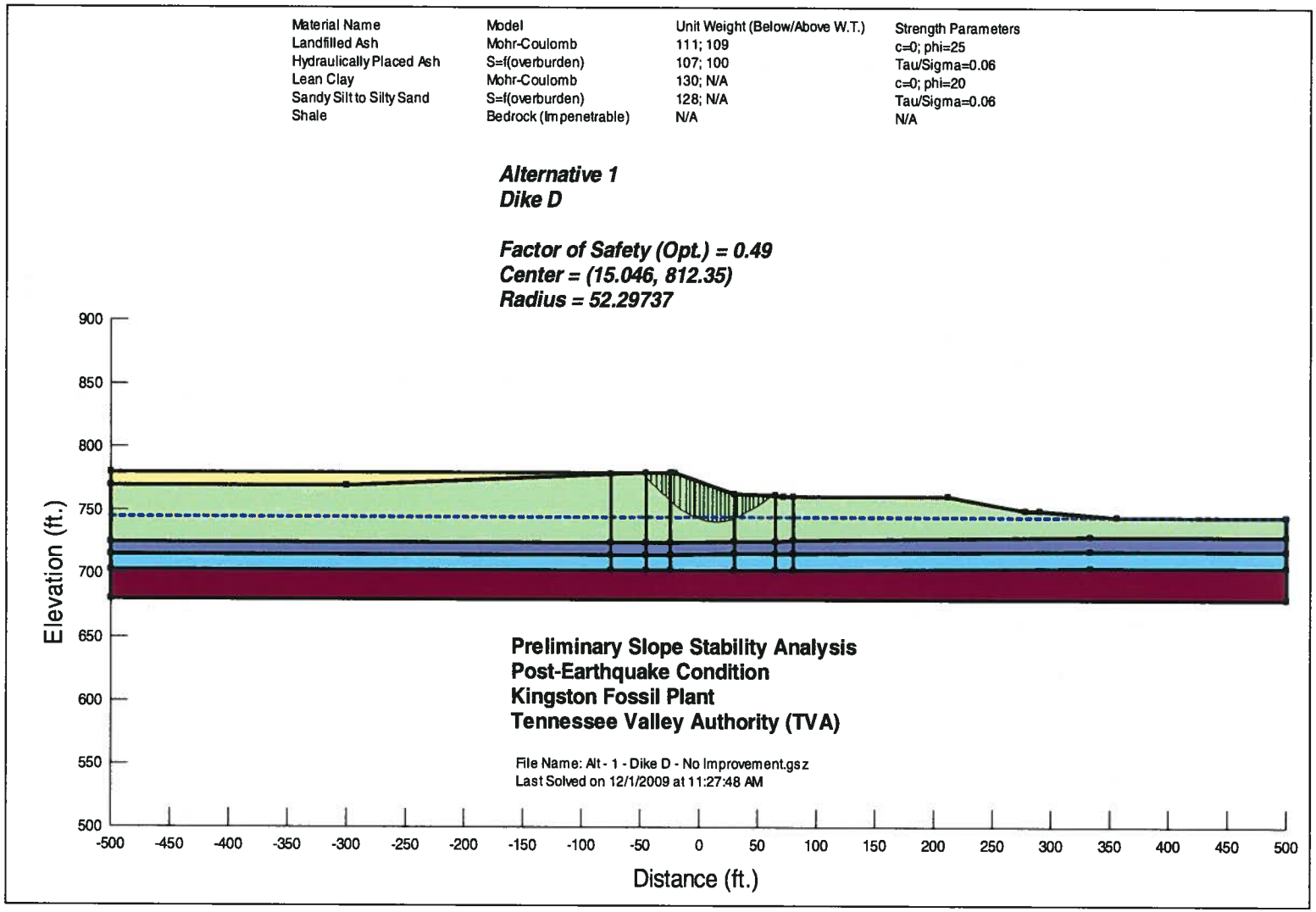


Figure 4: Alternative 1, Dike D, Without Improvement

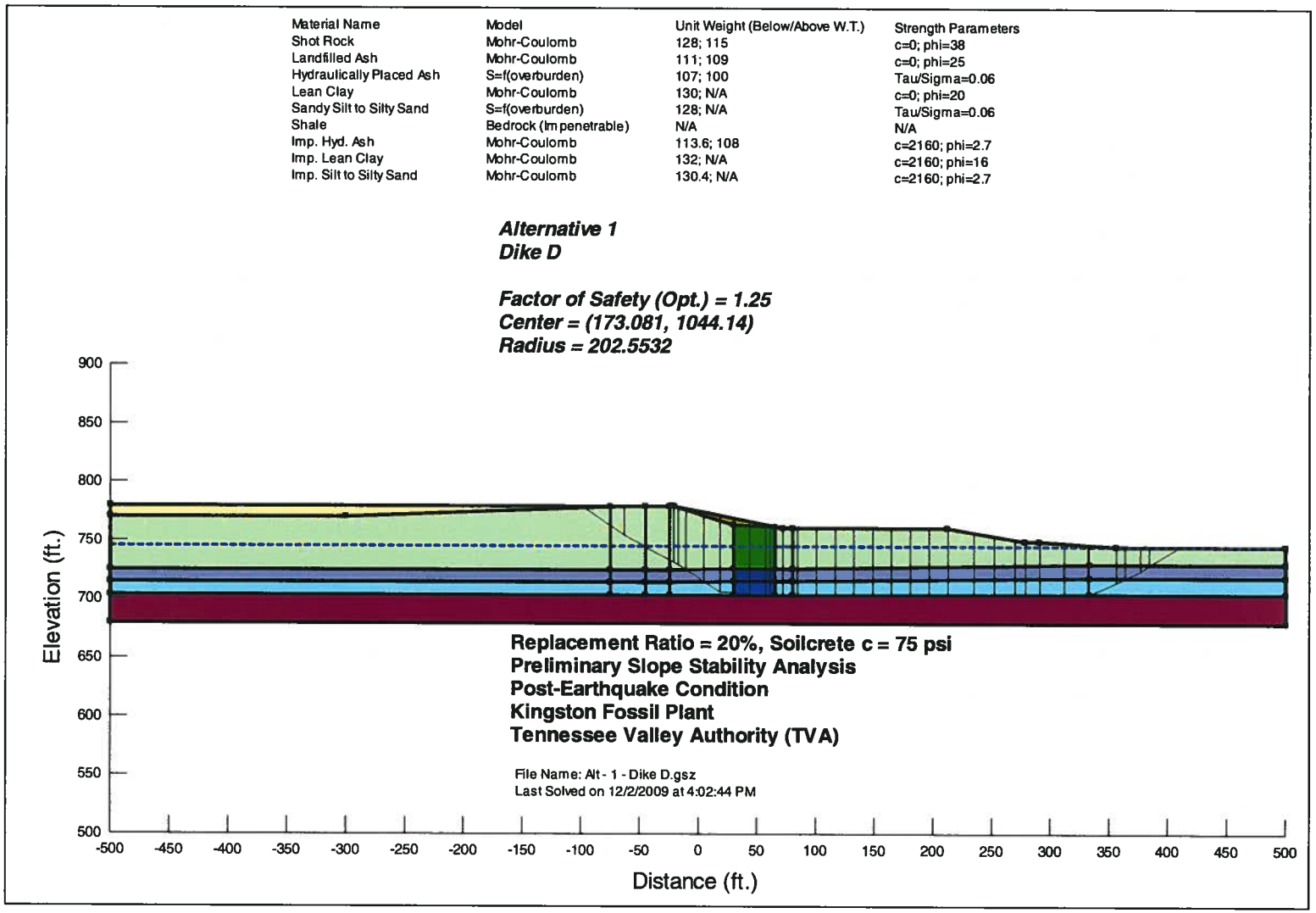


Figure 5: Alternative 1, Dike D, With Improvement

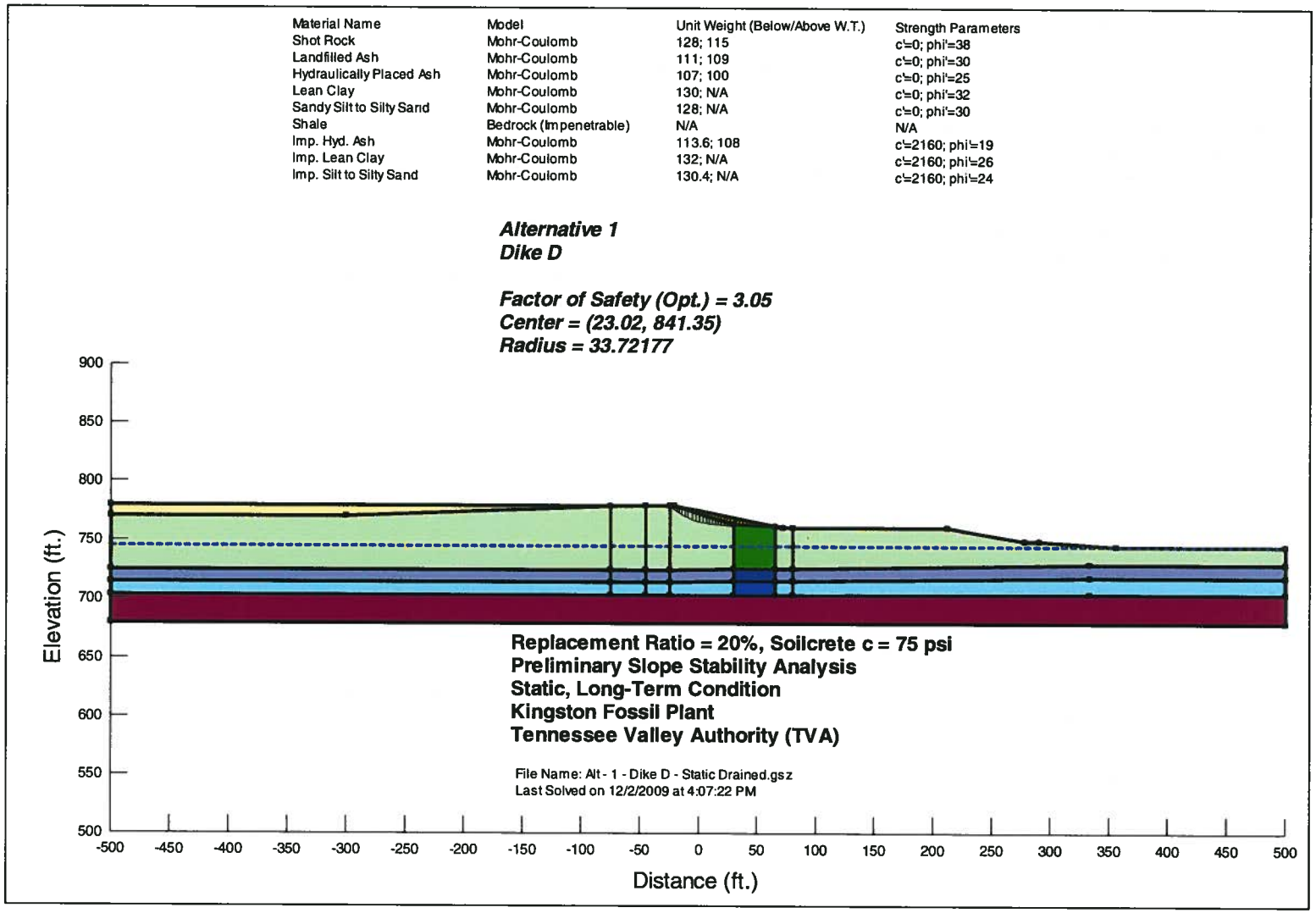


Figure 6: Alternative 1, Dike D, With Improvement, Static Drained Condition

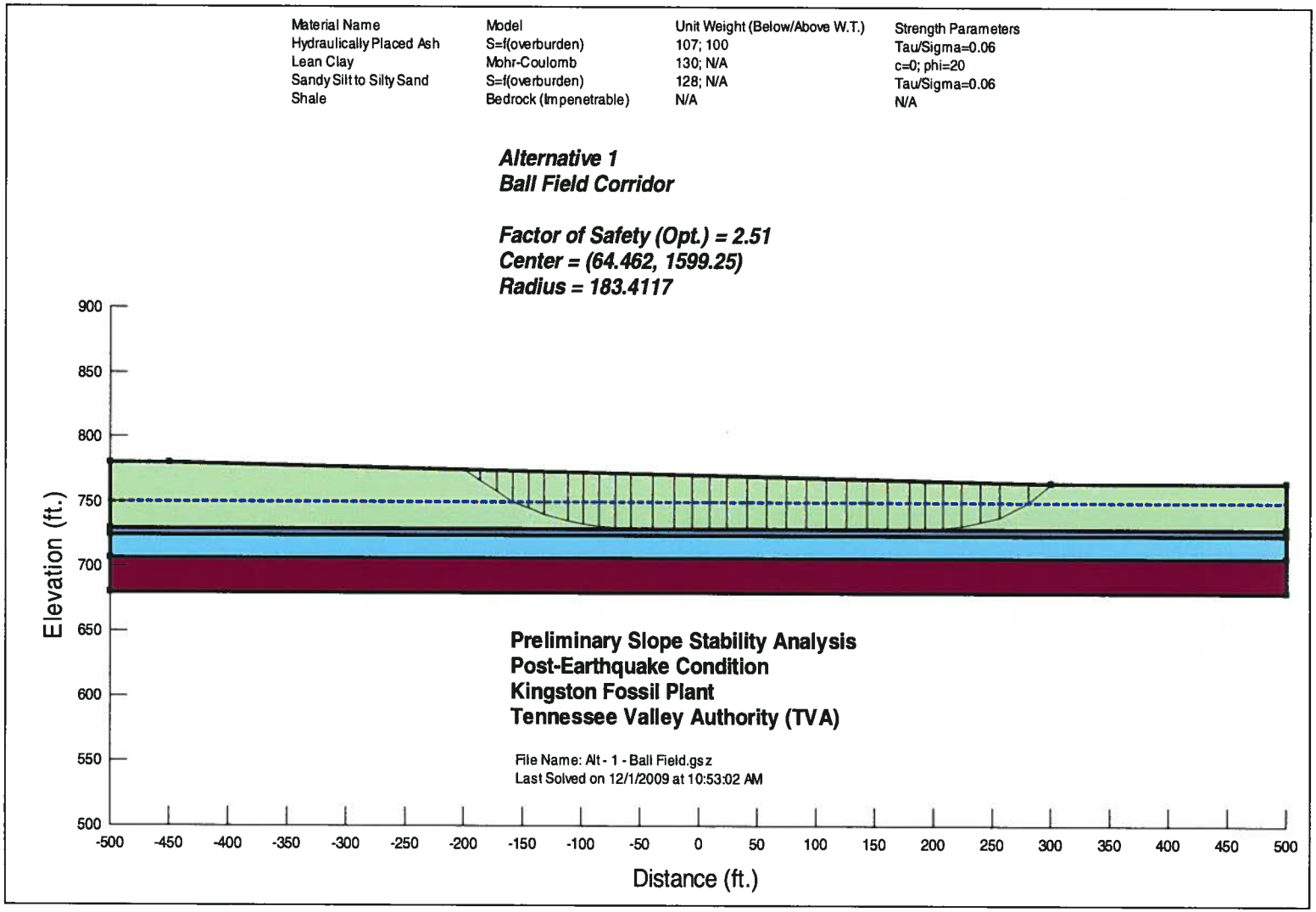


Figure 7: Alternative 1, Ball Field Corridor, Without Improvement

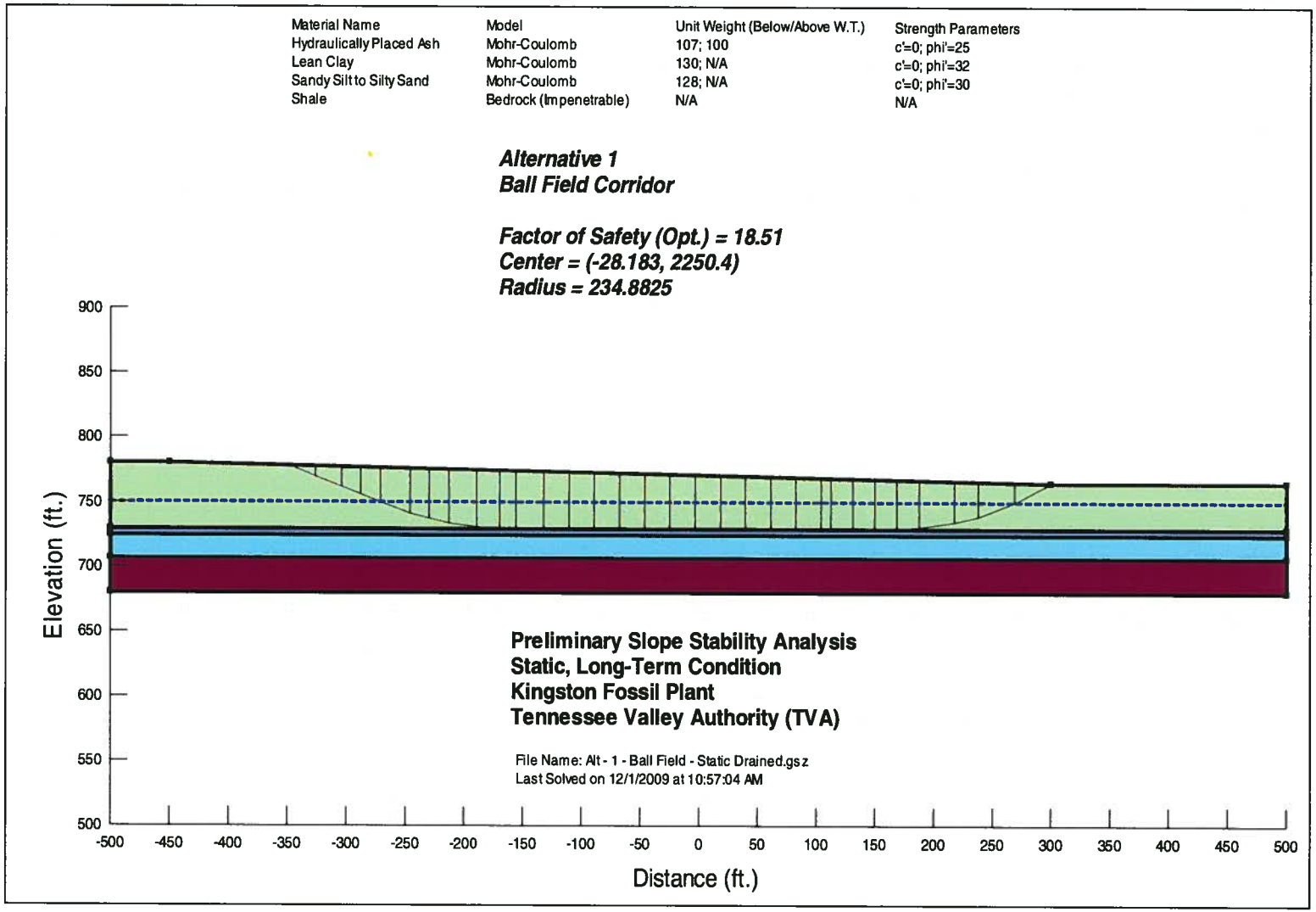


Figure 8: Alternative 1, Ball Field Corridor, Without Improvement, Static Drained Condition

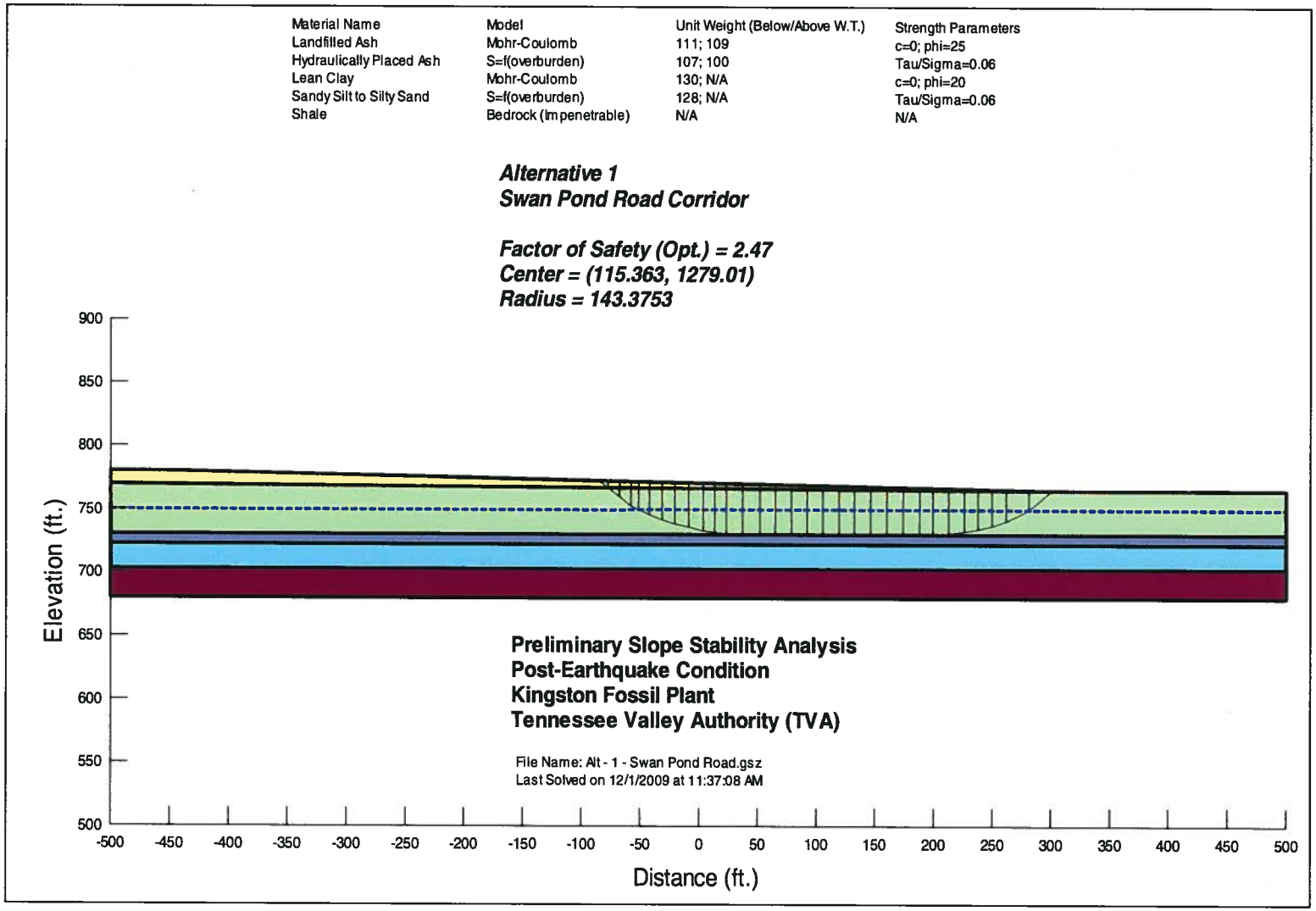


Figure 9: Alternative 1, Swan Pond Road Corridor, Without Improvement

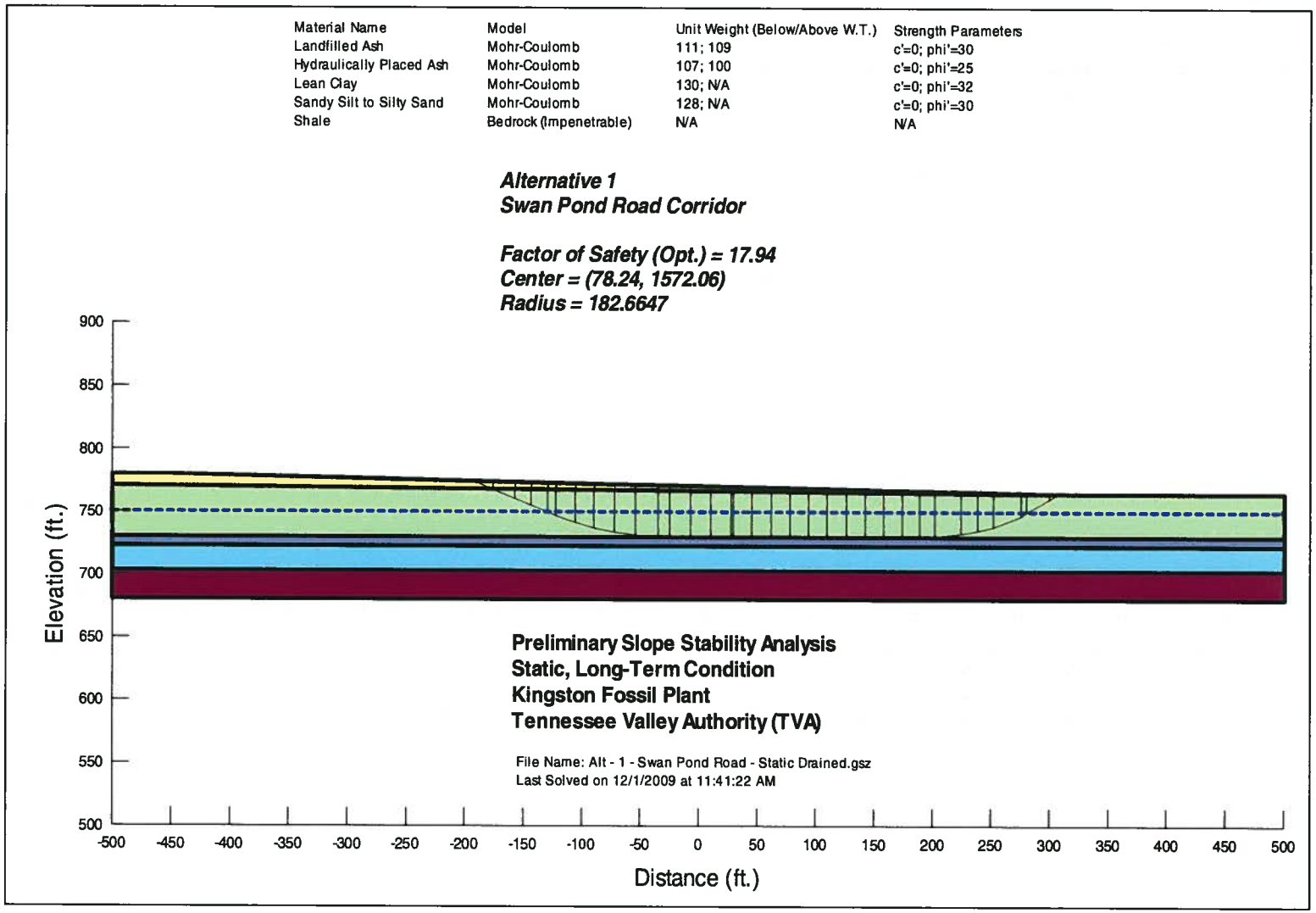


Figure 10: Alternative 1, Swan Pond Road Corridor, Without Improvement, Static Drained Condition

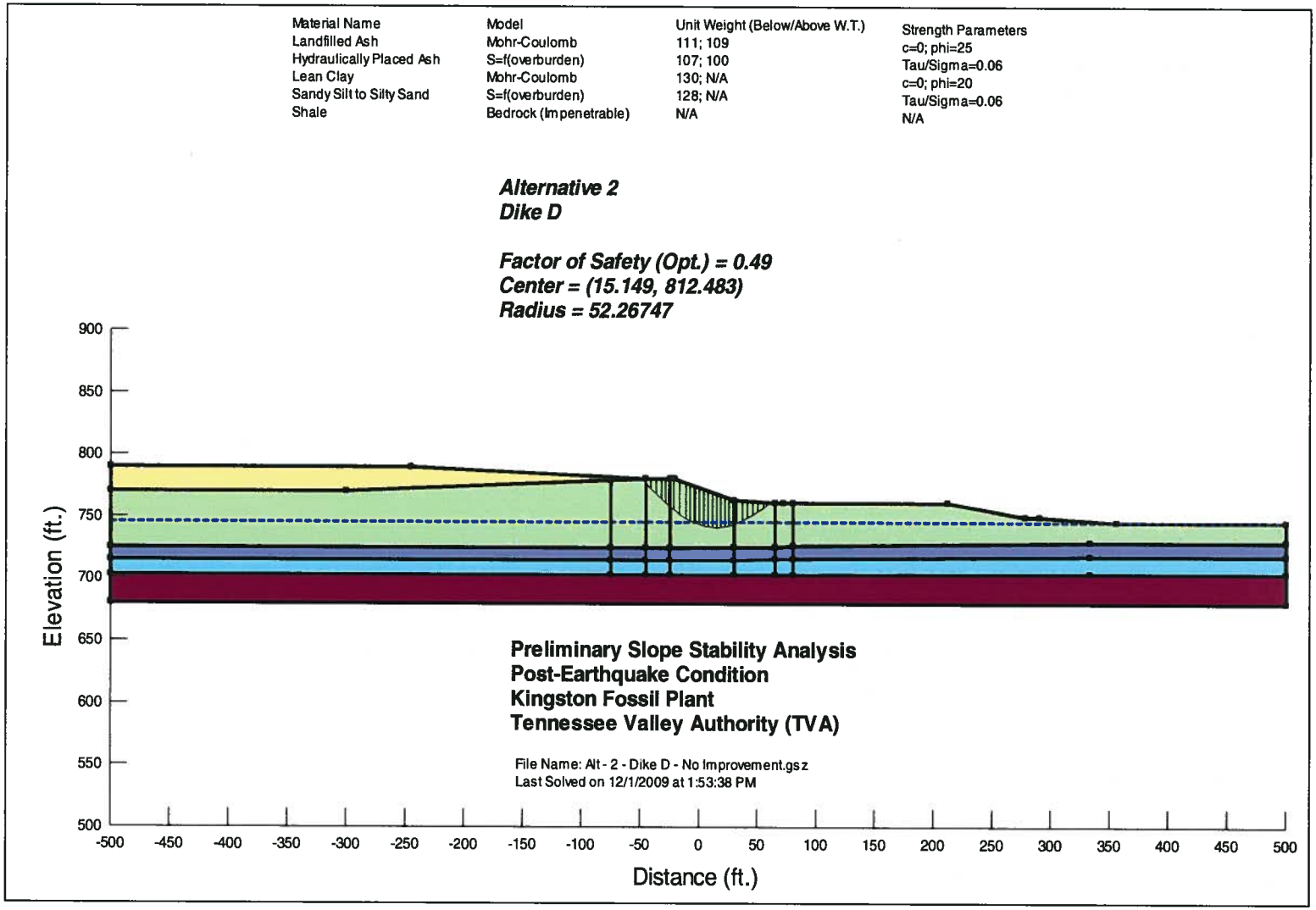


Figure 11: Alternative 2, Dike D, Without Improvement

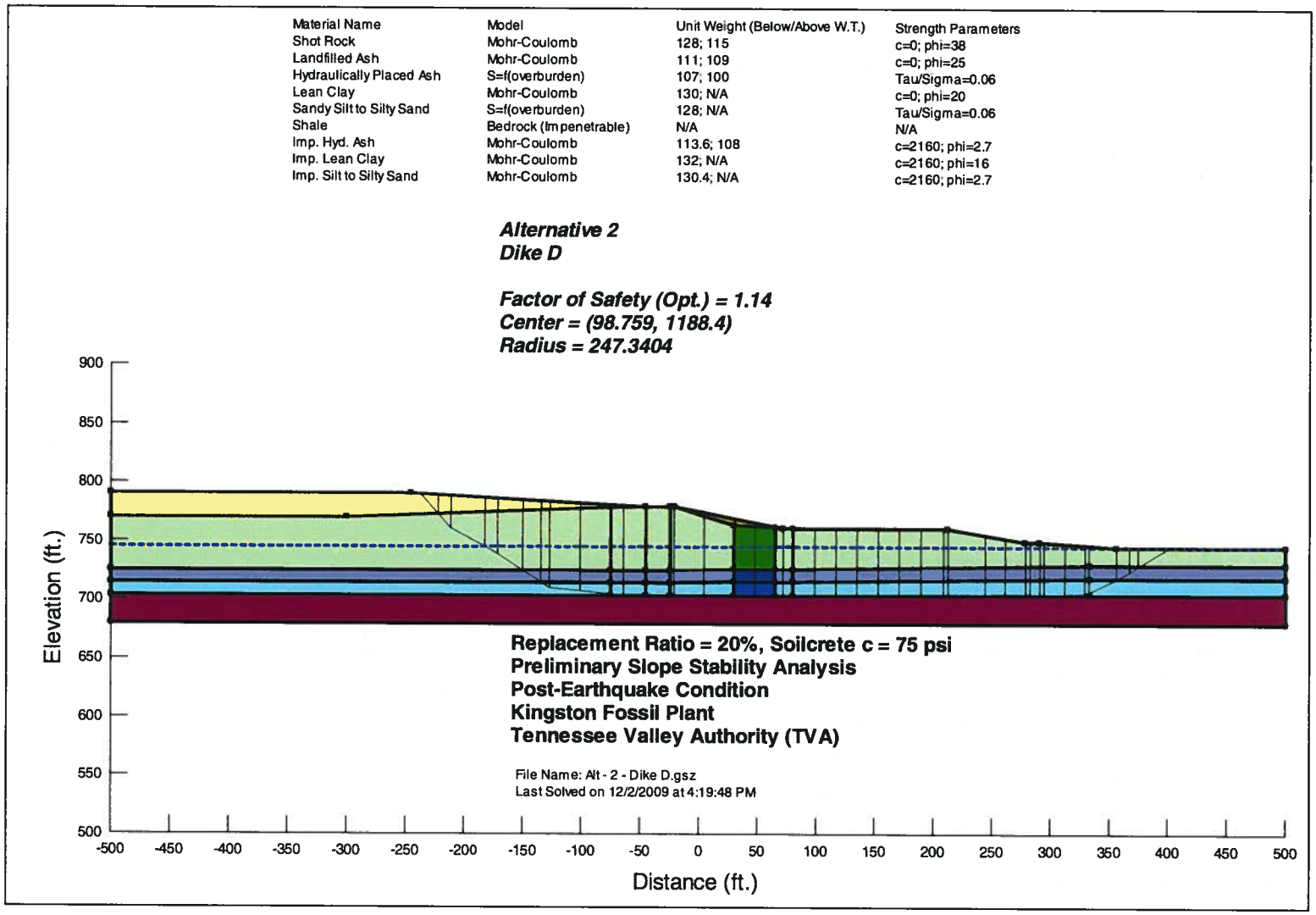


Figure 12: Alternative 2, Dike D, With Improvement

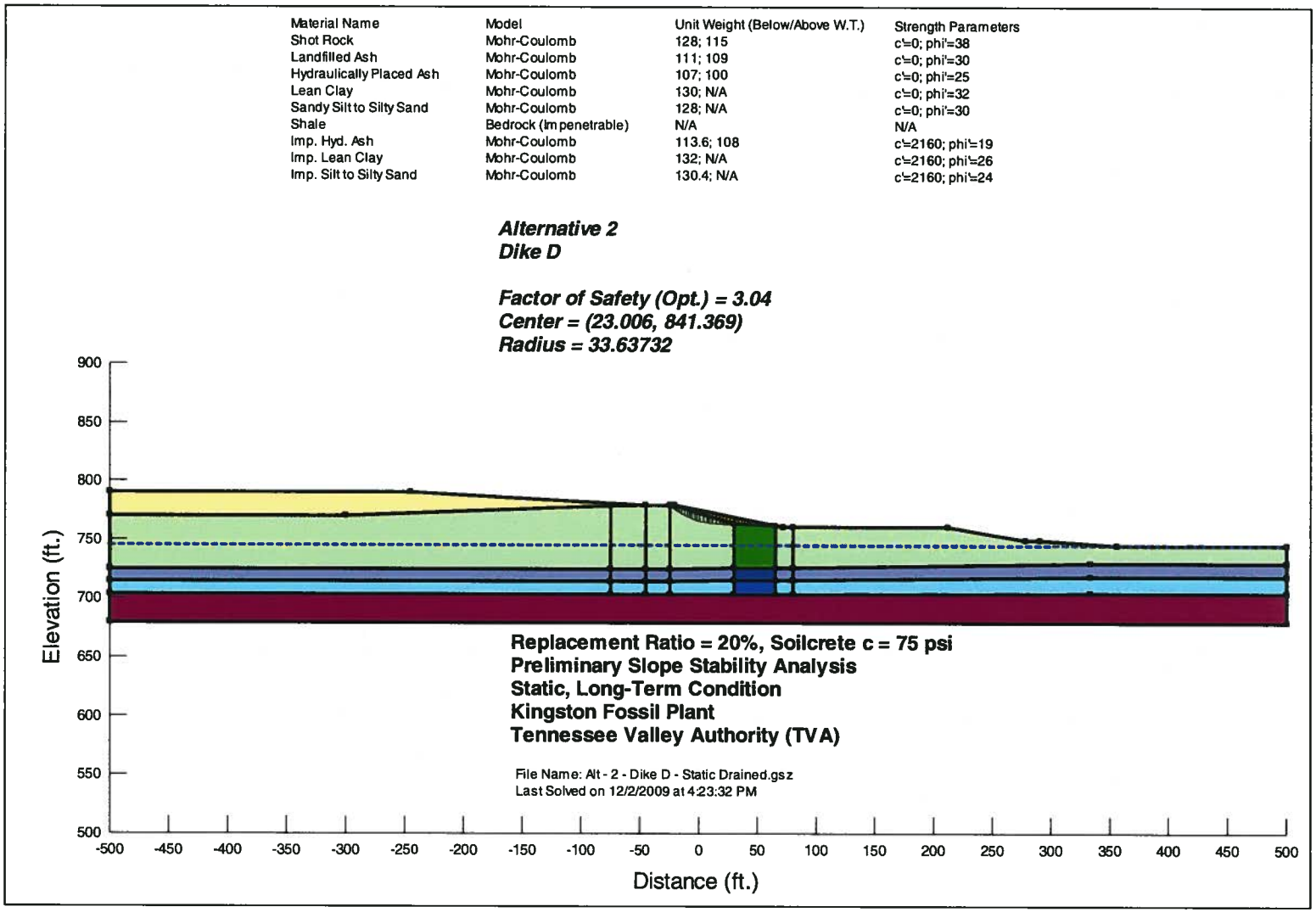


Figure 13: Alternative 2, Dike D, With Improvement, Static Drained Condition

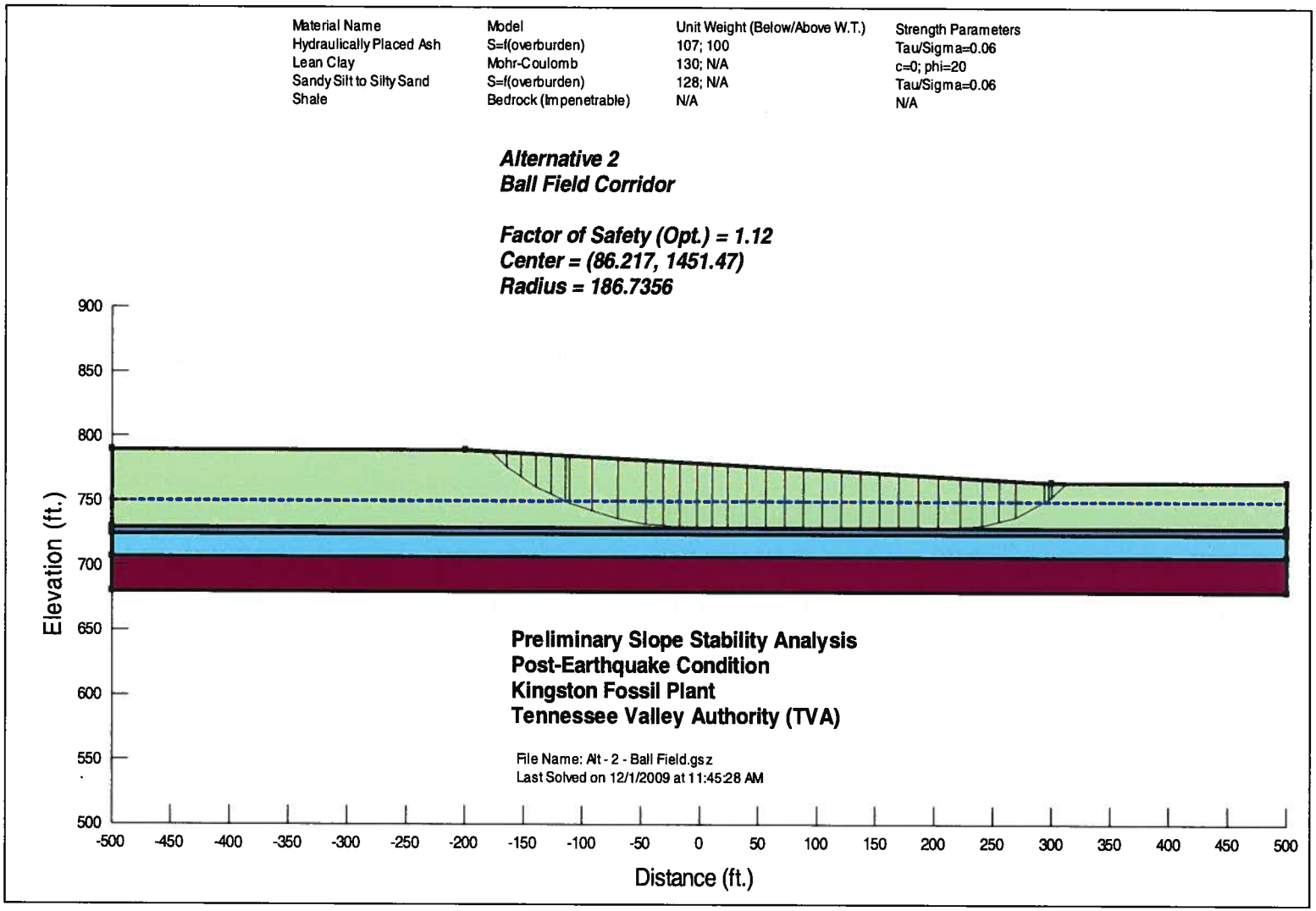


Figure 14: Alternative 2, Ball Field Corridor, Without Improvement

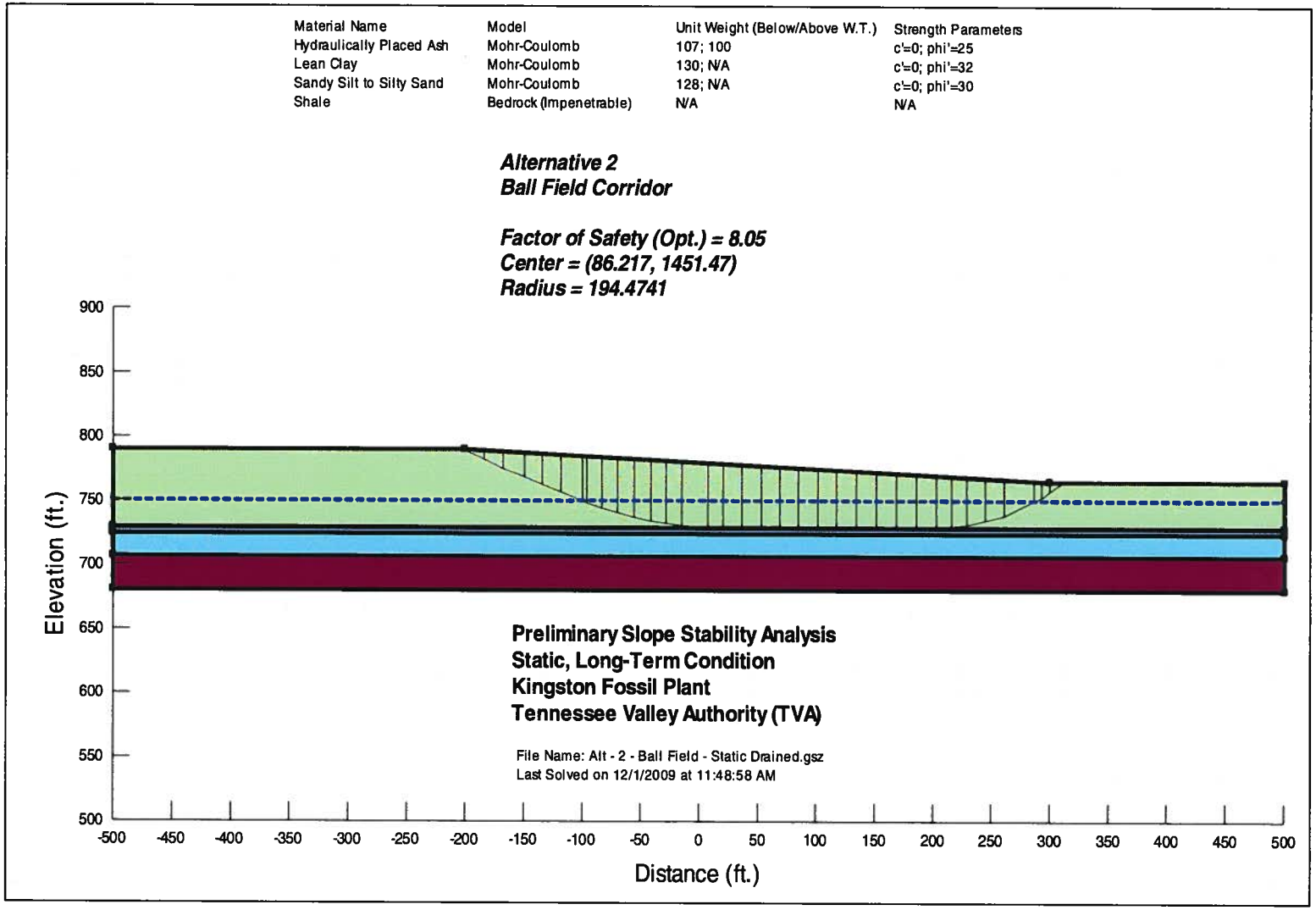


Figure 15: Alternative 2, Ball Field Corridor, Without Improvement, Static Drained Condition

Material Name	Model	Unit Weight (Below/Above W.T.)	Strength Parameters
Landfilled Ash	Mohr-Coulomb	111; 109	c=0; phi=25
Hydraulically Placed Ash	S=f(overburden)	107; 100	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	130; N/A	c=0; phi=20
Sandy Silt to Silty Sand	S=f(overburden)	128; N/A	Tau/Sigma=0.06
Shale	Bedrock (Impenetrable)	140; N/A	N/A

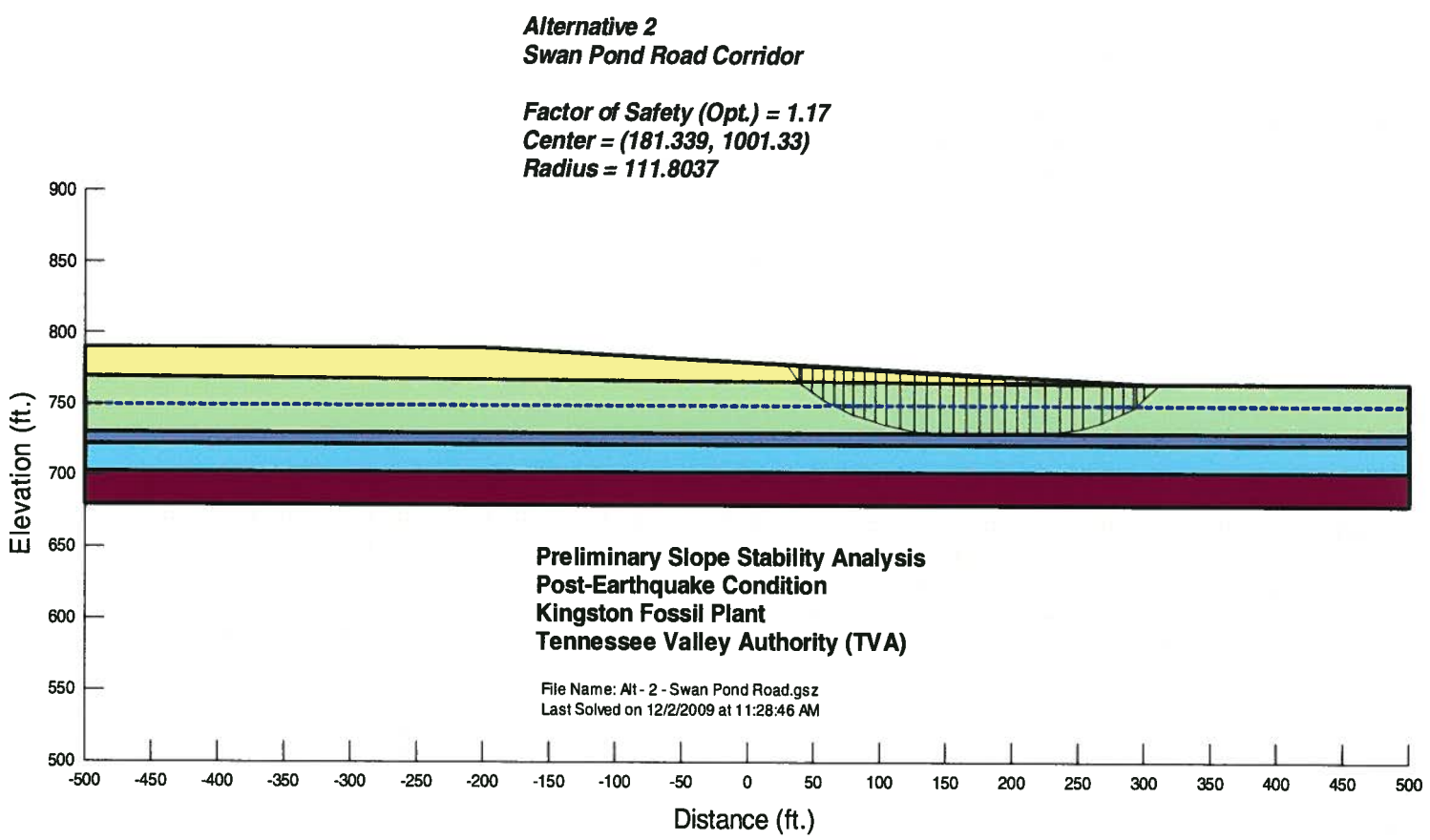


Figure 16: Alternative 2, Swan Pond Road Corridor, Without Improvement

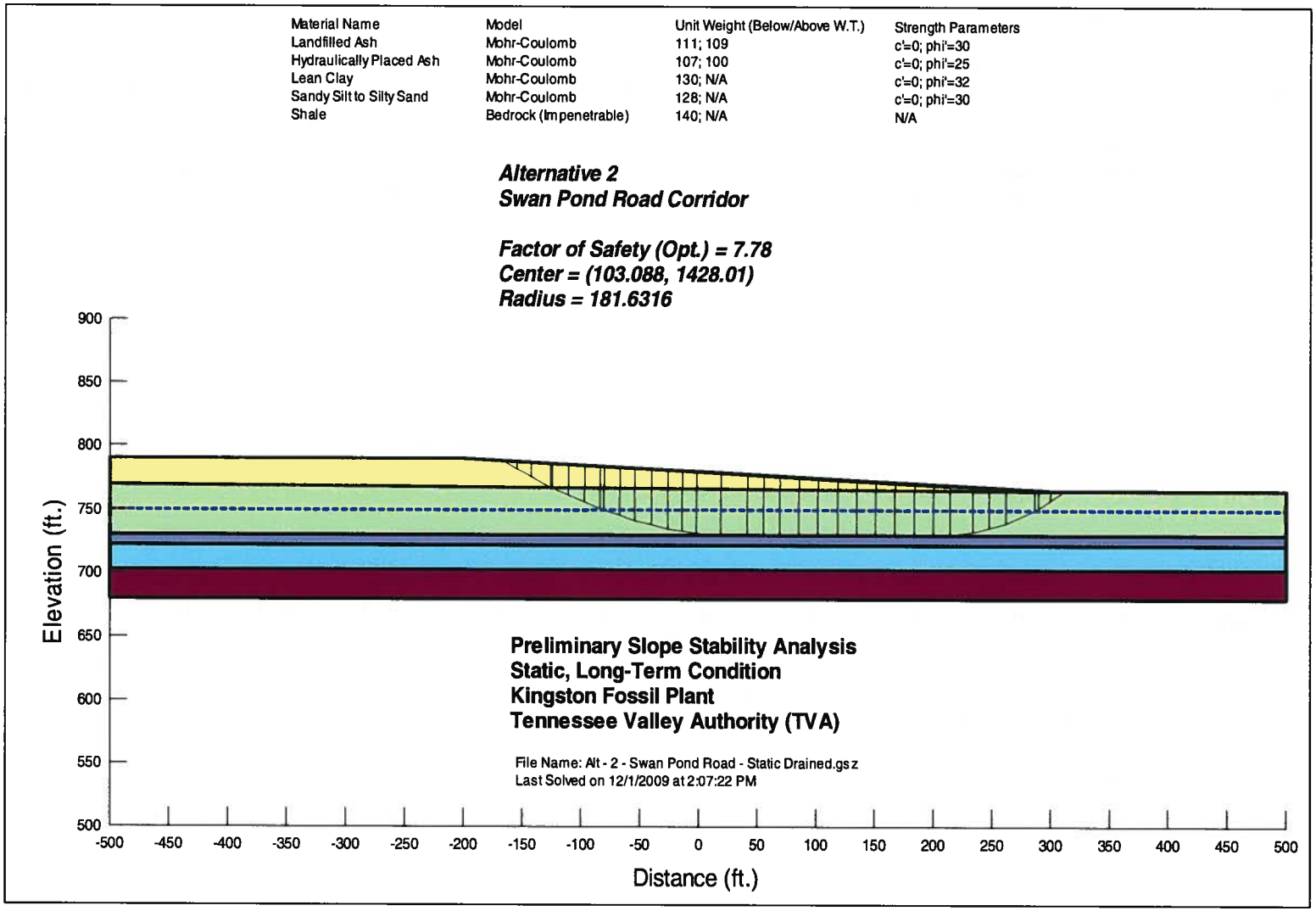


Figure 17: Alternative 2, Swan Pond Road Corridor, Without Improvement, Static Drained Condition

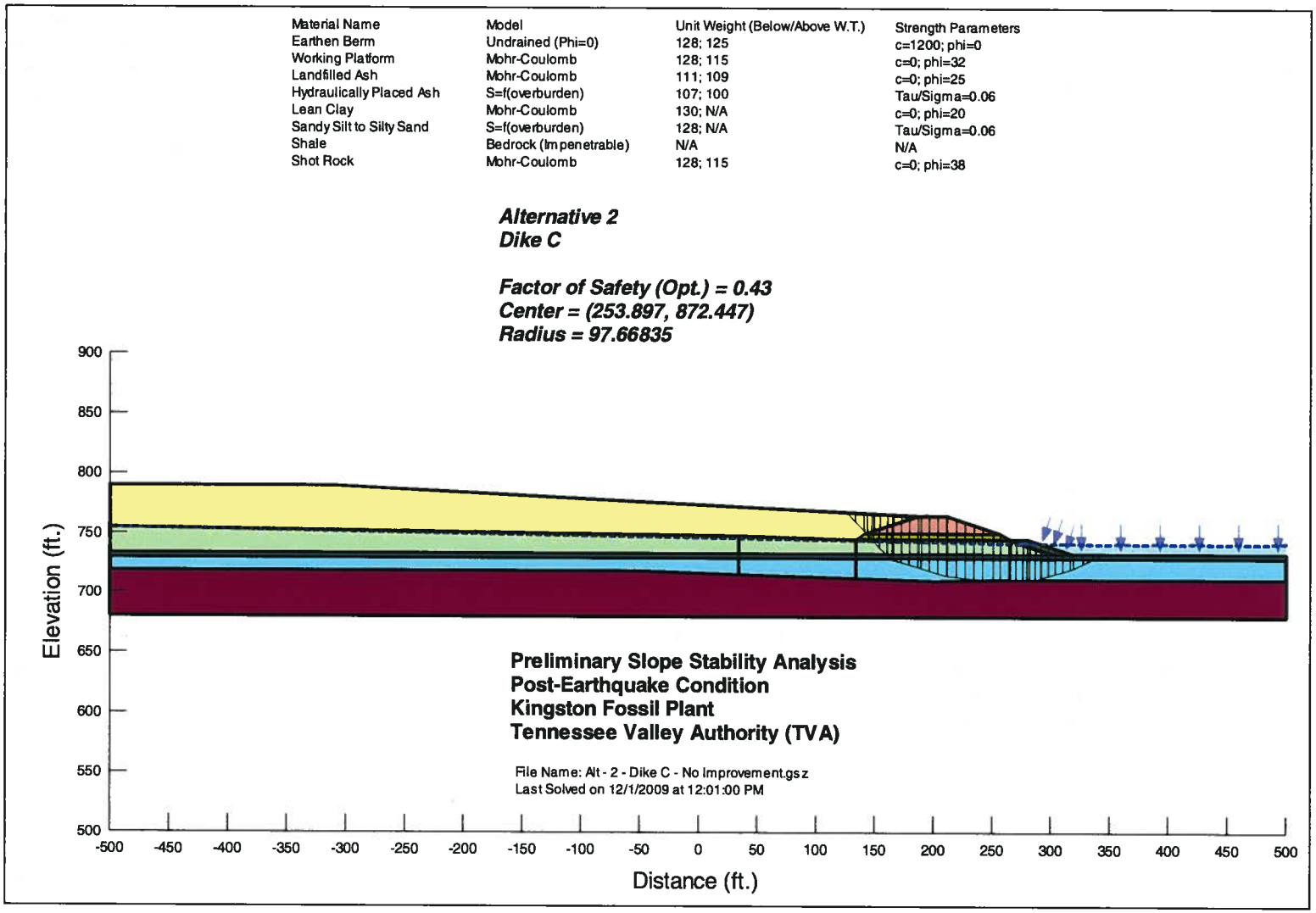


Figure 18: Alternative 2, Dike C, Without Improvement

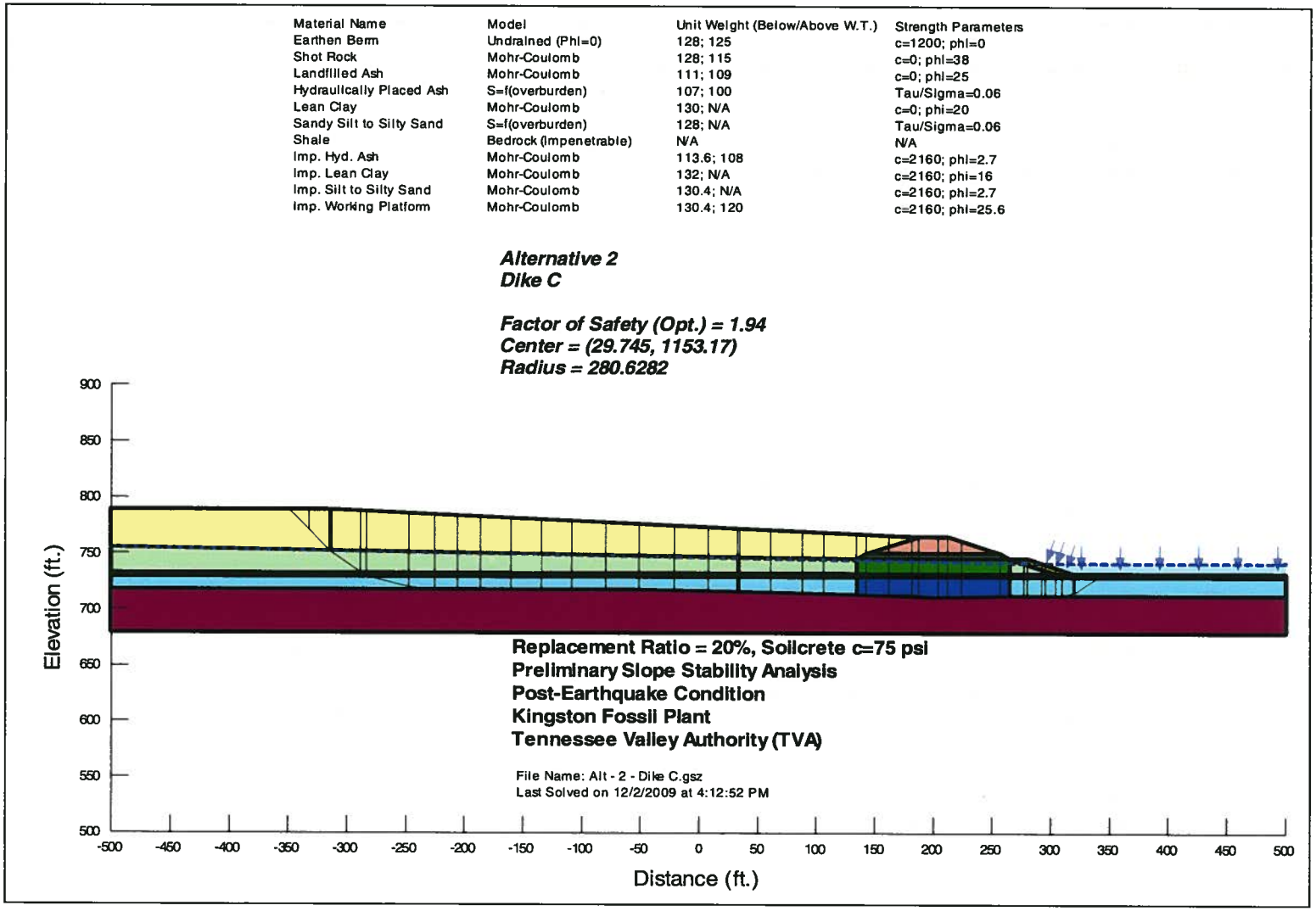


Figure 19: Alternative 2, Dike C, With Improvement

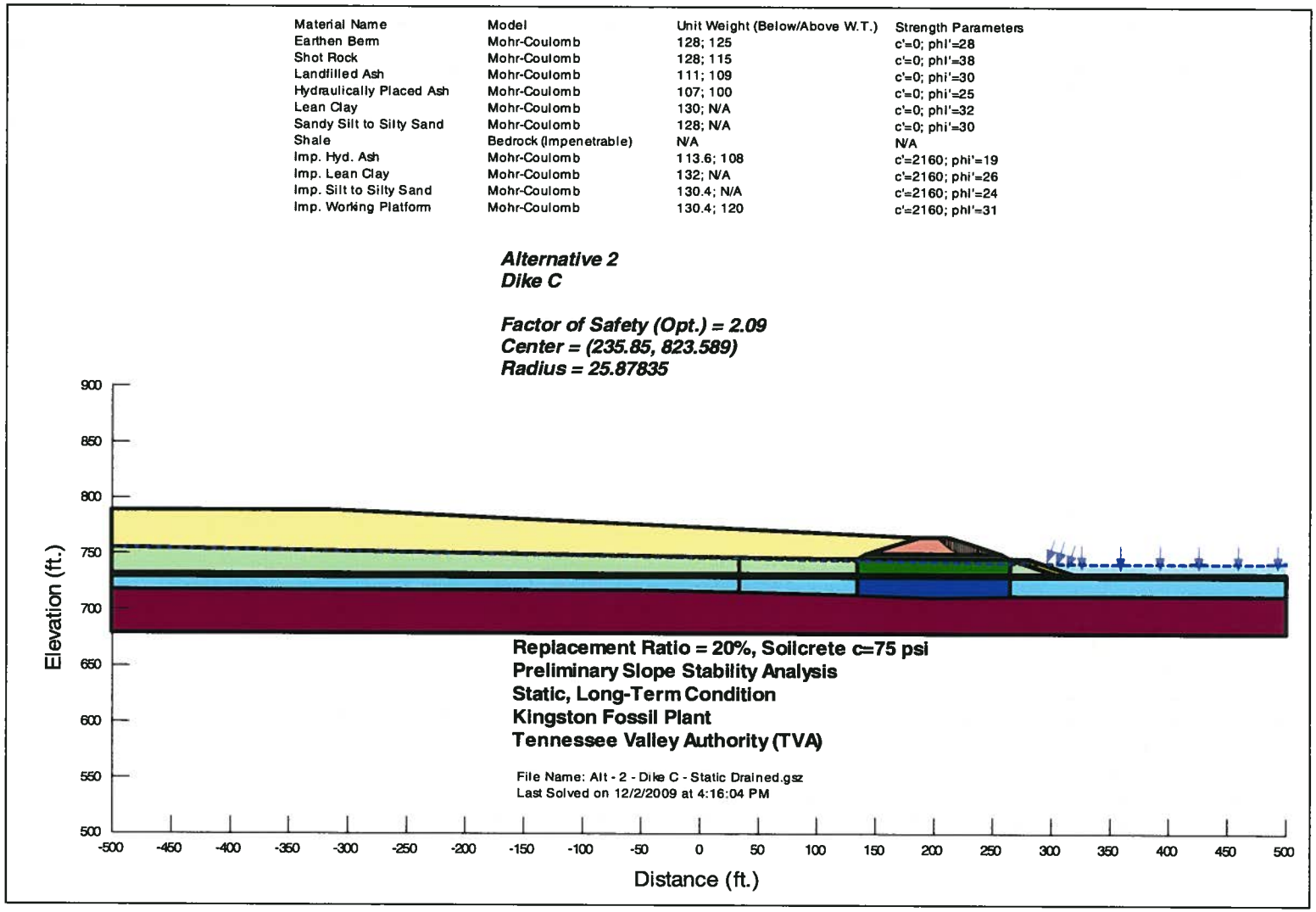


Figure 20: Alternative 2, Dike C, With Improvement, Static Drained Condition

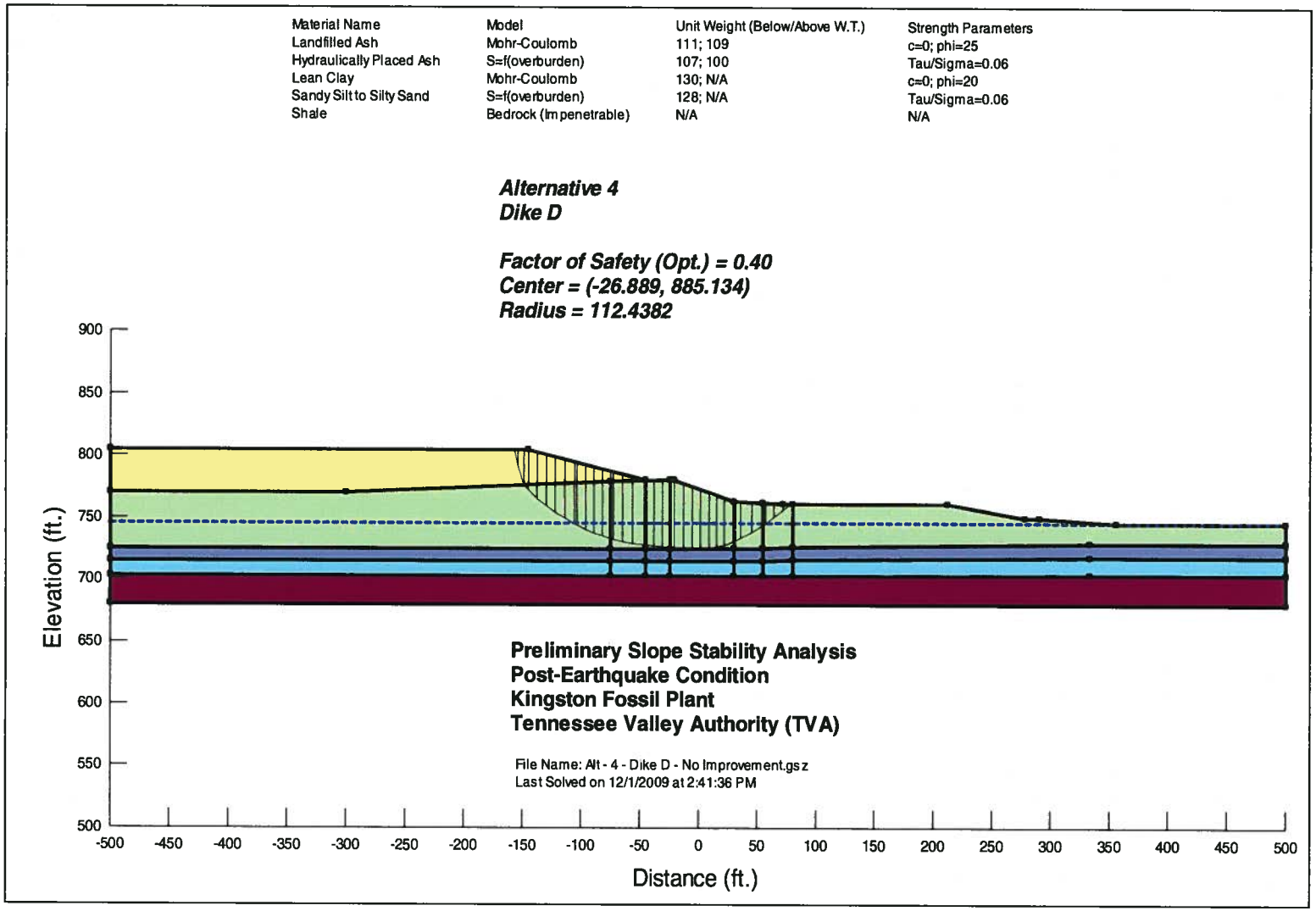


Figure 21: Alternative 4, Dike D, Without Improvement

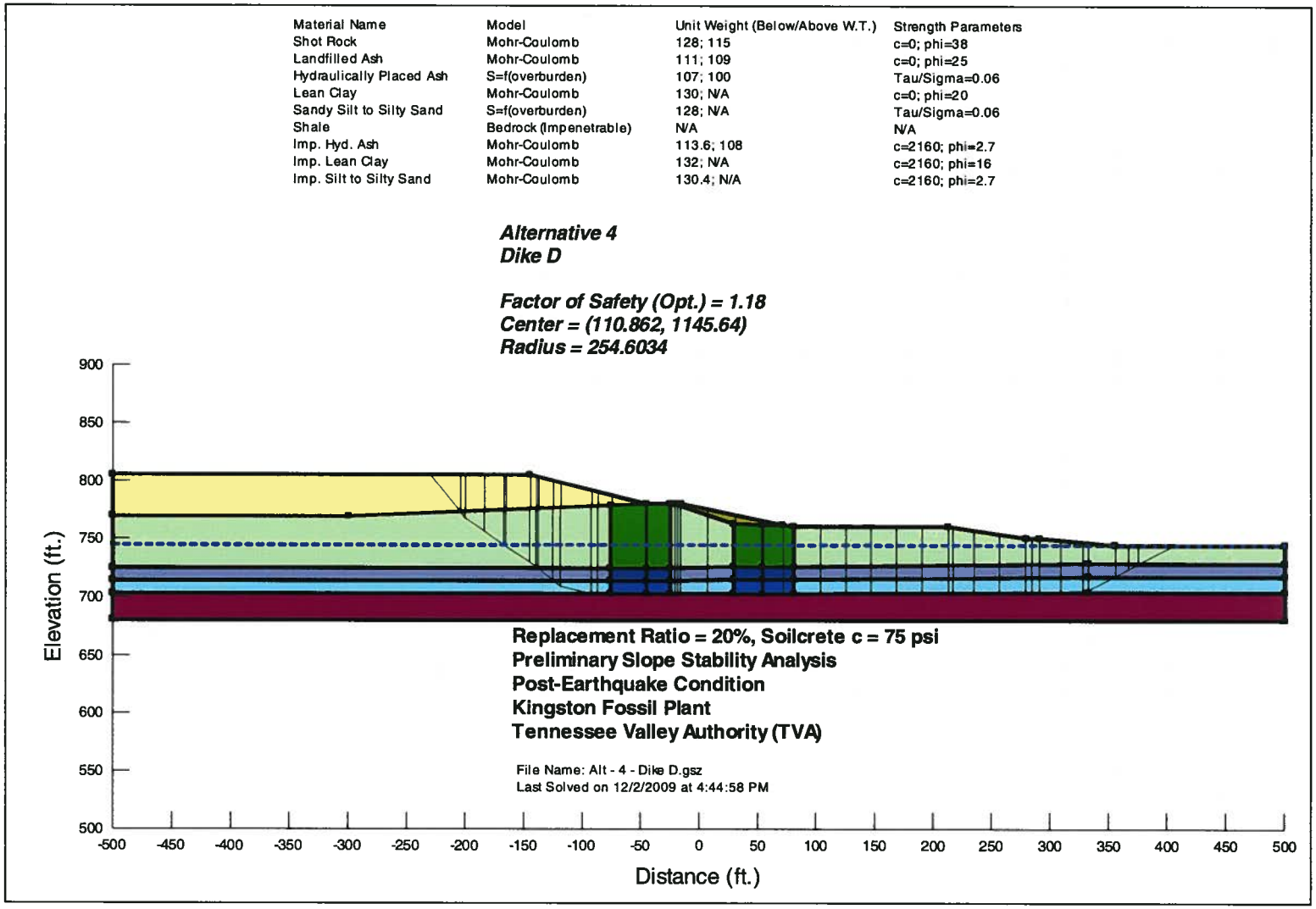


Figure 22: Alternative 4, Dike D, With Improvement

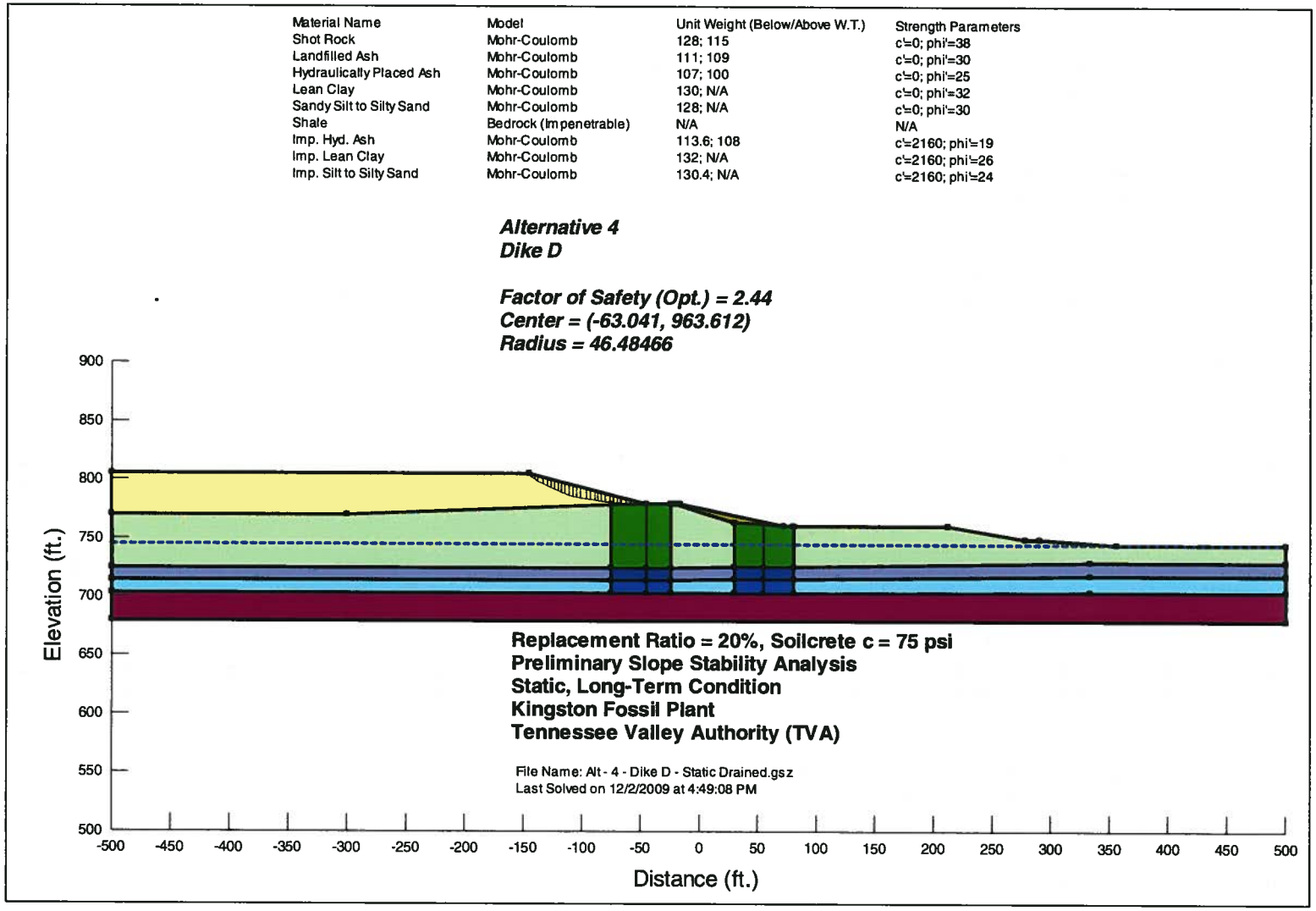


Figure 23: Alternative 4, Dike D, With Improvement, Static Drained Condition

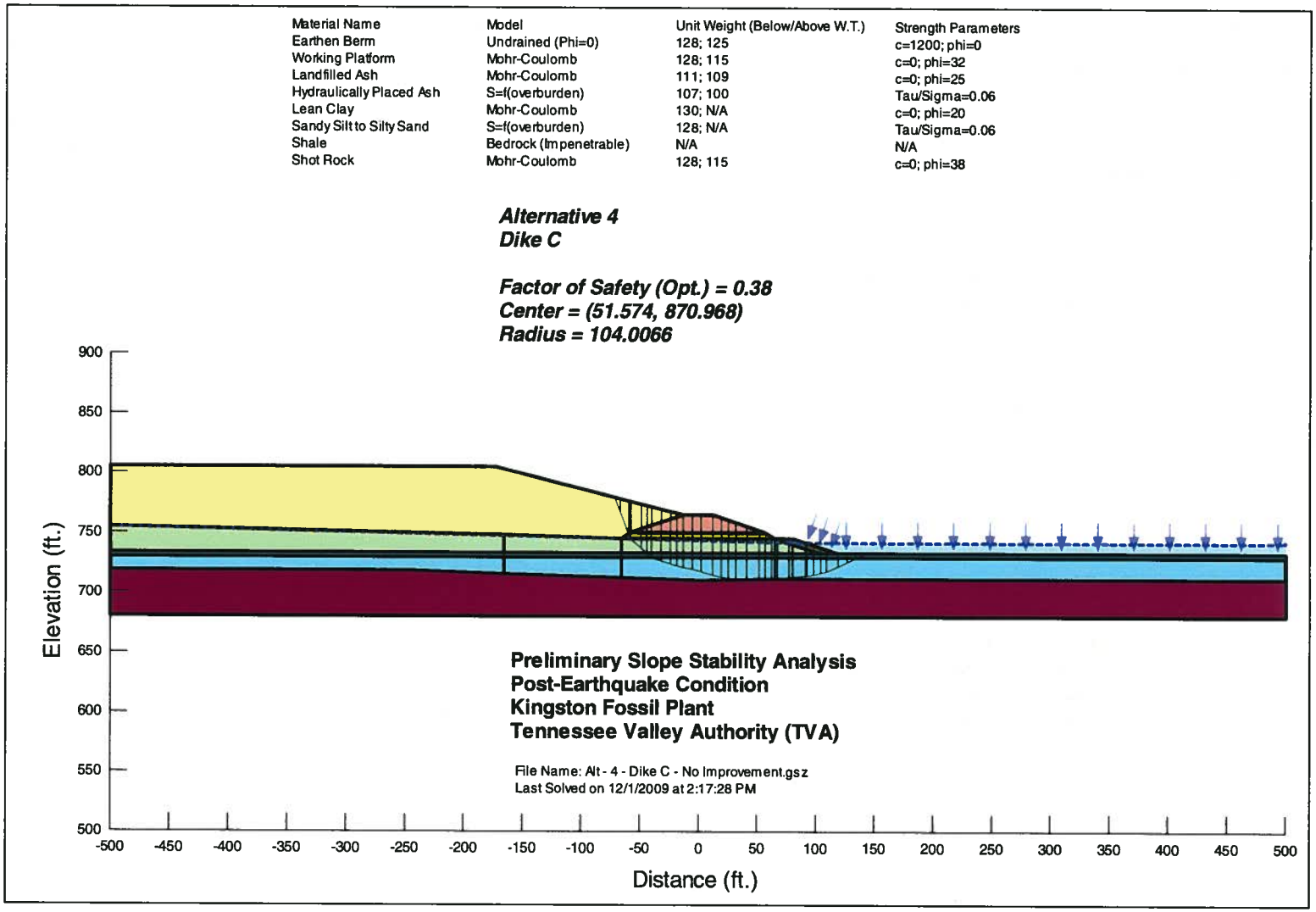


Figure 24: Alternative 4, Dike C, Without Improvement

Material Name	Model	Unit Weight (Below/Above W.T.)	Strength Parameters
Earthen Berm	Undrained (Phi=0)	128; 125	c=1200; phi=0
Shot Rock	Mohr-Coulomb	128; 115	c=0; phi=38
Landfilled Ash	Mohr-Coulomb	111; 109	c=0; phi=25
Hydraulically Placed Ash	S=f(overburden)	107; 100	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	130; N/A	c=0; phi=20
Sandy Silt to Silty Sand	S=f(overburden)	128; N/A	Tau/Sigma=0.06
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Hyd. Ash	Mohr-Coulomb	113.6; 108	c=2160; phi=2.7
Imp. Lean Clay	Mohr-Coulomb	132; N/A	c=2160; phi=16
Imp. Silt to Silty Sand	Mohr-Coulomb	130.4; N/A	c=2160; phi=2.7
Imp. Working Platform	Mohr-Coulomb	130.4; 120	c=2160; phi=25.6

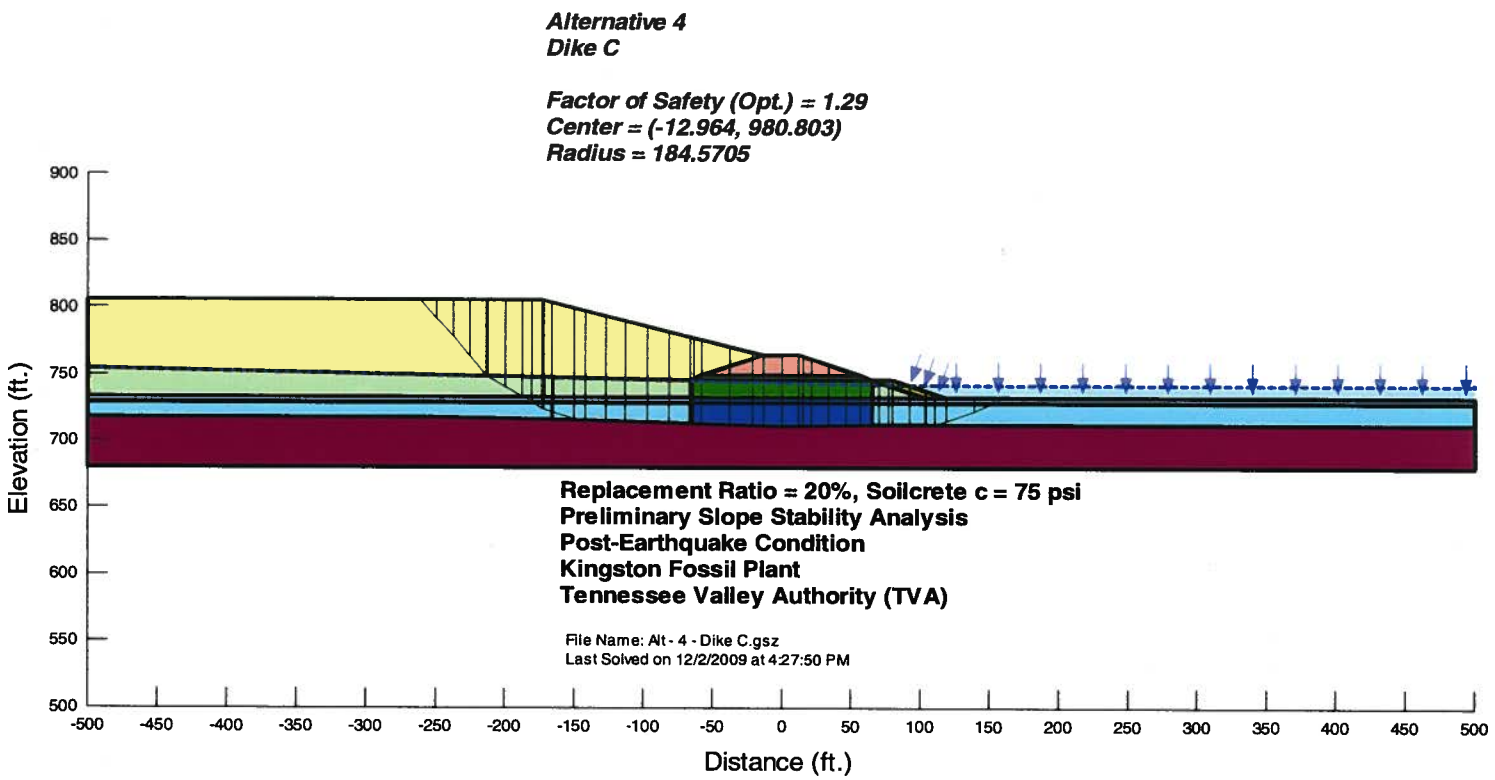


Figure 25: Alternative 4, Dike C, With Improvement

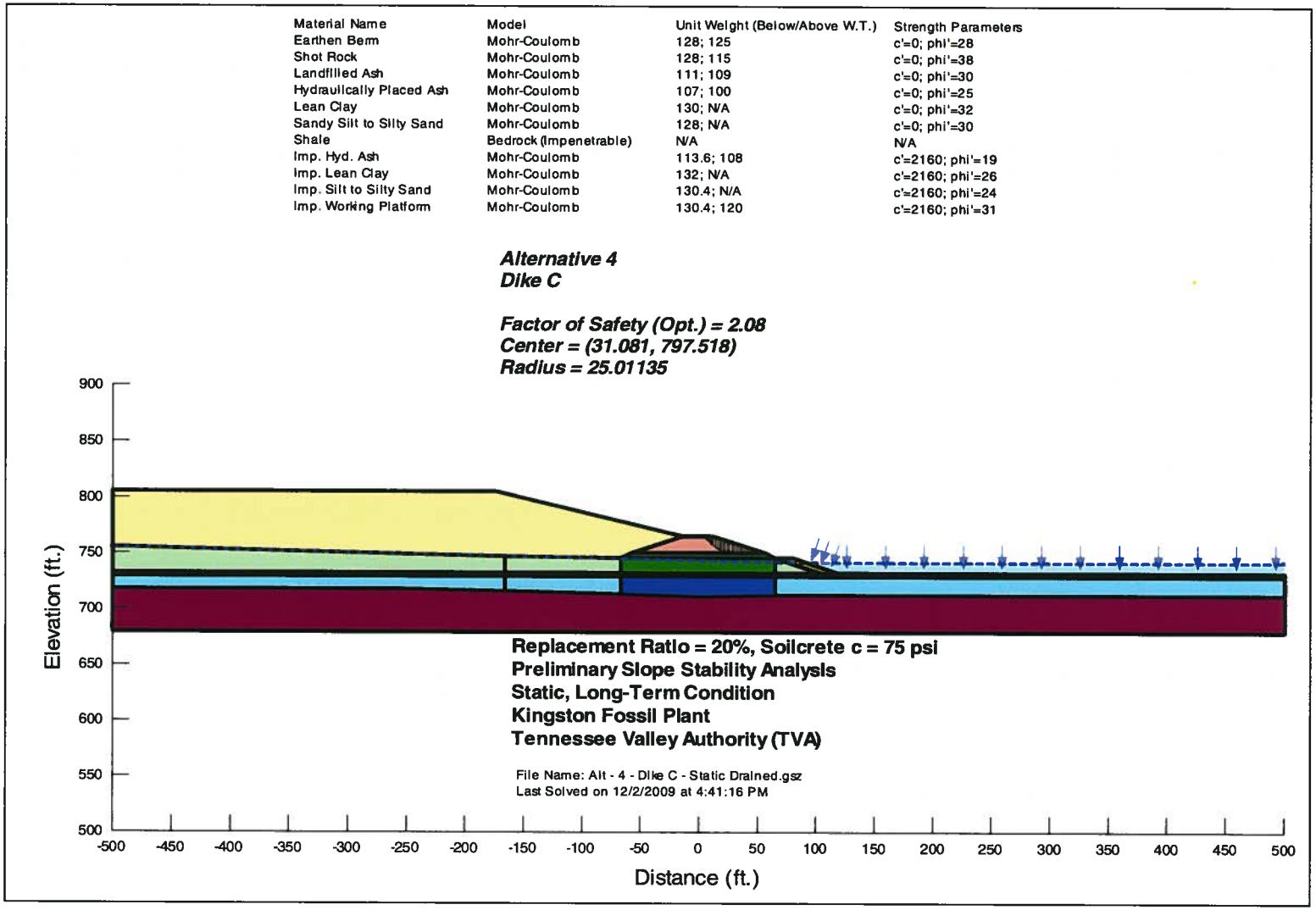
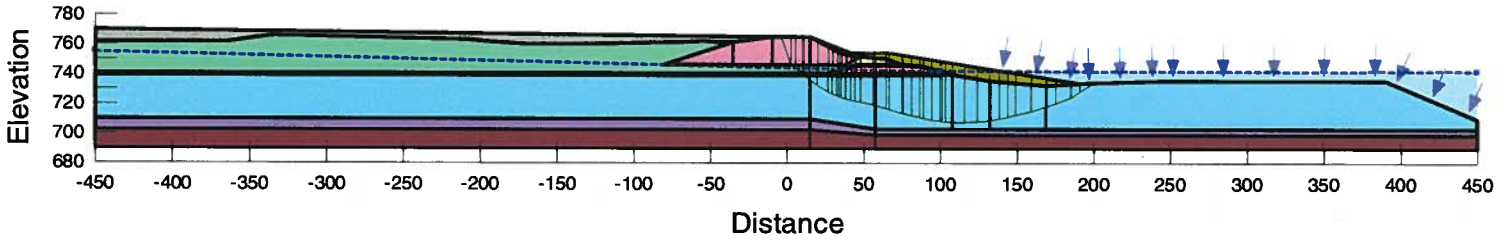


Figure 26: Alternative 4, Dike C, With Improvement, Static Drained Condition

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c=240 psf; phi=21 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c=52 psf; phi=19 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Sensitive Layer	S=f(overburden)	127 pcf	Tau/Sigma=0.06
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Sand with Silt	Mohr-Coulomb	128 pcf	c=0 psf; phi=27 °
Clay Fill	Mohr-Coulomb	125 pcf	c=1200 psf; phi=0 °
Rock	Mohr-Coulomb	110 pcf	c=0 psf; phi=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A

Lateral Expansion
Ash Pond North Dike

Factor of Safety (Opt.) = 0.32
Center = (109.793, 851.021) ft
Radius = 91.68368 ft



Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

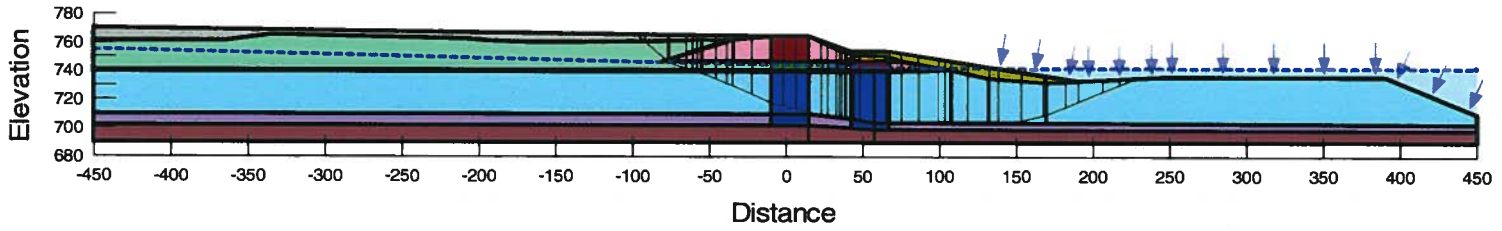
File Name: Lateral Expansion - Dike C - 149+00 - No Improvement.gsz
Last Solved on 12/8/2009 at 9:50:47 AM

Figure 27: Ash Pond North Dike C, Without Improvement

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c=240 psf; phi=21 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c=52 psf; phi=19 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Sensitive Layer	S=f(overburden)	127 pcf	Tau/Sigma=0.06
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Sand with Silt	Mohr-Coulomb	128 pcf	c=0 psf; phi=27 °
Clay Fill	Mohr-Coulomb	125 pcf	c=1200 psf; phi=0 °
Rock	Mohr-Coulomb	110 pcf	c=0 psf; phi=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Const. Ash	Mohr-Coulomb	102 pcf	c=2160 psf; phi=19 °
Imp. Starter Dike	Mohr-Coulomb	131 pcf	c=2352 psf; phi=17 °
Imp. Sensitive Layer	Mohr-Coulomb	130 pcf	c=2160 psf; phi=2.7 °
Imp. Silt to Silty Sand	Mohr-Coulomb	115 pcf	c=2160 psf; phi=2.7 °
Imp. Sand w/ Silt	Mohr-Coulomb	130 pcf	c=2160 psf; phi=22 °
Imp. Raised Dike	Mohr-Coulomb	128 pcf	c=2202 psf; phi=15 °
Imp. Hyd. Ash	Mohr-Coulomb	105 pcf	c=2160 psf; phi=2.7 °

Lateral Expansion
Ash Pond North Dike

Factor of Safety (Opt.) = 1.28
Center = (91.248, 1027.77) ft
Radius = 134.4258 ft



Replacement Ratio = 20%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

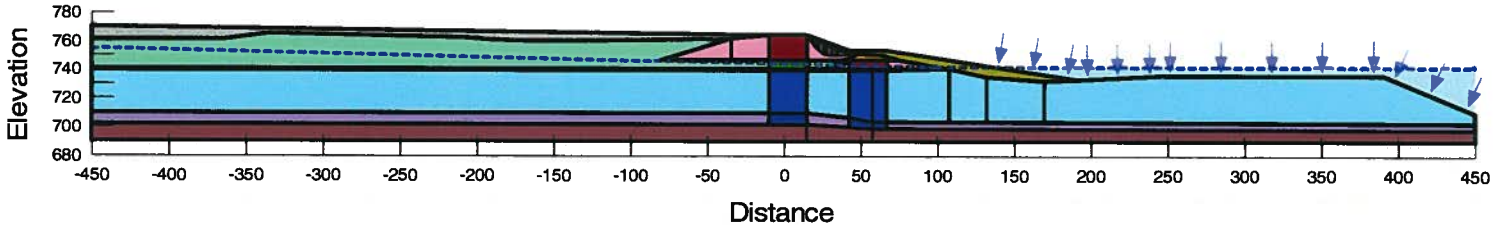
File Name: Lateral Expansion - Dike C - 149+00 - With Improvement.gsz
Last Solved on 12/8/2009 at 9:47:49 AM

Figure 28: Ash Pond North Dike C, With Improvement

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c'=0 psf; phi'=30 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c'=0 psf; phi'=30 °
Constructed Ash	Mohr-Coulomb	93 pcf	c'=0 psf; phi'=30 °
Hydraulically Placed Ash	Mohr-Coulomb	96 pcf	c'=0 psf; phi'=25 °
Sensitive Layer	Mohr-Coulomb	127 pcf	c'=0 psf; phi'=28 °
Sandy Silt to Silty Sand	Mohr-Coulomb	109 pcf	c'=0 psf; phi'=28 °
Sand with Silt	Mohr-Coulomb	128 pcf	c'=0 psf; phi'=36 °
Clay Fill	Mohr-Coulomb	125 pcf	c'=0 psf; phi'=28 °
Rock	Mohr-Coulomb	110 pcf	c'=0 psf; phi'=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Const. Ash	Mohr-Coulomb	102 pcf	c'=2160 psf; phi'=23 °
Imp. Starter Dike	Mohr-Coulomb	131 pcf	c'=2160 psf; phi'=24 °
Imp. Sensitive Layer	Mohr-Coulomb	130 pcf	c'=2160 psf; phi'=23 °
Imp. Silt to Silty Sand	Mohr-Coulomb	115 pcf	c'=2160 psf; phi'=22 °
Imp. Sand w/ Silt	Mohr-Coulomb	130 pcf	c'=2160 psf; phi'=30 °
Imp. Raised Dike	Mohr-Coulomb	128 pcf	c'=2160 psf; phi'=24 °
Imp. Hyd. Ash	Mohr-Coulomb	105 pcf	c'=2160 psf; phi'=19 °

Lateral Expansion
Ash Pond North Dike

Factor of Safety (Opt.) = 2.41
Center = (33.799, 764.887) ft
Radius = 18.41016 ft



Replacement Ratio = 20%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

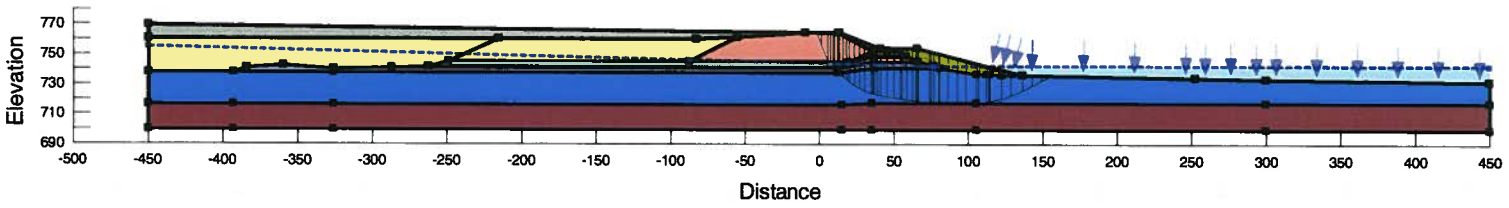
File Name: Lateral Expansion - Dike C - 149+00 - Imp - Static Drained.gsz
Last Solved on 12/8/2009 at 9:54:27 AM

Figure 29: Ash Pond North Dike C, With Improvement, Static Drained Condition

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c=240 psf; phi=21 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c=52 psf; phi=19 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Sensitive Layer	S=f(overburden)	127 pcf	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	129 pcf	c=160 psf; phi=12 °
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Clay Fill	Mohr-Coulomb	125 pcf	c=1200 psf; phi=0 °
Rock	Mohr-Coulomb	110 pcf	c=0 psf; phi=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A

Lateral Expansion
Ash Pond South Dike

Factor of Safety (Opt.) = 0.32
Center = (79.465, 802.956) ft
Radius = 74.66186 ft



Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

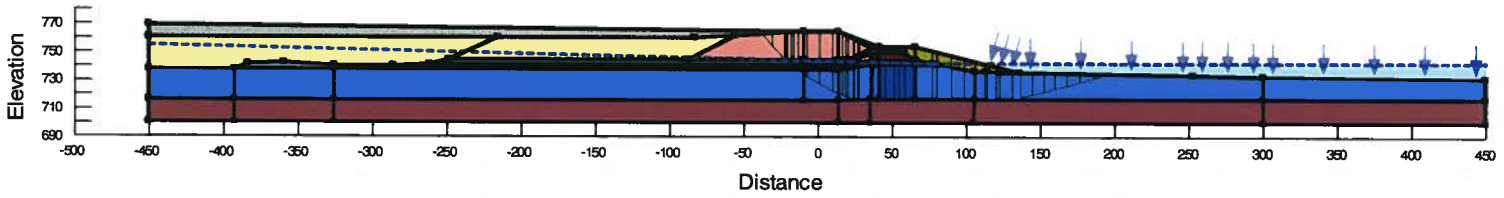
File Name: Lateral Expansion - Dike C - 109+00 - No Improvement.gsz
Last Solved on 12/7/2009 at 4:59:34 PM

Figure 30: Ash Pond South Dike C, Without Improvement

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c=240 psf; phi=21 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c=52 psf; phi=19 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Sensitive Layer	S=f(overburden)	127 pcf	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	129 pcf	c=160 psf; phi=12 °
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Clay Fill	Mohr-Coulomb	125 pcf	c=1200 psf; phi=0 °
Rock	Mohr-Coulomb	110 pcf	c=0 psf; phi=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Clay Starter Dike	Mohr-Coulomb	132 pcf	c=2880 psf; phi=16 °
Imp. Const. Ash	Mohr-Coulomb	105 pcf	c=2700 psf; phi=17 °
Imp. Sensitive Layer	Mohr-Coulomb	130 pcf	c=2700 psf; phi=2.6 °
Imp. Lean Clay	Mohr-Coulomb	132 pcf	c=2820 psf; phi=9 °
Imp. Silt to Silty Sand	Mohr-Coulomb	117 pcf	c=2700 psf; phi=2.6 °

Lateral Expansion
Ash Pond South Dike

Factor of Safety (Opt.) = 1.17
Center = (84.293, 870.194) ft
Radius = 101.9952 ft



Replacement Ratio = 25%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

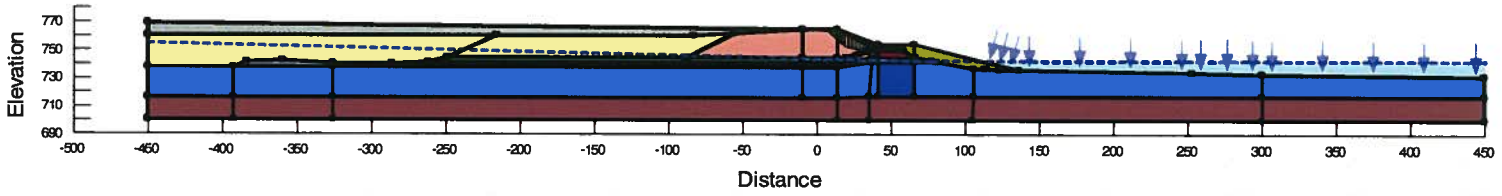
File Name: Lateral Expansion - Dike C - 109+00 - With Improvement.gsz
Last Solved on 12/7/2009 at 5:12:28 PM

Figure 31: Ash Pond South Dike C, With Improvement

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c'=0 psf; phi'=30 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c'=0 psf; phi'=30 °
Constructed Ash	Mohr-Coulomb	93 pcf	c'=0 psf; phi'=30 °
Hydraulically Placed Ash	Mohr-Coulomb	96 pcf	c'=0 psf; phi'=25 °
Sensitive Layer	Mohr-Coulomb	127 pcf	c'=0 psf; phi'=28 °
Lean Clay	Mohr-Coulomb	129 pcf	c'=0 psf; phi'=30 °
Sandy Silt to Silty Sand	Mohr-Coulomb	109 pcf	c'=0 psf; phi'=28 °
Landfilled Ash	Mohr-Coulomb	111 pcf	c'=0 psf; phi'=30 °
Clay Fill	Mohr-Coulomb	125 pcf	c'=0 psf; phi'=28 °
Rock	Mohr-Coulomb	110 pcf	c'=0 psf; phi'=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Clay Starter Dike	Mohr-Coulomb	132 pcf	c'=2700 psf; phi'=23 °
Imp. Const. Ash	Mohr-Coulomb	105 pcf	c'=2700 psf; phi'=21 °
Imp. Sensitive Layer	Mohr-Coulomb	130 pcf	c'=2700 psf; phi'=21 °
Imp. Lean Clay	Mohr-Coulomb	132 pcf	c'=2700 psf; phi'=23 °
Imp. Silt to Silty Sand	Mohr-Coulomb	117 pcf	c'=2700 psf; phi'=20 °

Lateral Expansion
Ash Pond South Dike

Factor of Safety (Opt.) = 2.09
Center = (29.862, 774.628) ft
Radius = 19.88624 ft



Replacement Ratio = 25%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

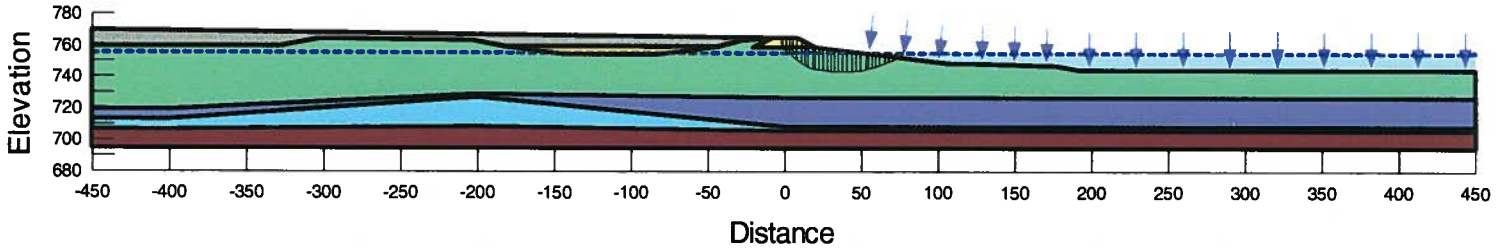
File Name: Lateral Expansion - Dike C - 109+00 - Imp - Static Drained.gsz
Last Solved on 12/7/2009 at 5:20:53 PM

Figure 32: Ash Pond South Dike C, With Improvement, Static Drained Condition

Material Name	Model	Unit Weight	Strength Parameters
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	129 pcf	c=160 psf; phi=12 °
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Clay Fill	Mohr-Coulomb	125 pcf	c=1200 psf; phi=0 °
Shale	Bedrock (Impenetrable)	N/A	N/A

Lateral Expansion
Ash Pond East Dike

Factor of Safety (Opt.) = 0.28
Center = (36.934, 793.186) ft
Radius = 34.94322 ft



Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
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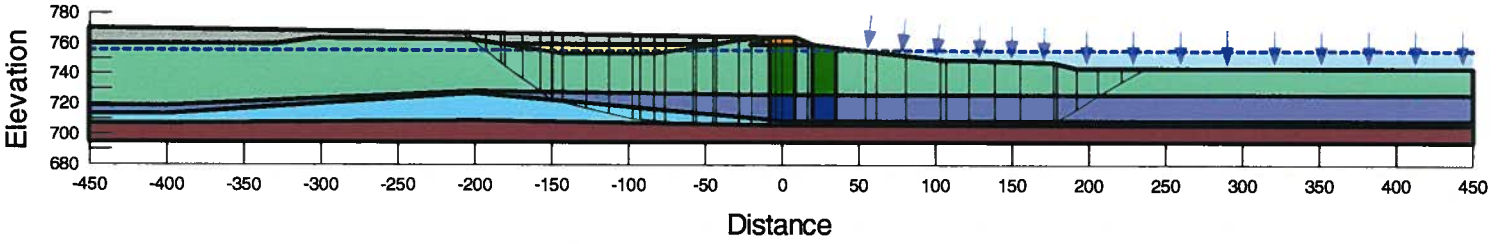
File Name: Lateral Expansion - Eastern Dike - No Improvement.gsz
Last Solved on 12/8/2009 at 10:19:55 AM

Figure 33: Ash Pond East Divider Dike, Without Improvement

Material Name	Model	Unit Weight	Strength Parameters
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	129 pcf	c=160 psf; phi=12 °
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Clay Fill	Mohr-Coulomb	125 pcf	c=1200 psf; phi=0 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Hyd. Ash	Mohr-Coulomb	105 pcf	c=2160 psf; phi=2.7 °
Imp. Lean Clay	Mohr-Coulomb	131 pcf	c=2288 psf; phi=9.5 °
Imp. Silt to Silty Sand	Mohr-Coulomb	115 pcf	c=2160 psf; phi=2.7 °
Imp. Const. Ash	Mohr-Coulomb	102 pcf	c=2160 psf; phi=19 °

Lateral Expansion
Ash Pond East Dike

Factor of Safety (Opt.) = 1.92
Center = (31.831, 1033.46) ft
Radius = 171.8776 ft



Replacement Ratio = 20%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

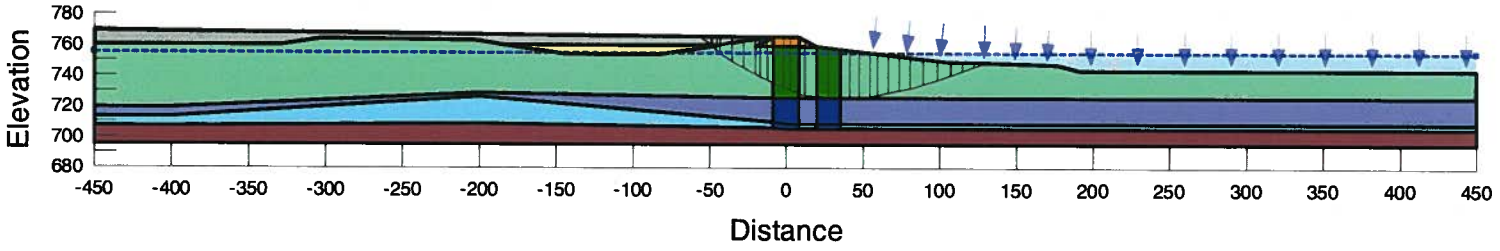
File Name: Lateral Expansion - Eastern Dike - With Improvement.gsz
Last Solved on 12/8/2009 at 4:22:15 PM

Figure 34: Ash Pond East Divider Dike, With Improvement

Material Name	Model	Unit Weight	Strength Parameters
Landfilled Ash	Mohr-Coulomb	111 pcf	c'=0 psf; phi'=30 °
Constructed Ash	Mohr-Coulomb	93 pcf	c'=0 psf; phi'=30 °
Hydraulically Placed Ash	Mohr-Coulomb	96 pcf	c'=0 psf; phi'=25 °
Lean Clay	Mohr-Coulomb	129 pcf	c'=0 psf; phi'=30 °
Sandy Silt to Silty Sand	Mohr-Coulomb	109 pcf	c'=0 psf; phi'=28 °
Clay Fill	Mohr-Coulomb	125 pcf	c'=0 psf; phi'=28 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Hyd. Ash	Mohr-Coulomb	105 pcf	c'=2160 psf; phi'=19 °
Imp. Lean Clay	Mohr-Coulomb	131 pcf	c'=2160 psf; phi'=24 °
Imp. Silt to Silty Sand	Mohr-Coulomb	115 pcf	c'=2160 psf; phi'=22 °
Imp. Const. Ash	Mohr-Coulomb	102 pcf	c'=2160 psf; phi'=23 °

Lateral Expansion
Ash Pond East Dike

Factor of Safety (Opt.) = 4.35
Center = (42.398, 871.204) ft
Radius = 77.40986 ft



Replacement Ratio = 20%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

File Name: Lateral Expansion - Eastern Dike - Imp - Static Drained.gsz
Last Solved on 12/8/2009 at 4:07:51 PM

Figure 35: Ash Pond East Divider Dike, With Improvement, Static Drained Condition

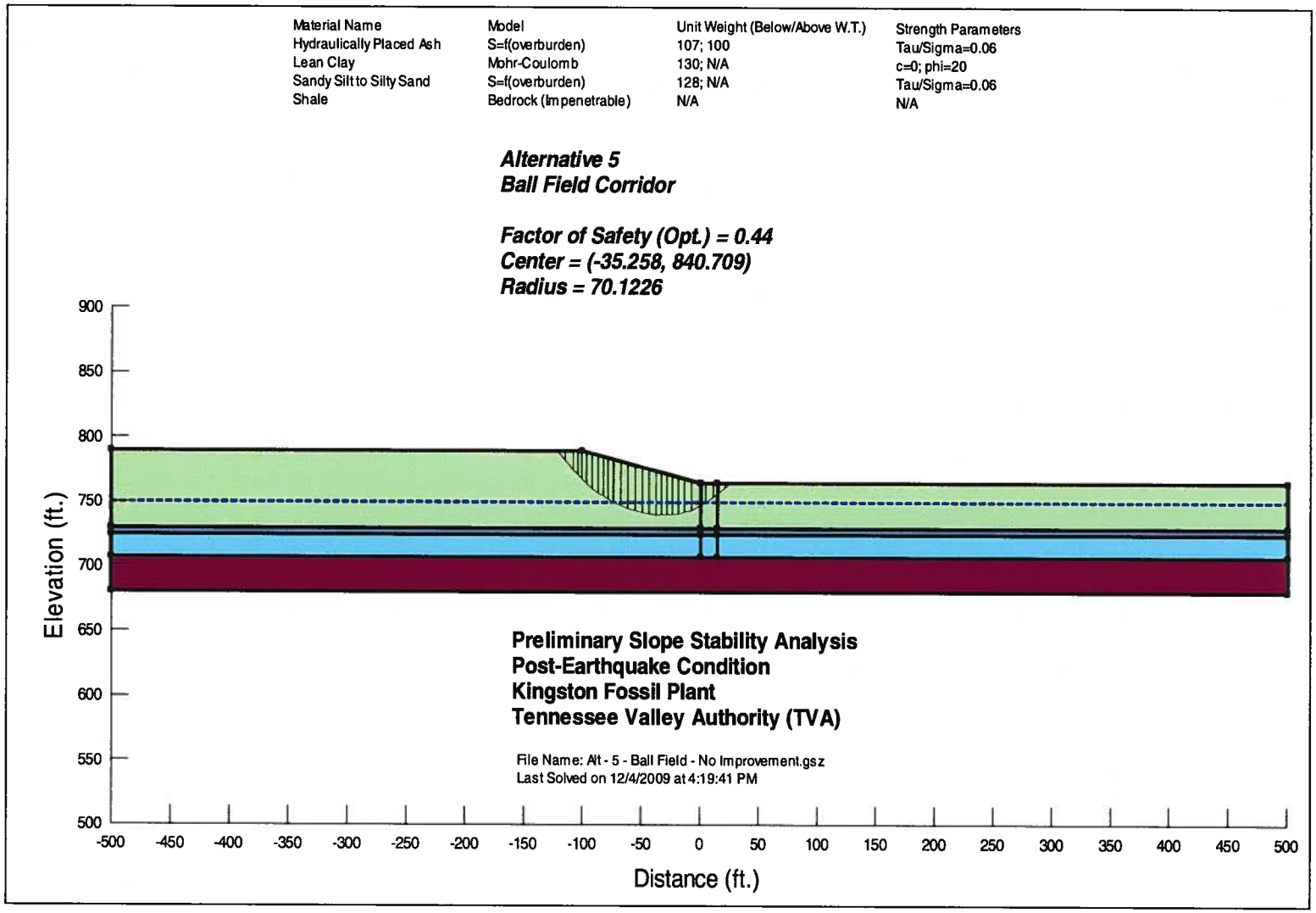


Figure 36: Alternative 5, Ball Field Corridor, Without Improvement

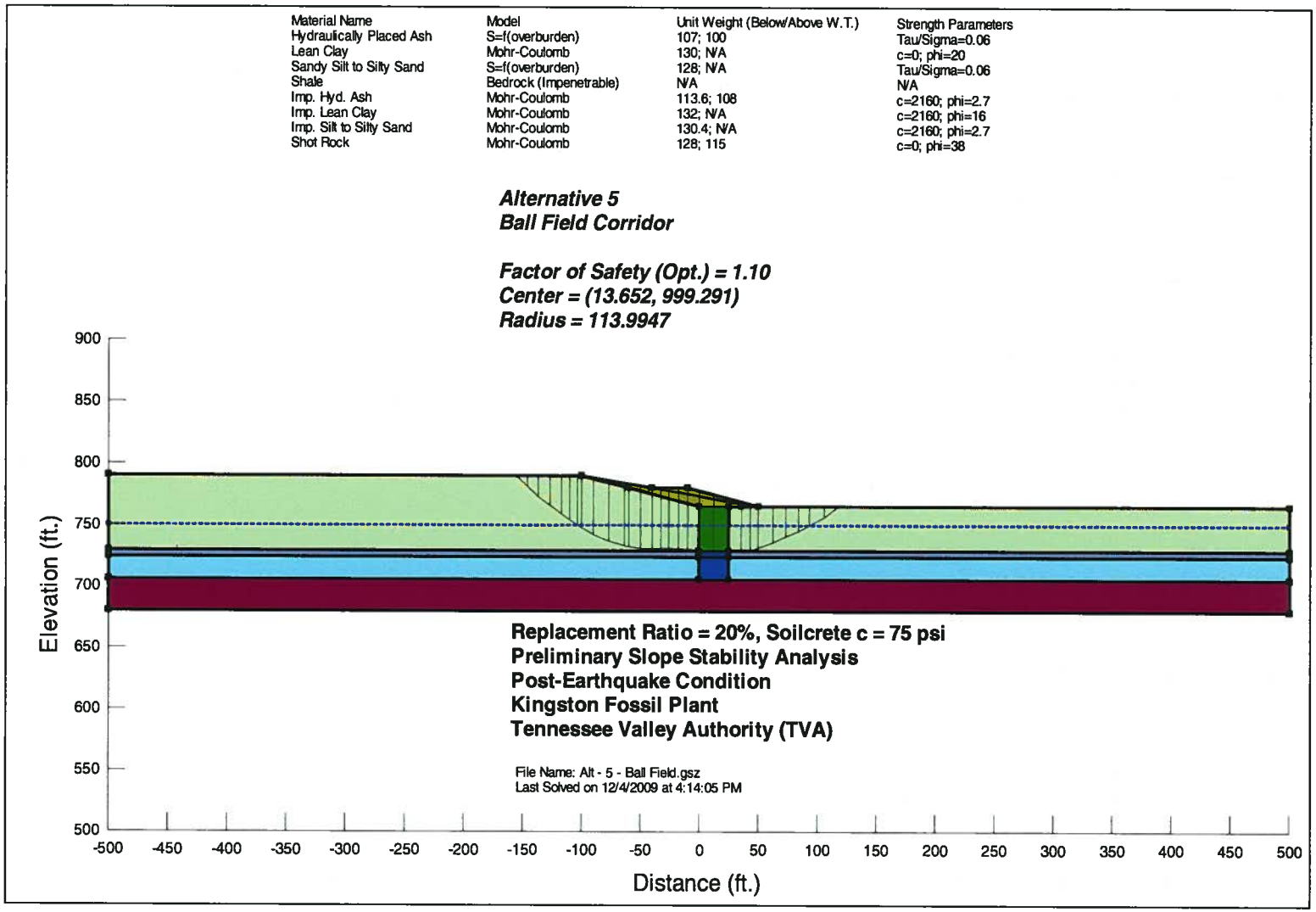


Figure 37: Alternative 5, Ball Field Corridor, With Improvement

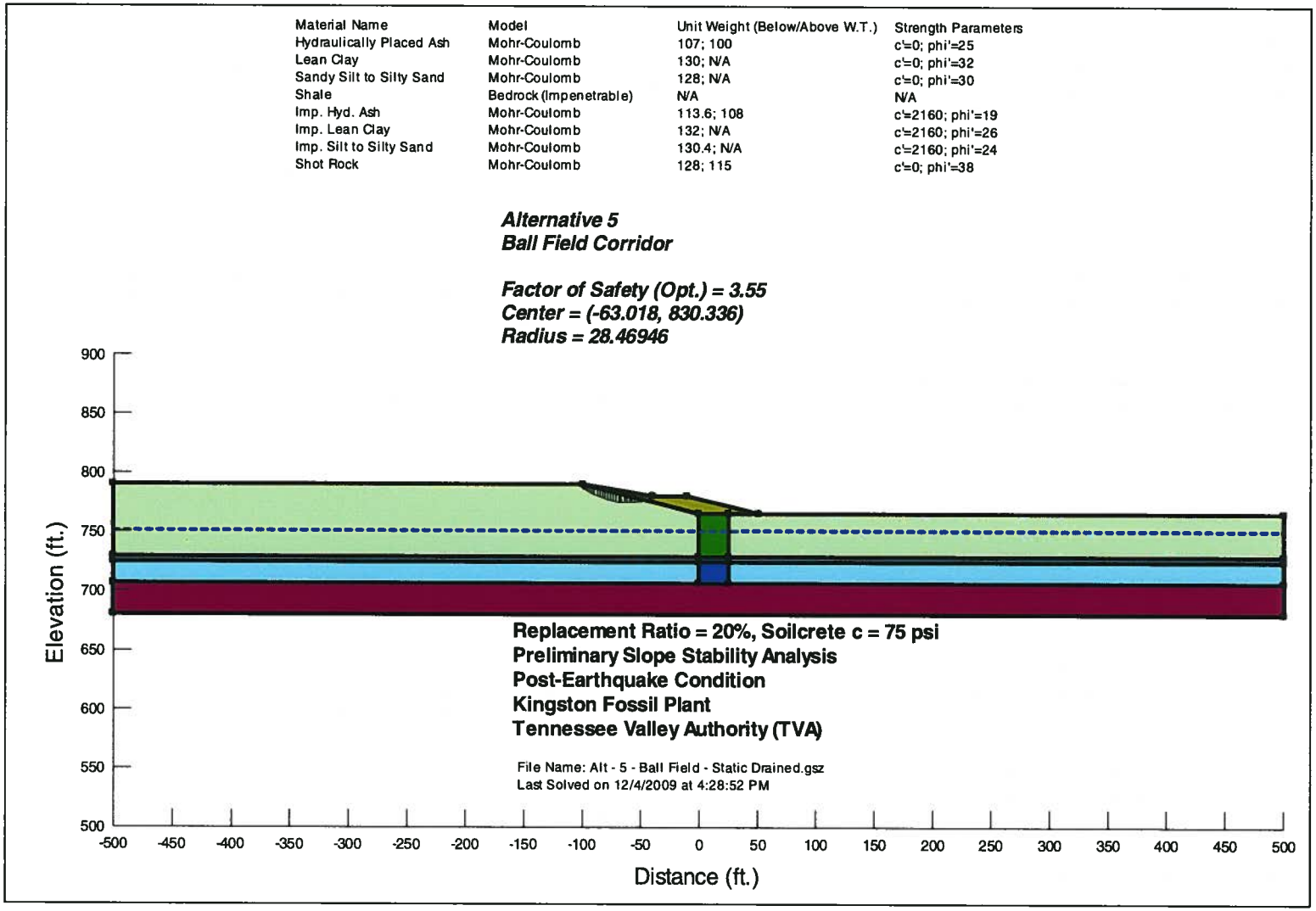


Figure 38: Alternative 5, Ball Field Corridor, With Improvement, Static Drained Condition

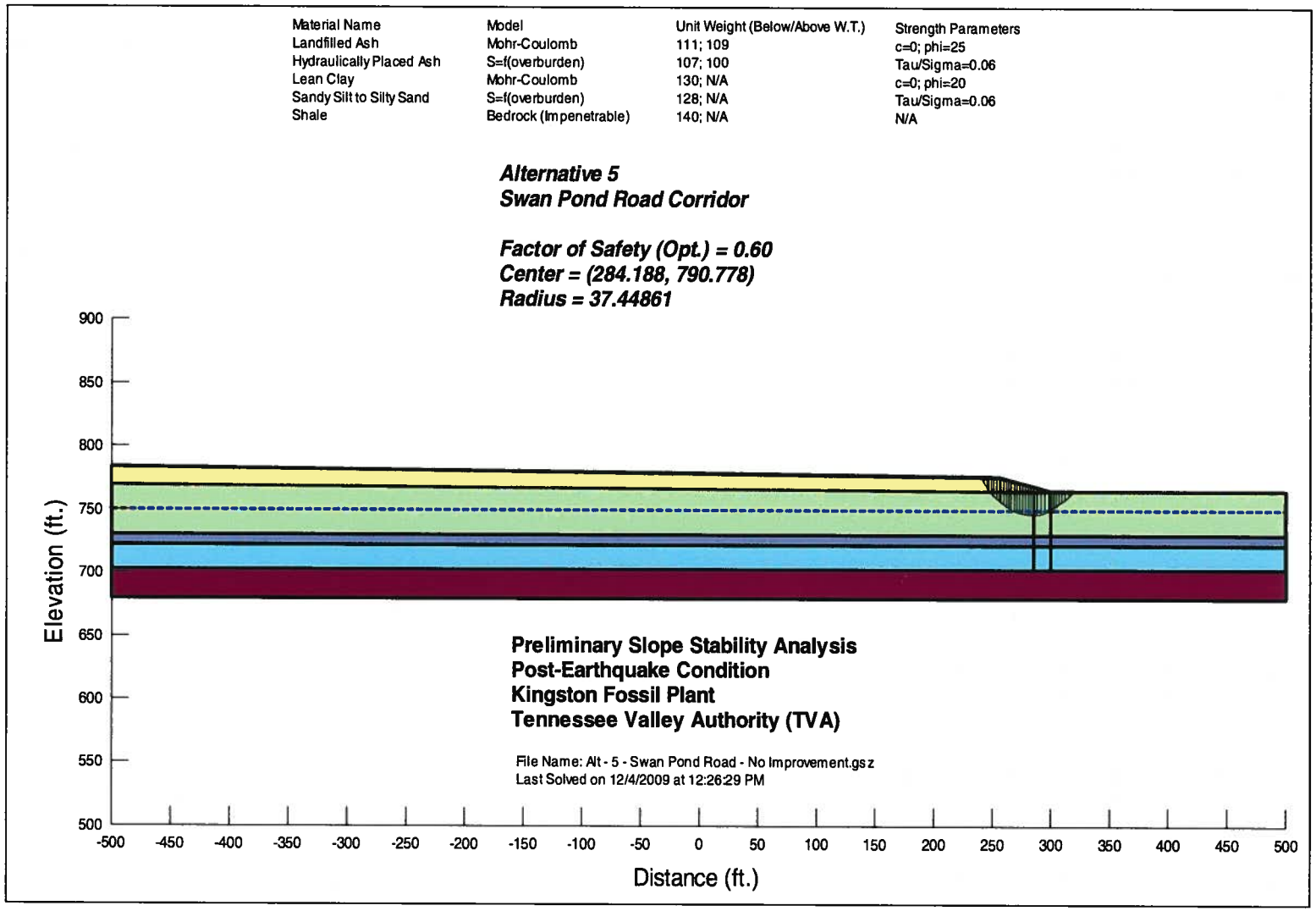


Figure 39: Alternative 5, Swan Pond Road Corridor, Without Improvement

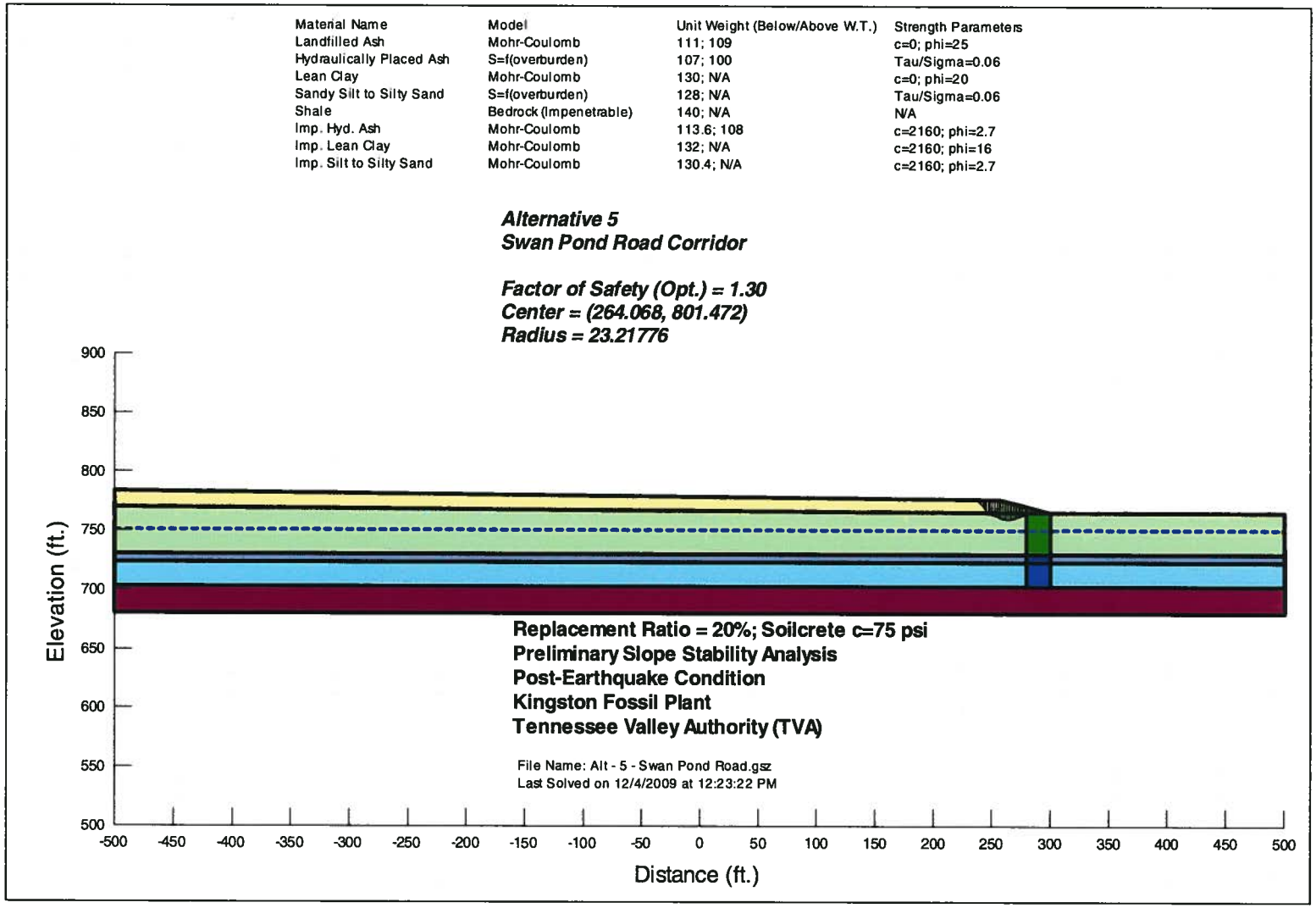


Figure 40: Alternative 5, Swan Pond Road Corridor, With Improvement

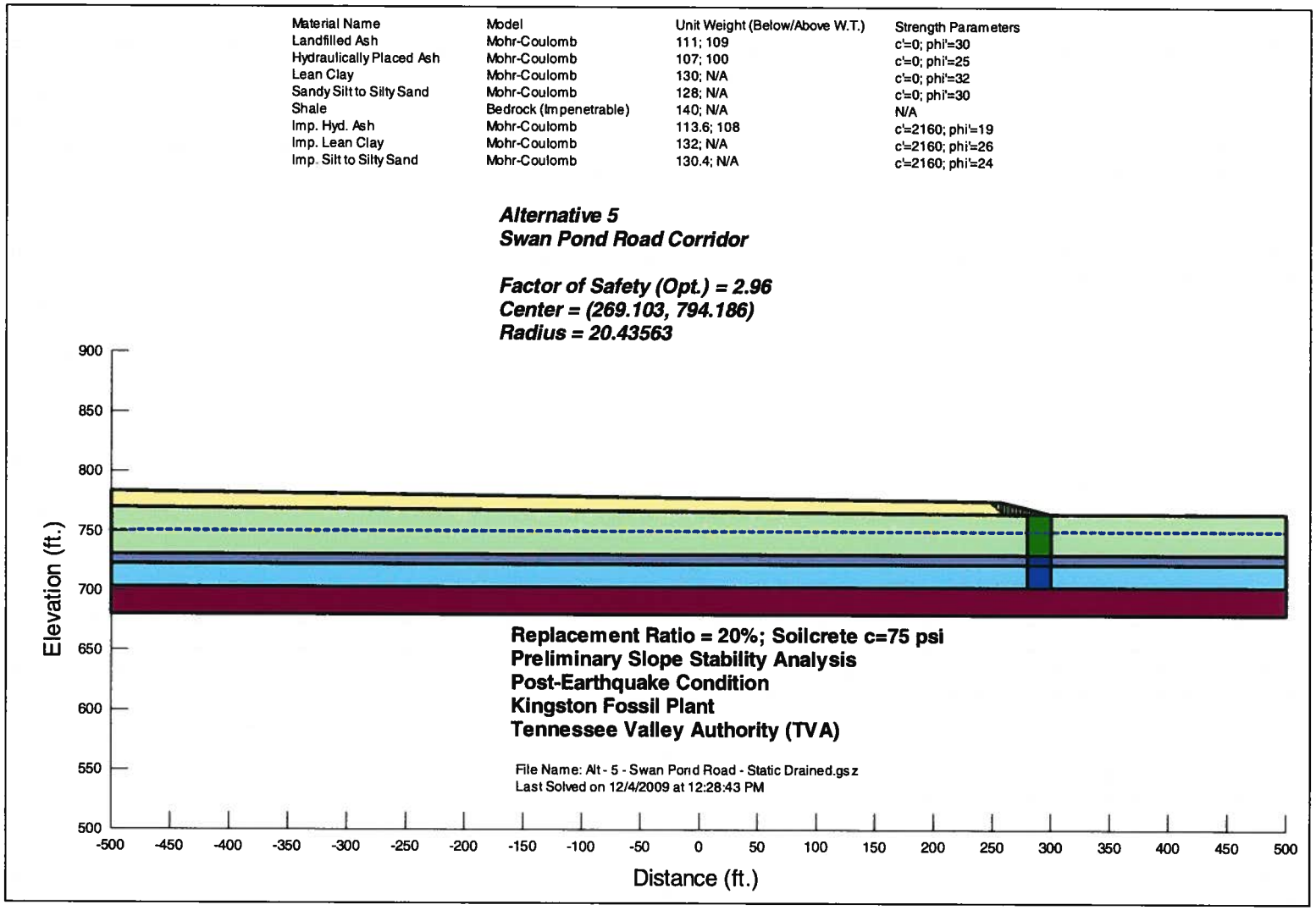


Figure 41: Alternative 5, Swan Pond Road Corridor, With Improvement, Static Drained Condition

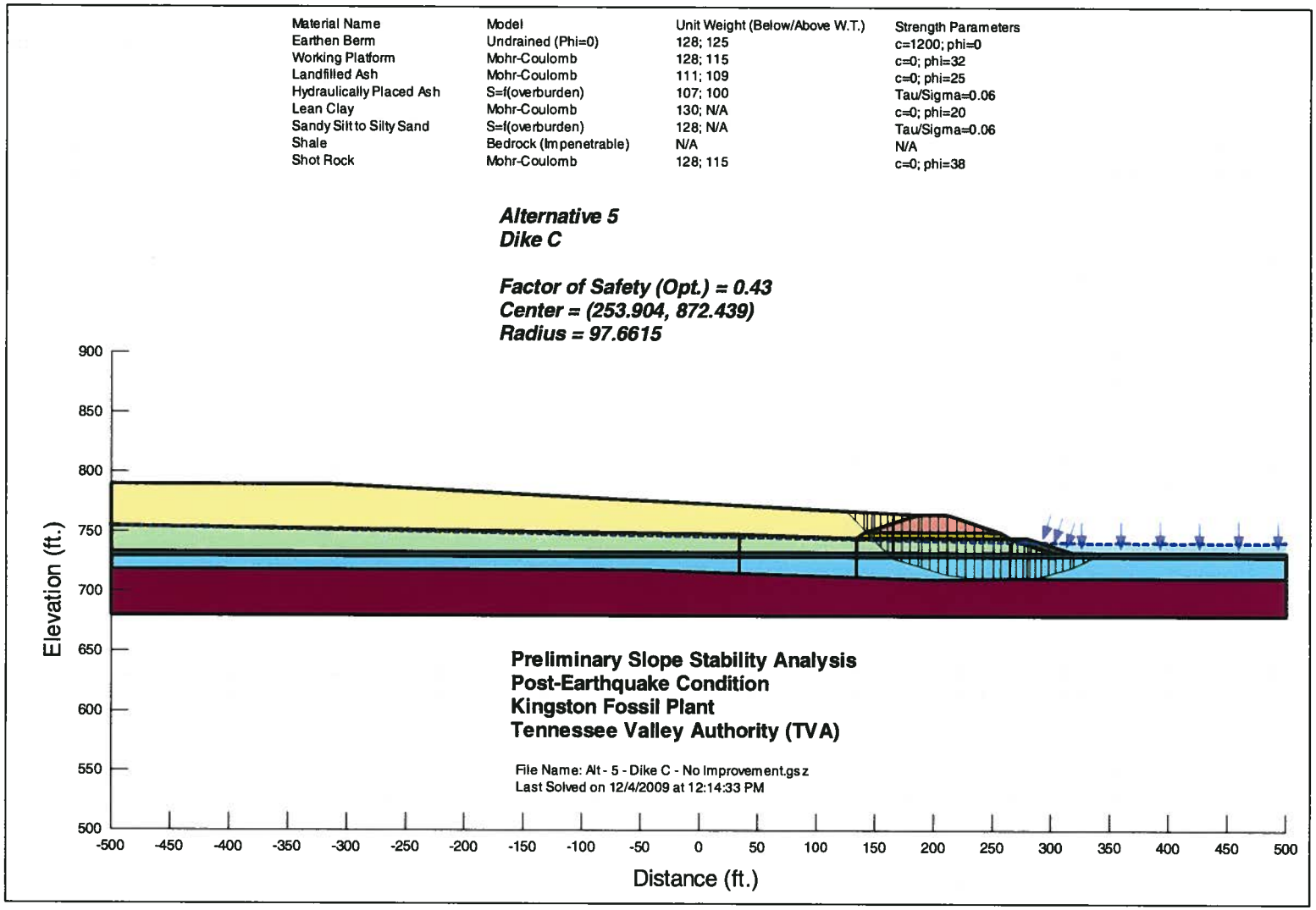


Figure 42: Alternative 5, Dike C, Without Improvement

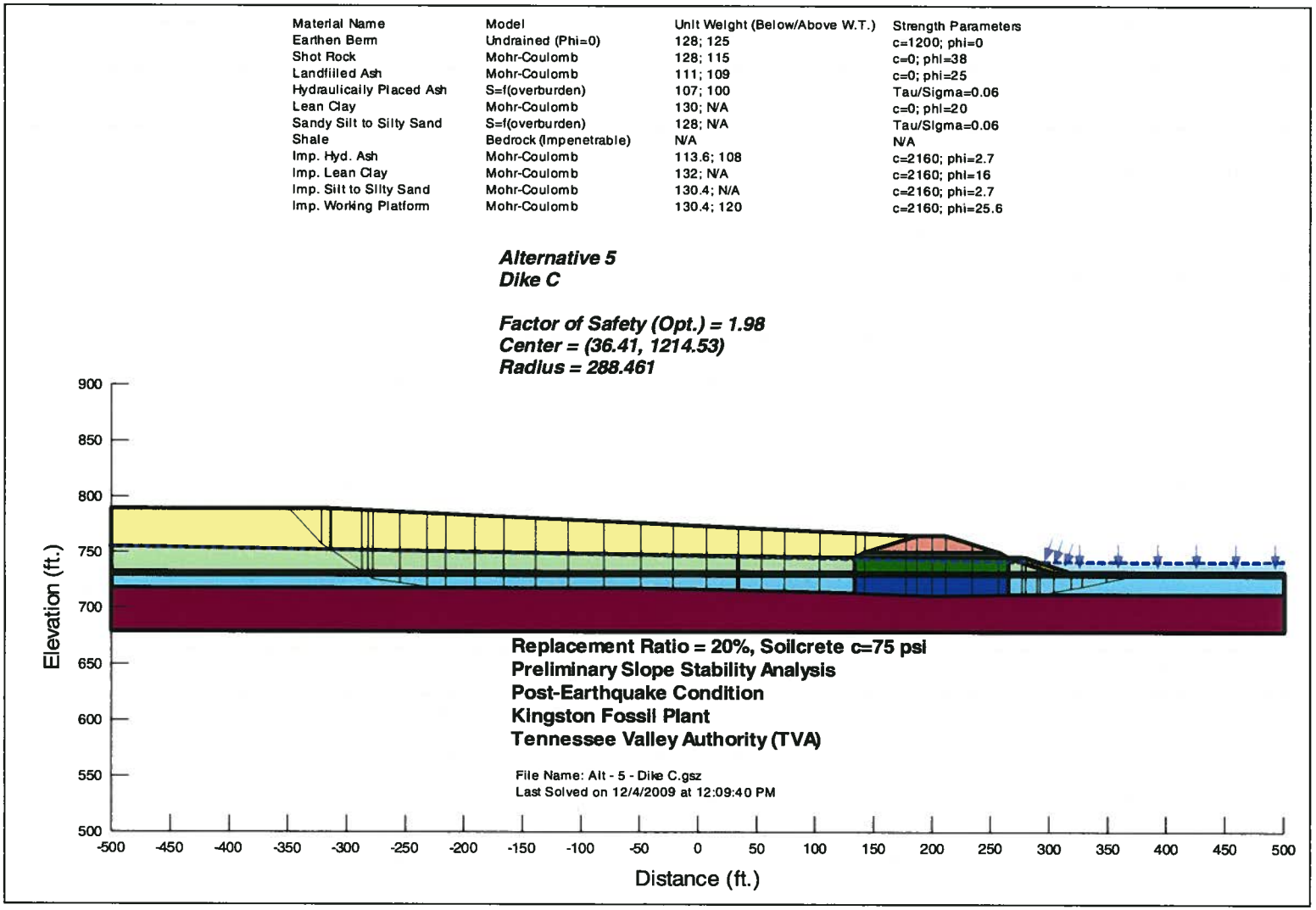


Figure 43: Alternative 5, Dike C, With Improvement

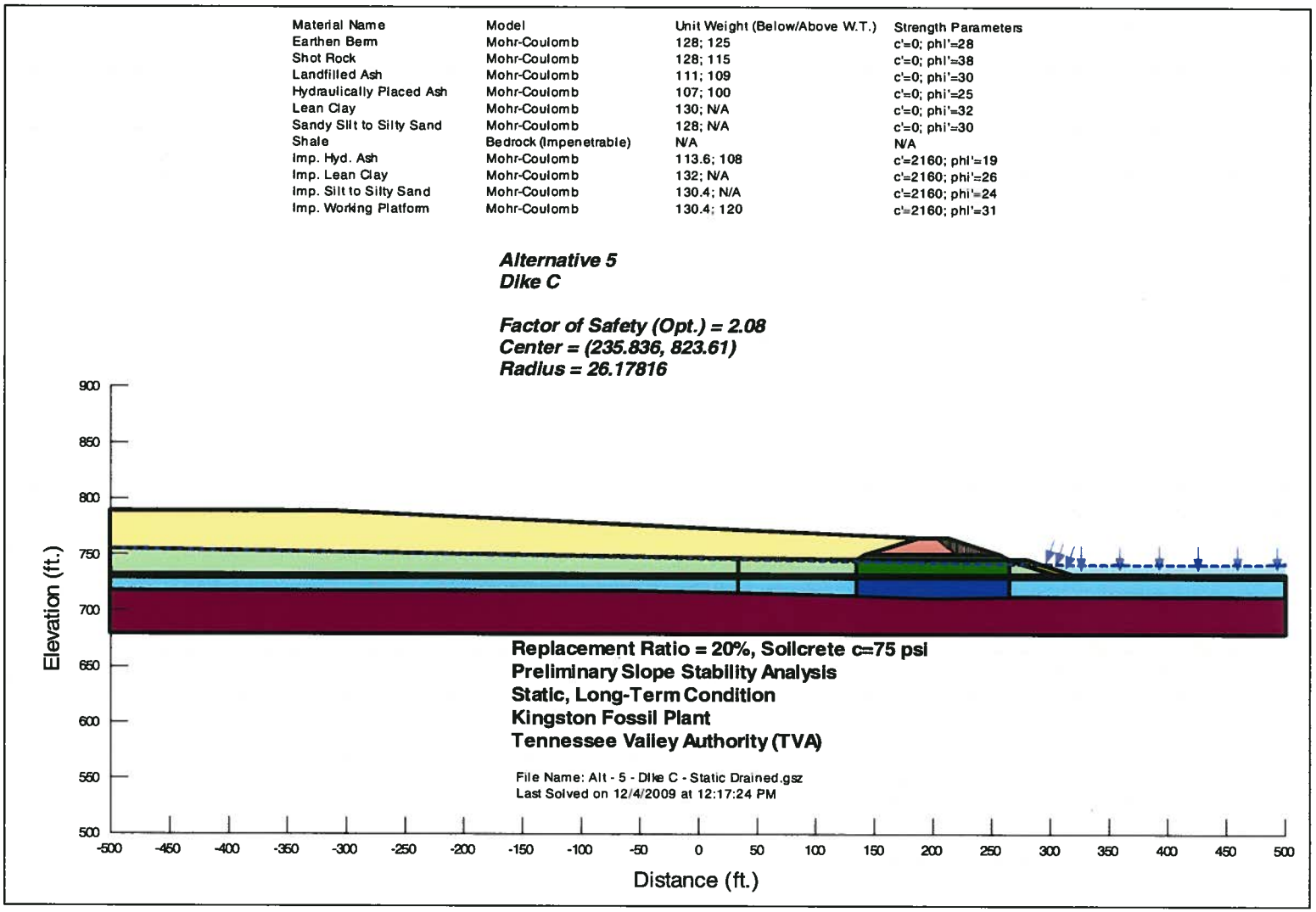
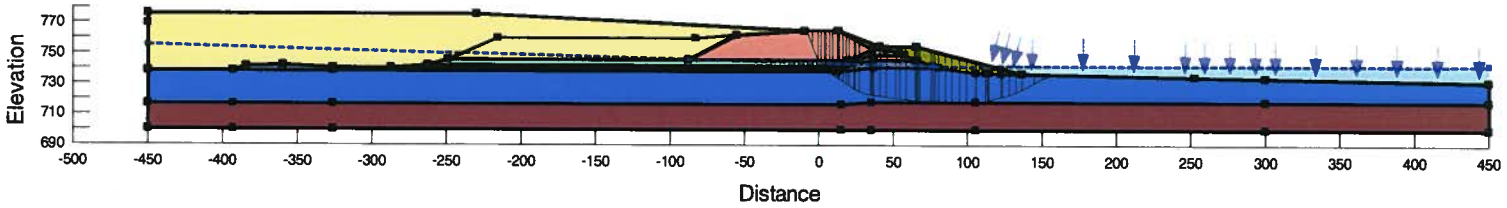


Figure 44: Alternative 5, Dike C, With Improvement, Static Drained Condition

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c=240 psf; phi=21 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c=52 psf; phi=19 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Sensitive Layer	S=f(overburden)	127 pcf	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	129 pcf	c=160 psf; phi=12 °
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Rock	Mohr-Coulomb	110 pcf	c=0 psf; phi=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A

Alternative 5
Ash Pond South Dike

Factor of Safety (Opt.) = 0.32
Center = (75.584, 804.844) ft
Radius = 76.00999 ft



Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

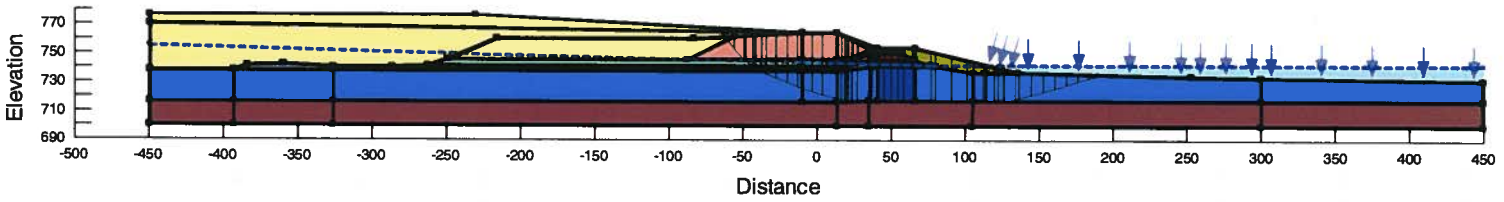
File Name: Alt 5 - Dike C - 109+00 - No Improvement.gsz
Last Solved on 12/3/2009 at 2:01:16 PM

Figure 45: Alternative 5, Ash Pond South Dike C, Without Improvement

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c=240 psf; phi=21 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c=52 psf; phi=19 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Sensitive Layer	S=f(overburden)	127 pcf	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	129 pcf	c=160 psf; phi=12 °
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Rock	Mohr-Coulomb	110 pcf	c=0 psf; phi=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Clay Starter Dike	Mohr-Coulomb	132 pcf	c=2880 psf; phi=16 °
Imp. Const. Ash	Mohr-Coulomb	105 pcf	c=2700 psf; phi=17 °
Imp. Sensitive Layer	Mohr-Coulomb	130 pcf	c=2700 psf; phi=2.6 °
Imp. Lean Clay	Mohr-Coulomb	132 pcf	c=2820 psf; phi=9 °
Imp. Silt to Silty Sand	Mohr-Coulomb	117 pcf	c=2700 psf; phi=2.6 °

Alternative 5
Ash Pond South Dike

Factor of Safety (Opt.) = 1.09
Center = (75.208, 921.633) ft
Radius = 110.1923 ft



Replacement Ratio = 25%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

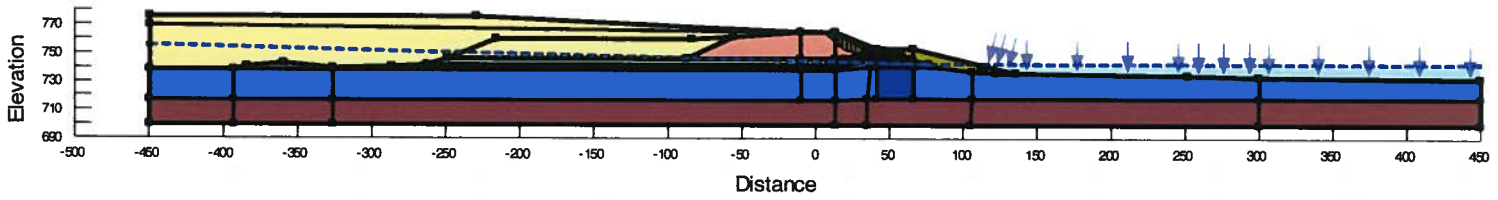
File Name: Alt 5 - Dike C - 109+00 - With Improvement.gsz
Last Solved on 12/3/2009 at 2:05:23 PM

Figure 46: Alternative 5, Ash Pond South Dike C, With Improvement

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c'=0 psf; phi'=30 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c'=0 psf; phi'=30 °
Constructed Ash	Mohr-Coulomb	93 pcf	c'=0 psf; phi'=30 °
Hydraulically Placed Ash	Mohr-Coulomb	96 pcf	c'=0 psf; phi'=25 °
Sensitive Layer	Mohr-Coulomb	127 pcf	c'=0 psf; phi'=28 °
Lean Clay	Mohr-Coulomb	129 pcf	c'=0 psf; phi'=30 °
Sandy Silt to Silty Sand	Mohr-Coulomb	109 pcf	c'=0 psf; phi'=28 °
Landfilled Ash	Mohr-Coulomb	111 pcf	c'=0 psf; phi'=30 °
Rock	Mohr-Coulomb	110 pcf	c'=0 psf; phi'=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Clay Starter Dike	Mohr-Coulomb	132 pcf	c'=2700 psf; phi'=23 °
Imp. Const. Ash	Mohr-Coulomb	105 pcf	c'=2700 psf; phi'=21 °
Imp. Sensitive Layer	Mohr-Coulomb	130 pcf	c'=2700 psf; phi'=21 °
Imp. Lean Clay	Mohr-Coulomb	132 pcf	c'=2700 psf; phi'=23 °
Imp. Silt to Silty Sand	Mohr-Coulomb	117 pcf	c'=2700 psf; phi'=20 °

Alternative 5
Ash Pond South Dike

Factor of Safety (Opt.) = 2.09
Center = (29.862, 774.627) ft
Radius = 19.88891 ft



Replacement Ratio = 25%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

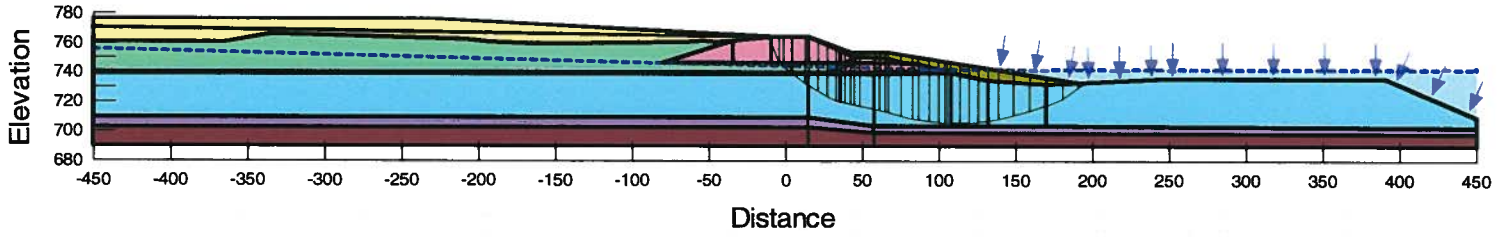
File Name: Alt 5 - Dike C - 109+00 - Imp - Static Drained.gsz
Last Solved on 12/3/2009 at 2:08:26 PM

Figure 47: Alternative 5, Ash Pond South Dike C, With Improvement, Static Drained Condition

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c=240 psf; phi=21 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c=52 psf; phi=19 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Sensitive Layer	S=f(overburden)	127 pcf	Tau/Sigma=0.06
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Sand with Silt	Mohr-Coulomb	128 pcf	c=0 psf; phi=27 °
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Rock	Mohr-Coulomb	110 pcf	c=0 psf; phi=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A

Alternative 5
Ash Pond North Dike

Factor of Safety (Opt.) = 0.32
Center = (105.983, 854.34) ft
Radius = 94.00132 ft



Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

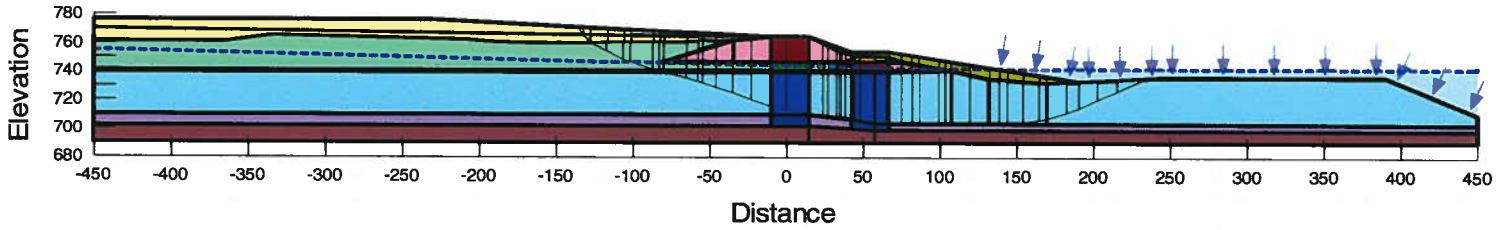
File Name: Alt 5 - Dike C - 149+00 - No Improvement.gsz
Last Solved on 12/3/2009 at 2:14:23 PM

Figure 48: Alternative 5, Ash Pond North Dike C, Without Improvement

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c=240 psf; phi=21 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c=52 psf; phi=19 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Sensitive Layer	S=f(overburden)	127 pcf	Tau/Sigma=0.06
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Sand with Silt	Mohr-Coulomb	128 pcf	c=0 psf; phi=27 °
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Rock	Mohr-Coulomb	110 pcf	c=0 psf; phi=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Const. Ash	Mohr-Coulomb	102 pcf	c=2160 psf; phi=19 °
Imp. Starter Dike	Mohr-Coulomb	131 pcf	c=2352 psf; phi=17 °
Imp. Sensitive Layer	Mohr-Coulomb	130 pcf	c=2160 psf; phi=2.7 °
Imp. Silt to Silty Sand	Mohr-Coulomb	115 pcf	c=2160 psf; phi=2.7 °
Imp. Sand w/ Silt	Mohr-Coulomb	130 pcf	c=2160 psf; phi=22 °
Imp. Raised Dike	Mohr-Coulomb	128 pcf	c=2202 psf; phi=15 °
Imp. Hyd. Ash	Mohr-Coulomb	105 pcf	c=2160 psf; phi=2.7 °

Alternative 5
Ash Pond North Dike

Factor of Safety (Opt.) = 1.14
Center = (93.91, 1135.48) ft
Radius = 150.3265 ft



Replacement Ratio = 20%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

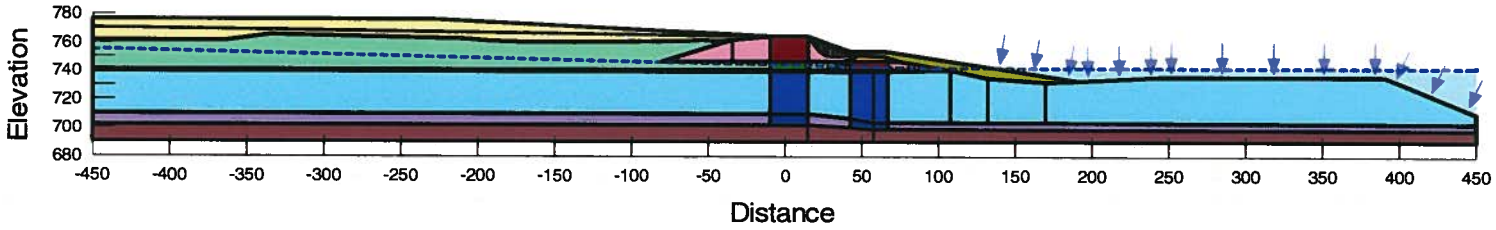
File Name: Alt 5 - Dike C - 149+00 - With Improvement.gsz
Last Solved on 12/3/2009 at 2:18:27 PM

Figure 49: Alternative 5, Ash Pond North Dike C, With Improvement

Material Name	Model	Unit Weight	Strength Parameters
Clay Starter Dike	Mohr-Coulomb	129 pcf	c'=0 psf; phi'=30 °
Clay Raised Dike	Mohr-Coulomb	125 pcf	c'=0 psf; phi'=30 °
Constructed Ash	Mohr-Coulomb	93 pcf	c'=0 psf; phi'=30 °
Hydraulically Placed Ash	Mohr-Coulomb	96 pcf	c'=0 psf; phi'=25 °
Sensitive Layer	Mohr-Coulomb	127 pcf	c'=0 psf; phi'=28 °
Sandy Silt to Silty Sand	Mohr-Coulomb	109 pcf	c'=0 psf; phi'=28 °
Sand with Silt	Mohr-Coulomb	128 pcf	c'=0 psf; phi'=36 °
Landfilled Ash	Mohr-Coulomb	111 pcf	c'=0 psf; phi'=30 °
Rock	Mohr-Coulomb	110 pcf	c'=0 psf; phi'=38 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Const. Ash	Mohr-Coulomb	102 pcf	c'=2160 psf; phi'=23 °
Imp. Starter Dike	Mohr-Coulomb	131 pcf	c'=2160 psf; phi'=24 °
Imp. Sensitive Layer	Mohr-Coulomb	130 pcf	c'=2160 psf; phi'=23 °
Imp. Silt to Silty Sand	Mohr-Coulomb	115 pcf	c'=2160 psf; phi'=22 °
Imp. Sand w/ Silt	Mohr-Coulomb	130 pcf	c'=2160 psf; phi'=30 °
Imp. Raised Dike	Mohr-Coulomb	128 pcf	c'=2160 psf; phi'=24 °
Imp. Hyd. Ash	Mohr-Coulomb	105 pcf	c'=2160 psf; phi'=19 °

Alternative 5
Ash Pond North Dike

Factor of Safety (Opt.) = 2.41
Center = (33.801, 764.885) ft
Radius = 18.40152 ft



Replacement Ratio = 20%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

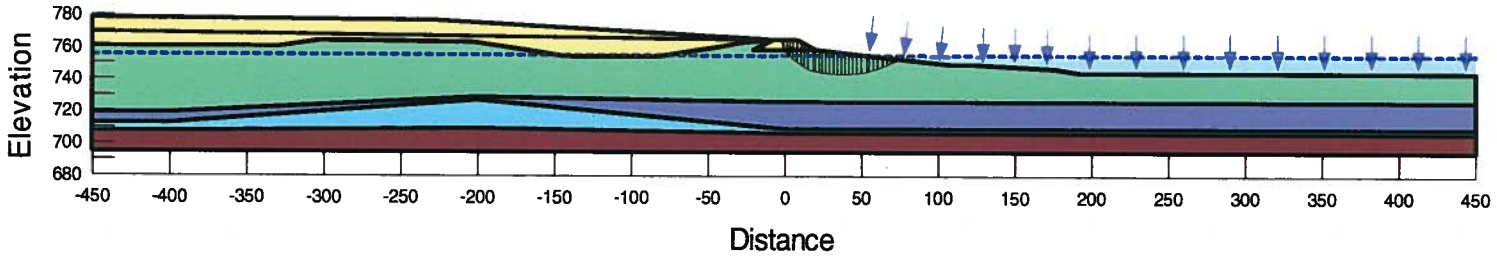
File Name: Alt 5 - Dike C - 149+00 - Imp - Static Drained.gsz
Last Solved on 12/3/2009 at 2:22:12 PM

Figure 50: Alternative 5, Ash Pond North Dike C, With Improvement, Static Drained Condition

Material Name	Model	Unit Weight	Strength Parameters
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	129 pcf	c=160 psf; phi=12 °
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Shale	Bedrock (Impenetrable)	N/A	N/A

Alternative 5
Ash Pond East Dike

Factor of Safety (Opt.) = 0.28
Center = (37.023, 793.126) ft
Radius = 34.71123 ft



Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

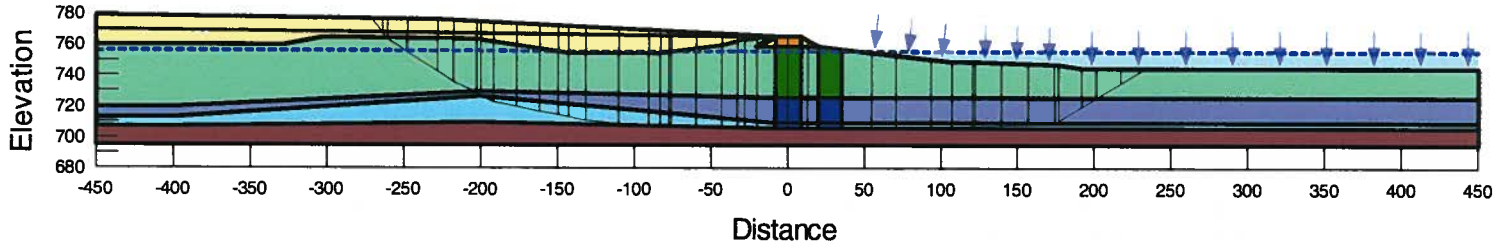
File Name: Alt 5 - Eastern Dike - No Improvement.gsz
Last Solved on 12/4/2009 at 11:58:08 AM

Figure 51: Alternative 5, Ash Pond East Divider Dike, Without Improvement

Material Name	Model	Unit Weight	Strength Parameters
Landfilled Ash	Mohr-Coulomb	111 pcf	c=0 psf; phi=25 °
Constructed Ash	Mohr-Coulomb	93 pcf	c=0 psf; phi=25 °
Hydraulically Placed Ash	S=f(overburden)	96 pcf	Tau/Sigma=0.06
Lean Clay	Mohr-Coulomb	129 pcf	c=160 psf; phi=12 °
Sandy Silt to Silty Sand	S=f(overburden)	109 pcf	Tau/Sigma=0.06
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Hyd. Ash	Mohr-Coulomb	105 pcf	c=2160 psf; phi=2.7 °
Imp. Lean Clay	Mohr-Coulomb	131 pcf	c=2288 psf; phi=9.5 °
Imp. Silt to Silty Sand	Mohr-Coulomb	115 pcf	c=2160 psf; phi=2.7 °
Imp. Const. Ash	Mohr-Coulomb	102 pcf	c=2160 psf; phi=19 °

Alternative 5
Ash Pond East Dike

Factor of Safety (Opt.) = 1.31
Center = (3.22, 1072.3) ft
Radius = 195.0849 ft



Replacement Ratio = 20%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

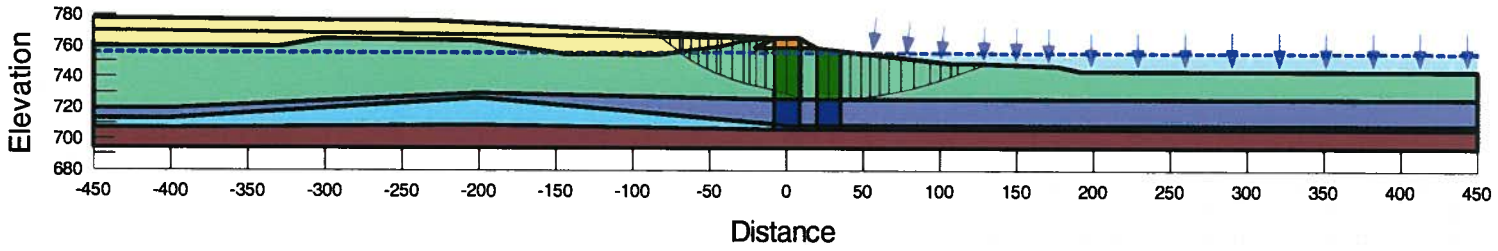
File Name: Alt 5 - Eastern Dike - With Improvement.gsz
Last Solved on 12/8/2009 at 4:01:41 PM

Figure 52: Alternative 5, Ash Pond East Divider Dike, With Improvement

Material Name	Model	Unit Weight	Strength Parameters
Landfilled Ash	Mohr-Coulomb	111 pcf	c'=0 psf; phi'=30 °
Constructed Ash	Mohr-Coulomb	93 pcf	c'=0 psf; phi'=30 °
Hydraulically Placed Ash	Mohr-Coulomb	96 pcf	c'=0 psf; phi'=25 °
Lean Clay	Mohr-Coulomb	129 pcf	c'=0 psf; phi'=30 °
Sandy Silt to Silty Sand	Mohr-Coulomb	109 pcf	c'=0 psf; phi'=28 °
Shale	Bedrock (Impenetrable)	N/A	N/A
Imp. Hyd. Ash	Mohr-Coulomb	105 pcf	c'=2160 psf; phi'=19 °
Imp. Lean Clay	Mohr-Coulomb	131 pcf	c'=2160 psf; phi'=24 °
Imp. Silt to Silty Sand	Mohr-Coulomb	115 pcf	c'=2160 psf; phi'=22 °
Imp. Const. Ash	Mohr-Coulomb	102 pcf	c'=2160 psf; phi'=23 °

Alternative 5
Ash Pond East Dike

Factor of Safety (Opt.) = 4.10
Center = (30.206, 912.494) ft
Radius = 89.66942 ft



Replacement Ratio = 20%, Soilcrete c = 75 psi
Preliminary Slope Stability Analysis
Post-Earthquake Condition
Kingston Fossil Plant
Tennessee Valley Authority (TVA)

File Name: Alt 5 - Eastern Dike - Imp - Static Drained.gsz
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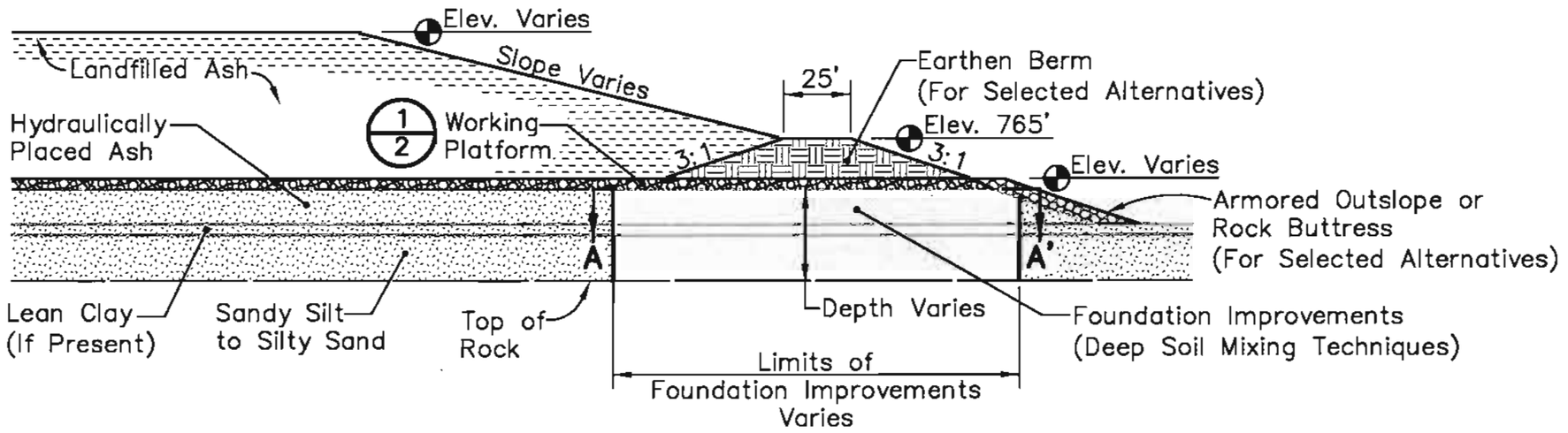
Figure 53: Alternative 5, Ash Pond East Divider Dike, With Improvement, Static Drained Condition

Appendix B

Conceptual Perimeter Improvements



SECTION – CONCEPTUAL FOUNDATION IMPROVEMENTS

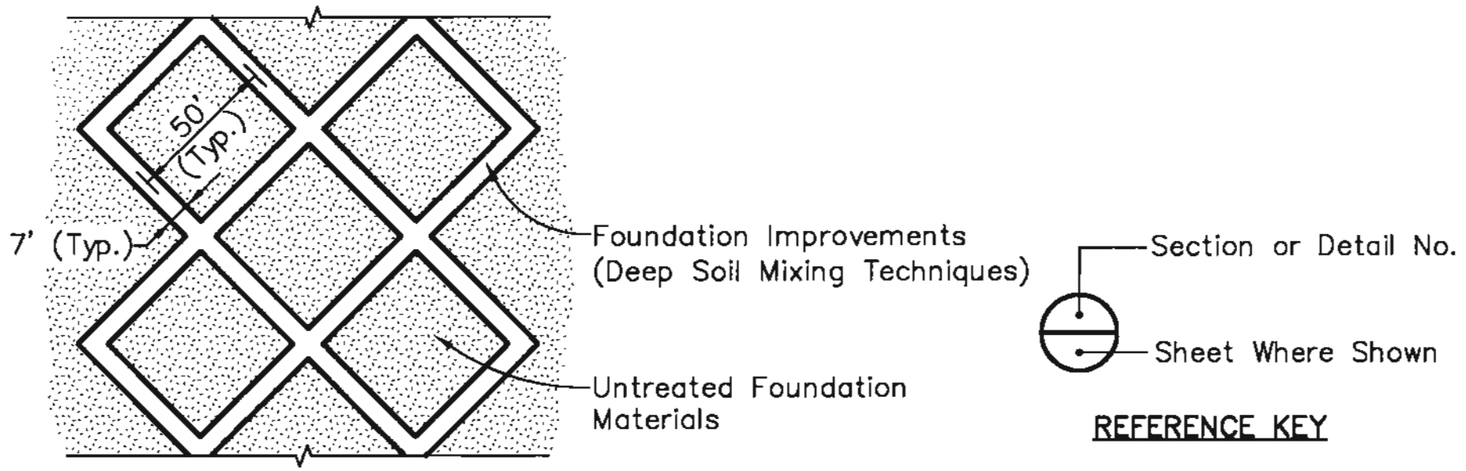
SCALE: 1"=50'

CONCEPT_DIKE.DWG

NOTES:

1. The provided sections and details are conceptual in nature and are solely intended to support the current Dredge Cell/Embayment Area Component Notebook activities. Information presented herein should be used to facilitate additional design/planning/decision activities only. The sections and details will be modified during future project phases and are not to be used for construction.

2. Generalized foundation conditions shown for this conceptual section were based on available site-specific geotechnical data/information provided by others.



REFERENCE KEY

SECTION A–A' – CONCEPTUAL FOUNDATION IMPROVEMENTS

SCALE: 1"=50'

CONCEPT_DIKE.DWG

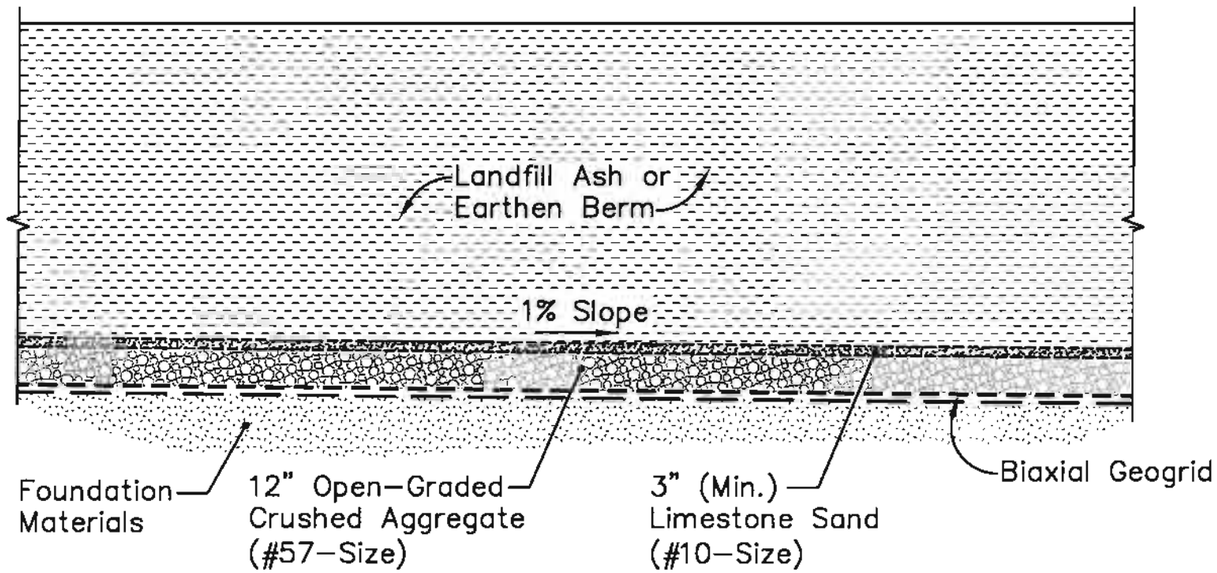
ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

CONCEPTUAL PERIMETER IMPROVEMENTS
DREDGE CELL / EMBAYMENT AREA COMPONENT NOTEBOOK
KINGSTON FOSSIL PLANT
HARRIMAN, ROANE COUNTY, TENNESSEE

Stantec
Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

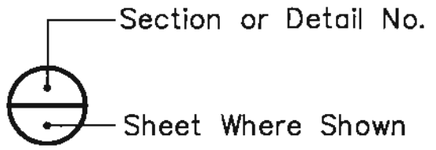
DRAWN BY	DMG	DATE	11/02/09	REVISED		SHEET
CHECKED BY	KDL	PROJ. NO.	175669014	1.	3.	1 OF 2
CHECKED BY	MJS	SCALE	AS SHOWN	2.	4.	

PLOT DATE: 11/02/2009 USER: SAMS, BRIAN
N:\1756\ACTIVE\175669014\ENVIRONMENTAL\DRAWING\NOTEBOOK\690140-KIF-306-K07.DWG



1/2 **DETAIL – WORKING PLATFORM**
SCALE: 1/4"=1'-0"
GEOXSEC.DWG

NOTE:
Based on results obtained from the test embankment program, the working platform is anticipated to consist of a subbase layer (geogrid overlain by 12-inches of open-graded crushed aggregate) and three-inch limestone sand layer. Final design and construction of the working platform will be field performance based and may require multiple subbase layers to achieve the design objective.



REFERENCE KEY

ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

CONCEPTUAL PERIMETER IMPROVEMENTS
DREDGE CELL / EMBAYMENT AREA COMPONENT NOTEBOOK
KINGSTON FOSSIL PLANT
HARRIMAN, ROANE COUNTY, TENNESSEE

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CHECKED BY	KDL	PROJ. NO.	175669014	1. 3.	2 OF 2
CHECKED BY	MJS	SCALE	AS SHOWN	2. 4.	

Appendix C

Specifications

Specifications

Dredge Cell / Embayment Area Component Notebook
Kingston Fossil Plant
Harriman, Roane County, Tennessee

The provided specifications are conceptual in nature and are solely intended to support current Dredge Cell / Embayment Area Component Notebook activities. Information provided herein should be used to facilitate additional design/planning/decision activities only. These specifications will be modified during future project phases and are not to be used for construction.

1. Site Preparation

1.1. General

Initial site preparation includes regrading existing surfaces to design subgrade elevations in accordance with the final design plans and drawings (to be developed in future project phases) in preparation for subsequent working platform construction.

1.2. Excavation

Excavation shall consist of the removal of ash materials in accordance with the final design plans and drawings.

1.3. Placement

Excavated ash materials shall be placed in accordance with the final design plans and drawings. These materials shall be placed in maximum 24-inch thick loose lifts distributed by blading or dozing (not dumped into final position). The sequence of filling shall commence at the lowest section (in elevation) of the subject footprint and proceed upward in controlled horizontal lifts in a manner to maintain positive drainage at all times. Positive drainage through minimum one percent cross-slopes shall be maintained on all fill surfaces.

2. Working Platform

2.1. General

One of the primary functions of the working platform is to provide a stable base for subsequent foundation improvements and embankment construction. Based on the results of the test embankment program, the working platform shall be constructed using biaxial geogrid, Tennessee Department of Transportation (TDOT) No. 57 aggregate (or Quality Control (QC) Manager approved equivalent) and TDOT No. 10 limestone sand (or approved equivalent) across prepared surfaces overlaying existing foundation materials. Geogrid shall conform to Tensar BX-1500 or approved equivalent.

2.2. Placement

Geogrid shall be placed in accordance with manufacturer's recommendations and the final design plans and drawings. Remaining working platform materials shall be placed in maximum 12-inch thick loose lifts distributed by blading or dozing (not dumped into final position). The sequence of filling shall commence at the lowest section (in elevation) of the subject footprint and proceed upward in controlled horizontal lifts in a manner to maintain positive drainage at all times. Positive drainage through minimum one percent cross-slopes shall be maintained on all fill surfaces.

2.3. Quality Control Requirements

Required submittals shall include documentation certifying compliance with the project requirements for subject materials. In addition, gradation analyses shall be performed on representative aggregate material samples for each proposed source at the frequency noted by the project requirements. Additional conformance documentation shall be required at any time a significant change in the supplied material is noted or the source has changed.

3. Foundation Improvements (Deep Soil Mixing Techniques)

3.1. General

Deep soil mixing activities are intended to improve potentially liquefiable foundation zones by reducing earthquake-induced shear strains within treated depths. A specialty contractor (and associated equipment) will be required to perform these activities.

3.2. Installation

Selected foundation zones shall be treated by mechanically blending in-situ materials with an engineered grout slurry using a hollow-stem paddle mixer (deep soil mixing). Foundation zones shall be treated in accordance with the final design plans and drawings.

3.3. Quality Control Requirements

Laboratory conformance testing shall consist of unconfined compression tests on the soil-cement mixture used in deep soil mixing applications. Representative samples shall be collected from designated treated foundation zones on approximate ten-foot vertical intervals each day.

4. Earthen Berm (for Selected Alternatives)

4.1. General

The earthen berm shall be constructed along the reconstructed Dike C alignment and shall consist of fine-grained soils with a clay-like consistency.

4.2. Placement

The earthen berm materials shall be placed in accordance with the final design plans and drawings. These materials shall be placed in maximum eight-inch thick loose lifts distributed by blading or dozing (not dumped into final position). The sequence of filling shall commence at the lowest section (in elevation) of the subject footprint and proceed upward in controlled horizontal lifts in a manner to maintain positive drainage at all times. Positive drainage through minimum one percent cross-slopes shall be maintained on all fill surfaces.

4.3. Compaction

The earthen berm material shall be compacted to a minimum of 95 percent of standard Proctor maximum dry density at a moisture content within minus two percent and plus two percent of optimum. Field density tests shall be performed at a minimum rate of nine tests per acre per lift to document compaction and moisture content. Following initial compaction, the surface shall be sealed with a smooth drum roller to reduce the potential for surface water infiltration. Prior to placement of subsequent lifts the surface shall be scarified to promote lift bonding.

4.4. Quality Control Requirements

In addition to the field density tests, quality control for the earthen berm materials shall include laboratory conformance testing. Testing shall consist of natural moisture content determinations and standard engineering classifications at approximate 10,000 cubic yard intervals of placement per soil type and standard Proctor moisture-density tests at approximate 20,000 cubic yard intervals of placement per soil type.

5. Rock Buttress or Outslope Armoring

5.1. General

The rock buttress shall be constructed from shot rock (durable) materials or approved equivalent. Outslope armoring shall be constructed from TDOT machined riprap class A-1 materials or approved equivalent.

5.2. Placement

A geotextile filter fabric shall be placed along existing surfaces before placement of rock buttress or outslope armoring materials in accordance with the manufacturer's recommendations and the final design plans and drawings.

Rock buttress or outslope armoring materials shall be placed in accordance with the final design plans and drawings. These materials shall be placed in maximum 12-inch thick loose lists distributed by bladding or dozing (not dumped into final position). The sequence of filling shall commence at the lowest section (in elevation) of the subject footprint and proceed upward in controlled horizontal lifts in a manner to maintain positive drainage at all times. Positive drainage through minimum one percent cross-slopes shall be maintained on all fill surfaces.

5.3. Quality Control Requirements

Required submittals shall include documentation certifying compliance with the project requirements for subject materials. In addition, gradation analyses shall be performed on representative aggregate material samples for each proposed source at the frequency noted by the project requirements. Additional conformance documentation shall be required at any time a significant change in the supplied material is noted or the source has changed.

6. Vegetative Soil Cover

6.1. General

The vegetative soil cover shall include 24 inches of topsoil and/or other soil materials that are capable of establishing and sustaining vegetative growth.

6.2. Placement

Prior to placement of vegetative soil cover material, existing surfaces shall be stripped of all vegetation, organic soils and final cover soils as well as any other deleterious materials. In addition, all surfaces shall be scarified to promote lift bonding. Vegetative soil cover material shall be placed in controlled maximum 12-inch thick loose lifts that are tracked into place by blading or similar approved methods. Each lift shall receive a minimum of two complete tracking passes.

6.3. Seeding and Mulching

As portions of vegetative soil cover reach final grade, they shall be seeded and mulched with an approved permanent seed mixture and mulch material. Seeded areas shall be maintained through irrigation appropriate for the prevailing weather conditions until the subject areas are fully vegetated.

6.4. Quality Control Requirements

Required submittals shall include prequalification testing and fertilizer/lime application rates that are to be established by a laboratory.

7. Perimeter Ditch

7.1. General

A perimeter ditch will be constructed to divert surface drainage away from the site. The perimeter ditch will be excavated into existing materials and lined with 12 inches of fine-grained soils with a clay-like consistency covered with 12 inches of vegetative soil cover and lined with a synthetic turf reinforcement mat.

7.2. Excavation

Excavation for the perimeter ditch shall consist of the removal of foundation materials in accordance with the final design plans and drawings.

7.3. Placement

The fine-grained soils layer shall be placed in maximum eight-inch thick loose lifts distributed by blading or dozing (not dumped into final position).

Vegetative soil cover material shall be placed in controlled maximum 12-inch thick loose lifts that are tracked into place by blading or similar approved methods. Each lift of the vegetative soil cover material shall receive a minimum of two complete tracking passes.

Synthetic turf reinforcement mats shall be installed up and down the slopes with a six-inch to eight-inch overlap. Stakes or staples shall be used to ensure that the mats remain flat.

7.4. Compaction

The fine-grained soil layer shall be compacted to a minimum of 92 percent of standard Proctor maximum dry density at a moisture content within minus four percent and plus two percent of optimum. Field density tests shall be performed at selected intervals to document compaction and moisture content. Following initial compaction, the surface shall be sealed with a smooth drum roller to reduce the potential for surface water infiltration. Prior to placement of subsequent lifts the surface shall be scarified to promote lift bonding.

7.5. Quality Control Requirements

In addition to the field density tests, quality control for fine-grained soil materials shall include laboratory conformance testing. Testing shall consist of natural moisture content determinations and standard engineering classifications at approximate 10,000 cubic yard intervals of placement per soil type and standard Proctor moisture-density tests at approximate 20,000 cubic yard intervals of placement per soil type.

Required submittals for vegetative soil cover materials shall include prequalification testing and fertilizer/lime application rates that are to be established by a laboratory.

Required submittals for the synthetic turf reinforcement mat shall include documentation certifying compliance with the project requirements for subject materials. Additional conformance documentation shall be required at any time a significant change in the supplied material is noted or the source has changed.

8. Erosion and Sediment Control

Erosion and sediment control measures (initially assumed to primarily consist of silt fences) shall be provided as field conditions dictate and approved by the QC Manager. Erosion and sediment control measures shall be periodically monitored along with overall site drainage conditions. Reports shall be prepared weekly, or after each precipitation event exceeding ½-inch, on the condition of sediment structures as documentation of monitoring. Appropriate adjustments to site drainage and related sediment control structures shall be made as necessary based on current site conditions during test embankment construction.

9. Dust Control

Dust shall be controlled by seeding and mulching finished graded areas and other disturbed areas promptly, and by wetting haul roads (or other disturbed areas) or applying approved chemical soil binders, as needed.

10. Quality Control

A QC Manager shall be responsible for management of construction monitoring, testing and related documentation. The QC Manager shall assign appropriate test standards and methods for field observations and laboratory testing and is responsible for review of all QC data to assess conformance with the final project requirements. The QC Manager shall also perform random observations of personnel and activities (to include final constructed elements) working and/or performed under his direct supervision as needed in order to complete the required certification during the course of the project.

Surveying services shall be required during the course of construction activities for construction layout, grading and measurement purposes.

Appendix D

Capital Cost Opinion

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 1 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
I. Dike 2					
A. Regrade Ramp Outslope to 3H:1V					
1. Materials and Hauling (assume five mile round trip)	900	CY	$ 61.56	$ 55,404.00	RS Means 2009 Item 31 37 1310 0300 (at 110 pcf) and 03 05 1325 1150
2. Placement	900	CY	$ 1.88	$ 1,692.00	RS Means 2009 Item 31 23 2317 0020
B. Working Platform					
1. Geogrid					
a. Materials	56,000	SF	$ 0.29	$ 16,240.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	56,000	SF	$ 0.06	$ 3,360.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,100	CY	$ 42.05	$ 88,305.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	2,100	CY	$ 1.88	$ 3,948.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	600	CY	$ 39.55	$ 23,730.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	600	CY	$ 1.88	$ 1,128.00	RS Means 2009 Item 31 23 2317 0020
C. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	1	LS	$ 250,000.00	$ 250,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	15,800	CY	$ 70.00	$ 1,106,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
D. Rock Buttress (5H:1V, 40 feet wide at the base)					
1. Geotextile Filter Fabric	57,400	SF	$ 0.30	$ 17,220.00	RS Means 2009 Item 31 32 1916 1500
2. Materials and Hauling (assume five mile round trip)	3,400	CY	$ 61.56	$ 209,304.00	RS Means 2009 Item 31 37 1310 0300 (at 110 pcf) and 03 05 1325 1150
3. Placement	3,400	CY	$ 1.88	$ 6,392.00	RS Means 2009 Item 31 23 2317 0020
E. Vegetative Soil Cover (assume 24 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	9,500	CY	$ 27.00	$ 256,500.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	9,500	CY	$ 5.45	$ 51,775.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	9,500	CY	$ 1.88	$ 17,860.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	138,600	SF	$ 0.35	$ 48,510.00	RS Means 2009 Item 32 91 1913 1000
F. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	8,300	CY	$ 2.13	$ 17,679.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,300	CY	$ 10.35	$ 23,805.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	2,300	CY	$ 5.45	$ 12,535.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,300	CY	$ 1.88	$ 4,324.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	2,300	CY	$ 1.50	$ 3,450.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,000	CY	$ 27.00	$ 54,000.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,000	CY	$ 5.45	$ 10,900.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,000	CY	$ 1.88	$ 3,760.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	47,600	SF	$ 0.35	$ 16,660.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	47,600	SF	$ 0.26	$ 12,376.00	RS Means 2009 Item 31 25 1310 0200
G. Silt Fence	1,400	LF	$ 1.26	$ 1,764.00	RS Means 2009 Item 31 25 1310 1100
H. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 24,400.00	$ 24,400.00	
I. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	528	HR	$ 75.00	$ 39,600.00	
2. QC Manager (assume 12 hours/shift)	528	HR	$ 120.00	$ 63,360.00	
3. Project Manager (assume 10% of QC Manager time)	53	HR	$ 160.00	$ 8,448.00	
4. Per Diem	88	SHIFT	$ 109.00	$ 9,592.00	
J. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 1 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
II. Dike D					
A. Working Platform					
1. Geogrid					
a. Materials	105,000	SF	$ 0.29	$ 30,450.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	105,000	SF	$ 0.06	$ 6,300.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,900	CY	$ 42.05	$ 163,995.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,000	CY	$ 39.55	$ 39,550.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	1,000	CY	$ 1.88	$ 1,880.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	58,500	CY	$ 70.00	$ 4,095,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Rock Buttress (5H:1V, 40 feet wide at the base)					
1. Geotextile Filter Fabric	123,000	SF	$ 0.30	$ 36,900.00	RS Means 2009 Item 31 32 1916 1500
2. Materials and Hauling (assume five mile round trip)	17,800	CY	$ 61.56	$ 1,095,768.00	RS Means 2009 Item 31 37 1310 0300 (at 110 pcf) and 03 05 1325 1150
3. Placement	17,800	CY	$ 1.88	$ 33,464.00	RS Means 2009 Item 31 23 2317 0020
D. Vegetative Soil Cover (assume 24 inches thick)					
1. Excavation and Loadout from Off-Site Borrow Area	20,400	CY	$ 27.00	$ 550,800.00	RS Means 2009 Item 31 23 2315 7010
2. Hauling (assume two mile round trip)	20,400	CY	$ 5.45	$ 111,180.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	20,400	CY	$ 1.88	$ 38,352.00	RS Means 2009 Item 31 23 2317 0020
4. Seeding and Mulching	297,000	SF	$ 0.35	$ 103,950.00	RS Means 2009 Item 32 91 1913 1000
E. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	17,800	CY	$ 2.13	$ 37,914.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,900	CY	$ 10.35	$ 50,715.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	4,900	CY	$ 5.45	$ 26,705.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,900	CY	$ 1.88	$ 9,212.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	4,900	CY	$ 1.50	$ 7,350.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,200	CY	$ 27.00	$ 113,400.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	4,200	CY	$ 5.45	$ 22,890.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,200	CY	$ 1.88	$ 7,896.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	102,000	SF	$ 0.35	$ 35,700.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	102,000	SF	$ 0.26	$ 26,520.00	RS Means 2009 Item 31 25 1310 0200
F. Silt Fence	3,000	LF	$ 1.26	$ 3,780.00	RS Means 2009 Item 31 25 1310 1100
G. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 71,000.00	$ 71,000.00	
H. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,896	HR	$ 75.00	$ 142,200.00	
2. QC Manager (assume 12 hours/shift)	1,896	HR	$ 120.00	$ 227,520.00	
3. Project Manager (assume 10% of QC Manager time)	190	HR	$ 160.00	$ 30,336.00	
4. Per Diem	316	SHIFT	$ 109.00	$ 34,444.00	
I. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 1 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
III. Swan Pond Road and Ball Field Corridors					
A. Working Platform					
1. Geogrid					
a. Materials	84,000	SF	$ 0.29	$ 24,360.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	84,000	SF	$ 0.06	$ 5,040.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,200	CY	$ 42.05	$ 134,560.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,200	CY	$ 1.88	$ 6,016.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	800	CY	$ 39.55	$ 31,640.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	800	CY	$ 1.88	$ 1,504.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	46,800	CY	$ 70.00	$ 3,276,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	28,500	CY	$ 2.13	$ 60,705.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	7,900	CY	$ 10.35	$ 81,765.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	7,900	CY	$ 5.45	$ 43,055.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	7,900	CY	$ 1.88	$ 14,852.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	7,900	CY	$ 1.50	$ 11,850.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	6,600	CY	$ 27.00	$ 178,200.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	6,600	CY	$ 5.45	$ 35,970.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	6,600	CY	$ 1.88	$ 12,408.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	163,200	SF	$ 0.35	$ 57,120.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	163,200	SF	$ 0.26	$ 42,432.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	4,800	LF	$ 1.26	$ 6,048.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 43,700.00	$ 43,700.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,476	HR	$ 75.00	$ 110,700.00	
2. QC Manager (assume 12 hours/shift)	1,476	HR	$ 120.00	$ 177,120.00	
3. Project Manager (assume 10% of QC Manager time)	148	HR	$ 160.00	$ 23,616.00	
4. Per Diem	246	SHIFT	$ 109.00	$ 26,814.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
IV. Ash Pond North Dike C					
A. Working Platform					
1. Geogrid					
a. Materials	105,000	SF	$ 0.29	$ 30,450.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	105,000	SF	$ 0.06	$ 6,300.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 1 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
a. Materials and Hauling (assume five mile round trip)	3,900	CY	$ 42.05	$ 163,995.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,000	CY	$ 39.55	$ 39,550.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	1,000	CY	$ 1.88	$ 1,880.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	53,750	CY	$ 70.00	$ 3,762,500.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	19,900	CY	$ 72.55	$ 1,443,745.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	19,900	CY	$ 1.88	$ 37,412.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	12,500	CY	$ 2.13	$ 26,625.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,500	CY	$ 10.35	$ 36,225.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,500	CY	$ 5.45	$ 19,075.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,500	CY	$ 1.88	$ 6,580.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,500	CY	$ 1.50	$ 5,250.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,900	CY	$ 27.00	$ 78,300.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,900	CY	$ 5.45	$ 15,805.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,900	CY	$ 1.88	$ 5,452.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	71,400	SF	$ 0.35	$ 24,990.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	71,400	SF	$ 0.26	$ 18,564.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	2,100	LF	$ 1.26	$ 2,646.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 61,100.00	$ 61,100.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,644	HR	$ 75.00	$ 123,300.00	
2. QC Manager (assume 12 hours/shift)	1,644	HR	$ 120.00	$ 197,280.00	
3. Project Manager (assume 10% of QC Manager time)	164	HR	$ 160.00	$ 26,304.00	
4. Per Diem	274	SHIFT	$ 109.00	$ 29,866.00	
H. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
V. Ash Pond East Divider Dike					
A. Working Platform					
1. Geogrid					
a. Materials	66,000	SF	$ 0.29	$ 19,140.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	66,000	SF	$ 0.06	$ 3,960.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,500	CY	$ 42.05	$ 105,125.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	2,500	CY	$ 1.88	$ 4,700.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	700	CY	$ 39.55	$ 27,685.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	700	CY	$ 1.88	$ 1,316.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 1 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	34,000	CY	$ 70.00	$ 2,380,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	13,100	CY	$ 2.13	$ 27,903.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,600	CY	$ 10.35	$ 37,260.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,600	CY	$ 5.45	$ 19,620.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,600	CY	$ 1.88	$ 6,768.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,600	CY	$ 1.50	$ 5,400.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,100	CY	$ 27.00	$ 83,700.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	3,100	CY	$ 5.45	$ 16,895.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,100	CY	$ 1.88	$ 5,828.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	74,800	SF	$ 0.35	$ 26,180.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	74,800	SF	$ 0.26	$ 19,448.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	2,200	LF	$ 1.26	$ 2,772.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 30,300.00	$ 30,300.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,020	HR	$ 75.00	$ 76,500.00	
2. QC Manager (assume 12 hours/shift)	1,020	HR	$ 120.00	$ 122,400.00	
3. Project Manager (assume 10% of QC Manager time)	102	HR	$ 160.00	$ 16,320.00	
4. Per Diem	170	SHIFT	$ 109.00	$ 18,530.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
VI. Ash Pond South Dike C					
A. Working Platform					
1. Geogrid					
a. Materials	30,000	SF	$ 0.29	$ 8,700.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	30,000	SF	$ 0.06	$ 1,800.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,200	CY	$ 42.05	$ 50,460.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	1,200	CY	$ 1.88	$ 2,256.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	300	CY	$ 39.55	$ 11,865.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	300	CY	$ 1.88	$ 564.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	8,500	CY	$ 70.00	$ 595,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	11,400	CY	$ 72.55	$ 827,070.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	11,400	CY	$ 1.88	$ 21,432.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	7,200	CY	$ 2.13	$ 15,336.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,000	CY	$ 10.35	$ 20,700.00	RS Means 2009 Item 31 23 2315 6010

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 1 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
b. Hauling (assume two mile round trip)	2,000	CY	$ 5.45	$ 10,900.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,000	CY	$ 1.88	$ 3,760.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	2,000	CY	$ 1.50	$ 3,000.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	1,700	CY	$ 27.00	$ 45,900.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	1,700	CY	$ 5.45	$ 9,265.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	1,700	CY	$ 1.88	$ 3,196.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	40,800	SF	$ 0.35	$ 14,280.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	40,800	SF	$ 0.26	$ 10,608.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	1,200	LF	$ 1.26	$ 1,512.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 17,400.00	$ 17,400.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	348	HR	$ 75.00	$ 26,100.00	
2. QC Manager (assume 12 hours/shift)	348	HR	$ 120.00	$ 41,760.00	
3. Project Manager (assume 10% of QC Manager time)	35	HR	$ 160.00	$ 5,568.00	
4. Per Diem	58	SHIFT	$ 109.00	$ 6,322.00	
H. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
VII. Working Platform (Excludes Dikes, Corridors, Test Embankment and Relic Area)					
A. Geogrid					
1. Materials	11,030,000	SF	$ 0.29	$ 3,198,700.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
2. Installation	11,030,000	SF	$ 0.06	$ 661,800.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
B. No. 57 Aggregate (assume 12 inches thick)					
1. Materials and Hauling (assume five mile round trip)	408,600	CY	$ 42.05	$ 17,181,630.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
2. Placement	408,600	CY	$ 1.88	$ 768,168.00	RS Means 2009 Items 31 23 2317 0020
C. No. 10 Limestone Sand (assume 3 inches thick)					
1. Materials and Hauling (assume five mile round trip)	102,200	CY	$ 39.55	$ 4,042,010.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
2. Placement	102,200	CY	$ 1.88	$ 192,136.00	RS Means 2009 Item 31 23 2317 0020
D. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 322,200.00	$ 322,200.00	
E. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	2,460	HR	$ 75.00	$ 184,500.00	
2. QC Manager (assume 12 hours/shift)	2,460	HR	$ 120.00	$ 295,200.00	
3. Project Manager (assume 10% of QC Manager time)	246	HR	$ 160.00	$ 39,360.00	
4. Per Diem	410	SHIFT	$ 109.00	$ 44,690.00	

Total Cost $ 52,000,000.00 (rounded)

Assumptions: (1) The volume/cost metrics are conceptual in nature and are based on initial design/planning efforts for potential closure alternatives under current consideration. These metrics are solely intended to facilitate additional design/planning/decision activities.
(2) Soil mix program unit rate includes labor, equipment, materials and quality control testing.
(3) One material type assumed for earthen berm and perimeter ditch soil barrier construction.
(4) Surveying services not included.

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 2 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
I. Reconstructed Dike C					
A. Site Preparation (includes regrading to design subgrade elevation)					
1. Excavation	196,000	CY	$ 2.13	$ 417,480.00	RS Means 2009 Items 31 23 1642 0020 and 31 23 1642 0250
2. Hauling (assume 2,000 ft cycle)	196,000	CY	$ 3.12	$ 611,520.00	RS Means 2009 Item 31 23 2320 5000
3. Placement (assume use of excavated materials from site preparation)	12,000	CY	$ 1.88	$ 22,560.00	RS Means 2009 Item 31 23 2317 0020
B. Working Platform					
1. Geogrid					
a. Materials	260,000	SF	$ 0.29	$ 75,400.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	260,000	SF	$ 0.06	$ 15,600.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	9,700	CY	$ 42.05	$ 407,885.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	9,700	CY	$ 1.88	$ 18,236.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,500	CY	$ 39.55	$ 98,875.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	2,500	CY	$ 1.88	$ 4,700.00	RS Means 2009 Item 31 23 2317 0020
C. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	1	LS	$ 250,000.00	$ 250,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	96,500	CY	$ 70.00	$ 6,755,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
D. Earthen Berm					
1. Excavation and Loadout from Off-Site Borrow Area	77,800	CY	$ 10.35	$ 805,230.00	RS Means 2009 Item 31 23 2315 6010
2. Hauling (assume two mile round trip)	77,800	CY	$ 5.45	$ 424,010.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	77,800	CY	$ 1.88	$ 146,264.00	RS Means 2009 Item 31 23 2317 0020
4. Compaction	77,800	CY	$ 1.50	$ 116,700.00	RS Means 2009 Item 31 23 2323 5640
E. Vegetative Soil Cover (assume 24 inches thick)					
1. Excavation and Loadout from Off-Site Borrow Area	18,800	CY	$ 27.00	$ 507,600.00	RS Means 2009 Item 31 23 2315 7010
2. Hauling (assume two mile round trip)	18,800	CY	$ 5.45	$ 102,460.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	18,800	CY	$ 1.88	$ 35,344.00	RS Means 2009 Item 31 23 2317 0020
4. Seeding and Mulching	268,000	SF	$ 0.35	$ 93,800.00	RS Means 2009 Item 32 91 1913 1000
F. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	18,900	CY	$ 72.55	$ 1,371,195.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	18,900	CY	$ 1.88	$ 35,532.00	RS Means 2009 Item 31 23 2317 0020
G. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	11,900	CY	$ 2.13	$ 25,347.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,300	CY	$ 10.35	$ 34,155.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,300	CY	$ 5.45	$ 17,985.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,300	CY	$ 1.88	$ 6,204.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,300	CY	$ 1.50	$ 4,950.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,800	CY	$ 27.00	$ 75,600.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,800	CY	$ 5.45	$ 15,260.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,800	CY	$ 1.88	$ 5,264.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	68,000	SF	$ 0.35	$ 23,800.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	68,000	SF	$ 0.26	$ 17,680.00	RS Means 2009 Item 31 25 1310 0200
H. Silt Fence	2,000	LF	$ 1.26	$ 2,520.00	RS Means 2009 Item 31 25 1310 1100
I. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 135,200.00	$ 135,200.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 2 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
J. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	4,224	HR	$ 75.00	$ 316,800.00	
2. QC Manager (assume 12 hours/shift)	4,224	HR	$ 120.00	$ 506,880.00	
3. Project Manager (assume 10% of QC Manager time)	422	HR	$ 160.00	$ 67,584.00	
4. Per Diem	704	SHIFT	$ 109.00	$ 76,736.00	
K. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	9	EA	$ 8.50	$ 76.50	
2. Atterberg Limits (ASTM D 4318)	9	EA	$ 60.00	$ 540.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	9	EA	$ 85.00	$ 765.00	
4. Specific Gravity (ASTM D 854)	9	EA	$ 45.00	$ 405.00	
5. Standard Proctor (ASTM D 698)	5	EA	$ 175.00	$ 875.00	
II. Dike D					
A. Working Platform					
1. Geogrid					
a. Materials	105,000	SF	$ 0.29	$ 30,450.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	105,000	SF	$ 0.06	$ 6,300.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,900	CY	$ 42.05	$ 163,995.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,000	CY	$ 39.55	$ 39,550.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	1,000	CY	$ 1.88	$ 1,880.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	58,500	CY	$ 70.00	$ 4,095,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Rock Buttress (5H:1V, 40 feet wide at the base)					
1. Geotextile Filter Fabric	123,000	SF	$ 0.30	$ 36,900.00	RS Means 2009 Item 31 32 1916 1500
2. Materials and Hauling (assume five mile round trip)	17,800	CY	$ 61.56	$ 1,095,768.00	RS Means 2009 Item 31 37 1310 0300 (at 110 pcf) and 03 05 1325 1150
3. Placement	17,800	CY	$ 1.88	$ 33,464.00	RS Means 2009 Item 31 23 2317 0020
D. Vegetative Soil Cover (assume 24 inches thick)					
1. Excavation and Loadout from Off-Site Borrow Area	20,400	CY	$ 27.00	$ 550,800.00	RS Means 2009 Item 31 23 2315 7010
2. Hauling (assume two mile round trip)	20,400	CY	$ 5.45	$ 111,180.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	20,400	CY	$ 1.88	$ 38,352.00	RS Means 2009 Item 31 23 2317 0020
4. Seeding and Mulching	297,000	SF	$ 0.35	$ 103,950.00	RS Means 2009 Item 32 91 1913 1000
E. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	17,800	CY	$ 2.13	$ 37,914.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,900	CY	$ 10.35	$ 50,715.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	4,900	CY	$ 5.45	$ 26,705.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,900	CY	$ 1.88	$ 9,212.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	4,900	CY	$ 1.50	$ 7,350.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,200	CY	$ 27.00	$ 113,400.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	4,200	CY	$ 5.45	$ 22,890.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,200	CY	$ 1.88	$ 7,896.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	102,000	SF	$ 0.35	$ 35,700.00	RS Means 2009 Item 32 91 1913 1000

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 2 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
4. Synthetic Turf Reinforcement Mat	102,000	SF	$ 0.26	$ 26,520.00	RS Means 2009 Item 31 25 1310 0200
F. Silt Fence	3,000	LF	$ 1.26	$ 3,780.00	RS Means 2009 Item 31 25 1310 1100
G. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 71,000.00	$ 71,000.00	
H. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,896	HR	$ 75.00	$ 142,200.00	
2. QC Manager (assume 12 hours/shift)	1,896	HR	$ 120.00	$ 227,520.00	
3. Project Manager (assume 10% of QC Manager time)	190	HR	$ 160.00	$ 30,336.00	
4. Per Diem	316	SHIFT	$ 109.00	$ 34,444.00	
I. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
III. Swan Pond Road and Ball Field Corridors					
A. Working Platform					
1. Geogrid					
a. Materials	84,000	SF	$ 0.29	$ 24,360.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	84,000	SF	$ 0.06	$ 5,040.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,200	CY	$ 42.05	$ 134,560.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,200	CY	$ 1.88	$ 6,016.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	800	CY	$ 39.55	$ 31,640.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	800	CY	$ 1.88	$ 1,504.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	46,800	CY	$ 70.00	$ 3,276,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	28,500	CY	$ 2.13	$ 60,705.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	7,900	CY	$ 10.35	$ 81,765.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	7,900	CY	$ 5.45	$ 43,055.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	7,900	CY	$ 1.88	$ 14,852.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	7,900	CY	$ 1.50	$ 11,850.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	6,600	CY	$ 27.00	$ 178,200.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	6,600	CY	$ 5.45	$ 35,970.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	6,600	CY	$ 1.88	$ 12,408.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	163,200	SF	$ 0.35	$ 57,120.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	163,200	SF	$ 0.26	$ 42,432.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	4,800	LF	$ 1.26	$ 6,048.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 43,700.00	$ 43,700.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,476	HR	$ 75.00	$ 110,700.00	
2. QC Manager (assume 12 hours/shift)	1,476	HR	$ 120.00	$ 177,120.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 2 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
3. Project Manager (assume 10% of QC Manager time)	148	HR	$ 160.00	$ 23,616.00	
4. Per Diem	246	SHIFT	$ 109.00	$ 26,814.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
IV. Ash Pond North Dike C					
A. Working Platform					
1. Geogrid					
a. Materials	105,000	SF	$ 0.29	$ 30,450.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	105,000	SF	$ 0.06	$ 6,300.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,900	CY	$ 42.05	$ 163,995.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,000	CY	$ 39.55	$ 39,550.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	1,000	CY	$ 1.88	$ 1,880.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	53,750	CY	$ 70.00	$ 3,762,500.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	19,900	CY	$ 72.55	$ 1,443,745.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	19,900	CY	$ 1.88	$ 37,412.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	12,500	CY	$ 2.13	$ 26,625.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,500	CY	$ 10.35	$ 36,225.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,500	CY	$ 5.45	$ 19,075.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,500	CY	$ 1.88	$ 6,580.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,500	CY	$ 1.50	$ 5,250.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,900	CY	$ 27.00	$ 78,300.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,900	CY	$ 5.45	$ 15,805.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,900	CY	$ 1.88	$ 5,452.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	71,400	SF	$ 0.35	$ 24,990.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	71,400	SF	$ 0.26	$ 18,564.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	2,100	LF	$ 1.26	$ 2,646.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 61,100.00	$ 61,100.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,644	HR	$ 75.00	$ 123,300.00	
2. QC Manager (assume 12 hours/shift)	1,644	HR	$ 120.00	$ 197,280.00	
3. Project Manager (assume 10% of QC Manager time)	164	HR	$ 160.00	$ 26,304.00	
4. Per Diem	274	SHIFT	$ 109.00	$ 29,866.00	
H. Laboratory Testing					

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 2 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
V. Ash Pond East Divider Dike					
A. Working Platform					
1. Geogrid					
a. Materials	66,000	SF	$ 0.29	$ 19,140.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	66,000	SF	$ 0.06	$ 3,960.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,500	CY	$ 42.05	$ 105,125.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	2,500	CY	$ 1.88	$ 4,700.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	700	CY	$ 39.55	$ 27,685.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	700	CY	$ 1.88	$ 1,316.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	34,000	CY	$ 70.00	$ 2,380,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	13,100	CY	$ 2.13	$ 27,903.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,600	CY	$ 10.35	$ 37,260.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,600	CY	$ 5.45	$ 19,620.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,600	CY	$ 1.88	$ 6,768.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,600	CY	$ 1.50	$ 5,400.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,100	CY	$ 27.00	$ 83,700.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	3,100	CY	$ 5.45	$ 16,895.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,100	CY	$ 1.88	$ 5,828.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	74,800	SF	$ 0.35	$ 26,180.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	74,800	SF	$ 0.26	$ 19,448.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	2,200	LF	$ 1.26	$ 2,772.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 30,300.00	$ 30,300.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,020	HR	$ 75.00	$ 76,500.00	
2. QC Manager (assume 12 hours/shift)	1,020	HR	$ 120.00	$ 122,400.00	
3. Project Manager (assume 10% of QC Manager time)	102	HR	$ 160.00	$ 16,320.00	
4. Per Diem	170	SHIFT	$ 109.00	$ 18,530.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
VI. Ash Pond South Dike C					

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 2 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
A. Working Platform					
1. Geogrid					
a. Materials	30,000	SF	$ 0.29	$ 8,700.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	30,000	SF	$ 0.06	$ 1,800.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,200	CY	$ 42.05	$ 50,460.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	1,200	CY	$ 1.88	$ 2,256.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	300	CY	$ 39.55	$ 11,865.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	300	CY	$ 1.88	$ 564.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	8,500	CY	$ 70.00	$ 595,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	11,400	CY	$ 72.55	$ 827,070.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	11,400	CY	$ 1.88	$ 21,432.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	7,200	CY	$ 2.13	$ 15,336.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,000	CY	$ 10.35	$ 20,700.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	2,000	CY	$ 5.45	$ 10,900.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,000	CY	$ 1.88	$ 3,760.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	2,000	CY	$ 1.50	$ 3,000.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	1,700	CY	$ 27.00	$ 45,900.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	1,700	CY	$ 5.45	$ 9,265.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	1,700	CY	$ 1.88	$ 3,196.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	40,800	SF	$ 0.35	$ 14,280.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	40,800	SF	$ 0.26	$ 10,608.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	1,200	LF	$ 1.26	$ 1,512.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 17,400.00	$ 17,400.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	348	HR	$ 75.00	$ 26,100.00	
2. QC Manager (assume 12 hours/shift)	348	HR	$ 120.00	$ 41,760.00	
3. Project Manager (assume 10% of QC Manager time)	35	HR	$ 160.00	$ 5,568.00	
4. Per Diem	58	SHIFT	$ 109.00	$ 6,322.00	
H. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
VII. Working Platform (Excludes Dikes, Corridors, Test Embankment and Relic Area)					
A. Geogrid					
1. Materials	6,240,000	SF	$ 0.29	$ 1,809,600.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
2. Installation	6,240,000	SF	$ 0.06	$ 374,400.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 2 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
B. No. 57 Aggregate (assume 12 inches thick)					
1. Materials and Hauling (assume five mile round trip)	231,200	CY	$ 42.05	$ 9,721,960.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
2. Placement	231,200	CY	$ 1.88	$ 434,656.00	RS Means 2009 Items 31 23 2317 0020
C. No. 10 Limestone Sand (assume 3 inches thick)					
1. Materials and Hauling (assume five mile round trip)	57,800	CY	$ 39.55	$ 2,285,990.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
2. Placement	57,800	CY	$ 1.88	$ 108,664.00	RS Means 2009 Item 31 23 2317 0020
D. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 150,600.00	$ 150,600.00	
E. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,392	HR	$ 75.00	$ 104,400.00	
2. QC Manager (assume 12 hours/shift)	1,392	HR	$ 120.00	$ 167,040.00	
3. Project Manager (assume 10% of QC Manager time)	139	HR	$ 160.00	$ 22,272.00	
4. Per Diem	232	SHIFT	$ 109.00	$ 25,288.00	

Total Cost $ 51,500,000.00 (rounded)

Assumptions:
(1) The volume/cost metrics are conceptual in nature and are based on initial design/planning efforts for potential closure alternatives under current consideration. These metrics are solely intended to facilitate additional design/planning/decision activities.
(2) Quantities based on lidar mapping dated August 14, 2009.
(3) Soil mix program unit rate includes labor, equipment, materials and quality control testing.
(4) One material type assumed for earthen berm and perimeter ditch soil barrier construction.
(5) Surveying services not included.

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 3 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
I. Dike D					
A. Working Platform					
1. Geogrid					
a. Materials	105,000	SF	$ 0.29	$ 30,450.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	105,000	SF	$ 0.06	$ 6,300.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,900	CY	$ 42.05	$ 163,995.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,000	CY	$ 39.55	$ 39,550.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	1,000	CY	$ 1.88	$ 1,880.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	1	LS	$ 250,000.00	$ 250,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	58,500	CY	$ 70.00	$ 4,095,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Rock Buttress (5H:1V, 40 feet wide at the base)					
1. Geotextile Filter Fabric	123,000	SF	$ 0.30	$ 36,900.00	RS Means 2009 Item 31 32 1916 1500
2. Materials and Hauling (assume five mile round trip)	17,800	CY	$ 61.56	$ 1,095,768.00	RS Means 2009 Item 31 37 1310 0300 (at 110 pcf) and 03 05 1325 1150
3. Placement	17,800	CY	$ 1.88	$ 33,464.00	RS Means 2009 Item 31 23 2317 0020
D. Vegetative Soil Cover (assume 24 inches thick)					
1. Excavation and Loadout from Off-Site Borrow Area	20,400	CY	$ 27.00	$ 550,800.00	RS Means 2009 Item 31 23 2315 7010
2. Hauling (assume two mile round trip)	20,400	CY	$ 5.45	$ 111,180.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	20,400	CY	$ 1.88	$ 38,352.00	RS Means 2009 Item 31 23 2317 0020
4. Seeding and Mulching	297,000	SF	$ 0.35	$ 103,950.00	RS Means 2009 Item 32 91 1913 1000
E. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	17,800	CY	$ 2.13	$ 37,914.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,900	CY	$ 10.35	$ 50,715.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	4,900	CY	$ 5.45	$ 26,705.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,900	CY	$ 1.88	$ 9,212.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	4,900	CY	$ 1.50	$ 7,350.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,200	CY	$ 27.00	$ 113,400.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	4,200	CY	$ 5.45	$ 22,890.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,200	CY	$ 1.88	$ 7,896.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	102,000	SF	$ 0.35	$ 35,700.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	102,000	SF	$ 0.26	$ 26,520.00	RS Means 2009 Item 31 25 1310 0200
F. Silt Fence	3,000	LF	$ 1.26	$ 3,780.00	RS Means 2009 Item 31 25 1310 1100
G. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 73,500.00	$ 73,500.00	
H. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,896	HR	$ 75.00	$ 142,200.00	
2. QC Manager (assume 12 hours/shift)	1,896	HR	$ 120.00	$ 227,520.00	
3. Project Manager (assume 10% of QC Manager time)	190	HR	$ 160.00	$ 30,336.00	
4. Per Diem	316	SHIFT	$ 109.00	$ 34,444.00	
I. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 3 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
II. Ash Pond North Dike C					
A. Working Platform					
1. Geogrid					
a. Materials	105,000	SF	$ 0.29	$ 30,450.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	105,000	SF	$ 0.06	$ 6,300.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,900	CY	$ 42.05	$ 163,995.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,000	CY	$ 39.55	$ 39,550.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	1,000	CY	$ 1.88	$ 1,880.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	53,750	CY	$ 70.00	$ 3,762,500.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	19,900	CY	$ 72.55	$ 1,443,745.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	19,900	CY	$ 1.88	$ 37,412.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	12,500	CY	$ 2.13	$ 26,625.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,500	CY	$ 10.35	$ 36,225.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,500	CY	$ 5.45	$ 19,075.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,500	CY	$ 1.88	$ 6,580.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,500	CY	$ 1.50	$ 5,250.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,900	CY	$ 27.00	$ 78,300.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,900	CY	$ 5.45	$ 15,805.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,900	CY	$ 1.88	$ 5,452.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	71,400	SF	$ 0.35	$ 24,990.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	71,400	SF	$ 0.26	$ 18,564.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	2,100	LF	$ 1.26	$ 2,646.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 61,100.00	$ 61,100.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,644	HR	$ 75.00	$ 123,300.00	
2. QC Manager (assume 12 hours/shift)	1,644	HR	$ 120.00	$ 197,280.00	
3. Project Manager (assume 10% of QC Manager time)	164	HR	$ 160.00	$ 26,304.00	
4. Per Diem	274	SHIFT	$ 109.00	$ 29,866.00	
H. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 3 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
III. Ash Pond East Divider Dike					
A. Working Platform					
1. Geogrid					
a. Materials	66,000	SF	$ 0.29	$ 19,140.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	66,000	SF	$ 0.06	$ 3,960.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,500	CY	$ 42.05	$ 105,125.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	2,500	CY	$ 1.88	$ 4,700.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	700	CY	$ 39.55	$ 27,685.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	700	CY	$ 1.88	$ 1,316.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	34,000	CY	$ 70.00	$ 2,380,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	13,100	CY	$ 2.13	$ 27,903.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,600	CY	$ 10.35	$ 37,260.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,600	CY	$ 5.45	$ 19,620.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,600	CY	$ 1.88	$ 6,768.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,600	CY	$ 1.50	$ 5,400.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,100	CY	$ 27.00	$ 83,700.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	3,100	CY	$ 5.45	$ 16,895.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,100	CY	$ 1.88	$ 5,828.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	74,800	SF	$ 0.35	$ 26,180.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	74,800	SF	$ 0.26	$ 19,448.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	2,200	LF	$ 1.26	$ 2,772.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 30,300.00	$ 30,300.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,020	HR	$ 75.00	$ 76,500.00	
2. QC Manager (assume 12 hours/shift)	1,020	HR	$ 120.00	$ 122,400.00	
3. Project Manager (assume 10% of QC Manager time)	102	HR	$ 160.00	$ 16,320.00	
4. Per Diem	170	SHIFT	$ 109.00	$ 18,530.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
IV. Ash Pond South Dike C					
A. Working Platform					
1. Geogrid					
a. Materials	30,000	SF	$ 0.29	$ 8,700.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	30,000	SF	$ 0.06	$ 1,800.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 3 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
a. Materials and Hauling (assume five mile round trip)	1,200	CY	$ 42.05	$ 50,460.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	1,200	CY	$ 1.88	$ 2,256.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	300	CY	$ 39.55	$ 11,865.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	300	CY	$ 1.88	$ 564.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	8,500	CY	$ 70.00	$ 595,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	11,400	CY	$ 72.55	$ 827,070.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	11,400	CY	$ 1.88	$ 21,432.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	7,200	CY	$ 2.13	$ 15,336.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,000	CY	$ 10.35	$ 20,700.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	2,000	CY	$ 5.45	$ 10,900.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,000	CY	$ 1.88	$ 3,760.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	2,000	CY	$ 1.50	$ 3,000.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	1,700	CY	$ 27.00	$ 45,900.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	1,700	CY	$ 5.45	$ 9,265.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	1,700	CY	$ 1.88	$ 3,196.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	40,800	SF	$ 0.35	$ 14,280.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	40,800	SF	$ 0.26	$ 10,608.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	1,200	LF	$ 1.26	$ 1,512.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 17,400.00	$ 17,400.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	348	HR	$ 75.00	$ 26,100.00	
2. QC Manager (assume 12 hours/shift)	348	HR	$ 120.00	$ 41,760.00	
3. Project Manager (assume 10% of QC Manager time)	35	HR	$ 160.00	$ 5,568.00	
4. Per Diem	58	SHIFT	$ 109.00	$ 6,322.00	
H. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
V. Working Platform (Excludes Dikes, Corridors, Test Embankment and Relic Area)					
A. Geogrid					
1. Materials	4,290,000	SF	$ 0.29	$ 1,244,100.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
2. Installation	4,290,000	SF	$ 0.06	$ 257,400.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
B. No. 57 Aggregate (assume 12 inches thick)					
1. Materials and Hauling (assume five mile round trip)	158,900	CY	$ 42.05	$ 6,681,745.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
2. Placement	158,900	CY	$ 1.88	$ 298,732.00	RS Means 2009 Items 31 23 2317 0020
C. No. 10 Limestone Sand (assume 3 inches thick)					
1. Materials and Hauling (assume five mile round trip)	39,800	CY	$ 39.55	$ 1,574,090.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 3 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
2. Placement	39,800	CY	$ 1.88	$ 74,824.00	RS Means 2009 Item 31 23 2317 0020
D. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 103,600.00	$ 103,600.00	
E. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	960	HR	$ 75.00	$ 72,000.00	
2. QC Manager (assume 12 hours/shift)	960	HR	$ 120.00	$ 115,200.00	
3. Project Manager (assume 10% of QC Manager time)	96	HR	$ 160.00	$ 15,360.00	
4. Per Diem	160	SHIFT	$ 109.00	$ 17,440.00	

Total Cost $ 28,900,000.00 (rounded)

Assumptions: (1) The volume/cost metrics are conceptual in nature and are based on initial design/planning efforts for potential closure alternatives under current consideration. These metrics are solely intended to facilitate additional design/planning/decision activities.
(2) Soil mix program unit rate includes labor, equipment, materials and quality control testing.
(3) One material type assumed for earthen berm and perimeter ditch soil barrier construction.
(4) Surveying services not included.

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 4 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
I. Reconstructed Dike C					
A. Site Preparation (includes regrading to design subgrade elevation)					
1. Excavation	196,000	CY	$ 2.13	$ 417,480.00	RS Means 2009 Items 31 23 1642 0020 and 31 23 1642 0250
2. Hauling (assume 2,000 ft cycle)	196,000	CY	$ 3.12	$ 611,520.00	RS Means 2009 Item 31 23 2320 5000
3. Placement (assume use of excavated materials from site preparation)	12,000	CY	$ 1.88	$ 22,560.00	RS Means 2009 Item 31 23 2317 0020
B. Working Platform					
1. Geogrid					
a. Materials	260,000	SF	$ 0.29	$ 75,400.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	260,000	SF	$ 0.06	$ 15,600.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	9,700	CY	$ 42.05	$ 407,885.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	9,700	CY	$ 1.88	$ 18,236.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,500	CY	$ 39.55	$ 98,875.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	2,500	CY	$ 1.88	$ 4,700.00	RS Means 2009 Item 31 23 2317 0020
C. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	1	LS	$ 250,000.00	$ 250,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	96,500	CY	$ 70.00	$ 6,755,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
D. Earthen Berm					
1. Excavation and Loadout from Off-Site Borrow Area	77,800	CY	$ 10.35	$ 805,230.00	RS Means 2009 Item 31 23 2315 6010
2. Hauling (assume two mile round trip)	77,800	CY	$ 5.45	$ 424,010.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	77,800	CY	$ 1.88	$ 146,264.00	RS Means 2009 Item 31 23 2317 0020
4. Compaction	77,800	CY	$ 1.50	$ 116,700.00	RS Means 2009 Item 31 23 2323 5640
E. Vegetative Soil Cover (assume 24 inches thick)					
1. Excavation and Loadout from Off-Site Borrow Area	18,800	CY	$ 27.00	$ 507,600.00	RS Means 2009 Item 31 23 2315 7010
2. Hauling (assume two mile round trip)	18,800	CY	$ 5.45	$ 102,460.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	18,800	CY	$ 1.88	$ 35,344.00	RS Means 2009 Item 31 23 2317 0020
4. Seeding and Mulching	268,000	SF	$ 0.35	$ 93,800.00	RS Means 2009 Item 32 91 1913 1000
F. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	18,900	CY	$ 72.55	$ 1,371,195.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	18,900	CY	$ 1.88	$ 35,532.00	RS Means 2009 Item 31 23 2317 0020
G. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	11,900	CY	$ 2.13	$ 25,347.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,300	CY	$ 10.35	$ 34,155.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,300	CY	$ 5.45	$ 17,985.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,300	CY	$ 1.88	$ 6,204.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,300	CY	$ 1.50	$ 4,950.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,800	CY	$ 27.00	$ 75,600.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,800	CY	$ 5.45	$ 15,260.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,800	CY	$ 1.88	$ 5,264.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	68,000	SF	$ 0.35	$ 23,800.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	68,000	SF	$ 0.26	$ 17,680.00	RS Means 2009 Item 31 25 1310 0200
H. Silt Fence	2,000	LF	$ 1.26	$ 2,520.00	RS Means 2009 Item 31 25 1310 1100
I. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 135,200.00	$ 135,200.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 4 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
J. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	4,224	HR	$ 75.00	$ 316,800.00	
2. QC Manager (assume 12 hours/shift)	4,224	HR	$ 120.00	$ 506,880.00	
3. Project Manager (assume 10% of QC Manager time)	422	HR	$ 160.00	$ 67,584.00	
4. Per Diem	704	SHIFT	$ 109.00	$ 76,736.00	
K. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	9	EA	$ 8.50	$ 76.50	
2. Atterberg Limits (ASTM D 4318)	9	EA	$ 60.00	$ 540.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	9	EA	$ 85.00	$ 765.00	
4. Specific Gravity (ASTM D 854)	9	EA	$ 45.00	$ 405.00	
5. Standard Proctor (ASTM D 698)	5	EA	$ 175.00	$ 875.00	
II. Dike D					
A. Working Platform					
1. Geogrid					
a. Materials	300,000	SF	$ 0.29	$ 87,000.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	300,000	SF	$ 0.06	$ 18,000.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	11,200	CY	$ 42.05	$ 470,960.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	11,200	CY	$ 1.88	$ 21,056.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,800	CY	$ 39.55	$ 110,740.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	2,800	CY	$ 1.88	$ 5,264.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	194,800	CY	$ 70.00	$ 13,636,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Rock Buttress (5H:1V, 40 feet wide at the base)					
1. Geotextile Filter Fabric	123,000	SF	$ 0.30	$ 36,900.00	RS Means 2009 Item 31 32 1916 1500
2. Materials and Hauling (assume five mile round trip)	17,800	CY	$ 61.56	$ 1,095,768.00	RS Means 2009 Item 31 37 1310 0300 (at 110 pcf) and 03 05 1325 1150
3. Placement	17,800	CY	$ 1.88	$ 33,464.00	RS Means 2009 Item 31 23 2317 0020
D. Vegetative Soil Cover (assume 24 inches thick)					
1. Excavation and Loadout from Off-Site Borrow Area	20,400	CY	$ 27.00	$ 550,800.00	RS Means 2009 Item 31 23 2315 7010
2. Hauling (assume two mile round trip)	20,400	CY	$ 5.45	$ 111,180.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	20,400	CY	$ 1.88	$ 38,352.00	RS Means 2009 Item 31 23 2317 0020
4. Seeding and Mulching	297,000	SF	$ 0.35	$ 103,950.00	RS Means 2009 Item 32 91 1913 1000
E. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	17,800	CY	$ 2.13	$ 37,914.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,900	CY	$ 10.35	$ 50,715.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	4,900	CY	$ 5.45	$ 26,705.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,900	CY	$ 1.88	$ 9,212.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	4,900	CY	$ 1.50	$ 7,350.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,200	CY	$ 27.00	$ 113,400.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	4,200	CY	$ 5.45	$ 22,890.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,200	CY	$ 1.88	$ 7,896.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	102,000	SF	$ 0.35	$ 35,700.00	RS Means 2009 Item 32 91 1913 1000

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 4 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
4. Synthetic Turf Reinforcement Mat	102,000	SF	$ 0.26	$ 26,520.00	RS Means 2009 Item 31 25 1310 0200
F. Silt Fence	3,000	LF	$ 1.26	$ 3,780.00	RS Means 2009 Item 31 25 1310 1100
G. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 179,500.00	$ 179,500.00	
H. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	5,580	HR	$ 75.00	$ 418,500.00	
2. QC Manager (assume 12 hours/shift)	5,580	HR	$ 120.00	$ 669,600.00	
3. Project Manager (assume 10% of QC Manager time)	558	HR	$ 160.00	$ 89,280.00	
4. Per Diem	930	SHIFT	$ 109.00	$ 101,370.00	
I. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
III. Swan Pond Road and Ball Field Corridors					
A. Working Platform					
1. Geogrid					
a. Materials	480,000	SF	$ 0.29	$ 139,200.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	480,000	SF	$ 0.06	$ 28,800.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	17,800	CY	$ 42.05	$ 748,490.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	17,800	CY	$ 1.88	$ 33,464.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	4,500	CY	$ 39.55	$ 177,975.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	4,500	CY	$ 1.88	$ 8,460.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	266,800	CY	$ 70.00	$ 18,676,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	28,500	CY	$ 2.13	$ 60,705.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	7,900	CY	$ 10.35	$ 81,765.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	7,900	CY	$ 5.45	$ 43,055.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	7,900	CY	$ 1.88	$ 14,852.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	7,900	CY	$ 1.50	$ 11,850.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	6,600	CY	$ 27.00	$ 178,200.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	6,600	CY	$ 5.45	$ 35,970.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	6,600	CY	$ 1.88	$ 12,408.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	163,200	SF	$ 0.35	$ 57,120.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	163,200	SF	$ 0.26	$ 42,432.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	4,800	LF	$ 1.26	$ 6,048.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 220,300.00	$ 220,300.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	7,296	HR	$ 75.00	$ 547,200.00	
2. QC Manager (assume 12 hours/shift)	7,296	HR	$ 120.00	$ 875,520.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 4 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
3. Project Manager (assume 10% of QC Manager time)	730	HR	$ 160.00	$ 116,736.00	
4. Per Diem	1,216	SHIFT	$ 109.00	$ 132,544.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
IV. Ash Pond North Dike C					
A. Working Platform					
1. Geogrid					
a. Materials	105,000	SF	$ 0.29	$ 30,450.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	105,000	SF	$ 0.06	$ 6,300.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,900	CY	$ 42.05	$ 163,995.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,000	CY	$ 39.55	$ 39,550.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	1,000	CY	$ 1.88	$ 1,880.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	53,750	CY	$ 70.00	$ 3,762,500.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	19,900	CY	$ 72.55	$ 1,443,745.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	19,900	CY	$ 1.88	$ 37,412.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	12,500	CY	$ 2.13	$ 26,625.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,500	CY	$ 10.35	$ 36,225.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,500	CY	$ 5.45	$ 19,075.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,500	CY	$ 1.88	$ 6,580.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,500	CY	$ 1.50	$ 5,250.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,900	CY	$ 27.00	$ 78,300.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,900	CY	$ 5.45	$ 15,805.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,900	CY	$ 1.88	$ 5,452.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	71,400	SF	$ 0.35	$ 24,990.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	71,400	SF	$ 0.26	$ 18,564.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	2,100	LF	$ 1.26	$ 2,646.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 61,100.00	$ 61,100.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,644	HR	$ 75.00	$ 123,300.00	
2. QC Manager (assume 12 hours/shift)	1,644	HR	$ 120.00	$ 197,280.00	
3. Project Manager (assume 10% of QC Manager time)	164	HR	$ 160.00	$ 26,304.00	
4. Per Diem	274	SHIFT	$ 109.00	$ 29,866.00	
H. Laboratory Testing					

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 4 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
V. Ash Pond East Divider Dike					
A. Working Platform					
1. Geogrid					
a. Materials	66,000	SF	$ 0.29	$ 19,140.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	66,000	SF	$ 0.06	$ 3,960.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,500	CY	$ 42.05	$ 105,125.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	2,500	CY	$ 1.88	$ 4,700.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	700	CY	$ 39.55	$ 27,685.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	700	CY	$ 1.88	$ 1,316.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	34,000	CY	$ 70.00	$ 2,380,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	13,100	CY	$ 2.13	$ 27,903.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,600	CY	$ 10.35	$ 37,260.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,600	CY	$ 5.45	$ 19,620.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,600	CY	$ 1.88	$ 6,768.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,600	CY	$ 1.50	$ 5,400.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,100	CY	$ 27.00	$ 83,700.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	3,100	CY	$ 5.45	$ 16,895.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,100	CY	$ 1.88	$ 5,828.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	74,800	SF	$ 0.35	$ 26,180.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	74,800	SF	$ 0.26	$ 19,448.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	2,200	LF	$ 1.26	$ 2,772.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 30,300.00	$ 30,300.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,020	HR	$ 75.00	$ 76,500.00	
2. QC Manager (assume 12 hours/shift)	1,020	HR	$ 120.00	$ 122,400.00	
3. Project Manager (assume 10% of QC Manager time)	102	HR	$ 160.00	$ 16,320.00	
4. Per Diem	170	SHIFT	$ 109.00	$ 18,530.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
VI. Ash Pond South Dike C					

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 4 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
A. Working Platform					
1. Geogrid					
a. Materials	30,000	SF	$ 0.29	$ 8,700.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	30,000	SF	$ 0.06	$ 1,800.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,200	CY	$ 42.05	$ 50,460.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	1,200	CY	$ 1.88	$ 2,256.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	300	CY	$ 39.55	$ 11,865.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	300	CY	$ 1.88	$ 564.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	8,500	CY	$ 70.00	$ 595,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	11,400	CY	$ 72.55	$ 827,070.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	11,400	CY	$ 1.88	$ 21,432.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	7,200	CY	$ 2.13	$ 15,336.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,000	CY	$ 10.35	$ 20,700.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	2,000	CY	$ 5.45	$ 10,900.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,000	CY	$ 1.88	$ 3,760.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	2,000	CY	$ 1.50	$ 3,000.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	1,700	CY	$ 27.00	$ 45,900.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	1,700	CY	$ 5.45	$ 9,265.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	1,700	CY	$ 1.88	$ 3,196.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	40,800	SF	$ 0.35	$ 14,280.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	40,800	SF	$ 0.26	$ 10,608.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	1,200	LF	$ 1.26	$ 1,512.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 17,400.00	$ 17,400.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	348	HR	$ 75.00	$ 26,100.00	
2. QC Manager (assume 12 hours/shift)	348	HR	$ 120.00	$ 41,760.00	
3. Project Manager (assume 10% of QC Manager time)	35	HR	$ 160.00	$ 5,568.00	
4. Per Diem	58	SHIFT	$ 109.00	$ 6,322.00	
H. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
VII. Working Platform (Excludes Dikes, Corridors, Test Embankment and Relic Area)					
A. Geogrid					
1. Materials	6,240,000	SF	$ 0.29	$ 1,809,600.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
2. Installation	6,240,000	SF	$ 0.06	$ 374,400.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 4 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
B. No. 57 Aggregate (assume 12 inches thick)					
1. Materials and Hauling (assume five mile round trip)	231,200	CY	$ 42.05	$ 9,721,960.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
2. Placement	231,200	CY	$ 1.88	$ 434,656.00	RS Means 2009 Items 31 23 2317 0020
C. No. 10 Limestone Sand (assume 3 inches thick)					
1. Materials and Hauling (assume five mile round trip)	57,800	CY	$ 39.55	$ 2,285,990.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
2. Placement	57,800	CY	$ 1.88	$ 108,664.00	RS Means 2009 Item 31 23 2317 0020
D. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 150,600.00	$ 150,600.00	
E. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,392	HR	$ 75.00	$ 104,400.00	
2. QC Manager (assume 12 hours/shift)	1,392	HR	$ 120.00	$ 167,040.00	
3. Project Manager (assume 10% of QC Manager time)	139	HR	$ 160.00	$ 22,272.00	
4. Per Diem	232	SHIFT	$ 109.00	$ 25,288.00	

Total Cost $ 80,300,000.00 (rounded)

Assumptions:
(1) The volume/cost metrics are conceptual in nature and are based on initial design/planning efforts for potential closure alternatives under current consideration. These metrics are solely intended to facilitate additional design/planning/decision activities.
(2) Quantities based on lidar mapping dated August 14, 2009.
(3) Soil mix program unit rate includes labor, equipment, materials and quality control testing.
(4) One material type assumed for earthen berm and perimeter ditch soil barrier construction.
(5) Surveying services not included.

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 5 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
I. Reconstructed Dike C					
A. Site Preparation (includes regrading to design subgrade elevation)					
1. Excavation	196,000	CY	$ 2.13	$ 417,480.00	RS Means 2009 Items 31 23 1642 0020 and 31 23 1642 0250
2. Hauling (assume 2,000 ft cycle)	196,000	CY	$ 3.12	$ 611,520.00	RS Means 2009 Item 31 23 2320 5000
3. Placement (assume use of excavated materials from site preparation)	12,000	CY	$ 1.88	$ 22,560.00	RS Means 2009 Item 31 23 2317 0020
B. Working Platform					
1. Geogrid					
a. Materials	260,000	SF	$ 0.29	$ 75,400.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	260,000	SF	$ 0.06	$ 15,600.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	9,700	CY	$ 42.05	$ 407,885.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	9,700	CY	$ 1.88	$ 18,236.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,500	CY	$ 39.55	$ 98,875.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	2,500	CY	$ 1.88	$ 4,700.00	RS Means 2009 Item 31 23 2317 0020
C. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	1	LS	$ 250,000.00	$ 250,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	96,500	CY	$ 70.00	$ 6,755,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
D. Earthen Berm					
1. Excavation and Loadout from Off-Site Borrow Area	77,800	CY	$ 10.35	$ 805,230.00	RS Means 2009 Item 31 23 2315 6010
2. Hauling (assume two mile round trip)	77,800	CY	$ 5.45	$ 424,010.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	77,800	CY	$ 1.88	$ 146,264.00	RS Means 2009 Item 31 23 2317 0020
4. Compaction	77,800	CY	$ 1.50	$ 116,700.00	RS Means 2009 Item 31 23 2323 5640
E. Vegetative Soil Cover (assume 24 inches thick)					
1. Excavation and Loadout from Off-Site Borrow Area	18,800	CY	$ 27.00	$ 507,600.00	RS Means 2009 Item 31 23 2315 7010
2. Hauling (assume two mile round trip)	18,800	CY	$ 5.45	$ 102,460.00	RS Means 2009 Item 31 23 2320 1430
3. Placement	18,800	CY	$ 1.88	$ 35,344.00	RS Means 2009 Item 31 23 2317 0020
4. Seeding and Mulching	268,000	SF	$ 0.35	$ 93,800.00	RS Means 2009 Item 32 91 1913 1000
F. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	18,900	CY	$ 72.55	$ 1,371,195.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	18,900	CY	$ 1.88	$ 35,532.00	RS Means 2009 Item 31 23 2317 0020
G. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	11,900	CY	$ 2.13	$ 25,347.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,300	CY	$ 10.35	$ 34,155.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,300	CY	$ 5.45	$ 17,985.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,300	CY	$ 1.88	$ 6,204.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,300	CY	$ 1.50	$ 4,950.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,800	CY	$ 27.00	$ 75,600.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,800	CY	$ 5.45	$ 15,260.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,800	CY	$ 1.88	$ 5,264.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	68,000	SF	$ 0.35	$ 23,800.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	68,000	SF	$ 0.26	$ 17,680.00	RS Means 2009 Item 31 25 1310 0200
H. Silt Fence	2,000	LF	$ 1.26	$ 2,520.00	RS Means 2009 Item 31 25 1310 1100
I. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 135,200.00	$ 135,200.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 5 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
J. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	4,224	HR	$ 75.00	$ 316,800.00	
2. QC Manager (assume 12 hours/shift)	4,224	HR	$ 120.00	$ 506,880.00	
3. Project Manager (assume 10% of QC Manager time)	422	HR	$ 160.00	$ 67,584.00	
4. Per Diem	704	SHIFT	$ 109.00	$ 76,736.00	
K. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	9	EA	$ 8.50	$ 76.50	
2. Atterberg Limits (ASTM D 4318)	9	EA	$ 60.00	$ 540.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	9	EA	$ 85.00	$ 765.00	
4. Specific Gravity (ASTM D 854)	9	EA	$ 45.00	$ 405.00	
5. Standard Proctor (ASTM D 698)	5	EA	$ 175.00	$ 875.00	
II. Swan Pond Road Corridor					
A. Working Platform					
1. Geogrid					
a. Materials	70,000	SF	$ 0.29	$ 20,300.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	70,000	SF	$ 0.06	$ 4,200.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,600	CY	$ 42.05	$ 109,330.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	2,600	CY	$ 1.88	$ 4,888.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	700	CY	$ 39.55	$ 27,685.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	700	CY	$ 1.88	$ 1,316.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	40,000	CY	$ 70.00	$ 2,800,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	16,600	CY	$ 2.13	$ 35,358.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	4,600	CY	$ 10.35	$ 47,610.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	4,600	CY	$ 5.45	$ 25,070.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	4,600	CY	$ 1.88	$ 8,648.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	4,600	CY	$ 1.50	$ 6,900.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,900	CY	$ 27.00	$ 105,300.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	3,900	CY	$ 5.45	$ 21,255.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	95,200	SF	$ 0.35	$ 33,320.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	95,200	SF	$ 0.26	$ 24,752.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	2,800	LF	$ 1.26	$ 3,528.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 35,700.00	$ 35,700.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,200	HR	$ 75.00	$ 90,000.00	
2. QC Manager (assume 12 hours/shift)	1,200	HR	$ 120.00	$ 144,000.00	
3. Project Manager (assume 10% of QC Manager time)	120	HR	$ 160.00	$ 19,200.00	
4. Per Diem	200	SHIFT	$ 109.00	$ 21,800.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 5 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
II. Ball Field Corridor					
A. Working Platform					
1. Geogrid					
a. Materials	50,000	SF	$ 0.29	$ 14,500.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	50,000	SF	$ 0.06	$ 3,000.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,900	CY	$ 42.05	$ 79,895.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	1,900	CY	$ 1.88	$ 3,572.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	500	CY	$ 39.55	$ 19,775.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	500	CY	$ 1.88	$ 940.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	30,000	CY	$ 70.00	$ 2,100,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Rock Buttress (4H:1V, 50 feet wide and 15 feet tall; 6H:1V to top of slope)					
1. Geotextile Filter Fabric	306,000	SF	$ 0.30	$ 91,800.00	RS Means 2009 Item 31 32 1916 1500
2. Materials and Hauling (assume five mile round trip)	63,000	CY	$ 61.56	$ 3,878,280.00	RS Means 2009 Item 31 37 1310 0300 (at 110 pcf) and 03 05 1325 1150
3. Placement	63,000	CY	$ 1.88	$ 118,440.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	11,900	CY	$ 2.13	$ 25,347.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,300	CY	$ 10.35	$ 34,155.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,300	CY	$ 5.45	$ 17,985.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,300	CY	$ 1.88	$ 6,204.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,300	CY	$ 1.50	$ 4,950.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,800	CY	$ 27.00	$ 75,600.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,800	CY	$ 5.45	$ 15,260.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,800	CY	$ 1.88	$ 5,264.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	68,000	SF	$ 0.35	$ 23,800.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	68,000	SF	$ 0.26	$ 17,680.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	2,000	LF	$ 1.26	$ 2,520.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 67,500.00	$ 67,500.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	900	HR	$ 75.00	$ 67,500.00	
2. QC Manager (assume 12 hours/shift)	900	HR	$ 120.00	$ 108,000.00	
3. Project Manager (assume 10% of QC Manager time)	90	HR	$ 160.00	$ 14,400.00	
4. Per Diem	150	SHIFT	$ 109.00	$ 16,350.00	
H. Laboratory Testing					

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 5 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
IV. Ash Pond North Dike C					
A. Working Platform					
1. Geogrid					
a. Materials	105,000	SF	$ 0.29	$ 30,450.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	105,000	SF	$ 0.06	$ 6,300.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	3,900	CY	$ 42.05	$ 163,995.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	3,900	CY	$ 1.88	$ 7,332.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,000	CY	$ 39.55	$ 39,550.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	1,000	CY	$ 1.88	$ 1,880.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	53,750	CY	$ 70.00	$ 3,762,500.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	19,900	CY	$ 72.55	$ 1,443,745.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	19,900	CY	$ 1.88	$ 37,412.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	12,500	CY	$ 2.13	$ 26,625.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,500	CY	$ 10.35	$ 36,225.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,500	CY	$ 5.45	$ 19,075.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,500	CY	$ 1.88	$ 6,580.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,500	CY	$ 1.50	$ 5,250.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,900	CY	$ 27.00	$ 78,300.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	2,900	CY	$ 5.45	$ 15,805.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,900	CY	$ 1.88	$ 5,452.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	71,400	SF	$ 0.35	$ 24,990.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	71,400	SF	$ 0.26	$ 18,564.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	2,100	LF	$ 1.26	$ 2,646.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 61,100.00	$ 61,100.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,644	HR	$ 75.00	$ 123,300.00	
2. QC Manager (assume 12 hours/shift)	1,644	HR	$ 120.00	$ 197,280.00	
3. Project Manager (assume 10% of QC Manager time)	164	HR	$ 160.00	$ 26,304.00	
4. Per Diem	274	SHIFT	$ 109.00	$ 29,866.00	
H. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 5 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
V. Ash Pond East Divider Dike					
A. Working Platform					
1. Geogrid					
a. Materials	66,000	SF	$ 0.29	$ 19,140.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	66,000	SF	$ 0.06	$ 3,960.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	2,500	CY	$ 42.05	$ 105,125.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
b. Placement	2,500	CY	$ 1.88	$ 4,700.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	700	CY	$ 39.55	$ 27,685.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	700	CY	$ 1.88	$ 1,316.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	34,000	CY	$ 70.00	$ 2,380,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	13,100	CY	$ 2.13	$ 27,903.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,600	CY	$ 10.35	$ 37,260.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	3,600	CY	$ 5.45	$ 19,620.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,600	CY	$ 1.88	$ 6,768.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	3,600	CY	$ 1.50	$ 5,400.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	3,100	CY	$ 27.00	$ 83,700.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	3,100	CY	$ 5.45	$ 16,895.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	3,100	CY	$ 1.88	$ 5,828.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	74,800	SF	$ 0.35	$ 26,180.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	74,800	SF	$ 0.26	$ 19,448.00	RS Means 2009 Item 31 25 1310 0200
D. Silt Fence	2,200	LF	$ 1.26	$ 2,772.00	RS Means 2009 Item 31 25 1310 1100
E. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 30,300.00	$ 30,300.00	
F. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,020	HR	$ 75.00	$ 76,500.00	
2. QC Manager (assume 12 hours/shift)	1,020	HR	$ 120.00	$ 122,400.00	
3. Project Manager (assume 10% of QC Manager time)	102	HR	$ 160.00	$ 16,320.00	
4. Per Diem	170	SHIFT	$ 109.00	$ 18,530.00	
G. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
VI. Ash Pond South Dike C					
A. Working Platform					
1. Geogrid					
a. Materials	30,000	SF	$ 0.29	$ 8,700.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
b. Installation	30,000	SF	$ 0.06	$ 1,800.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
2. No. 57 Aggregate (assume 12 inches thick)					
a. Materials and Hauling (assume five mile round trip)	1,200	CY	$ 42.05	$ 50,460.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 5 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
b. Placement	1,200	CY	$ 1.88	$ 2,256.00	RS Means 2009 Items 31 23 2317 0020
3. No. 10 Limestone Sand (assume 3 inches thick)					
a. Materials and Hauling (assume five mile round trip)	300	CY	$ 39.55	$ 11,865.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
b. Placement	300	CY	$ 1.88	$ 564.00	RS Means 2009 Item 31 23 2317 0020
B. Foundation Improvements (Deep Soil Mixing Techniques)					
1. Mobilization and Test Programs	0	LS	$ 250,000.00	$ -	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
2. Soil Mix Program	8,500	CY	$ 70.00	$ 595,000.00	Hayward Baker Soil Mix Soil Stabilization Budgetary Proposal dated September 17, 2009
C. Riprap Armoring (assume 5 feet thick)					
1. Materials and Hauling (assume five mile round trip)	11,400	CY	$ 72.55	$ 827,070.00	RS Means 2009 31 37 1310 0100 and 03 05 1325 1150
2. Placement	11,400	CY	$ 1.88	$ 21,432.00	RS Means 2009 Item 31 23 2317 0020
D. Perimeter Ditch (assume trap. ditch: 8 ft wide base, 4 ft deep, 3H:1V side slopes)					
1. Excavation	7,200	CY	$ 2.13	$ 15,336.00	RS Means 2009 Items 31 23 1642 0020, and 31 23 1642 0250
2. Soil Barrier (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	2,000	CY	$ 10.35	$ 20,700.00	RS Means 2009 Item 31 23 2315 6010
b. Hauling (assume two mile round trip)	2,000	CY	$ 5.45	$ 10,900.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	2,000	CY	$ 1.88	$ 3,760.00	RS Means 2009 Item 31 23 2317 0020
d. Compaction	2,000	CY	$ 1.50	$ 3,000.00	RS Means 2009 Item 31 23 2323 5640
3. Vegetative Soil Cover (assume 12 inches thick)					
a. Excavation and Loadout from Off-Site Borrow Area	1,700	CY	$ 27.00	$ 45,900.00	RS Means 2009 Item 31 23 2315 7010
b. Hauling (assume two mile round trip)	1,700	CY	$ 5.45	$ 9,265.00	RS Means 2009 Item 31 23 2320 1430
c. Placement	1,700	CY	$ 1.88	$ 3,196.00	RS Means 2009 Item 31 23 2317 0020
d. Seeding and Mulching	40,800	SF	$ 0.35	$ 14,280.00	RS Means 2009 Item 32 91 1913 1000
4. Synthetic Turf Reinforcement Mat	40,800	SF	$ 0.26	$ 10,608.00	RS Means 2009 Item 31 25 1310 0200
E. Silt Fence	1,200	LF	$ 1.26	$ 1,512.00	RS Means 2009 Item 31 25 1310 1100
F. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 17,400.00	$ 17,400.00	
G. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	348	HR	$ 75.00	$ 26,100.00	
2. QC Manager (assume 12 hours/shift)	348	HR	$ 120.00	$ 41,760.00	
3. Project Manager (assume 10% of QC Manager time)	35	HR	$ 160.00	$ 5,568.00	
4. Per Diem	58	SHIFT	$ 109.00	$ 6,322.00	
H. Laboratory Testing					
1. Natural Moisture Content (ASTM D 2216)	1	EA	$ 8.50	$ 8.50	
2. Atterberg Limits (ASTM D 4318)	1	EA	$ 60.00	$ 60.00	
3. Sieve and Hydrometer Analysis (ASTM D 422)	1	EA	$ 85.00	$ 85.00	
4. Specific Gravity (ASTM D 854)	1	EA	$ 45.00	$ 45.00	
5. Standard Proctor (ASTM D 698)	1	EA	$ 175.00	$ 175.00	
III. Working Platform (Excludes Dikes, Corridors, Test Embankment and Relic Area)					
A. Geogrid					
1. Materials	6,240,000	SF	$ 0.29	$ 1,809,600.00	Tensar Corp Communication September 18, 2009 (Additional shipping fees for small orders)
2. Installation	6,240,000	SF	$ 0.06	$ 374,400.00	Assuming 1 Foreman and 2 Laborers working and placing 2500 SY per day
B. No. 57 Aggregate (assume 12 inches thick)					
1. Materials and Hauling (assume five mile round trip)	231,200	CY	$ 42.05	$ 9,721,960.00	RS Means 2009 Items 03 05 1325 1050 and 03 05 1325 1150
2. Placement	231,200	CY	$ 1.88	$ 434,656.00	RS Means 2009 Items 31 23 2317 0020

Capital Cost Opinion

Dredge Cell / Embayment Area Component Notebook
Alternative 5 - Base Grade / Working Platform Construction and Conceptual Perimeter Improvements

Kingston Fossil Plant
Harriman, Roane County, Tennessee

Project Element	Quantity	Units	Unit Rate	Cost	Source
C. No. 10 Limestone Sand (assume 3 inches thick)					
1. Materials and Hauling (assume five mile round trip)	57,800	CY	$ 39.55	$ 2,285,990.00	RS Means 2009 Items 03 05 1325 0950 and 03 05 1325 1150
2. Placement	57,800	CY	$ 1.88	$ 108,664.00	RS Means 2009 Item 31 23 2317 0020
D. Dust Control (assume light dusting during construction period; 1% of capital costs)	1	LS	$ 150,600.00	$ 150,600.00	
E. Construction Monitoring					
1. Engineering Technician (assume 12 hours/shift)	1,392	HR	$ 75.00	$ 104,400.00	
2. QC Manager (assume 12 hours/shift)	1,392	HR	$ 120.00	$ 167,040.00	
3. Project Manager (assume 10% of QC Manager time)	139	HR	$ 160.00	$ 22,272.00	
4. Per Diem	232	SHIFT	$ 109.00	$ 25,288.00	

Total Cost $ 50,300,000.00 (rounded)

Assumptions:
(1) The volume/cost metrics are conceptual in nature and are based on initial design/planning efforts for potential closure alternatives under current consideration. These metrics are solely intended to facilitate additional design/planning/decision activities.
(2) Quantities based on lidar mapping dated August 14, 2009.
(3) Soil mix program unit rate includes labor, equipment, materials and quality control testing.
(4) One material type assumed for earthen berm and perimeter ditch soil barrier construction.
(5) Surveying services not included.