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Coal Combustion Residue Impoundment

Round 9 - Dam Assessment Report

Plant Kraft

Ash Dikes

Georgia Power Company

Port Wentworth, Georgia

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

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Fairfax, Virginia

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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion waste from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008 flooded more than 300 acres of land, damaging homes and property. In response the U.S. EPA is assessing the stability and functionality of the coal combustion ash impoundments and other management units across the country and, as necessary, identifying any needed corrective measures.

This assessment of the stability and functionality of the Plant Kraft Coal Combustion Residue (CCR) Impoundment is based on a review of available documents and on the site assessment conducted by Dewberry personnel on March 3, 2011. We found the supporting technical documentation Fair (Section 1.1.3). As detailed in Section 1.2.3, there is one recommendation based on the review of supporting technical documentation that may help to maintain a safe and trouble-free operation.

In summary, the Georgia Power Plant Kraft CCR Impoundment is SATISFACTORY for continued safe and reliable operation, with no recognized existing or potential management unit safety deficiencies.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety)

In early 2009, the EPA sent a first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is **to evaluate the condition and potential of residue release from management units**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. Also, after the field visit, additional information was received by Dewberry & Davis, LLC about the Plant Kraft CCR impoundment that was reviewed in preparing this report.

Factors considered in determining the hazard potential classification of the management units(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 Conclusions

Conclusions are based on visual observations from a one-day site visit in Thursday March 3, 2011, and review of technical documentation provided by the Georgia Power Company.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The dike embankments and spillway appear to be structurally sound based on a review of the engineering data provided by the owner's technical staff and Dewberry engineers' observations during the site visit.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

Hydrologic and hydraulic analyses provided to Dewberry indicate adequate impoundment capacity to contain the 1 percent probability design storm without overtopping the dikes but with no freeboard.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

Engineering documentation reviewed is referenced in Appendix A. The supporting technical documentation is Fair. The technical documentation provided for review has discrepancies in the embankment crest elevations used for the different analyses. The hydraulic analysis indicates an embankment crest elevation of 15 ft. The slope stability analyses indicate an embankment elevation of about 16 ft. As whichever elevation is correct has an effect on the hydrologic and structural stability results. If the 15 ft. elevation is correct, the slope height decreases and the safety factors should increase above currently acceptable levels. If the 16 ft. elevation is correct the impoundment may be able to contain the 100 year, 24-hour storm with a freeboard of 1-foot.

Note that the discrepancy does not change Dewberry's overall assessment of the safety of the Plant Kraft CCR impoundment.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the management unit provided by the owner was an accurate representation of what Dewberry observed in the field.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the management unit required to conduct a thorough field observation. The visible parts of the embankment dikes and outlet structure were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability. Embankments appear structurally sound. There are no apparent indications of unsafe conditions or conditions needing remedial action.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation appear to be adequate for the ash management unit. There was no evidence of significant embankment repairs or prior releases observed during the field inspection.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program appears to be adequate. The management unit dikes are not instrumented. Based on the size of the dikes, the portion of the impoundment currently used to store wet ash and stormwater, the history of satisfactory performance and the current inspection program, installation of a dike monitoring system is not needed at this time.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The facility is SATISFACTORY for continued safe and reliable operation. No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria.

1.2 Recommendations

1.2.1 Recommendations Regarding the Supporting Technical Documentation

Dewberry recommends that the apparent discrepancy in crest elevation data used in the hydraulic and slope stability analyses be resolved for purposes of clarity and consistency.

1.3 Participants and Acknowledgement

1.3.1 List of Participants

Scott Smith, Georgia Power Co.

Joe R. Griggs, Georgia Power Co.

Bruce McClure, Georgia Power Co.

Brenda Fischer, Georgia Power Co.

Lee Lively, Georgia Power Co.

Brian Nease, Georgia Power Co.

Brian Barton, Georgia Power Co.

Rochelle Routman, Georgia Power Co.

Billie Jo Huddleston, Georgia Power Co.

Joel L. Galt, P.E., Southern Company

Gary H. McWhorter, P.E., Southern Company

Hollister A. Hill, Troutman Sanders LLP

Bradley J. Adams, Troutman Sanders LLP

Frank B. Lockridge, P.E., Dewberry

Joseph P. Klein III, P.E., Dewberry

1.3.2 Acknowledgement and Signature

We acknowledge that the management unit referenced herein has been assessed on March 3, 2011.

__________________________	__________________________
Frank B. Lockridge, P.E. (GA PE033424)	Joseph P. Klein III, P.E.
Dewberry	Dewberry

2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

2.1 Location and General Description

Plant Kraft is located on the south bank of the Savannah River approximately 5 miles north of the city of Savannah. The plant is operated by Georgia Power Company and is comprised of four operating units: three coal-fired and one oil/natural gas-fired. Commercial operation of the plant began July 1, 1958 and the ash pond was commissioned at that time. The impoundment was expanded in 1963 and reduced to its present size in 1977.

The ash pond is rectangular, with two partial interior dikes forming a serpentine drainage path through three long, narrow, interior cells. Ash is sluiced to the impoundment, given time to precipitate out of the slurry, and is then excavated for transport to an off-site, permitted solid waste disposal facility.

A project location aerial photograph is provided in Appendix A-Doc 01 and a topographic map is included in Appendix A Doc 02.

Table 2.1: Summary of Dam Dimensions and Size

	Plant Kraft Ash Pond
Dam Height (ft)	6 ft.
Crest Width (ft)	North side; 25 ft. Other sides: 20 ft.
Length (ft)	2350 ft.
Side Slopes (upstream) H:V	1.5:1.0
Side Slopes (downstream) H:V	1.5:1.0

2.2 Coal Combustion Residue Handling

2.2.1 Fly Ash

Fly ash generated from the combustion of coal is collected in an electrostatic precipitator. A rapping system removes the fly ash from the precipitator plates into an ash hopper. The fly ash is transported from the ash hopper to an ash silo by a vacuum piping system. If necessary, the fly ash can be sluiced to the ash pond as an alternate storage location. From the silo fly ash is either 1) sold for beneficial re-use, 2) transported by covered truck to a Georgia Power owned and operated permitted solid waste landfill, or 3) sluiced to the ash pond (See Appendix A Doc 3).

Due to site access restrictions, Dewberry personnel could not obtain pictures of the handling equipment.

2.2.2 Bottom Ash

Bottom ash is collected in the bottom ash hopper at the bottom of the boiler and is sluiced directly to the ash pond via a hydraulic piping system. After settling in the ash pond, it is dewatered, excavated, and transported to a Georgia Power owned and operated permitted solid waste disposal facility via a covered truck.

2.2.3 Boiler Slag

Boiler slag is cleaned out by a steam lancing process and collected in the bottom ash hopper. It is pulverized by grinders located in the bottom ash hopper, and is sluiced to the ash pond by a hydraulic system. It is transported to the landfill in the same manner as the bottom ash.

2.2.4 Flue Gas Desulfurization Sludge

No flue gas desulfurization sludge is generated by the plant.

2.3 Size and Hazard Classification

Due to low height and storage volume, the Plant Kraft Ash Pond is neither listed on the National Inventory of Dams nor identified by the Georgia Environmental Protection Division Safe Dams Program. The height of the dam is about 6 feet and the storage capacity of the impoundment is 40.5 acre feet. Based on these sizes, the impoundment would fall into the Small Category as listed in Table 2.2a.

Table 2.2a: USACE ER 1110-2-106 Size Classification

Category	**Impoundment Storage (Ac-ft)**	**Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

Because of the small size, the Plant Kraft ash pond has not been given a hazard classification under the Georgia Safe Dams Program. Dewberry conducted a qualitative hazard classification based on the Federal Guidelines for Dam Safety, dated April, 2004 and shown in accordance with Table 2.2b.

Table 2.2b: FEMA Federal Guidelines for Dam Safety Hazard Classification		
	Loss of Human Life	**Economic, Environmental, Lifeline Losses**
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

Based on the location and size of the impoundment, in the event of a catastrophic failure, loss of human life is not probable, and economic or environmental losses would be limited to land owned by Georgia Power Company. Therefore Dewberry evaluated the impoundment as a Low hazard potential.

2.4 Amount and Type of Residuals Currently Contained in the Unit(s) and Maximum Capacity

Currently bottom ash and boiler slag are stored in the ash pond. Intermittently, fly ash may be sluiced to the pond.

Table 2.3: Maximum Capacity of Unit	
Plant Kraft Ash Pond	
Surface Area (acre)[1]	7.0
Current Storage Capacity (cubic yards)[1]	32,363
Current Storage Capacity (acre-feet)	20.2
Total Storage Capacity (cubic yards)[1]	65,395
Total Storage Capacity (acre-feet)	40.5
Crest Elevation (feet)	20.0[2]
Normal Pond Level (feet)	12.5

[1] Estimates provided by Georgia Power based on available data

[2] Crest elevation shown on construction drawing 9477-FY-3A dated 8/7/68 by Stone and Webster (See Appendix A Doc 04).

2.5 Principal Project Structures

2.5.1 Earth Embankment

The Plant Kraft ash pond impoundment is formed by an earth fill embankment constructed of sand and sandy silt excavated from the pond area. The design crest width is 25 feet on the north side of the impoundment and approximately 20 ft. on the other sides. A waste treatment pond formerly located adjacent to the south side of the ash pond has been filled and the area reclaimed. As a result the south side of the impoundment embankment is barely discernable. The maximum height of the embankment is about 6 feet.

The total length of the perimeter embankment is about 2350ft. The embankment slopes are 1.5H to 1.0V.

The crests are graveled to allow vehicle access for maintenance. Both the inside and outside slopes of the embankment are protected by grass. Riprap has been placed for erosions protection in small sections of the east and north sides of the embankment where adjacent ground is above the crest elevation, allowing surface water to drain into the pond.

2.5.2 Outlet Structures

An overflow structure is located in the southwest corner of the impoundment. Water elevation in the CCR impoundment is controlled by placement of stop logs in the overflow structure. The overflow structure discharges through a 42-inch diameter concrete pipe to a canal south of the impoundment that flows into the Savannah River.

2.6 Critical Infrastructure Within Five Miles Down Gradient

Critical infrastructure inventory data was not provided to Dewberry for review.

A review of a topographic map of the area and observations during our site visit indicate surface drainage is to the southeast. Drainage is intercepted by a canal that runs parallel and south of the ponds. This canal drains to the Savannah River. The area south of the canal is an industrial area. The aerial photographs indicate a fuel storage tank farm at the Port of Savannah approximately 2-1/4 miles downriver from the Plant Kraft CCR impoundment.

The nearest town is Savannah which is located approximately 5 miles south of the site.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

Summary of Reports on the Safety of the Management Unit

Georgia Power Company provided reports of two internal corporate dam safety inspections conducted by Southern Company engineers. The reports provided included:

- *Plant Kraft, Dam Safety Inspection,* February 13, 2009 (See Appendix A Doc. 05)
- *Plant Kraft, Dam Safety Inspection,* August 12, 2010 (See Appendix A Doc. 06)

Georgia Power Company also provided reports of weekly ash pond dike inspections for the weeks of December 17, 2009, November 18, 2010 and December 30, 2010 (See Appendix A Doc 07)

The 2009 inspection report included two recommendations in response to observations of missing grass cover on areas of the embankment. The recommendations were:

- Correct surface drainage conditions to reduce eroding grass surface
- Grass cover in southeast corner of embankment worn away by vehicle traffic should be replaced by gravel roadway, or reseeded and traffic banned from the area.

The 2010 inspection concluded that the 2009 recommendations had been effective in the areas where they had been implemented. The 2010 report recommended that drainage repairs be made to additional areas and that gravel be added to additional areas.

The weekly pond dike inspection log for the week of December 30, 2010 indicated that grass was thin in areas near the southeast corner of the impoundment. The report recommended reseeding and fertilizing the area in the spring.

Data provided to Dewberry for review indicated that there have been no State or Federal inspections of the Plant Kraft ash pond.

3.1 Summary of Local, State, and Federal Environmental Permits

Due to the small size of the embankment and impoundment, the CCR impoundment is not required to be permitted under the Georgia Safe Dams Program.

Discharge from the impoundment is regulated by the Georgia Department of Natural Resources and the impoundment has been issued a National Pollutant Discharge Elimination System Permit. Permit No. GA 0003816 dated June 6, 1999.

3.2 Summary of Spill/Release Incidents

Data reviewed by Dewberry did not indicate any spills, unpermitted releases, or other performance related problems with the dam over the last 10 years.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 Summary of Construction History

4.1.1 Original Construction

Data provided to Dewberry for review indicated Plant Kraft, including the ash pond, was designed by Stone and Webster Engineering (See Appendix A Doc 04). The original ash pond was commissioned in 1958.

4.1.2 Significant Changes/Modifications in Design since Original Construction

Data provided to Dewberry for review indicated the pond was expanded in 1963 and reduced and reconfigured to its present size in 1977.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

No significant repairs have been required since the initial construction of the pond.

4.2 Summary of Operational Procedures

4.2.1 Original Operational Procedures

Data describing the original operating procedures were not provided to Dewberry for review.

4.2.2 Significant Changes in Operational Procedures and Original Startup

Data provided to Dewberry for review indicated that after the 1963 expansion, the Plant Kraft ash pond included a three cell layout. However, unlike the current configuration, the 1960s cells were separated at the east end of the impoundment and connected with an open header flow area at the west end (See Appendix A Doc 04).

4.2.3 Current Operational Procedures

Currently the impoundment primarily receives slurried bottom ash and boiler slag; occasionally fly ash is slurried into the pond as well. A small amount of surrounding surface runoff also enters the pond. The interior dikes have been reconfigured to provide a serpentine drainage path through the impoundment (See Appendix A Doc 02). As ash settles out and fills a cell, the ash is excavated and hauled to an off-site, permitted disposal facility.

After precipitation of ash, slurry water is pumped back to the plant for reuse. An overflow outlet is located in the southwest corner of the impoundment to maintain the pond water level. Water level is maintained by positioning stop logs in the spillway structure. The overflow outlet discharges into a canal located south of the site which discharges into the Savannah River located along the east side of Plant Kraft.

4.2.4 Other Notable Events since Original Startup

No additional information was provided to Dewberry concerning notable events impacting the operation of the impoundment.

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5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Frank B. Lockridge, P.E. and Joseph P. Klein III, P.E., performed a site visit on Thursday March 3, 2011 in company with the participants.

The site visit began at 9:00A.M.. The weather was sunny and warm. Photographs were taken of conditions observed. Please refer to the Dam Inspection Checklist in Appendix B Doc 11. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the dam was that it was in satisfactory condition and no significant findings were noted.

5.2 EMBANKMENT

5.2.1 Embankment Crest

The crest of the CCR impoundment embankment had no signs of depressions, tension cracks, or other indications of failure. Previous inspection reports reviewed by Dewberry did not indicate issues concerning the crest. Figure 5.2 – 1 shows the condition of the embankment crest.

Figure 5.2-1: Embankment Crest on North Side of CCR Impoundment

5.2.2 Embankment Upstream/Inside Slopes

The inside slope of the embankment is covered with grass vegetation. There were no observed scarps, sloughs, bulging, cracks, depression, or other indications of slope instability or signs of erosion. Areas of the inside slope impacted by surface runoff across the crest have been armored by the addition of small riprap. Figure 5.3-1 shows the general condition of the slope and an area to which riprap protection has been added.

Figure 5.3-1: Inside Slope of Embankment on North Side of Impoundment

5.2.3 Downstream/Outside Slope And Toe

The outside slope of the embankment is covered with grass vegetation. There were no observed scarps, sloughs, bulging, cracks, depression, or other indications of slope instability or signs of erosion. No standing water or signs of uncontrolled seepage was observed along the toe of the embankment.

Figures 5.4-1 and 5.4-2 show the outside slopes of the embankment on the north and south sides of the impoundment, respectively.

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Figure 5.4-1 Outside Slope of Embankment on North Side of Impoundment

Figure 5.4-2: Outside Slope of Embankment on South Side of Impoundment

5.2.4 Abutments And Groin Areas

Erosion or uncontrolled seepage was not observed along embankment groins. Embankment groins on the north side of the CCR impoundment have had riprap added to protect against erosion caused by surface runoff across the embankment crest.

Figure 5.5-1: Groin Area in Northwest Corner of Embankment

Figure 5.5-2: Groin Area Southeast Corner of Embankment

5.3 OUTLET STRUCTURES

5.3.1 Overflow Structure

The impoundment overflow structure is located in the southwestern corner of the impoundment. The overflow structure consists of a concrete riser in which flow is controlled by a weir and stop logs. Figure 5.6.1-1 shows the riser structure.

Figure 5.3.2-1 Outlet Structure

5.3.2 Outlet Conduit

The outlet conduit consists of a 42-inch diameter concrete pipe that discharges to a drainage canal south of the CCR impoundment. The canal flows along the Plant Kraft property line to the Savannah River. At the time of Dewberry's site visit the water level in the drainage canal was above the bottom of the outlet conduit. Figure 5.6.2-1 shows the outlet conduit.

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Figure 5.6.2-1 Outlet Conduit Discharge Location

5.4 EMERGENCY SPILLWAY

There is no emergency spillway for the impoundment.

5.5 LOW LEVEL OUTLET

There is no low level outlet for the impoundment.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 Supporting Technical Documentation

6.1.1 Flood of Record

No documentation has been provided about the flood of record.

6.1.2 Inflow Design Flood

Southern Company Generation conducted a flood evaluation for the Plant Kraft CCR impoundment (See Appendix A Doc 08). The design storm was the 100 year (1 percent probability of occurrence in any given year), 24-hour event with an intensity of 6.72 inches. The report estimated the 1 percent probability storm can be retained by the impoundment between elevation 13.5 (assumed normal operating pool elevation) and elevation 15 with no freeboard.

6.1.3 Spillway Rating

There is no spillway at this site.

6.1.4 Downstream Flood Analysis

No downstream flood analysis data were provided for review.

6.2 Adequacy of Supporting Technical Documentation

Supporting documentation reviewed by Dewberry is fair.

The flood evaluation report (See Appendix A Doc 08) results indicated an embankment crest elevation of 15 ft. Other data provided to Dewberry indicated crest elevations of 20 ft. (See Appendix A Doc 04) and about 16 ft. (See Section 7 of this report). Although the apparent discrepancy may make the flood evaluation conclusions conservative, it nonetheless creates uncertainty about the actual crest elevation.

6.3 Assessment of Hydrologic/Hydraulic Safety

Based on the flood evaluation (See Appendix A Doc 08) the CCR impoundment can retain the 1 percent probability design storm event with no freeboard. Based on the height of the embankment and the relatively small area of the cells, dam failure by overtopping seems improbable.

Probability of overtopping can be decreased by either lowering the normal pool elevation or determining if the actual crest elevation is higher than 15 ft.

7.0 STRUCTURAL STABILITY

7.1 Supporting Technical Documentation

7.1.1 Stability Analyses and Load Cases Analyzed

Southern Company Engineering and Construction Services conducted slope stability analyses for the CCR impoundment embankment. The results of the analyses were provided in a report dated February 11, 2011 (See Appendix A Doc 09). The analyses were conducted following the guidelines of the U. S. Army Corps of Engineers slope stability manuals. A geotechnical exploration including soil test borings and laboratory was undertaken to provide data for the analyses.

The stability analyses included the results for four loading conditions

- Long-term, steady state conditions
- Steady state with seismic loading
- Design storm event contained within the impoundment
- Design storm event water level and rapid drawdown

7.1.2 Design Parameters and Dam Materials

Documentation provided to Dewberry for review (See Appendix A Doc 09) indicated the stability analyses assumed five soil strata. The assumed soil strata and properties used for the stability analyses are shown in Table 7.1.2.

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Soil Description	Moist Unit Weight (pcf)	Effective Strength Parameters		Total Strength Parameters	
		Cohesion (psf)	Friction (Degrees)	Cohesion (psf)	Friction (Degrees)
Sand – Dike Fill	120	0	35	0	35
Clayey Sandy Silt and Silty Sand	120	104	33	331	10.6
Sandy Clay	115	104	33	331	10.6
Clay	120	200	20	300	12
Sand	120	0	30	0	30

7.1.3 Uplift and/or Phreatic Surface Assumptions

No uplift calculations were provided to Dewberry for review. Based on the stability analyses (See Appendix Doc 09) groundwater elevation is based on monitoring wells at Plant Kraft and the normal pool elevation of the impoundment.

7.1.4 Factors of Safety and Base Stresses

No data pertaining to base stresses were provided to Dewberry for review.

The safety factors computed in the Geotechnical Findings (See Appendix A Doc 09) are listed in Table 7.1.4

Table 7.1.4 Factors of Safety for Plant Kraft

Failure Condition (Load Case)	Computed Factor of Safety	Required Minimum Factor of Safety
Northwest Section of Embankment - Section A-A[1]		
Upstream Steady State	2.2	1.5
Upstream Seismic	1.5	1.1
Downstream Steady State	4.3	1.5
Downstream Seismic	2.4	1.1
Downstream - Max Surcharge	4.3	1.4
Upstream Rapid Drawdown – in dike	2.1	1.3
Southeast Section of Embankment - Section B-B		
Upstream Steady State	2.2	1.5
Upstream Seismic	1.5	1.1
Downstream Steady State	4.0	1.5
Downstream Seismic	2.1	1.1
Downstream - Max Surcharge	3.8	1.4
Upstream Rapid Drawdown – in dike	2.1	1.3
East Side Embankment - Section C-C		
Upstream Steady State	2.2	1.5
Upstream Seismic	1.5	1.1
Downstream Steady State	3.5	1.5
Downstream Seismic	2.2	1.1
Downstream - Max Surcharge	3.5	1.4
Upstream Rapid Drawdown – in dike	2.1	1.3

[1] Section locations included in stability analyses report (See Appendix A – Doc 09)

The analyses indicate that in all cases the ash pond dikes are stable.

7.1.5 Liquefaction Potential

The documentation provided to Dewberry did not include an evaluation of the liquefaction potential.

The soil boring data provided with the stability analyses (See Appendix Doc 09) appears to have a thin layer of loose sand at a depth of about 6 to 9 feet that may be susceptible to liquefaction. However, as the sand layer is only about three feet thick and overlain be a clay layer not expected to be susceptible to liquefaction, is likely that the clay layer can provide temporary support for the impoundment in event of liquefaction of the sand layer.

7.1.6 Critical Geological Conditions

Data provided to Dewberry from review indicated Plant Kraft is underlain by two general geologic units. The upper unit consists of about 12 to 28 feet of medium to coarse grained, loose, and set sand and sandy silt with numerous, discontinuous layers and lenses of silty sand, sandy silt and silty clay. The upper unit comprises the surficial aquifer at the site.

The lower geologic unit consists of an olive-green, dense, micaceous, clayey to sandy silt interspersed with thin sandy layers, peat and shell fragments. The silty layer is encountered at depths of about 24 to 37 feet and is generally the top of a regional hydrogeologic confining bed.

In accordance with the Georgia Rules for Dam Safety, and as shown on the USGS Map for "Peak Acceleration with a 2% Exceedance in 50 years" in the vicinity of Plant Kraft, the ground motion is 0.16g.

7.2 Adequacy of Supporting Technical Documentation

Structural stability documentation is Fair.

The stability analyses report (See Appendix A Doc 09) results indicated an embankment crest elevation of about 16 ft. Other data provided to Dewberry indicated crest elevations of 20 ft. (See Appendix A Doc 04) and about 15 ft. (See Section 6 of this report). Although the apparent discrepancy may make the stability analyses conclusions conservative, it nonetheless creates uncertainty about the actual crest elevation.

7.3 Assessment of Structural Stability

Overall, the structural stability of the dam appears to be satisfactory based on the following observations:

- The site visit of March 3, 2011 did not reveal any areas of concern.
- The Dam Safety Reports provided during our visit indicate good periodic review of the condition of the dikes by competent engineering staff.
- The computed factors of safety for the structural stability of the dikes are within acceptable criteria.

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 Operating Procedures

This impoundment is operated for the storage and settling of ash deposits. Clear water is recycled to the plant or discharged via an overflow system to a canal that empties into the Savannah River.

8.2 Maintenance of the Dam and Project Facilities

The Southern Company has developed a manual entitled, Safety Procedures for Dams and Dikes (Appendix A- Doc.10) that establishes inspection and maintenance requirements for the impoundment dikes. The required procedures include:

- Weekly inspection by plant personnel
- Annual inspections by Southern Company Generation Hydro Services
- Maintain a uniform cover of suitable species of grass on embankment slopes which shall be mowed at least twice a year
- Dam crest shall be protected by a suitable granular surface, and
- Trees and woody brush should not be allowed on the slopes, crest and along the water line of the dikes unless an exception is approved by Southern Company Hydro Services

8.3 Assessment of Maintenance and Methods of Operations

8.3.1 Adequacy of Operating Procedures

Based on the assessments of this report, operating procedures appear to be adequate.

8.3.2 Adequacy of Maintenance

Dewberry engineers reviewed the Dam Safety Reports and the Weekly Ash Pond Inspection Logs provided. These reports did not reflect any serious concerns. Based on this review and the findings of our visit, operation and maintenance procedures seem to be adequate.

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 Surveillance Procedures

Weekly inspections

Weekly inspections are conducted by plant personnel. Inspection observations are documented on the Plant Kraft Weekly Ash Pond Dike Inspection Log visual inspection check list and report (see Appendix A Doc 07). Inspection reports are submitted to the plant manager for review and appropriate corrective actions taken.

Annual inspections

Annual inspections are conducted by Southern Company Generation Hydro Services dam safety engineers. The 2010 inspection report was submitted August 12, 2010 (see Appendix A – 06)

9.2 INSTRUMENTATION MONITORING

The Plant Kraft CCR impoundment embankment does not have an instrumentation monitoring system.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

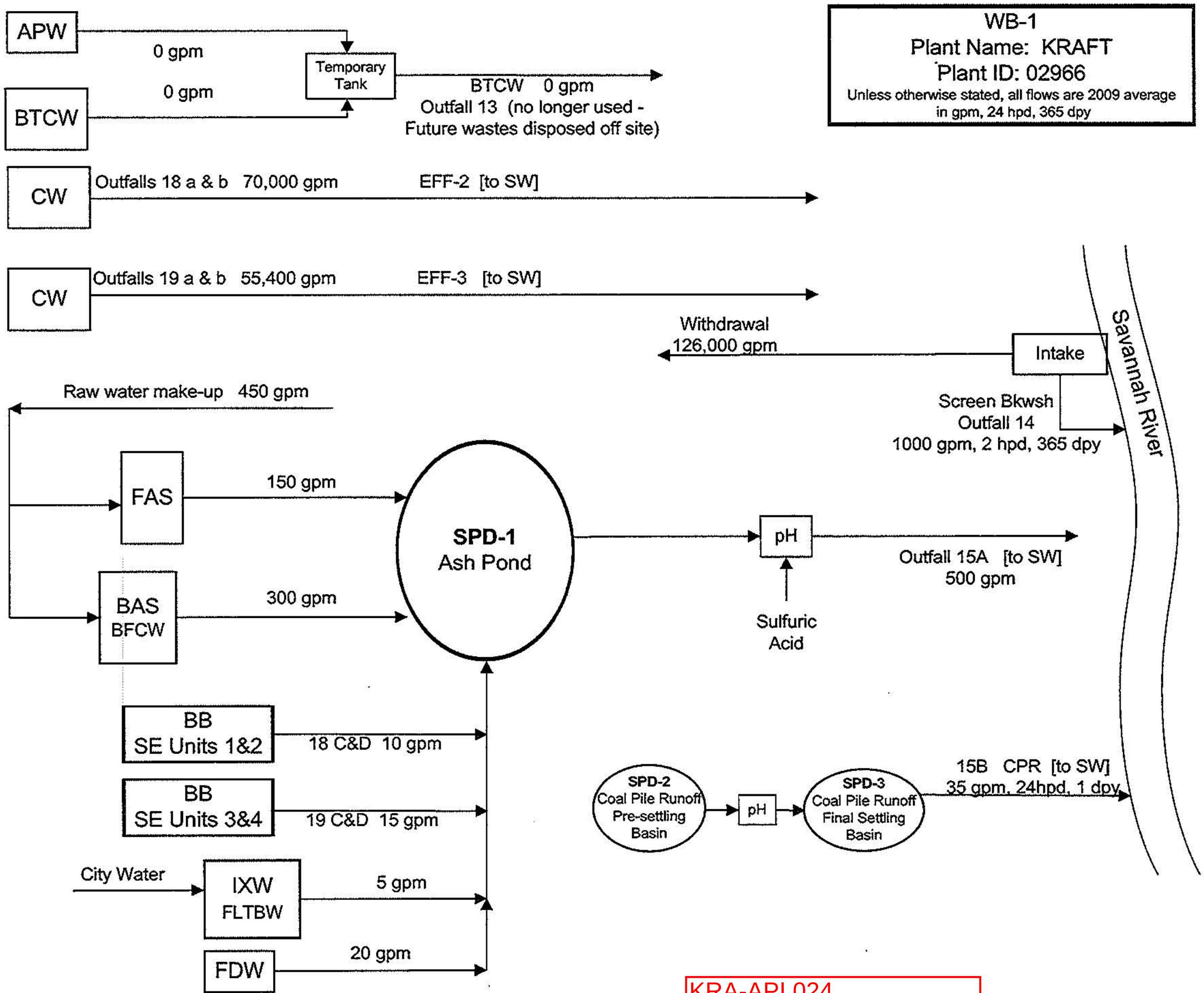
Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

Based on the size of the embankment, a monitoring system is not considered necessary.


Imagery Date: Jan 29, 2011
32°08'52.26" N 81°08'57.04" W elev 14 ft
Eye alt 4687 ft
©2010 Google

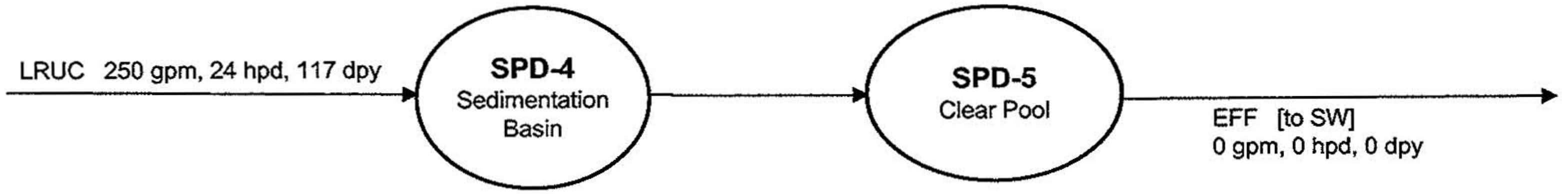
Document 02: Plant McIntosh Topographic Map



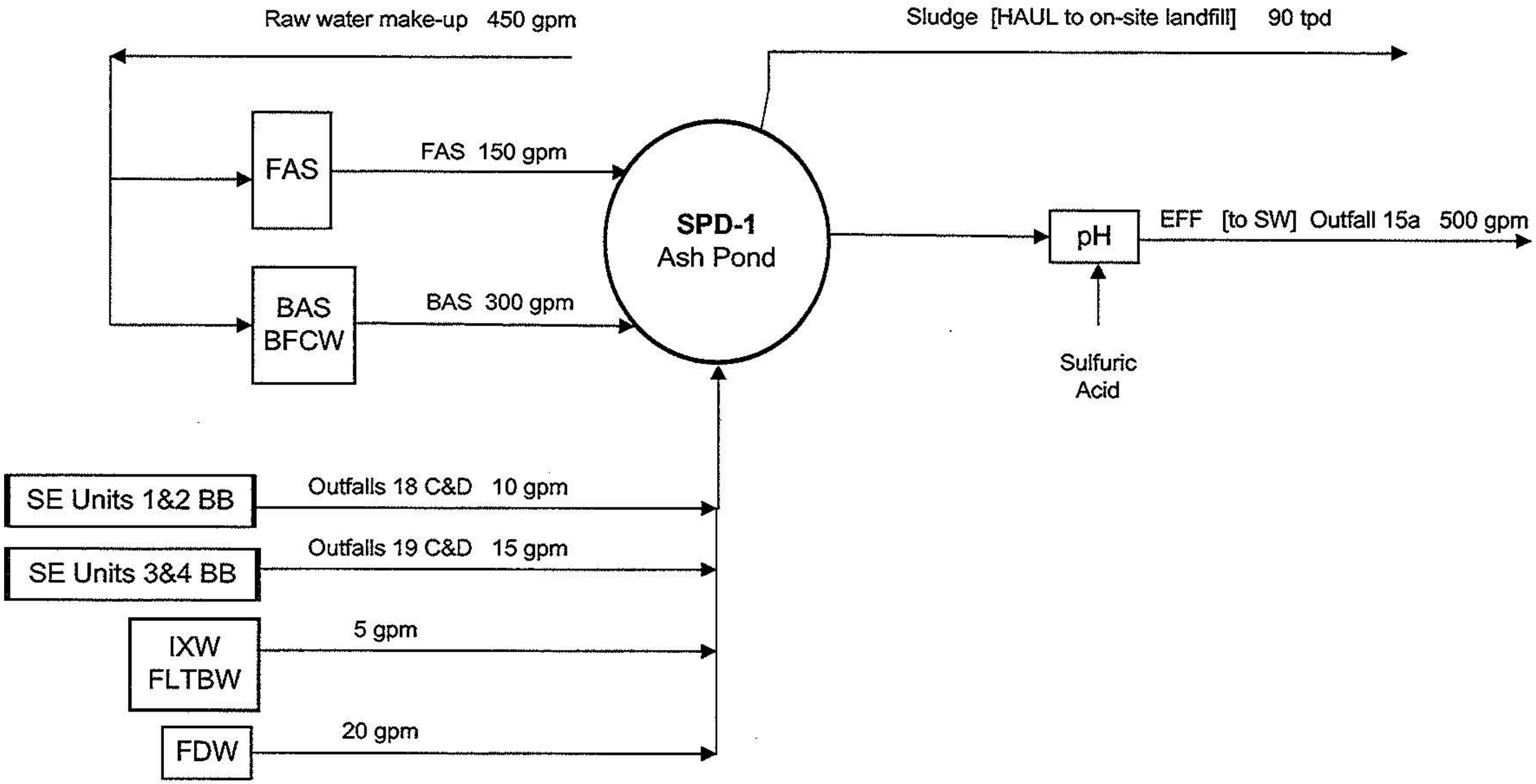
WB-1
Plant Name: KRAFT
Plant ID: 02966
Unless otherwise stated, all flows are 2009 average in gpm, 24 hpd, 365 dpy
APW
0 gpm
Temporary Tank
BTCW
0 gpm
BTCW 0 gpm
Outfall 13 (no longer used - Future wastes disposed off site)
CW
Outfalls 18 a & b 70,000 gpm
EFF-2 [to SW]
CW
Outfalls 19 a & b 55,400 gpm
EFF-3 [to SW]
Withdrawal
126,000 gpm
Intake
Savannah River
Raw water make-up 450 gpm
Screen Bkwsh
Outfall 14
1000 gpm, 2 hpd, 365 dpy
FAS
150 gpm
SPD-1
Ash Pond
pH
Outfall 15A [to SW]
500 gpm
Sulfuric Acid
BAS
BFCW
300 gpm
BB
SE Units 1&2
18 C&D 10 gpm
BB
SE Units 3&4
19 C&D 15 gpm
SPD-2
Coal Pile Runoff Pre-settling Basin
pH
SPD-3
Coal Pile Runoff Final Settling Basin
15B CPR [to SW]
35 gpm, 24hpd, 1 dpy
City Water
IXW
FLTBW
5 gpm
FDW
20 gpm

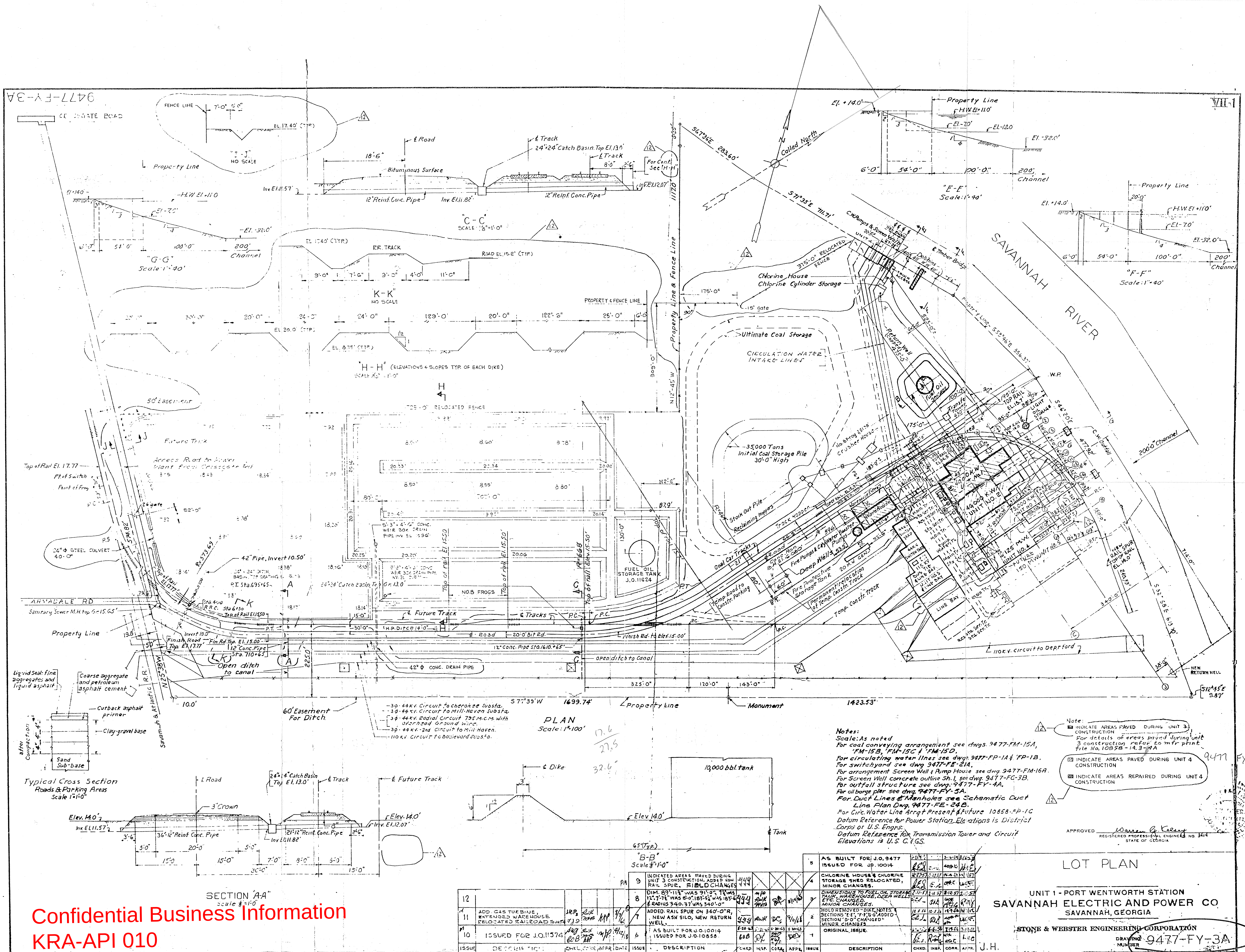
KRA-API 024

Company Name: Georgia Power Company
Plant Name: Plant Kraft
Plant ID: 02966
Diagram: D-2
POND-2 Grumman Road Landfill Runoff Pond System



Company Name: Georgia Power Company
Plant Name: Plant Kraft
Plant ID: 02966
Diagram: D-1
POND-1 Ash Pond System





LOT PLAN
UNIT 1 - PORT WENTWORTH STATION
SAVANNAH ELECTRIC AND POWER CO
SAVANNAH, GEORGIA
STONE & WEBSTER ENGINEERING CORPORATION
DRAWING NUMBER 9477-FY-3A
Notes:
Scale: As noted
For coal conveying arrangement see dwgs. 9477-FM-15A, 'FM-15B, 'FM-15C & 'FM-15D.
For circulating water lines see dwgs. 9477-FP-1A & 'FP-1B.
For switchyard see dwg 9477-FE-21A.
For arrangement Screen Well & Pump House see dwg. 9477-FM-16A.
For Screen Well concrete outline Sh. 1, see dwg. 9477-FC-3B.
For outfall structure see dwg. 9477-FY-4A.
For oil barge pier see dwg. 9477-FY-5A.
For Duct Lines & Manholes see Schematic Duct Line Plan Dwg. 9477-FE-24B.
For Circ. Water Line Arrgt Present & Future 10858-FP-1C
Datum Reference for Power Station Elevations is District Corps of U.S. Engrs.
Datum Reference for Transmission Tower and Circuit Elevations is U.S. C. & GS.
Note:
INDICATE AREAS PAVED DURING UNIT 3 CONSTRUCTION
For details of areas paved during unit 3 construction refer to mfr print file No. 10858-14.3-4A
INDICATE AREAS PAVED DURING UNIT 4 CONSTRUCTION
INDICATE AREAS REPAIRED DURING UNIT 4 CONSTRUCTION
APPROVED
REGISTERED PROFESSIONAL ENGINEER NO. 3414 STATE OF GEORGIA
5 AS BUILT FOR J.O. 9477 ISSUED FOR J.O. 10014
4 CHLORINE HOUSE & CHLORINE STORAGE SHED RELOCATED, MINOR CHANGES.
3 DIMENSIONS TO FUEL OIL STORAGE TANK, WAREHOUSE, DEEP WELLS ETC. CHANGED. MINOR CHANGES.
2 HOLD REMOVED - DIKE, NOTES, SECTIONS "E-E", "F-F", "G-G" ADDED - SECTION "D-D" CHANGED - MINOR CHANGES
1 ORIGINAL ISSUE
9 INDICATED AREAS PAVED DURING UNIT 3 CONSTRUCTION, ADDED NEW RAIL SPUR. FIELD CHANGES
8 DIM. 89'-11¾" WAS 91'-0", 183'-5¼" WAS 183'-6" & RADIUS 340.37' WAS 340'-0"
7 ADDED: RAIL SPUR ON 340'-0" R, NEW ASH SILO, NEW RETURN WELL.
6 AS BUILT FOR J.O. 10014 ISSUED FOR J.O. 10858
12
11 ADD. GAS TURBINE, EXTENDED WAREHOUSE, RELOCATED RAILROAD
10 ISSUED FOR J.O. 11574
ISSUE DESCRIPTION CHKD. INSP. CORR. APPR.
J.H.
PLAN
Scale: 1"=100'
SAVANNAH RIVER
Called North
Property Line
Property Line & Fence Line
ARTHALE RD
Savannah & Atlantic R.R.
Sanitary Sewer M.H. top Gr. 15.65'
60' Easement For Ditch
50' Easement
Future Track
Access Road to Power Plant From Crossgate Rd.
Open ditch to canal
42" Ø CONC. DRAIN PIPE
12" Conc. Pipe Sta. 16.10+65'
FUEL OIL STORAGE TANK J.O. 11624
NO. 8 FROGS
Top of rail El. 15.50
Coal Car Tracks
Ultimate Coal Storage
CIRCULATION WATER INTAKE LINES
35,000 Tons Initial Coal Storage Pile 30'-0" High
Stock Out Pile
Reclaiming Hoppers
Track Hopper
Crusher House
Chlorine House
Chlorine Cylinder Storage
Warehouse
Deep Wells
Fire Protective Storage Tank
Temp. Constr. track
Temp. Road to Constr. Parking
Fuel Oil
Return Well
W.R.
C.W. Outfall
200'-0" Channel
46,000 K.W. UNIT NO. 1
125 M.W. UNIT NO. 4
LINE BAY
110 KV circuit to Deptford
NEW RETURN WELL
Monument
1699.74'
1423.53'
S 77°39' W
N 25°38' W
N 12°-45' W
S 71°35' E 711.71'
S 47°36' E 283.60'
1117.0'
30-44 KV Circuit to Cherokee Substa.
30-44 KV Circuit to Mill-Haven Substa.
30-44 KV Radial Circuit 795 M.C.M. with overhead ground wire.
30-44 KV 2nd Circuit to Mill Haven.
110 KV Circuit to Boulevard Substa.
"C-C" SCALE 1/8"=1'-0"
"K-K" NO SCALE
R.R. TRACK
ROAD EL. 15.8' (TYP.)
"H-H" (ELEVATIONS & SLOPES TYP. OF EACH DIKE)
"G-G" Scale: 1"=40'
"E-E" Scale: 1"=40'
"F-F" Scale: 1"=40'
"J-J" NO SCALE
FENCE LINE
"B-B" Scale 1/8"=1'-0"
10,000 bbl. tank
SECTION "A-A" scale 1/8"=1'-0"
Typical Cross Section Roads & Parking Areas Scale 1"=1'-0"
Liquid Seal: fine aggregates and liquid asphalt
Coarse aggregate and petroleum asphalt cement
Cutback asphalt primer
Clay-gravel base
Sand Sub-base
after Compaction
VII-1
9477-FY-3A

Southern Company Generation
Hydro Services
Bin 10193
241 Ralph McGill Boulevard NE
Atlanta, Georgia 30308-3374
Tel 404.506.7033

SOUTHERN COMPANY
Energy to Serve Your World℠

February 13, 2009

Plant Kraft
Dam Safety Inspection

Mr. W. S. Smith
Plant Manager
Plant Kraft
Georgia Power Company

Dear Mr. Smith:

Attached is the 2009 Dam Safety Inspection Report for Plant Kraft. I did the inspections on January 16, 2009, with the help of Lee Lively. The report includes a discussion and photographs of site conditions noted during the dike inspections and a list of recommendations.

No conditions that posed an immediate threat to the safety of the ash pond were noted during this inspection. For the most part, the ash pond looked to be in good shape. The grass cover on the ash pond dikes and the oil containment dikes could be in better shape than it is. Most of the problems noted with the grass cover appear to be a result of vehicular traffic or grass mowing activities.

I also did a review of the Grumman Road Ash Monofill. There are some grassing and erosion issues at that site that need attention. Most of these problems seem to originate from damage to the grass cover by mowing equipment.

A detailed listing of the recommendations for the ash pond, oil retention dikes, and the Grumman Road ash monofill is included in the attached report. I am available to talk over the recommendations and SCG Hydro Services will provide any assistance requested in obtaining the engineering resources needed.

Details of this inspection were discussed with Mr. Lively at the conclusion of the inspection. Should you have any questions, please contact me at 404-506-7033.

Sincerely,

Joel Galt

Joel Galt
Hydro Services Supervisor

Attachment

KRA-API 015

XC: **Georgia Power Company**
D. E. Jones (w/ attachment)
S. H. Houston (w/attachment)
L. P. Lively (w/attachment)

Southern Company Services
E. B. Allison (w/ attachment)
L. B. Wills (w/ attachment)

Plant Kraft

Ash Pond, Oil Containment Dike and Grumman Road Ash Monofill Inspection Report

Date of Inspection:	January 16, 2009	**Inspection by:**	Joel Galt
Weather:	clear and windy		Lee Lively
Temperature:	30 to 40 F	**Report by:**	Joel Galt
Rainfall (past 24 hrs):	None	**Date of Report:**	February 13, 2009

SUMMARY

Ash Pond: No conditions were found that posed a threat to the safety of the ash pond. The ash pond dikes are generally well-maintained. There are a number of areas where the grass cover has been damaged. These areas need some attention to prevent them from becoming eroded areas that will be more expensive to fix.

Oil Containment Dikes: Like the ash pond dike, the oil containment dike has some areas where the grass cover is damaged.

Ash Monofill: The monofill grass cover has been damaged by mowers. Action is needed to prevent these areas from getting worse.

ADDITIONAL COMMENTS

The common theme for all three locations is that the mowers seem to be causing most of the problems. It would be prudent to change the equipment and techniques used for the mowing in order to reduce the danger to the earth structures and to reduce the cost of maintaining these structures.

RECOMMENDATIONS

No.	Description		Location No.-Photo No.
1	Ash Pond: There are a number of places where the dikes do not have the grass cover they should. This appears to be due to drainage in some locations. The drainage should be corrected and the area grassed.		285-2832 285-2833
2	Ash Pond/Oil containment: The grass cover on some of the dike crests seems to have been worn out by wheeled traffic. These crests should either be graveled to accommodate the traffic, or grassed and the vehicles excluded.		285-2834 286-2835 286-2836 287-2837
3	Ash Pond/Oil Containment: The grass cover on some of the dike slopes and the dikes themselves seem to have been damaged by mower tires rutting the slope and mower blades gouging the slopes. It would be worth investigating different mowing equipment that would be more suitable. Some portions of the dike slopes appear to be steeper than they should be. It would be prudent to cut the grass on these with a weedeater rather than a riding mower.		288-2838 293-2843
4	Oil containment: There is a spot on the rim of the containment that appears to be lower than the remainder of the rim. This should be checked with a level to see if it is lower or not, and if there is a particular reason that it is lower.		292-2842
5	Ash Monofill: The whole site could use a general application of fertilizer to invigorate the grass cover.		296-2856 299-2859 300-2860 302-2864
6	Ash Monofill: There are a number of scalped and rutted places on the monofill that are the direct result of mowing activity. The mowing techniques and equipment should be changed to prevent this damage from recurring. This mowing damage will result in higher maintenance costs at best and may result in erosion of the earth cap and release of ash at the worst.		294-2854 300-2860 304-2867

Plant Kraft

7	Ash Monofill: The bare spots on the monofill should be treated with seed, fertilizer and mulch to replace the grass cover.	**294-2854** **297-2857** **298-2858** **304-2867**
8	Ash Monofill: The slide on the south side of the detention pond should be monitored to see if it moves any more	**306-2870**
9	Ash monofill: A splash pad should be constructed at the outlet for the plastic down drain pipe at location 301.	**301-2862** **301-2863**
10	The oversteep slopes and ditches at locations 295, 301 and other locations should be flattened to a 3:1 or flatter slope, then grassed.	**295-2855** **301-2862**

PREVIOUS RECOMMENDATIONS

No.	Description	Location	Status Open/Closed
1	none		
2			

Plant Kraft

OBSERVATIONS

I - Ash Pond

	Observations - Comments	Location No. - Photograph No.
General Comments	The ash pond is mostly excavated, so there would be very little opportunity for a breach. The only dike of any height is that between the ash pond and the oil containment area, and this one is not very tall.	
1. Upstream Slope		
a. Condition	*There is a fair amount of bare soil showing on the upstream slope, particularly along the south dike. This appears to be due to mower damage and to the fact that the south slope is overly steep. The fix for this would be to grass this area and to cut it with weedeaters rather than mowers.*	**285-2832 285-2833 285-2834**
b. Erosion/Sloughing	*Yes (X) No ( ) There is some washing of the interior slope due to lack of grass cover and oversteepening of the slope.*	
2. Crest		
a. Condition	*The crest of the ash pond dike and the oil containment dike is bare in many areas. This appears to be due in some areas to four-wheeler traffic. It would be a good idea to either discontinue this traffic and grass the crest or, if the traffic is to continue, to gravel the crest.*	**286-2835 286-2836**
3. Downstream Slope		
a. Condition	*There are a number of bare spots on the slope that need attention.*	**288-2838**
b. Seepage/Wet Spots	*Yes ( ) No (x)*	n/a
c. Erosion/Sloughing	*Yes (x) No ( ) There is a fair amount of bare soil showing on the downstream (outside) slope, particularly along the south dike. This appears to be due to mower damage and to the fact that the south slope is overly steep. The fix for this would be to grass this area and to cut it with weedeaters rather than mowers.*	**286-2836**
4. Emergency Aggregate Stockpiles		
a. Available	*Yes ( ) No ( ) Not recommended in this case.*	*n/a*

II - Oil Tank Containment Dikes

	Observations - Comments	Photograph No.
1. Crest		
a. Condition	*The crest of the ash pond dike and the oil containment dike is bare in many areas. This appears to be due in some areas to four-wheeler traffic. It would be a good idea to either discontinue this traffic and grass the crest or, if the traffic is to continue, to gravel the crest. There is a spot (at location 292 on the aerial photo, photo number 2842) where the elevation of the oil containment dike crest appears to be lower than the other parts of the dike crest.*	**289-2839 292-2842**
b. Bare spots/erosion	*Yes (X) No ( ) See comment above.*	*n/a*
2. Inside slopes		
a. Condition	*The inside slopes have a generally good grass cover but need some attention in some areas. There has been damage to the grass cover and to the dike from mower wheels and from mower blades gouging the soil. Part of this is due to the fact that the slopes are somewhat steeper than they ought to be in places. It may be necessary to cut the grass with a weedeater in some areas.*	**289-2839 290-2840 291-2841**
b. Bare spots/erosion	*Yes (x) No ( ) As described above.*	*n/a*
3. Outside Slopes		
a. Condition	*The outside slopes seem to be in decent condition for the most part.*	*n/a*

b. Bare spots/erosion	*Yes (X) No ( ) There are a few spots where the grass cover is not as good as it could be. Mower gouges were noted on the outside slope near the southeast corner. There are some areas under the piping where some gravel should be placed to reduce the chance of erosion.*	**287-2837** **288-2838** **293-2843**

Grumman Road Ash Monofill

	Observations - Comments	Location No. - Photograph No.
a. Condition	*The monofill appears to be secure and there is grass cover over most of the landfill. The grass cover appears to be thin in spots and appears to have been damaged in a number of locations by mowers.*	**298-2858** **299-2859** **302-2864**
b. Bare spots/erosion	*Yes (X) No ( ) There are a number of locations where the grass cover has been damaged. This damage is due to tire rutting and mower blade scalping and gouging. These areas should be treated with seed, fertilizer and mulch to reestablish the grass cover. It would be worthwhile to review the mowing operation to see if changes in practice or equipment can be made to prevent future damage to the landfill cover. There are some minor erosion problems but no major ones. If unaddressed these minor problems could become major. There are some small slopes that are oversteep. These should be regraded and regrassed.*	**294-2854** **295-2855** **297-2857** **300-2860** **304-2867**
c. Detention pond	*The detention pond outlet structure has some brush growing up through the bonnet. This brush was removed shortly after this inspection. There is a slide on the south bank of the detention pond. The slide should be checked periodically for changes. At present it does not appear to be a danger to the operation of the detention pond or the monofill.*	**306-2870** **307-2871**
d. Other Comments	*At the time of this inspection a number of the black plastic drain pipes had been moved from their normal locations and not replaced. This appeared to be the work of the mowing crew. Significant damage to the grass and soil cap could have resulted if there had been a large rainfall event with the drain pipes in this condition. At location 301 a gully has started to erode at the exit for a plastic down drain. This area should be regraded and a splash pad should be constructed at the drain outlet.*	**301-2862** **301-2863**

XIV - Additional Observation/Comments - General

Observations - Comments	Photograph No.
	n/a

Joel Galt - Supervisor
SCG - Hydro Services

Plant Kraft

Ash Pond Inspection Photographs - January 16, 2009

(See accompanying report attached)

Location No. Photo No.	Description	Photo
		
285 **2832**	Alternate ash discharge point. (looking north)	
285 **2833**	Looking at southernmost cell from east end (looking west) There is a lot of bare soil in this area. It would be a good idea to get some grass growing on this slope and to put some gravel on the crest here.	

Plant Kraft

Ash Pond Inspection Photographs - January 16, 2009

(See accompanying report attached)

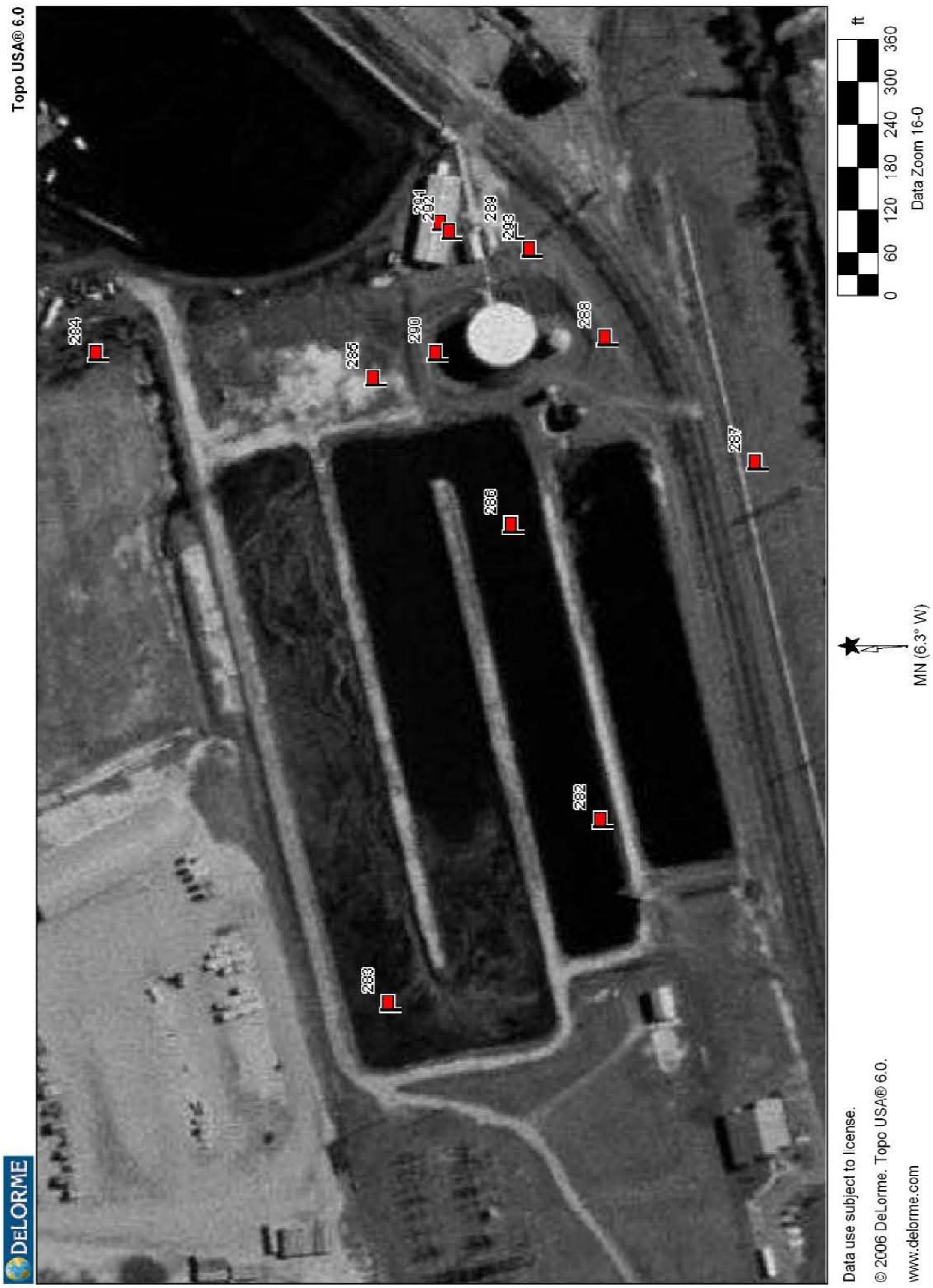
Location No. Photo No.	Description	Photo
285 2834	(looking south) West dike of southernmost ash cell. Slopes need to be grassed and crest needs to be grassed or graveled.	
286 2835	South dike (looking east) The crest of the dike needs to be graveled or grassed. The bare spots appear to be the result of four-wheeler traffic. In that case, it would be better to gravel the crest.	
286 2836	South dike (looking west) Crest needs grassing.	

Plant Kraft

Ash Pond Inspection Photographs - January 16, 2009

(See accompanying report attached)

Location No. Photo No.	Description	Photo



Plant Kraft

Oil Containment Dike Inspection Photographs - January 16, 2009

(See accompanying report attached)

Location No. Photo No.	Description	Photo
288 **2837**	Oil tank containment berm (looking west) Loss of grass, probably due to four-wheeler traffic. The crest needs grassing or gravel.	
287 **2838**	South side of oil tank containment (looking northeast) Grass is thin in some spots on outside of containment dike.	

Plant Kraft

Oil Containment Dike Inspection Photographs - January 16, 2009

(See accompanying report attached)

Location No. Photo No.	Description	Photo
289 **2839**	Oil tank containment dike (looking west) Inside slope. There is some damage to the grass from mowers.	
290 **2840**	This segment of the outside of the containment dike is way too steep. This is contributing to the erosion. The best way to fix this would be to import some soil and flatten the slope. Barring that, the next best thing to do would be to mulch, seed, fertilize the slope, then mow it carefully with weedeaters.	
291 **2841**	Minor erosion on inside of oil containment dike. This area could use some gravel.	
292 **2842**	This may be a low spot on the dike rim. It would be a good idea to shoot this with a level to see if it is.	

Plant Kraft

Oil Containment Dike Inspection Photographs - January 16, 2009

(See accompanying report attached)

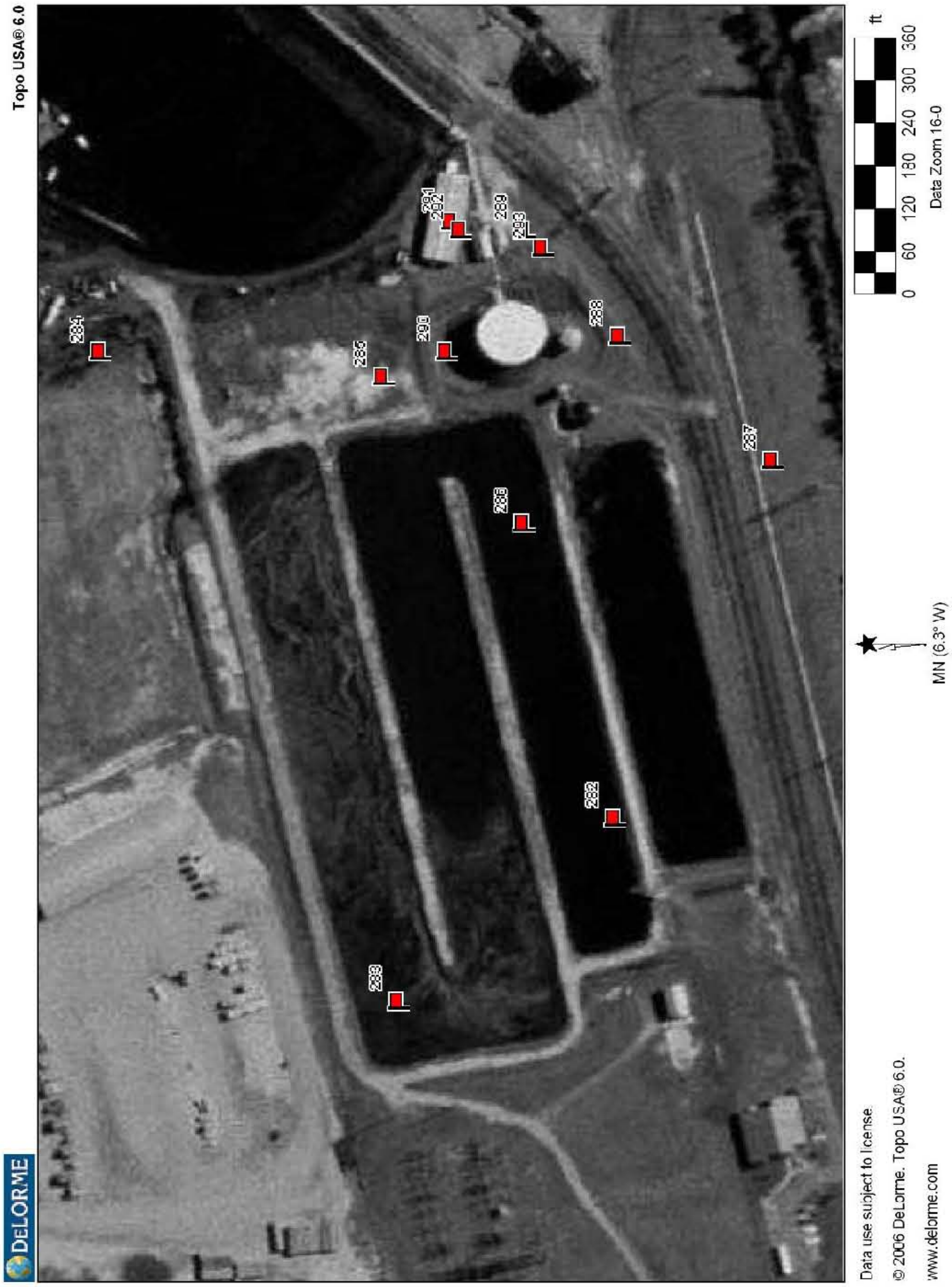
Location No. Photo No.	Description	Photo
293 **2843**	Mower gouges on slope.	

Plant Kraft

Oil Containment Dike Inspection Photographs - January 16, 2009

(See accompanying report attached)

Location No. Photo No.	Description	Photo



Plant Kraft

Grumman Road Ash Monofill Inspection Photographs
January 16, 2009
(See accompanying report attached)

Location No. Photo No.	Description	Photo
294 2854	Bare patch on slope. Areas like this need to be seeded and mulched. The whole monofill could use a general application of fertilizer to strengthen the grass cover as well as special attention to bare spots like this one.	
295 2855	Erosion of oversteep slope. This area should be graded to a flatter slope then seeded, fertilized and mulched.	
296 2856	Bare patches on slope.	
297 2857	Bare spot that has started to erode.	

Plant Kraft

Grumman Road Ash Monofill Inspection Photographs
January 16, 2009
(See accompanying report attached)

Location No. Photo No.	Description	Photo
298 **2858**	Bare spot in foreground and thin grass on the slope in the background.	
299 **2859**	View of northern cell from top of southern cell. Note thin grass cover in some areas.	
300 **2860**	Bare patches on crest of cell.	
300 **2861**	View looking south from crest of northern cell toward southern cell. Note displaced black plastic down drain.	

Plant Kraft

Grumman Road Ash Monofill Inspection Photographs

January 16, 2009

(See accompanying report attached)

Location No. Photo No.	Description	Photo
301 2862	Eroded area at termination of plastic down drain. The pipe should be put back in place. These oversteep slopes should be laid back to a reasonable slope, then grassed, fertilized and mulched. A splash pad for the down drain outlet should be constructed. This could be made of sand-cement bags or of riprap on a bed of gravel.	
301 2863	The large black plastic down drain has been moved, probably to facilitate mowing, and has not been replaced. This could lead to erosion in the event of rain.	
302 2864	View of south cell from north cell.	
304 2867	Damage to berm on top of landfill due to mower scalping. This could lead to serious erosion problems is not corrected.	

Plant Kraft

Grumman Road Ash Monofill Inspection Photographs

January 16, 2009

(See accompanying report attached)

Location No. Photo No.	Description	Photo
305 **2869**	Displaced black plastic down drain. Probably moved by mowing crew.	
306 **2870**	Slide on south bank of detention pond. Large compliance specialist inserted for scale.	
307 **2871**	East side of detention pond. Vegetation growing through outlet structure has been removed since the inspection. There are some bare spots on the pond slope.	

Plant Kraft

Grumman Road Ash Monofill Inspection Photographs
January 16, 2009
(See accompanying report attached)

Location No. Photo No.	Description	Photo

Southern Company Generation
Hydro Services
Bin 10193
241 Ralph McGill Boulevard NE
Atlanta, Georgia 30308-3374
Tel 404.506.7033

SOUTHERN COMPANY
Energy to Serve Your World℠

August 12, 2010

Plant Kraft
Dam Safety Inspection

Mr. W. S. Smith
Plant Manager
Coastal Generation
Georgia Power Company

Dear Mr. Smith:

Attached is the 2010 Dam Safety Inspection Report for Plant Kraft. I did the inspections on May 26, 2010, accompanied by Lee Lively. The report includes a discussion and photographs of site conditions noted during the dike inspections and a list of recommendations.

No conditions that posed an immediate threat to the safety of the ash pond were noted during this inspection. The grass cover on the ash pond dikes and the oil containment dikes could be in better shape than it is. Most of the problems noted with the grass cover appear to be a result of vehicular traffic and grass mowing activities. The mowing equipment and techniques should be changed to avoid the current pattern of damage to the dikes. Gravel should be placed on the crests where traffic has worn off the turf. Some earthwork is needed to correct some over-steepened slopes. An ongoing turf management program to include regularly scheduled over-seeding, fertilizer application, fire ant control and woody brush control is needed to assure the protection of the dikes.

A detailed listing of the recommendations for the ash pond and oil retention dikes is included in the attached report. I am available to talk over the recommendations and SCG Hydro Services will provide any assistance requested in obtaining the engineering resources needed.

Should you have any questions, please contact me at 404-506-7033.

Sincerely,

Joel Galt

Joel Galt
Hydro Services Supervisor

Attachment

KRA-API 016

XC: **Georgia Power Company**

S. W. Connally	(w/ attachment)
M. B. McClure	(w/attachment)
B. Fischer	(w/attachment)
B. N. Nease	(w/attachment)
L. P. Lively	(w/attachment)

Southern Company Services

E. B. Allison	(w/ attachment)
J. F. Crew	(w/ attachment)
L. B. Wills	(w/ attachment)

Plant Kraft

Ash Pond Dike and Oil Containment Dike Inspection Report

Date of Inspection:	May 26, 2009	**Inspection by:**	Joel Galt
Weather:	warm and muggy		Lee Lively
Temperature:	80 F	**Report by:**	Joel Galt
Rainfall (past 24 hrs):	None	**Date of Report:**	August 9, 2010

SUMMARY

Ash Pond: No conditions were found that posed a threat to the safety of the ash pond dikes. There are a large number of areas where the grass cover has been damaged, mainly by mowers, but some due to rainfall runoff.
Oil Containment Dikes: No conditions were found that posed an immediate threat to the oil containment dikes. Like the ash pond dike, the oil containment dikes have some areas where the grass cover is damaged. Some of the slopes are too steep and should be flattened.

ADDITIONAL COMMENTS

The common theme for both locations is that the mowers seem to be causing most of the problems. It would be prudent to change the equipment and techniques used for the mowing in order to reduce the damage to the earth structures and to reduce the cost of maintaining these structures.
The addition of gravel to the crest of some of the dikes has been beneficial and should be employed in similar areas over the remainder of the dikes.
A regular turf care program is needed to maintain the turf cover on the dikes. This program will pay for itself in reduced maintenance costs.

RECOMMENDATIONS

No.	Description	Photo No.
1	Ash Pond/Oil Containment: There are a number of places where the dikes do not have the grass cover they should. A comprehensive program of turf maintenance should be put into place. This program should include scheduled fertilization and over-seeding, plus fire ant control. Such a program will pay for itself in reduced maintenance costs in the long run.	**3904, 3911, 3915, 3916, 3918**
2	Ash Pond/Oil containment: The grass cover on some of the dike crests has been worn out by wheeled traffic. These crests should be graveled to accommodate the traffic. This method has been successful on the parts of the dikes where it was employed.	**3903. 3905, 3908, 3920**
3	Ash Pond/Oil Containment: The grass cover on some of the dike slopes has been damaged by mower tires rutting the slope and mower blades gouging the slopes. On all of the inside slopes the mower scalped off the top edge of the slope. Different mowing equipment and different mowing techniques are needed to do this job right. The mowers should be restricted to mowing the slopes when they are dry. The current practice is damaging the dikes and resulting in increased maintenance costs.	**3904, 3911, 3915, 3918**
4	Ash Pond/Oil Containment: There are a number of areas on the inside slope of the ash pond where concentrated rainfall runoff has cut gullies in the slopes. These areas should be repaired by placing earth berms and plastic down drains at the gullies or by creating swales lined with filter fabric and rock at the gully locations. Smaller gullies can be filled with #57 stone.	**3906, 3912**
5	Ash Pond: There is some woody brush growing on the inside slope of the ash pond. This brush should be poisoned.	**3905, 3912**

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6	Ash Pond/Oil Containment: Some portions of the dike slopes are much steeper than they should be. These may be subject to sloughing in the long term, particularly after a heavy rain. In the short term they create maintenance problems and costs. It would be prudent to cut the grass on these with a weedeater rather than a riding mower in the short term. In the long term, these slopes should be flattened with fill to match adjacent slopes (approximately 2:1).	**3909, 3918, 3920**
7	Oil containment: There is a spot on the rim of the containment that appears to be lower than the remainder of the rim. This should be checked with a level to see if it is lower or not, and if there is a particular reason that it is lower.	

STATUS OF PREVIOUS RECOMMENDATIONS FROM JANUARY 2009

No.	Description	Location	Status
1	Ash Pond: There are a number of places where the dikes do not have the grass cover they should. This appears to be due to drainage in some locations. The drainage should be corrected and the area grassed.		**Continued**
	The drainage improvements made have had some positive effects. There are still some places where drainage improvements (gravel filling of rills, plastic down drain installation) would help.		
2	Ash Pond/Oil containment: The grass cover on some of the dike crests seems to have been worn out by wheeled traffic. These crests should either be graveled to accommodate the traffic, or grassed and the vehicles excluded.		**Continued**
	The addition of gravel to the crest to deal with the vehicle traffic has been successful in the areas where it has been employed. We recommend that gravel be added to the other locations where there is vehicle traffic.		
3	Ash Pond/Oil Containment: The grass cover on some of the dike slopes and the dikes themselves seem to have been damaged by mower tires rutting the slope and mower blades gouging the slopes. It would be worth investigating different mowing equipment that would be more suitable. Some portions of the dike slopes appear to be steeper than they should be. It would be prudent to cut the grass on these with a weedeater rather than a riding mower.		**Continued**
	This situation is basically the same as it was in 2009. It is important to make sure that grass cutting contractors have the correct equipment and are given clear instructions in order to avoid damage to the turf and slopes.		
4	Oil containment: There is a spot on the rim of the containment that appears to be lower than the remainder of the rim. This should be checked with a level to see if it is lower or not, and if there is a particular reason that it is lower.		**Continued**
	Funds have been procured to perform this work and plans are being made for a survey of the rim.		

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OBSERVATIONS

I - Ash Pond		
	Observations - Comments	**Photograph No.**
General Comments	The ash pond is mostly excavated, so there would be very little opportunity for a breach. The only dike of any height is that between the ash pond and the oil containment area, and this one is about 6 feet tall.	
1. Upstream Slope		
a. Condition	There is a fair amount of bare soil showing on the upstream slope. This appears to be due to mower damage and to erosion. There are some woody plants growing on the slope that should be poisoned.	**3904, 3905. 3907, 3909, 3910**
b. Erosion/Sloughing	Yes (X) No ( ) There is some washing of the interior slope due to lack of grass cover and the slope is overly steep.	**3906**
2. Crest		
a. Condition	The crest of the ash pond dike and the oil containment dikes is bare in many areas. This appears to be due mostly to traffic. It would be a good idea to either discontinue this traffic and grass the crest or, if the traffic is to continue, to **gravel the crest.** The areas that were graveled last year have held up well, so this looks like the better choice.	**3903, 3904, 3908, 3910**
3. Downstream Slope		
a. Condition	There some bare spots on the slope that need attention.	
b. Seepage/Wet Spots	*Yes ( ) No (x)* No seepage noted.	
c. Erosion/Sloughing	*Yes (x) No ( ) There are some locations where washing is taking place.*	
4. Emergency Aggregate Stockpiles		
a. Available	*Yes ( ) No (X) Aggregate stockpiles were not recommended in this case.*	

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II - Oil Tank Containment Dikes

	Observations - Comments	Photograph No.
1. Crest		
a. Condition	The crest of the oil containment dike was treated in several locations with gravel last year to address erosion issues. The graveling has been very successful in protecting the crest of the dike. This practice should be extended to the few remaining areas of the oil containment dike where there is bare dirt on the crest.	**3911, 3914, 3920**
b. Bare spots/erosion	*Yes (X) No ( ) See comment above.*	see above
2. Inside slopes		
a. Condition	The inside slopes have a generally good grass cover but need some attention in some areas. There has been damage to the grass cover and to the dike from mower wheels and from mower blades gouging the soil. Part of this is due to the fact that the slopes are somewhat steeper than they ought to be in places. It may be necessary to cut the grass with a weedeater in some areas.	**3917, 3918, 3919, 3920**
b. Bare spots/erosion	*Yes (x) No ( ) As described above.*	see above
3. Outside Slopes		
a. Condition	The outside slopes have a number of areas where the grass is thin. These areas should be treated to establish a good turf cover.	**3911, 3914**
b. Bare spots/erosion	Yes (X) No ( ) There are a few spots where the grass cover is not as good as it could be. Mower gouges were noted on the outside slope near the southeast corner. Gravel placed under the piping has helped to reduce the chance of erosion.	see above

XIV - Additional Observation/Comments - General

Observations - Comments	Photograph No.

Joel Galt - Supervisor

SCG - Hydro Services

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Ash Pond Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo

Photo No.	Description	Photo
3902	This part of the crest looks like it might be slightly lower than the surrounding dike. It would be a good idea to **get surveyors to check the elevation.**	
3903	Vehicle traffic makes it difficult to establish grass on the crest of this divider dike. **Graveling the crest** has been successful in other parts of the dike in reducing erosion problems and reducing future maintenance.	

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Ash Pond Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo
3904	The mower has scalped the edge of the crest here, while leaving vegetation high near the water. There is a high potential for mowers to do more harm than good. **This area will need to be reseeded, fertilized and mulched.** Improper mowing does more harm than good.	
3905	As in the photo above, the mower has scalped the edge of the crest while leaving tall vegetation near the water. **The tall vegetation, in this case willows, should be cut down and the stumps poisoned.** Woody vegetation will degrade earth structures.	
3906	Erosion under matting where concentrated storm flow from the crest road enters the pond. **This location can be improved with a plastic down drain and earth berm.**	
3907	North dike showing fair grass cover on upstream slope.	

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Ash Pond Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo
3908	Bare crest of dike. **This area would benefit from gravel.**	
3909	The addition of gravel to the crest in this area has worked well. **This slope is overly steep and should be flattened with the addition of suitable fill**.	
3910	The addition of gravel to the crest in this area has solved the rutting and erosion problems noted in 2009.	
3912	A number of woody plants were noted around the perimeter of the dike. **All woody plants around the dike should be treated with herbicide.**	

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Ash Pond Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo
3913	Cattails growing in ash are not a problem from a dam safety standpoint.	

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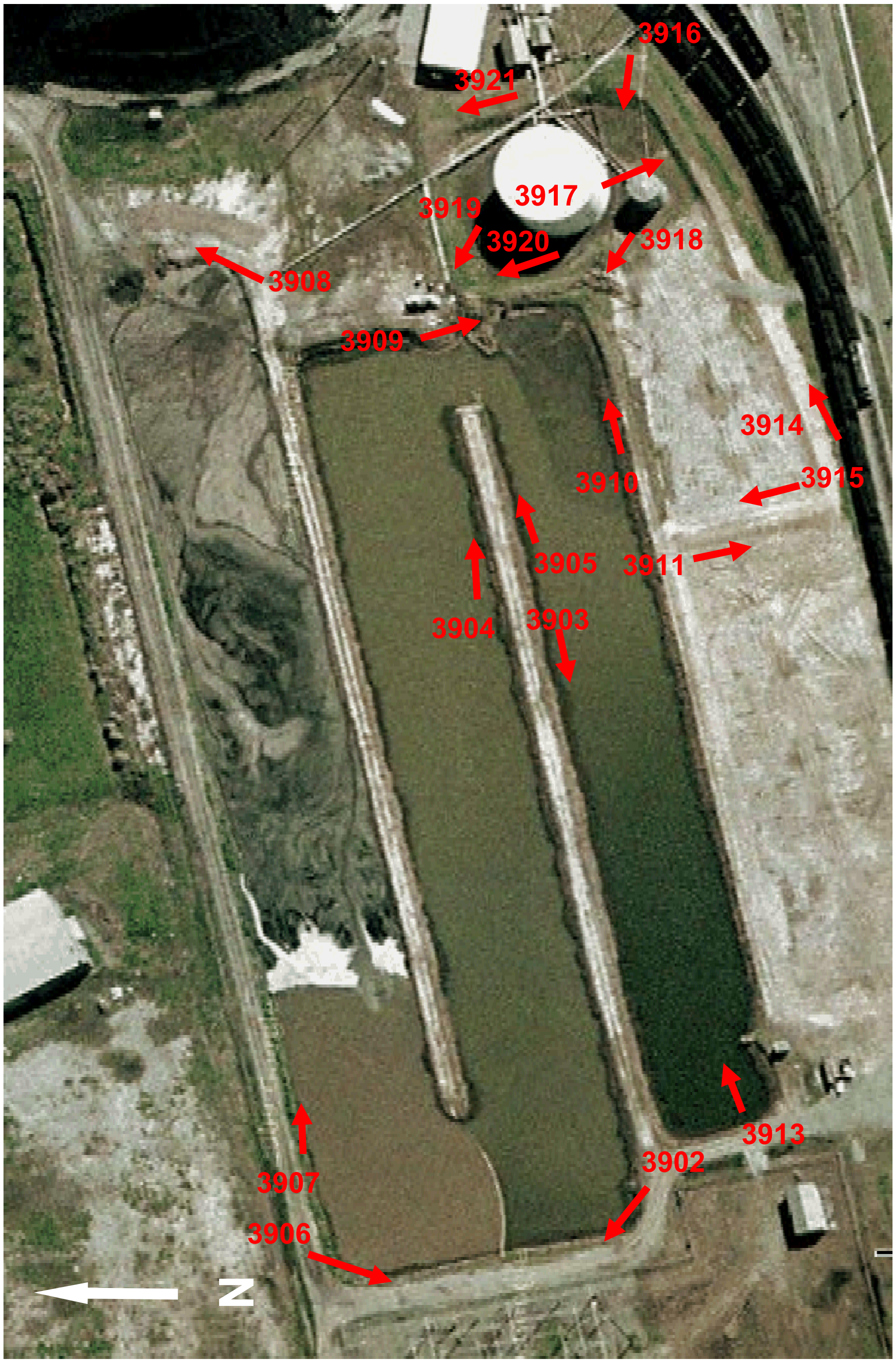
Ash Pond Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo



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Oil Containment Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo
3911	Placing gravel on the crest of the dike has solved the problem of rutting and erosion. The slope has some **bare and thin spots that should be treated with seed and fertilizer.** It looks like mower tires may be the culprit here.	
3914	Placing gravel on the crest of the dike has solved the problem of rutting and erosion.	

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Oil Containment Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo
3915	This slope needs grass seed, fertilizer and gentle mowing in order to develop a good stand of grass.	
3916	Some fire ant mounds were noted. Fire ants damage the dike by removing soil. In smaller dikes like these, this can sometimes lead to the loss of the structure. At the least the nest will cave in at some point, leaving a low spot that can lead to mowing problems. **It would be a good idea to institute a systematic fire ant control program.**	
3917	Ruts on slopes from mower tires.	

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Oil Containment Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo
3918	The slope to the right is very steep, making it very difficult to care for. This slope should be flattened with fill. The bare areas to the left will need treatment with seed and fertilizer and be mowed gently.	
3919	This bare spot is due to erosion from concentrated rainfall runoff. The fix would be to **install an earth berm and plastic pipe down drain** buried in the slope.	
3920	This slope is too steep to maintain and is also a risk for a slide. **This area needs to be filled in to a slope matching that of the surrounding slopes** (roughly 2:1).	

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Oil Containment Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo
3921	The dike in this location shows bare spots, some due to rutting and some due to scalping. The slope is too steep. The slope should be flattened and the area regrassed with suitable grass seed, fertilizer and mulch.	

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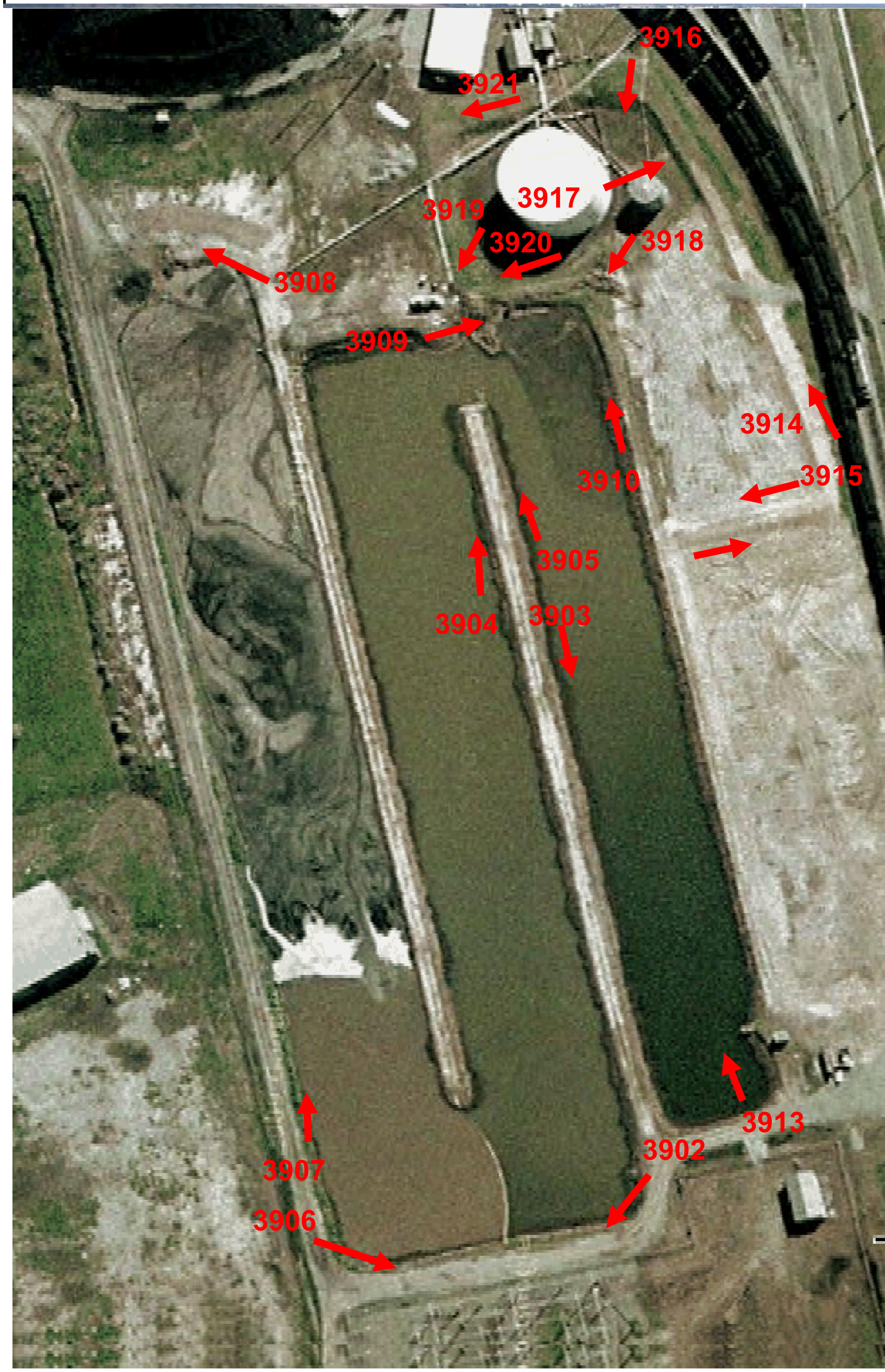
Oil Containment Dike Inspection Photographs - May 26, 2010

(See accompanying report attached)

Photo No.	Description	Photo



Plant Kraft Weekly Ash Pond Dike Inspection Log

Weather: Clear	Date of Inspection: 11/18/10
Temperature: 46°F	Inspection by: [signature]
Rainfall (past 24 hrs): 0.0 in	Pond Elev. :
Rainfall (past week): 0.01 in	2 ft 11 1/2 TOC

General Comments

Dikes may need to be cut again soon. Grass a little high

Ash Pond Dike

		Observations - Comments
North Dike		
1. Upstream Slope		
a. General Condition		
b. Erosion/Sloughing	Yes / (No)	
c. Excess Vegetation	Yes / (No)	
2. Crest		
a. General Condition		
b. Bare areas	Yes / (No)	
c. Rutting	Yes / (No)	
3. Downstream Slope		
a. General Condition		
b. Seepage/Wet Spots	Yes / (No)	
c. Erosion/Sloughing	Yes / (No)	
East Dike		
1. Upstream Slope		
a. General Condition		
b. Erosion/Sloughing	Yes / (No)	
c. Excess Vegetation	Yes / (No)	
2. Crest		
a. General Condition		Stone added @ crest
b. Bare areas	(Yes) / No	
c. Rutting	Yes / (No)	
3. Downstream Slope		
a. General Condition		
b. Seepage/Wet Spots	Yes / (No)	
c. Erosion/Sloughing	Yes / (No)	
South Dike		
1. Upstream Slope		
a. General Condition		
b. Erosion/Sloughing	Yes / (No)	
c. Excess Vegetation	Yes / (No)	
2. Crest		
a. General Condition		
b. Bare areas	Yes / (No)	
c. Rutting	Yes / (No)	
3. Downstream Slope		
a. General Condition		
b. Seepage/Wet Spots	Yes / (No)	
c. Erosion/Sloughing	Yes / (No)	
West Dike		
1. Upstream Slope		
a. General Condition		
b. Erosion/Sloughing	Yes / (No)	
c. Excess Vegetation	Yes / (No)	
2. Crest		
a. General Condition		
b. Bare areas	Yes / (No)	
c. Rutting	Yes / (No)	
3. Downstream Slope		
a. General Condition		
b. Seepage/Wet Spots	Yes / (No)	
c. Erosion/Sloughing	Yes / (No)	

Plant Kraft Weekly Ash Pond Dike Inspection Log

Item	Response	Comments
North Interior Dike		
1. North Slope		
a. General Condition		
b. Erosion/Sloughing	Yes / (No)	
c. Excess Vegetation	Yes / (No)	
2. Crest		
a. General Condition		
b. Bare areas	Yes / (No)	
c. Rutting	Yes / (No)	
3. South Slope		
a. General Condition		
b. Seepage/Wet Spots	Yes / (No)	
c. Excess Vegetation	Yes / (No)	
South Interior Dike		
1. North Slope		
a. General Condition		
b. Erosion/Sloughing	Yes / (No)	
c. Excess Vegetation	Yes / (No)	
2. Crest		
a. General Condition		
b. Bare areas	Yes / (No)	
c. Rutting	Yes / (No)	
3. South Slope		
a. General Condition		
b. Seepage/Wet Spots	Yes / (No)	
c. Excess Vegetation	Yes / (No)	
4. Emergency Aggregate Stockpiles		
a. Available/condition	Yes / (No)	*Good / not good*

Ash Pond Outlet Structure		Observations - Comments
1. Outlet structure		
a. General Condition		
b. Seepage	Yes / (No)	
c. Debris in weir	Yes / (No)	
d. Discharge this week	(Yes) / No	
4. Emergency Overflow		
a. General Condition		
b. Erosion	Yes / (No)	
c. Seepage	Yes / (No)	
d. Debris blocking channel	Yes / (No)	

Plant Kraft Weekly Ash Pond Dike Inspection Log

Weather: Clear	Date of Inspection:12/17/2009
Temperature:55 deg. F	Inspection by:Lee Lively
Rainfall (past 24 hrs):0.0 inches	Pond Elev. :1 & 2 - filling, 3 - being excavated.
Rainfall (past week):6.5 inches	

General Comments

*Grassing date extended due to extra work on pond 3

Ash Pond Dike		
		Observations - Comments
North Dike		
1. Upstream Slope		
a. General Condition		*Area in the process of being top soiled.*
b. Erosion/Sloughing	Yes	*Top soil has washed due to heavy rains*
c. Excess Vegetation	No	
2. Crest		
a. General Condition		
b. Bare areas	Yes	*Mostly rocky area*
c. Rutting	No	
3. Downstream Slope		
a. General Condition		
b. Seepage/Wet Spots	No	*Fence line*
c. Erosion/Sloughing	No	
East Dike		
1. Upstream Slope		
a. General Condition		
b. Erosion/Sloughing	Yes	*Top soil has washed due to heavy rains - In process on adding topsoil to some of slope for grassing(ponds 1 and 2)*
c. Excess Vegetation	Yes	
2. Crest		
a. General Condition		*High traffic due to construction*
b. Bare areas	Yes	*This area should be fixed when equipment is removed and area grassed *(12/31/2009)*
c. Rutting	Yes	
3. Downstream Slope		
a. General Condition		
b. Seepage/Wet Spots	No	*Erosion to be graded and grassed *(12/31/09)*
c. Erosion/Sloughing	Yes	
South Dike		
1. Upstream Slope		
a. General Condition		*In process of excavating pond 3.*
b. Erosion/Sloughing	Yes	*Need to cut slopes per Joel Galt recommedation*
c. Excess Vegetation	Yes	
2. Crest		
a. General Condition		
b. Bare areas	Yes	*Need to fertilize in Spring*
c. Rutting	No	
3. Downstream Slope		
a. General Condition		*Need to fertilize in Spring(Talk to lawn crew)*
b. Seepage/Wet Spots	No	*Minimal erosion*
c. Erosion/Sloughing	Yes	
West Dike		
1. Upstream Slope		
a. General Condition		
b. Erosion/Sloughing	Yes	*Topsoil washed due to heavy rains - Area being topsoiled*
c. Excess Vegetation	No	
2. Crest		
a. General Condition		*Road*
b. Bare areas	Yes	
c. Rutting	No	
3. Downstream Slope		
a. General Condition		*Minimal slope in this area (Switchyard)*
b. Seepage/Wet Spots	No	*Ponding water in switchyard due to heavy rains*
c. Erosion/Sloughing	No	

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Plant Kraft Weekly Ash Pond Dike Inspection Log

North Interior Dike

1. North Slope		
a. General Condition		
b. Erosion/Sloughing	Yes	Topsoil washed due to heavy rains-In process on adding topsoil to slope for grassing
c. Excess Vegetation	No	
2. Crest		
a. General Condition		Equipment on crest
b. Bare areas	Yes	
c. Rutting	No	
3. South Slope		
a. General Condition		
b. Seepage/Wet Spots	No	
c. Excess Vegetation	Yes	

South Interior Dike

1. North Slope		
a. General Condition		
b. Erosion/Sloughing	Yes	Area being top soiled/Vegetation needs to be trimmed on NE end. Seepage on SW end due to dike being closed off. Cell will not have issue when opened up to one cell 12/31/2009
c. Excess Vegetation	/ No	
2. Crest		
a. General Condition		
b. Bare areas	Yes	Maintenance underway on dike area
c. Rutting	Yes	
3. South Slope		
a. General Condition		
b. Seepage/Wet Spots	No	Needs to be cut in a few areas on slope
c. Excess Vegetation	Yes	
4. Emergency Aggregate Stockpiles		
a. Available/condition	No	None kept for this location due to smaller dikes

Ash Pond Outlet Structure

		Observations - Comments
1. Outlet structure		
a. General Condition		Need to repair valves when pond is pulled down.
b. Seepage	No	
c. Debris in weir	No	
d. Discharge this week	Yes	
4. Emergency Overflow		
a. General Condition		N/A
b. Erosion	Yes / No	
c. Seepage	Yes / No	
d. Debris blocking channel	Yes	Grass blocking valves. Due to pulling down water level in pond 3

Plant Kraft Weekly Ash Pond Dike Inspection Log

Weather:	Clear	Date of Inspection:	12/30/10
Temperature:	47° F	Inspection by:	[illegible]
Rainfall (past 24 hrs):	0.0 in	Pond Elev. :	
Rainfall (past week):	0.52 in		2 ft 9 in TOC

General Comments

Grass thin in several areas – (winter kill ?
Fertilize & regrass in spring

Ash Pond Dike

	Observations - Comments
North Dike	
1. Upstream Slope	
a. General Condition	
b. Erosion/Sloughing Yes / (No)	
c. Excess Vegetation Yes / (No)	
2. Crest	
a. General Condition	
b. Bare areas Yes / (No)	
c. Rutting Yes / (No)	
3. Downstream Slope	
a. General Condition	
b. Seepage/Wet Spots Yes / (No)	
c. Erosion/Sloughing Yes / (No)	
East Dike	
1. Upstream Slope	
a. General Condition	
b. Erosion/Sloughing Yes / (No)	
c. Excess Vegetation Yes / (No)	
2. Crest	
a. General Condition	
b. Bare areas (Yes) / No	
c. Rutting Yes / (No)	
3. Downstream Slope	
a. General Condition	
b. Seepage/Wet Spots Yes / (No)	
c. Erosion/Sloughing Yes / (No)	
South Dike	
1. Upstream Slope	
a. General Condition	
b. Erosion/Sloughing Yes / (No)	
c. Excess Vegetation Yes / (No)	
2. Crest	
a. General Condition	
b. Bare areas Yes / (No)	
c. Rutting Yes / (No)	
3. Downstream Slope	
a. General Condition	
b. Seepage/Wet Spots Yes / (No)	
c. Erosion/Sloughing Yes / (No)	
West Dike	
1. Upstream Slope	
a. General Condition	
b. Erosion/Sloughing Yes / (No)	
c. Excess Vegetation Yes / (No)	
2. Crest	
a. General Condition	
b. Bare areas Yes / (No)	
c. Rutting Yes / (No)	
3. Downstream Slope	
a. General Condition	
b. Seepage/Wet Spots Yes / (No)	
c. Erosion/Sloughing Yes / (No)	

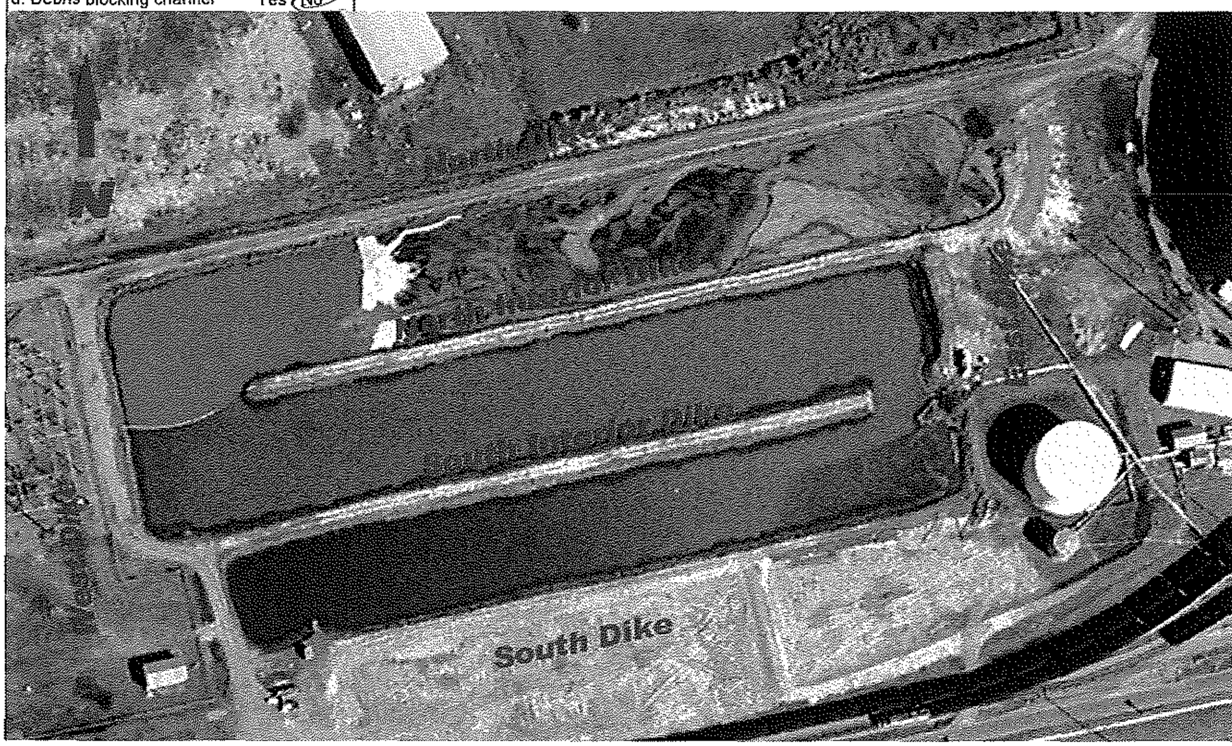
KRA-API 020

Plant Kraft Weekly Ash Pond Dike Inspection Log

North Interior Dike	
1. North Slope	
a. General Condition	
b. Erosion/Sloughing Yes / No	
c. Excess Vegetation Yes / No	
2. Crest	
a. General Condition	
b. Bare areas Yes / No	
c. Rutting Yes / No	
3. South Slope	
a. General Condition	
b. Seepage/Wet Spots Yes / No	
c. Excess Vegetation Yes / No	

South Interior Dike	
1. North Slope	
a. General Condition	
b. Erosion/Sloughing Yes / No	
c. Excess Vegetation Yes / No	
2. Crest	
a. General Condition	
b. Bare areas Yes / No	
c. Rutting Yes / No	
3. South Slope	
a. General Condition	
b. Seepage/Wet Spots Yes / No	
c. Excess Vegetation Yes / No	
4. Emergency Aggregate Stockpiles	
a. Available/condition Yes / No	*Good / not good*

Ash Pond Outlet Structure	
	Observations - Comments
1. Outlet structure	
a. General Condition	
b. Seepage Yes / No	
c. Debris in weir Yes / No	
d. Discharge this week Yes / No	
4. Emergency Overflow	
a. General Condition	
b. Erosion Yes / No	
c. Seepage Yes / No	
d. Debris blocking channel Yes / No	



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Plant Kraft Weekly Ash Pond Dike Inspection Log

12/24/10

GRASS THINNING IN SEVERAL AREAS

Calculation Cover Sheet

Southern Company Generation

	Calculation Number SH-KR-10911-01
Project Kraft Ash Pond Flood Evaluation	Discipline Hydro Services
Objective	___Number
Subject/Title	
Originator's Signature [signature] Date 1/31/11	Last Page Number 5

Contents

Topic	Page	Attachments (Computer Printouts, Technical Papers, Sketches, Correspondence, etc.)	Number of Pages
Purpose of Calculation/ Summary of Conclusions	1		
Criteria	1		
Major Equation Sources/ Derivation Methods	1-2		
Assumptions	1		
Listed References	1		
Body of Calculations	2-5		

Record of Revisions

Rev. No.	Description	Originator / Date	Reviewer / Date	Approver / Date
0	Initial Calcs	[initials] 1/31/11	[initials] 2/1/11	[initials] 2-1-11

NOTES:

KRA-API 013

SOUTHERN COMPANY
Energy to Serve Your World

Design Calculations

Project Kraft Ash Pond Flood Evaluation	Prepared By C.R. O'Mara, P.E.	Date 1/27/2011
Subject/Title	Reviewed By F.L. Cox, Jr., P.E.	Date 1/28/2011
	Calculation Number SH-KR-10911-01	Sheet 1 of 5

1.0 Purpose of Calculation:

To develop an estimate of the storm water handling capacity of the Kraft ash pond.

2.0 Summary of Conclusions:

The ash pond at Kraft can fully contain the 100-year storm with no freeboard. Additional volume could be insured by lowering the pond level by approximately one foot, which can be achieved by removing one of the stop logs within the outlet structure (stop logs are approximately 11-12" tall according to site measurements). Changing the normal pond level to elevation 12.5 would provide storage for the 100-year storm with one foot of freeboard.

3.0 Criteria:

Plant Kraft's ash pond structure is exempt from the Georgia Environmental Protection Division Rules for Dam Safety, Chapter 391-3-8-.04, because it does not meet the minimum height or volume criteria required for regulation. Accordingly, the Georgia rules and regulations exclude these structures from the Standards for the Design and Evaluation of Dams, (Chapter 391-3-8-.09 for the design standards). Thus, the appropriate design storm is left up to the owner/engineer. The 100-year storm is considered adequate for this site.

4.0 References:

1) Ash Pond survey in Georgia Power Land Department property plat drawing M-177-7.dwg with topographic survey dated August 1994.
2) Ash Pond survey in Georgia Power Land Department drawing P-146-4.dwg with topographic survey dated November 2008.
3) Georgia Stormwater Manual, Table A-13, Savannah, Georgia

5.0 Assumptions:

See Section 7.0 for complete calculation, but some assumptions include that a CN of 100 was used to conservatively estimate runoff, the plant normally operates the pond at an elevation of 13.5, and the site continues to follow the ash management practice of dredging one section of the three section pond, after the one section has been filled with ash.

6.0 Major Equation Sources/Derivation of Methods:

The following equations were used to calculate stormwater runoff.

$CN = 1000/ 10+S$

$Q= (P-0.2S)^2 / (P+0.8S)$

$RO = Q/12 *$ acres of entire site

With CN, being the SCS curve number, P is the precipitation in inches, S is the storage capacity of the soil, and Q is the runoff flow in inches. RO is then the calculated runoff volume for the entire site in acre-ft. Using a CN of 100 conservatively estimates runoff as the wet surface area of the pond is only 7 acres and the surrounding runoff from the access road is the remaining 1.29 acres.

The following equations were used to calculate the flow either as an orifice or weir inlet configuration at the discharge structure.

Orifice formula:
$Q=CA_o(2gh)^{1/2}$, with Q being peak flow in cfs, C being the coefficient of discharge for an orifice, which is 0.6, A_o is the area of the orifice in square feet, and h is difference in water surface elevations on either side of a submerged orifice, or the upstream head above the centerline of an orifice not submerged on the downstream side.

Weir formula:
$Q=CL_eH^{1.5}$, with Q being peak flow in cfs, C being the coefficient of discharge for a weir, which is 3.0, L_e is the effective length of the weir in feet and H is the head about the invert of the weir in feet.

7.0 Body of Calculations:

The Kraft ash pond is approximately 7 acres in size and collects a little runoff from the surrounding area, with a total drainage area of 8.29 acres. See Figure 1 for area layout. Ash pond area and drainage area confirmed from References 1 and 2.

Runoff Calculation

Return Period, Yrs.	10YR	25YR	50YR	100YR
CN	100	100	100	100
S	0	0	0	0
24-hr intensity (inches/hr)	0.28	0.33	0.37	0.41
P, rain, inches	6.72	7.92	8.88	9.84
Q, runoff, inches	6.72	7.92	8.88	9.84
Area, acres	8.29	8.29	8.29	8.29
Runoff, ac-ft	4.64	5.47	6.13	6.80

Rainfall data is from Georgia Stormwater Manual, Table A-13, Savannah, Georgia (Reference 4), and uses the rainfall intensity of a 24-hour storm with return periods of 10-year, 25-year, 50-year, and 100-year (see Figure 2).

Current Elevation-Volume Table Above Level of 12

Volume is reported above elevation 12. Water levels are recorded at the site on a weekly basis and elevation 12 is the lowest recorded elevation, however 13.5 is the average water level for 2010. However, based upon site observation and the site's ash management practice, one section of the three section pond is filled above the water level with ash and may be undergoing dredging at any time. Therefore, it was assumed that only 2/3 of the storage listed below would be available for stormwater surcharge storage.

Elevation	Cumulative Volume (ac-ft)	2/3 of the Cumulative Volume (ac-ft) Available for Stormwater Storage	Area (acres)
12	0	0	6.1
12.5	3.1	2.1	6.3
13	6.2	4.1	6.4
13.5	9.5	6.3	6.5
14	12.8	8.5	6.7
15	19.6	13.1	7.0

Analysis

Determine if the 100-year stormwater runoff can be contained:

The 100-year runoff volume is 6.8 acre-feet, which can be stored between elevation 13.5 and elevation 15, with no freeboard.

Discharge Capacity of the Outlet Structure:

The discharge capacity of the outlet structure was also analyzed to see if there was any benefit to routing the storm flows. The outlet structure in the ash pond is a concrete box structure with grate on top. According to measurements provided by site personnel, there is an 8-inch pipe near the bottom of the concrete box and a rectangular weir at the top of the concrete box measuring approximately 24" wide; both lead into the concrete box from the pond. Inside the box is a set of stop logs, which also controls flow within the box. Water exits the box via a pipe approximately 44 inches in diameter. Using weir and orifice equations described in Section 6.0, the discharge was calculated for both orifice and weir flow conditions in the outlet structure and it was determined that the flow capacity over the stoplogs is 12.5 cfs when the pond level is at elevation 15.

Because any significant storm would generate peak flows greater than the 12.5 cfs and because most all of the drainage is the pond itself, routing storm flows will not improve the condition.

Conclusion of Analysis:

The ash pond at Kraft can fully contain the 100-year storm with no freeboard. Additional volume could be insured by lowering the pond level by approximately one foot to elevation 12.5, which can be achieved by removing one of the stop logs within the outlet structure (stop logs are approximately 11-12" tall according to site measurements).

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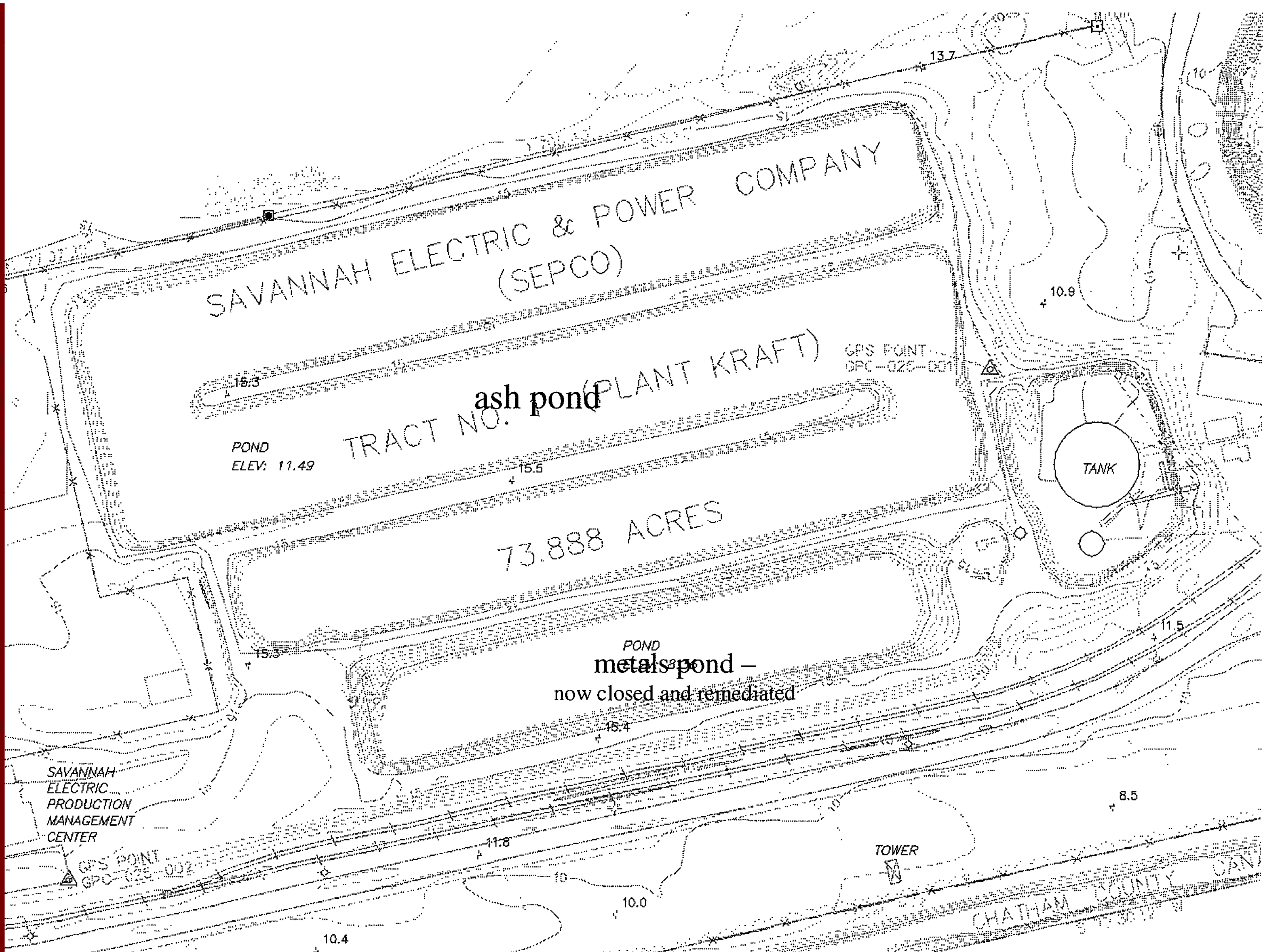
Design Calculations

Project Kraft Ash Pond Flood Evaluation	Prepared By C.R. O'Mara, P.E.	Date 1/27/2011
Subject/Title	Reviewed By F.L. Cox, Jr., P.E.	Date 1/28/2011
	Calculation Number SH-KR-10911-01	Sheet 4 of 5

Figure 1:



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Design Calculations

Project Kraft Ash Pond Flood Evaluation	Prepared By C.R. O'Mara, P.E.	Date 1/27/2011
Subject/Title	Reviewed By F.L. Cox, Jr., P.E.	Date 1/28/2011
	Calculation Number SH-KR-10911-01	Sheet 5 of 5

Figure 2:

Table A-13
Savannah

Hours	Minutes	Return Period 1	2	5	10	25	50	100
	N	0.7585	0.9086	0.8696	0.8401	0.8597	0.8619	0.8671
	A	47.79	117.57	125.46	126.12	167.17	191.57	220.00
	B	12	20	23	24	28	30	32
Hours	Minutes	Rainfall Intensity						
0.08	5	5.57	6.31	6.92	7.45	8.27	8.94	9.61
	6	5.34	6.09	6.71	7.24	8.06	8.73	9.39
	7	5.12	5.88	6.52	7.04	7.86	8.52	9.18
	8	4.93	5.69	6.33	6.86	7.68	8.33	8.98
	9	4.75	5.51	6.16	6.68	7.50	8.15	8.79
	10	4.58	5.35	6.00	6.52	7.33	7.97	8.61
	11	4.43	5.19	5.85	6.36	7.17	7.80	8.43
	12	4.29	5.04	5.70	6.21	7.01	7.64	8.27
	13	4.16	4.90	5.56	6.07	6.86	7.49	8.11
	14	4.04	4.77	5.43	5.94	6.72	7.34	7.96
0.25	15	3.92	4.65	5.31	5.81	6.59	7.20	7.81
	16	3.82	4.53	5.19	5.69	6.46	7.07	7.67
	17	3.72	4.42	5.07	5.57	6.34	6.94	7.53
	18	3.62	4.31	4.97	5.46	6.22	6.81	7.40
	19	3.53	4.21	4.86	5.35	6.10	6.69	7.27
	20	3.45	4.12	4.77	5.25	5.99	6.58	7.15
	21	3.37	4.03	4.67	5.15	5.89	6.46	7.04
	22	3.29	3.94	4.58	5.06	5.79	6.36	6.92
	23	3.22	3.86	4.49	4.97	5.69	6.25	6.81
	24	3.15	3.78	4.41	4.88	5.60	6.15	6.71
	25	3.09	3.70	4.33	4.80	5.50	6.06	6.61
	26	3.03	3.63	4.25	4.71	5.42	5.96	6.51
	27	2.97	3.56	4.18	4.64	5.33	5.87	6.41
	28	2.91	3.49	4.11	4.56	5.25	5.79	6.32
	29	2.86	3.42	4.04	4.49	5.17	5.70	6.23
0.50	30	2.81	3.36	3.97	4.42	5.09	5.62	6.14
	31	2.76	3.30	3.91	4.35	5.02	5.54	6.06
	32	2.71	3.24	3.85	4.29	4.95	5.46	5.97
	33	2.66	3.19	3.79	4.22	4.88	5.39	5.89
	34	2.62	3.13	3.73	4.16	4.81	5.31	5.82
	35	2.58	3.08	3.67	4.10	4.74	5.24	5.74
	36	2.54	3.03	3.62	4.04	4.68	5.18	5.67
	37	2.50	2.98	3.57	3.99	4.62	5.11	5.60
	38	2.46	2.94	3.52	3.93	4.56	5.04	5.53
	39	2.42	2.89	3.47	3.88	4.50	4.98	5.46
	40	2.39	2.85	3.42	3.83	4.44	4.92	5.39
	41	2.35	2.81	3.37	3.78	4.39	4.86	5.33
	42	2.32	2.76	3.33	3.73	4.33	4.80	5.27
	43	2.29	2.72	3.28	3.69	4.28	4.75	5.21
	44	2.26	2.69	3.24	3.64	4.23	4.69	5.15
0.75	45	2.23	2.65	3.20	3.60	4.18	4.64	5.09
	46	2.20	2.61	3.16	3.55	4.13	4.58	5.03
	47	2.17	2.58	3.12	3.51	4.08	4.53	4.98
	48	2.14	2.54	3.08	3.47	4.04	4.48	4.92
	49	2.11	2.51	3.04	3.43	3.99	4.43	4.87
	50	2.09	2.48	3.01	3.39	3.95	4.39	4.82
	51	2.06	2.44	2.97	3.35	3.91	4.34	4.77
	52	2.04	2.41	2.94	3.32	3.86	4.29	4.72
	53	2.01	2.38	2.90	3.28	3.82	4.25	4.67
	54	1.99	2.35	2.87	3.24	3.78	4.20	4.62
	55	1.97	2.33	2.84	3.21	3.74	4.16	4.58
	56	1.95	2.30	2.81	3.18	3.70	4.12	4.53
	57	1.93	2.27	2.78	3.14	3.67	4.08	4.49
	58	1.90	2.24	2.75	3.11	3.63	4.04	4.45
	59	1.88	2.22	2.72	3.08	3.59	4.00	4.40
1	60	1.86	2.19	2.69	3.05	3.56	3.96	4.36
2	120	1.04	1.28	1.55	1.80	2.13	2.30	2.55
3	180	0.79	0.92	1.17	1.33	1.57	1.72	1.90
6	360	0.46	0.56	0.71	0.81	0.94	1.03	1.15
12	720	0.28	0.33	0.43	0.49	0.57	0.63	0.70
24	1440	0.15	0.20	0.25	0.28	0.33	0.37	0.41

SOUTHERN COMPANY

Engineering and Construction Services Calculation

Calculation Number: TV-KR-3319HB-001

Project/Plant: Plant Kraft Ash Pond Dikes	**Unit(s):**	**Discipline/Area:** ES&EE
Title/Subject: Slope Stability Analyses of Ash Pond Dikes		
Purpose/Objective: Analyze slope stability of Ash Pond Dikes		
System or Equipment Tag Numbers: NA	**Originator:** Terri H. Hartsfield	

Contents

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	THH/2-11-11	GHM/2-11-11	JCP/2-11-11

Notes:

KRA-API 025

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Purpose of Calculation

Georgia Power Company's Plant Kraft is located in Port Wentworth, about 5 miles north of Savannah, on the south bank of the Savannah River. The plant is comprised of eight generating units: four fossil steam units, 3 coal fired and 1 oil/natural gas. Initial startup for the plant was May 27, 1958, and it began its commercial operation July 1 of the same year. The ash pond was commissioned at that time.

The ash pond is rectangular, with two partial interior divider dikes forming a serpentine-shaped interior of three long narrow cells. The cells function as ash dewatering cells in turn. Ash is sluiced to a cell, allowed to dry and is then excavated and dry stacked in the permitted solid waste disposal facility located off-site.

The purpose of this calculation is to check the stability of the ash pond dikes using current software.

Methodology

The calculation was performed using the following methods and software:

GeoStudio 2007 (Version 7.16, Build 4840), Copyright 1991-2010, GEO-SLOPE International, Ltd.

Bishop, Ordinary, Janbu and Morgenstern-Price analytical methods were run. Morgenstern-Price was reported.

Criteria and Assumptions

The slope stability models were run using the following assumptions and design criteria:

- The locations of the borings and cross-sections analyzed are shown on Figure 1, Attachment A.
- The current required minimum criteria (factors of safety) were taken from the Georgia Department of Natural Resources, Environmental Protection, Rules for Dam Safety, Chapter 391-3-8, supplemented by the US Corps of Engineers Manual EM 1110-2-1902, October 2003.
- In August 2010, drilling was performed on the dikes, split spoon and undisturbed samples were taken in the dike fill and the foundation soils on the north and south dikes. Boring logs are on Attachment B.
- The soil properties of unit weight, phi angle, and cohesion were obtained from triaxial shear testing performed on UD samples of the fill and foundation soils obtained during drilling in August 2010. The testing was performed according to ASTM D 4767. Laboratory analyses and water elevations are on Attachment C.
- The COE EM 1110-2-1902, October 2003, allows the use of the phreatic surface established for the maximum storage condition (normal pool) in the analysis for the

maximum surcharge loading condition. This is based on the short term duration of the surcharge loading relative to the permeability of the embankment and the foundation materials. This method is used in the analysis for the impoundments at this facility with surcharge loading.

- As a worst case, the ponds were assumed to have no ash.
- In accordance with the Georgia Rules for Dam Safety, and as shown on the USGS "Map for Peak Acceleration with a 2% Exceedance in 50 Years" for the vicinity of Plant Kraft, the ground motion having a 2% probability of exceedance in 50 years is 0.16g (See Attachment D).
- Cross sections were based on a survey performed in August 2010 and on a November 2008 survey of the interior of the cells.
- Groundwater elevation was obtained from monitoring wells located at Plant Kraft and is about elevation 3.5 feet msl.
- The following pool elevations were used in the analyses:

Section	Normal Pool Elev.	Max Surcharge Elev.	Top of Dike Elev.
A-A'	13.3	15.3	16.3
B-B'	12.5	14.7	15.7
C-C'	13.0	15.0	16.0

Input Data

The following soil properties were used in the analyses. This data was obtained from laboratory triaxial testing performed in September 2010 by Contour Engineering. The laboratory testing consisted of classification testing as well as consolidated undrained triaxial tests with pore pressure measurements in order to provide total as well as effective shear strength parameters of the embankment and foundation soils.

Soil Description	Moist Unit Weight, pcf	Effective Stress Parameters		Total Stress Parameters	
		Cohesion, psf	Phi Angle, degrees	Cohesion, psf	Phi Angle, degrees
North Dike (Section A-A')					
Sand Dike Fill	120	0	35	0	35
Clayey Sandy Silt	120	104	33	331	10.6
Silty Sand	120	104	33	331	10.6
Clay	120	200	20	300	12
Sand	120	0	30	0	30
South Dike (Section B-B')					
Sand Dike Fill	120	0	35	0	35
Sandy Clay	115	104	33	331	10.6
Clayey Sand	120	104	33	331	10.6
Clay	120	200	20	300	12
Sand	120	0	30	0	30
East Dike (Section C-C')					
Sand Dike Fill	120	0	35	0	35
Sandy Clayey Silt	120	104	33	331	10.6
Silty Sand	120	104	33	331	10.6
Clay	120	200	20	300	12
Sand	120	0	30	0	30

Summary of Conclusions

The impoundment dikes at Plant Kraft were evaluated for the load cases indicated in the following table. The table lists the factors of safety for various slope stability failure conditions. All conditions are steady state except where noted. Construction cases were not considered. Based on the results of these analyses all structures are stable.

Failure Condition (Load Case)	Computed Factor of Safety	Required Minimum Factor of Safety
Northwest Dike – Section A-A'		
Upstream Steady State	2.2	1.5
Upstream Seismic	1.5	1.1
Downstream Steady State	4.3	1.5
Downstream Seismic	2.4	1.1
Downstream – Max Surcharge	4.3	1.4[1]
Upstream Rapid Drawdown – in dike	2.1	1.3
Southeast Dike – Section B-B'		
Upstream Steady State	2.2	1.5
Upstream Seismic	1.5	1.1
Downstream Steady State	4.0	1.5
Downstream Seismic	2.1	1.1
Downstream – Max Surcharge	3.8	1.4[1]
Upstream Rapid Drawdown – in dike	2.1	1.3
East Dike at Containment - Section C-C'		
Upstream Steady State	2.2	1.5
Upstream Seismic	1.5	1.1
Downstream Steady State	3.5	1.5
Downstream Seismic	2.2	1.1
Downstream – Max Surcharge	3.5	1.4[1]
Upstream Rapid Drawdown – in dike	2.1	1.3

Note 1 – from (COE EM1110-2-1902, 2003).

The analyses indicate that in all cases the ash pond dikes are stable, both inboard and outboard.

Design Inputs/References

USGS Earthquake Hazards website, http://www.usgs.gov/hazards/earthquakes/.

Georgia Department of Natural Resources, Environmental Protection, Rules for Dam Safety.

Savannah Electric and Power Company Drawing 9477-FY-3A Unit 1 Port Wentworth Stataion Lot Plan

Georgia Power Company Drawing P-146-4, Plant Kraft - Ash Pond November 2009 Survey

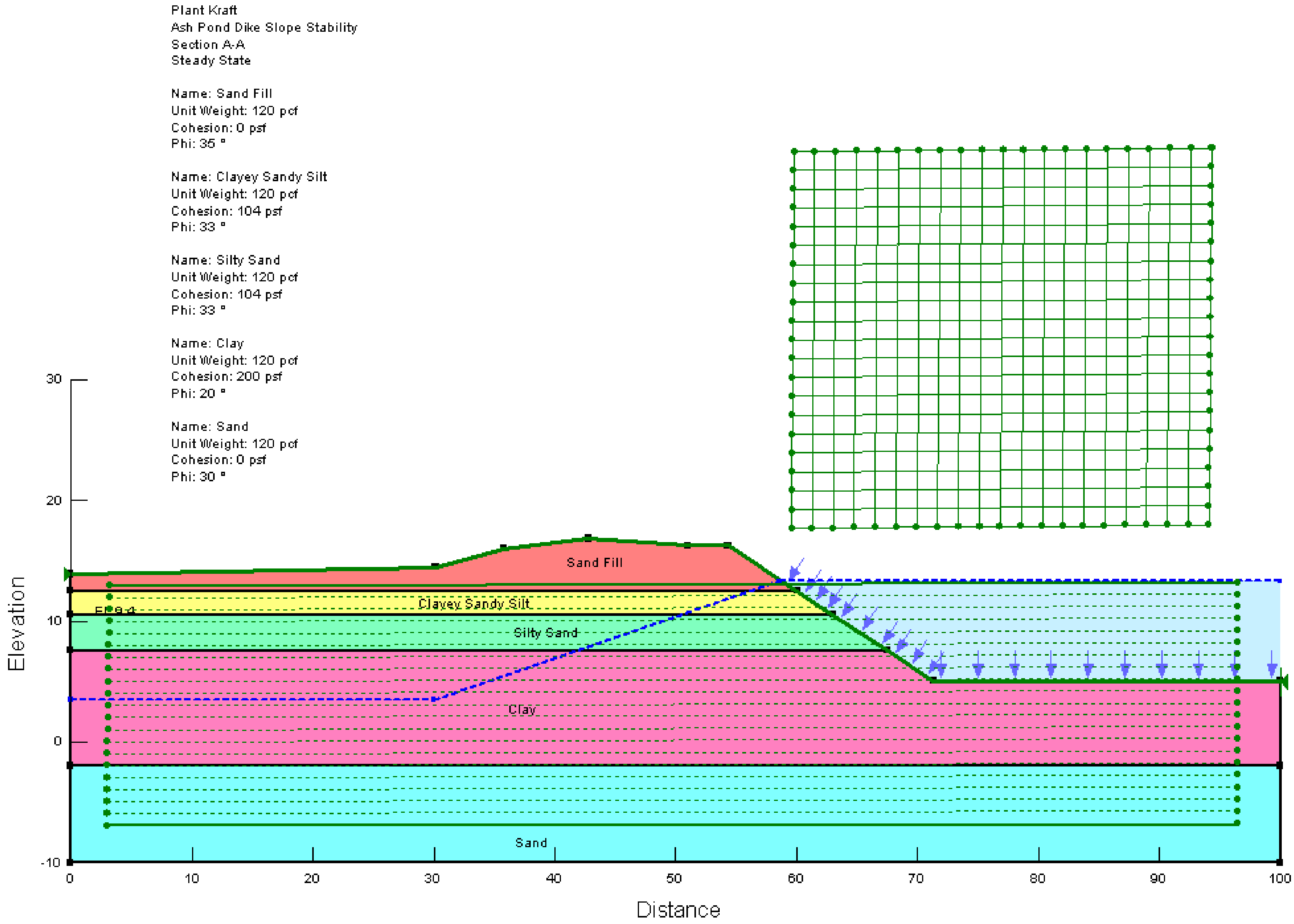
Body of Calculation

Calculation consists of Slope-W modeling attached.

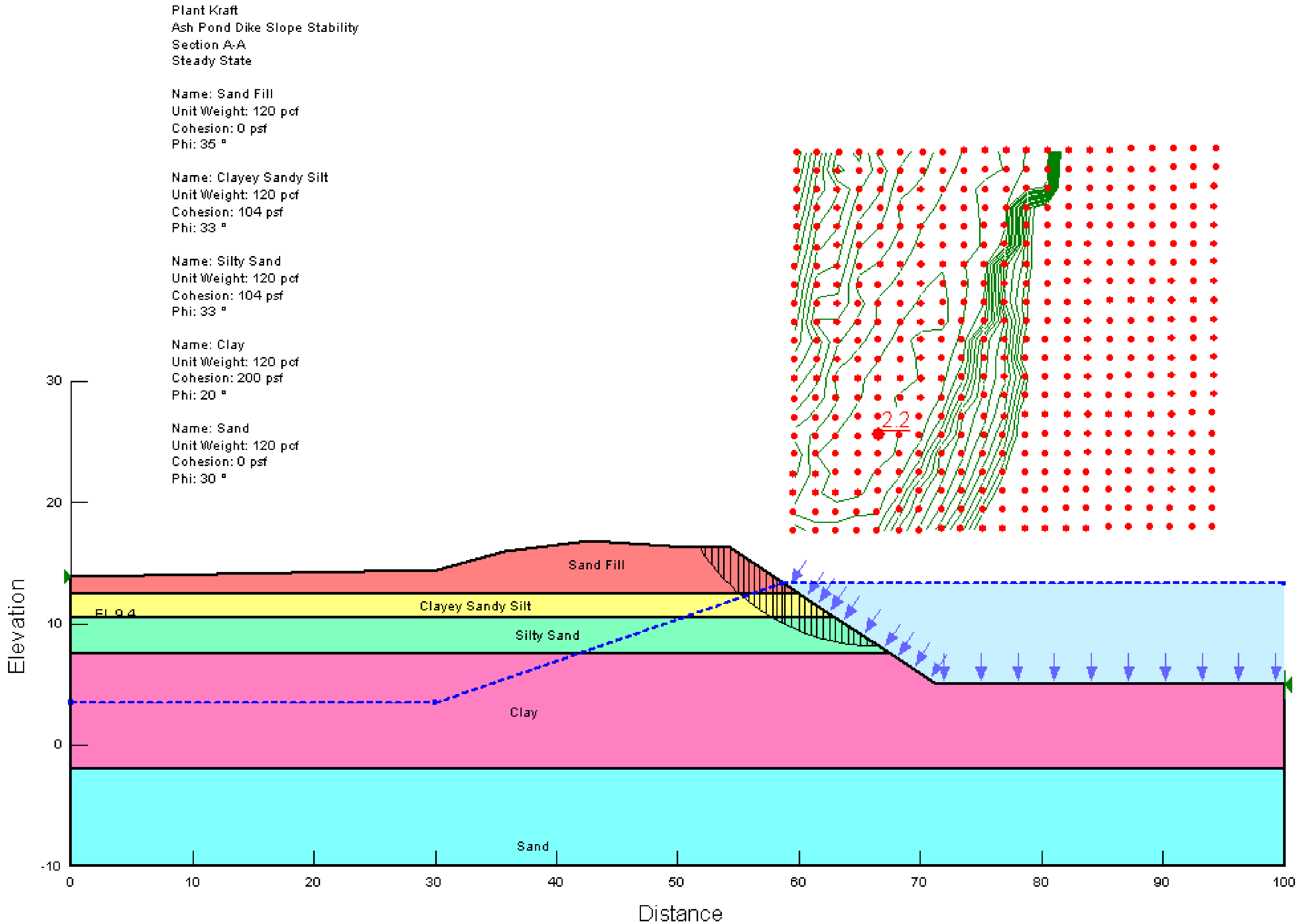
Attachments

Slope W Computer Runs

Section A-A'



Plant Kraft
Ash Pond Dike Slope Stability
Section A-A
Steady State
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Clayey Sandy Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Sand Fill
Clayey Sandy Silt
Silty Sand
Clay
Sand
Elevation
Distance
30
20
10
0
-10
0
10
20
30
40
50
60
70
80
90
100



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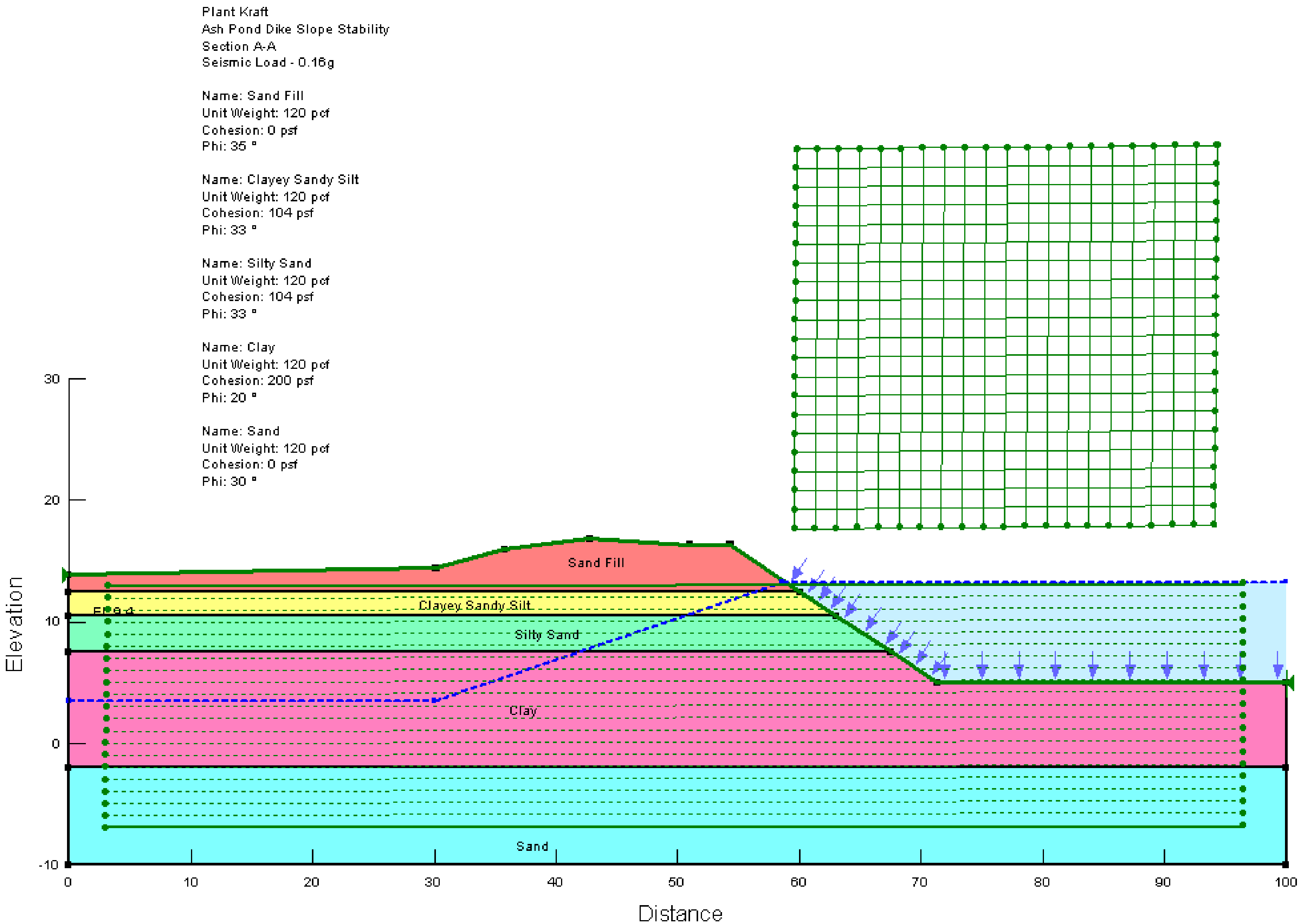

Plant Kraft
Ash Pond Dike Slope Stability
Section A-A
Seismic Load - 0.16g

Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °

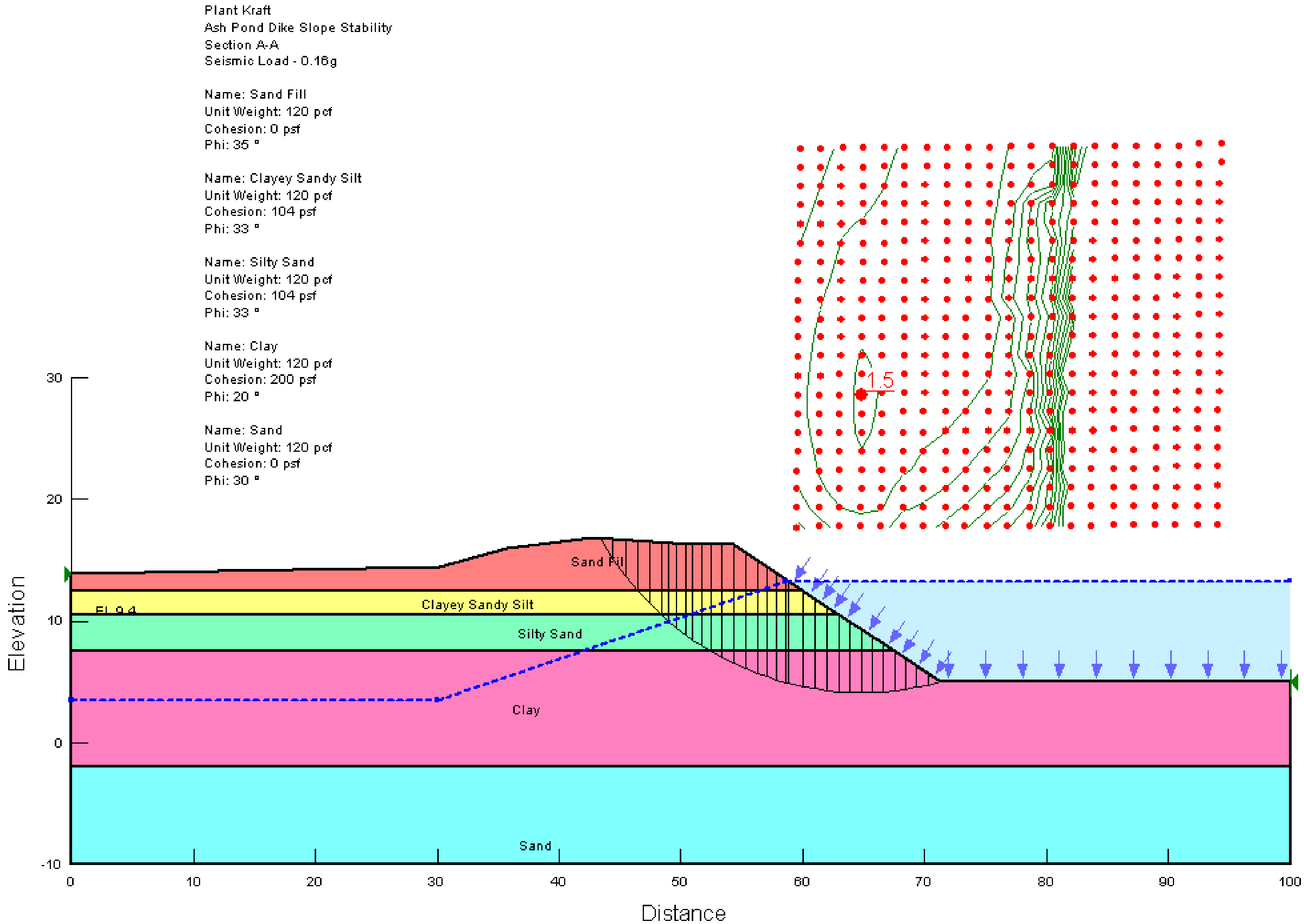
Name: Clayey Sandy Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °

Sand Fill
Clayey Sandy Silt
Silty Sand
Clay
Sand
Elevation
Distance
30
20
10
0
-10
0
10
20
30
40
50
60
70
80
90
100


Plant Kraft
Ash Pond Dike Slope Stability
Section A-A
Seismic Load - 0.16g

Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °

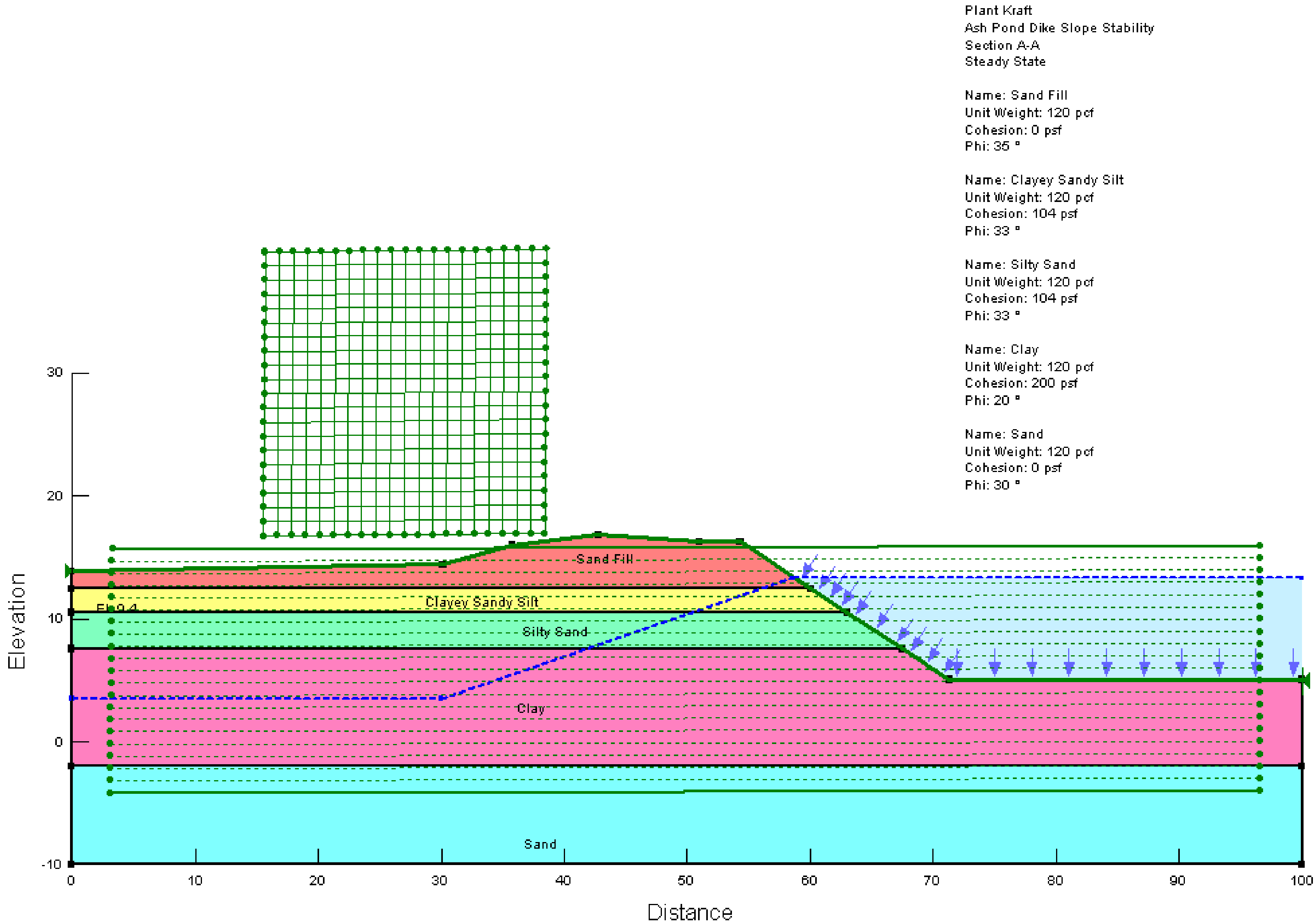
Name: Clayey Sandy Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °

1.5
Sand Fill
Clayey Sandy Silt
Silty Sand
Clay
Sand
Elevation
30
20
10
0
-10
0
10
20
30
40
50
60
70
80
90
100
Distance



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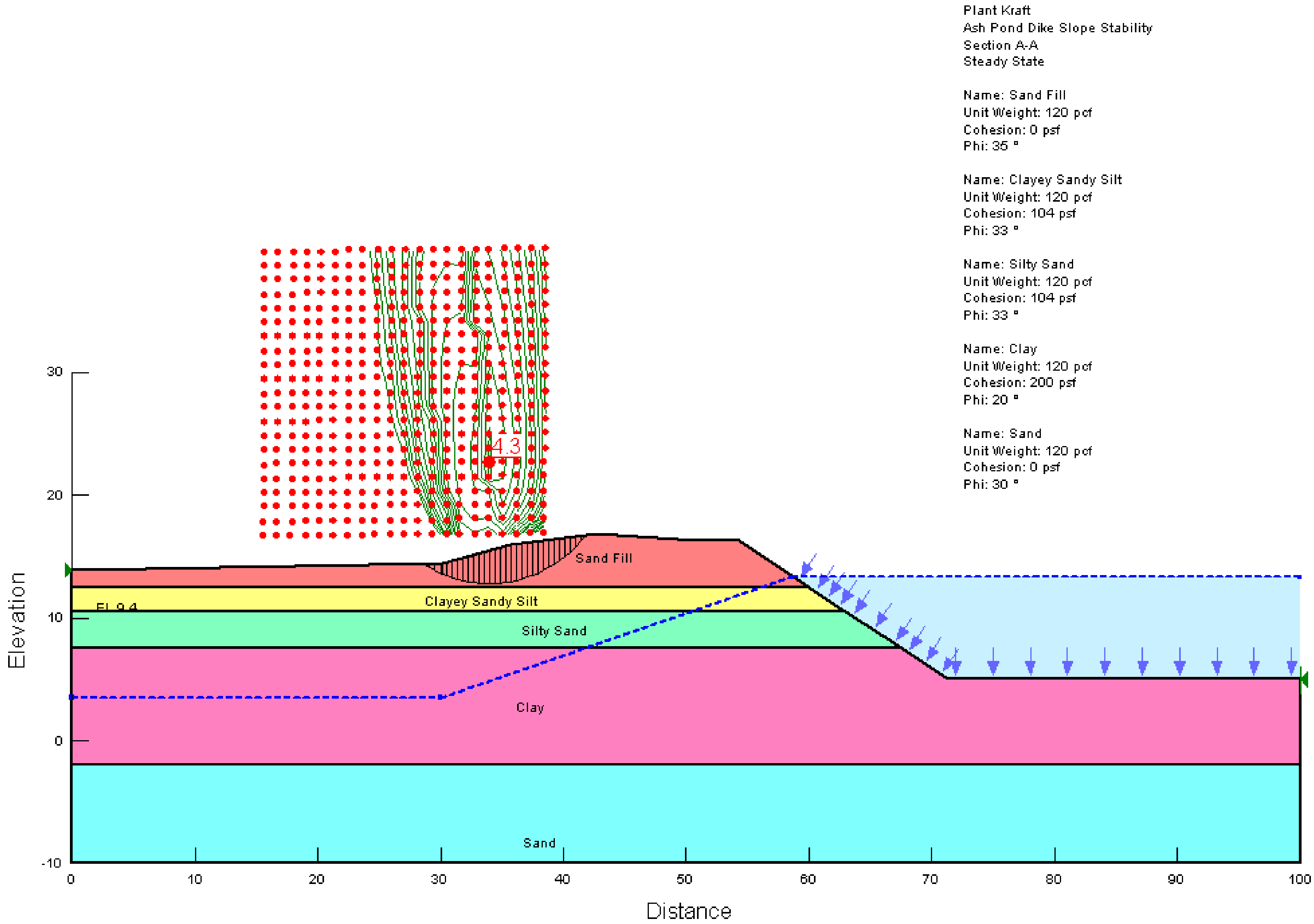

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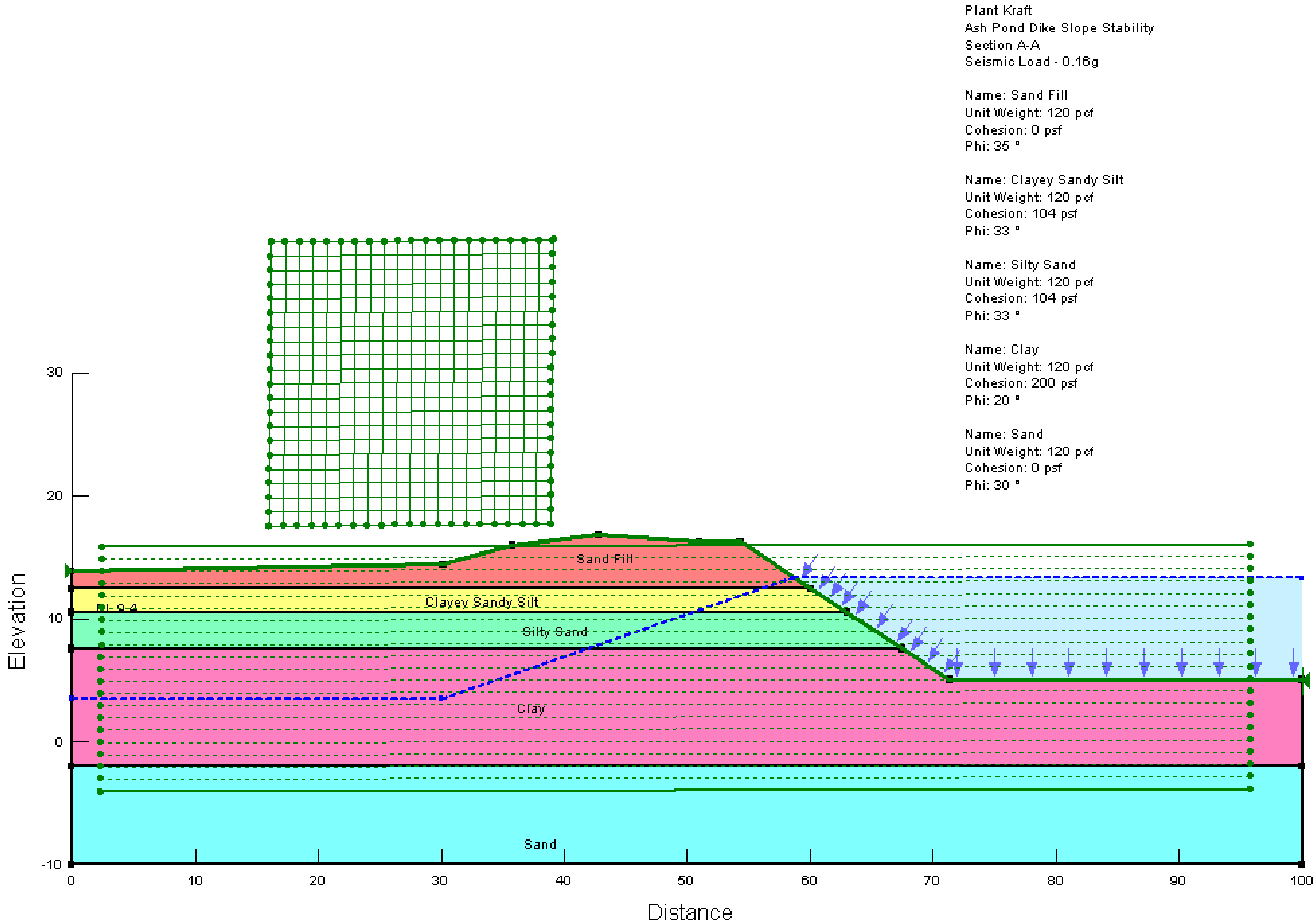
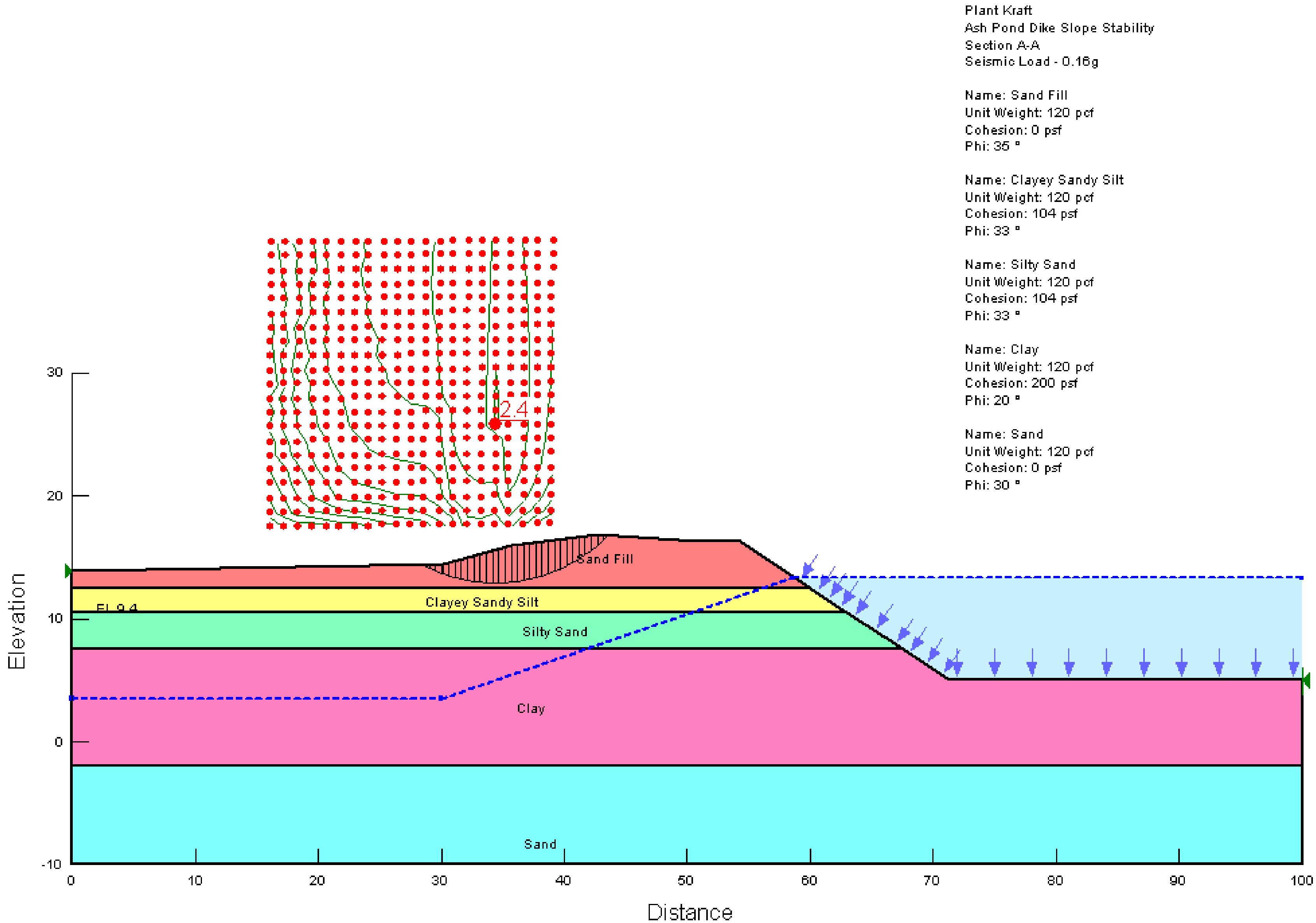

Plant Kraft
Ash Pond Dike Slope Stability
Section A-A
Seismic Load - 0.16g
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Clayey Sandy Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Sand Fill
Clayey Sandy Silt
Silty Sand
Clay
Sand
Elevation
Distance
30
20
10
0
-10
0
10
20
30
40
50
60
70
80
90
100


Plant Kraft
Ash Pond Dike Slope Stability
Section A-A
Seismic Load - 0.16g

Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °

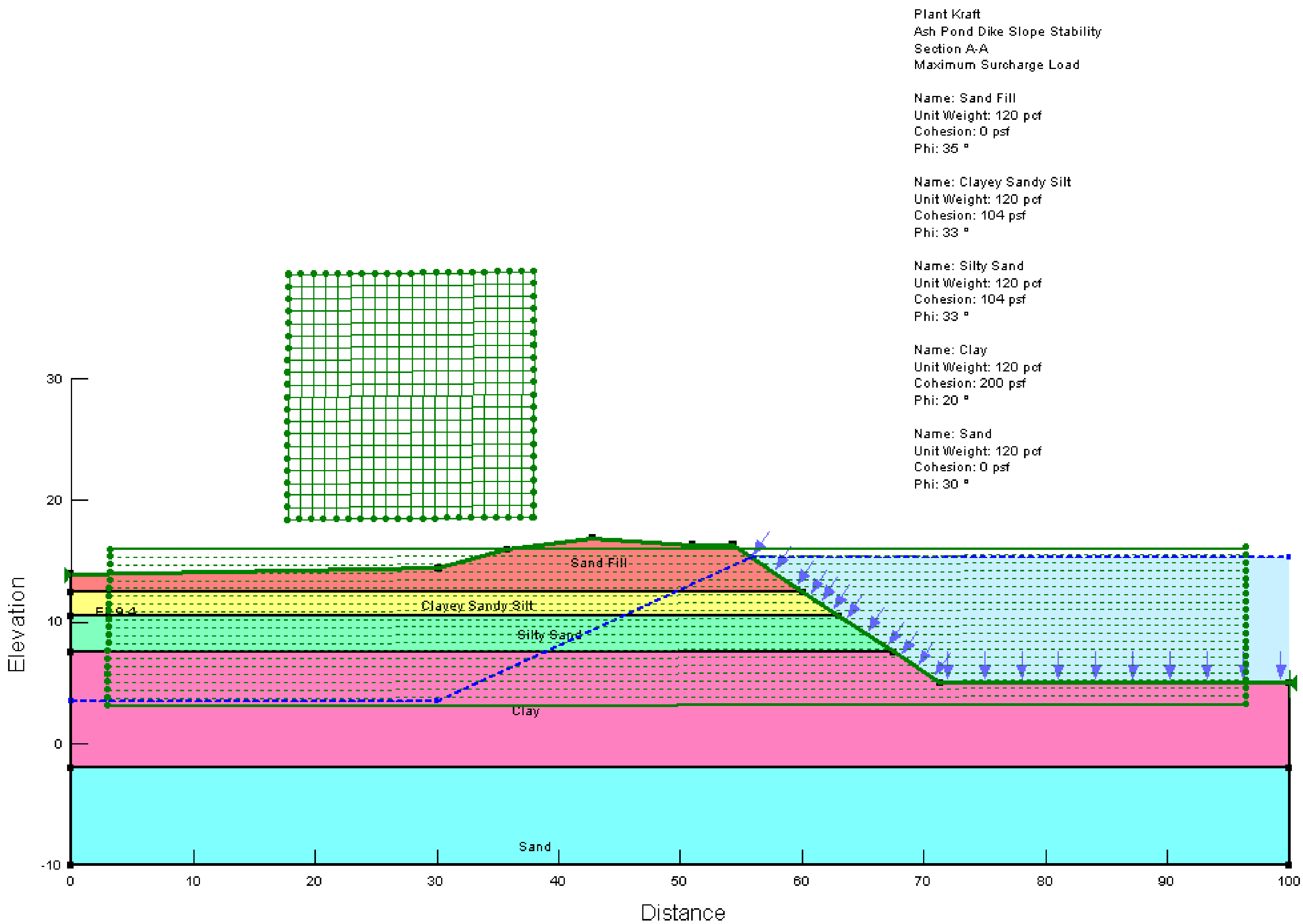
Name: Clayey Sandy Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °

2.4
Sand Fill
Clayey Sandy Silt
EL 9.4
Silty Sand
Clay
Sand
Elevation
30
20
10
0
-10
0
10
20
30
40
50
60
70
80
90
100
Distance



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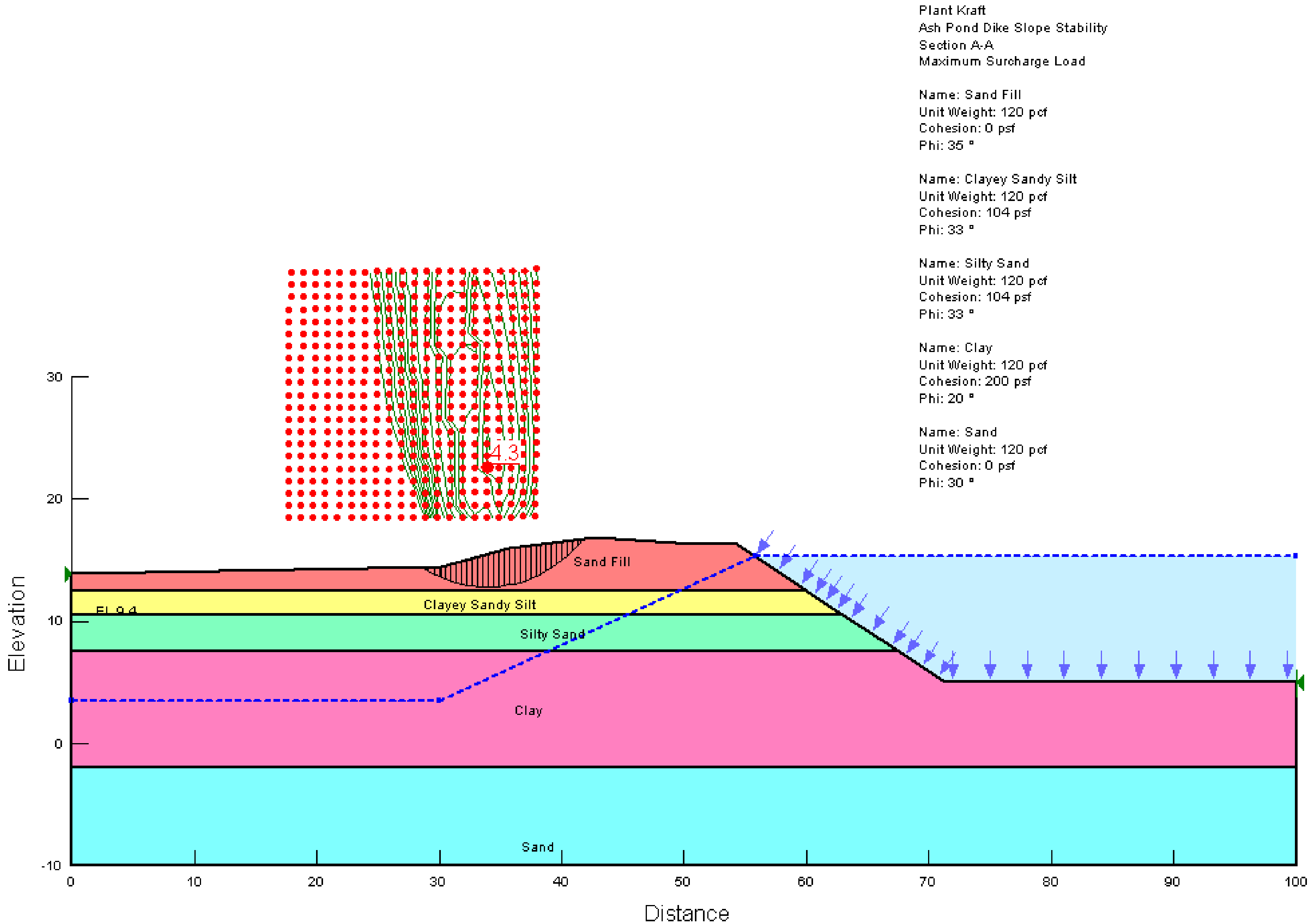
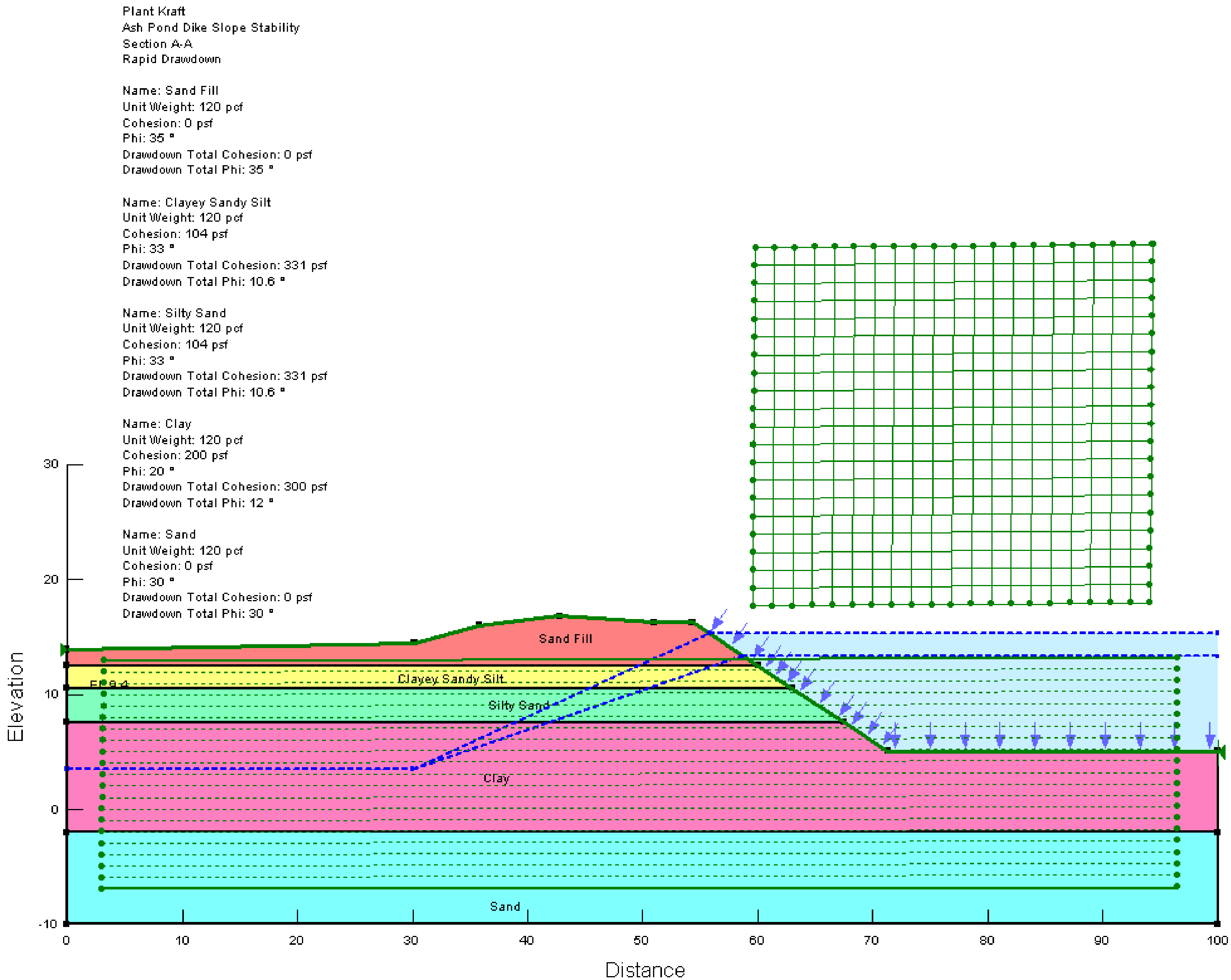
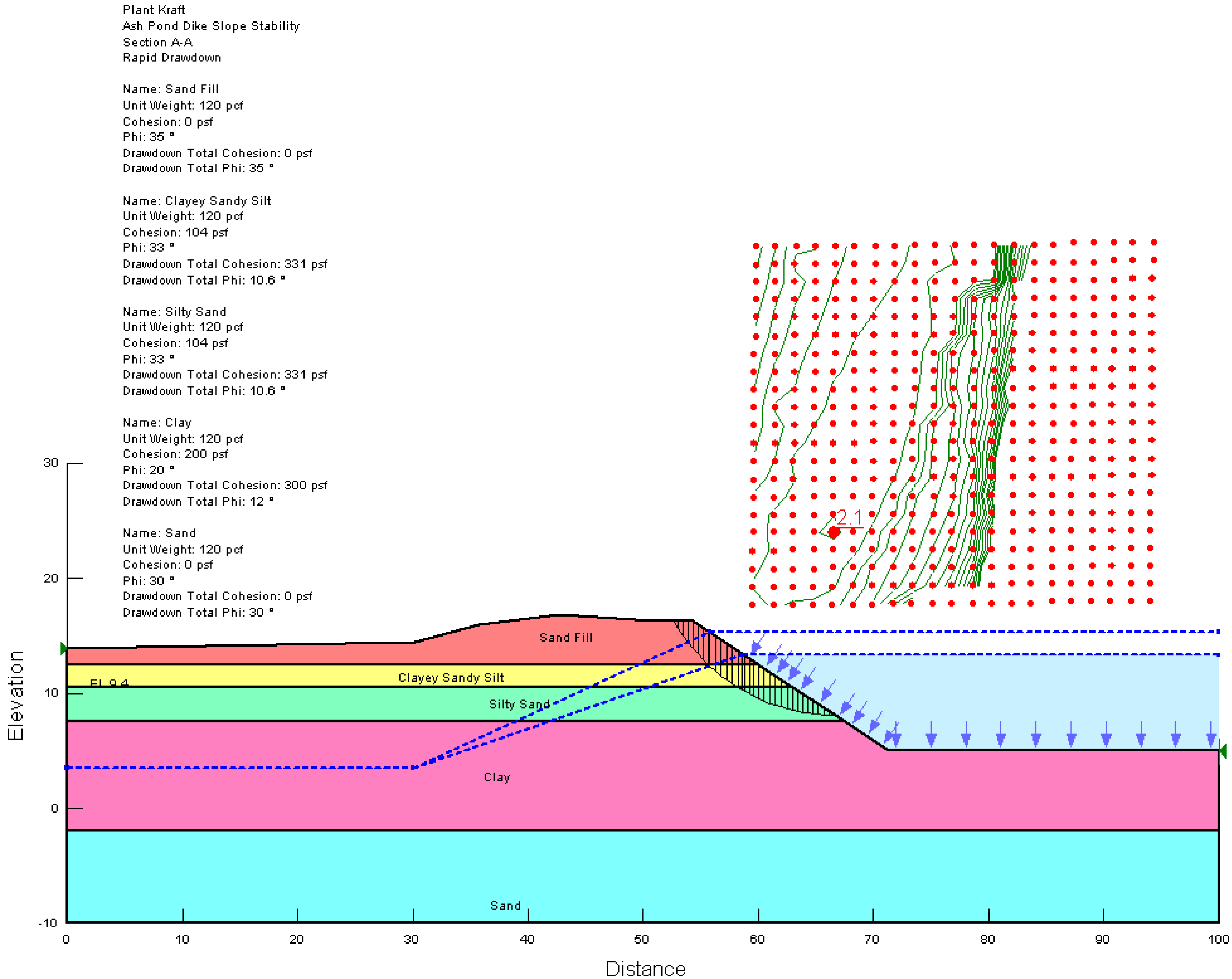

Plant Kraft
Ash Pond Dike Slope Stability
Section A-A
Maximum Surcharge Load
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Clayey Sandy Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
4.3
Sand Fill
Clayey Sandy Silt
EL 9.4
Silty Sand
Clay
Sand
Elevation
30
20
10
0
-10
0
10
20
30
40
50
60
70
80
90
100
Distance



CONFIDENTIAL BUSINESS INFORMATION



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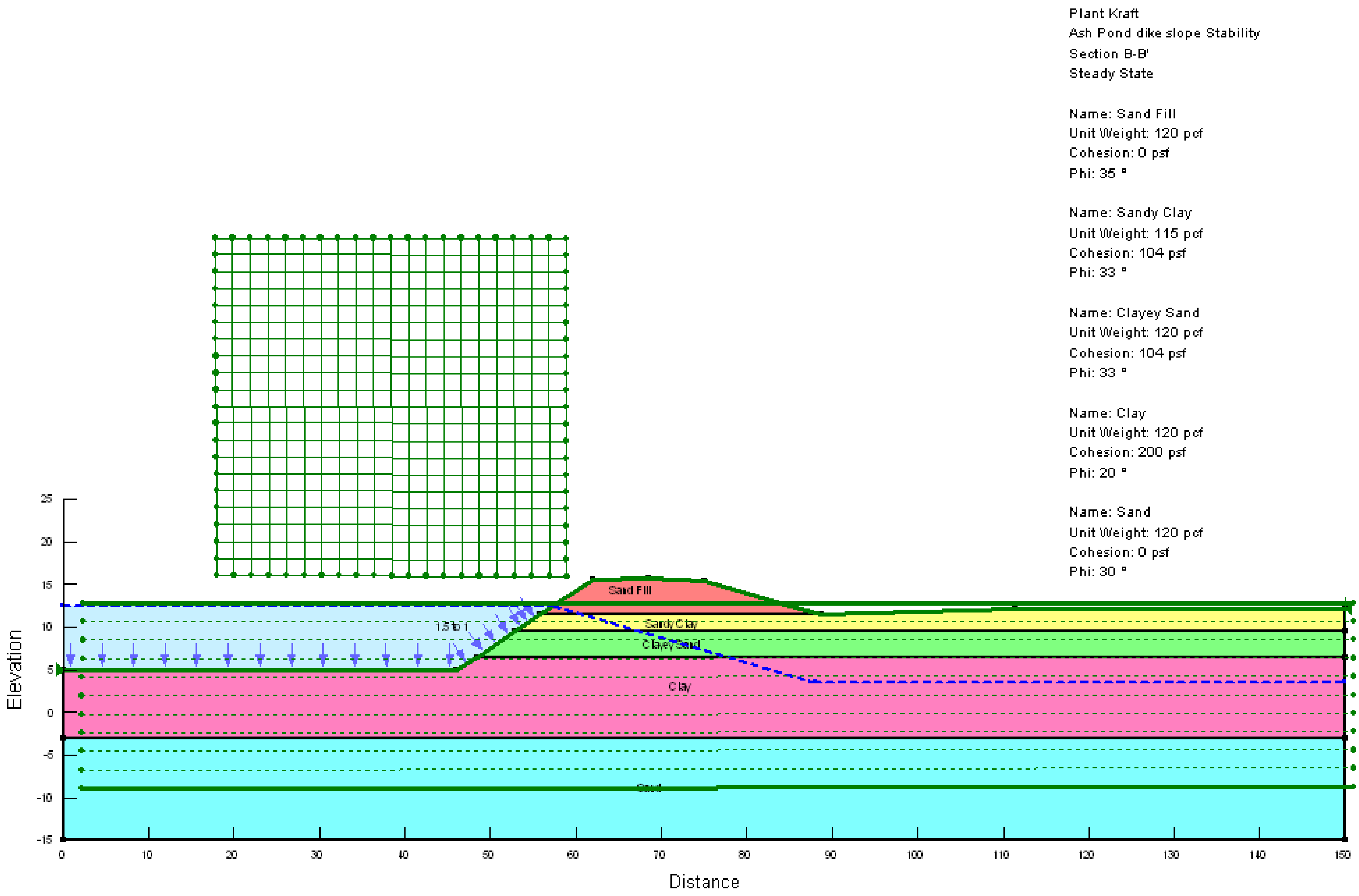
SECTION BB


Plant Kraft
Ash Pond dike slope Stability
Section B-B'
Steady State
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clay
Unit Weight: 115 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clayey Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Sand Fill
Sandy Clay
Clayey Sand
Clay
Sand
1.5 to 1
Elevation
Distance
25
20
15
10
5
0
-5
-10
-15
0
10
20
30
40
50
60
70
80
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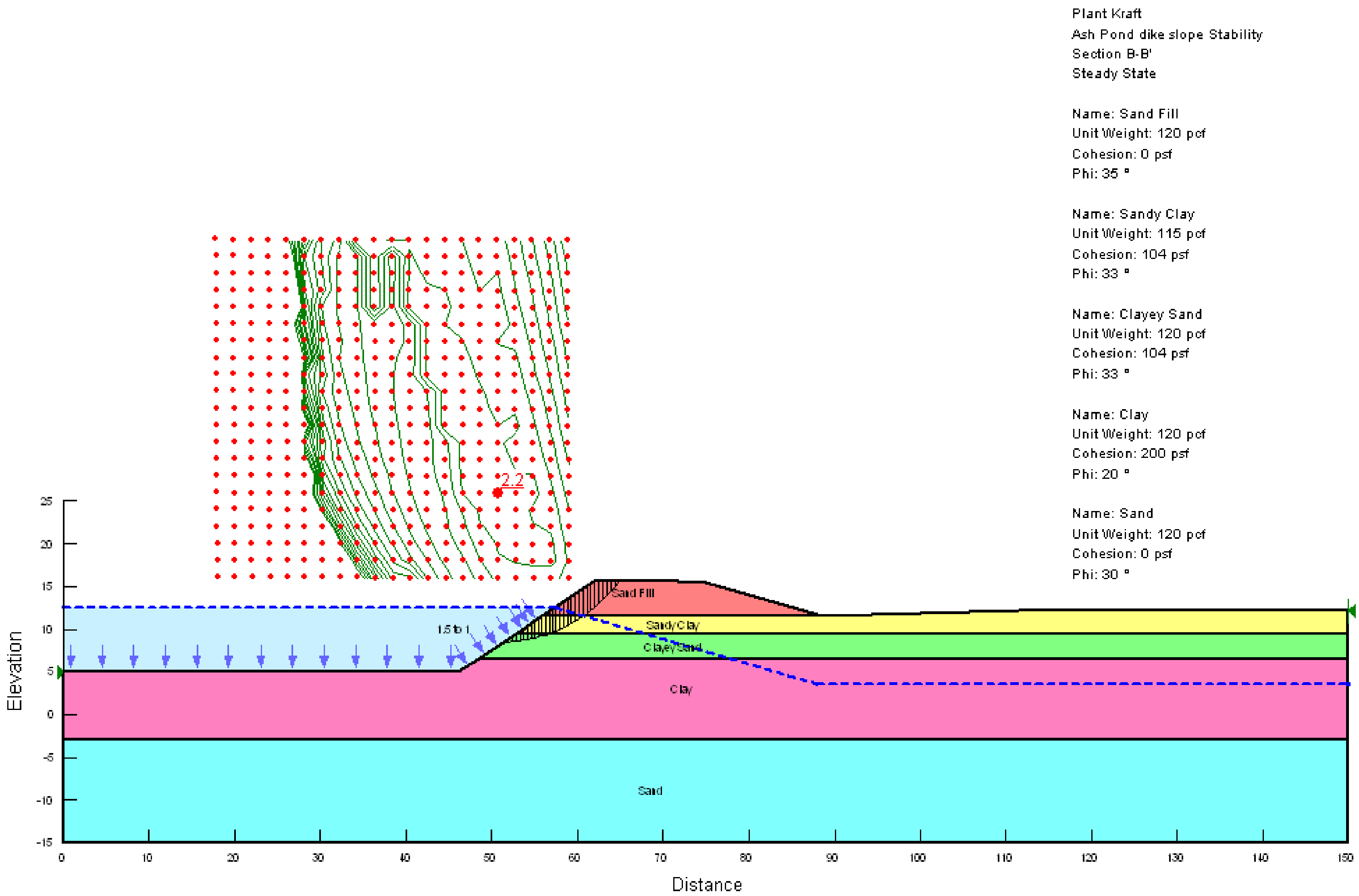
100
110
120
130
140
150


Plant Kraft
Ash Pond dike slope Stability
Section B-B'
Steady State
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clay
Unit Weight: 115 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clayey Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
2.2
1.5 to 1
Sand Fill
Sandy Clay
Clayey Sand
Clay
Sand
Elevation
Distance

Plant Kraft
Ash Pond dike slope Stability
Section B-B'
Seismic Load - 0.16g

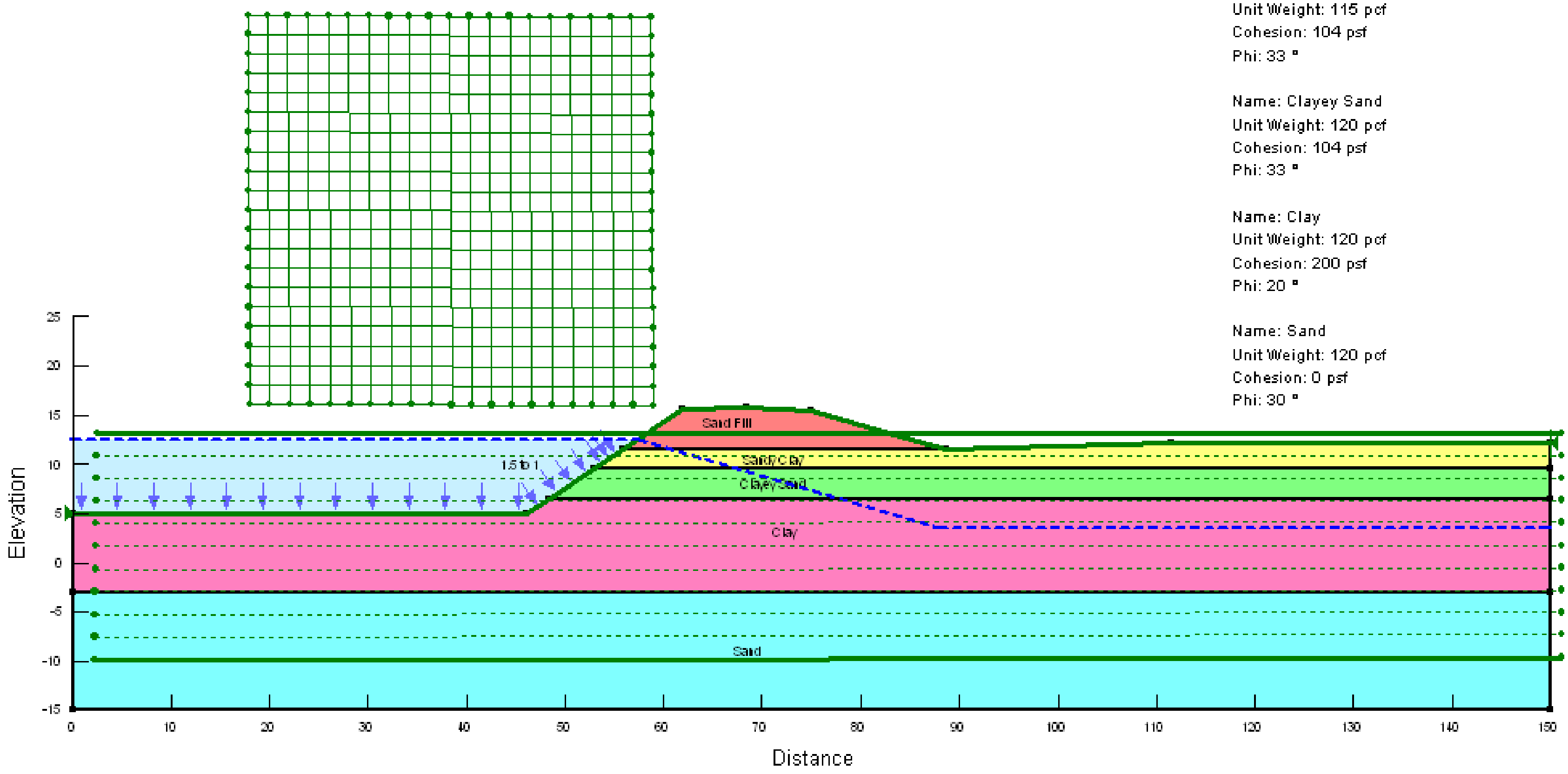
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °

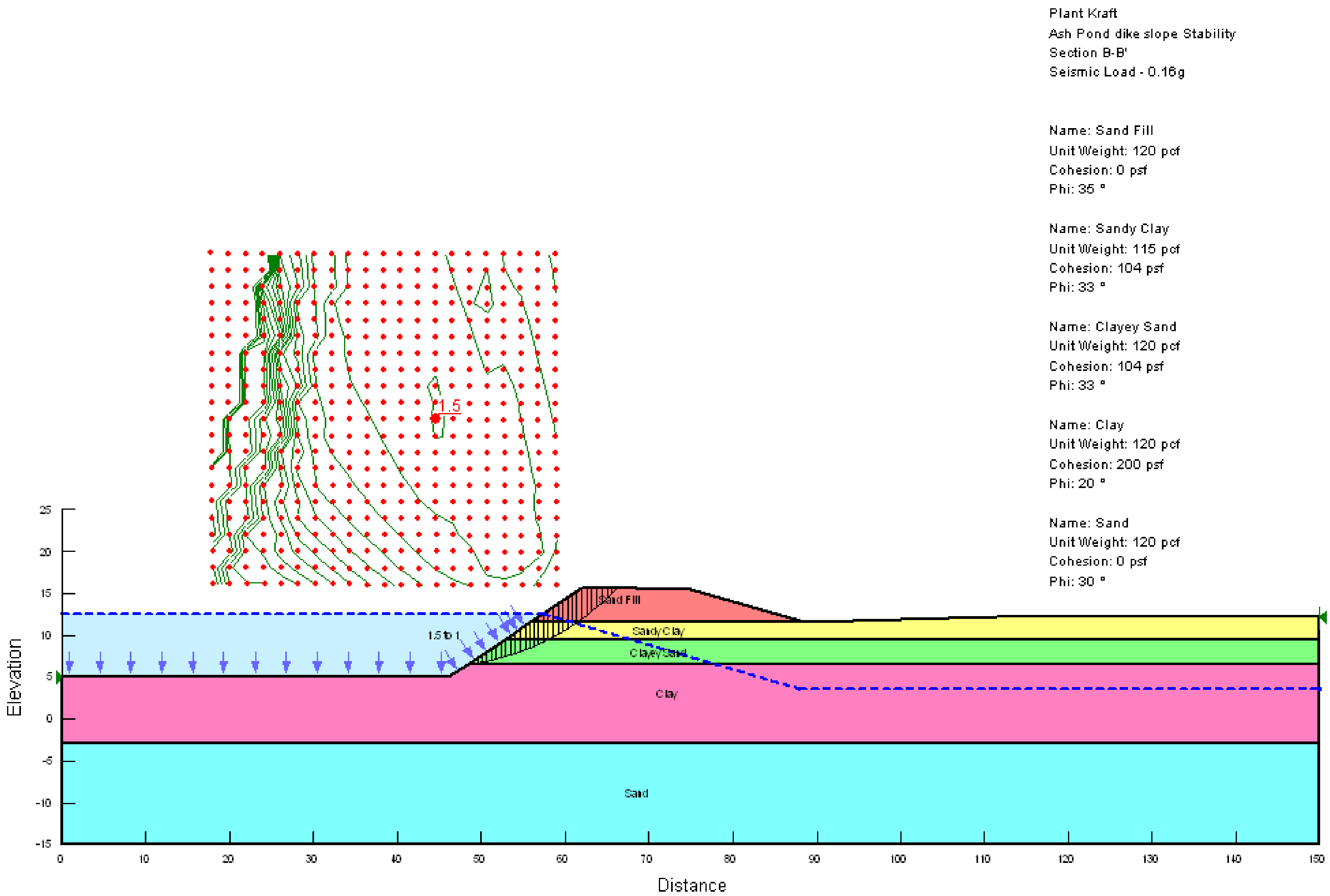
Name: Sandy Clay
Unit Weight: 115 pcf
Cohesion: 104 psf
Phi: 33 °

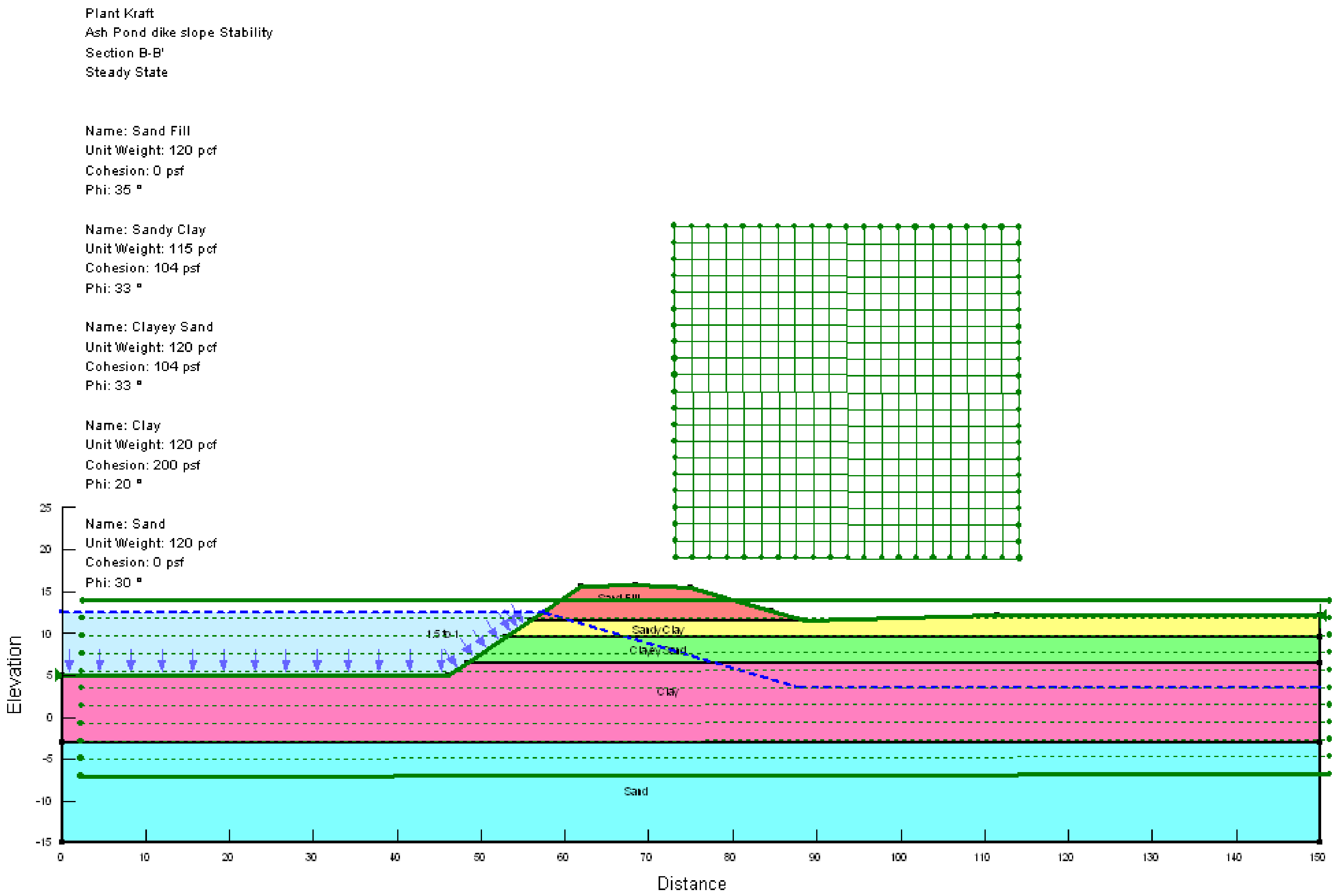
Name: Clayey Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °




Plant Kraft
Ash Pond dike slope Stability
Section B-B'
Seismic Load - 0.16g
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clay
Unit Weight: 115 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clayey Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
1.5
1.5 to 1
Sand Fill
Sandy Clay
Clayey Sand
Clay
Sand
Elevation
Distance



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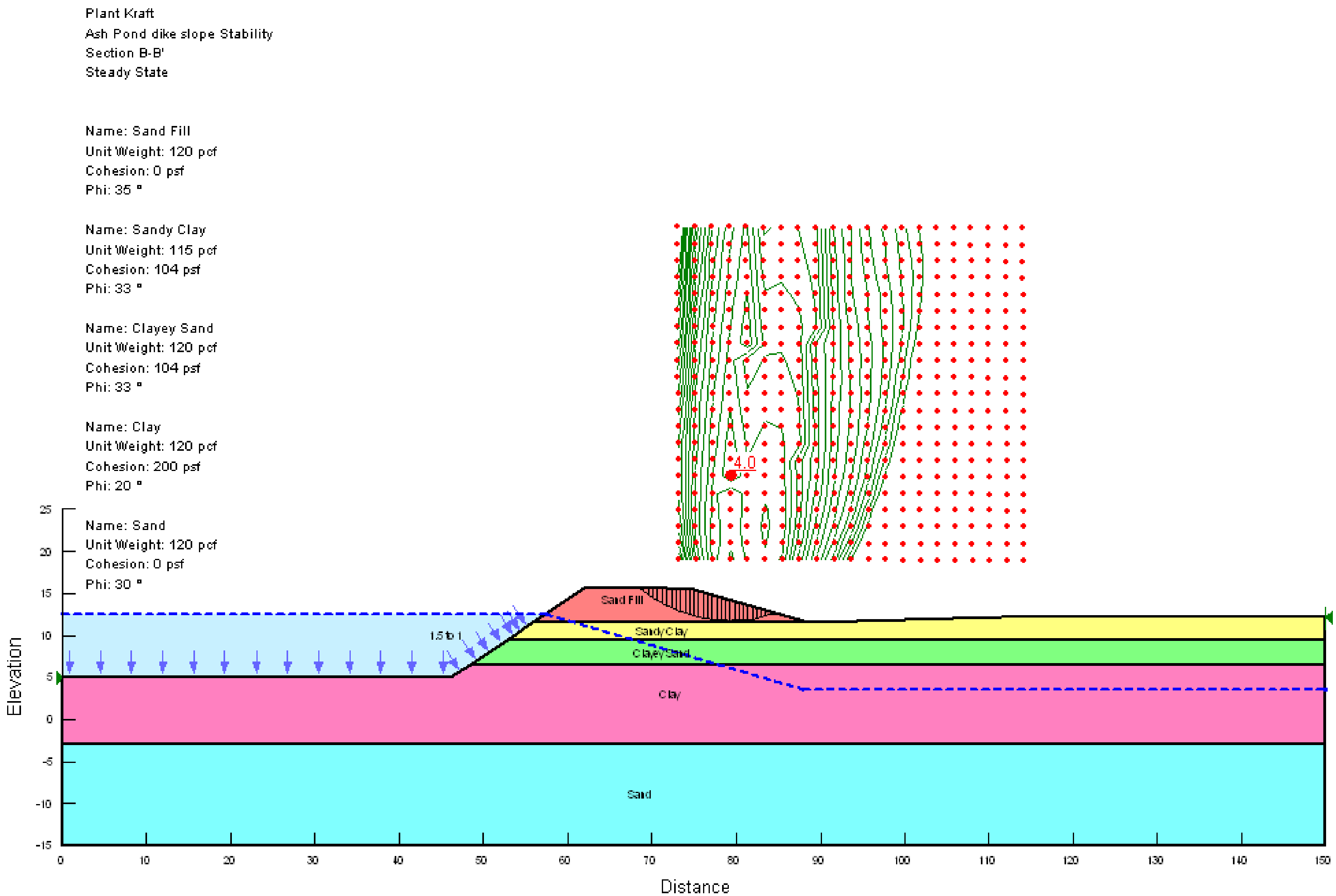
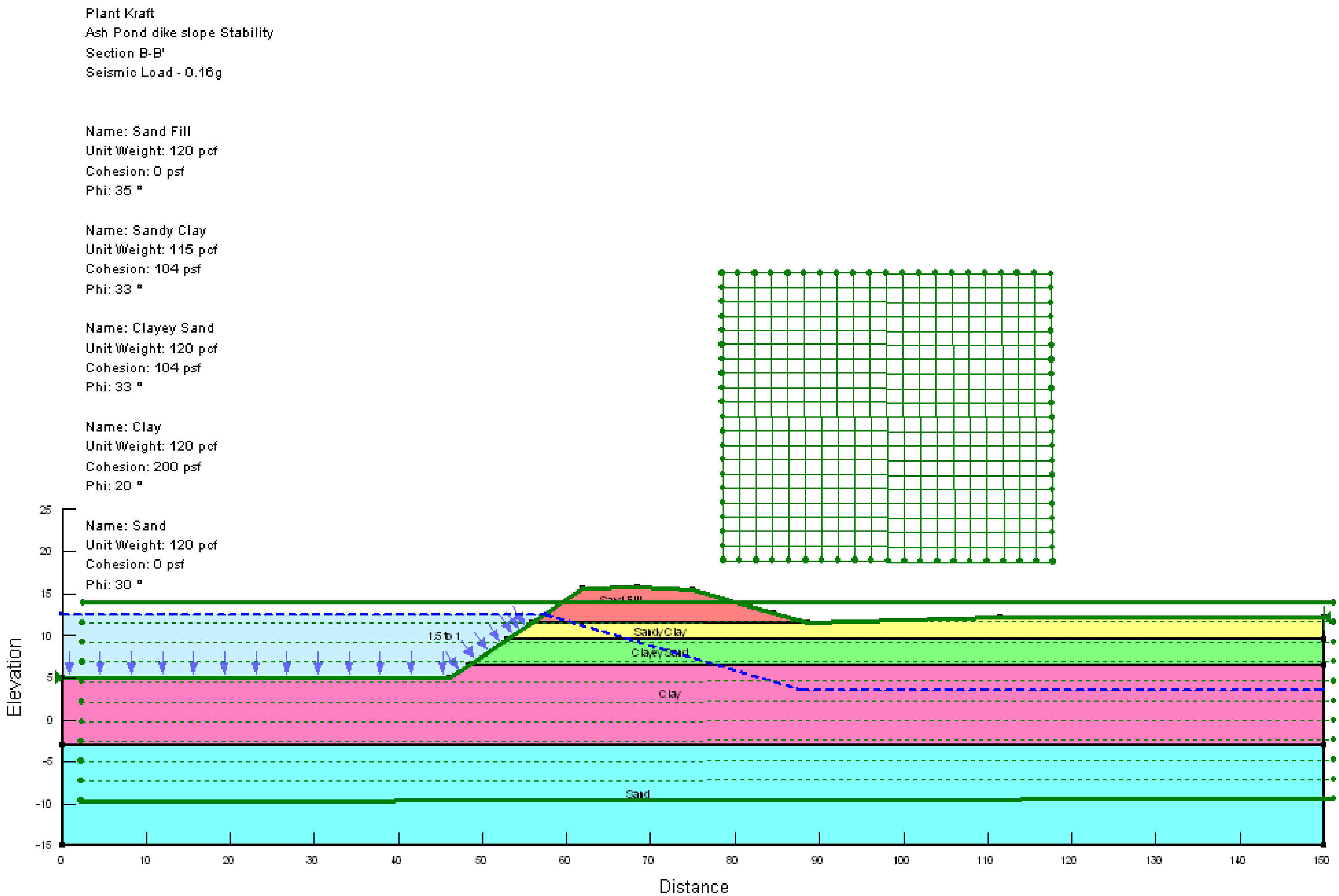
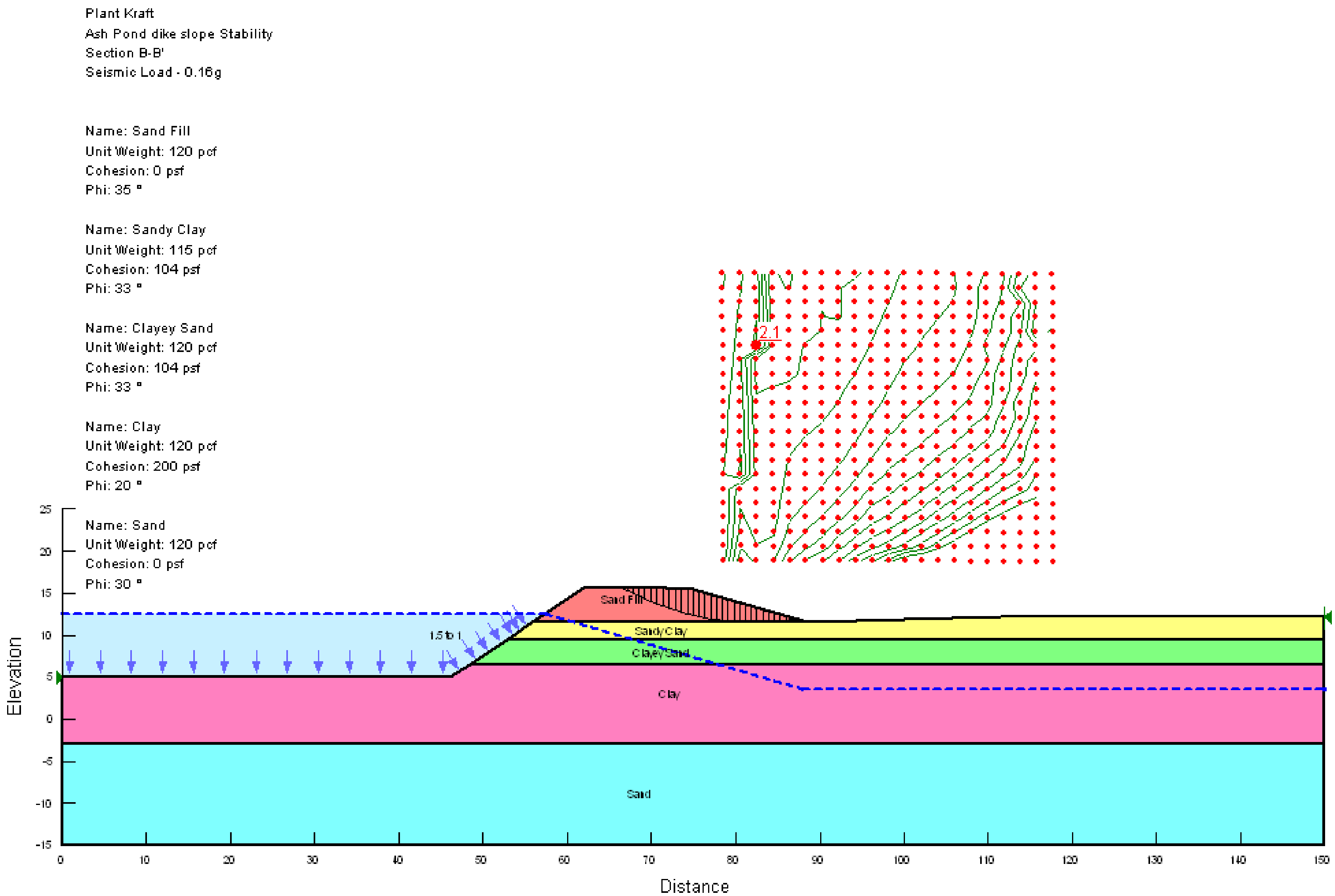
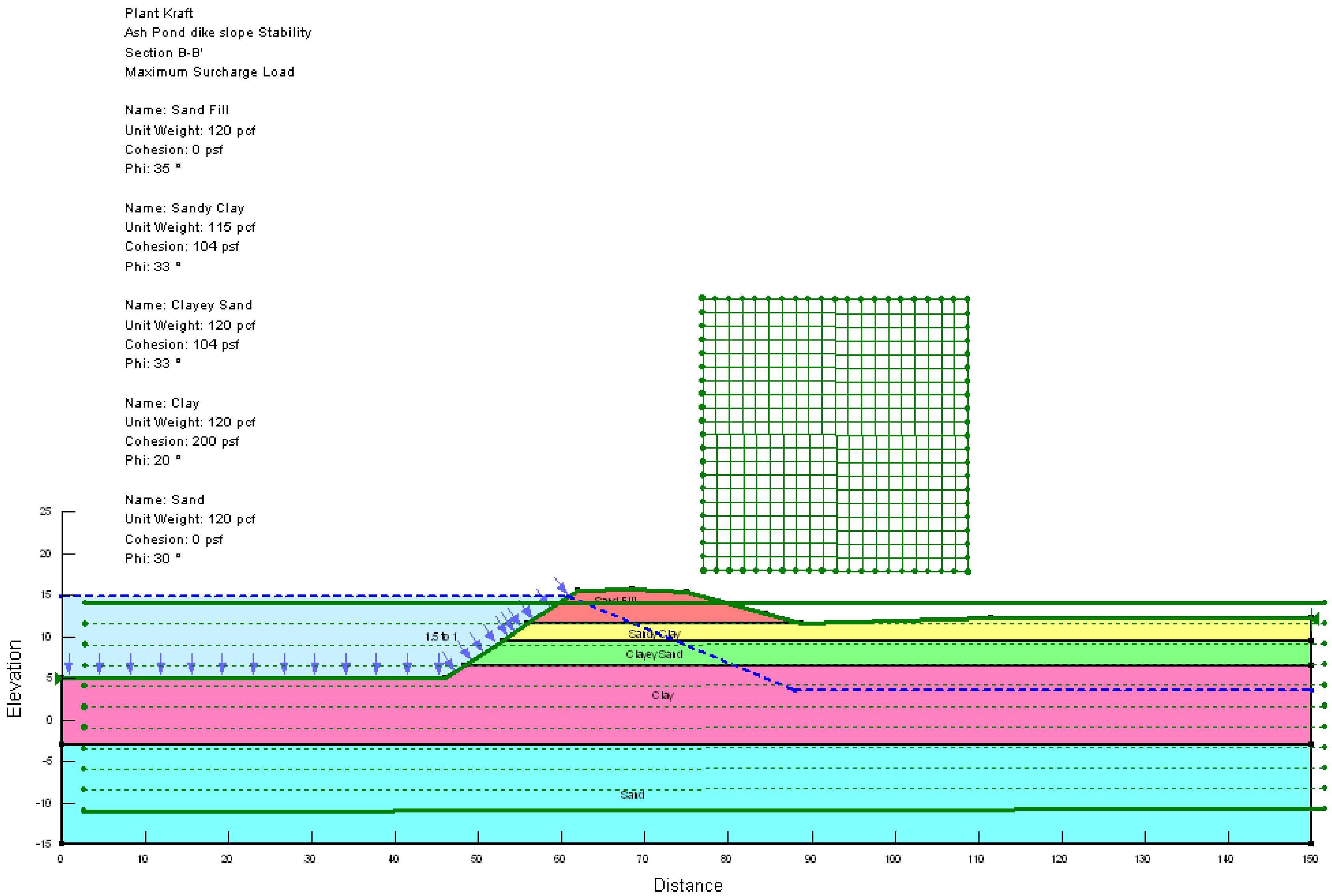


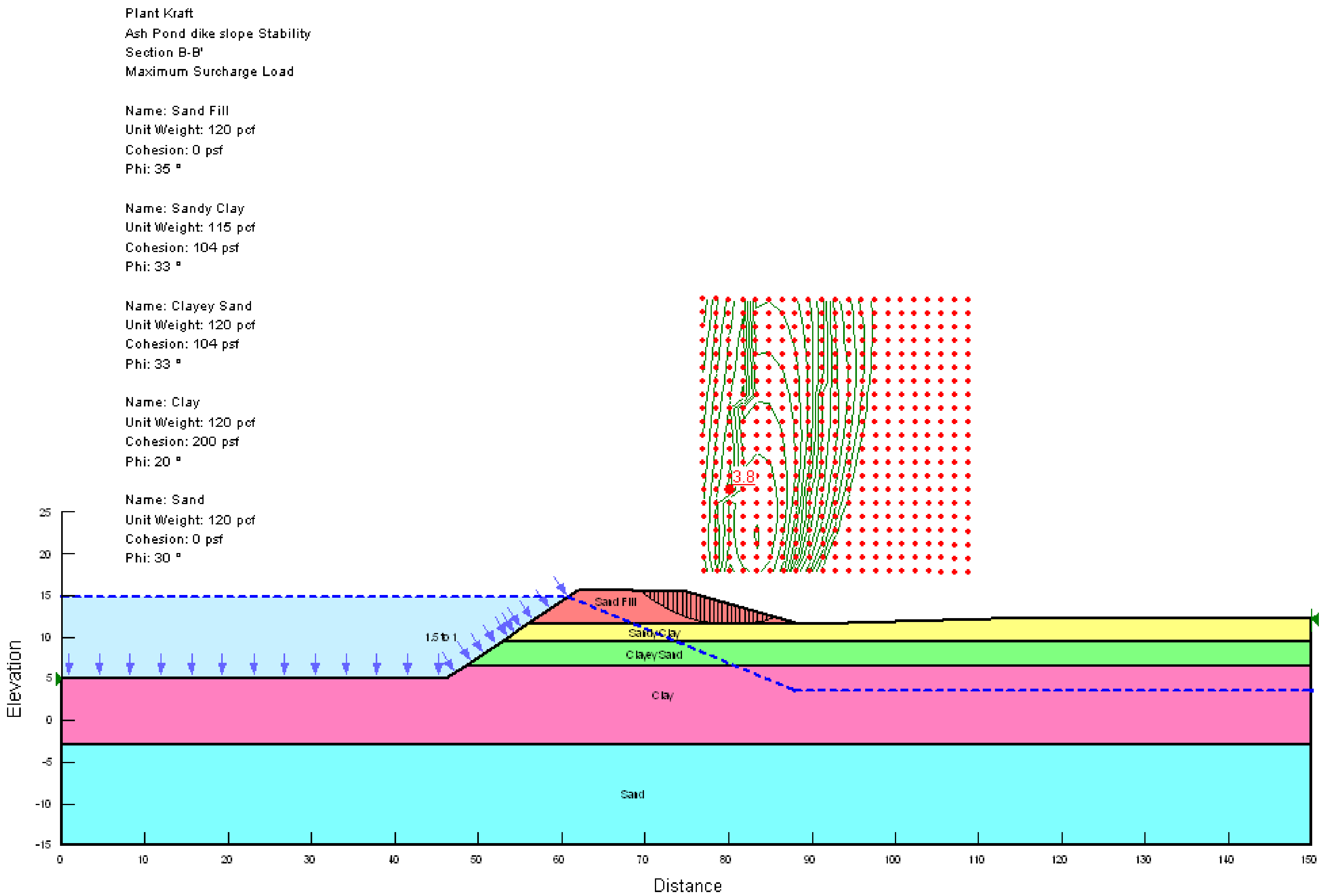
CONFIDENTIAL BUSINESS INFORMATION


Plant Kraft
Ash Pond dike slope Stability
Section B-B'
Seismic Load - 0.16g
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clay
Unit Weight: 115 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clayey Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
1.5 to 1
Sandy Clay
Clayey Sand
Clay
Sand
25
20
15
10
5
0
-5
-10
-15
Elevation
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Distance



CONFIDENTIAL BUSINESS INFORMATION


Plant Kraft
Ash Pond dike slope Stability
Section B-B'
Maximum Surcharge Load
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clay
Unit Weight: 115 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clayey Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
1.5 to 1
Sandy Clay
Clayey Sand
Clay
Sand
Elevation
25
20
15
10
5
0
-5
-10
-15
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Distance


Plant Kraft
Ash Pond dike slope Stability
Section B-B'
Maximum Surcharge Load
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clay
Unit Weight: 115 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clayey Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
3.8
1.5 to 1
Sand Fill
Sandy Clay
Clayey Sand
Clay
Sand
Elevation
Distance
25
20
15
10
5
0
-5
-10
-15
0
10
20
30
40
50
60
70
80
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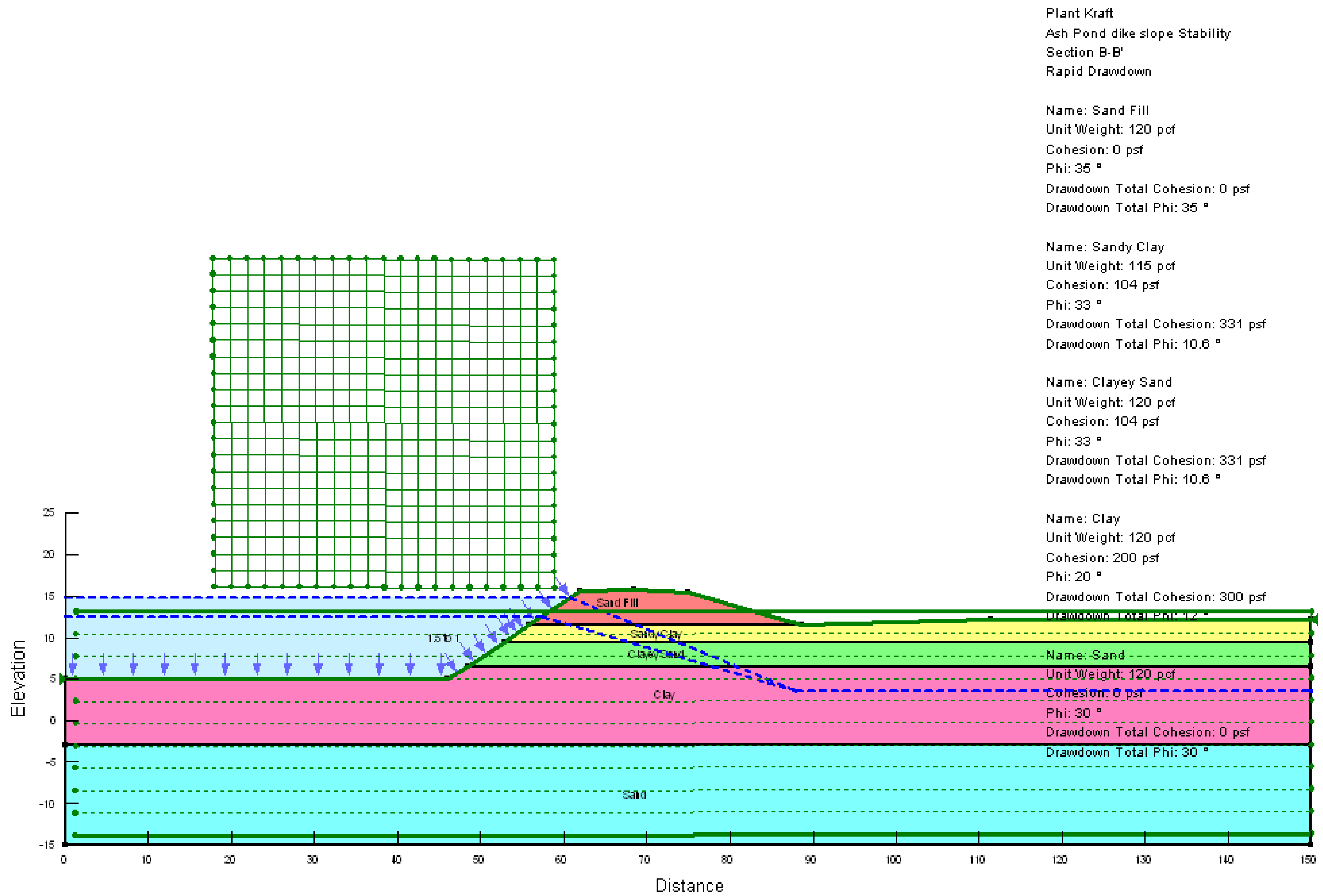
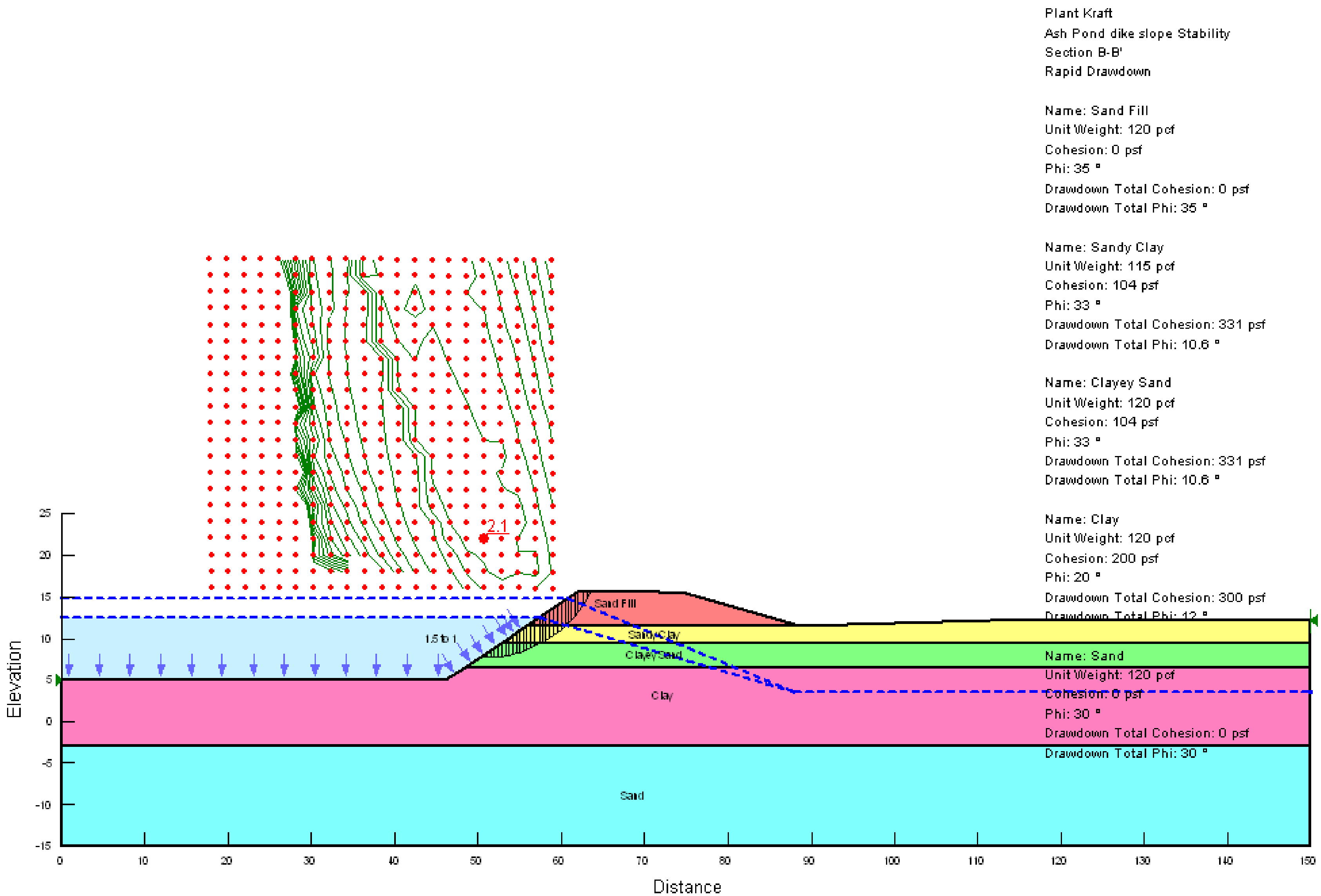
100
110
120
130
140
150

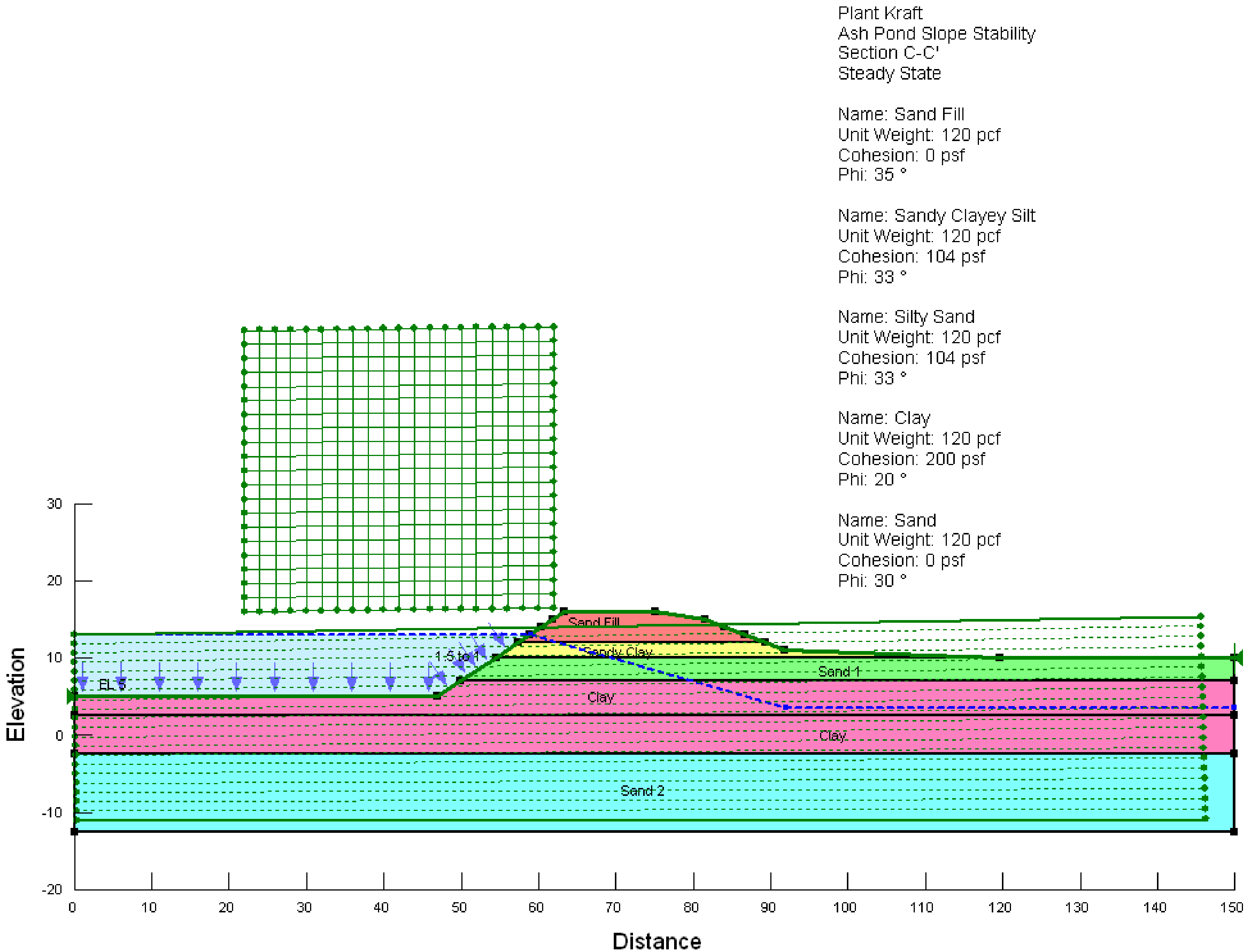


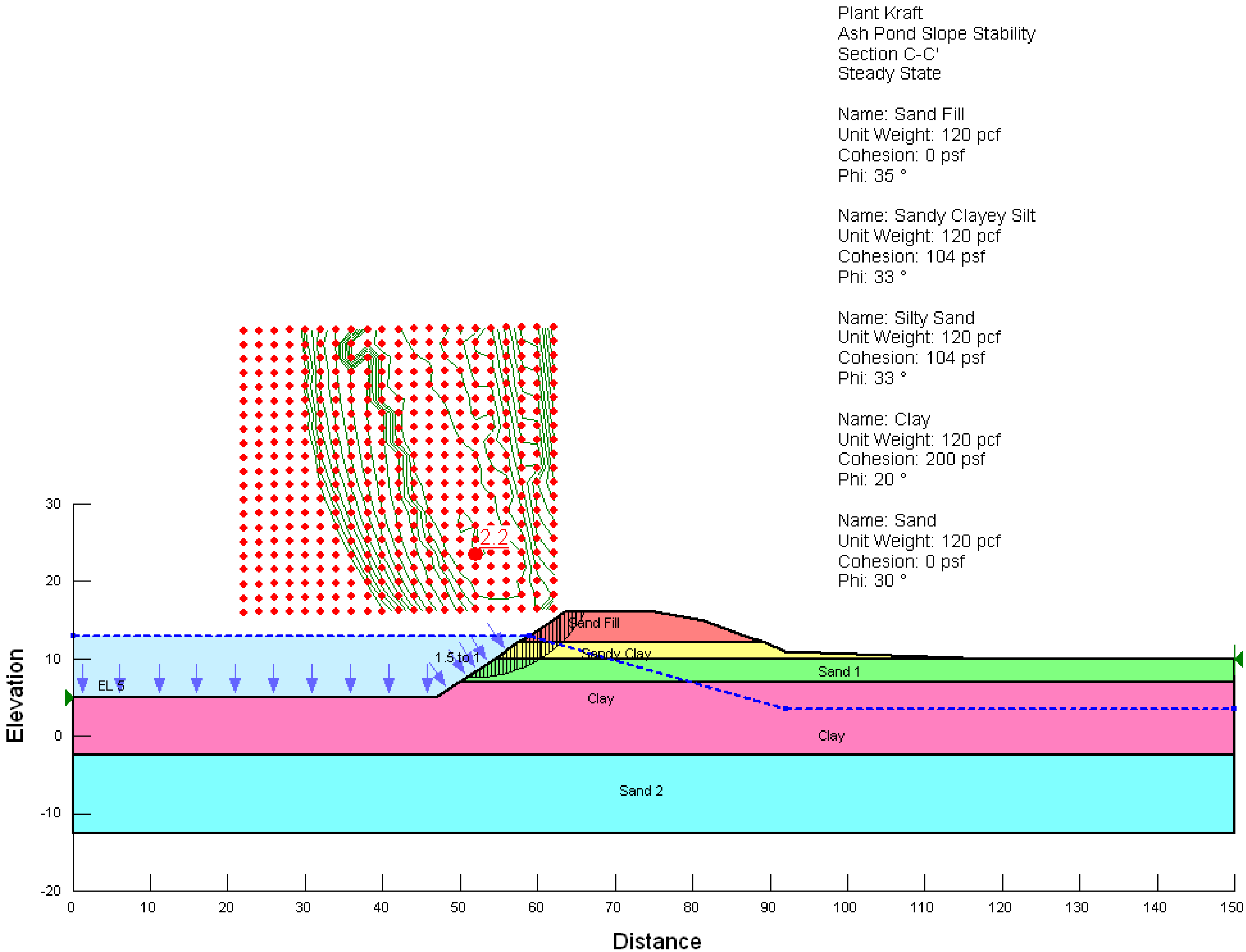
CONFIDENTIAL BUSINESS INFORMATION



Plant Kraft
Ash Pond dike slope Stability
Section B-B'
Rapid Drawdown
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Drawdown Total Cohesion: 0 psf
Drawdown Total Phi: 35 °
Name: Sandy Clay
Unit Weight: 115 pcf
Cohesion: 104 psf
Phi: 33 °
Drawdown Total Cohesion: 331 psf
Drawdown Total Phi: 10.6 °
Name: Clayey Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Drawdown Total Cohesion: 331 psf
Drawdown Total Phi: 10.6 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Drawdown Total Cohesion: 300 psf
Drawdown Total Phi: 12 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Drawdown Total Cohesion: 0 psf
Drawdown Total Phi: 30 °
2.1
Sand Fill
Sandy Clay
Clayey Sand
Clay
Sand
1.5 to 1
Elevation
Distance

Section CC


Plant Kraft
Ash Pond Slope Stability
Section C-C'
Steady State
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Sand Fill
Sandy Clay
1.5 to 1
EL 5
Sand 1
Clay
Clay
Sand 2
Elevation
Distance
30
20
10
0
-10
-20
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150



Plant Kraft
Ash Pond Slope Stability
Section C-C'
Steady State

Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °

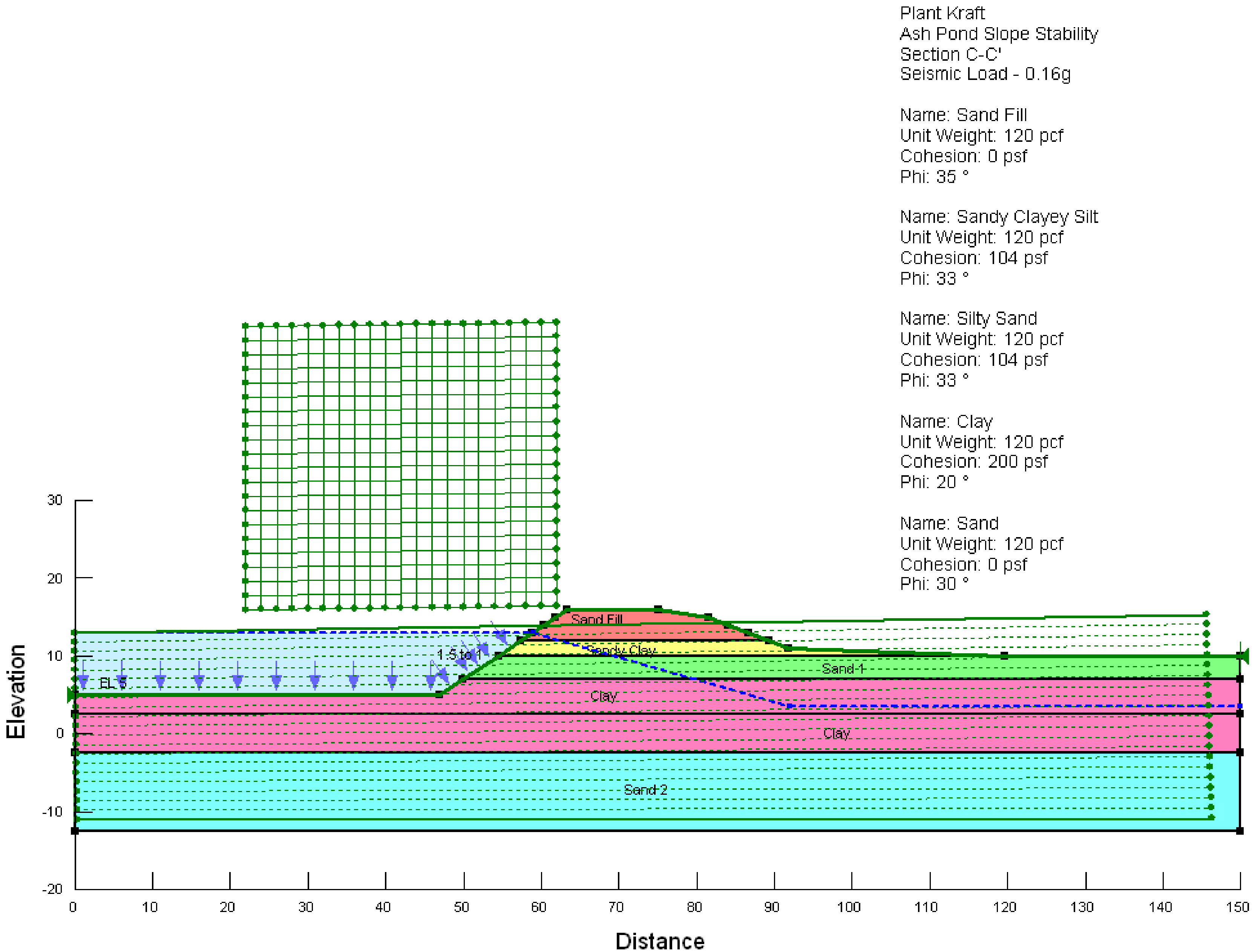
Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °

2.2
Sand Fill
Sandy Clay
1.5 to 1
EL 5
Sand 1
Clay
Clay
Sand 2
Elevation
30
20
10
0
-10
-20
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Distance


Plant Kraft
Ash Pond Slope Stability
Section C-C'
Seismic Load - 0.16g

Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °

Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °

Sand Fill
Sandy Clay
1.5 to 1
EL 5
Sand-1
Clay
Clay
Sand-2
Elevation
Distance
30
20
10
0
-10
-20
0
10
20
30
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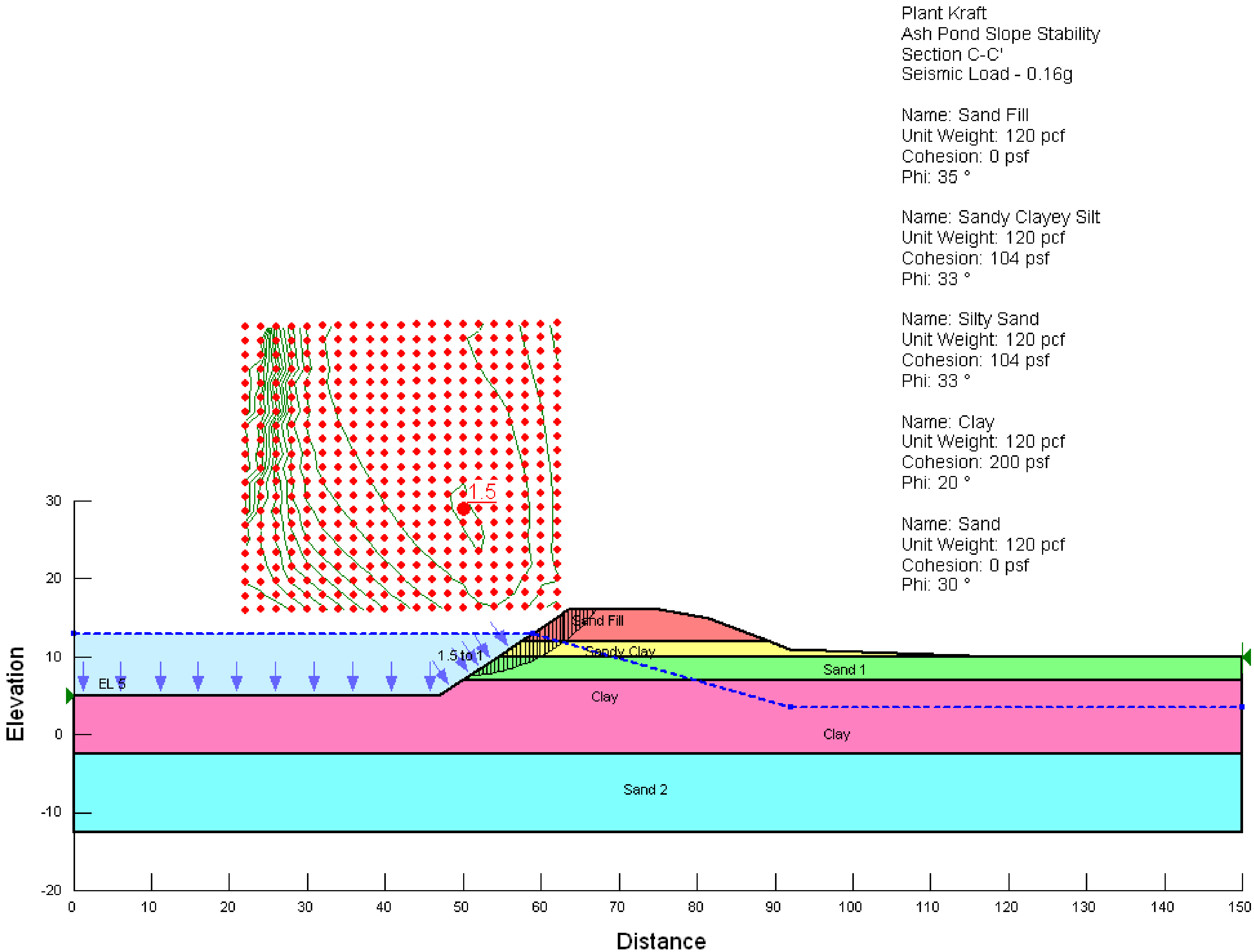
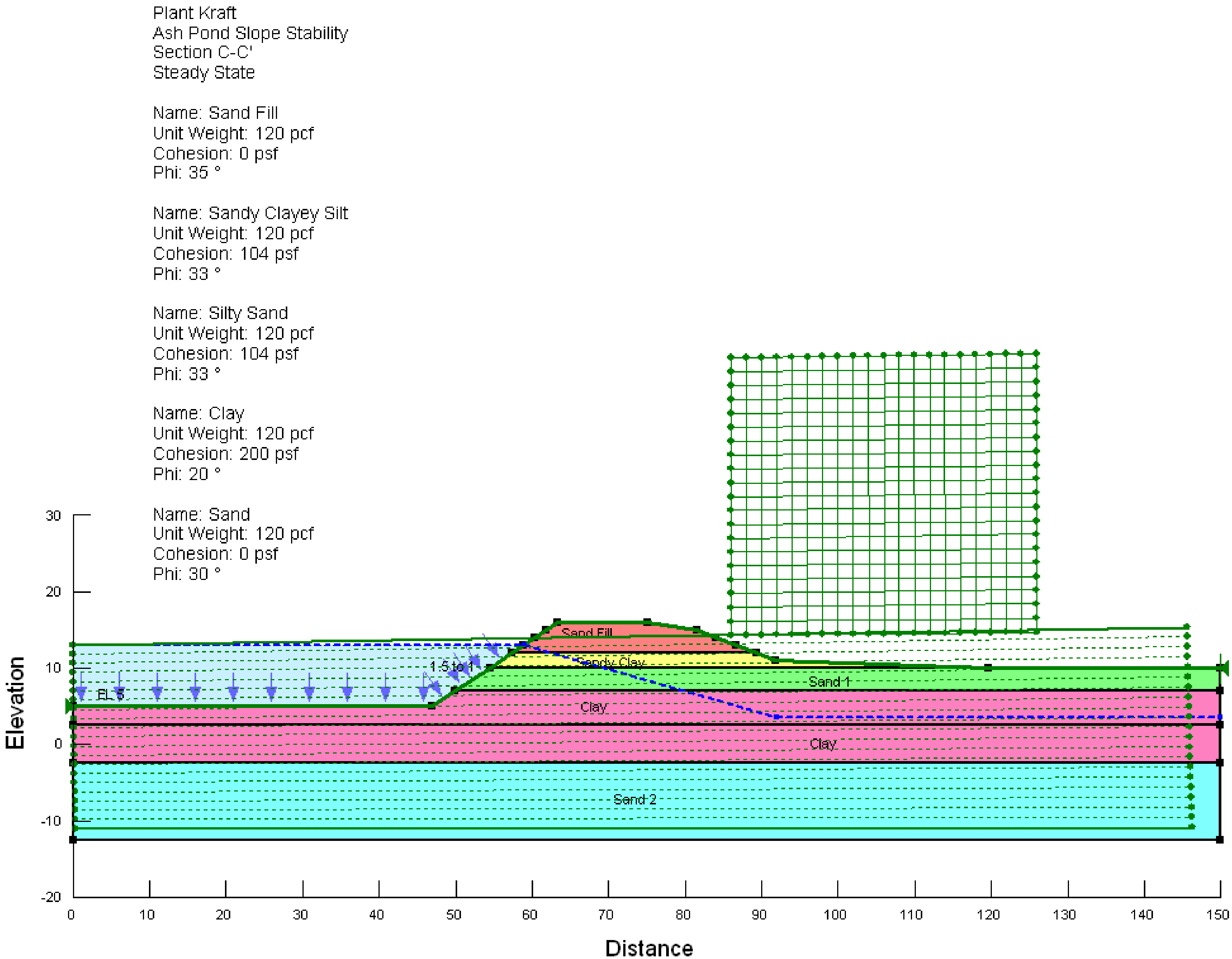
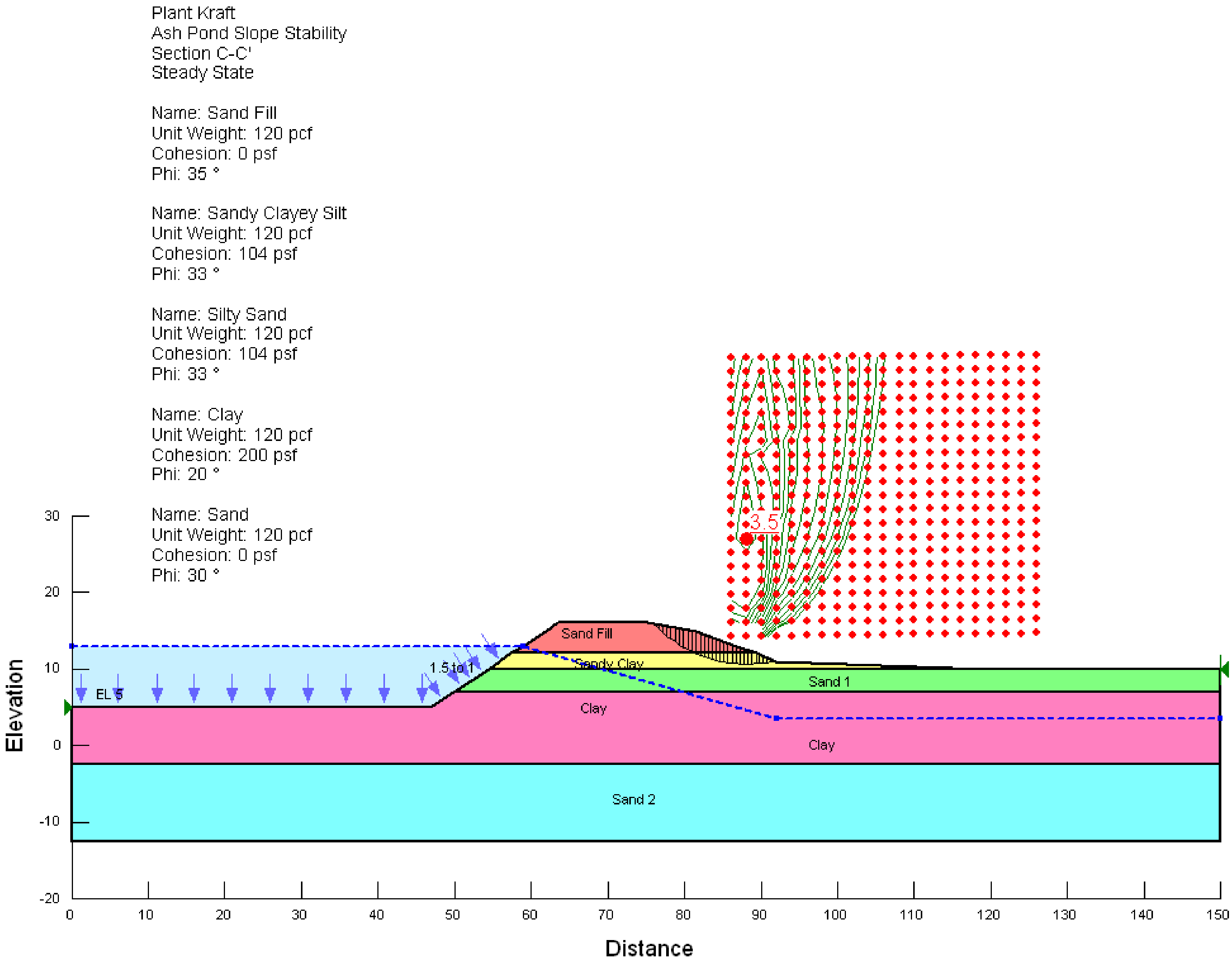
110
120
130
140
150



CONFIDENTIAL BUSINESS INFORMATION



CONFIDENTIAL BUSINESS INFORMATION



Plant Kraft
Ash Pond Slope Stability
Section C-C'
Steady State

Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °

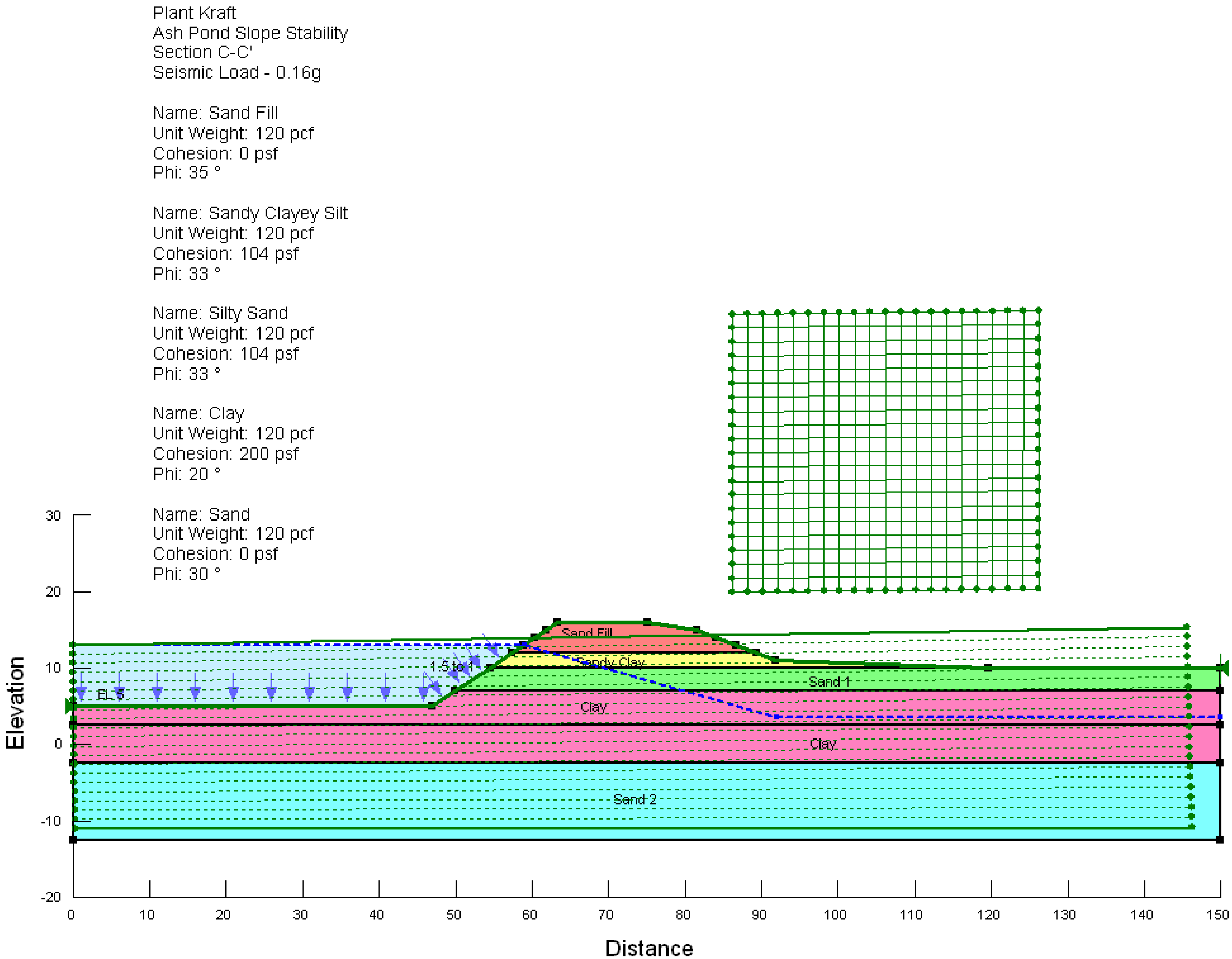
Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °

3.5
Sand Fill
Sandy Clay
1.5 to 1
EL 5
Sand 1
Clay
Clay
Sand 2
Elevation
Distance
30
20
10
0
-10
-20
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150


Plant Kraft
Ash Pond Slope Stability
Section C-C'
Seismic Load - 0.16g
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Sand Fill
Sandy Clay
1.5 to 1
EL 5
Sand 1
Clay
Clay
Sand 2
Elevation
30
20
10
0
-10
-20
0
10
20
30
40
50
60
70
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90
100
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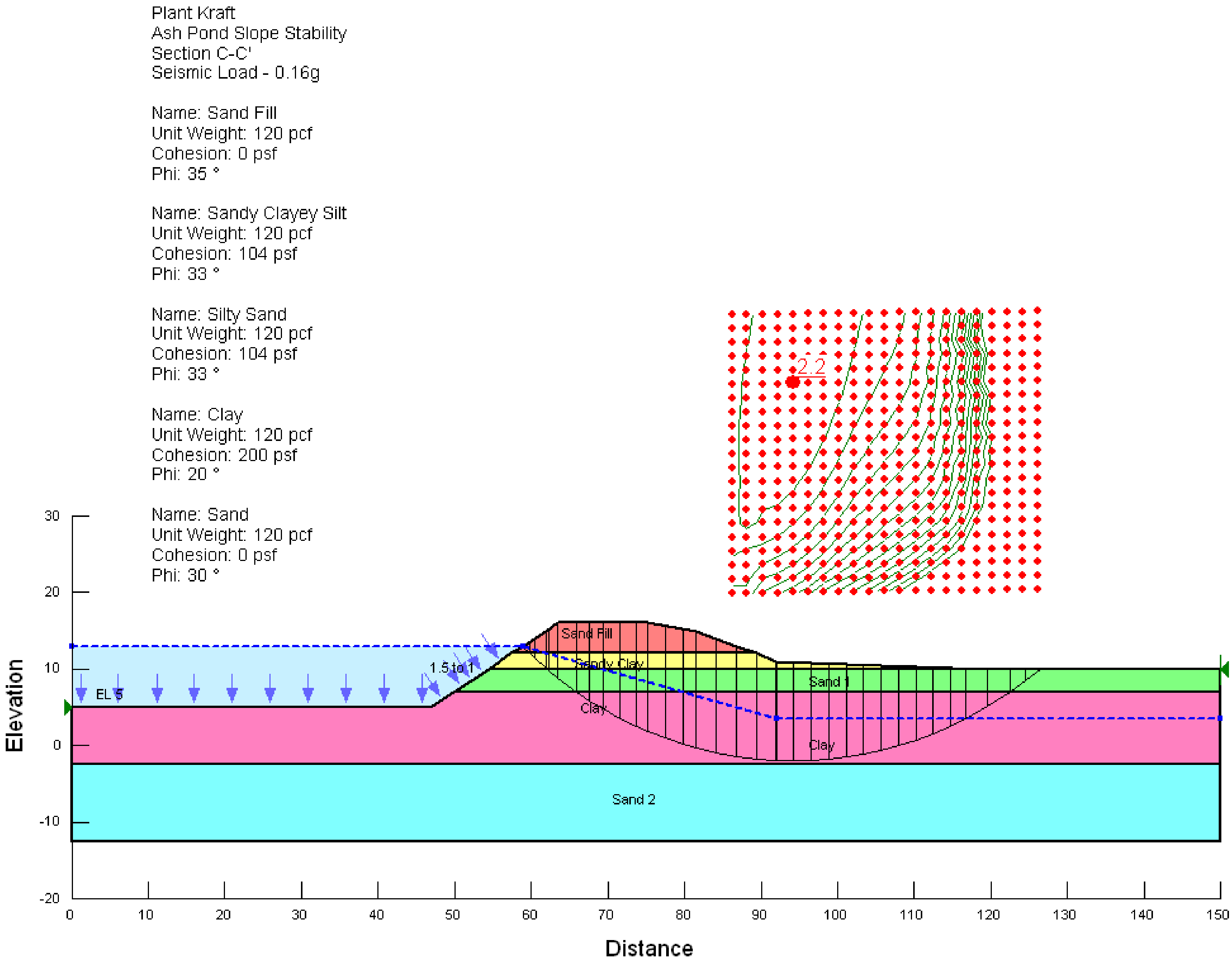
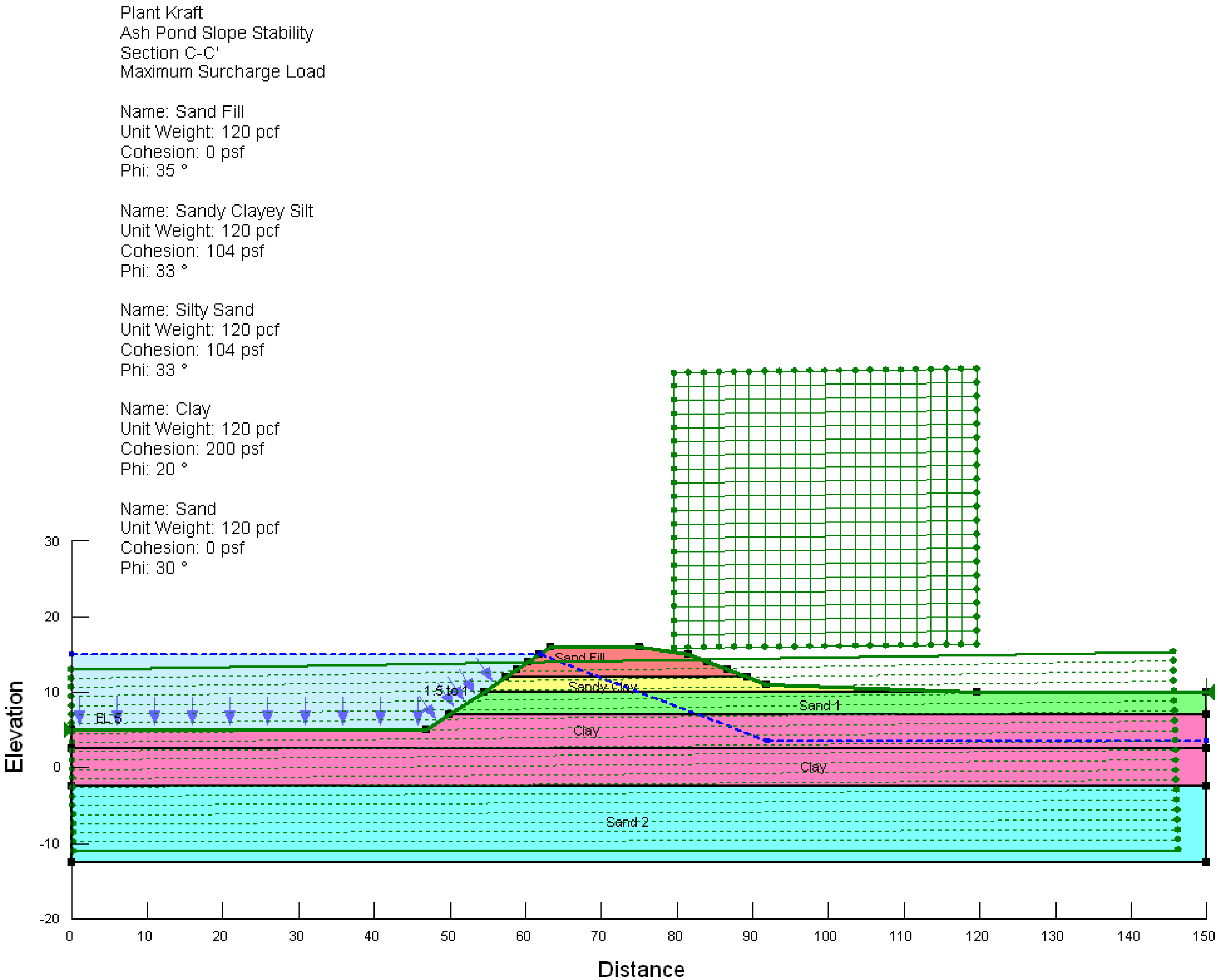
120
130
140
150
Distance


Plant Kraft
Ash Pond Slope Stability
Section C-C'
Seismic Load - 0.16g
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
2.2
Sand Fill
Sandy Clay
Sand 1
Clay
Clay
Sand 2
EL 5
1.5 to 1
Elevation
Distance
30
20
10
0
-10
-20
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150


Plant Kraft
Ash Pond Slope Stability
Section C-C'
Maximum Surcharge Load
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Sand Fill
Sandy Clay
1.5 to 1
EL 5
Sand 1
Clay
Clay
Sand 2
Elevation
Distance
30
20
10
0
-10
-20
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

Plant Kraft
Ash Pond Slope Stability
Section C-C'
Maximum Surcharge Load

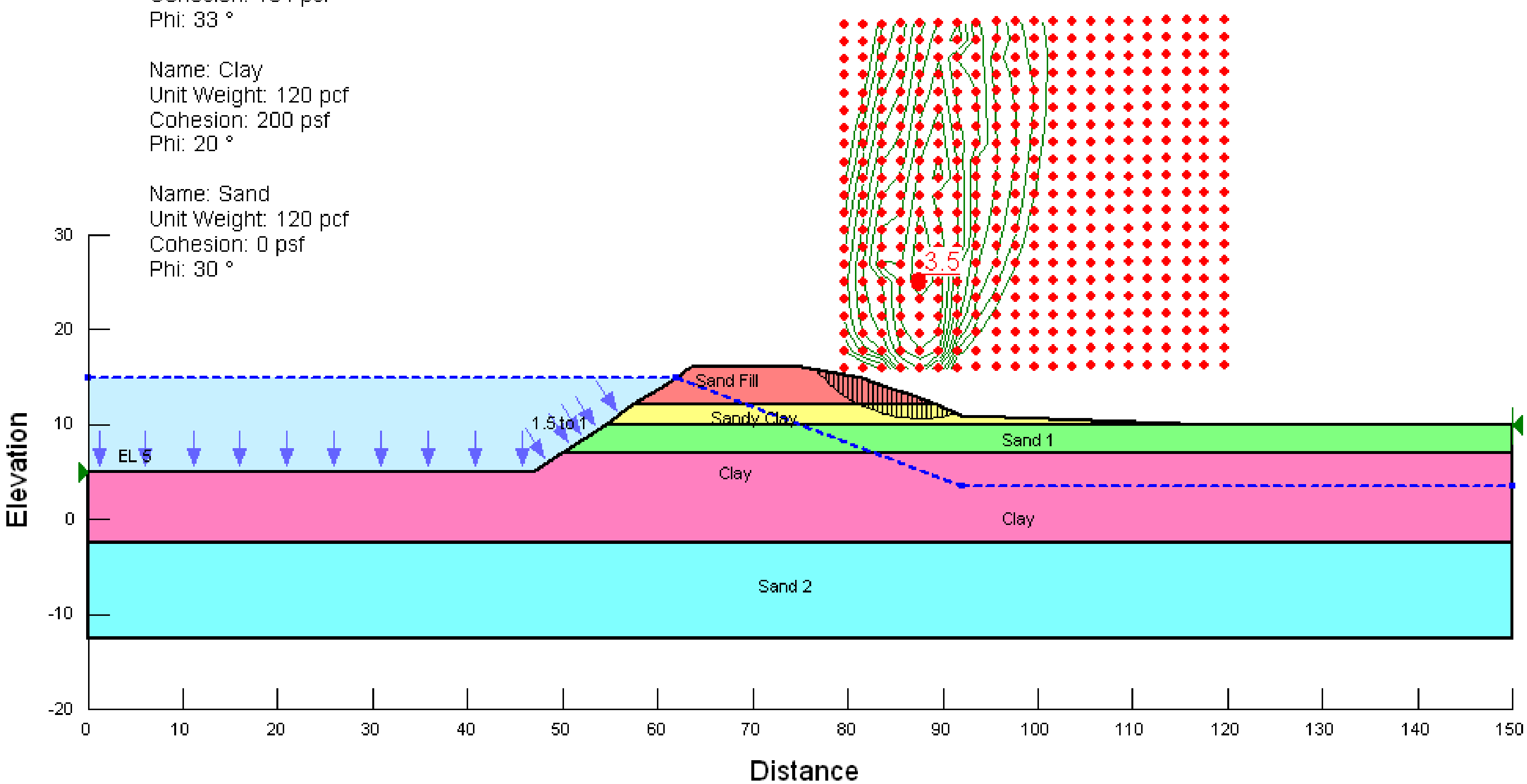
Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °

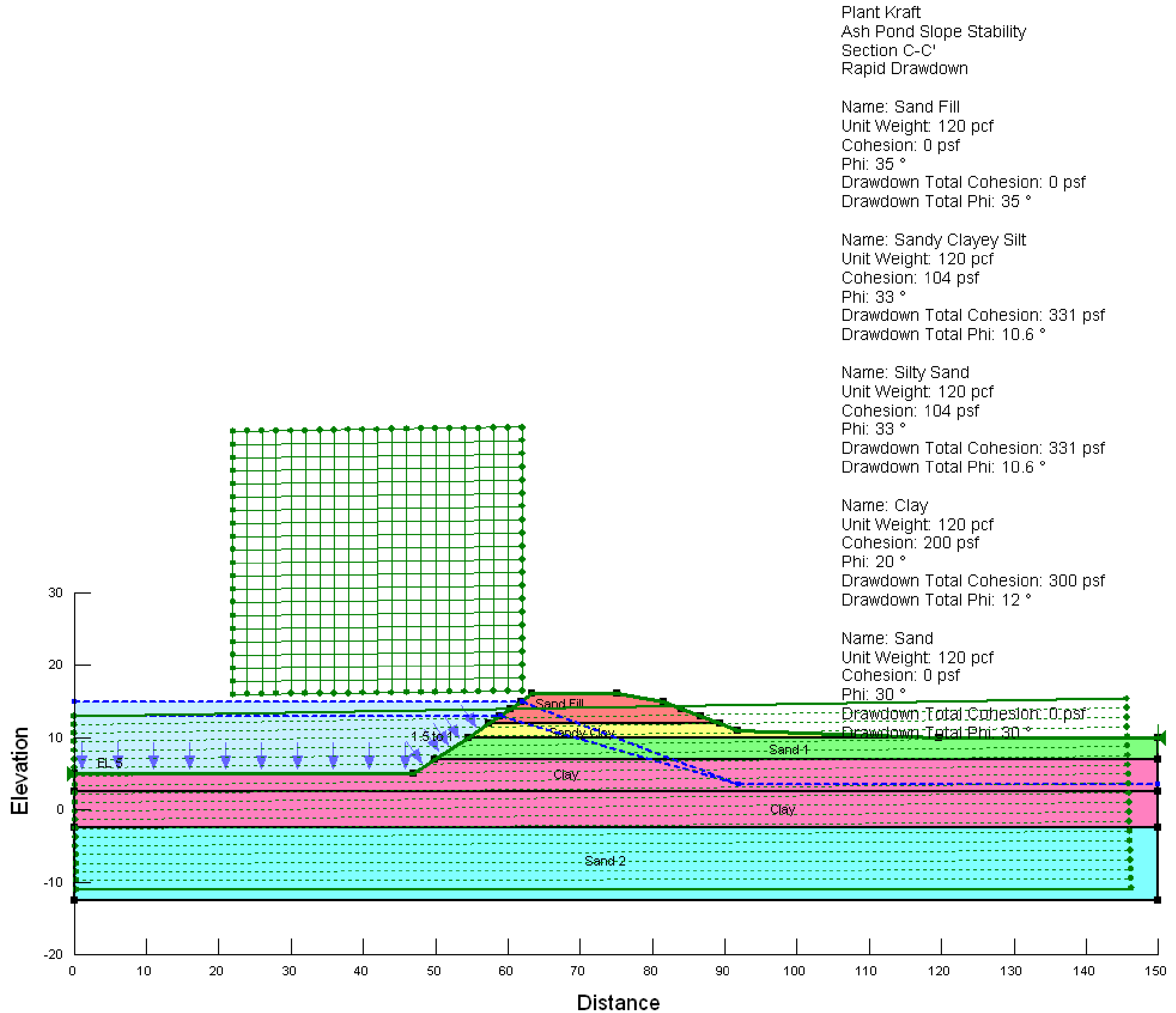
Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °




Plant Kraft
Ash Pond Slope Stability
Section C-C'
Rapid Drawdown

Name: Sand Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 35 °
Drawdown Total Cohesion: 0 psf
Drawdown Total Phi: 35 °

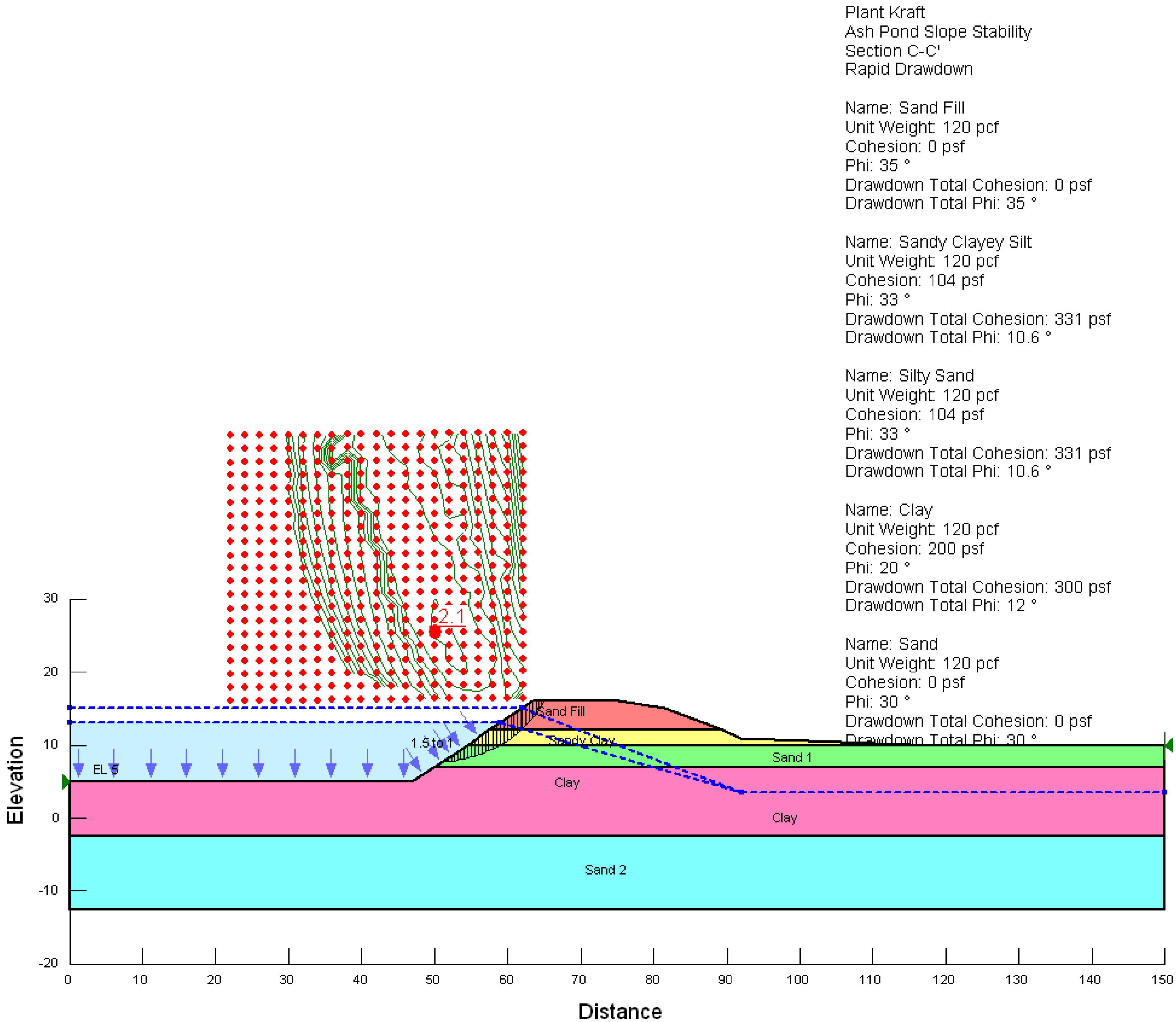
Name: Sandy Clayey Silt
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Drawdown Total Cohesion: 331 psf
Drawdown Total Phi: 10.6 °

Name: Silty Sand
Unit Weight: 120 pcf
Cohesion: 104 psf
Phi: 33 °
Drawdown Total Cohesion: 331 psf
Drawdown Total Phi: 10.6 °

Name: Clay
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 20 °
Drawdown Total Cohesion: 300 psf
Drawdown Total Phi: 12 °

Name: Sand
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Drawdown Total Cohesion: 0 psf
Drawdown Total Phi: 30 °

Sand Fill
Sandy Clay
1.5 to 1
EL 5
Sand 1
Clay
Clay
Sand 2
Elevation
Distance
30
20
10
0
-10
-20
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150



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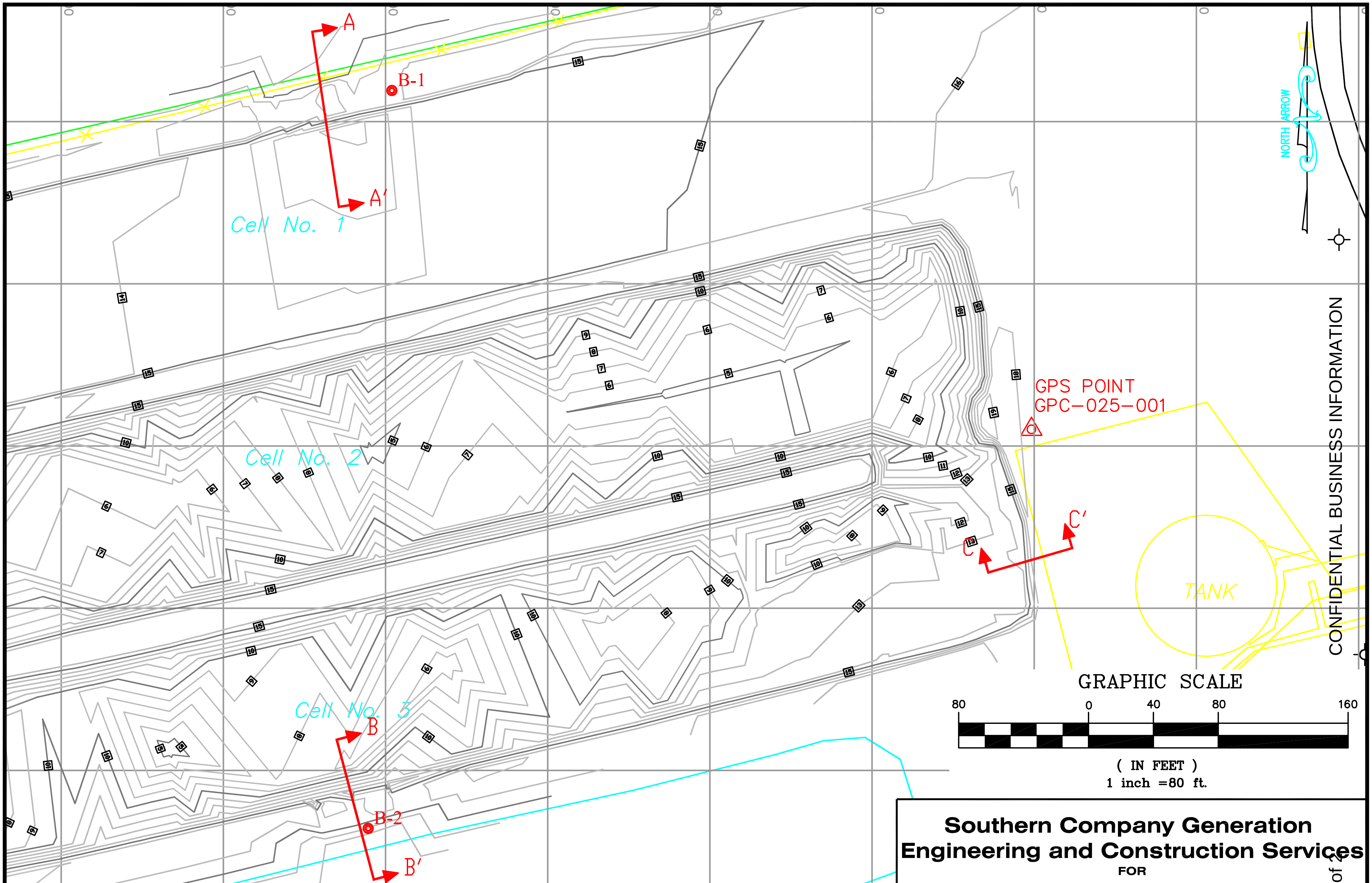
ATTACHMENT A

Figure 1

Boring Locations

Cross-Sections A-A' and B-B'



CONFIDENTIAL BUSINESS INFORMATION

Plant Kraft
Calculation No. TV-KR-3319HB-001
Figure 1 – Attachment A

Southern Company Generation Engineering and Construction Services
FOR
Georgia Power Company

PROJ I.D.	DRAWING NUMBER	SHEET	CONT'D	REV
	ES1901S2	1	FINAL	0

ATTACHMENT B

Boring Logs

SOUTHERN COMPANY

LOG OF TEST BORING

BORING B-1

ECS10459

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Kraft Ash Pond Dike
LOCATION Ash Pond Dike

DATE STARTED 8/27/2010 **COMPLETED** 8/27/2010 **SURF. ELEV.** Not Surveyed **COORDINATES:** Lat. N32.148772 Long. W-81.150361
CONTRACTOR Universal **EQUIPMENT** CME-55 **METHOD** Mud Rotary
DRILLED BY P. Buckler **LOGGED BY** G. Wilson **CHECKED BY** T. Hartsfield **ANGLE** **BEARING**
BORING DEPTH 20 ft. **GROUND WATER DEPTH: DURING** 7 ft. **COMP.** 7 ft. **DELAYED**
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	COMMENTS
		- Silty clayey fine-grained SAND, dark brown, moist, medium dense. (SM)					
			SS -1	2.0-3.5	6-9-9 (18)	100	
5		- Clayey, sandy SILT (ash?), dark brown, moist, medium stiff. (ML)	SS -2	4.0-5.5	3-5-5 (10)	100	(MC = 30.8%; FC = 61.4%; Gravel = 0.2%) non-plastic.
		- Silty fine-grained SAND with clay and trace gravel, black, moist, very soft. (SM)	SS -3	6.0-7.5	2-1-1 (2)	100	(MC = 27.2%; FC = 39.3%; Gravel = 2.1%) non-plastic.
10		- Slightly micaceous CLAY, gray, moist, very soft. (CL)	SS -4	9.0-10.5	1-1-2 (3)	100	(MC = 33.9%; LL=41; PI=-24; FC = 71.3%)
15			SS -5	13.5-15.0	1-1-2 (3)	100	
20		- SAND, brown, wet, loose. (SP)	SS -6	18.5-20.0	2-4-5 (9)	100	
25		Bottom of borehole at 20.0 feet.					

GEOTECH ENGINEERING LOGS - ESEE DATABASE.GDT - 2/14/11 13:10 - T:\ESEE MAJOR PROJECTS\PROJECTS\KRAFT\2010\ES1901 EPA ASH POND INSPECTION\LOGS\ASH POND LOGS.GPJ

SOUTHERN COMPANY

LOG OF TEST BORING

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Kraft Ash Pond Dike
LOCATION Ash Pond Dike

DATE STARTED 8/27/2010 **COMPLETED** 8/27/2010 **SURF. ELEV.** Not Surveyed **COORDINATES:** Lat. N32.147522 Long. W-81.150422
CONTRACTOR Universal **EQUIPMENT** CME-55 **METHOD** Mud Rotary
DRILLED BY P. Buckler **LOGGED BY** G. Wilson **CHECKED BY** T. Hartsfield **ANGLE** **BEARING**
BORING DEPTH 30 ft. **GROUND WATER DEPTH: DURING** 18 ft. **COMP.** 18 ft. **DELAYED**
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	COMMENTS
		- Clayey SAND, red, moist, medium dense. (SC)	SS -1	1.0-2.5	6-9-12 (21)	100	(MC = 30.4%; LL=42; PI=27; FC = 63.7%; UW(d) = 88.6pcf) (Triaxial Test Performed) UD taken in offset hole from 3.5 to 5.0 ft.
5		- CLAY with fine sand, gray, moist, very soft. (CL)	SS -2	4.0-5.5	1-WH-1 (1)	100 100	UD-1 (3.5-5.5)
		- Brown SAND with clay	SS -3	6.0-7.5	WH-WH-WH (0)	100	Large % of sand in sample.
10		- Brown Sandy CLAY	SS -4	9.0-10.5	WH-WH-1 (1)	100	
15		- Gray CLAY (CL)	SS -5	13.5-15.0	WH-1-1 (2)	100	
20		- SAND, gray, sat, loose. (SW)	SS -6	18.5-20.0	2-4-6 (10)	100	
25			SS -7	23.5-25.0	2-4-6 (10)	100	

(Continued Next Page)

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Kraft Ash Pond Dike

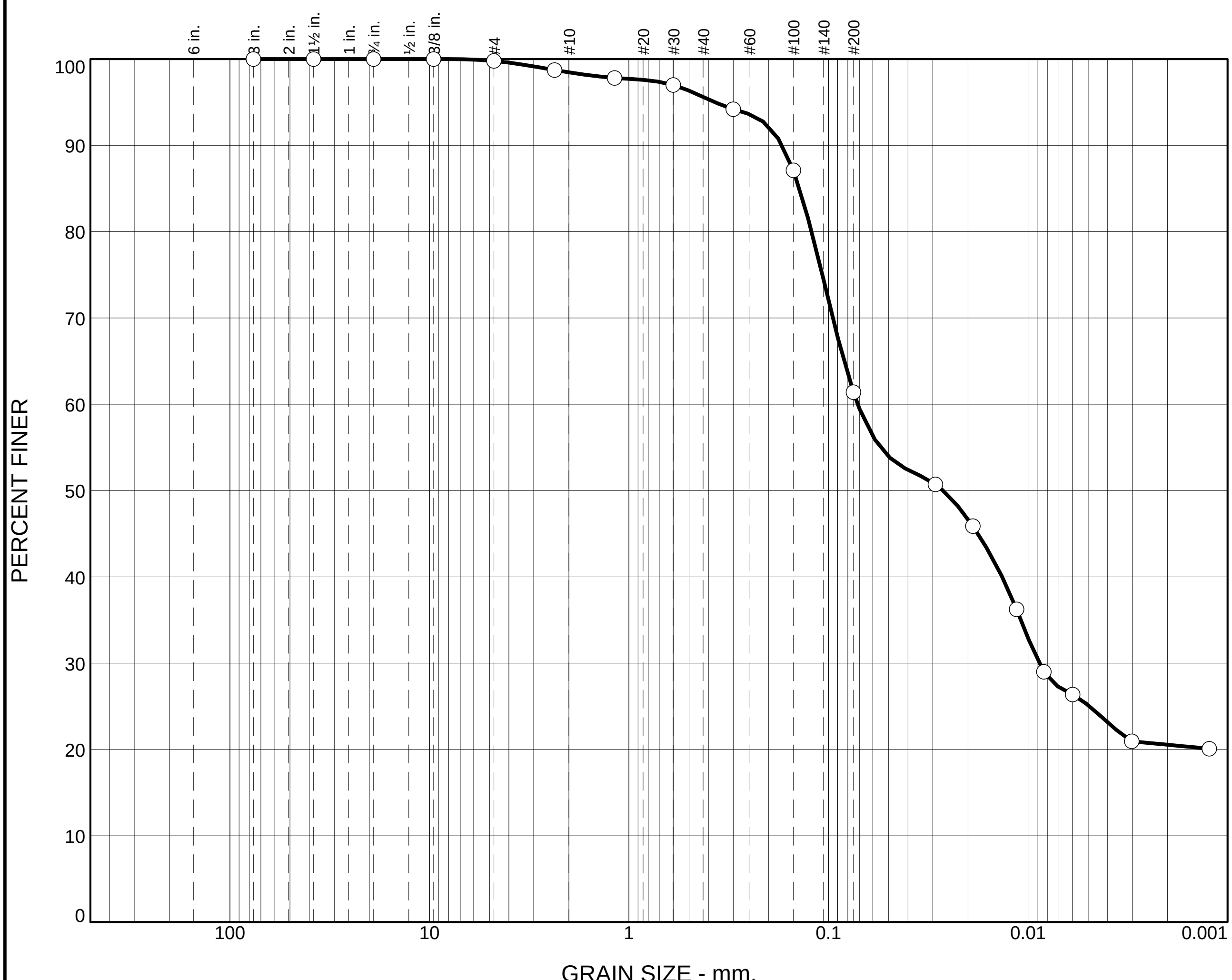
LOCATION Ash Pond Dike

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	COMMENTS
		(con't)					
30		- Medium Dense	SS -8	28.5-30.0	6-7-13 (20)	100	
		Bottom of borehole at 30.0 feet.					
35							
40							
45							
50							

ATTACHMENT C

Soil Laboratory Analyses

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.2	1.3	2.9	34.2	36.3	25.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.1397	0.0714	0.0266	0.0088				

Material Description	USCS	AASHTO
○ Dark Gray Ash	ML	A-4(0)

Project No. AT10SOC03- **Client:** Southern Company

Project: Plant Kraft Ash Pond Dikes

○ **Location:** B-1 **Depth:** 4.0-5.5' **Sample Number:** S-2

Contour Engineering, LLC

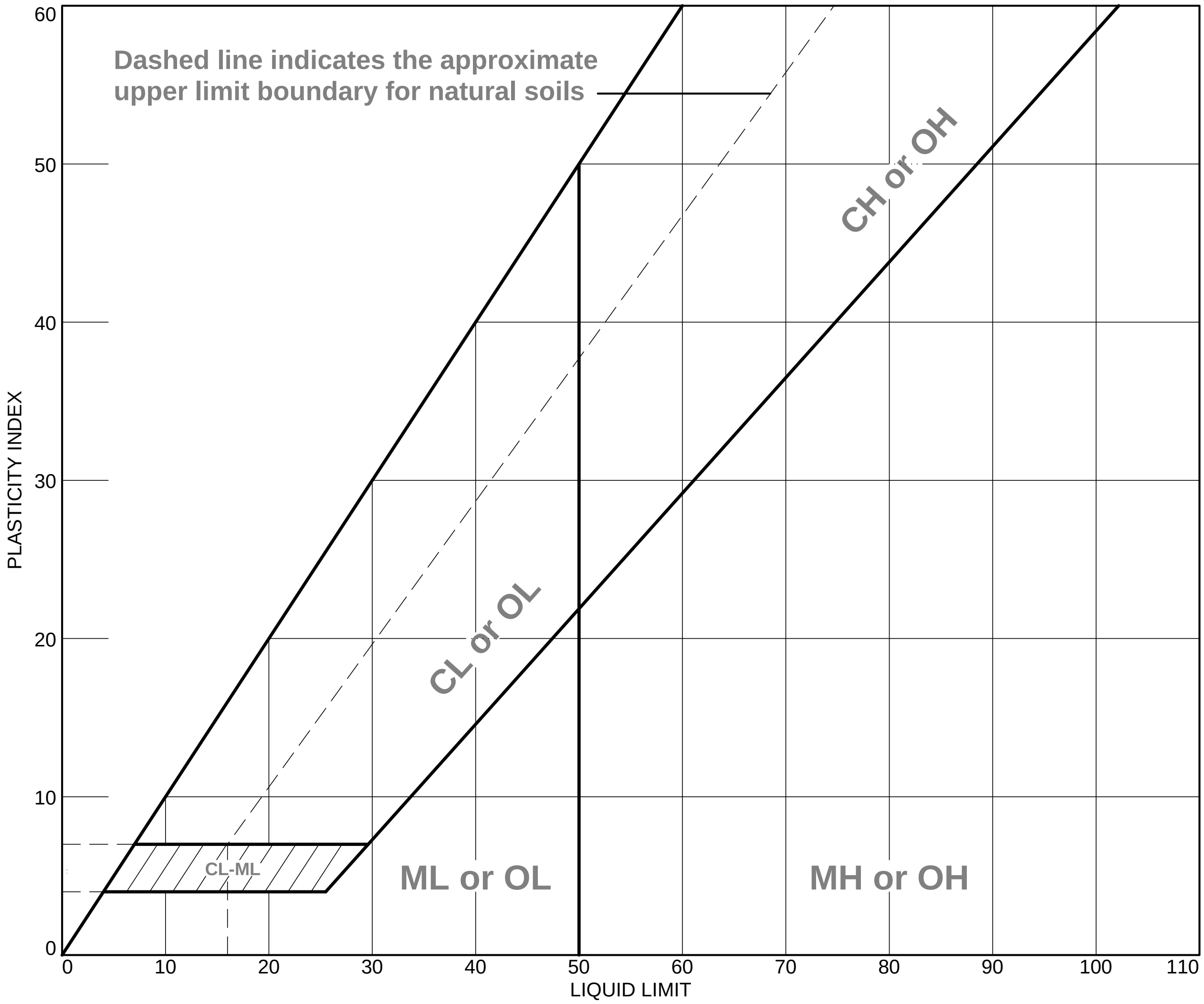
Kennesaw, GA

Remarks:

○ Moisture = 30 .8%

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Gray Ash	NV	NP	NP	95.6	61.4	ML

Project No. AT10SOC03- **Client:** Southern Company

Project: Plant Kraft Ash Pond Dikes

● **Location:** B-1 **Depth:** 4.0-5.5' **Sample Number:** S-2

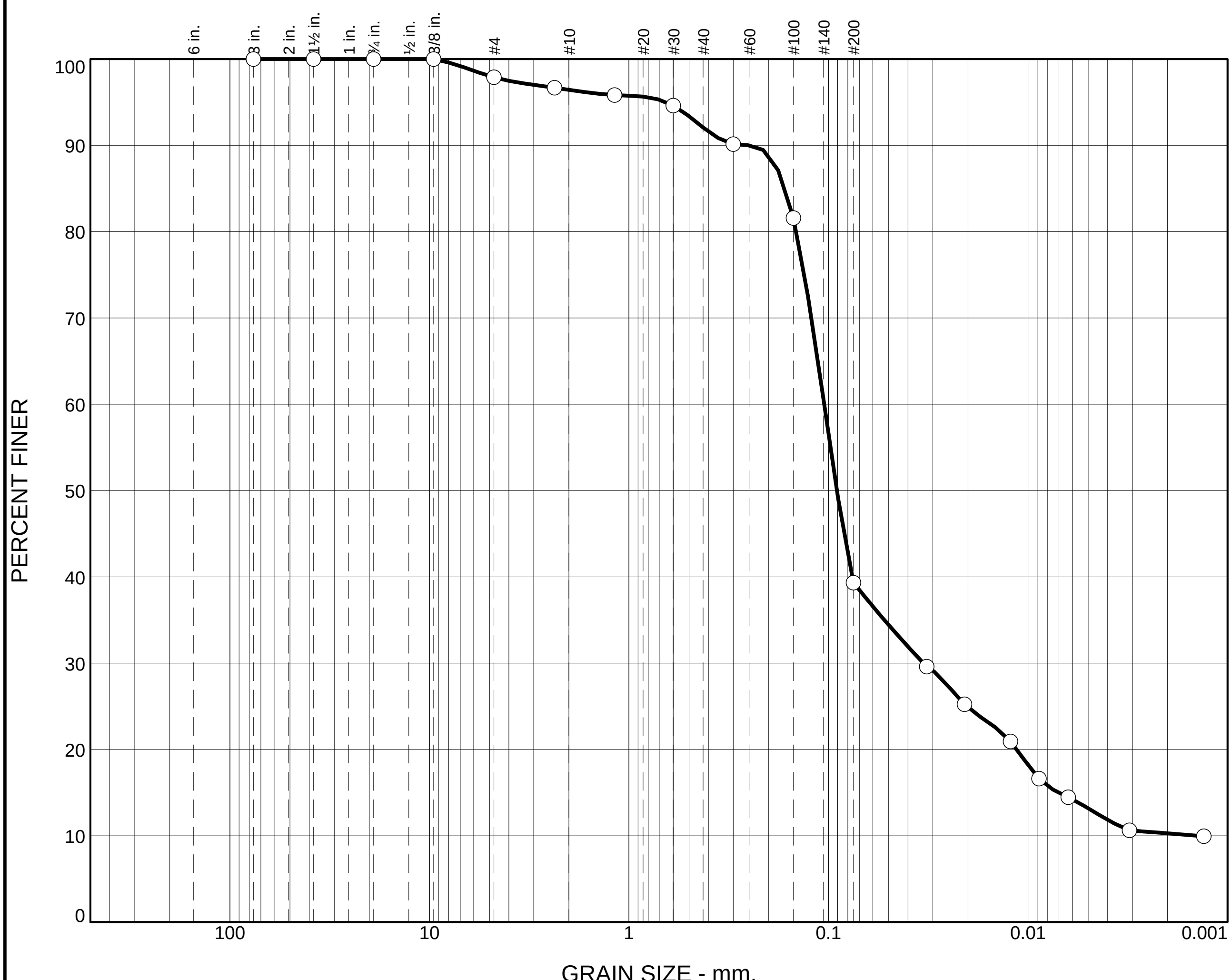
Remarks:

Contour Engineering, LLC

Kennesaw, GA

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.1	1.5	4.3	52.8	26.1	13.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.1646	0.1051	0.0907	0.0335	0.0070	0.0014	7.58	74.80

Material Description	USCS	AASHTO
○ Dark Gray Ash, with sand (SM) and trace clay	SM	A-4(0)

Project No. AT10SOC03- **Client:** Southern Company

Project: Plant Kraft Ash Pond Dikes

○ **Location:** B-1 **Depth:** 6.0-7.5' **Sample Number:** S-3

Contour Engineering, LLC

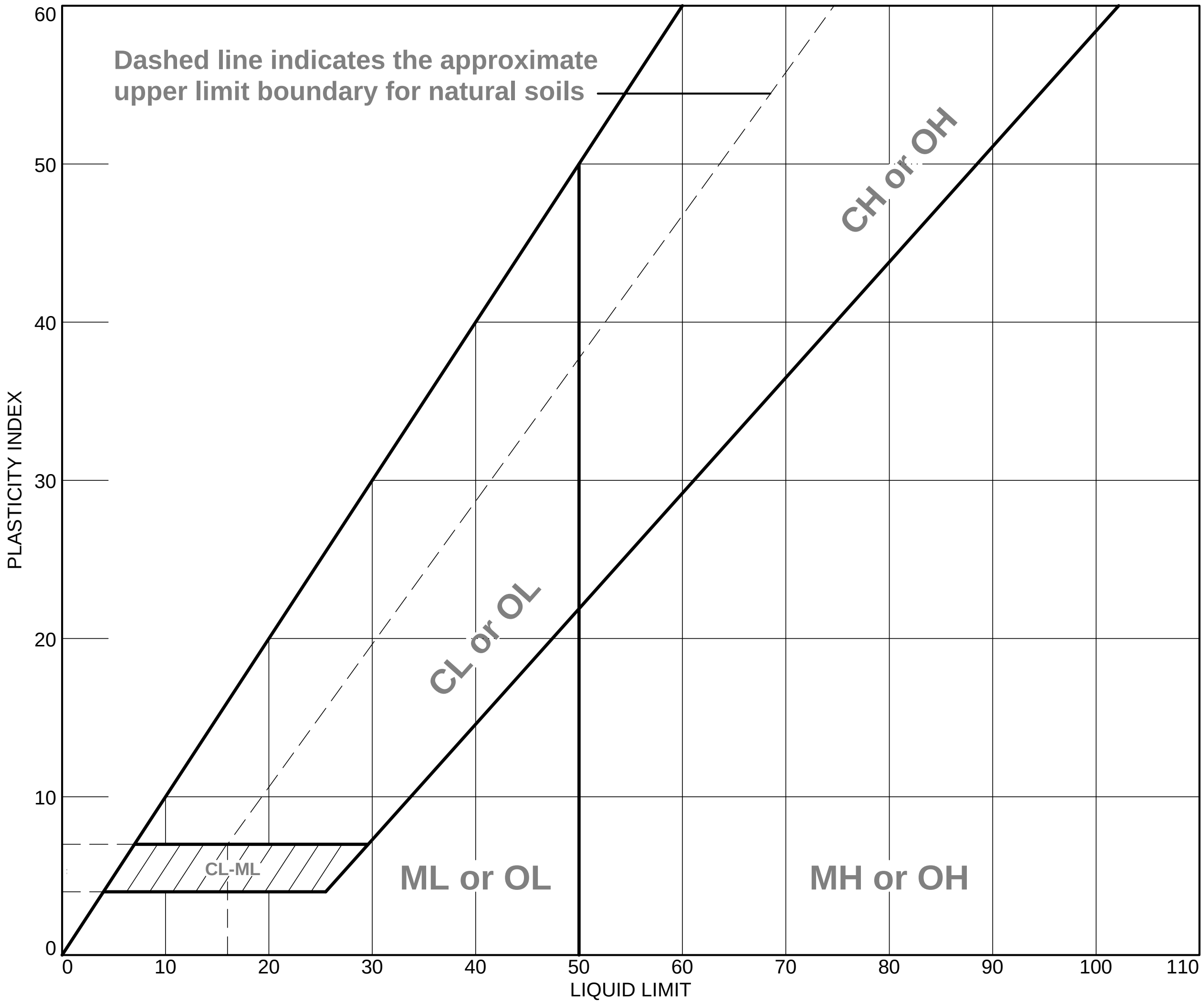
Kennesaw, GA

Remarks:

○ Moisture =27.2%

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Gray Ash, with sand (SM) and trace clay	NV	NP	NP	92.1	39.3	SM

Project No. AT10SOC03- **Client:** Southern Company

Project: Plant Kraft Ash Pond Dikes

● **Location:** B-1 **Depth:** 6.0-7.5' **Sample Number:** S-3

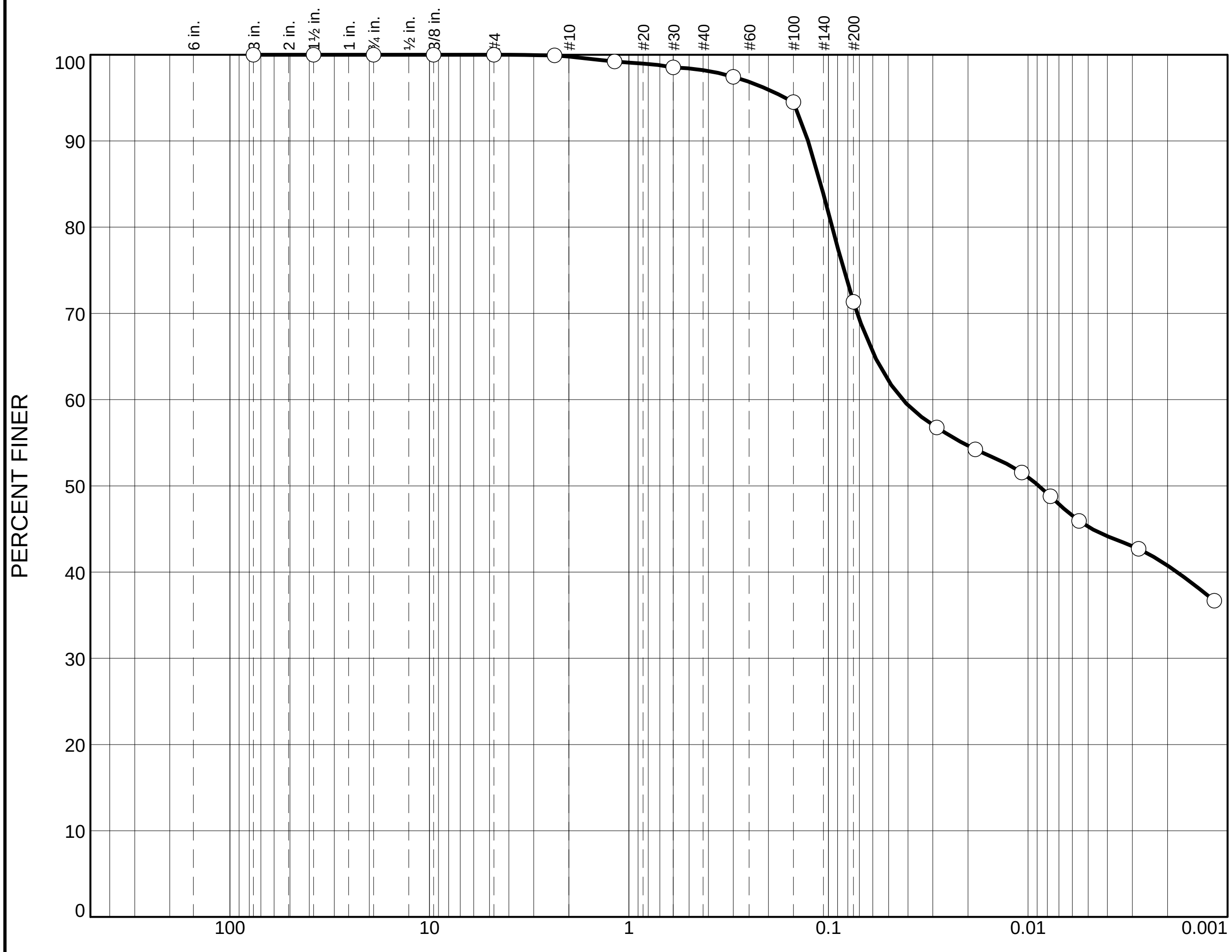
Remarks:

Contour Engineering, LLC

Kennesaw, GA

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.2	1.6	26.9	26.1	45.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	41	17	0.1095	0.0425	0.0088					

Material Description	USCS	AASHTO
○ Gray CLAY (CL), with trace ash and sand	CL	A-7-6(15)

Project No. AT10SOC03- **Client:** Southern Company

Project: Plant Kraft Ash Pond Dikes

○ **Location:** B-1 **Depth:** 9.0-10.5' **Sample Number:** S-4

Remarks:

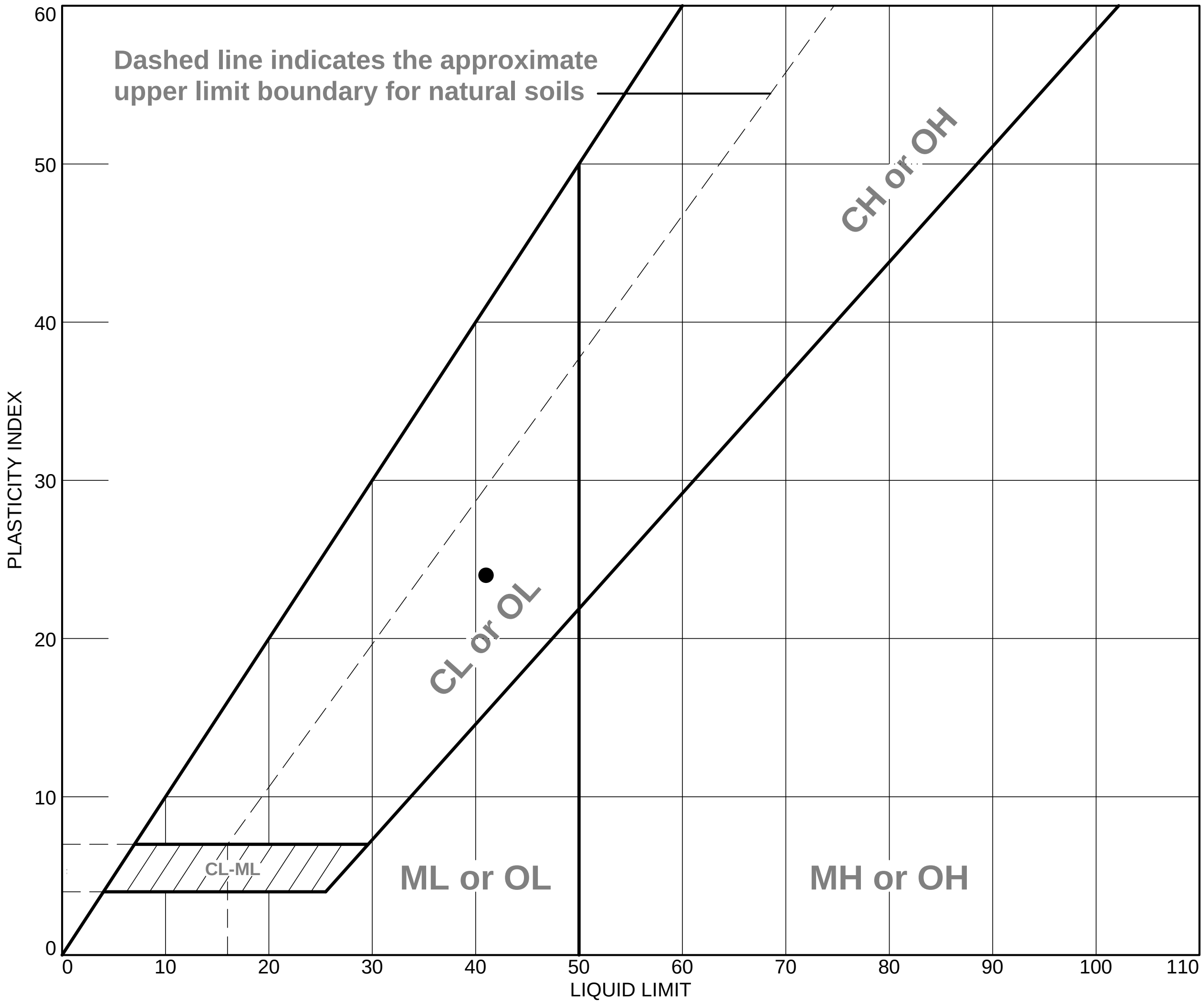
○ Moisture = 33.9%

Contour Engineering, LLC

Kennesaw, GA

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray CLAY (CL), with trace ash and sand	41	17	24			

Project No. AT10SOC03- **Client:** Southern Company

Project: Plant Kraft Ash Pond Dikes

● **Location:** B-1 **Depth:** 9.0-10.5' **Sample Number:** S-4

Remarks:

Contour Engineering, LLC

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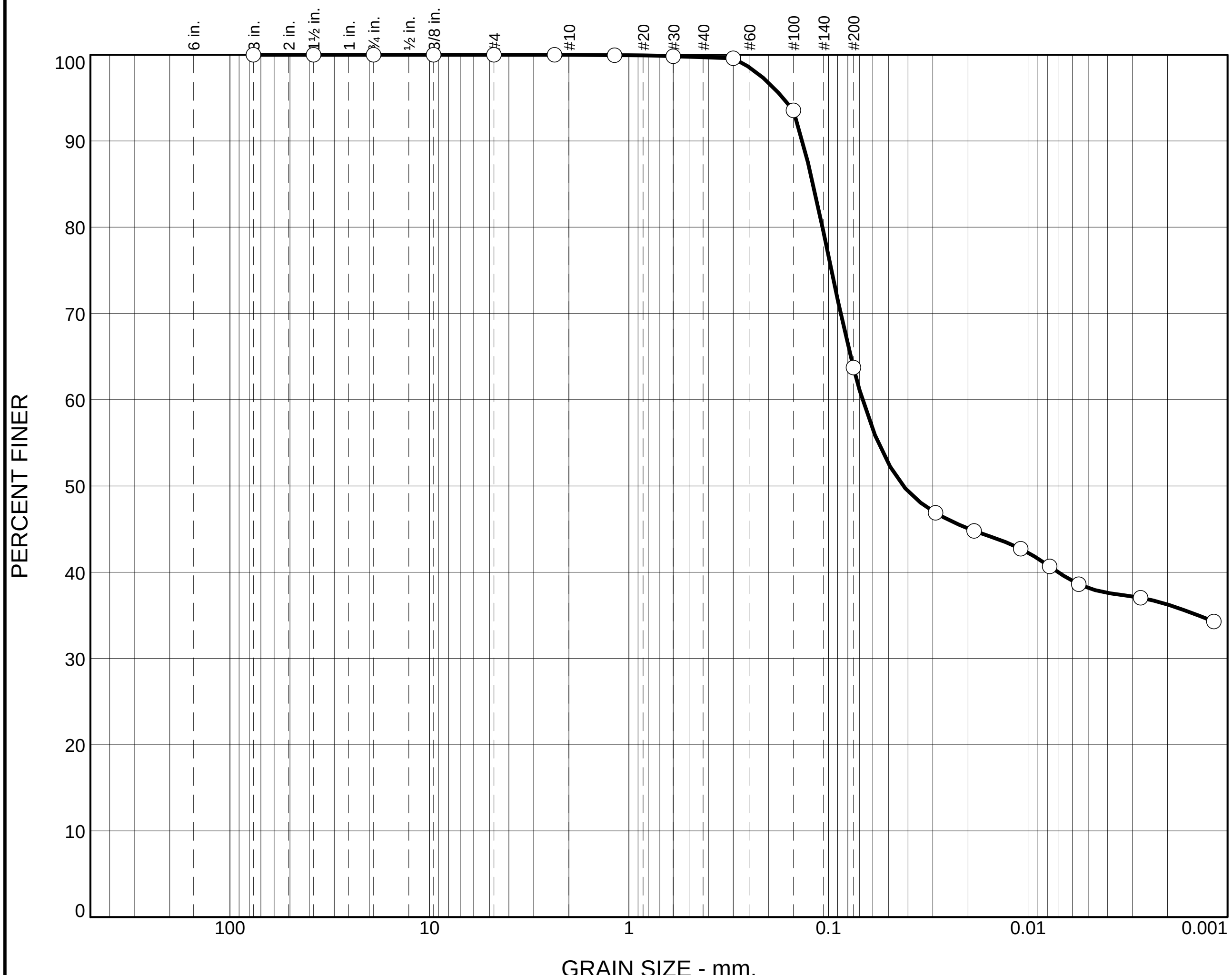
Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.3	36.0	25.5	38.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	42	15	0.1196	0.0675	0.0422					

Material Description	USCS	AASHTO
○ Gray CLAY (CL)	CL	A-7-6(14)

Project No. AT10SOC03- **Client:** Southern Company
Project: Plant Kraft Ash Pond Dikes

○ **Location:** B-2 **Depth:** 3.5-5.5' **Sample Number:** UD-1

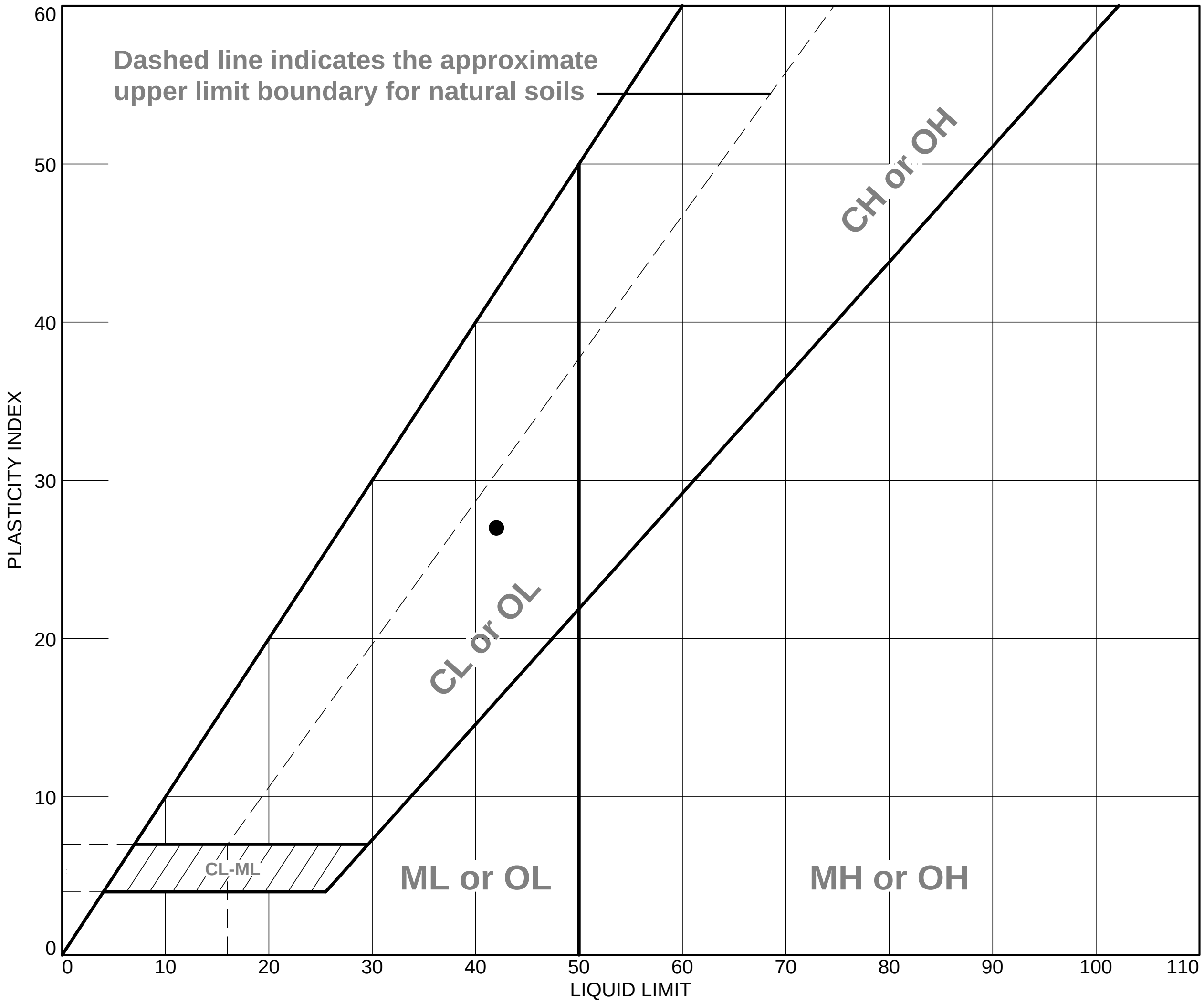
Remarks:

Contour Engineering, LLC

Kennesaw, GA

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray CLAY (CL)	42	15	27	99.7	63.7	CL

Project No. AT10SOC03- **Client:** Southern Company

Project: Plant Kraft Ash Pond Dikes

● **Location:** B-2 **Depth:** 3.5-5.5' **Sample Number:** UD-1

Remarks:

Contour Engineering, LLC

Kennesaw, GA

Figure

Date:

Checked By:

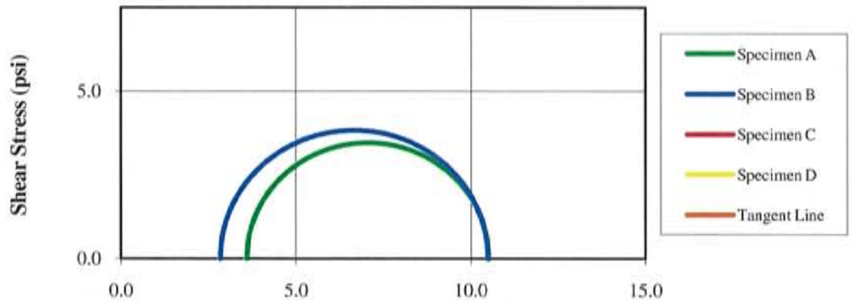
Date

Tested By:

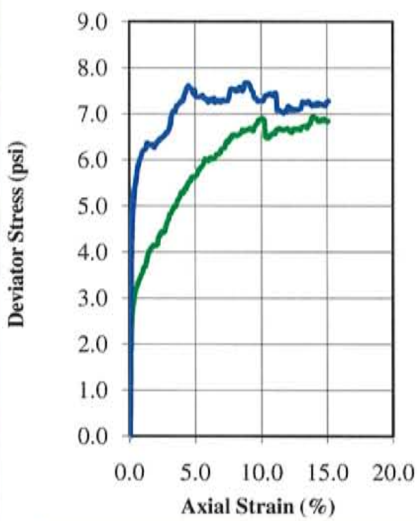
Contour Engineering

Consolidated Undrained Triaxial Test (ASTM D4767)

Effective Stress at Maximum Deviator Stress Criterion



Deviator Stress Vs. Axial Strain

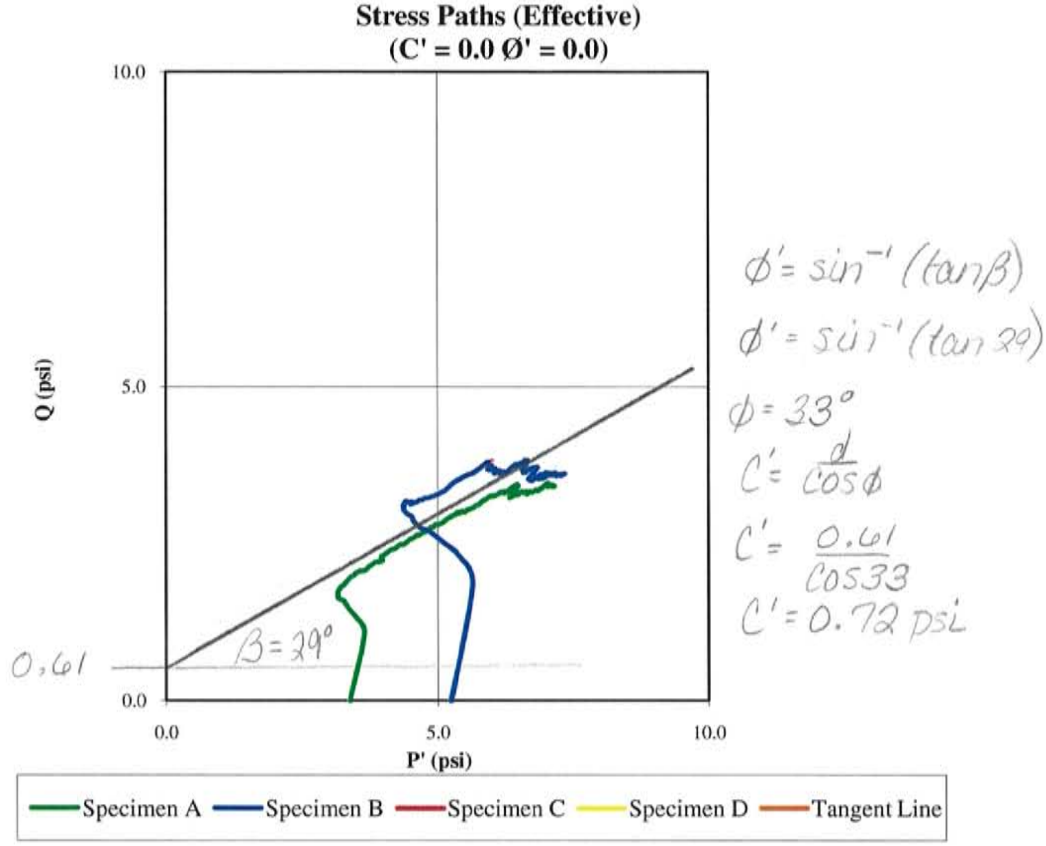


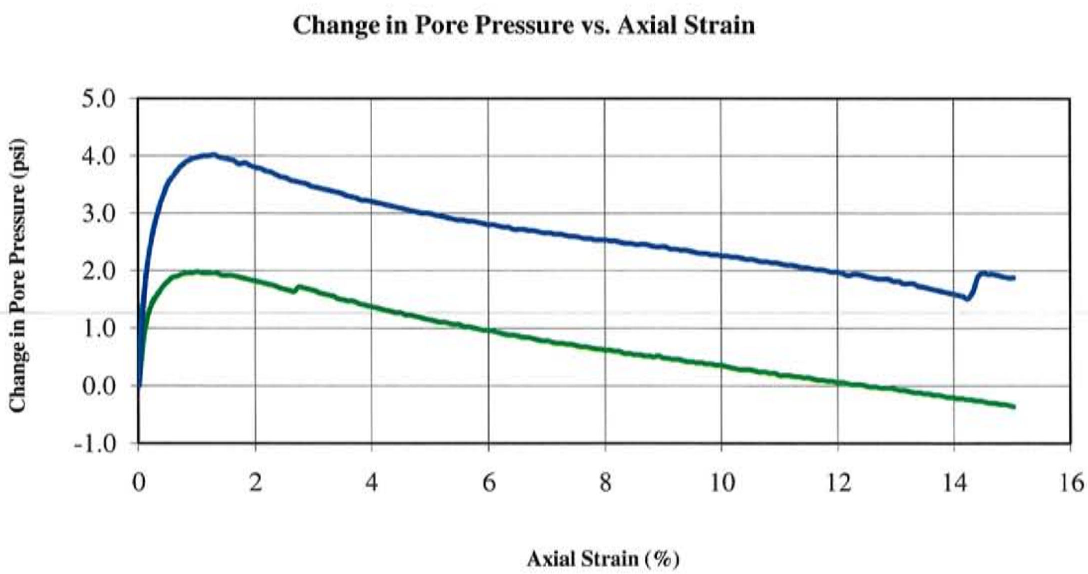
Initial	A	B	C	D
Water Content (%)	27.7	33.1		
Dry Density (pcf)	91.4	85.8		
Saturation (%)	88.66	92.84		
Void Ratio	0.840	0.960		
Diameter (in)	2.860	2.860		
Height (in)	6.077	5.823		
Specific Gravity	2.70	2.70		
Liquid Limit	42	42		
Plastic Limit	15	15		
After Consolidation	**A**	**B**	**C**	**D**
B-Value	0.95	0.95		
Water Content (%)	27.7	33.2		
Dry Density (pcf)	94.33	88.58		
Saturation (%)	100.00	100.00		
Void Ratio	0.787	0.903		
Effective Stress (psi)	3.4	5.2		
Back Press. (psi)	75.1	75.0		
Rate of Strain	0.01	0.01		
After Shear	**A**	**B**	**C**	**D**
σ'1 at Failure (psi)	10.50	10.48		
σ'3 at Failure (psi)	3.56	2.80		

Maximum Deviator Stress Criterion	
C (psi)	2.3
C' (psi)	0.0
Ø (deg)	10.6
Ø' (deg)	0.0

Project:	Plant Kraft Ash Pond Dikes
Location:	B-2, UD-1
Project Number:	AT10SOC03-K
Boring Number:	B-2
Sample Number:	B-2, UD-1
Depth:	3.5-5.5'
Sample Type:	Undisturbed
Description:	Upper 7 inches - Ash, middle - Gray silty CLAY (CL), lower - Gray CLAY (CL)
Test Type	Consolidated Undrained
Remarks	Upper 6-7 inches of Shelby Tube void, upper sample - Ash - fell apart upon extraction.

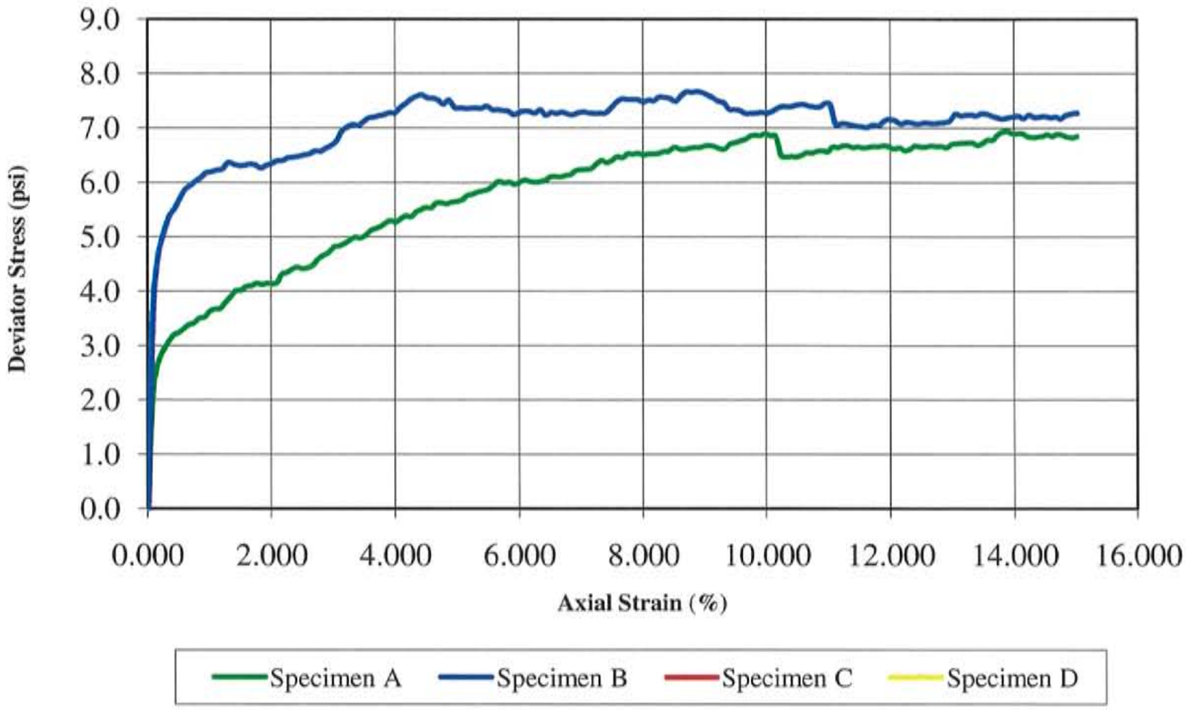
N/A	N/A	N/A	N/A
Failure Photographs			



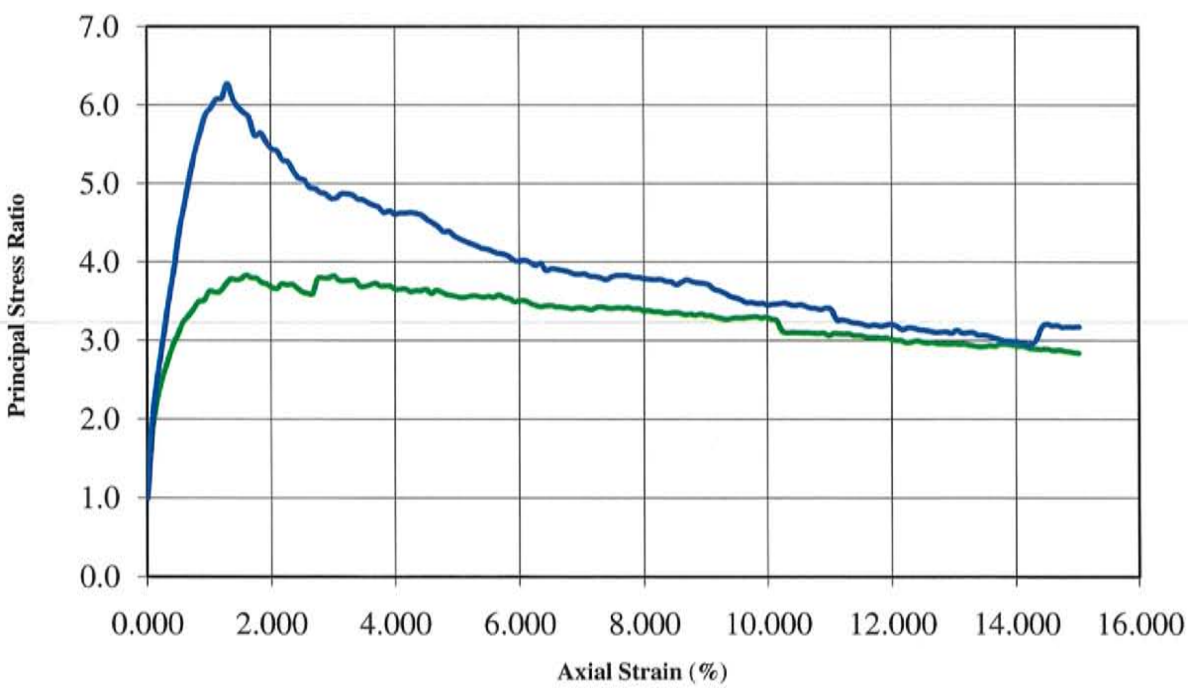


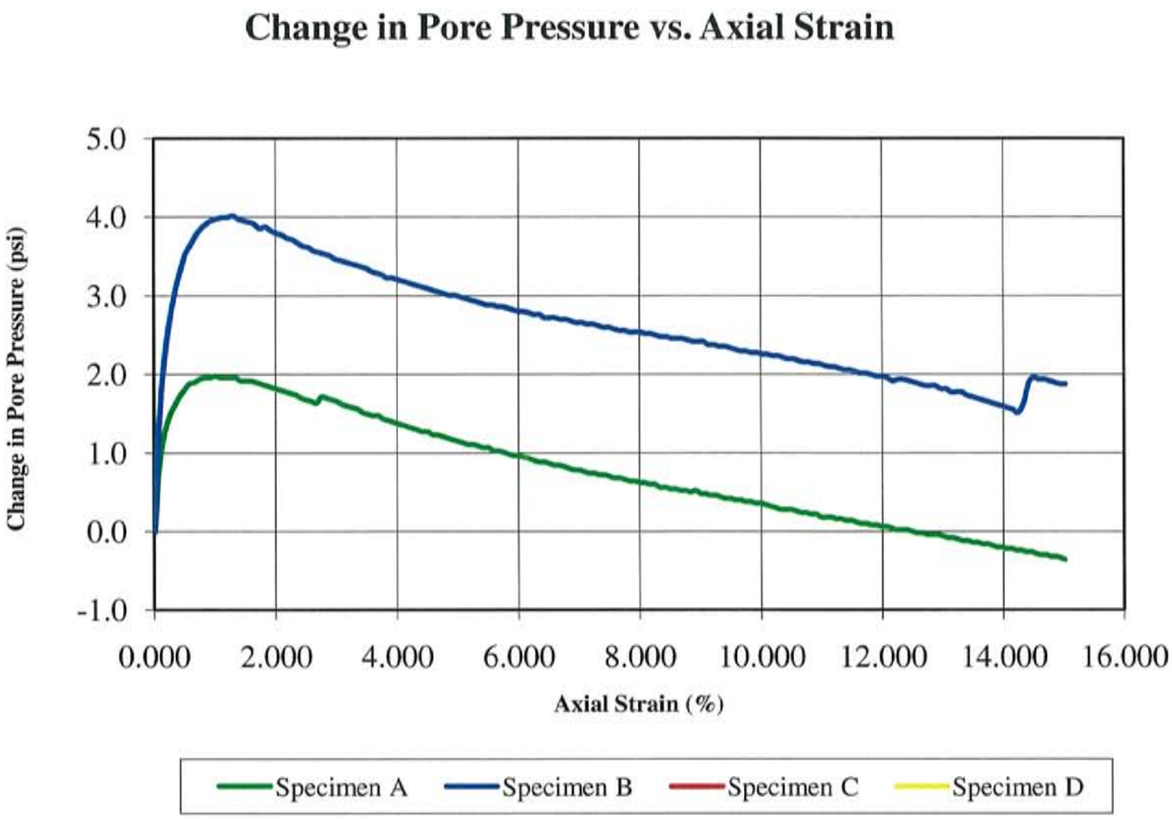
Tested By: Date: Checked By: Date:

Deviator Stress vs. Axial Strain



Principal Stress Ratio vs. Axial Strain

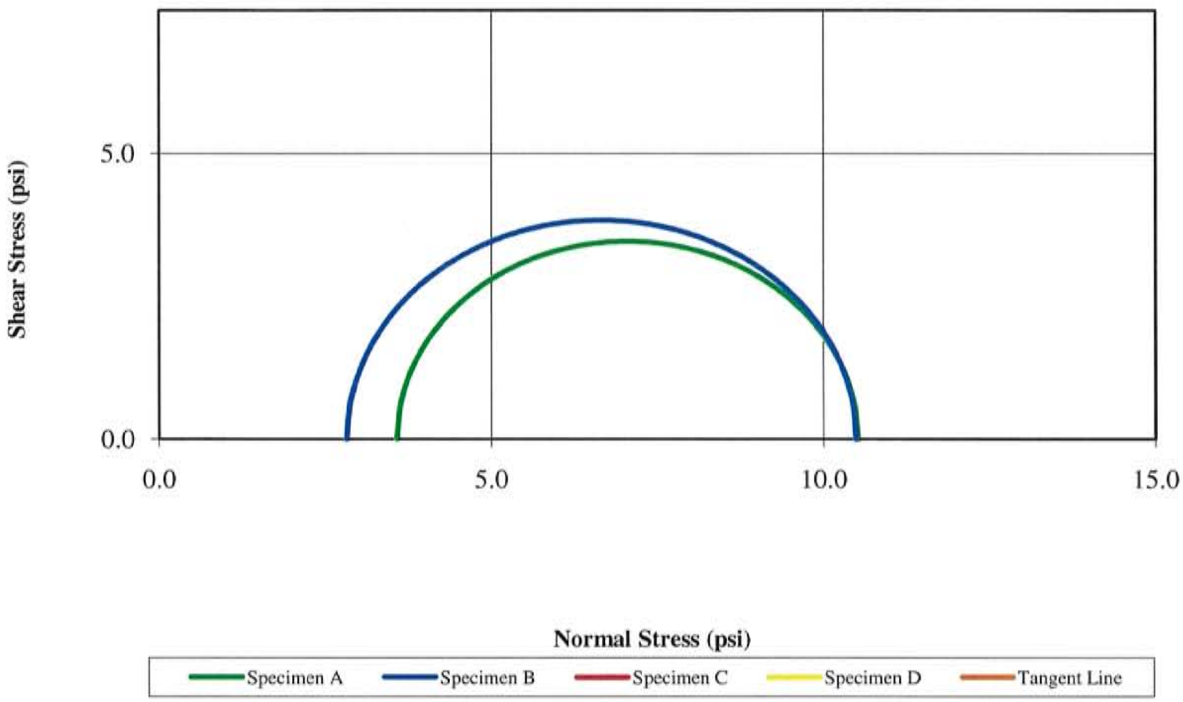




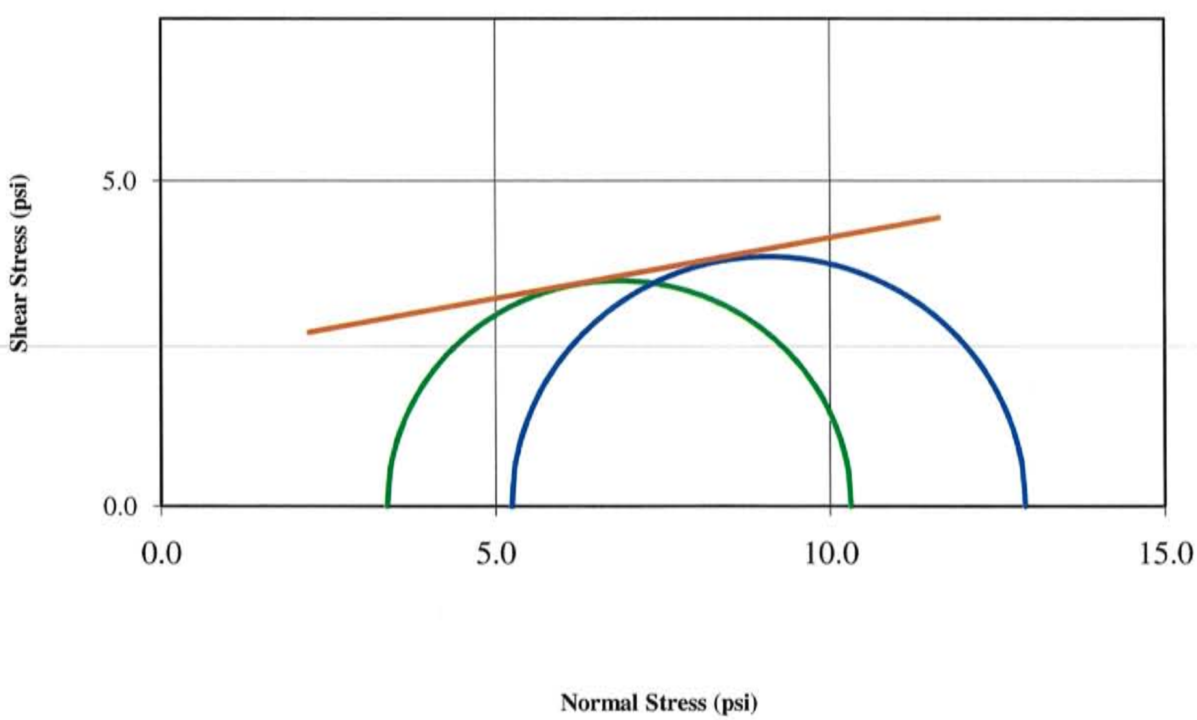
Change in Pore Pressure vs. Axial Strain
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
Change in Pore Pressure (psi)
0.000
2.000
4.000
6.000
8.000
10.000
12.000
14.000
16.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

Mohr Stress Circles at Maximum Deviator Stress Criterion

Effective Stress
(C' = 0.0 Ø' = 0.0)

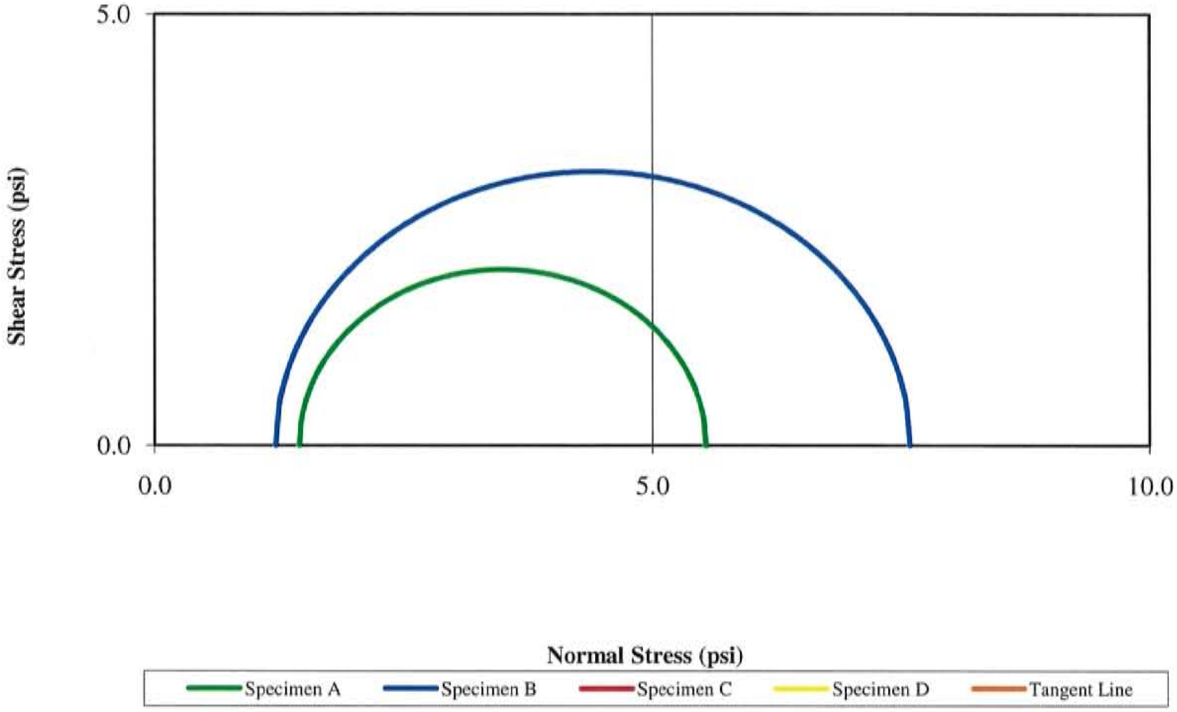


Total Stress
(C = 2.3 Ø = 10.6)

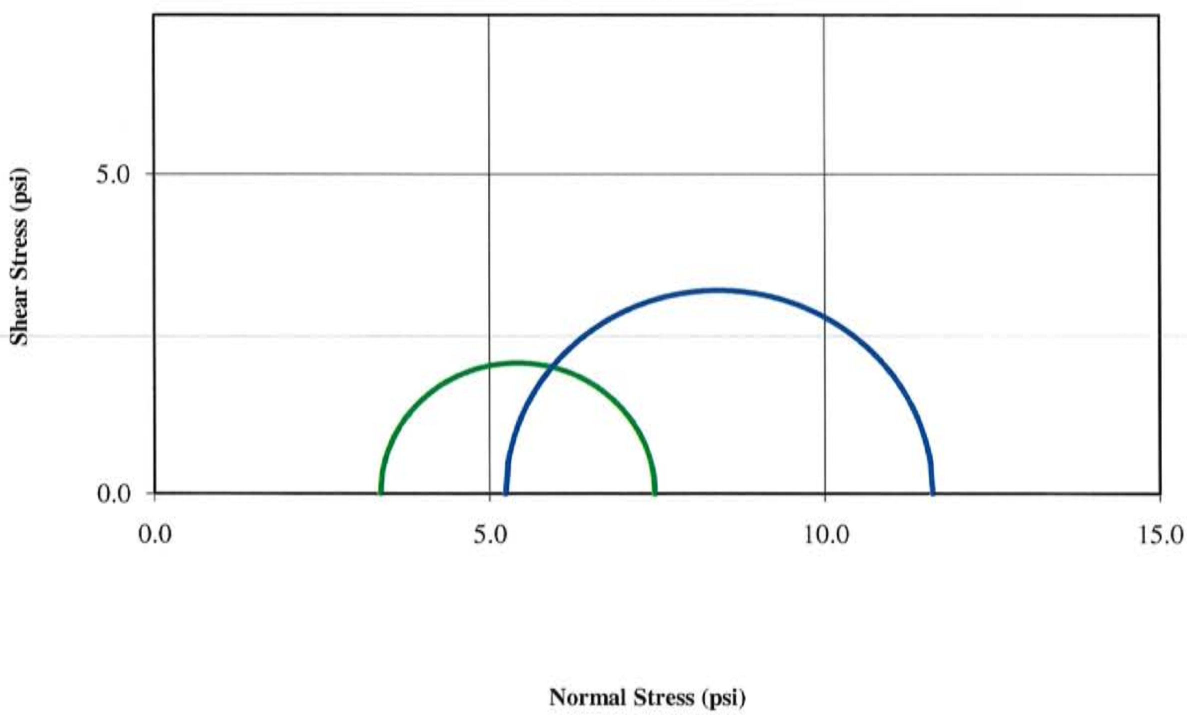


Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

Effective Stress
(C' = 0.0 Ø' = 0.0)

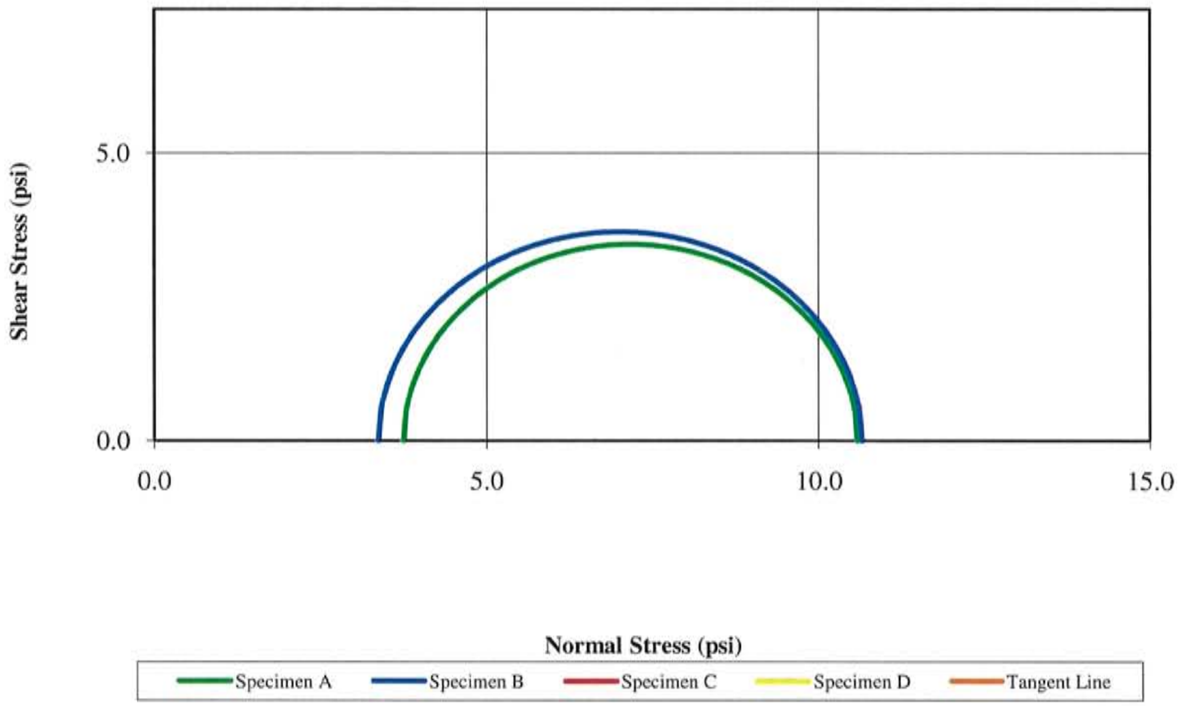


Total Stress
(C = 0.0 Ø = 0.0)

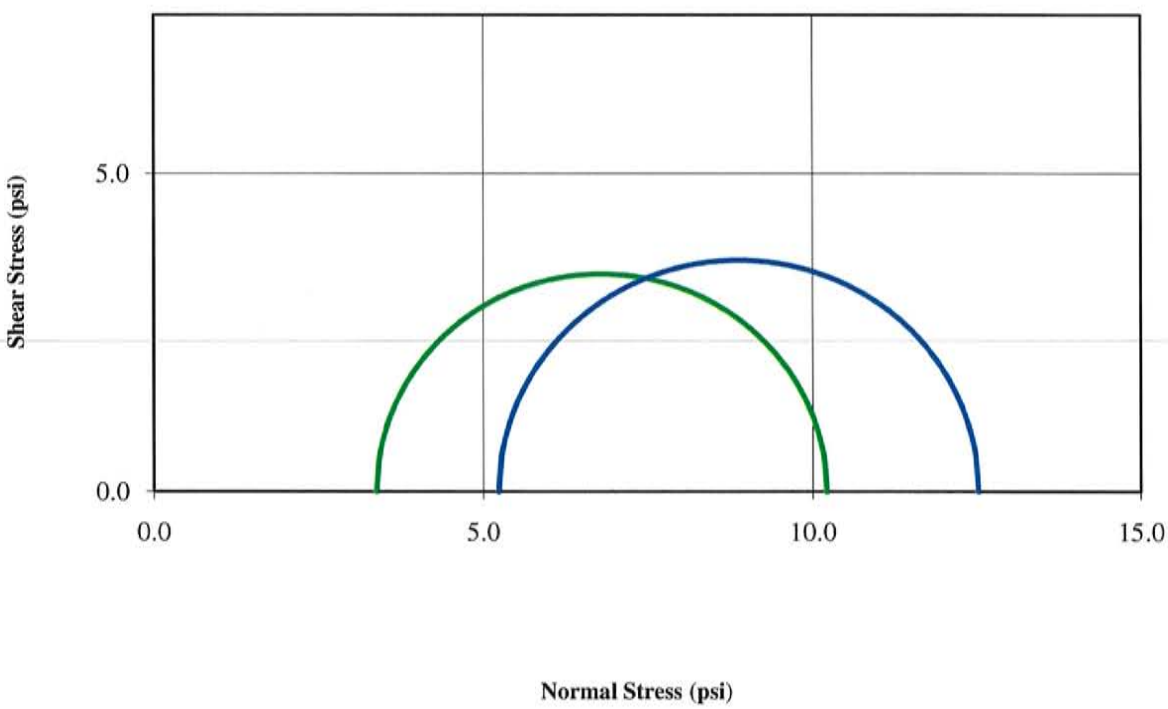


Mohr Stress Circles at 15% Axial Strain Criterion

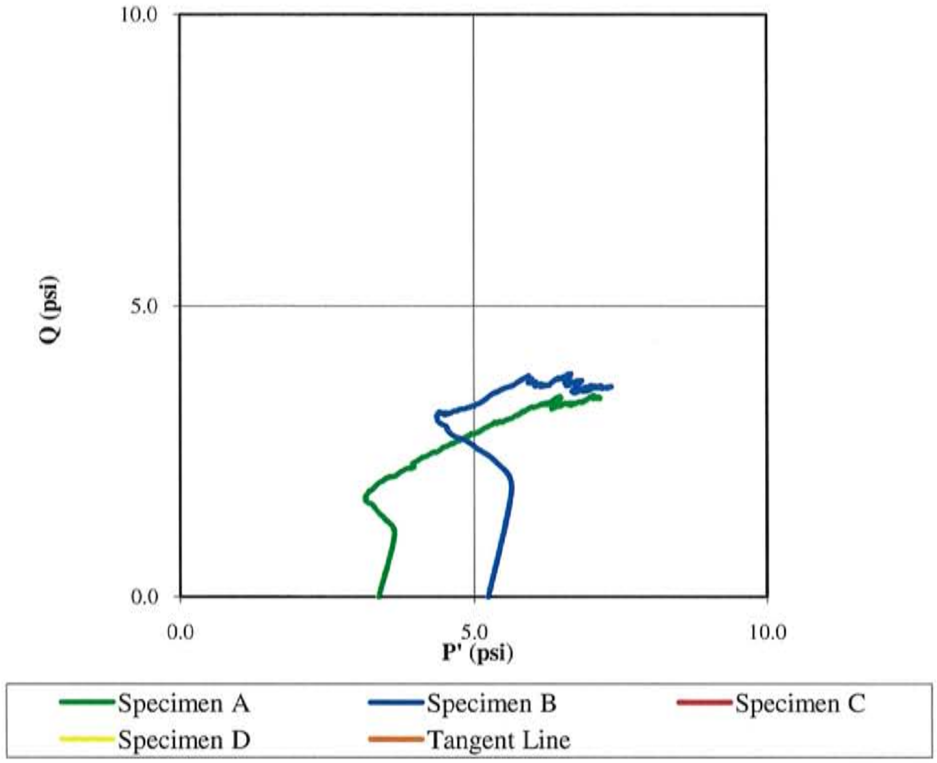
Effective Stress
(C' = 0.0 Ø' = 0.0)



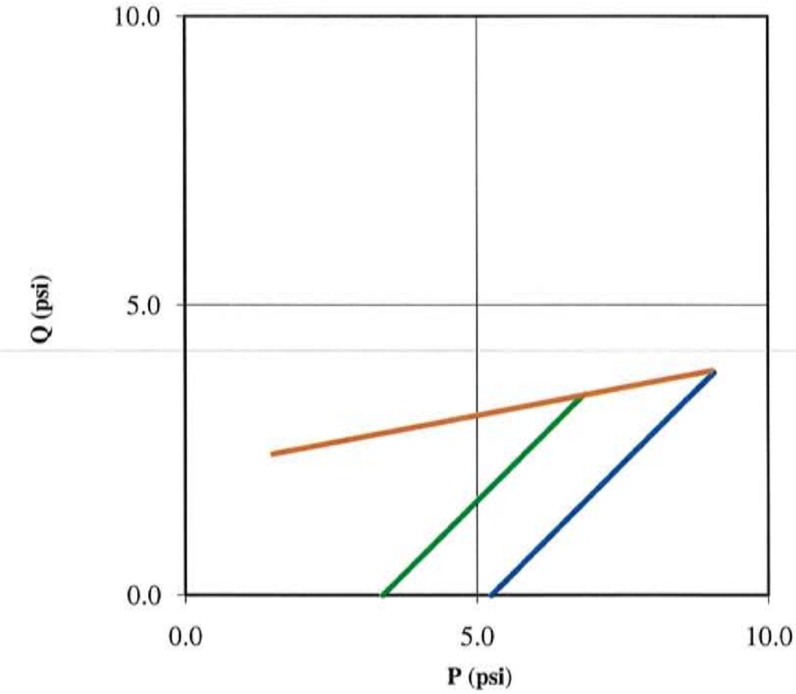
Total Stress
(C = 0.0 Ø = 0.0)



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)

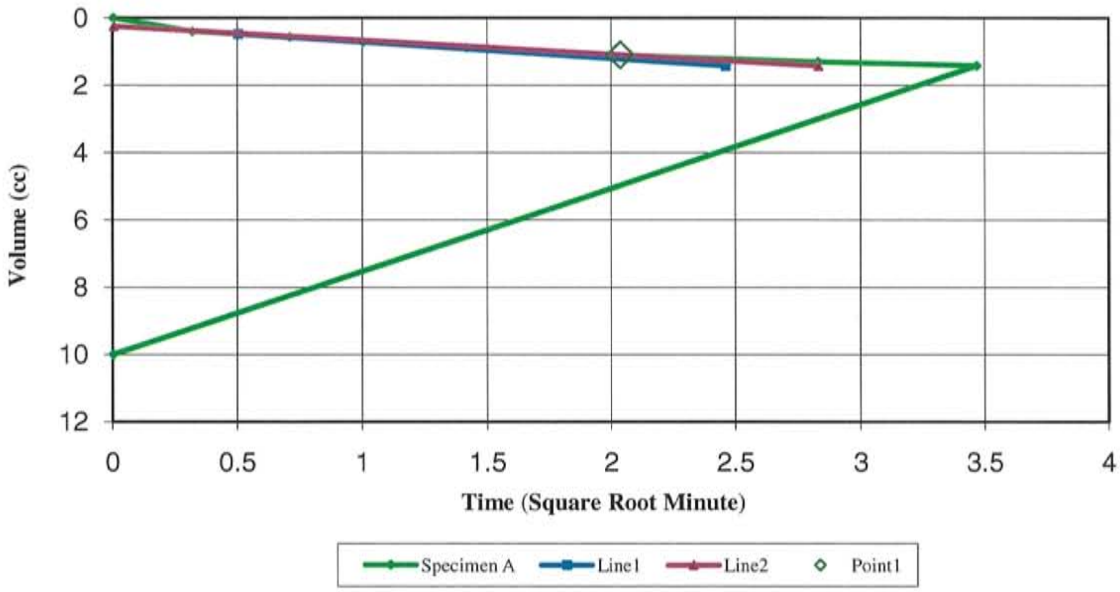


Stress Paths (Total)
(C' = 2.2 Ø' = 10.8)

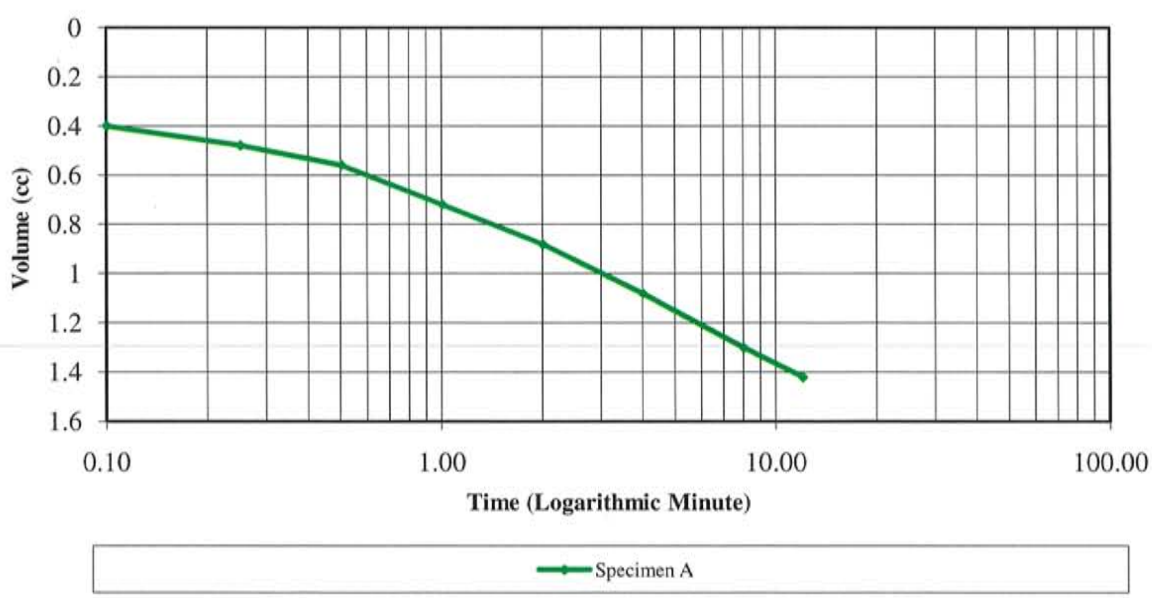


Specimen A Consolidation Graphs

Consolidation Graph (Square Root Time)

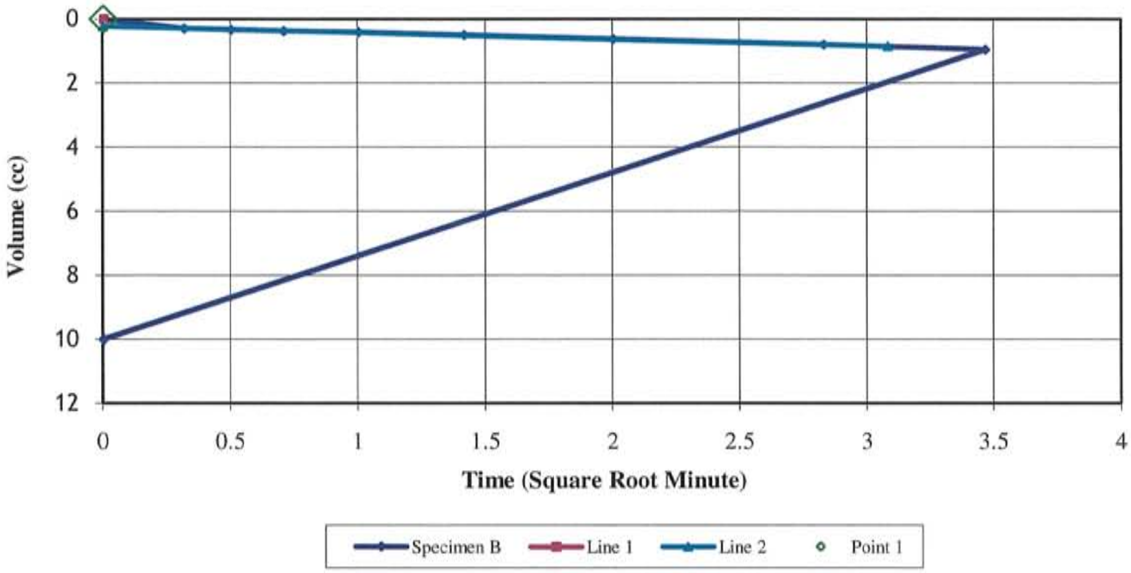


Consolidation Graph (Logarithmic Time)

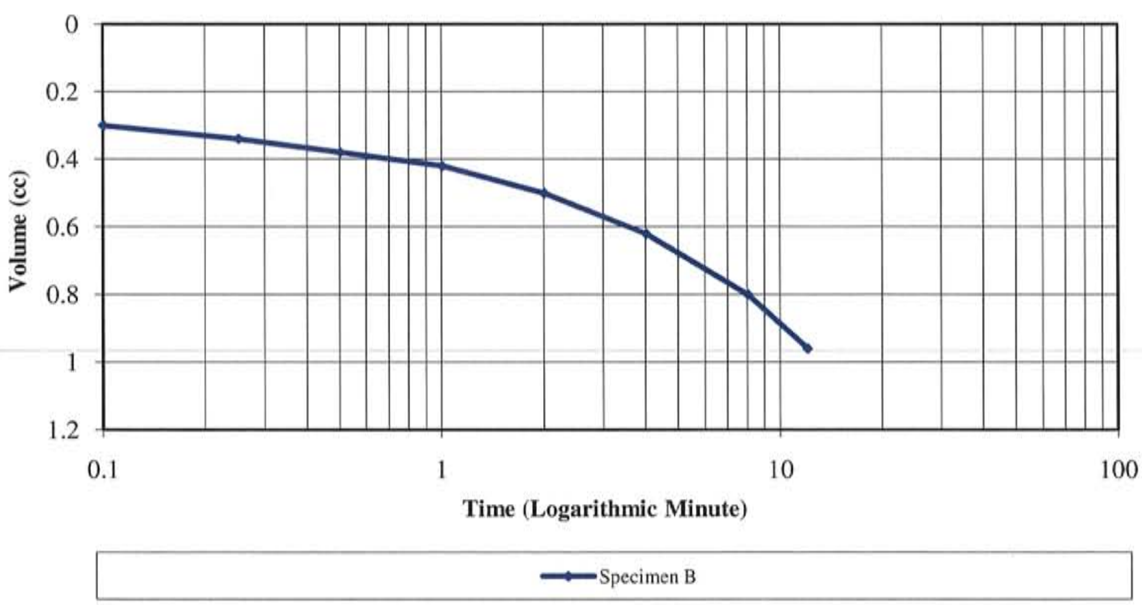


Specimen B Consolidation Graphs

Consolidation Graph (Square Root Time)



Consolidation Graph (Logarithmic Time)



Consolidation Calculations Specimen A

CU Triaxial Test

Contour Engineering

Client: Southern Company

Project No. AT10SOC03-K

Project Name: Plant Kraft Ash Pond Dikes

Project Location: B-2, UD-1

Hole No. B-2

Depth: 3.5-5.5'

Cell Pressure (psi) = 78.47

Back Pressure (psi) = 75

Effective Pressure (psi)= 3.47

Test Type = CU

Initial Sample Diameter (in) = 2.86

Initial Sample Height (in) = 6.077

Initial Sample Area (in2) = 6.424

Initial Volume (in3) = 39.04

Burrette Reading at Start of Test (cc)= 0

Time	Burrette Reading (cc)	Volume Change (cc)
00:00:00	0.00	N/A
00:00:06	-0.40	0.400
00:00:15	-0.48	0.480
00:00:30	-0.56	0.560
00:01:00	-0.72	0.720
00:02:00	-0.88	0.880
00:04:00	-1.08	1.080
00:08:00	-1.30	1.300
00:12:00	-1.42	1.420
	-10.00	10

Laboratory Supervisor

Consolidation Calculations Specimen B

CU Triaxial Test

Contour Engineering

Client: Southern Company

Project No. AT10SOC03-K

Project Name: Plant Kraft Ash Pond Dikes

Project Location: B-2, UD-1

Hole No. B-2

Depth: 3.5-5.5'

Cell Pressure (psi) = 80.21

Back Pressure (psi) = 75

Effective Pressure (psi)= 5.21

Test Type = CU

Initial Sample Diameter (in) = 2.86

Initial Sample Height (in) = 5.823

Initial Sample Area (in2) = 6.424

Initial Volume (in3) = 37.41

Burrette Reading at Start of Test (cc)= 0

Time	Burrette Reading (cc)	Volume Change (cc)
00:00:00	0.00	N/A
00:00:06	-0.30	0.300
00:00:15	-0.34	0.340
00:00:30	-0.38	0.380
00:01:00	-0.42	0.420
00:02:00	-0.50	0.500
00:04:00	-0.62	0.620
00:08:00	-0.80	0.800
00:12:00	-0.96	0.960
	-10.00	10

Laboratory Supervisor

Specimen A Shear Data

CU Triaxial Test

Contour Engineering

File Location
Plant Kraft B-2 UD-1 (9-20-10).HSD

Project Information

Project No. AT10SOC03-K
Project Name: Plant Kraft Ash Pond Dikes
Client: Southern Company
Sample Location: B-2, UD-1
Sample Description: Gray silty CLAY (CL)
Remarks:

Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.7
LL: 42.000
PL: 15.000

Sample Parameters	Initial	After Consolidation	Final
Diameter (in)	2.860	2.846	
Height (in)	6.077	6.032	
Weight (grams)	1196.47		1213.09
Moisture (%)	27.70		27.70
Dry Density (pcf)	91.43	94.33	
Saturation (%)	88.66	100.00	
Void Ratio	0.840	0.787	

Test Data

Rate of Strain: 0.01
Cell Pressure (psi): 78.470
Effective Confining Stress (psi): 3.4
Corrected Peak Deviator Stress (psi): 6.936 at reading number: 167

Specimen A

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
0	2.8	0.000	75.1	0.0	6.36	0.000	0.000	0.000	3.4	3.4	3.4	3.4	1.00	0.00	3.4	0.0	3.4
1	16.7	0.005	75.9	0.8	6.37	0.076	2.185	2.154	5.5	3.4	4.7	2.6	1.84	0.37	4.4	1.1	3.6
2	20.1	0.009	76.3	1.2	6.37	0.151	2.719	2.657	6.0	3.4	4.8	2.2	2.23	0.46	4.7	1.3	3.5
3	21.9	0.014	76.6	1.5	6.38	0.236	2.999	2.900	6.3	3.4	4.8	1.9	2.52	0.50	4.8	1.5	3.4
4	23.1	0.019	76.7	1.6	6.38	0.321	3.193	3.059	6.4	3.4	4.8	1.8	2.73	0.52	4.9	1.5	3.3
5	24.2	0.024	76.8	1.7	6.39	0.406	3.363	3.192	6.6	3.4	4.8	1.6	2.94	0.54	5.0	1.6	3.2
6	24.6	0.029	76.9	1.8	6.39	0.482	3.436	3.233	6.6	3.4	4.8	1.6	3.06	0.56	5.0	1.6	3.2
7	25.3	0.034	77.0	1.9	6.40	0.567	3.545	3.306	6.7	3.4	4.8	1.5	3.23	0.57	5.0	1.7	3.1
8	26.0	0.039	77.0	1.9	6.40	0.652	3.654	3.379	6.7	3.4	4.8	1.5	3.31	0.56	5.1	1.7	3.2
9	26.5	0.044	77.0	1.9	6.41	0.737	3.727	3.415	6.8	3.4	4.8	1.4	3.40	0.57	5.1	1.7	3.1
10	27.3	0.050	77.1	2.0	6.41	0.822	3.848	3.499	6.9	3.4	4.9	1.4	3.49	0.56	5.1	1.7	3.2
11	27.6	0.055	77.1	2.0	6.42	0.907	3.909	3.523	6.9	3.4	4.9	1.4	3.51	0.56	5.1	1.8	3.2
12	28.6	0.060	77.1	2.0	6.42	0.992	4.055	3.631	7.0	3.4	5.0	1.4	3.62	0.54	5.2	1.8	3.2
13	29.0	0.065	77.1	2.0	6.43	1.077	4.128	3.667	7.0	3.4	5.1	1.4	3.61	0.53	5.2	1.8	3.2
14	29.3	0.070	77.1	2.0	6.44	1.162	4.176	3.679	7.0	3.4	5.1	1.4	3.62	0.53	5.2	1.8	3.2
15	30.3	0.075	77.1	2.0	6.44	1.247	4.334	3.798	7.2	3.4	5.2	1.4	3.70	0.52	5.3	1.9	3.3
16	31.3	0.080	77.1	2.0	6.45	1.332	4.480	3.905	7.3	3.4	5.3	1.4	3.78	0.50	5.3	2.0	3.4
17	32.1	0.085	77.0	1.9	6.45	1.407	4.613	4.005	7.4	3.4	5.4	1.4	3.77	0.48	5.4	2.0	3.4
18	32.4	0.090	77.0	1.9	6.46	1.492	4.662	4.016	7.4	3.4	5.5	1.4	3.78	0.48	5.4	2.0	3.5

Specimen A

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
19	33.1	0.095	77.0	1.9	6.46	1.577	4.771	4.086	7.4	3.4	5.5	1.4	3.83	0.47	5.4	2.0	3.5
20	33.4	0.100	77.0	1.9	6.47	1.662	4.820	4.097	7.5	3.4	5.6	1.5	3.80	0.46	5.4	2.0	3.5
21	34.0	0.105	77.0	1.9	6.47	1.747	4.905	4.144	7.5	3.4	5.6	1.5	3.79	0.45	5.4	2.1	3.6
22	34.1	0.111	77.0	1.9	6.48	1.832	4.917	4.119	7.5	3.4	5.6	1.5	3.74	0.45	5.4	2.1	3.6
23	34.4	0.115	76.9	1.8	6.48	1.908	4.978	4.145	7.5	3.4	5.7	1.5	3.72	0.44	5.4	2.1	3.6
24	34.6	0.120	76.9	1.8	6.49	1.993	5.002	4.132	7.5	3.4	5.7	1.5	3.67	0.44	5.4	2.1	3.6
25	34.8	0.125	76.9	1.8	6.50	2.078	5.038	4.160	7.5	3.4	5.7	1.6	3.66	0.43	5.4	2.1	3.6
26	35.8	0.130	76.9	1.8	6.50	2.153	5.196	4.311	7.7	3.4	5.9	1.6	3.72	0.41	5.5	2.2	3.7
27	36.1	0.135	76.9	1.8	6.51	2.238	5.233	4.342	7.7	3.4	5.9	1.6	3.70	0.40	5.5	2.2	3.8
28	36.5	0.140	76.8	1.7	6.51	2.323	5.305	4.409	7.8	3.4	6.0	1.6	3.71	0.39	5.6	2.2	3.8
29	36.8	0.145	76.8	1.7	6.52	2.408	5.342	4.440	7.8	3.4	6.1	1.7	3.66	0.38	5.6	2.2	3.9
30	36.6	0.150	76.8	1.7	6.52	2.484	5.317	4.412	7.8	3.4	6.1	1.7	3.61	0.38	5.6	2.2	3.9
31	36.8	0.156	76.8	1.7	6.53	2.578	5.342	4.431	7.8	3.4	6.1	1.7	3.59	0.37	5.6	2.2	3.9
32	37.1	0.160	76.7	1.6	6.53	2.654	5.390	4.474	7.8	3.4	6.2	1.7	3.59	0.37	5.6	2.2	4.0
33	37.8	0.165	76.8	1.7	6.54	2.739	5.512	4.588	8.0	3.4	6.2	1.6	3.79	0.37	5.7	2.3	3.9
34	38.3	0.170	76.8	1.7	6.55	2.824	5.585	4.654	8.0	3.4	6.3	1.7	3.79	0.36	5.7	2.3	4.0
35	38.7	0.175	76.8	1.7	6.55	2.909	5.645	4.708	8.1	3.4	6.4	1.7	3.79	0.36	5.7	2.4	4.0
36	39.4	0.181	76.8	1.7	6.56	2.994	5.755	4.809	8.2	3.4	6.5	1.7	3.82	0.34	5.8	2.4	4.1
37	39.5	0.186	76.7	1.6	6.56	3.079	5.779	4.828	8.2	3.4	6.6	1.7	3.76	0.33	5.8	2.4	4.2
38	39.8	0.191	76.7	1.6	6.57	3.164	5.827	4.870	8.2	3.4	6.6	1.8	3.75	0.33	5.8	2.4	4.2
39	40.3	0.196	76.7	1.6	6.57	3.249	5.900	4.935	8.3	3.4	6.7	1.8	3.76	0.32	5.8	2.5	4.3
40	40.7	0.201	76.7	1.6	6.58	3.334	5.961	4.989	8.4	3.4	6.8	1.8	3.76	0.31	5.9	2.5	4.3
41	40.6	0.206	76.6	1.5	6.58	3.409	5.949	4.973	8.3	3.4	6.8	1.8	3.69	0.30	5.8	2.5	4.3
42	40.9	0.211	76.6	1.5	6.59	3.494	5.997	5.015	8.4	3.4	6.9	1.9	3.68	0.30	5.9	2.5	4.4
43	41.5	0.216	76.6	1.5	6.60	3.579	6.094	5.103	8.5	3.4	7.0	1.9	3.70	0.29	5.9	2.6	4.4
44	41.9	0.221	76.6	1.5	6.60	3.664	6.143	5.145	8.5	3.4	7.0	1.9	3.72	0.29	5.9	2.6	4.5
45	42.2	0.226	76.5	1.4	6.61	3.749	6.192	5.186	8.5	3.4	7.1	1.9	3.69	0.28	6.0	2.6	4.5
46	42.6	0.231	76.5	1.4	6.61	3.834	6.264	5.251	8.6	3.4	7.2	1.9	3.69	0.27	6.0	2.6	4.6
47	42.9	0.236	76.5	1.4	6.62	3.910	6.313	5.293	8.7	3.4	7.3	2.0	3.69	0.26	6.0	2.6	4.6
48	42.8	0.241	76.5	1.4	6.62	3.995	6.289	5.264	8.6	3.4	7.3	2.0	3.65	0.26	6.0	2.6	4.6
49	43.2	0.246	76.5	1.4	6.63	4.080	6.362	5.329	8.7	3.4	7.3	2.0	3.65	0.25	6.0	2.7	4.7
50	43.6	0.251	76.4	1.3	6.64	4.155	6.422	5.382	8.7	3.4	7.4	2.0	3.65	0.25	6.1	2.7	4.7
51	43.6	0.256	76.4	1.3	6.64	4.240	6.410	5.365	8.7	3.4	7.4	2.1	3.62	0.24	6.0	2.7	4.7
52	44.2	0.261	76.4	1.3	6.65	4.325	6.507	5.453	8.8	3.4	7.5	2.1	3.63	0.24	6.1	2.7	4.8
53	44.5	0.265	76.4	1.3	6.65	4.401	6.556	5.494	8.9	3.4	7.6	2.1	3.63	0.23	6.1	2.7	4.8
54	44.8	0.271	76.4	1.3	6.66	4.486	6.604	5.535	8.9	3.4	7.6	2.1	3.65	0.23	6.1	2.8	4.9
55	44.8	0.276	76.3	1.2	6.66	4.571	6.604	5.529	8.9	3.4	7.7	2.1	3.59	0.22	6.1	2.8	4.9
56	45.4	0.280	76.3	1.2	6.67	4.646	6.701	5.617	9.0	3.4	7.7	2.1	3.64	0.22	6.2	2.8	4.9
57	45.5	0.285	76.3	1.2	6.68	4.731	6.714	5.623	9.0	3.4	7.8	2.2	3.61	0.22	6.2	2.8	5.0
58	45.4	0.291	76.3	1.2	6.68	4.816	6.701	5.606	9.0	3.4	7.8	2.2	3.58	0.21	6.2	2.8	5.0
59	45.6	0.295	76.3	1.2	6.69	4.892	6.738	5.635	9.0	3.4	7.8	2.2	3.57	0.21	6.2	2.8	5.0

Specimen A

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
60	45.8	0.301	76.3	1.2	6.69	4.986	6.762	5.652	9.0	3.4	7.9	2.2	3.55	0.20	6.2	2.8	5.0
61	46.0	0.306	76.2	1.1	6.70	5.071	6.799	5.681	9.0	3.4	7.9	2.2	3.54	0.20	6.2	2.8	5.1
62	46.6	0.310	76.2	1.1	6.71	5.147	6.884	5.756	9.1	3.4	8.0	2.3	3.56	0.19	6.2	2.9	5.1
63	46.8	0.316	76.2	1.1	6.71	5.241	6.920	5.784	9.1	3.4	8.0	2.3	3.57	0.19	6.3	2.9	5.1
64	47.1	0.321	76.2	1.1	6.72	5.317	6.969	5.825	9.2	3.4	8.1	2.3	3.56	0.19	6.3	2.9	5.2
65	47.3	0.326	76.2	1.1	6.72	5.402	6.993	5.842	9.2	3.4	8.1	2.3	3.55	0.18	6.3	2.9	5.2
66	47.5	0.331	76.2	1.1	6.73	5.487	7.029	5.871	9.2	3.4	8.2	2.3	3.56	0.18	6.3	2.9	5.2
67	48.0	0.336	76.1	1.0	6.74	5.572	7.114	5.945	9.3	3.4	8.3	2.3	3.55	0.17	6.3	3.0	5.3
68	48.6	0.341	76.1	1.0	6.74	5.657	7.199	6.019	9.4	3.4	8.4	2.3	3.58	0.17	6.4	3.0	5.3
69	48.4	0.346	76.1	1.0	6.75	5.742	7.175	5.990	9.4	3.4	8.3	2.4	3.55	0.17	6.4	3.0	5.3
70	48.6	0.351	76.1	1.0	6.75	5.827	7.199	6.007	9.4	3.4	8.4	2.4	3.53	0.16	6.4	3.0	5.4
71	48.3	0.357	76.1	1.0	6.76	5.912	7.163	5.966	9.3	3.4	8.4	2.4	3.49	0.16	6.3	3.0	5.4
72	48.6	0.362	76.1	1.0	6.77	5.997	7.211	6.006	9.4	3.4	8.4	2.4	3.51	0.16	6.4	3.0	5.4'
73	49.0	0.367	76.1	0.9	6.77	6.082	7.260	6.045	9.4	3.4	8.5	2.4	3.50	0.16	6.4	3.0	5.4
74	48.8	0.372	76.0	0.9	6.78	6.167	7.236	6.016	9.4	3.4	8.5	2.4	3.47	0.15	6.4	3.0	5.4
75	48.8	0.377	76.0	0.9	6.78	6.242	7.236	6.011	9.4	3.4	8.5	2.5	3.45	0.15	6.4	3.0	5.5
76	48.9	0.382	76.0	0.9	6.79	6.327	7.248	6.016	9.4	3.4	8.5	2.5	3.43	0.15	6.4	3.0	5.5
77	49.1	0.387	76.0	0.9	6.80	6.412	7.284	6.044	9.4	3.4	8.5	2.5	3.44	0.15	6.4	3.0	5.5
78	49.6	0.392	76.0	0.9	6.80	6.497	7.357	6.106	9.5	3.4	8.6	2.5	3.45	0.14	6.4	3.1	5.5
79	49.7	0.396	76.0	0.8	6.81	6.573	7.369	6.112	9.5	3.4	8.6	2.5	3.43	0.14	6.4	3.1	5.6
80	49.7	0.402	76.0	0.8	6.81	6.658	7.369	6.106	9.5	3.4	8.6	2.5	3.43	0.14	6.4	3.1	5.6
81	49.9	0.407	75.9	0.8	6.82	6.743	7.406	6.133	9.5	3.4	8.7	2.5	3.42	0.13	6.4	3.1	5.6
82	50.0	0.411	75.9	0.8	6.83	6.818	7.430	6.150	9.5	3.4	8.7	2.6	3.41	0.13	6.4	3.1	5.6
83	50.6	0.416	75.9	0.8	6.83	6.903	7.515	6.223	9.6	3.4	8.8	2.6	3.42	0.13	6.5	3.1	5.7
84	50.7	0.422	75.9	0.8	6.84	6.988	7.539	6.239	9.6	3.4	8.8	2.6	3.42	0.13	6.5	3.1	5.7
85	50.8	0.426	75.9	0.8	6.84	7.064	7.551	6.245	9.6	3.4	8.8	2.6	3.41	0.12	6.5	3.1	5.7
86	51.0	0.431	75.9	0.7	6.85	7.149	7.576	6.261	9.6	3.4	8.9	2.6	3.39	0.12	6.5	3.1	5.7
87	51.6	0.436	75.9	0.7	6.86	7.234	7.673	6.345	9.7	3.4	9.0	2.6	3.43	0.12	6.5	3.2	5.8
88	52.0	0.441	75.8	0.7	6.86	7.319	7.746	6.406	9.8	3.4	9.0	2.6	3.43	0.11	6.6	3.2	5.8
89	51.8	0.446	75.8	0.7	6.87	7.394	7.709	6.366	9.7	3.4	9.0	2.6	3.42	0.11	6.5	3.2	5.8
90	52.1	0.451	75.8	0.7	6.87	7.479	7.758	6.404	9.8	3.4	9.1	2.7	3.41	0.11	6.6	3.2	5.9
91	52.7	0.456	75.8	0.7	6.88	7.564	7.843	6.476	9.8	3.4	9.2	2.7	3.42	0.11	6.6	3.2	5.9
92	52.6	0.461	75.8	0.7	6.89	7.649	7.831	6.458	9.8	3.4	9.1	2.7	3.41	0.11	6.6	3.2	5.9
93	53.1	0.467	75.8	0.7	6.89	7.734	7.916	6.530	9.9	3.4	9.2	2.7	3.42	0.10	6.6	3.3	6.0
94	53.1	0.472	75.8	0.6	6.90	7.819	7.916	6.524	9.9	3.4	9.2	2.7	3.40	0.10	6.6	3.3	6.0
95	53.3	0.476	75.8	0.6	6.91	7.895	7.940	6.540	9.9	3.4	9.3	2.7	3.41	0.10	6.6	3.3	6.0
96	53.1	0.482	75.7	0.6	6.91	7.989	7.916	6.510	9.9	3.4	9.2	2.7	3.38	0.10	6.6	3.3	6.0
97	53.3	0.486	75.7	0.6	6.92	8.065	7.940	6.526	9.9	3.4	9.3	2.7	3.38	0.10	6.6	3.3	6.0
98	53.4	0.492	75.7	0.6	6.92	8.150	7.952	6.531	9.9	3.4	9.3	2.8	3.37	0.09	6.6	3.3	6.0
99	53.4	0.497	75.7	0.6	6.93	8.235	7.964	6.535	9.9	3.4	9.3	2.8	3.37	0.09	6.6	3.3	6.0
100	53.7	0.502	75.7	0.6	6.94	8.320	8.013	6.573	9.9	3.4	9.4	2.8	3.35	0.09	6.6	3.3	6.1

Specimen A

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
101	53.8	0.507	75.7	0.6	6.94	8.405	8.025	6.577	9.9	3.4	9.4	2.8	3.35	0.09	6.7	3.3	6.1
102	54.4	0.512	75.7	0.5	6.95	8.490	8.110	6.648	10.0	3.4	9.5	2.8	3.36	0.08	6.7	3.3	6.1
103	54.2	0.517	75.7	0.5	6.96	8.575	8.085	6.619	10.0	3.4	9.4	2.8	3.35	0.08	6.7	3.3	6.1
104	54.2	0.522	75.6	0.5	6.96	8.660	8.085	6.612	10.0	3.4	9.4	2.8	3.33	0.08	6.7	3.3	6.1
105	54.4	0.527	75.6	0.5	6.97	8.745	8.122	6.639	10.0	3.4	9.5	2.8	3.34	0.08	6.7	3.3	6.2
106	54.5	0.532	75.6	0.5	6.98	8.820	8.134	6.644	10.0	3.4	9.5	2.9	3.32	0.08	6.7	3.3	6.2
107	54.6	0.537	75.6	0.5	6.98	8.905	8.146	6.648	10.0	3.4	9.5	2.8	3.34	0.08	6.7	3.3	6.2
108	54.8	0.542	75.6	0.5	6.99	8.990	8.183	6.674	10.0	3.4	9.6	2.9	3.32	0.07	6.7	3.3	6.2
109	54.9	0.547	75.6	0.5	6.99	9.066	8.195	6.679	10.0	3.4	9.6	2.9	3.32	0.07	6.7	3.3	6.2
110	54.8	0.552	75.6	0.5	7.00	9.151	8.183	6.661	10.0	3.4	9.6	2.9	3.30	0.07	6.7	3.3	6.2
111	54.6	0.557	75.6	0.5	7.01	9.236	8.146	6.621	10.0	3.4	9.5	2.9	3.28	0.07	6.7	3.3	6.2
112	54.7	0.562	75.6	0.4	7.01	9.321	8.158	6.625	10.0	3.4	9.5	2.9	3.27	0.07	6.7	3.3	6.2
113	55.3	0.567	75.5	0.4	7.02	9.396	8.255	6.707	10.1	3.4	9.6	2.9	3.28	0.06	6.7	3.4	6.3
114	55.5	0.572	75.5	0.4	7.03	9.481	8.292	6.733	10.1	3.4	9.7	2.9	3.29	0.06	6.7	3.4	6.3
115	55.8	0.577	75.5	0.4	7.03	9.566	8.340	6.769	10.1	3.4	9.7	3.0	3.29	0.06	6.7	3.4	6.3
116	56.1	0.582	75.5	0.4	7.04	9.651	8.377	6.795	10.2	3.4	9.8	3.0	3.30	0.06	6.8	3.4	6.4
117	56.5	0.587	75.5	0.4	7.05	9.727	8.450	6.855	10.2	3.4	9.8	3.0	3.30	0.06	6.8	3.4	6.4
118	56.7	0.592	75.5	0.4	7.05	9.812	8.474	6.869	10.2	3.4	9.8	3.0	3.31	0.06	6.8	3.4	6.4
119	56.7	0.596	75.5	0.4	7.06	9.887	8.474	6.863	10.2	3.4	9.9	3.0	3.29	0.05	6.8	3.4	6.4
120	57.0	0.602	75.5	0.4	7.06	9.972	8.523	6.900	10.3	3.4	9.9	3.0	3.30	0.05	6.8	3.4	6.4
121	56.8	0.607	75.5	0.3	7.07	10.057	8.486	6.860	10.2	3.4	9.9	3.0	3.27	0.05	6.8	3.4	6.4
122	56.8	0.612	75.4	0.3	7.08	10.142	8.486	6.852	10.2	3.4	9.9	3.0	3.25	0.05	6.8	3.4	6.5
123	56.8	0.617	75.4	0.3	7.08	10.227	8.486	6.500	9.9	3.4	9.6	3.1	3.12	0.05	6.6	3.3	6.3
124	56.6	0.622	75.4	0.3	7.09	10.312	8.462	6.468	9.8	3.4	9.5	3.1	3.10	0.04	6.6	3.2	6.3
125	56.8	0.627	75.4	0.3	7.10	10.397	8.486	6.480	9.8	3.4	9.6	3.1	3.10	0.04	6.6	3.2	6.3
126	56.8	0.632	75.4	0.3	7.10	10.473	8.486	6.471	9.8	3.4	9.6	3.1	3.10	0.04	6.6	3.2	6.3
127	57.1	0.637	75.4	0.3	7.11	10.567	8.535	6.503	9.9	3.4	9.6	3.1	3.10	0.04	6.6	3.3	6.4
128	57.4	0.642	75.3	0.2	7.12	10.643	8.595	6.548	9.9	3.4	9.7	3.1	3.10	0.04	6.6	3.3	6.4
129	57.4	0.647	75.3	0.2	7.12	10.728	8.595	6.538	9.9	3.4	9.7	3.1	3.10	0.04	6.6	3.3	6.4
130	57.8	0.652	75.3	0.2	7.13	10.813	8.644	6.571	9.9	3.4	9.7	3.1	3.09	0.03	6.6	3.3	6.4
131	57.9	0.657	75.3	0.2	7.14	10.898	8.668	6.583	9.9	3.4	9.7	3.1	3.10	0.03	6.7	3.3	6.4
132	57.8	0.662	75.3	0.2	7.15	10.983	8.656	6.562	9.9	3.4	9.7	3.2	3.06	0.03	6.6	3.3	6.5
133	58.5	0.667	75.3	0.2	7.15	11.058	8.765	6.650	10.0	3.4	9.8	3.2	3.09	0.03	6.7	3.3	6.5
134	58.5	0.672	75.3	0.2	7.16	11.143	8.765	6.640	10.0	3.4	9.8	3.2	3.09	0.03	6.7	3.3	6.5
135	58.8	0.677	75.3	0.2	7.16	11.228	8.814	6.672	10.0	3.4	9.9	3.2	3.08	0.02	6.7	3.3	6.5
136	58.9	0.682	75.3	0.2	7.17	11.304	8.826	6.674	10.0	3.4	9.9	3.2	3.08	0.02	6.7	3.3	6.5
137	58.8	0.687	75.2	0.1	7.18	11.389	8.802	6.642	10.0	3.4	9.9	3.2	3.06	0.02	6.7	3.3	6.5
138	58.9	0.692	75.2	0.1	7.18	11.474	8.826	6.653	10.0	3.4	9.9	3.2	3.07	0.02	6.7	3.3	6.5
139	58.8	0.697	75.2	0.1	7.19	11.550	8.814	6.633	10.0	3.4	9.9	3.2	3.05	0.02	6.7	3.3	6.6
140	59.0	0.702	75.2	0.1	7.20	11.635	8.838	6.644	10.0	3.4	9.9	3.3	3.04	0.02	6.7	3.3	6.6
141	59.1	0.707	75.2	0.1	7.20	11.720	8.862	6.655	10.0	3.4	9.9	3.3	3.04	0.02	6.7	3.3	6.6

Specimen A

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
142	59.2	0.712	75.2	0.1	7.21	11.805	8.875	6.656	10.0	3.4	9.9	3.3	3.03	0.01	6.7	3.3	6.6
143	59.5	0.717	75.2	0.1	7.22	11.889	8.911	6.677	10.0	3.4	10.0	3.3	3.03	0.01	6.7	3.3	6.6
144	59.3	0.722	75.2	0.1	7.22	11.965	8.887	6.647	10.0	3.4	9.9	3.3	3.01	0.01	6.7	3.3	6.6
145	59.1	0.727	75.2	0.1	7.23	12.050	8.862	6.615	10.0	3.4	9.9	3.3	3.00	0.01	6.7	3.3	6.6
146	59.4	0.732	75.1	0.0	7.24	12.135	8.899	6.637	10.0	3.4	10.0	3.3	3.00	0.01	6.7	3.3	6.6
147	59.1	0.737	75.1	0.0	7.25	12.211	8.850	6.585	9.9	3.4	9.9	3.3	2.97	0.00	6.7	3.3	6.6
148	59.3	0.742	75.1	0.0	7.25	12.296	8.887	6.606	10.0	3.4	9.9	3.3	2.98	0.00	6.7	3.3	6.6
149	59.8	0.747	75.1	0.0	7.26	12.381	8.972	6.670	10.0	3.4	10.0	3.3	3.00	0.00	6.7	3.3	6.7
150	59.8	0.752	75.1	0.0	7.27	12.466	8.960	6.649	10.0	3.4	10.0	3.4	2.98	0.00	6.7	3.3	6.7
151	59.8	0.757	75.1	0.0	7.27	12.551	8.972	6.649	10.0	3.4	10.0	3.4	2.97	0.00	6.7	3.3	6.7
152	60.1	0.762	75.1	0.0	7.28	12.636	9.008	6.671	10.0	3.4	10.1	3.4	2.97	0.00	6.7	3.3	6.7
153	60.1	0.767	75.1	0.0	7.29	12.721	9.008	6.660	10.0	3.4	10.1	3.4	2.96	-0.01	6.7	3.3	6.7
154	60.2	0.772	75.1	0.0	7.29	12.806	9.020	6.660	10.0	3.4	10.1	3.4	2.96	-0.01	6.7	3.3	6.7
155	60.1	0.778	75.1	0.0	7.30	12.891	9.008	6.639	10.0	3.4	10.0	3.4	2.95	-0.01	6.7	3.3	6.7
156	60.6	0.783	75.0	-0.1	7.31	12.976	9.093	6.702	10.1	3.4	10.1	3.4	2.96	-0.01	6.7	3.4	6.8
157	60.8	0.788	75.0	-0.1	7.32	13.061	9.117	6.713	10.1	3.4	10.2	3.4	2.95	-0.01	6.7	3.4	6.8
158	60.9	0.792	75.0	-0.1	7.32	13.136	9.142	6.725	10.1	3.4	10.2	3.4	2.95	-0.01	6.7	3.4	6.8
159	61.0	0.797	75.0	-0.1	7.33	13.221	9.154	6.725	10.1	3.4	10.2	3.5	2.94	-0.02	6.7	3.4	6.8
160	61.1	0.803	75.0	-0.1	7.34	13.306	9.166	6.724	10.1	3.4	10.2	3.5	2.93	-0.02	6.7	3.4	6.8
161	60.8	0.808	75.0	-0.1	7.34	13.391	9.130	6.682	10.0	3.4	10.2	3.5	2.92	-0.02	6.7	3.3	6.8
162	61.2	0.813	75.0	-0.1	7.35	13.476	9.190	6.724	10.1	3.4	10.2	3.5	2.92	-0.02	6.7	3.4	6.9
163	61.7	0.817	75.0	-0.1	7.36	13.552	9.263	6.778	10.1	3.4	10.3	3.5	2.93	-0.02	6.8	3.4	6.9
164	61.8	0.823	74.9	-0.2	7.36	13.637	9.275	6.777	10.1	3.4	10.3	3.5	2.92	-0.02	6.8	3.4	6.9
165	62.5	0.827	74.9	-0.2	7.37	13.712	9.397	6.873	10.2	3.4	10.4	3.5	2.95	-0.02	6.8	3.4	7.0
166	63.0	0.832	74.9	-0.2	7.38	13.797	9.469	6.924	10.3	3.4	10.5	3.5	2.95	-0.03	6.8	3.5	7.0
167	63.2	0.837	74.9	-0.2	7.38	13.873	9.494	6.936	10.3	3.4	10.5	3.6	2.95	-0.03	6.8	3.5	7.0
168	62.9	0.841	74.9	-0.2	7.39	13.948	9.457	6.895	10.3	3.4	10.5	3.6	2.93	-0.03	6.8	3.4	7.0
169	63.0	0.846	74.9	-0.2	7.40	14.033	9.469	6.894	10.3	3.4	10.5	3.6	2.92	-0.03	6.8	3.4	7.0
170	63.1	0.852	74.9	-0.2	7.41	14.118	9.482	6.894	10.3	3.4	10.5	3.6	2.92	-0.03	6.8	3.4	7.0
171	62.8	0.856	74.9	-0.2	7.41	14.194	9.433	6.842	10.2	3.4	10.4	3.6	2.90	-0.04	6.8	3.4	7.0
172	62.7	0.861	74.9	-0.2	7.42	14.279	9.421	6.821	10.2	3.4	10.4	3.6	2.89	-0.04	6.8	3.4	7.0
173	62.9	0.866	74.8	-0.3	7.43	14.354	9.445	6.832	10.2	3.4	10.5	3.6	2.88	-0.04	6.8	3.4	7.0
174	63.0	0.871	74.8	-0.3	7.43	14.439	9.469	6.842	10.2	3.4	10.5	3.6	2.89	-0.04	6.8	3.4	7.0
175	63.3	0.876	74.8	-0.3	7.44	14.515	9.518	6.874	10.2	3.4	10.5	3.6	2.89	-0.04	6.8	3.4	7.1
176	63.2	0.881	74.8	-0.3	7.45	14.600	9.494	6.842	10.2	3.4	10.5	3.7	2.87	-0.04	6.8	3.4	7.1
177	63.5	0.886	74.8	-0.3	7.46	14.685	9.554	6.883	10.2	3.4	10.5	3.7	2.88	-0.04	6.8	3.4	7.1
178	63.5	0.891	74.8	-0.3	7.46	14.770	9.542	6.862	10.2	3.4	10.5	3.7	2.86	-0.05	6.8	3.4	7.1
179	63.3	0.895	74.8	-0.3	7.47	14.845	9.518	6.831	10.2	3.4	10.5	3.7	2.85	-0.05	6.8	3.4	7.1
180	63.3	0.901	74.8	-0.3	7.48	14.940	9.518	6.819	10.2	3.4	10.5	3.7	2.84	-0.05	6.8	3.4	7.1
181	63.5	0.905	74.7	-0.4	7.48	15.006	9.554	6.841	10.2	3.4	10.6	3.7	2.84	-0.05	6.8	3.4	7.1

Specimen A

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)

File Location
Plant Kraft B-2 UD-1 (9-20-10).HSD

Project Information

Project No. AT10SOC03-K
Project Name: Plant Kraft Ash Pond Dikes
Client: Southern Company
Sample Location: B-2, UD-1
Sample Description: Gray silty CLAY (CL)
Remarks:

Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.7
LL: 42.000
PL: 15.000

Sample Parameters	Initial	After Consolidation	Final
Diameter (in)	2.860	2.845	
Height (in)	5.823	5.775	
Weight (grams)	1122.23		1136.90
Moisture (%)	33.13		33.17
Dry Density (pcf)	85.85	88.58	
Saturation (%)	92.84	100.00	
Void Ratio	0.960	0.903	

Test Data

Rate of Strain: 0.01
Cell Pressure (psi): 80.210
Effective Confining Stress (psi): 5.2
Corrected Peak Deviator Stress (psi): 7.673 at reading number: 102

Specimen B

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
0	2.2	0.000	75.0	0.0	6.36	0.000	0.000	0.000	5.2	5.2	5.2	5.2	1.00	0.00	5.2	0.0	5.2
1	26.2	0.005	76.5	1.5	6.36	0.079	3.777	3.744	9.0	5.2	7.5	3.8	2.00	0.39	7.1	1.9	5.6
2	32.2	0.009	77.2	2.2	6.37	0.158	4.725	4.656	9.9	5.2	7.7	3.0	2.54	0.47	7.6	2.3	5.4
3	35.1	0.014	77.7	2.7	6.37	0.247	5.186	5.078	10.3	5.2	7.6	2.5	3.02	0.53	7.8	2.5	5.1
4	37.3	0.019	78.1	3.1	6.38	0.335	5.526	5.378	10.6	5.2	7.5	2.2	3.49	0.57	7.9	2.7	4.8
5	38.5	0.024	78.3	3.3	6.38	0.424	5.709	5.520	10.7	5.2	7.4	1.9	3.91	0.60	8.0	2.8	4.7
6	39.8	0.029	78.5	3.5	6.39	0.503	5.927	5.703	10.9	5.2	7.4	1.7	4.37	0.62	8.1	2.9	4.5
7	41.2	0.034	78.6	3.7	6.40	0.592	6.134	5.869	11.1	5.2	7.4	1.6	4.74	0.62	8.2	2.9	4.5
8	41.9	0.039	78.8	3.8	6.40	0.681	6.255	5.949	11.2	5.2	7.4	1.4	5.10	0.63	8.2	3.0	4.4
9	42.6	0.044	78.8	3.9	6.41	0.760	6.364	6.022	11.2	5.2	7.4	1.4	5.40	0.64	8.2	3.0	4.4
10	43.3	0.049	78.9	3.9	6.41	0.848	6.474	6.091	11.3	5.2	7.4	1.3	5.65	0.64	8.3	3.0	4.4
11	44.1	0.054	78.9	4.0	6.42	0.927	6.595	6.176	11.4	5.2	7.4	1.3	5.87	0.64	8.3	3.1	4.4
12	44.5	0.059	79.0	4.0	6.42	1.016	6.656	6.195	11.4	5.2	7.4	1.2	5.96	0.64	8.3	3.1	4.3
13	44.9	0.064	79.0	4.0	6.43	1.105	6.729	6.227	11.5	5.2	7.5	1.2	6.07	0.64	8.3	3.1	4.3
14	45.3	0.069	79.0	4.0	6.43	1.194	6.789	6.247	11.5	5.2	7.5	1.2	6.09	0.64	8.3	3.1	4.4
15	46.3	0.074	79.0	4.0	6.44	1.282	6.947	6.363	11.6	5.2	7.6	1.2	6.27	0.63	8.4	3.2	4.4
16	46.4	0.079	79.0	4.0	6.45	1.371	6.960	6.334	11.6	5.2	7.6	1.2	6.07	0.63	8.4	3.2	4.4
17	46.5	0.084	78.9	4.0	6.45	1.450	6.972	6.310	11.5	5.2	7.6	1.3	5.98	0.63	8.4	3.2	4.4
18	46.8	0.089	78.9	3.9	6.46	1.549	7.020	6.313	11.5	5.2	7.6	1.3	5.90	0.62	8.4	3.2	4.4

Specimen B

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
19	47.2	0.094	78.9	3.9	6.46	1.628	7.081	6.336	11.6	5.2	7.6	1.3	5.84	0.62	8.4	3.2	4.5
20	47.3	0.099	78.8	3.9	6.47	1.716	7.105	6.320	11.5	5.2	7.7	1.4	5.62	0.61	8.4	3.2	4.5
21	47.3	0.105	78.9	3.9	6.48	1.815	7.093	6.263	11.5	5.2	7.6	1.3	5.64	0.62	8.4	3.1	4.5
22	47.8	0.109	78.8	3.8	6.48	1.894	7.178	6.310	11.5	5.2	7.7	1.4	5.54	0.61	8.4	3.2	4.5
23	48.3	0.115	78.8	3.8	6.49	1.993	7.263	6.348	11.6	5.2	7.8	1.4	5.44	0.60	8.4	3.2	4.6
24	48.7	0.120	78.8	3.8	6.49	2.081	7.324	6.398	11.6	5.2	7.8	1.4	5.41	0.59	8.4	3.2	4.6
25	48.8	0.125	78.7	3.7	6.50	2.170	7.336	6.404	11.6	5.2	7.9	1.5	5.30	0.58	8.4	3.2	4.7
26	49.2	0.130	78.7	3.7	6.50	2.259	7.397	6.456	11.7	5.2	8.0	1.5	5.27	0.58	8.5	3.2	4.7
27	49.3	0.135	78.7	3.7	6.51	2.338	7.409	6.462	11.7	5.2	8.0	1.6	5.17	0.57	8.5	3.2	4.8
28	49.4	0.140	78.6	3.6	6.52	2.427	7.433	6.480	11.7	5.2	8.1	1.6	5.07	0.56	8.5	3.2	4.8
29	49.7	0.146	78.6	3.6	6.52	2.525	7.470	6.508	11.7	5.2	8.1	1.6	5.04	0.56	8.5	3.3	4.9
30	49.8	0.150	78.6	3.6	6.53	2.604	7.494	6.526	11.7	5.2	8.2	1.7	4.95	0.55	8.5	3.3	4.9
31	50.2	0.156	78.5	3.6	6.53	2.693	7.555	6.578	11.8	5.2	8.2	1.7	4.93	0.54	8.5	3.3	5.0
32	50.2	0.161	78.5	3.5	6.54	2.782	7.555	6.571	11.8	5.2	8.3	1.7	4.88	0.54	8.5	3.3	5.0
33	50.6	0.165	78.5	3.5	6.54	2.861	7.615	6.624	11.8	5.2	8.3	1.7	4.87	0.53	8.5	3.3	5.0
34	51.0	0.170	78.5	3.5	6.55	2.949	7.676	6.676	11.9	5.2	8.4	1.8	4.81	0.52	8.6	3.3	5.1
35	51.6	0.175	78.4	3.5	6.56	3.038	7.773	6.764	12.0	5.2	8.5	1.8	4.82	0.51	8.6	3.4	5.2
36	52.7	0.180	78.4	3.4	6.56	3.117	7.955	6.934	12.2	5.2	8.7	1.8	4.87	0.49	8.7	3.5	5.3
37	53.3	0.185	78.4	3.4	6.57	3.206	8.041	7.009	12.2	5.2	8.8	1.8	4.87	0.49	8.7	3.5	5.3
38	53.7	0.190	78.4	3.4	6.57	3.295	8.101	7.061	12.3	5.2	8.9	1.8	4.85	0.48	8.8	3.5	5.4
39	53.6	0.195	78.4	3.4	6.58	3.383	8.089	7.042	12.3	5.2	8.9	1.9	4.80	0.48	8.7	3.5	5.4
40	54.1	0.200	78.3	3.3	6.59	3.462	8.162	7.106	12.3	5.2	9.0	1.9	4.79	0.47	8.8	3.6	5.4
41	54.6	0.205	78.3	3.3	6.59	3.551	8.247	7.181	12.4	5.2	9.1	1.9	4.75	0.46	8.8	3.6	5.5
42	54.7	0.210	78.3	3.3	6.60	3.640	8.271	7.197	12.4	5.2	9.1	1.9	4.72	0.46	8.8	3.6	5.5
43	55.0	0.215	78.3	3.3	6.60	3.719	8.308	7.226	12.4	5.2	9.2	2.0	4.70	0.45	8.8	3.6	5.6
44	55.1	0.220	78.2	3.2	6.61	3.807	8.332	7.242	12.5	5.2	9.2	2.0	4.63	0.45	8.8	3.6	5.6
45	55.4	0.225	78.2	3.2	6.62	3.896	8.381	7.281	12.5	5.2	9.3	2.0	4.65	0.44	8.9	3.6	5.6
46	55.4	0.230	78.2	3.2	6.62	3.975	8.381	7.274	12.5	5.2	9.3	2.0	4.61	0.44	8.9	3.6	5.7
47	56.1	0.235	78.2	3.2	6.63	4.064	8.490	7.372	12.6	5.2	9.4	2.0	4.62	0.43	8.9	3.7	5.7
48	56.7	0.240	78.2	3.2	6.63	4.153	8.575	7.446	12.7	5.2	9.5	2.1	4.62	0.43	8.9	3.7	5.8
49	57.3	0.245	78.1	3.1	6.64	4.241	8.672	7.531	12.8	5.2	9.6	2.1	4.63	0.42	9.0	3.8	5.8
50	57.7	0.250	78.1	3.1	6.65	4.330	8.733	7.581	12.8	5.2	9.7	2.1	4.62	0.41	9.0	3.8	5.9
51	57.9	0.255	78.1	3.1	6.65	4.419	8.769	7.608	12.8	5.2	9.7	2.1	4.60	0.41	9.0	3.8	5.9
52	57.6	0.260	78.1	3.1	6.66	4.508	8.721	7.554	12.8	5.2	9.7	2.1	4.54	0.41	9.0	3.8	5.9
53	57.6	0.265	78.1	3.1	6.66	4.587	8.721	7.547	12.8	5.2	9.7	2.2	4.50	0.41	9.0	3.8	5.9
54	57.4	0.270	78.0	3.0	6.67	4.675	8.696	7.517	12.7	5.2	9.7	2.2	4.45	0.41	9.0	3.8	5.9
55	57.0	0.275	78.0	3.0	6.68	4.764	8.624	7.439	12.7	5.2	9.6	2.2	4.39	0.41	8.9	3.7	5.9
56	57.5	0.280	78.0	3.0	6.68	4.853	8.709	7.513	12.7	5.2	9.7	2.2	4.39	0.40	9.0	3.8	6.0
57	56.7	0.285	78.0	3.0	6.69	4.942	8.575	7.378	12.6	5.2	9.6	2.2	4.33	0.41	8.9	3.7	5.9
58	56.7	0.291	78.0	3.0	6.69	5.031	8.575	7.370	12.6	5.2	9.6	2.2	4.29	0.41	8.9	3.7	5.9
59	56.7	0.296	78.0	3.0	6.70	5.119	8.575	7.363	12.6	5.2	9.6	2.3	4.26	0.40	8.9	3.7	5.9

Specimen B

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
60	56.8	0.301	77.9	2.9	6.71	5.208	8.587	7.367	12.6	5.2	9.6	2.3	4.23	0.40	8.9	3.7	6.0
61	56.8	0.306	77.9	2.9	6.71	5.297	8.599	7.370	12.6	5.2	9.7	2.3	4.21	0.40	8.9	3.7	6.0
62	56.8	0.310	77.9	2.9	6.72	5.376	8.599	7.364	12.6	5.2	9.7	2.3	4.18	0.39	8.9	3.7	6.0
63	57.1	0.316	77.9	2.9	6.73	5.465	8.648	7.402	12.6	5.2	9.7	2.3	4.17	0.39	8.9	3.7	6.0
64	56.8	0.321	77.9	2.9	6.73	5.553	8.587	7.337	12.6	5.2	9.7	2.3	4.14	0.39	8.9	3.7	6.0
65	56.8	0.326	77.9	2.9	6.74	5.642	8.599	7.341	12.6	5.2	9.7	2.4	4.11	0.39	8.9	3.7	6.0
66	56.8	0.330	77.9	2.9	6.74	5.721	8.587	7.323	12.5	5.2	9.7	2.4	4.11	0.39	8.9	3.7	6.0
67	56.8	0.336	77.8	2.8	6.75	5.810	8.587	7.315	12.5	5.2	9.7	2.4	4.08	0.39	8.9	3.7	6.0
68	56.4	0.341	77.8	2.8	6.76	5.899	8.526	7.250	12.5	5.2	9.6	2.4	4.02	0.39	8.8	3.6	6.0
69	56.7	0.346	77.8	2.8	6.76	5.987	8.575	7.288	12.5	5.2	9.7	2.4	4.01	0.38	8.9	3.6	6.1
70	56.9	0.350	77.8	2.8	6.77	6.066	8.611	7.316	12.5	5.2	9.7	2.4	4.02	0.38	8.9	3.7	6.1
71	56.9	0.355	77.8	2.8	6.77	6.155	8.611	7.308	12.5	5.2	9.7	2.4	4.00	0.38	8.9	3.7	6.1
72	56.8	0.361	77.8	2.8	6.78	6.244	8.587	7.278	12.5	5.2	9.7	2.5	3.96	0.38	8.9	3.6	6.1
73	57.2	0.366	77.8	2.8	6.79	6.333	8.660	7.338	12.6	5.2	9.8	2.5	3.98	0.38	8.9	3.7	6.1
74	56.6	0.370	77.7	2.7	6.79	6.412	8.563	7.241	12.5	5.2	9.7	2.5	3.90	0.38	8.8	3.6	6.1
75	57.0	0.375	77.7	2.7	6.80	6.500	8.624	7.290	12.5	5.2	9.8	2.5	3.92	0.37	8.9	3.6	6.1
76	56.9	0.381	77.7	2.7	6.81	6.589	8.611	7.271	12.5	5.2	9.8	2.5	3.91	0.37	8.9	3.6	6.1
77	57.1	0.386	77.7	2.7	6.81	6.678	8.648	7.297	12.5	5.2	9.8	2.5	3.90	0.37	8.9	3.6	6.2
78	57.0	0.390	77.7	2.7	6.82	6.757	8.624	7.268	12.5	5.2	9.8	2.5	3.88	0.37	8.9	3.6	6.2
79	56.9	0.395	77.7	2.7	6.82	6.846	8.611	7.249	12.5	5.2	9.8	2.5	3.85	0.37	8.8	3.6	6.2
80	57.2	0.400	77.7	2.7	6.83	6.934	8.660	7.286	12.5	5.2	9.8	2.6	3.85	0.37	8.9	3.6	6.2
81	57.4	0.406	77.7	2.7	6.84	7.033	8.684	7.300	12.5	5.2	9.9	2.6	3.85	0.36	8.9	3.7	6.2
82	57.3	0.411	77.6	2.6	6.84	7.112	8.672	7.282	12.5	5.2	9.9	2.6	3.82	0.36	8.9	3.6	6.2
83	57.3	0.416	77.6	2.6	6.85	7.201	8.672	7.274	12.5	5.2	9.9	2.6	3.82	0.36	8.9	3.6	6.2
84	57.4	0.422	77.6	2.6	6.86	7.299	8.684	7.277	12.5	5.2	9.9	2.6	3.80	0.36	8.9	3.6	6.2
85	57.4	0.426	77.6	2.6	6.86	7.378	8.696	7.281	12.5	5.2	9.9	2.6	3.78	0.36	8.9	3.6	6.3
86	58.1	0.431	77.6	2.6	6.87	7.467	8.806	7.375	12.6	5.2	10.0	2.6	3.81	0.35	8.9	3.7	6.3
87	58.9	0.436	77.6	2.6	6.88	7.556	8.927	7.479	12.7	5.2	10.1	2.6	3.83	0.35	9.0	3.7	6.4
88	59.4	0.441	77.5	2.6	6.88	7.644	9.000	7.539	12.8	5.2	10.2	2.7	3.83	0.34	9.0	3.8	6.4
89	59.4	0.447	77.5	2.6	6.89	7.733	9.000	7.531	12.8	5.2	10.2	2.7	3.83	0.34	9.0	3.8	6.4
90	59.5	0.451	77.5	2.5	6.90	7.812	9.012	7.535	12.8	5.2	10.2	2.7	3.81	0.34	9.0	3.8	6.4
91	59.5	0.456	77.5	2.5	6.90	7.901	9.012	7.527	12.8	5.2	10.2	2.7	3.81	0.34	9.0	3.8	6.4
92	59.2	0.461	77.5	2.5	6.91	7.990	8.976	7.485	12.7	5.2	10.2	2.7	3.79	0.34	9.0	3.7	6.4
93	59.5	0.467	77.5	2.5	6.92	8.079	9.024	7.522	12.7	5.2	10.2	2.7	3.78	0.34	9.0	3.8	6.5
94	59.5	0.471	77.5	2.5	6.92	8.157	9.012	7.504	12.7	5.2	10.2	2.7	3.78	0.34	9.0	3.8	6.5
95	60.0	0.476	77.5	2.5	6.93	8.246	9.097	7.574	12.8	5.2	10.3	2.7	3.78	0.33	9.0	3.8	6.5
96	60.0	0.481	77.5	2.5	6.94	8.335	9.097	7.566	12.8	5.2	10.3	2.7	3.76	0.33	9.0	3.8	6.5
97	59.9	0.486	77.5	2.5	6.94	8.424	9.085	7.546	12.8	5.2	10.3	2.7	3.75	0.33	9.0	3.8	6.5
98	59.6	0.492	77.4	2.5	6.95	8.513	9.036	7.494	12.7	5.2	10.3	2.8	3.71	0.33	9.0	3.7	6.5
99	60.3	0.496	77.4	2.5	6.96	8.591	9.146	7.587	12.8	5.2	10.3	2.8	3.75	0.32	9.0	3.8	6.6
100	60.9	0.501	77.4	2.5	6.96	8.680	9.243	7.667	12.9	5.2	10.4	2.8	3.78	0.32	9.1	3.8	6.6

Specimen B

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
101	60.9	0.506	77.4	2.4	6.97	8.769	9.243	7.659	12.9	5.2	10.4	2.8	3.75	0.32	9.1	3.8	6.6
102	61.1	0.512	77.4	2.4	6.98	8.858	9.267	7.673	12.9	5.2	10.5	2.8	3.74	0.32	9.1	3.8	6.6
103	61.0	0.517	77.4	2.4	6.98	8.947	9.255	7.654	12.9	5.2	10.5	2.8	3.73	0.32	9.1	3.8	6.6
104	60.8	0.521	77.4	2.4	6.99	9.025	9.219	7.613	12.8	5.2	10.4	2.8	3.72	0.32	9.0	3.8	6.6
105	60.5	0.526	77.4	2.4	7.00	9.114	9.170	7.561	12.8	5.2	10.4	2.8	3.66	0.31	9.0	3.8	6.6
106	60.1	0.531	77.4	2.4	7.00	9.203	9.109	7.498	12.7	5.2	10.3	2.8	3.64	0.32	9.0	3.7	6.6
107	59.9	0.537	77.3	2.4	7.01	9.292	9.085	7.468	12.7	5.2	10.3	2.9	3.61	0.32	9.0	3.7	6.6
108	59.1	0.542	77.3	2.4	7.02	9.381	8.964	7.350	12.6	5.2	10.2	2.9	3.57	0.32	8.9	3.7	6.5
109	59.1	0.547	77.3	2.3	7.02	9.469	8.964	7.342	12.6	5.2	10.2	2.9	3.55	0.32	8.9	3.7	6.6
110	59.1	0.552	77.3	2.3	7.03	9.558	8.951	7.323	12.5	5.2	10.2	2.9	3.52	0.32	8.9	3.7	6.6
111	58.8	0.557	77.3	2.3	7.04	9.647	8.903	7.271	12.5	5.2	10.2	2.9	3.49	0.32	8.9	3.6	6.6
112	58.8	0.562	77.3	2.3	7.04	9.736	8.915	7.274	12.5	5.2	10.2	2.9	3.49	0.32	8.9	3.6	6.6
113	58.9	0.567	77.3	2.3	7.05	9.824	8.927	7.277	12.5	5.2	10.2	2.9	3.47	0.31	8.9	3.6	6.6
114	59.1	0.572	77.3	2.3	7.06	9.913	8.951	7.291	12.5	5.2	10.2	2.9	3.48	0.31	8.9	3.6	6.6
115	59.0	0.577	77.2	2.3	7.06	9.992	8.939	7.273	12.5	5.2	10.2	3.0	3.45	0.31	8.9	3.6	6.6
116	59.3	0.582	77.2	2.3	7.07	10.081	8.988	7.309	12.5	5.2	10.3	3.0	3.47	0.31	8.9	3.7	6.6
117	59.8	0.587	77.2	2.2	7.08	10.170	9.061	7.366	12.6	5.2	10.3	3.0	3.47	0.30	8.9	3.7	6.7
118	60.1	0.592	77.2	2.2	7.08	10.258	9.109	7.402	12.6	5.2	10.4	3.0	3.48	0.30	8.9	3.7	6.7
119	60.1	0.598	77.2	2.2	7.09	10.347	9.109	7.394	12.6	5.2	10.4	3.0	3.46	0.30	8.9	3.7	6.7
120	60.2	0.602	77.2	2.2	7.10	10.426	9.134	7.408	12.6	5.2	10.4	3.0	3.45	0.30	8.9	3.7	6.7
121	60.5	0.607	77.2	2.2	7.10	10.515	9.170	7.433	12.7	5.2	10.5	3.0	3.46	0.30	8.9	3.7	6.7
122	60.5	0.612	77.2	2.2	7.11	10.594	9.182	7.436	12.7	5.2	10.5	3.0	3.44	0.29	8.9	3.7	6.8
123	60.4	0.617	77.1	2.2	7.12	10.683	9.158	7.406	12.6	5.2	10.5	3.1	3.42	0.29	8.9	3.7	6.8
124	60.3	0.622	77.1	2.2	7.12	10.771	9.146	7.387	12.6	5.2	10.5	3.1	3.41	0.29	8.9	3.7	6.8
125	60.4	0.627	77.1	2.1	7.13	10.850	9.158	7.391	12.6	5.2	10.5	3.1	3.40	0.29	8.9	3.7	6.8
126	60.8	0.631	77.1	2.1	7.14	10.929	9.231	7.449	12.7	5.2	10.5	3.1	3.41	0.29	8.9	3.7	6.8
127	60.8	0.636	77.1	2.1	7.14	11.018	9.231	7.440	12.7	5.2	10.5	3.1	3.40	0.28	8.9	3.7	6.8
128	60.9	0.641	77.1	2.1	7.15	11.107	9.243	7.068	12.3	5.2	10.2	3.1	3.26	0.30	8.8	3.5	6.7
129	61.1	0.646	77.1	2.1	7.16	11.186	9.267	7.080	12.3	5.2	10.2	3.1	3.27	0.30	8.8	3.5	6.7
130	61.2	0.651	77.1	2.1	7.17	11.274	9.279	7.080	12.3	5.2	10.2	3.1	3.25	0.29	8.8	3.5	6.7
131	61.1	0.656	77.0	2.1	7.17	11.353	9.267	7.059	12.3	5.2	10.2	3.2	3.23	0.29	8.8	3.5	6.7
132	61.0	0.661	77.0	2.1	7.18	11.442	9.255	7.037	12.3	5.2	10.2	3.2	3.22	0.29	8.7	3.5	6.7
133	61.0	0.666	77.0	2.0	7.19	11.531	9.255	7.026	12.2	5.2	10.2	3.2	3.21	0.29	8.7	3.5	6.7
134	61.0	0.671	77.0	2.0	7.19	11.620	9.255	7.014	12.2	5.2	10.2	3.2	3.19	0.29	8.7	3.5	6.7
135	61.4	0.676	77.0	2.0	7.20	11.708	9.316	7.057	12.3	5.2	10.3	3.2	3.20	0.29	8.8	3.5	6.7
136	61.4	0.681	77.0	2.0	7.21	11.797	9.316	7.045	12.3	5.2	10.3	3.2	3.18	0.28	8.7	3.5	6.7
137	62.1	0.686	77.0	2.0	7.22	11.886	9.425	7.131	12.4	5.2	10.4	3.2	3.20	0.28	8.8	3.6	6.8
138	62.4	0.691	77.0	2.0	7.22	11.965	9.474	7.163	12.4	5.2	10.4	3.2	3.21	0.28	8.8	3.6	6.8
139	62.3	0.696	76.9	2.0	7.23	12.054	9.462	7.141	12.4	5.2	10.4	3.3	3.19	0.27	8.8	3.6	6.8
140	61.9	0.702	76.9	1.9	7.24	12.152	9.401	7.075	12.3	5.2	10.4	3.3	3.14	0.27	8.8	3.5	6.8
141	62.2	0.707	76.9	1.9	7.24	12.241	9.449	7.106	12.3	5.2	10.4	3.3	3.16	0.27	8.8	3.6	6.8

Specimen B

Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)
142	62.2	0.712	76.9	1.9	7.25	12.330	9.449	7.095	12.3	5.2	10.4	3.3	3.16	0.27	8.8	3.5	6.8
143	62.2	0.717	76.9	1.9	7.26	12.419	9.437	7.073	12.3	5.2	10.4	3.3	3.14	0.27	8.8	3.5	6.8
144	62.4	0.722	76.9	1.9	7.27	12.507	9.474	7.094	12.3	5.2	10.4	3.3	3.13	0.27	8.8	3.5	6.9
145	62.5	0.727	76.9	1.9	7.27	12.596	9.486	7.093	12.3	5.2	10.4	3.3	3.12	0.26	8.8	3.5	6.9
146	62.5	0.733	76.8	1.9	7.28	12.685	9.486	7.081	12.3	5.2	10.4	3.4	3.10	0.26	8.8	3.5	6.9
147	62.6	0.737	76.8	1.9	7.29	12.764	9.510	7.092	12.3	5.2	10.5	3.4	3.11	0.26	8.8	3.5	6.9
148	62.8	0.742	76.8	1.9	7.30	12.853	9.534	7.102	12.3	5.2	10.5	3.4	3.11	0.26	8.8	3.6	6.9
149	63.1	0.747	76.8	1.8	7.30	12.941	9.583	7.133	12.4	5.2	10.5	3.4	3.09	0.25	8.8	3.6	7.0
150	64.1	0.752	76.8	1.8	7.31	13.030	9.741	7.259	12.5	5.2	10.7	3.4	3.13	0.25	8.9	3.6	7.0
151	63.9	0.757	76.8	1.8	7.32	13.109	9.717	7.227	12.5	5.2	10.7	3.4	3.10	0.25	8.8	3.6	7.1
152	64.1	0.762	76.8	1.8	7.32	13.198	9.741	7.237	12.5	5.2	10.7	3.4	3.10	0.25	8.8	3.6	7.1
153	64.2	0.767	76.8	1.8	7.33	13.287	9.765	7.246	12.5	5.2	10.7	3.4	3.10	0.25	8.8	3.6	7.1
154	64.2	0.772	76.7	1.7	7.34	13.366	9.753	7.225	12.4	5.2	10.7	3.5	3.07	0.24	8.8	3.6	7.1
155	64.6	0.777	76.7	1.7	7.35	13.454	9.814	7.266	12.5	5.2	10.8	3.5	3.07	0.24	8.9	3.6	7.1
156	64.6	0.782	76.7	1.7	7.35	13.543	9.814	7.254	12.5	5.2	10.8	3.5	3.06	0.23	8.9	3.6	7.2
157	64.4	0.787	76.7	1.7	7.36	13.622	9.790	7.223	12.4	5.2	10.8	3.5	3.04	0.23	8.8	3.6	7.2
158	64.2	0.792	76.6	1.7	7.37	13.711	9.765	7.190	12.4	5.2	10.8	3.6	3.01	0.23	8.8	3.6	7.2
159	64.2	0.796	76.6	1.6	7.37	13.790	9.753	7.170	12.4	5.2	10.8	3.6	3.00	0.23	8.8	3.6	7.2
160	64.4	0.801	76.6	1.6	7.38	13.878	9.790	7.189	12.4	5.2	10.8	3.6	2.99	0.22	8.8	3.6	7.2
161	64.6	0.807	76.6	1.6	7.39	13.967	9.826	7.209	12.4	5.2	10.8	3.6	2.99	0.22	8.8	3.6	7.2
162	64.8	0.811	76.6	1.6	7.40	14.046	9.850	7.219	12.4	5.2	10.9	3.6	2.98	0.22	8.8	3.6	7.3
163	64.6	0.816	76.5	1.6	7.40	14.135	9.814	7.176	12.4	5.2	10.8	3.7	2.96	0.22	8.8	3.6	7.3
164	65.1	0.821	76.5	1.5	7.41	14.224	9.899	7.238	12.5	5.2	10.9	3.7	2.95	0.21	8.8	3.6	7.3
165	64.9	0.827	76.6	1.6	7.42	14.312	9.862	7.195	12.4	5.2	10.8	3.6	3.00	0.23	8.8	3.6	7.2
166	65.0	0.832	76.9	1.9	7.43	14.401	9.887	7.204	12.4	5.2	10.5	3.3	3.17	0.26	8.8	3.6	6.9
167	65.2	0.836	76.9	2.0	7.43	14.480	9.911	7.214	12.4	5.2	10.5	3.3	3.21	0.27	8.8	3.6	6.9
168	65.1	0.841	76.9	1.9	7.44	14.569	9.899	7.192	12.4	5.2	10.5	3.3	3.19	0.27	8.8	3.6	6.9
169	65.2	0.846	76.9	1.9	7.45	14.658	9.923	7.201	12.4	5.2	10.5	3.3	3.19	0.27	8.8	3.6	6.9
170	65.1	0.851	76.9	1.9	7.46	14.737	9.899	7.170	12.4	5.2	10.5	3.3	3.17	0.27	8.8	3.6	6.9
171	65.6	0.856	76.9	1.9	7.46	14.825	9.984	7.230	12.5	5.2	10.6	3.3	3.17	0.26	8.8	3.6	6.9
172	65.9	0.861	76.9	1.9	7.47	14.914	10.032	7.260	12.5	5.2	10.6	3.3	3.17	0.26	8.9	3.6	7.0
173	66.2	0.866	76.9	1.9	7.48	15.003	10.069	7.279	12.5	5.2	10.6	3.3	3.17	0.26	8.9	3.6	7.0
174	66.1	0.867	76.9	1.9	7.48	15.013	10.057	7.267	12.5	5.2	10.6	3.3	3.17	0.26	8.9	3.6	7.0

Specimen B

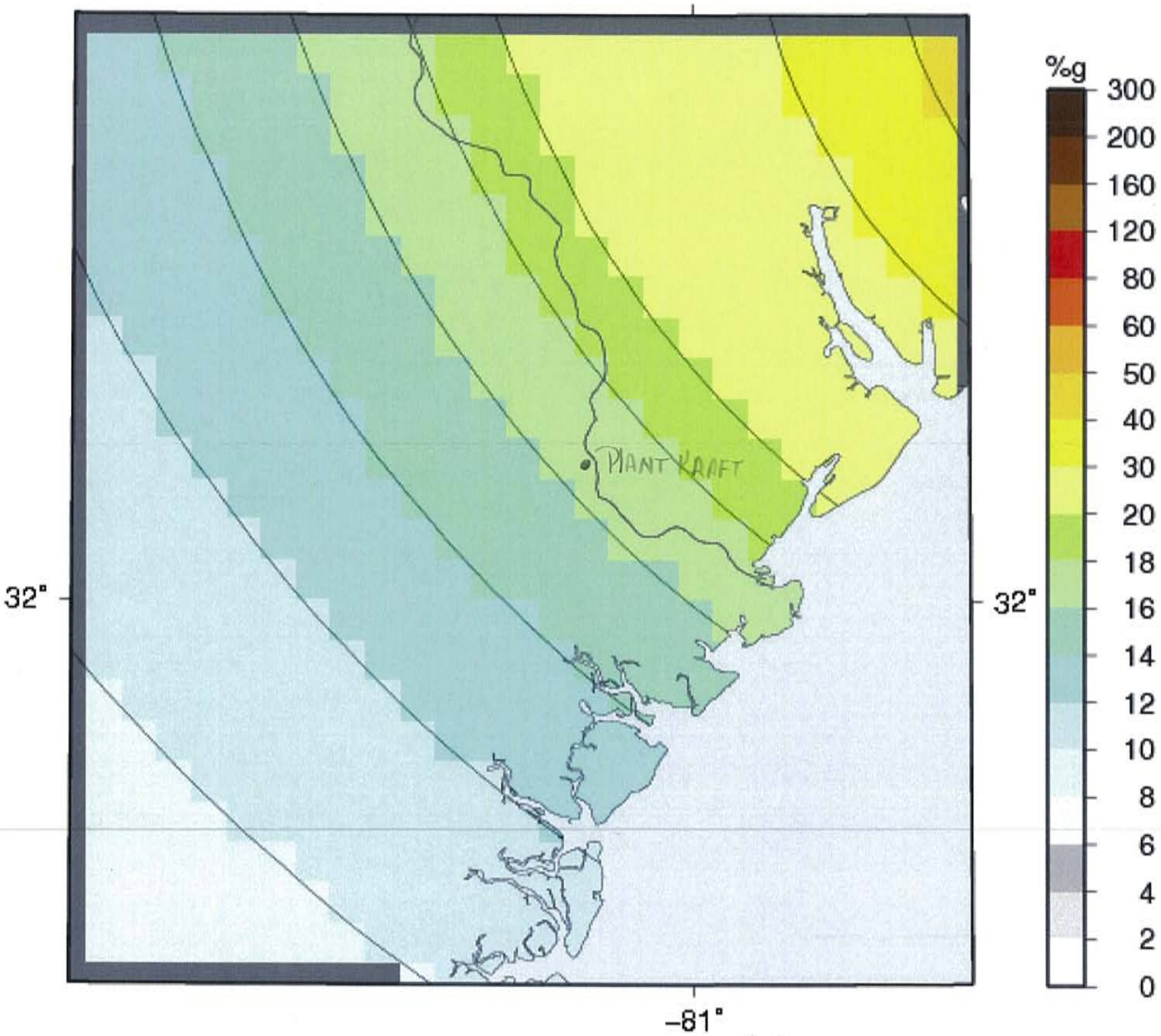
Reading No.	Deviator Load (lbs)	Axial Deformation (in)	Pore Pressure (psi)	Change in Pore Pressure (psi)	Corrected Area (in2)	Axial Strain (%)	Deviator Stress (psi)	Corrected Deviator Stress (psi)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	σ'_1/σ'_3	Abar	P (psi)	Q (psi)	P' (psi)

CONFIDENTIAL BUSINESS INFORMATION

ATTACHMENT D

Hazard Map

Custom Hazard Map



Peak Ground Acceleration

GEN-10003, Rev. 0
APPROVAL:

TITLE,
Southern Company
Generation

SIGNATURE 6-29-09

Safety Procedure
for
Dams and Dikes

KRA-API 014

Table of Contents

10003.000 Purpose

Safe operation of water retaining structures is required to ensure public safety, environmental safety and to protect Company assets. A comprehensive dam safety program sets forth guidelines for the safe operation of water retaining structures.

A coordinated, pre-planned, effective emergency response is crucial to lessen the danger to public and environmental safety and to minimize the risk to Company assets.

This procedure documents responsibility for dam safety actions including inspection, reporting, analysis, regulatory compliance, and emergency response.

This procedure also documents vegetation control standards for dams and dikes.

10003.100 General Information

10003.110 Definitions

Toe – the junction of the downstream slope or surface with the original ground surface

Water retaining structure – an artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage: dam, dike

Water control structure – structure appurtenant to a water retaining structure that allows conveyance of water, controls the direction or rate of discharge or maintains a prescribed water elevation, such as a spillway gate or discharge structure

Crest – top of the dam

Dam Safety Engineer – Individual determined by the Hydro Services Principal Engineer responsible for condition assessment of dams and the General Manager - Hydro to be qualified to conduct dam safety inspections and evaluations based on education, experience or other qualifications.

10003.120 Dam Safety Criteria

10003.120.1 FERC-Licensed Structures

FERC-licensed structures shall be governed by the FERC criteria as set forth in the FERC Engineering Guidelines or as approved by FERC on a case-by-case basis.

10003.120.2 Other Structures

Where structures are under the jurisdiction of a state dam safety program, the criteria set forth in that program shall apply. Where structures are not governed by a state dam safety program, generally accepted engineering criteria for slope stability, structural stability, and hydraulic adequacy shall apply.

10003.130 Regulatory Interface

The environmental organizations of the individual operating companies will be responsible for the interface with State and Federal environmental regulatory agencies. In practice, SCG Hydro Services may provide technical interface with State and Federal regulatory agencies regarding dam safety.

10003.140 Compliance

SCG dams and dikes will meet applicable dam safety requirements or have a plan for investigation and remediation to meet these requirements.

The plant manager will be responsible for ensuring on-site compliance with dam safety requirements. Appropriate reference to and/or provisions of this procedure should be included in the plant's general emergency plan documents.

10003.200 Inspections

10003.210 Inspection Applicability

This procedure is applicable to the following water retaining structures:

- hydroelectric project dams
- ash pond dams and dikes (active or water retaining)
- cooling water and make-up water pond dams and dikes
- gypsum pond dikes
- other similar structures as requested by generating plants

10003.220 Inspection Scheduling

10003.220.1 Inspections by Plant Personnel

Plant personnel will inspect the water retaining structures weekly at a minimum, unless more frequent inspection is warranted by previous maintenance history or by site specific conditions.

10003.220.2 Inspections by Dam Safety Engineers

Structures will be inspected by SCG Hydro Services dam safety engineers annually at a minimum, unless more frequent inspection is warranted by previous maintenance history or by unusual events. If deemed necessary, Hydro Services may obtain assistance in the inspections from qualified personnel working in other SCG engineering departments or the operating companies.

Plant management will be contacted (ideally 30 days or more prior to the inspection date) by SCG Hydro Services to schedule a mutually acceptable date. The following items shall be discussed at this time:

a) Status of previous inspection recommendations
b) Proper vegetation control to ensure the Dam Safety Engineer has adequate visibility to perform a comprehensive inspection.
c) Identify plant personnel to take part in the inspection (should include personnel who conduct weekly plant inspections to the extent possible).
d) Any necessary arrangements such as safety equipment or transportation needed to conduct the inspection.

10003.220.3 Unusual Circumstances

The water retaining and control structures should be inspected by either plant personnel and/or a Dam Safety Engineer any time one of the following unusual circumstances occurs:

a) Severe rain event
b) Post storm (hurricane, tornado, etc.)
c) High river or stream flow (if adjacent to a river or stream)
d) Unusually high tide (if adjacent to a tidal area)
e) Earthquake

Plant personnel will notify SCG Hydro Services if any of these events occurs at their site. SCG Hydro Services will notify plant management in the event of an earthquake.

This inspection will be conducted as soon as safety allows and/or there is sufficient visibility. SCG Hydro Services may request plant personnel to perform these inspections. Results of such inspections shall be reported to SCG Hydro Services immediately upon completion. Depending on the findings of the inspection by plant personnel, a follow-up inspection may be conducted by SCG Hydro Services.

10003.230 Inspection Methodology

Inspections should be conducted using a checklist that is specific to the water retaining structure and/or water control structure being inspected.

10003.230.1 Checklist for Inspection by Plant Personnel

The inspection checklist should be developed cooperatively by SCG Hydro Services dam safety engineers and plant personnel and may include some or all of the following items:

a) Inspector(s)
b) Date / time
c) Checklist revision number
d) Pond level
e) Weather conditions
f) Rainfall since last inspection
g) Instrumentation readings (if applicable)
h) Condition of slopes, crest, and toe (i.e. evidence of seepage, wet/saturated ground surface, water-boils etc)
i) Drains – drainage ditches / weir flows
j) Vegetation
k) Erosion
l) Animal damage
m) Anthills
n) Depressions
o) Misalignment of retaining structures
p) Condition of outlet structures (i.e. emergency spillway, gates)

10003.230.2 Checklist for Inspection by Dam Safety Engineers

The Dam Safety Engineer Inspection Checklist should contain the same information as the Plant Personnel Inspection Checklist, with the addition of the following information at minimum:

a) Instrumentation readings review
b) Instrumentation reading spot check
c) Condition of instrumentation
d) Maintenance / remediation performed since last inspection
e) Status of prior inspection recommendations
f) Check for posting of current emergency notification information

10003.240 Inspection Documentation

10003.240.1 Documentation of Inspections by Plant Personnel

Inspections performed by plant personnel shall be documented on the checklist described in section 10003.230.1.

Any areas of concern identified during the inspection should be brought to the attention of the assigned SCG Hydro Services Dam Safety Engineer immediately by phone. If unable to contact the assigned Dam Safety Engineer, call the Dam Safety Referral Line number noted on the checklist for the Engineer on duty. Fax or email a copy of the checklist noting the unusual condition or concern to SCG Hydro Services.

Inspection reports with no areas of concern identified shall be retained for the current year plus one year. Inspection reports with areas of concern identified shall be retained for the life of the plant plus ten years.

<u>10003.240.2 Documentation of Inspections by Dam Safety Engineers</u>

Inspections performed by the Dam Safety Engineer shall be documented on the checklist described in section 10003.230.2. Once the inspection is concluded, the Dam Safety Engineer will conduct an exit meeting with the plant personnel to discuss the observations made during the inspection and to point out any items that need immediate attention. The Dam Safety Engineer will prepare a standardized report for distribution in a timely manner that provides more detailed information regarding inspection observations.

This report shall contain (at a minimum):

a) Instrumentation review (if applicable)
b) Findings
c) Recommendation items requiring immediate attention for the safety of the structure (if any are identified)
d) Items requiring attention to assure the long-term safety of the structure (if any are identified).

These reports shall be retained by SCG Hydro Services for the life of the corporation.

<u>10003.240.2.1 Dam Safety Engineer Inspection Recommendation Tracking</u>

Inspection reports will include the outstanding recommendations from previous inspections and the status of the recommendations. SCG Hydro Services will track the recommendations to completion.

<u>10003.240.2.2 Dam Safety Engineer Inspection Report Distribution</u>

Inspection reports will be distributed to the following:

1. SPO
2. Plant Manager or Superintendent (as addressee)
3. OPCO Environmental Manager
4. Hydro General Manager
5. Plant Compliance Manager (if applicable)

6. Any other personnel designated by the Plant Manager

10003.300 Instrumentation

If dam safety instrumentation is installed at the site, instrument readings are to be reported to SCG Hydro Services as soon as possible, but within a maximum of five working days of being taken. Instrument readings will be reviewed by SCG Hydro Services as soon as possible, but within a maximum of five working days of receipt. (These maximums may be reduced as necessary if site specific conditions at a particular location dictate that a shorter review time is appropriate.) The schedule for instruments read by the plant shall be entered into the Plant's work order management system for compliance tracking.

Data from installed instrumentation can provide early warning for potential problems and is important to the success of the Dam Safety Program. Readings from installed instruments should be made on schedule and should be taken by a qualified individual who has undergone applicable training.

Abnormal instrument readings should be brought to the attention of SCG Hydro Services immediately by phone. If necessary, call the Dam Safety Referral Line for the contact information of the Engineer on Duty.

Dam movement surveys require a significant amount of post-processing and therefore cannot be accommodated in the five working day window cited above. These results should be forwarded to SCG Hydro Services as soon as possible. The movement survey results will be reviewed by SCG Hydro Services as soon as possible after receipt.

10003.400 Emergency Response

<u>10003.410 Emergency Notification</u>

SCG Hydro Services maintains two dam safety referral phone numbers, one each for the Atlanta and Birmingham offices. Each office will maintain an on-call roster so that an engineer is available for response at all times. The referral phone number will connect with a recorded message that provides the caller with the name and contact information for the Engineer on Duty at the time. The referral phone number and the contact information for the individual Dam Safety Engineers will be included on cards distributed to the SCG plants. These cards shall be posted in the Control Room and other conspicuous locations as designated by the plant manager.

<u>10003.420 Dam Safety Problem Reporting</u>

Suspected dam safety problems should be brought to the attention of the assigned SCG Hydro Services Dam Safety Engineer immediately by phone. If unable to contact the assigned Dam Safety Engineer, call the Dam Safety Referral Line number for contact information for the Engineer on duty.

FERC requires that any condition affecting the safety of a FERC-licensed hydro project be reported to them immediately. FERC describes a condition affecting safety by saying: "Such conditions may include, but are not limited to, gate operation failure, piping, seepage, slides, unusual instrumentation readings, sinkholes, sabotage, natural disasters (floods, earthquakes) and other signs of instability of any project works. Additional conditions, include, but are not limited to, reservoir monitoring instrumentation and communication systems malfunction or failure, and remote control systems malfunction or failure."

For problems occurring at hydro plants, SCG Hydro Services will be responsible for notification of FERC and, if applicable, state dam safety agencies.

10003.430 Emergency Equipment

In conjunction with the designated plant management team, equipment present at the plant location for loading or moving material (or other uses) may be utilized, as necessary, to respond to emergency conditions at the dams.

10003.440 Emergency Supplies

In order to be able to deal with boils or large seeps in a timely manner, granular materials for constructing filters should be stockpiled at earth embankments. These stockpiles should be located as near to the toe of the embankment as practical so that the material can readily be moved to any location along the toe of the dam. The amounts and specifications for material to be stockpiled at each location will be determined by SCG Hydro Services. These stockpiles should be protected with a silt fence or safety fence enclosure and should be labeled "Emergency Filter Stockpile, Emergency Use Only".

10003.500 Training

SCG Hydro Services will be responsible for development and maintenance of a training program for plant personnel who conduct safety inspections of water retaining structures. The training may include instructor-led classroom training and on-the-job-training with Dam Safety Engineers and shall be required on an annual basis. Video-based training may be used as appropriate for refresher training or for new or temporary employees.

The classroom training may consist of technical presentations using training materials such as FEMA publications and Association of State Dam Safety Officials or United States Society on Dams training programs as well as materials developed by SCG Hydro Services.

Dam Safety Engineers will provide on-the-job-training on the actual retaining structures and demonstrate appropriate inspection procedures and techniques. The Dam Safety Engineer will also conduct training on proper instrument reading procedures and data recording for the sites with installed instrumentation that is read by plant personnel.

10003.600 Vegetation Control

A uniform cover of a suitable species of grass shall be maintained on all earth dams or dikes. The grass should be mowed at least twice a year at a reasonable height to facilitate adequate inspection, unless drought or other circumstances make mowing unnecessary. Mowing should be done with appropriate equipment in such a way as to minimize damage to the dam or grass cover from mower tires or blades.

Dam crests should be protected by a suitable granular surface material if traffic prevents establishment of a good grass cover. The use of bottom ash or similar CCB materials for this purpose should be limited to material that is free of pyrites or other components that would be harmful to grass.

Generally, trees and woody brush should not be allowed on the slopes, crest or along the water line of any dam or dike. Exceptions to this provision (in the case of beneficial vegetation or other situations) may be made as deemed appropriate by SCG Hydro Services dam safety engineers. The areas adjacent to the toe of the dam and the contact of the dam and the abutment should also be clear of trees and woody brush to distances deemed appropriate by SCG Hydro Services dam safety engineers (ideally a minimum of 20 feet).

Outlet structures and associated inlet and outlet channels should be kept free of vegetation that would impede the flow of water.

10003.700 Modification of Retaining Structures and Water Levels

The FERC and state safe dams organizations require that any modifications to water retaining structures (that they regulate) be reviewed and approved by their organization prior to construction. In addition, FERC requires that any soil boring program on a FERC-regulated structure be reviewed and approved by FERC prior to implementation. For FERC regulated structures, SCG Hydro Services will serve as the contact with FERC and, if applicable, with the state dam safety regulatory agencies in these matters.

Proposed new water retaining structures and proposed modifications to existing dams and associated structures (including discharge structures, internal retaining structures, diversion dikes and dry ash storage within existing ponds) should be reviewed with SCG Hydro Services prior to and during design and construction. SCG Hydro Services shall be included in the review and approval process for new water retaining structures and for modifications to existing structures.

Increases in maximum pond elevations should be reviewed with SCG Hydro Services prior to exceeding existing maximum elevations.

10003.900 References

The documents listed below contain both general and specific guidance on topics related to the safety of dams and dikes. Requirements and provisions of these documents may or may not apply to a specific dam or dike covered under this procedure.

FEMA-93 Federal Guidelines for Dam Safety Rev. April, 2004

FEMA-473 Technical Manual for Dam Owners - Impacts of Animals on Earthen Dams Rev. September, 2005

FEMA-534 Technical Manual for Dam Owners - Impacts of Plants on Earthen Dams Rev. September, 2005

FERC Engineering Guidelines, Ch. 14 Dam Safety Performance Monitoring Program Rev. July 2005

Georgia Environmental Protection Division Rules for Dam Safety Environmental Rule 391-3-8. Authorized by OCGA 12-5-370 GA Safe Dams Act of 1978.

Georgia Safe Dams Program Engineering Guidelines v.3.1, Georgia EPD Safe Dams Program, 2007.

Mississippi Commission on Environmental Quality Dam Safety Regulation LW-4 Revised August 2005

Northwest Florida Water Management District, Chapter 40A-4, Florida Administrative Code

Southern Company Records Management home page
http://compliance.southernco.com/records-mgmt/SoCoRecordsMgtHome.html

The Southern Company Records and Information Management Retention Schedule, Revision 12, June 16, 2009.
http://compliance.southernco.com/records-mgmt/SOCORIMRetentionSchedule_06_16_2009.pdf

Site Name:	Kraft Plant	Date:	3 March 2011
Unit Name:		Operator's Name:	Georgia Power
Unit I.D.:		Hazard Potential Classification:	High ☐ Significant ☐ Low ☒
Inspector's Name:	Frank Lockridge, P.E. and Joe Klein, P.E.		

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	12.5		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	12.5		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	20.0		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A Note Below		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	Daily observations are made by plant personnel. The Southern Company Generation (SCG) *Safety Procedures for Dames and Dikes* requires weekly documented inspections by plant personnel and annual inspections by SCG Hydro Services Dam Safety Engineers
8	Soil borings conducted for new stability analyses did not indicate topsoil under the dam. Construction photographs show area being stripped.

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit GA 0003816 **INSPECTOR** Frank Lockridge & Joe Klein

Date June 30, 1999

Impoundment Name Plant Kraft

Impoundment Company Georgia Power

EPA Region IV

State Agency (Field Office) Address GA Department of Natural Resources
4220 International Parkway
Atlanta, GA

Name of Impoundment Plant McIntosh

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☒ **Update** ☐

	Yes	No
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: Storage of sluiced coal combustion residue

Nearest Downstream Town Name: Savannah, GA

Distance from the impoundment: Approx. 5 miles

Location:

Latitude	32	Degrees	8	Minutes	53.49	Seconds	**N**
Longitude	81	Degrees	8	Minutes	59.35	Seconds	**W**

State Georgia **County** Chatham

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? GA Department of Natural Resources
Environmental Protection Division

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☒ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

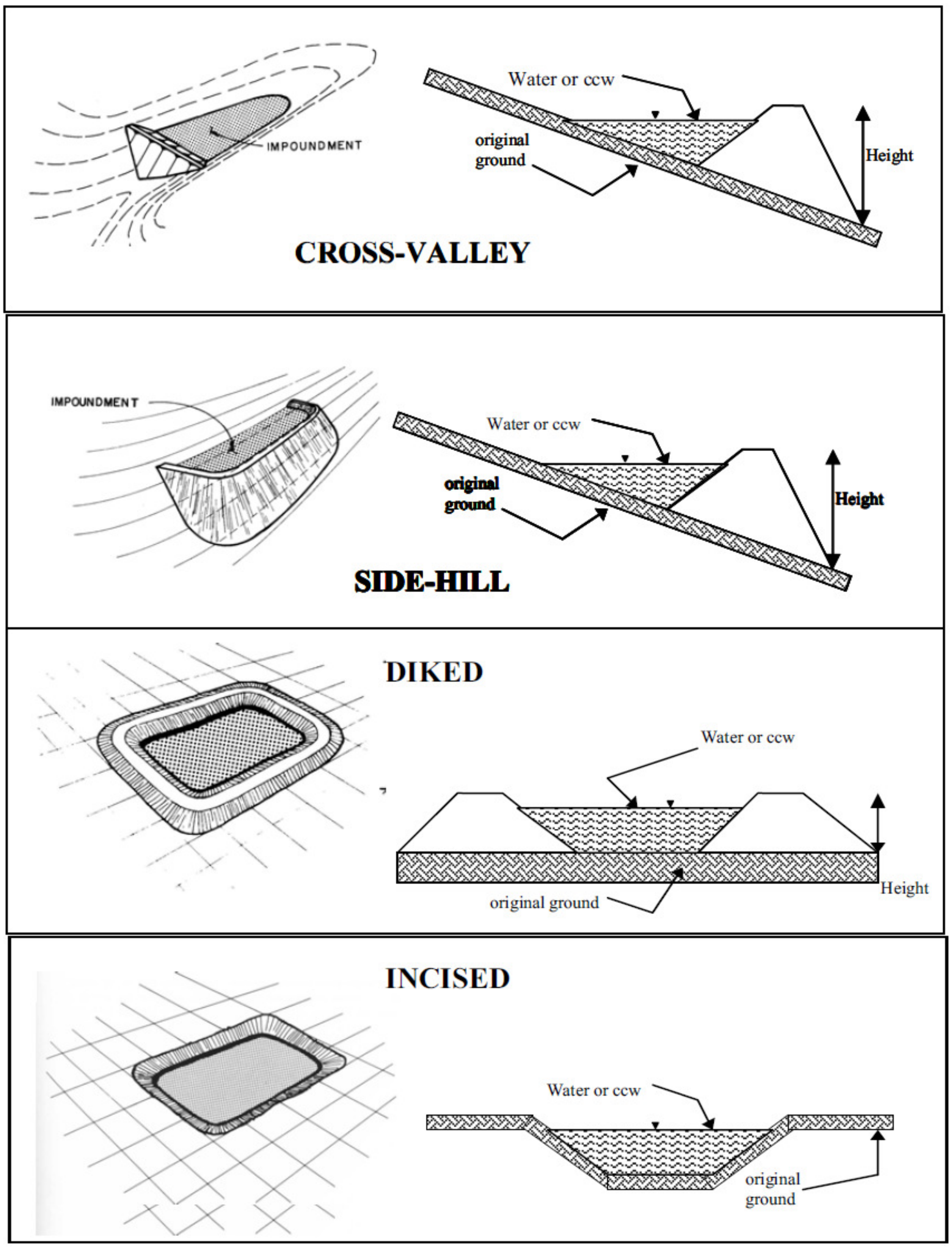
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

The impoundment is in a relatively remote location. Based on the location and size of the impoundment, loss of life due to a failure or misoperation is not probable and the economic and/or environmental losses are expected to be limited to the owner's property.

CONFIGURATION:



- [ ] Cross-Valley
- [x] Side-Hill
- [ ] Diked
- [x] Incised (form completion optional)
- [ ] Combination Incised/Diked

Embankment Height (ft)	6	**Embankment Material**	Silty, sandy clay
Pool Area (ac)	7	**Liner**	None
Current Freeboard (ft)	7.5	**Liner Permeability**	N/A

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

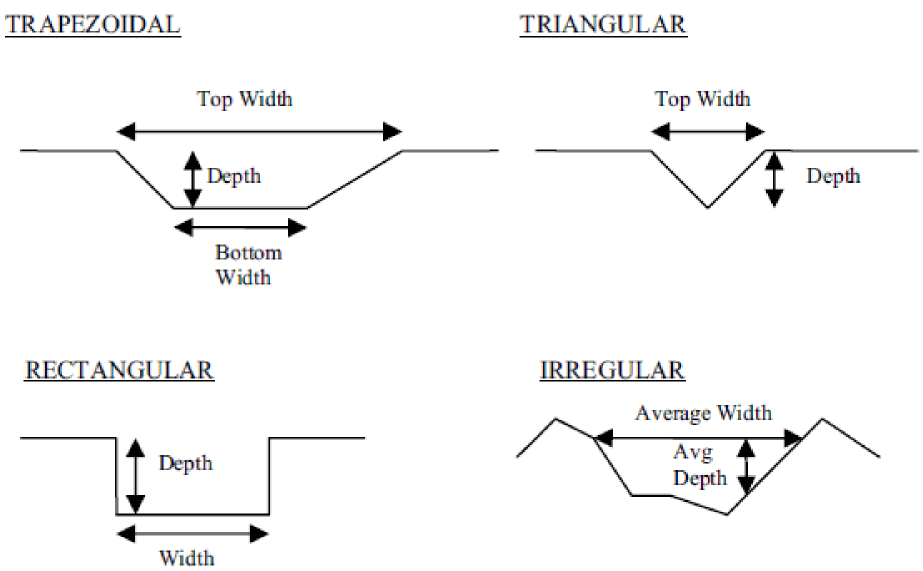
☐ Rectangular

☐ Irregular

depth (ft)

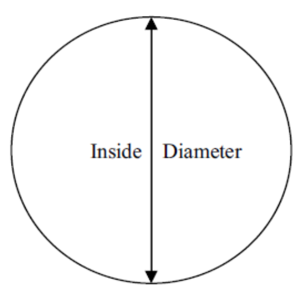
average bottom width (ft)

top width (ft)



☒ **Outlet**

42-inch diameter



Material

☐ corrugated metal

☐ welded steel

☒ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Designer data not avialable

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No.

Soil borings for recent slope stability analyses indicate dike subgrade consists of natural soils.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

No

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No