

US EPA ARCHIVE DOCUMENT

MEMORANDUM

SUBJECT: EPA Comments on "Assessment of Dam Safety of Coal Combustion Surface Impoundments: Gulf Power Plant Crist, Pensacola, Florida"

DATE: March 31, 2014

1. As a result of the correspondence (attached in the utility comment package) between the utility and the state, the Ash Pond no longer remains in the scope of the assessment effort. Please remove the condition and hazard ratings and any recommendations related to the Ash Pond. You may retain all other information in the report. Please include a statement in the introduction indicating that this pond no longer falls within the program scope.
2. On Page 1-2, last line, add "been" after "have not".
3. On Page 1-6, Section 1.4.2, the signatory block for Mr. Gutiérrez-Pacheco has been removed. Unless he has left the company, please add it back in:
Eduardo Gutiérrez-Pacheco, P.E.
Geotechnical Engineer
Florida Registration No. 74455
4. On Page 4-3, Section 4.2.1, first line, delete one of the two "a series of" phrases.
5. In Appendix B, the Liner question is not addressed in checklist sheet for the Ash Pond. Please indicate whether or not a liner exists.

One Energy Place
Pensacola, Florida 32520
Tel 850-444-6000



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February 10, 2014

By Overnight Delivery

Mr. Stephen Hoffman
Office of Resource Conservation and
Recovery
U.S. Environmental Protection Agency
Two Potomac Yard
2733 South Crystal Dr. 5th Floor, N5237
Arlington, Virginia 22202-2733

Re: Assessment of Dam Safety of Coal Combustion Surface Impoundments
Draft Report (October 2012; Revision 1, November 2013)
Gulf Power Company
Plant Crist
Pensacola, Florida

Dear Mr. Hoffman:

By email dated November 13, 2013, the U.S. Environmental Protection Agency ("EPA") provided to Gulf Power Company ("GPC") the above-referenced report ("Draft Report") regarding the surface impoundments utilized for management of coal combustion residuals ("CCRs") generated at GPC's Plant Crist ("Plant"). The Draft Report was prepared by CDM Smith ("CDM" or "Consultant") following CDM's August 20 and 21, 2012, Plant surface impoundment inspections and review of information provided to CDM by GPC both on and after August 20 and 21, 2012. Provided below are GPC's comments regarding the Draft Report. As well, GPC is providing responses to the conclusions and recommendations set forth in the Draft Report which are found in Section 1.3 beginning on page 1-1 of the Draft Report. For

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ease of reference, the Draft Report recommendations are repeated in italics followed by GPC's response.

General Comments/Corrections

Ash Pond

As acknowledged by CDM in Section 2.2 of the Draft Report (Page 2-2), the Ash Pond is currently used as a wastewater treatment pond, and has not received a coal ash sluice stream for some time. Over the history of the site, much of the coal ash that had been placed in the pond was dredged with significant dredging taking place in 2011. As the Ash Pond still contains some residual coal ash, however, CDM performed a condition assessment of the Ash Pond per EPA requirements. CDM also opined that the condition assessment was still appropriate since the Ash Pond "has not been formally closed in compliance with applicable federal or state closure/reclamation regulations."

GPC and Plant personnel are currently in the midst of a dredging project to remove the residual coal ash from the pond, coordinating these activities with the State of Florida Department of Environmental Protection (FDEP). The dredging plan has been developed with input from Southern Company licensed engineers. Elevations have been established based on original pond bottom elevations to ensure that all residual coal ash is removed. Upon completion of the dredging project, GPC will request that the Ash Pond be reclassified by FDEP under the NPDES permit program as an industrial wastewater treatment pond. This plan has been discussed with FDEP representatives and FDEP has verbally approved this approach.

It is GPC's opinion that upon completion of the dredging project and reclassification of the pond as an industrial wastewater treatment pond, the requirements for being "formally closed in compliance with applicable federal or state closure/reclamation regulations" will have been met. GPC requests that the Ash Pond be removed from the EPA inventory as an ash pond, and/or that documentation be placed in the EPA's

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regulatory file and public record acknowledging that the remaining residual coal ash has been removed and the pond reclassified by the FDEP.

Gypsum Storage Pond, Process Sedimentation Pond, Process Return Water Pond

CDM provided assessments and ratings for three ponds at the Plant gypsum storage facility. Only one of those ponds (the Gypsum Storage Pond) receives and stores gypsum. The remaining two ponds (the Process Sedimentation Pond and the Process Return Water Pond) are water storage ponds only. GPC questions CDM's rationale for including the Process Sedimentation Pond and the Process Return Water Pond in the assessment since they do not receive CCRs (i.e., gypsum) for storage/disposal. Therefore, GPC requests that these two ponds be removed from the Draft Report and EPA's inventory of coal combustion residual impoundments.

GPC also disagrees with the Significant Hazard rating assigned to the Gypsum Storage Pond. Table 3 in the Draft Report addresses the basis for the Significant Hazard rating for the Gypsum Storage Pond in this manner:

A breach could release waste into the Process Sedimentation Pond which may result in a breach of the Process Sedimentation Pond and cause environmental impacts to the Escambia River and adjacent lands.

GPC requests clarification on why emphasis was placed by CDM on a potential progressive failure beginning with a breach of the common dike between the two ponds. The common dike was constructed in the same manner using the same materials as the perimeter dikes, and is not inherently more at risk (as the rating basis implies); especially given the fact that both ponds are constructed with a composite liner. Furthermore, the characteristics of gypsum are such that if the gypsum was released through an embankment breach, the quantity of material that would flow would be nominal, and it would not flow a significant distance from the pond. Observations of numerous gypsum pond operations reveal that sluice channels (or rim ditches) in stored gypsum will stand nearly-vertical, even immediately adjacent to

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channels with flowing water. GPC maintains that there is a very low probability that a progressive failure of the Process Sedimentation Pond would result from a breach between the Gypsum Storage Pond and the Process Sedimentation Pond.

In addition to its position that the Process Sedimentation Pond and Process Return Water Pond should not be included in this assessment in the first instance, GPC also disagrees with the Significant Hazard rating assigned to these two ponds. The basis of the Significant Hazard rating for the Process Sedimentation Pond was addressed in a similar manner to that presented for the Gypsum Storage Pond:

A breach could release waste into the Gypsum Storage Pond that may result in a breach of the Gypsum Storage Pond embankment(s) and cause environmental impacts to the Escambia River and adjacent lands

GPC disagrees with this rationale as well. All gypsum is sluiced to the Gypsum Storage Pond, and gypsum is not sluiced to or otherwise placed in the Process Sedimentation Pond. Any residual gypsum left in the water that flows into the Process Sedimentation Pond as a suspended solid is considered by GPC to be *de minimis*, and would not present a threat to the environment in the unlikely event of a breach or release. Furthermore, the facility is designed so that water flows from the Gypsum Storage Pond to the Process Sedimentation Pond through a spillway/culvert. By design, the water level in the Process Sedimentation Pond is lower than the water level in the Gypsum Storage Pond. Therefore, a breach would not result in gypsum material flowing from the Process Sedimentation Pond into the Gypsum Storage Pond, as hypothesized by CDM. Finally, as provided in prior discussion, due to the physical characteristics of gypsum and the head differential between the two ponds, it is unlikely that there would be a breach of the common embankment between the two ponds, and the probability of such an event causing a progressive failure is extremely low.

The Significant Hazard rating basis for the Process Return Water Pond was less specific in the Draft Report:

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A breach could have an environmental impact of the Escambia River, approximately 800 feet north of the pond.

First, GPC would like to point out that the description in the hazard rating basis is factually incorrect. Governor's Bayou is located in close proximity and downstream of the Process Return Water Pond. In the unlikely event of a breach or release of water from the Process Return Water Pond, the water may flow into Governor's Bayou, and then flow southward to the Escambia River.

Furthermore, as with the Process Sedimentation Pond, gypsum is not sluiced or otherwise placed into the Process Return Water Pond. Thus, in the highly unlikely event of a breach, there would not be a release of gypsum; just water. Based on the aforementioned information and comments, it is GPC's opinion that a Low Hazard Rating is more appropriate for the Gypsum Storage Pond, Process Sedimentation Pond and the Process Return Water Pond.

GPC Responses to Draft Report Conclusions and Recommendations

Conclusions (Section 1.3.1)

CDM states that "Plant Crist's CCW impoundments appear to be structurally sound based on the visual observations of the structural components (i.e., inlet structures, earth embankments and outlet structures)." Furthermore, towards the end of this section, CDM concluded that "[no] apparent unsafe conditions or conditions in need of immediate remedial action were observed at the Plant Crist CCW impoundments." GPC concurs with both of these statements. GPC and Plant personnel operate the Ash Pond and Gypsum Storage Pond in a safe and appropriate manner. As reported to CDM at the time of the inspection, and as referenced in the Draft Report, no failures or spills have been experienced at any of these facilities.

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Additional conclusions offered by CDM follow, along with appropriate responses from GPC. Please note that not all conclusions referenced in Section 1.3.1 of the Draft Report are addressed below, but may be addressed in GPC responses to specific recommendations, as presented by CDM in Section 1.3.2. of the Draft Report.

- *Slope stability calculations determined inadequate factors of safety for Steady-State Condition at Normal Pool and Rapid Drawdown Condition from Normal Pool loading conditions for the Ash Pond.*

GPC Response:

The factors of safety referenced in this conclusion were provided in Calculation TV-CR-FPC30795-001 (Exhibit 1). This calculation makes reference to "recommended minimum factors of safety" in the summary table. These minimum factors of safety are generally accepted by the industry, and are based on published references from the U.S. Army Corps of Engineers ("COE"), FERC and other agencies.

GPC acknowledges that the factors of safety calculated for the steady-state condition and rapid drawdown condition are slightly less than the reported suggested minimums. Nevertheless, two points are important to remember in this respect. First, the Ash Pond is not operated in a manner that would result in a rapid drawdown condition. The pond level is maintained by an overflow spillway. If the pond level had to be lowered for maintenance purposes by pumping or siphoning, the discharge rate would be controlled to avoid a rapid drawdown condition.

Second, the minimum factors of safety recommended by the COE are for new embankments and may not be strictly applicable to existing embankments. This topic is addressed in the COE Engineer Manual EM-1110-2-1902, Chapter 3 (this document was also referenced by CDM on Page 7-1). Section 3-1 states: "[w]hat is considered an acceptable factor of safety should reflect the differences between new slopes, where stability must be forecast, and existing slopes, where information regarding past slope performance is available. A history free of signs of slope movements provides firm evidence that a slope has been stable under the conditions it has

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experienced...Therefore, **values of factors of safety that are lower than those required for new slopes can often be justified for existing slopes.**" (emphasis added). Furthermore, in Section 3-3(1)c, the COE Manual states: "[a]cceptable values of factors of safety for existing dams may be less than those for design of new dams, considering the benefits of being able to observe the actual performance of the embankment over a period of time." (emphasis added).

It is GPC's position that the performance history of the embankments of the Ash Pond at the Plant indicates that the slopes are stable. CDM has stated as much in its opening remarks in Section 1.3.1. It is GPC's technical and engineering opinion that the calculated factors of safety should be considered adequate and representative of a safe operating environment for the embankments.

- *Liquefaction potential analyses for the Ash Pond and Gypsum Storage Pond evaluated the liquefaction potential of the two ponds when subjected to loading associated with a seismic event having a 2-percent exceedance over a 50-year period, considering seismic hazards derived from both the Central and Eastern U.S. random faulting source (CEUS) and the New Madrid Source Zone (NMSZ).*
- ✓ *At the Ash Pond, the analysis indicates liquefaction of the foundation soils does not appear to be a threat during the CEUS scenario earthquake. During the NMSZ scenario earthquake, soft natural soils encountered immediately below the embankment fill exhibited factors of safety of 1.1 and 1.2. For the purpose of the liquefaction potential analyses, water was assumed to be 10 feet below the top of crest for the Ash Pond. CDM Smith notes there was approximately 3 feet of freeboard in the Ash Pond during our August 20, 2012 condition assessment.*

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GPC Response:

The original calculation considered the water level of the river on the exterior slope of the Ash Pond. Additional liquefaction calculations have been performed to assess the impact of a lower freeboard of 3 feet, and are attached as Exhibit 2.

- *Documentation of slope stability analyses for the Process Sedimentation Pond and the Process Return Water Pond was not provided.*

GPC Response:

As stated previously, GPC questions the justification of including the Process Sedimentation Pond and the Process Return Water Pond in the assessment since they do not receive gypsum for storage/disposal. As it was GPC's expectation that these two ponds would not be included in the assessment, stability analyses were not initially provided. While GPC maintains that the inclusion of these two ponds in the assessment is inappropriate, stability analyses have been performed and included in this response. The same applies for the later conclusion regarding the lack of liquefaction analyses on these two ponds. The stability analyses performed indicate that factors of safety are above generally recognized minimum factors of safety for new embankments.

- *CDM Smith observed the following during our site assessment of the Gypsum Storage Pond:*
 - ✓ *Areas of possible seepage were observed near the toe of the southwest embankment and at the toe of the east embankment.*

GPC Response:

The Gypsum Storage Pond is constructed with a composite liner system (GCL overlain by 60-mil HDPE) on the bottom and interior slopes. There is no evidence to support a conclusion that this liner system is leaking. The "possible seepage" noted by CDM personnel is discharge of rainfall that infiltrated the surficial soils/topsoil at higher elevations on the exterior slopes, and not seepage from the interior of the pond. As noted in Table 5 of Section 5.1 in the Draft Report, the area experienced approximately 3

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to 4 inches of rainfall in the days preceding the assessment, including rain the morning of the assessment.

Recommendations (Section 1.3.2)

The following recommendations were included in Section 1.3.2 of the Draft Report. GPC's responses follow each recommendation.

- *Currently the State of Florida does not require Emergency Action Plans (EAPs) for CCW impoundments. Gulf Power does not have an EAP for the CCW impoundments, judged by CDM Smith to be Significant Hazard structures. CDM Smith recommends that Gulf Power develop an EAP for these impoundments.*

GPC Response:

Subsequent to the site visit by CDM in August 2012, the Plant updated its overall Plant Emergency Action Plan (EAP), and this update now includes references to the coal combustion byproduct storage facilities. A copy of the revised EAP dated December 2012 is attached to this response as Exhibit 3.

- *Inspections should be made following periods of heavy and/or prolonged rainfall and/or high water events on the Escambia River, and the occurrence of these events should be documented. Inspection records should be retained at the facility for a minimum of three years.*

GPC Response:

In addition to regular weekly inspections, trained Plant personnel performing such inspections are instructed to inspect the embankments following periods of heavy or prolonged rain events, as required by the NPDES permit for the Plant, and appropriate inspection records are prepared. These records are retained by the facility in accordance with established GPC and Southern Company policy.

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- *Regular monitoring is essential to detect and monitor seepage and to reduce the potential for failure. If seepage areas are observed, services of a qualified engineer should be retained by Gulf Power to assess the area of seepage and recommend remedial actions.*

GPC Response:

Trained Plant personnel perform regular weekly inspections in accordance with established GPC and Southern Company policy. If potential areas of seepage are noted, they would be recorded and monitored for changes in flow patterns and characteristics. If any noted potential areas of seepage exceeded normal seepage patterns or if there was a change in seepage characteristics, the services of a qualified engineer would be engaged to provide further assessment and remedial action recommendations, again in accordance with established GPC and Southern Company policy.

- *Erosion rills – Erosion rills were observed on the northwest, southwest, and southeast interior slopes of the Ash Pond and on the north exterior slope of the Process Sedimentation Pond. Structural fill should be placed and compacted in the rills and graded to adjacent existing contours. These areas should be covered with sod or hydro seed to establish vegetative cover.*

GPC Response:

The weekly inspections performed by trained Plant personnel include notation and documentation of such erosion rills. Maintenance and repair of erosion rills are routinely addressed as a part of regular, ongoing maintenance of the Ash Pond embankments.

- *Voids and missing riprap – Locations of voids within riprap armor and missing riprap were observed at the exterior slopes of the CCW impoundments. In these areas, the existing riprap should be removed and the embankment slope restored to no steeper than 2.5H:1V or the original contour (whichever is flatter) with compacted structural fill. Riprap (similar size to existing), consisting of a heterogeneous mixture of irregular shaped rocks should be placed over the compacted fill and a geotextile fabric. The*

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armorings should extend at least 3 feet vertically below lowest anticipated pool elevation and at least 2 feet above normal pool elevation.

GPC Response:

The exterior embankments of most areas around the Ash Pond are waters of the State (i.e., Florida) and/or United States. The placement of new/additional areas of riprap along the exterior slopes is an ongoing, phased project that requires interaction with and permitting by State of Florida and Federal authorities (except in the instance of maintenance). The program will continue as needed. Due to restrictions that would be placed on GPC by these regulatory agencies, flattening of the exterior slopes is not possible. As discussed previously the exterior slopes of the Ash Pond are performing in a satisfactory and safe manner, and modifications to the slope of the exterior embankments are not warranted.

For the Gypsum Storage Pond, Process Sedimentation Pond, Process Return Water Pond and areas of existing riprap around the Ash Pond, maintenance related repair of rip rapped areas is a part of regular, ongoing maintenance of the Plant and its facilities.

- *Scarps -Scarps were observed on the northwest, southwest and southeast interior slopes of the Ash Pond. The embankment slopes should be restored to the original contours by placing select structural fill in 12-inch lifts and compacting to recommended density. The exposed surface of the embankment should be stabilized with sod, hydro-seeding, or riprap consisting of a heterogeneous mixture of irregular-shaped rocks placed over the compacted fill and a geotextile fabric.*

GPC Response:

The weekly inspections performed by trained Plant personnel include notation and documentation of such scarps. As with erosion rills, maintenance and repair of scarps are addressed as a part of regular, ongoing maintenance of the Ash Pond, Gypsum Storage Pond, Process Sedimentation Pond, and Process Return Water Pond embankments.

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- *Animal burrows – Animal burrows were observed on the northeast and southeast exterior slopes of the Ash Pond and northwest and east exterior slopes of the Gypsum Storage Pond. Although not seen on other areas, vegetation cover may have hidden additional animal burrows. CDM Smith recommends documenting areas disturbed by animal activity, removing the animals, and backfilling the burrows with compacted structural fill to protect the integrity of the embankments.*

The weekly inspections performed by trained Plant personnel include notation and documentation of animal burrows. Proper treatment and repair of animal burrows are addressed as a part of regular, ongoing maintenance of the Ash Pond and Gypsum Storage Pond embankments.

- *CDM Smith recommends a qualified professional engineer performs H&H analyses for the Ash Pond, Gypsum Storage Pond, Process Sedimentation Pond, and Process Return Water Pond.*

GPC Response:

Notwithstanding GPC's position that the Process Sedimentation Pond and Process Return Water Pond should not be included in this assessment, additional H&H-based calculations have been completed and are attached to this response as Exhibit 4. The analyses indicate that the Ash Pond (which is expected to be reclassified as an industrial wastewater treatment pond) and all three Gypsum Facility ponds can safely store or pass the ½ PMP storm event.

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- *CDM Smith recommends a qualified professional engineer performs liquefaction potential analyses for the Ash Pond with 3 feet of freeboard to determine if strength loss would result in unacceptable seismic deformations.*

GPC Response:

As stated in previous paragraphs, the original liquefaction analysis considered the exterior (river) water level, which was about 10 feet below the embankment crest. Additional analyses have been performed using the interior freeboard of 3 feet. Slightly lower factors of safety against liquefaction were indicated with the higher interior water level in some instances, with factors of safety ranging from 0.9 to 1.4. Given the very low probability of the NMSZ earthquake event, and most of the factors of safety against liquefaction being above 1.0, it is GPC's technical opinion that loss of strength, and subsequent seismic deformations, associated with a NMSZ-related seismic event are not a concern for the Ash Pond. The factors of safety against liquefaction for the more likely CEUS seismic event indicate no concern with liquefaction.

- *CDM Smith recommends a qualified professional engineer performs an H&H analyses to determine Escambia River flood levels and flows for the 50% PMP event and evaluate potential impacts to the CCW impoundments, particularly the Ash Pond, under the 50 % PMP flood condition.*

GPC Response:

GPC respectfully disagrees with this recommendation. GPC maintains that such an evaluation is unwarranted for this assessment, given the fact that the remaining coal ash has been removed from the Ash Pond and the pond will in the relatively near future be reclassified by FDEP as an industrial wastewater treatment pond. As well, considering the watershed and basin for the Escambia River, along with close proximity to Escambia Bay, such studies would require extensive resources and time (likely taking months to perform appropriately).

- *CDM Smith recommends remedial actions, designed by a registered professional engineer experienced with earthen dam design, to meet required factors of safety for the Ash Pond.*

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GPC Response:

As provided previously in this response, GPC acknowledges that the factors of safety calculated for the steady-state condition and rapid drawdown condition are slightly less than the reported suggested minimums. There are two points GPC wishes to repeat here. First, the Ash Pond is not operated in a manner that would result in a rapid drawdown condition. The pond level is maintained by an overflow spillway. If the pond level had to be lowered for maintenance purposes by pumping or siphoning, the discharge rate would be controlled to avoid this condition.

Second, the minimum factors of safety recommended by the U.S. Corps of Engineers are for new embankments. This topic is addressed in the COE Engineer Manual EM-1110-2-1902, Chapter 3. Section 3-1 of the COE Manual states: "[w]hat is considered an acceptable factor of safety should reflect the differences between new slopes, where stability must be forecast, and existing slopes, where information regarding past slope performance is available. A history free of signs of slope movements provides firm evidence that a slope has been stable under the conditions it has experienced...Therefore, **values of factors of safety that are lower than those required for new slopes can often be justified for existing slopes.**" (emphasis added). Furthermore, in Section 3-3(1)c, the COE Manual states: "**[a]cceptable values of factors of safety for existing dams may be less than those for design of new dams, considering the benefits of being able to observe the actual performance of the embankment over a period of time.**" (emphasis added).

It is GPC's opinion that the performance history of the embankments of the Ash Pond at the Plant indicates that the slopes are stable. CDM stated as much in its opening remarks in Section 1.3.1. Further, it is GPC's position that the calculated factors of safety should be considered adequate and representative of a safe operating environment for the embankments.

- *CDM Smith recommends remedial repairs for slope restoration, designed by a registered professional engineer experienced with earthen dam design.*

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GPC Response:

In accordance with GPC and Southern Company policy, any remedial repairs beyond typical maintenance items are designed by and implemented under the direction of a registered professional engineer.

- *CDM Smith recommends a qualified professional engineer performs embankment stability analyses and liquefaction potential analyses for the Process Sedimentation Pond and the Process Return Water Pond.*

GPC Response:

Stability analyses (Exhibit 5) and liquefaction potential calculations (Exhibit 2) for the Process Sedimentation Pond and Process Return Water Pond are attached to this response as Exhibit 5. However, it remains the position of GPC that these two ponds should not be included in the assessment since they do not receive gypsum for storage/disposal.

* * * *

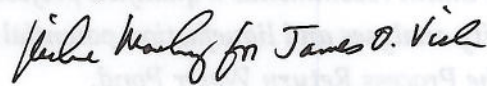
GPC appreciates the opportunity to provide these comments regarding the Draft Report. GPC respectfully requests that all of the comments and additional information provided herein be incorporated into the next iteration of the Draft Report. As well, GPC requests that it be provided the additional opportunity to review and comment on the next version of the Draft Report before it is finalized by CDM and EPA.

Mr. Stephen Hoffman
February 10, 2014
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Should you have any questions regarding the comments or information contained in this response, please do not hesitate to contact Mike Markey of Gulf Power Company at (850) 444-6573.

Sincerely,



James O. Vick
Director
Environmental Affairs

cc: Nik Budney, Gulf Power Company
Mike Markey, Gulf Power Company
Jim Pegues, Southern Company Generation Technical Services
Russell Badders, Esq., Beggs & Lane
Michael Petrovich, Esq., Hopping Green & Sams

One Energy Place
Pensacola, Florida 32520
Tel 850-444-6000



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February 10, 2014

By Overnight Delivery

Mr. Stephen Hoffman
Office of Resource Conservation and
Recovery
U.S. Environmental Protection Agency
Two Potomac Yard
2733 South Crystal Dr. 5th Floor, N5237
Arlington, Virginia 22202-2733

Re: Draft Assessment of Dam Safety of Coal Combustion Surface
Impoundments (October 2012; Revision 1, November 2013)
Gulf Power Company
Plant Crist
Pensacola, Florida

Dear Mr. Hoffman:

By email dated November 13, 2013, the U.S. Environmental Protection Agency ("EPA") provided to Gulf Power Company ("GPC") a draft report regarding certain facilities for the management of coal combustion residuals ("CCRs") at Plant Crist ("Draft Report"). The Draft Report was prepared by CDM Smith ("CDM") and was dated October 2012 with a Revision 1 date of November 2013. This letter provides the comments of GPC with respect to issues of confidentiality. GPC requests that EPA maintain this entire letter and the enclosed GPC response letter and its attachments as confidential business information not subject to disclosure for purposes of 5 U.S.C. Section 552 (b)(2), (4) and (7) and 18 U.S.C. Section 1905.

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GPC provided certain information about the Plant Crist CCR surface impoundments to representatives of EPA's contractor CDM in the context of the inspection that took place on August 20 and 21, 2012. That information was provided subject to a claim of confidentiality. At that time, EPA assured GPC that the information would be treated as confidential and would be destroyed or returned to GPC after CDM's report to EPA was complete. If EPA decides to destroy these documents, then Gulf Power requests again that written notice of such destruction be provided. Finally, it was agreed that the documents would not be reproduced without notice to and approval from GPC.

The Draft Report includes information that GPC regards as confidential. My letter to Ms. Betsy Devlin dated December 27, 2012, explained the bases for GPC's concerns with respect to public disclosure of certain information relating to impoundments for the management of CCRs at GPC's Plant Crist and Plant Scholz. That letter addressed similar information to the information being provided in this letter and the enclosed GPC response letter and related attachments. Thus, the same concerns apply. GPC requests that EPA provide an opportunity for GPC to identify confidential information in the Draft Report prior to any public distribution. GPC requests that EPA maintain the entire document as confidential until that opportunity is provided.

EPA's method to convey the Draft Report was to post it to a file-sharing web site. EPA then provided a link to the page and invited GPC to download the Draft Report. While EPA stated it was a secure site, and appeared to be password protected, if EPA has not already removed the Draft Report from the site, GPC requests that EPA do so immediately. GPC objects to any posting or other distribution of the Draft Report in a manner that may expose it to public disclosure. Regardless of EPA's response to this request, GPC continues to assert its claims of confidentiality and has not waived any such claim.

Mr. Stephen Hoffman
February 10, 2014
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Thank you for this opportunity to comment. Please direct any future correspondence on this issue to me and GPC's Mike Markey who can be reached at the same address as me.

Sincerely,

Mike Markey for James O. Vick

James O. Vick
Director
Environmental Affairs

cc: Nik Budney, Gulf Power Company
Mike Markey, Gulf Power Company
Jim Pegues, Southern Company Generation Technical Services
Russell Badders, Esq., Beggs & Lane
Michael Petrovich, Esq., Hopping Green & Sams



March 31, 2014

Jana Englander
Office of Resource Conservation and Recovery
Materials Recovery Waste Management Division
Energy Recovery and Waste Disposal Branch
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

RE: Former Ash Pond at Plant Crist

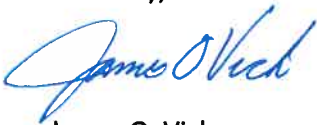
Dear Ms. Englander:

As mentioned on several phone calls with you in the past, Gulf Power is in the process of completing our dredging the Plant Crist former ash pond to remove the last remaining ash. We have requested that the Florida Department of Environmental Protection (FDEP) acknowledge that the term "ash pond" will no longer be appropriate or applicable upon completion of the historical ash removal.

We have included both Gulf Power's letter to FDEP dated March 24, 2014 as well as FDEP's response back to Gulf dated March 28th. In the Department's letter, they acknowledge that with the cessation of coal ash storage, calling the pond and ash pond is not appropriate and the pond description will be updated in a permit revision or permit renewal, whichever occurs first.

If you should have any questions please feel free to call me (850) 444-6311 or Mike Markey of my staff at (850) 444-6573.

Sincerely,



James O. Vick
Director of Environmental Affairs

Cc: Jora Maxwell
Mike Markey
Terry Wright
Kevin Beaty
Robert Jernigan



**FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION**
BOB MARTINEZ CENTER
2600 BLAIRSTONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

RICK SCOTT
GOVERNOR

CARLOS LOPEZ-CANTERA
LT. GOVERNOR

HERSCHEL T. VINYARD JR.
SECRETARY

March 28, 2014

Sent by E-mail to:

rmmarkey@southernco.com

Richard "Mike" Markey
Manager, Land and Water Programs
One Energy Place
Pensacola, Florida 32520

Re: Gulf Power Company
Crist Electric Generating Plant
NPDES Permit No. FL0002275
Pond Ash Removal

Dear Mr. Markey:

The Florida Department of Environmental Protection (Department) acknowledges receipt of Gulf Power's letter dated March 24, 2014, regarding the removal of historical ash from the ash pond at Plant Crist. The Department recognizes that with the cessation of coal ash storage and treatment in the pond the term "ash pond" would no longer be appropriate. Please notify both the Department's Industrial Wastewater Program and the Northwest District Office upon completing the removal of the historical ash from the pond.

The pond description in the above referenced NPDES permit will be updated to reflect the use of the pond during the following permit revision or renewal, whichever occurs first. Please note that the monitoring requirements for the pond remain in effect.

Please contact me at (850) 245-8590 if you have any questions concerning our comments.

Sincerely,

Marc Harris, P.E.
Environmental Administrator
Industrial Wastewater Program
Division of Water Resource Management

cc: Jim Vick, GPC (jovick@southernco.com)
Richard Tedder, P.E., DEP Solid Waste Tallahassee (richard.tedder@dep.state.fl.us)
Dawn Templin, P.E., DEP Solid Waste Pensacola (dawn.templin@dep.state.fl.us)
Kim Allen, DEP Pensacola (kim.allen@dep.state.fl.us)

215 South Monroe St
Suite 618
Tallahassee, Florida 32301

Tel 850.224.6199
Fax 850.881.5654



March 24, 2014

Mr. Marc Harris, P.E.
Environmental Administrator
Power Plant NPDES Permitting
Industrial Wastewater Section
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 3545
Tallahassee, FL 32399-2400

RE: Plant Crist Former Ash Pond NPDES Permit No. FL0002275

Dear Mr. Harris:

As previously discussed with the Department, Gulf Power's Plant Crist is in the process of completing the dredging of its former Ash Pond to remove the last remaining historical ash. The dredged ash is being stored in Plant Crist's onsite FDEP approved ash landfill.

Plant Crist stores fly ash and bottom ash dry in our FDEP approved and permitted landfill at the plant. The applicable wet fly ash lines have been removed. Subsequent to the historical ash removal, the term "ash pond" is no longer appropriate.

The former ash pond is no longer used for the active storage and treatment of ash and therefore should be removed from the Department's database of ash ponds. To identify the conditions onsite, attached Figure 1 illustrates current operations at Plant Crist, along with renaming the former Ash Pond as "Industrial Wastewater Treatment Pond No. 1."

Also discussed was the need for the pond to remain in place so Plant Crist can continue to treat storm water, low volume wastewater, cooling tower blow down, and other applicable plant process waters. We would appreciate the Department's acknowledgement of this change.

If you should have any questions regarding this information please feel free to give me a call at (850) 384-7713.

Sincerely,

A handwritten signature in black ink that reads "Mike Markey".

Richard "Mike" Markey
Manager of Land & Water Programs

Cc: Gulf Power

Jim Vick

Terry Wright

Jora Maxwell

Robert Jernigan

FDEP

Elsa Potts

Dawn Templin

Kim Allen

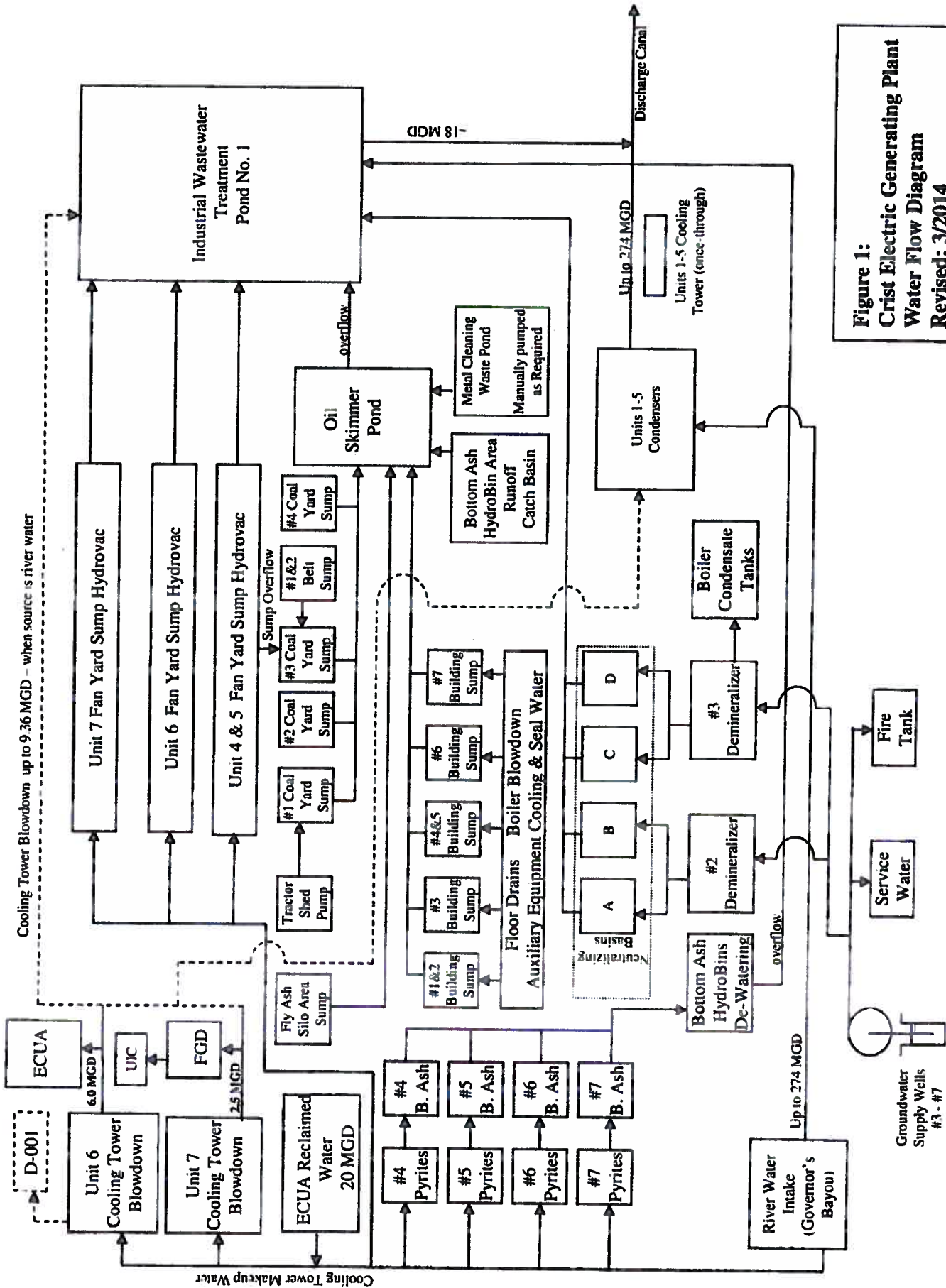


Figure 1:
Crist Electric Generating Plant
Water Flow Diagram
Revised: 3/2014



Engineering and Construction Services Calculation

Calculation Number:
TV-CR-FPC30795-001

Project/Plant: Plant Crist Ash Pond Dike	Unit(s): Units 1-4	Discipline/Area: ES&EE
Title/Subject: Slope Stability Analyses of Ash Pond Dike		
Purpose/Objective: Analyze slope stability of Ash Pond Dike		
System or Equipment Tag Numbers: NA	Originator: Terri H. Hartsfield	

Contents

Topic	Page	Attachments (Computer Printouts, Tech. Papers, Sketches, Correspondence)	# of Pages
Purpose of Calculation	1	Attachment A – Figure 1	1
Methodology	1	Attachment B – 1992 Boring, Dilatometer Logs and Laboratory Analyses	18
Criteria & Assumptions	1-3	Attachment C – 2010 CPT Logs	10
Summary of Conclusions	3-4		
Design Inputs/References	4-5		
Body of Calculation (print outs)	6-90		
Total # of pages including cover sheet & attachments:		120	

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	THH/8-17-12	JAL/8-17-12	JCP/8-17-12

Notes:

Purpose of Calculation

Gulf Power Company's Plant Crist has one open ash pond located on the east side of the plant next to the Escambia River. The Ash Pond was constructed about 1960 and has been in operation for over 50 years. Currently, the Ash Pond is used as a waste water pond and does not receive sluiced ash material from the plant. The pond has not been used for this purpose for over 20 years. The pond has been dredged and presently contains only residual ash.

The purpose of this calculation is to check the stability of the dikes of the Ash Pond using current software.

Methodology

The calculation was performed using the following methods and software:

GeoStudio 2007 (Version 7.17, Build 4921), 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:

- To remain consistent with historic drawings, all elevations are adjusted to plant datum by adding 72.69 feet to any elevations given based on mean sea level.
- The current required minimum criteria (factors of safety) were taken from the US Corps of Engineers Manual EM 1110-2-1902, October 2003.
- The soil properties of unit weight, phi angle, and cohesion were obtained from blow counts obtained during drilling on the dike, dilatometer data, and triaxial shear testing all performed in 1992. Additionally, cone penetrometer testing performed in 2010 in the area of the discharge structure was used to determine soil strength parameters.
- Seismic analyses were performed using a ground motion having a 2% probability of exceedance in 50 years of 0.03 g from the USGS "Map for Peak Acceleration with a 2% Exceedance in 50 Years" for the vicinity of Plant Crist.
- According to the Northwest Florida Water Management website, the flood elevation for the Escambia River at Pensacola Bay is 8.4 feet (or 81.09 feet adjusted to plant datum). This was used as the river flood elevation.
- From the Hydrologic and Hydraulic Study performed in 2011, normal pool elevation in the Ash Pond is 87.03 feet adjusted to plant elevation datum (72.69 ft + Elevation MSL). The 100 year storm maximum pool elevation is 87.58 feet.
- The cross-sections of the Ash Pond were developed using the survey performed in 2010 of the northeast corner of the dike, the survey performed in August 2012, and cross-sections developed for various maintenance performed on the dike over the past 20 years.

Input Data

The following soil properties were used in the analyses.

Soil Description	Moist Unit Weight, pcf	Cohesion, psf	Phi Angle, degrees
Sections 1 & 2 – NE Dike, Barge Canal/River			
Clayey Sand 1	120	100	33
Clayey Sand 2	120	100	28
Silty Clay	115	385	10
Silt & Clay	115	115	10
Sand	120	0	27
Rip Rap	140	0	40
Fly Ash	80	0	18
Section 3 – West Dike at Weir in Discharge Canal			
Clayey Sand	120	100	34
Clayey Silt	115	625	10
Silty Sand	120	100	30
Silt & Clay	115	308	10
Fly Ash	80	0	18
Sand	120	0	36
Sheet Pile	shear force – 50,000 lbs		
Section 4 – West Dike, South of Discharge Canal Weir			
Clayey Sand	120	100	34
Clayey Silt	115	625	10
Silty Sand	120	100	30
Silt & Clay	115	308	10
Fly Ash	80	0	18
Sand	120	0	36
Rip Rap	140	0	40
Section 5 - West Dike, North of Discharge Canal Weir			
Clayey Sand 1	120	100	34
Clayey Sand 2	115	100	31
Clayey Silt	115	135	10
Sand 1	120	100	37
Sand 2	120	0	36
Section 6 – South Dike at Thompson Bayou			
Clayey Sand	120	100	34
Silty Sand	120	100	34
Silty Clay	115	390	10
Clayey Silt	115	200	10
Flay Ash	80	0	18
Silty Sand 2	120	100	31
Silty Clay 2	115	275	10
Sand	120	0	32

Hydrologic Considerations

The following hydrologic information, based on SCS Civil calculation DC-FP-FPC34288-100 dated August 15, 2011, was utilized in the stability analyses.

<u>Minimum Pool</u>	<u>Normal Pool</u>	<u>Maximum Pool Surge</u>
87.03 (14.34)	87.03 (14.34)	87.58 (14.89)

Elevations 87.03 (14.34) are relative to plant datum (feet MSL).

Summary of Conclusions

The following 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.

Failure Condition (Load Case)	Computed Factor of Safety	Recommended Minimum Factor of Safety ¹
Section 1 – Barge Canal/River		
Downstream Steady State	1.4	1.5
Downstream Seismic	1.2	1.1
Upstream Steady State	2.4	1.5
Upstream Seismic	2.1	1.1
Downstream – 100 Year Storm	1.7	1.4
Upstream – 100 Year Storm	2.5	1.4
Upstream Rapid Drawdown	1.2	1.3
Section 2 – River Side		
Downstream Steady State	1.2	1.5
Downstream Seismic	1.1	1.1
Upstream Steady State	2.5	1.5
Upstream Seismic	2.2	1.1
Downstream – 100 Year Storm	1.4	1.4
Upstream – 100 Year Storm	2.5	1.4
Upstream Rapid Drawdown	1.3	1.3
Section 3 – Discharge Canal Weir		
Downstream Steady State	2.2	1.5
Downstream Seismic	1.9	1.1
Upstream Steady State	2.4	1.5
Upstream Seismic	2.1	1.1
Downstream – 100 Year Storm	2.6	1.4
Upstream – 100 Year Storm	2.5	1.4
Upstream Rapid Drawdown	1.3	1.3
Section 4 – Discharge Canal South		
Downstream Steady State – In Bolster	1.4	1.5
Downstream Steady State – In Dike	1.4	1.5

Downstream Seismic	1.2	1.1
Upstream Steady State	2.4	1.5
Upstream Seismic	2.1	1.1
Downstream – 100 Year Storm	1.8	1.4
Upstream – 100 Year Storm	2.5	1.4
Upstream Rapid Drawdown	1.3	1.3
Section 5 – Discharge Canal North		
Downstream Steady State	1.4	1.5
Downstream Seismic	1.3	1.1
Upstream Steady State	1.9	1.5
Upstream Seismic	1.7	1.1
Downstream – 100 Year Storm	1.7	1.4
Upstream – 100 Year Storm	1.9	1.4
Upstream Rapid Drawdown	1.0	1.3
Section 6 – Thompson Bayou		
Downstream Steady State	2.0	1.5
Downstream Seismic	1.7	1.1
Upstream Steady State	2.5	1.5
Upstream Seismic	2.2	1.1
Downstream – 100 Year Storm	2.3	1.4
Upstream – 100 Year Storm	2.5	1.4
Upstream Rapid Drawdown	1.4	1.3

Design Inputs/References

Federal Emergency Management Agency, Flood Insurance Study Number 12033, September 30, 2006, Accessed from the web on August 10, 2012.

<http://www.nwfwmdfloodmaps.com/pdf/2008/Escambia%20FIS%20DFIRM%20Update%2001-16-08.pdf>

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

Southern Company Generation Sketch Number ES1989S1, Plant Crist Barge Canal Slope Repair Limits of Remediation

Calculation Number DC-FP-FPC34288-100, Plant Crist Ash Ponds Hydrologic and Hydraulic Study

Plant Crist Ash Pond Dike Study, internal report prepared by Southern Company Services for Gulf Power Company, 1992.

Cone Penetration Test data performed in 2010 for the replacement of the discharge structure.

Southern Company Services Drawing No D-30512, Crist Steam Plant Units 1 through 5, Cooling Tower Reservoir, Modification-Piling Layout, Dike Wing Walls.

Southern Company Services Drawing No D-34344, Plant Crist Ash Pond, Ash Pond Dike Modifications, Cross-Sections.

Southern Company Services Drawing No D-34343, Plant Crist, Ash Pond Dike Modifications, Plan

Southern Company Services Drawing No ES1989S1, Plant Crist, Barge Canal Slope Repair, Limits of Remediation.

Body of Calculation

Calculation consists of Slope-W modeling attached. Basic input data is given for each of the 6 cross-sections.

Attachments

Slope W Computer Runs

Section 1 – Northeast Dike at Barge Canal/River

Plant Crist Ash Pond Dike Slope Stability

TV-CR-FPC30795-001

Clayey Sand 1
120 pcf
100 psf
33°

Clayey Sand 2
120 pcf
100 psf
28°

Silty Clay
115 pcf
385 psf
10°

Silty & Clay
115 pcf
115 psf
10°

Sand
120 pcf
0 psf
27°

Ash
80 pcf
0 psf
18°

Rip Rap
140 pcf
0 psf
40°

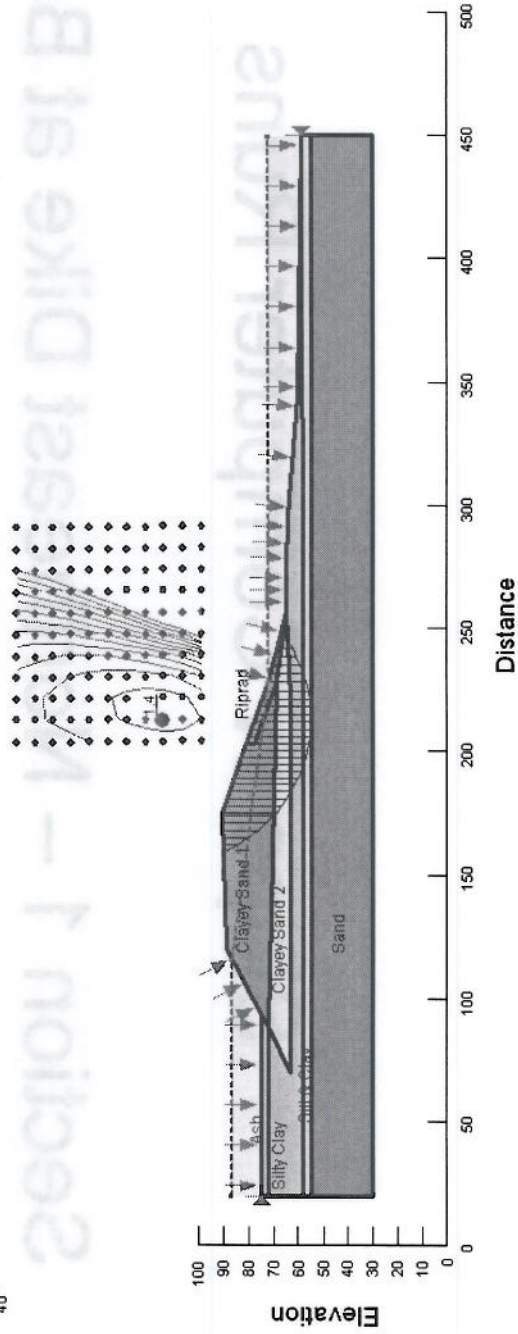
Plant Crist Ash Pond dike

Section 1

Steady State

Method: Morgenstern-Price

All elevation are on plant datum (MSL + 72.69 ft)



8/17/2012

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Plant Crist Ash Pond Dike Slope Stability

TV-CR-FPC30795-001

Clayey Sand 1
120 pcf
100 psf
33°

Clayey Sand 2
120 pcf
100 psf
28°

Silty Clay
115 pcf
385 psf
10°

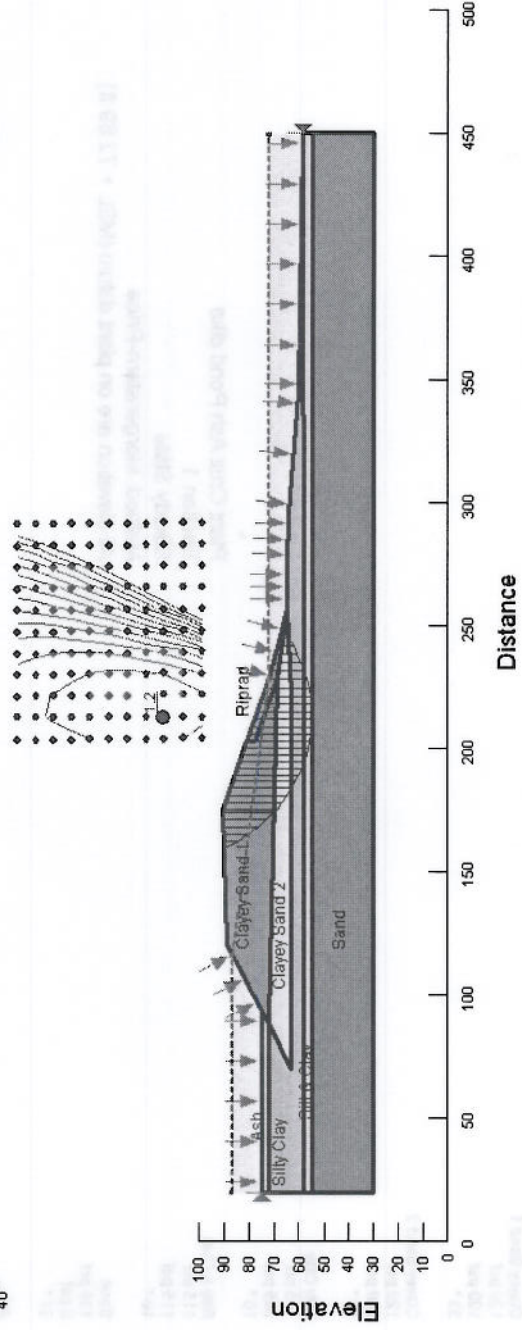
Silty & Clay
115 pcf
115 psf
10°

Sand
120 pcf
0 psf
27°

Ash
80 pcf
0 psf
18°

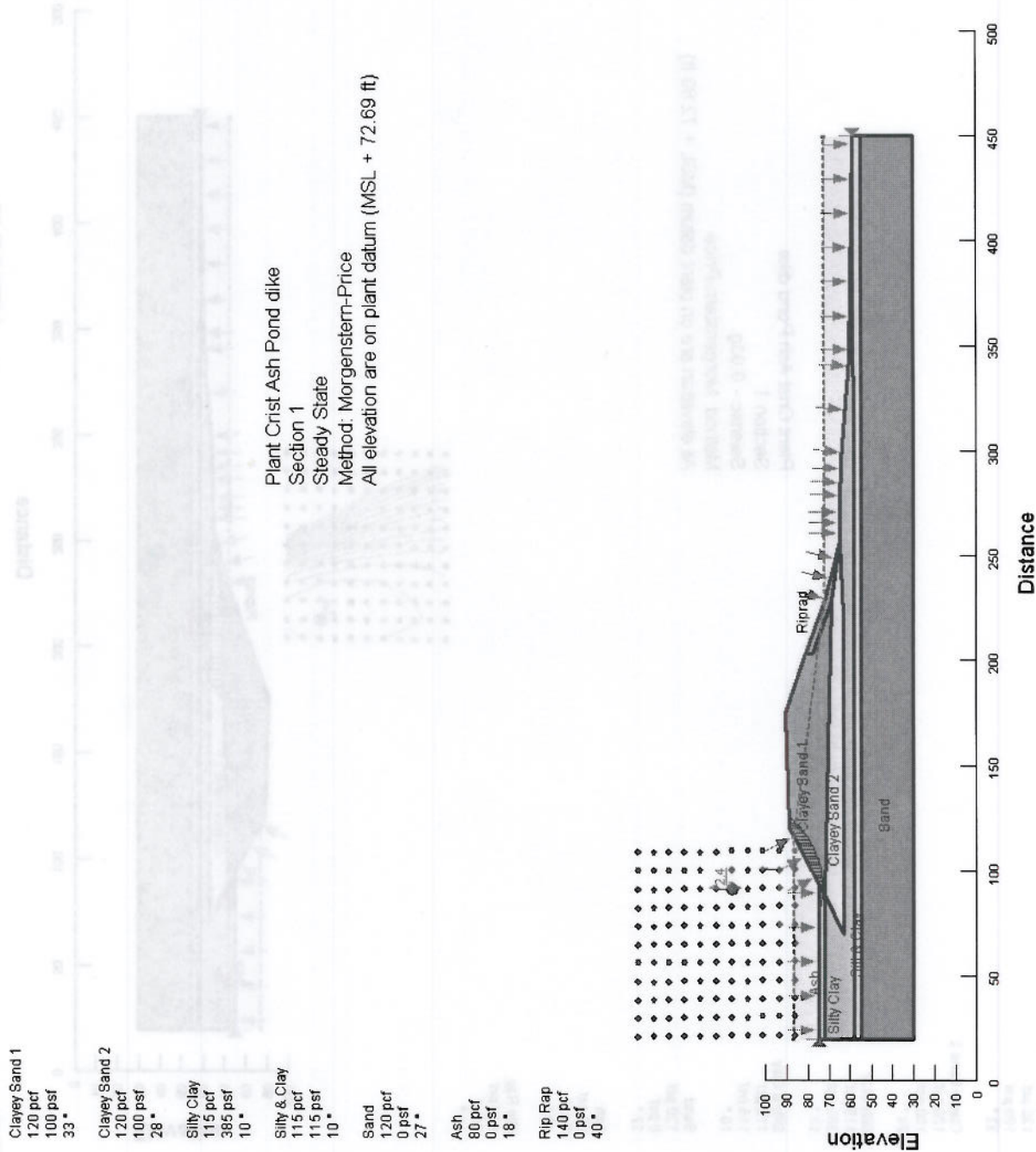
Rip Rap
140 pcf
0 psf
40°

Plant Crist Ash Pond dike
Section 1
Seismic - 0.03g
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)



8/17/2012

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Plant Crist Ash Pond Dike Slope Stability

TV-CR-FPC30795-001

Clayey Sand 1
120 pcf
100 psf
33°

Clayey Sand 2
120 pcf
100 psf
28°

Silty Clay
115 pcf
385 psf
10°

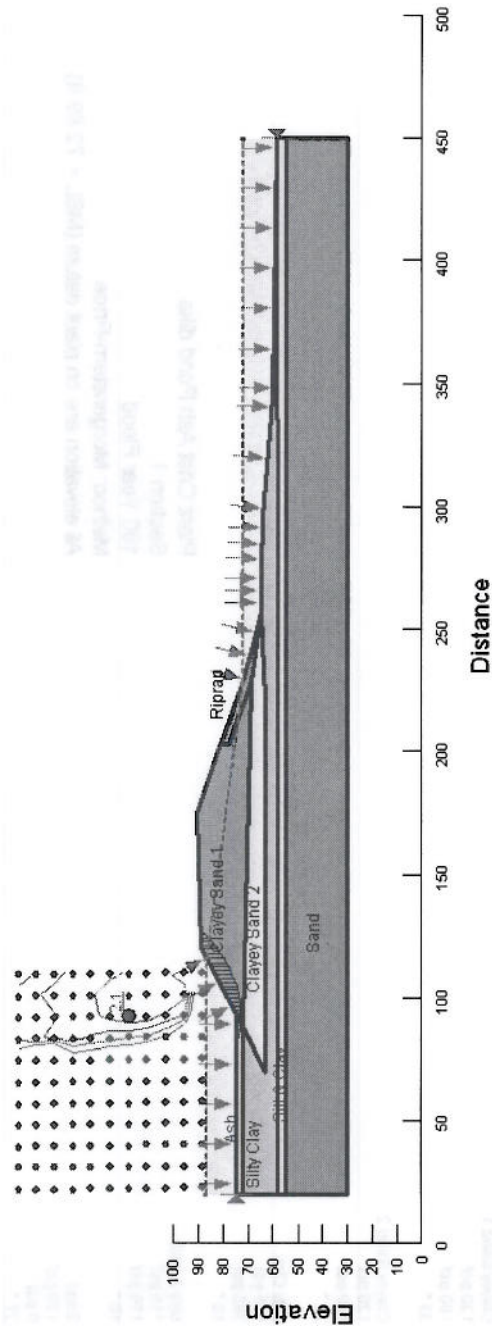
Silty & Clay
115 pcf
115 psf
10°

Sand
120 pcf
0 psf
27°

Ash
80 pcf
0 psf
18°

Rip Rap
140 pcf
0 psf
40°

Plant Crist Ash Pond dike
Section 1
Seismic - 0.03g
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)

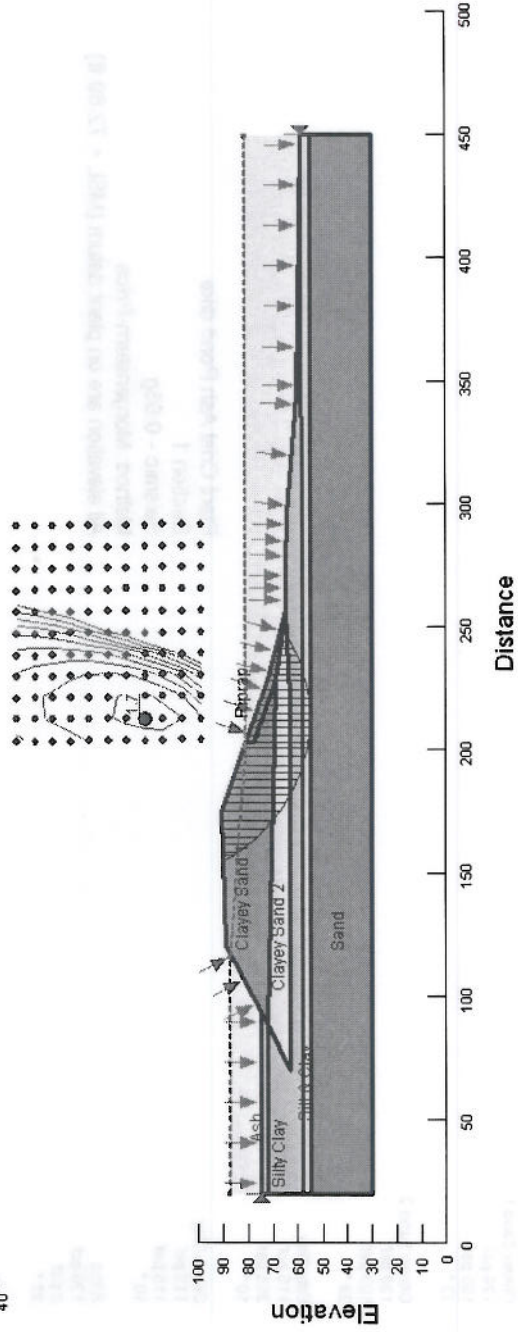


Nov. 3
8/17/2012

CONFIDENTIAL BUSINESS INFORMATION

Clayey Sand 1
120 pcf
100 psf
33°
Clayey Sand 2
120 pcf
100 psf
28°
Silty Clay
115 pcf
385 psf
10°
Silty & Clay
115 pcf
115 psf
10°
Sand
120 pcf
0 psf
27°
Ash
80 pcf
0 psf
18°
Rip Rap
140 pcf
0 psf
40°

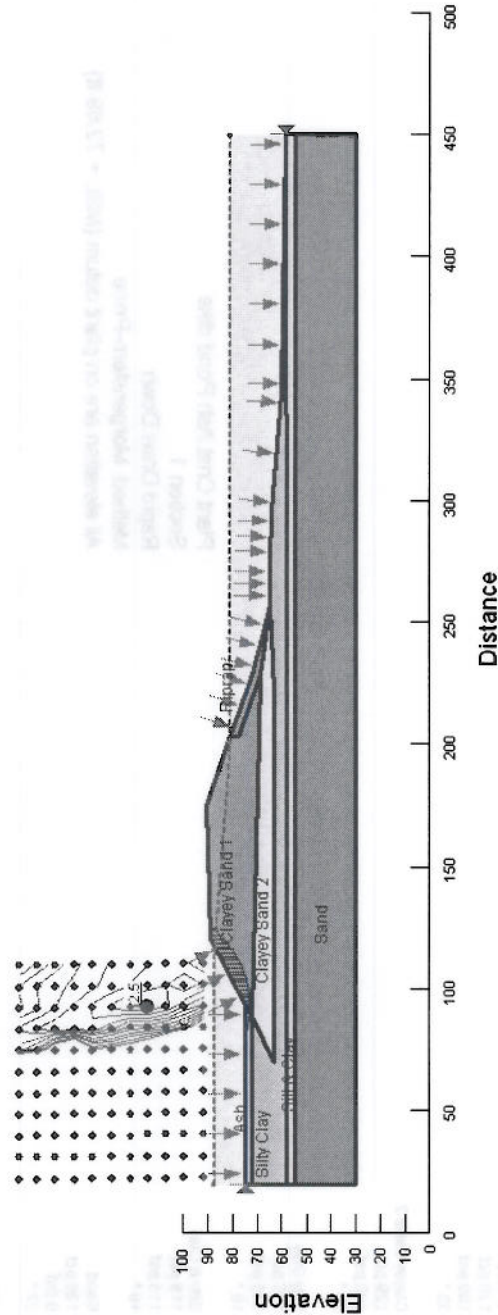
Plant Crist Ash Pond dike
 Section 1
 100 Year Flood
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

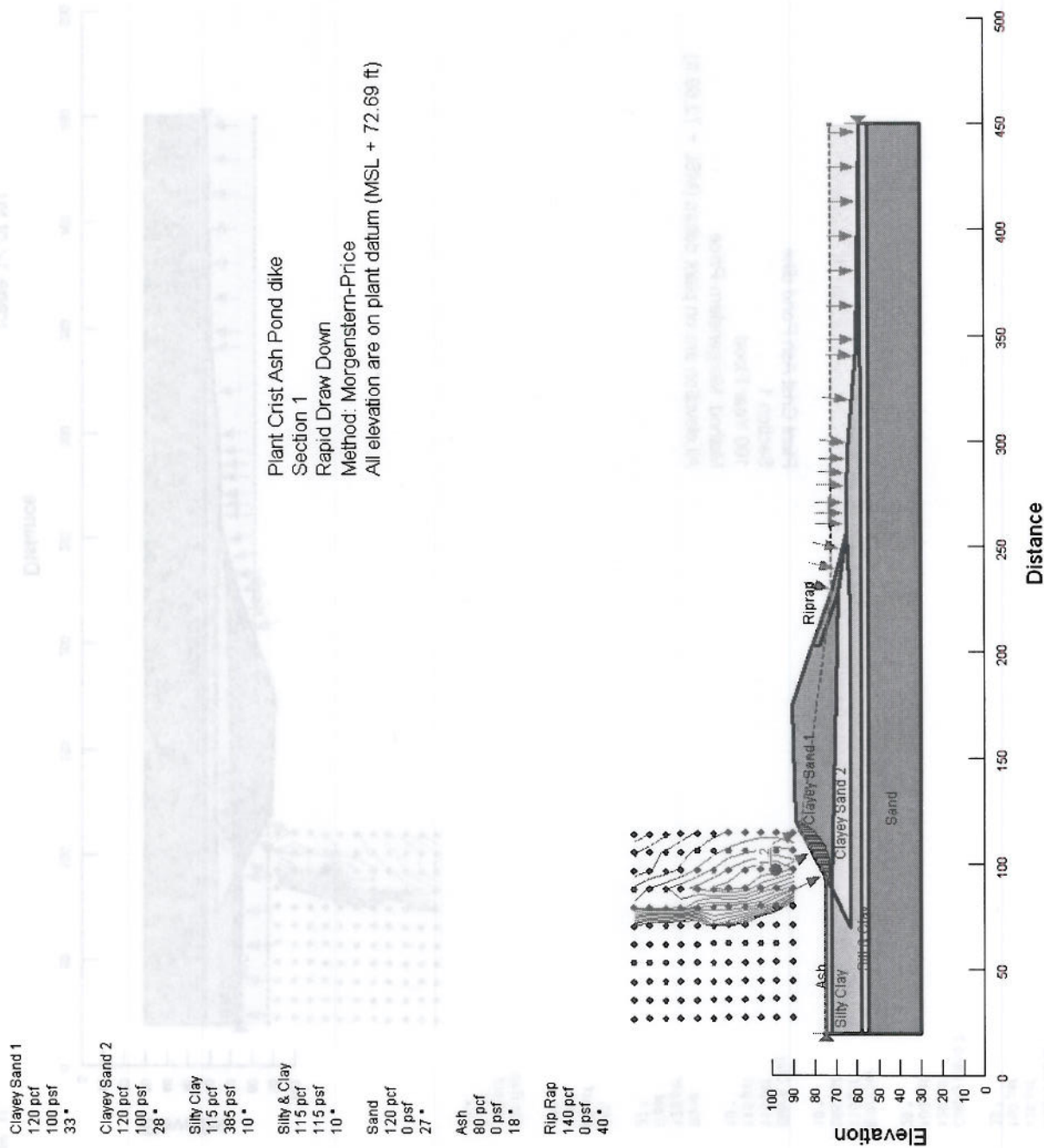


8/17/2012

Clayey Sand 1
120 pcf
100 psf
33°
Clayey Sand 2
120 pcf
100 psf
28°
Silty Clay
115 pcf
385 psf
10°
Silty & Clay
115 pcf
115 psf
10°
Sand
120 pcf
0 psf
27°
Ash
80 pcf
0 psf
18°
Rip Rap
140 pcf
0 psf
40°

Plant Crist Ash Pond dike
Section 1
100 Year Flood
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)





SLOPE/W Analysis

Report generated using GeoStudio 2007, version 7.17. Copyright © 1991-2010 GEO-SLOPE International Ltd.

File Information

Created By: Hartsfield, Terri H.
Revision Number: 55
Last Edited By: Hartsfield, Terri H.
Date: 8/15/2012
Time: 8:26:28 AM
File Name: Crist Ash Pond Section 1 - Seis.gsz
Directory: T:\ESEE MAJOR PROJECTS\PROJECTS\CRIST\2012\Attorney-Client Privilege EPA Sub\Slope Stability\Ash Pond\Sect 1-NE\
Last Solved Date: 8/15/2012
Last Solved Time: 8:26:32 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
 Apply Phreatic Correction: No
 Side Function
 Interslice force function option: Half-Sine
 PWP Conditions Source: Piezometric Line
 Use Staged Rapid Drawdown: No
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Grid and Radius
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
Tension Crack
 Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Clayey Sand 1

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Clayey Sand 2

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Clay

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 385 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty & Clay

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 115 psf

Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sand

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 27 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Ash

Model: Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 0 psf
Phi: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rip Rap

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Grid

Upper Left: (203.60855, 173.48564) ft
Lower Left: (204.72497, 99.04784) ft
Lower Right: (292.17785, 99.04784) ft
Grid Horizontal Increment: 10
Grid Vertical Increment: 10
Left Projection Angle: 0 °
Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (22.95343, 78.16971) ft
Upper Right Coordinate: (398.55973, 74.48144) ft
Lower Left Coordinate: (22.68571, 32.98223) ft
Lower Right Coordinate: (400.60067, 34.68302) ft

Number of Increments: 10
 Left Projection: No
 Left Projection Angle: 135 °
 Right Projection: No
 Right Projection Angle: 45 °

Slip Surface Limits

Left Coordinate: (20, 75) ft
 Right Coordinate: (450, 59) ft

Piezometric Lines

Piezometric Line 1

Coordinates

X (ft) Y (ft)

20 87.03

116 87.03

228 72

450 72

Seismic Loads

Horz Seismic Load: 0.03
 Vert Seismic Load: 0.03
 Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft²)
Region 1	Sand	16,17,18,15,14,13	10750
Region 2	Silty & Clay	13,10,11,12,15,14	1404.5
Region 3	Silty Clay	1,3,2,8,20,21,22,23,12,11,10	2249.75
Region 4	Ash	24,25,3,1	212.25
Region 5	Rip Rap	26,27,28,20,9,7	117.05775
Region 6	Clayey Sand 2	20,28,3,2,8	1211.7543
Region 7	Clayey Sand 1	28,27,26,6,5,4,25,3	1891.1879

Points

	X (ft)	Y (ft)
Point 1	20	72
Point 2	70	63
Point 3	88	72
Point 4	120	89

Point 5	157.5	90
Point 6	175	91
Point 7	228	72
Point 8	221	63
Point 9	252.5	66
Point 10	20	58
Point 11	221	58
Point 12	450	59
Point 13	20	55
Point 14	221	55
Point 15	450	55
Point 16	20	30
Point 17	221	30
Point 18	450	30
Point 19	20	87.03
Point 20	257	65
Point 21	275	65
Point 22	295.5	64
Point 23	344	60
Point 24	20	75
Point 25	93.5	75
Point 26	202.95828	80.97722
Point 27	202.99592	77.9756
Point 28	227.97602	69.00992

Critical Slip Surfaces

Slip Surface FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1 259	1.2 (213.247, 113.935)	58.861	(159.423, 90.1099)	(248.682, 66.935)

Slices of Slip Surface: 259

Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1 259	160.77185	87.438585	-400.4137	84.717614	55.016262	100
2 259	163.46955	82.623015	122.50739	434.58266	282.22128	100
3 259	166.3306	78.477855	112.19281	822.91072	461.54561	100
4 259	169.355	74.78176	317.49903	1230.2895	592.77305	100
5 259	172.3794	71.6259	489.0978	1592.0531	716.26752	100
6 259	174.4458	69.67933	593.26478	1888.7738	688.83436	100
7 259	176.4578	68.025245	679.619	2040.7038	723.70163	100
8 259	179.3734	65.830545	792.16739	2214.8886	756.47428	100

9 259	182.289	63.90201	888.09258	2366.6913	786.1849	100
10 259	185.14335	62.24077	967.86025	2564.059	281.45291	385
11 259	187.93645	60.8161	1033.3642	2657.6517	286.40571	385
12 259	190.72955	59.572205	1087.5803	2737.8379	290.98494	385
13 259	193.52265	58.496875	1131.3078	2805.2143	295.15488	385
14 259	196.25905	57.596	1164.6195	2879.9644	302.46159	115
15 259	198.93875	56.856135	1188.3388	2908.1704	303.25272	115
16 259	201.61845	56.25018	1203.691	2924.4671	303.41927	115
17 259	204.4346	55.756475	1210.9457	2986.9124	313.15084	115
18 259	207.36835	55.38652	1209.4492	2973.6162	311.07023	115
19 259	210.28325	55.16668	1198.7408	2940.7814	307.16877	115
20 259	213.1982	55.09197	1178.9939	2885.854	300.96549	115
21 259	216.24175	55.171595	1148.5474	2801.9002	291.53072	115
22 259	219.4139	55.419585	1106.5221	2683.5551	278.07347	115
23 259	222.744	55.871995	1050.4026	2520.8814	259.28509	115
24 259	226.244	56.554995	978.46266	2306.1938	234.11482	115
25 259	229.85845	57.49977	904.81224	2090.8395	209.1286	115
26 259	233.3688	58.648	833.16623	2000.4864	205.83004	385
27 259	236.67255	59.9662	750.90142	1769.4663	179.60046	385
28 259	239.9763	61.525665	653.58931	1497.2774	148.76498	385
29 259	243.28005	63.34884	539.83232	1186.4547	114.01697	385
30 259	246.3591	65.30125	417.99129	756.46172	179.96792	100
31 259	248.23415	66.603985	336.71125	416.59073	67.026839	0

DATE: 11/10/2011

Distance

Section 2 – East Dike at River



1.5H:1V
2H:1V
10' crest
10' height

Clayey Sand 1
120 pcf
100 psf
33°

Clayey Sand 2
120 pcf
100 psf
28°

Silty Clay
115 pcf
385 psf
10°

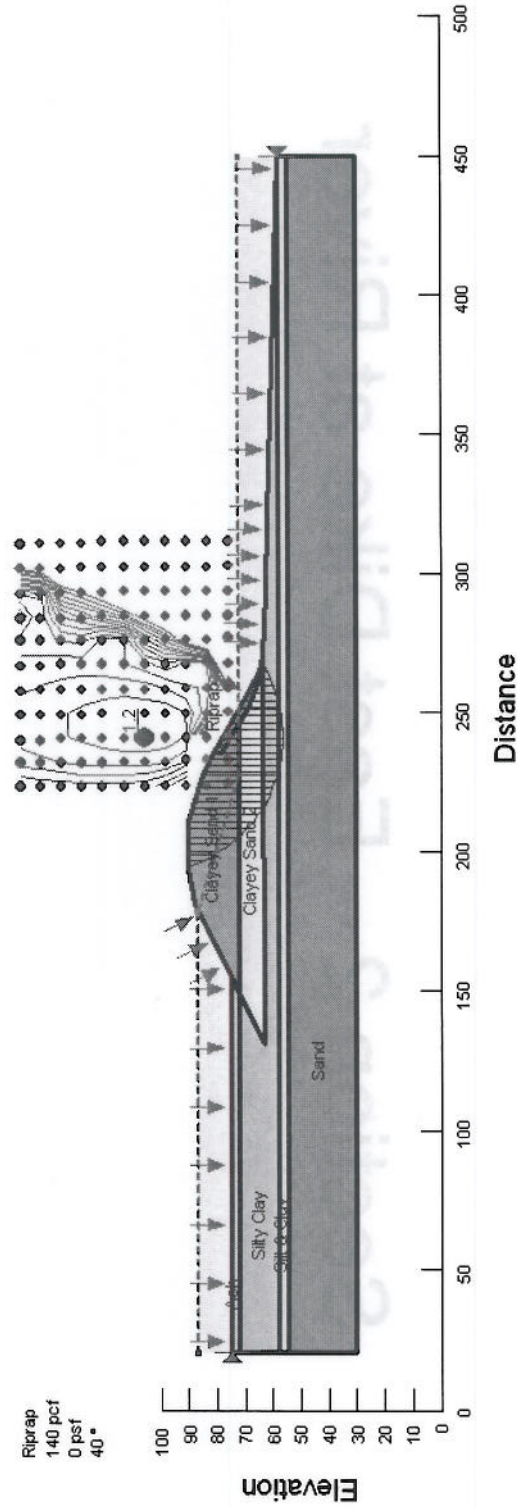
Silty & Clay
115 pcf
115 psf
10°

Sand
120 pcf
0 psf
27°

Ash
80 pcf
0 psf
18°

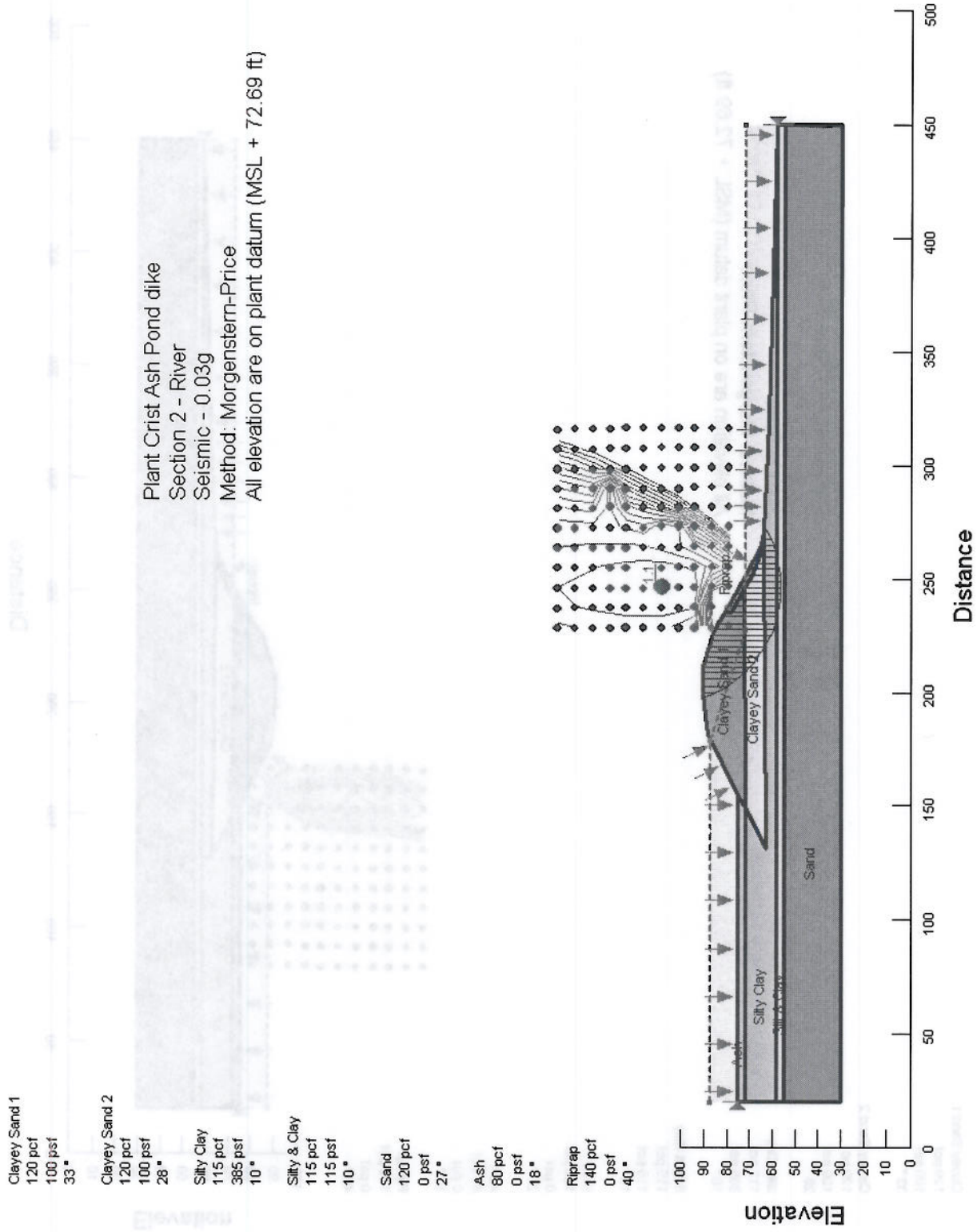
Riprap
140 pcf
0 psf
40°

Plant Crist Ash Pond dike
Section 2 - River
Steady State
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)



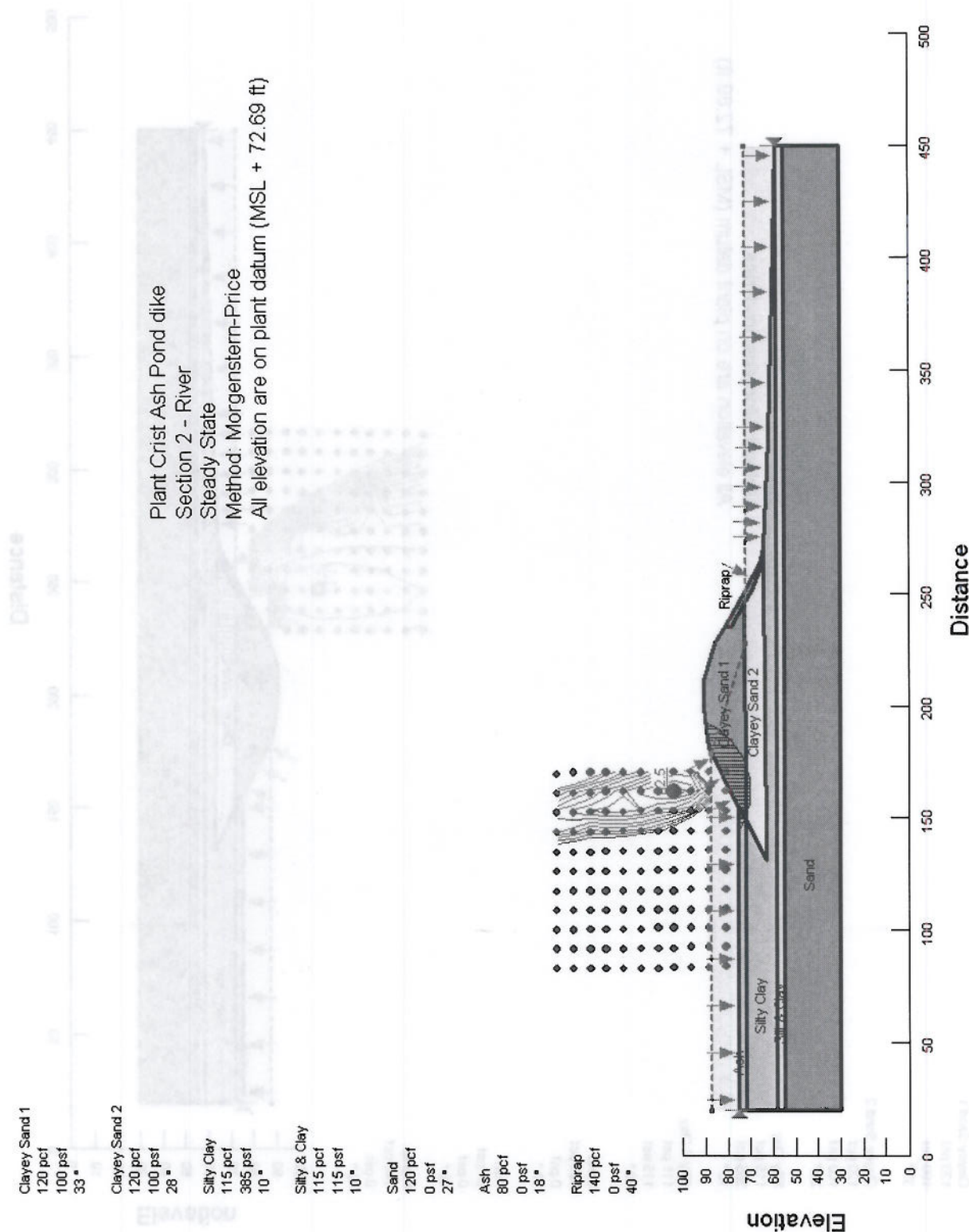
Plant Crist Ash Pond Dike Slope Stability

TV-CR-FPC30795-001

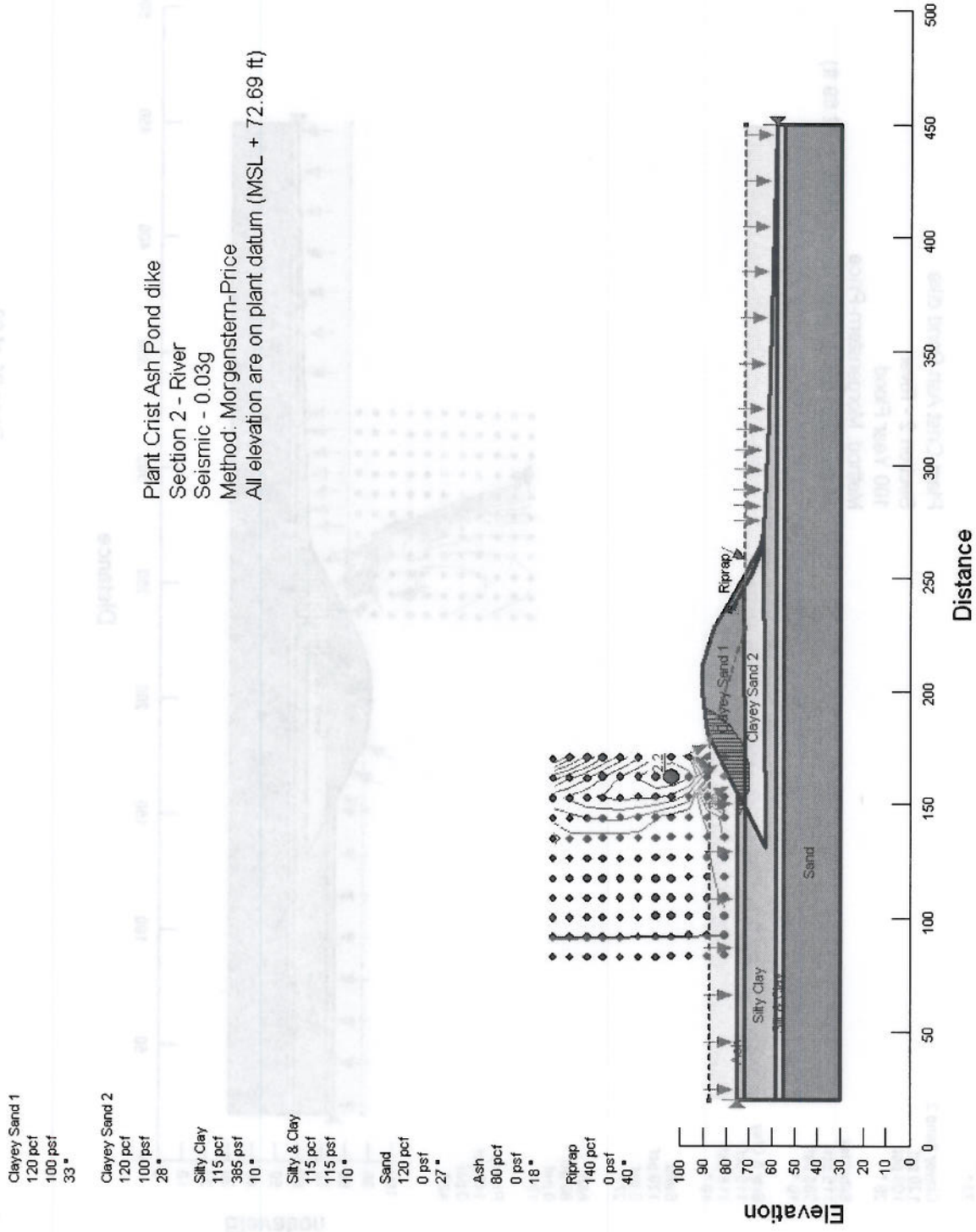


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Clayey Sand 1
120 pcf
100 psf
33°

Clayey Sand 2
120 pcf
100 psf
28°

Silty Clay
115 pcf
385 psf
10°

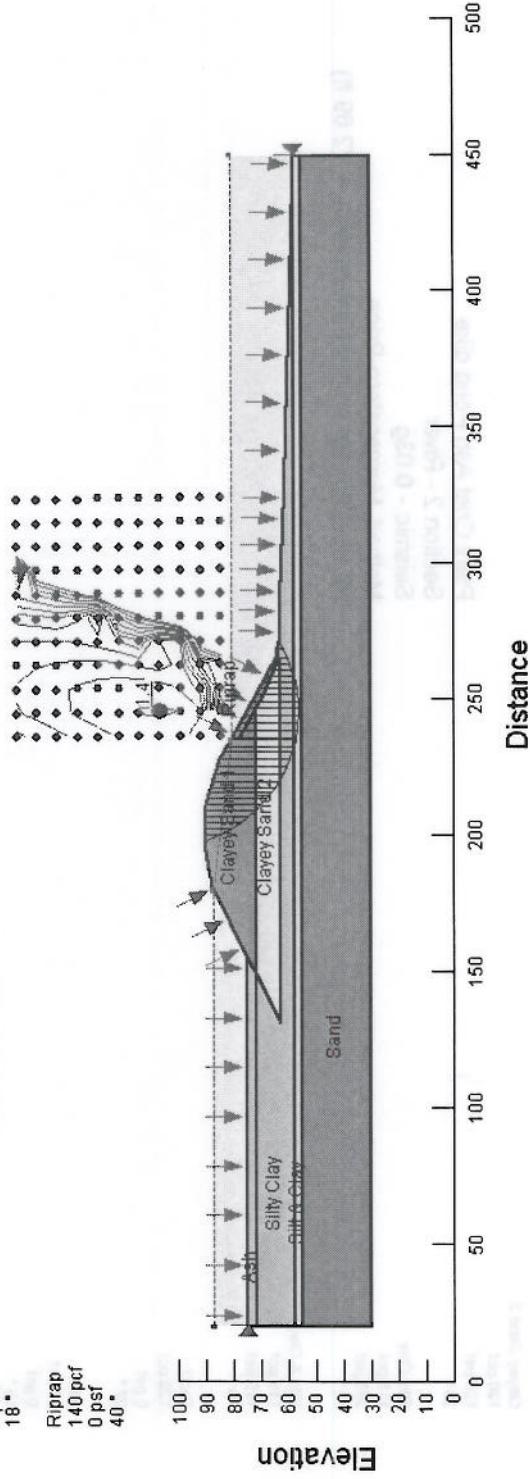
Silty & Clay
115 pcf
115 psf
10°

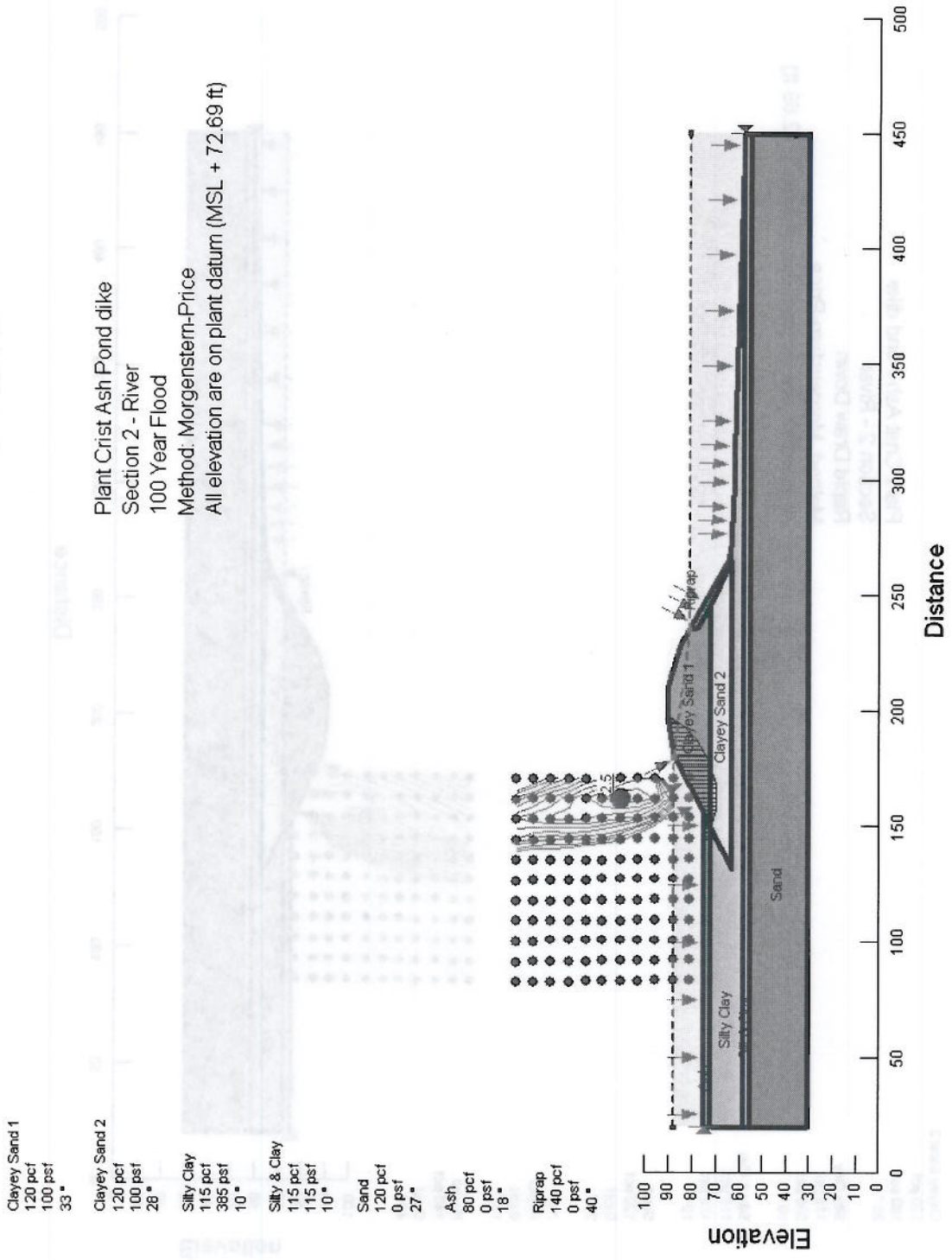
Sand
120 pcf
0 psf
27°

Ash
80 pcf
0 psf
18°

Riprap
140 pcf
0 psf
40°

Plant Crist Ash Pond dike
Section 2 - River
100 Year Flood
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)





Plant Crist Ash Pond dike
Section 2 - River
100 Year Flood
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)

Clayey Sand 1
120 pcf
100 psf
33°

Clayey Sand 2
120 pcf
100 psf
28°

Silty Clay
115 pcf
365 psf
10°

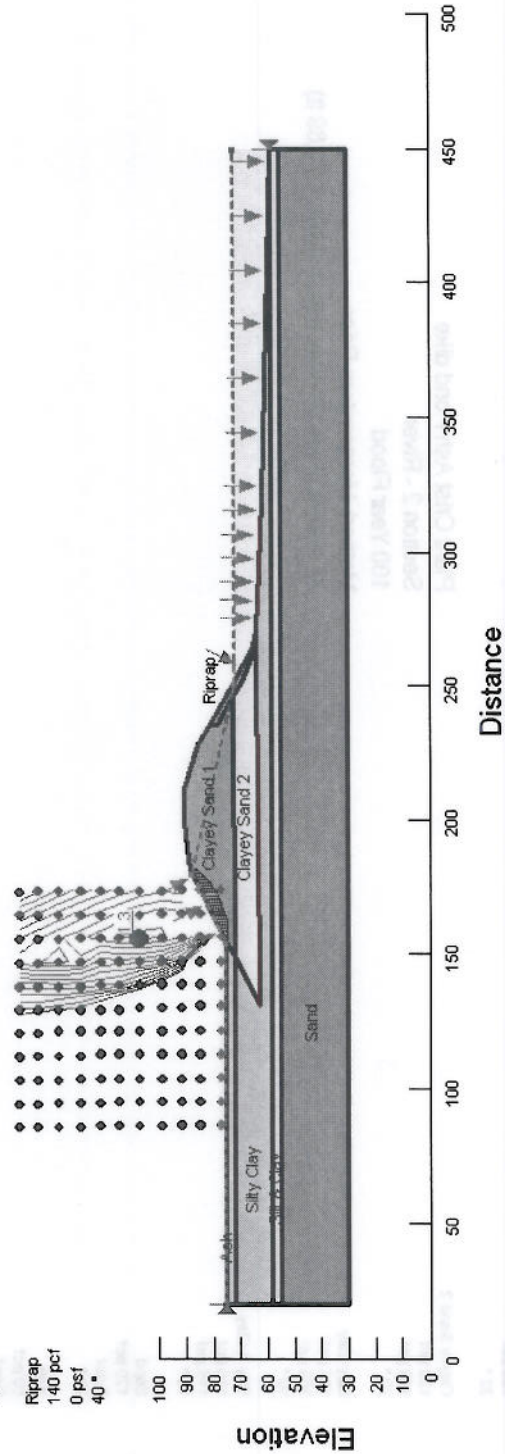
Silty & Clay
115 pcf
115 psf
10°

Sand
120 pcf
0 psf
27°

Ash
80 pcf
0 psf
18°

Riprap
140 pcf
0 psf
40°

Plant Crist Ash Pond dike
Section 2 - River
Rapid Draw Down
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)



SLOPE/W Analysis

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File Information

Created By: Hartsfield, Terri H.
Revision Number: 59
Last Edited By: Hartsfield, Terri H.
Date: 8/15/2012
Time: 8:41:11 AM
File Name: Crist Ash Pond Section 2.gsz
Directory: T:\ESEE MAJOR PROJECTS\PROJECTS\CRIST\2012\Attorney-Client Privilege EPA Sub\Slope Stability\Ash Pond\Sect 2-Mid River\
Last Solved Date: 8/15/2012
Last Solved Time: 8:41:18 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
 Apply Phreatic Correction: No
 Side Function
 Interslice force function option: Half-Sine
 PWP Conditions Source: Piezometric Line
 Use Staged Rapid Drawdown: No
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Grid and Radius
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Clayey Sand 1

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Clayey Sand 2

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Clay

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 385 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty & Clay

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 115 psf

Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sand

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 27 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Ash

Model: Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 0 psf
Phi: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Riprap

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Grid

Upper Left: (223.38424, 150.20276) ft
Lower Left: (224.50066, 75.76496) ft
Lower Right: (311.95354, 75.76496) ft
Grid Horizontal Increment: 10
Grid Vertical Increment: 10
Left Projection Angle: 0 °
Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (65.01521, 75.13013) ft
Upper Right Coordinate: (440.62151, 71.44186) ft
Lower Left Coordinate: (64.74749, 29.94265) ft
Lower Right Coordinate: (442.66245, 31.64344) ft

Number of Increments: 10
 Left Projection: No
 Left Projection Angle: 135 °
 Right Projection: No
 Right Projection Angle: 45 °

Slip Surface Limits

Left Coordinate: (20, 75) ft
 Right Coordinate: (450, 58) ft

Piezometric Lines

Piezometric Line 1

Coordinates

X (ft)	Y (ft)
20	87.03
178.80882	87.03686
228	72
450	72

Seismic Loads

Horz Seismic Load: 0
 Vert Seismic Load: 0

Regions

Material	Points	Area (ft ²)
Region 1 Ash	10,12,13,11	396
Region 2 Silty Clay	11,10,15,23,7,8,9,18,16	2852.7997
Region 3 Silty & Clay	16,17,19,18	1290
Region 4 Sand	17,20,21,19	10750
Region 5 Riprap	23,7,6,14,24,25,26,22	77.08772
Region 6 Clayey Sand 2	26,22,23,15,10	999.28961
Region 7 Clayey Sand 1	26,25,24,5,4,3,2,1,12,10	1167.8079

Points

	X (ft)	Y (ft)
Point 1	181	88
Point 2	194	90
Point 3	200	90.2
Point 4	211	90.2
Point 5	228	85.2

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Point 6	265	64.7
Point 7	271	63.7
Point 8	293.5	62.7
Point 9	320	61.7
Point 10	149	72
Point 11	20	72
Point 12	155	75
Point 13	20	75
Point 14	251.74	72
Point 15	131	63
Point 16	20	58
Point 17	20	55
Point 18	450	58
Point 19	450	55
Point 20	20	30
Point 21	450	30
Point 22	251.97769	69.02989
Point 23	265.03687	63.67018
Point 24	235.47716	81.04252
Point 25	235.50233	77.93455
Point 26	246.4514	72.01676

Critical Slip Surfaces

Slip Surface FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1 511	1.2 (241.545, 105.54)	49.204	(194.85, 90.0283)	(268.181, 64.1698)

Slices of Slip Surface: 511

Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1 511	195.88025	87.430905	350.22183	47.021916	30.536389	100
2 511	197.9404	82.853635	103.89311	346.90032	225.2797	100
3 511	199.48525	80.025255	43.130427	578.90452	347.93576	100
4 511	201.38375	77.21479	182.29151	860.44325	440.39689	100
5 511	204.1512	73.631295	353.11927	1227.5556	567.86562	100
6 511	206.9012	70.65299	486.50624	1604.7305	594.57039	100
7 511	209.63375	68.130805	591.76145	1889.1317	689.82402	100
8 511	212.2754	66.020745	673.0466	2111.9814	765.09522	100
9 511	214.8262	64.250825	734.82172	2276.8085	819.88893	100
10 511	217.287	62.753455	781.34317	2499.2047	302.90533	385

11 511	219.6578	61.492385	814.81789	2614.3601	317.30784	385
12 511	222.0286	60.39097	838.31403	2720.3778	331.85863	385
13 511	224.3994	59.43773	852.56194	2817.5857	346.48672	385
14 511	226.7924	58.617225	858.13516	2906.4658	361.17596	385
15 511	228.42945	58.11878	866.19336	2950.5602	367.53011	385
16 511	229.96195	57.73276	890.26105	2953.8358	363.8639	115
17 511	232.16805	57.25133	920.31337	2934.5724	355.16821	115
18 511	234.37415	56.874615	943.81295	2902.0701	345.29357	115
19 511	236.8584	56.579885	962.21239	2908.0061	343.09592	115
20 511	239.60825	56.393755	973.82958	2822.7442	326.01353	115
21 511	242.3455	56.36212	975.80754	2708.5472	305.52875	115
22 511	245.08275	56.483115	968.27076	2562.0022	281.01786	115
23 511	247.7813	56.751825	951.50083	2383.9731	252.58352	115
24 511	250.4256	57.163125	925.83412	2175.0835	220.27637	115
25 511	251.85885	57.429895	909.16608	2055.1571	202.06914	115
26 511	253.10405	57.727685	890.57454	1982.305	192.50154	115
27 511	255.5766	58.40072	848.58319	1913.7441	187.81661	385
28 511	258.269	59.28822	793.22084	1701.67	160.1841	385
29 511	260.9614	60.35346	726.74969	1453.3629	128.12151	385
30 511	263.6538	61.60943	648.37559	1171.973	92.324345	385
31 511	266.2038	62.98449	562.5694	906.52953	60.64945	385
32 511	267.79425	63.92594	503.81994	551.99705	40.425397	0

Section 3 – West Dike at the Weir Across the Discharge Canal

Plant Crist Ash Pond Dike Slope Stability

TV-CR-FPC30795-001

Clayey Sand
120 pcf
100 psf
34°

Clayey Silt
115 pcf
625 psf
10°

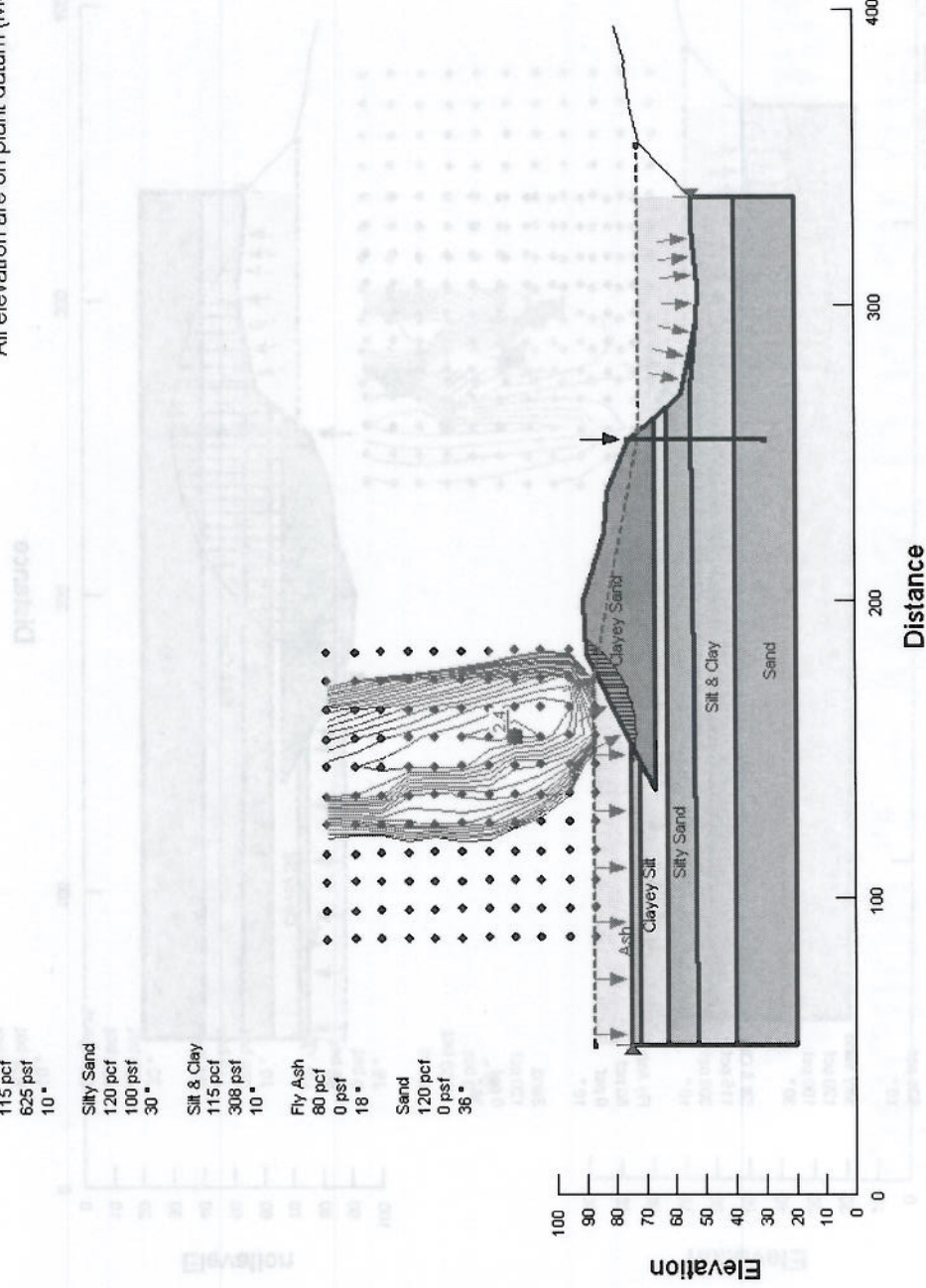
Silty Sand
120 pcf
100 psf
30°

Silt & Clay
115 pcf
308 psf
10°

Fly Ash
80 pcf
0 psf
18°

Sand
120 pcf
0 psf
36°

Plant Crist Ash Pond dike
Section 3 - Weir
Steady State
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)



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8/17/2012

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Plant Crist Ash Pond dike
 Section 3 - Weir
 Seismic - 0.03g
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

Clayey Sand
 120 pcf
 100 psf
 34°

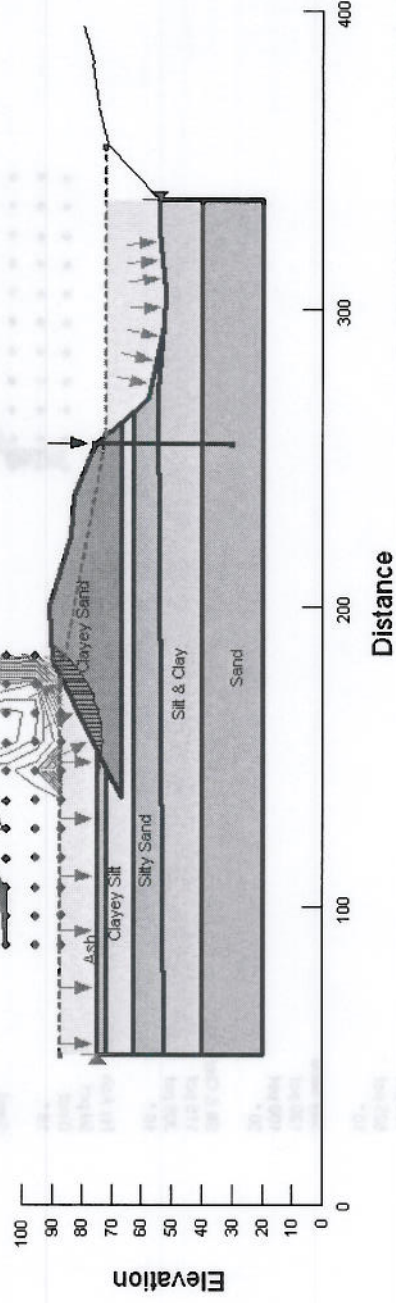
Clayey Silt
 115 pcf
 625 psf
 10°

Silty Sand
 120 pcf
 100 psf
 30°

Silt & Clay
 115 pcf
 308 psf
 10°

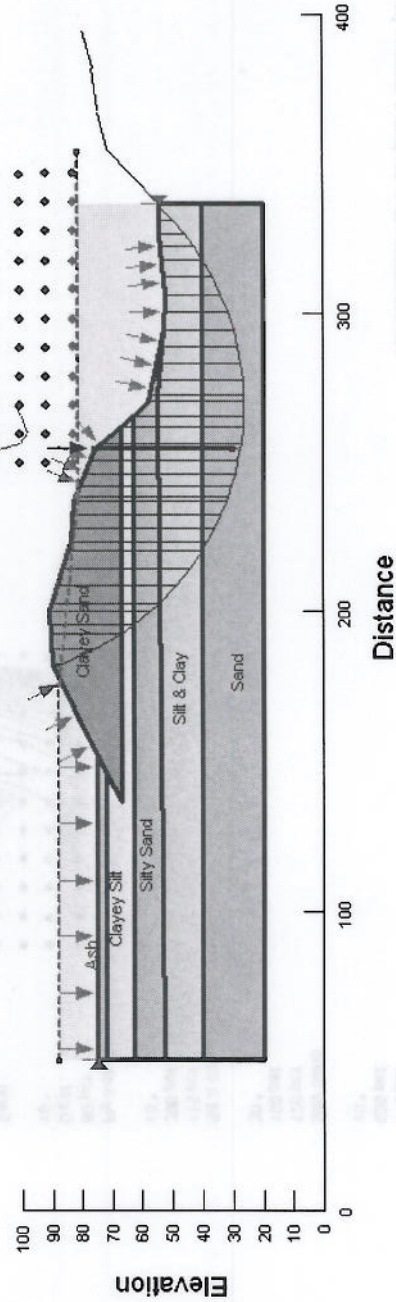
Fly Ash
 80 pcf
 0 psf
 18°

Sand
 120 pcf
 0 psf
 36°



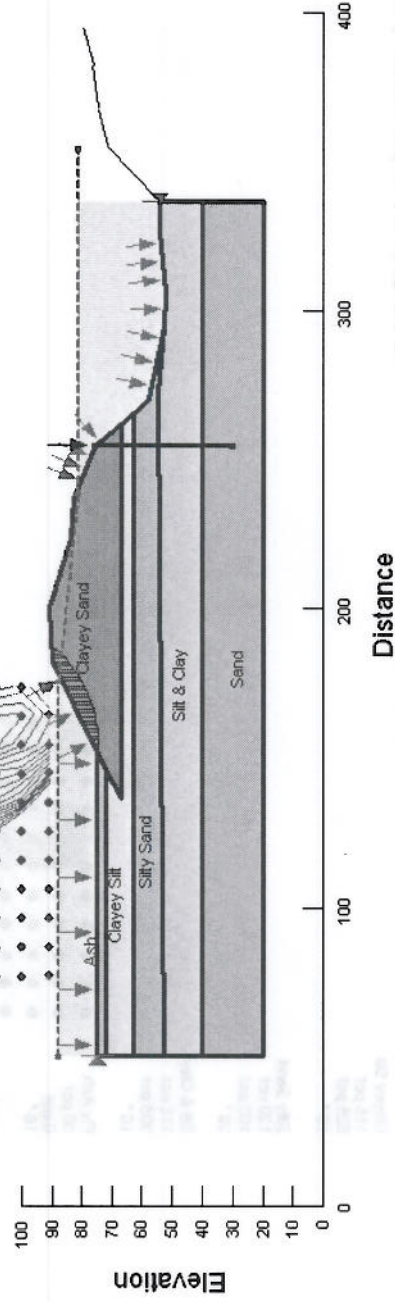
Plant Crist Ash Pond dike
 Section 3 - Weir
 100 Year Flood
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

Clayey Sand
120 pcf
100 psf
34°
Clayey Silt
115 pcf
625 psf
10°
Silty Sand
120 pcf
100 psf
30°
Silt & Clay
115 pcf
308 psf
10°
Fly Ash
80 pcf
0 psf
18°
Sand
120 pcf
0 psf
36°

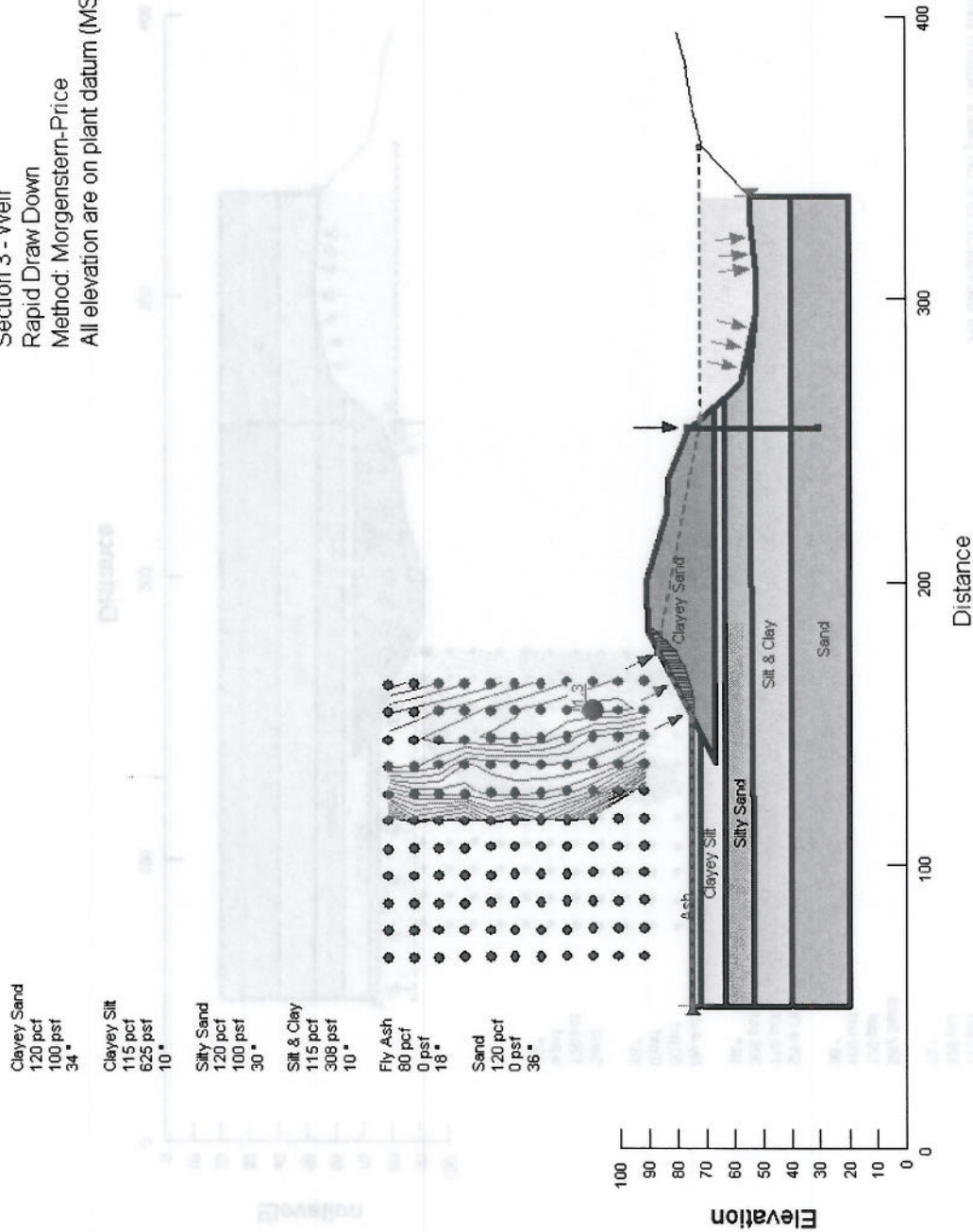


Plant Crist Ash Pond dike
 Section 3 - Weir
 100 Year Flood
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

Clayey Sand
120 pcf
100 psf
34°
Clayey Silt
115 pcf
625 psf
10°
Silty Sand
120 pcf
100 psf
30°
Silt & Clay
115 pcf
308 psf
10°
Fly Ash
80 pcf
0 psf
18°
Sand
120 pcf
0 psf
36°



Plant Crist Ash Pond dike
 Section 3 - Weir
 Rapid Draw Down
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



SLOPE/W Analysis

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File Information

Created By: Hartsfield, Terri H.

Revision Number: 34

Last Edited By: Hartsfield, Terri H.

Date: 8/15/2012

Time: 10:40:20 AM

File Name: Crist Ash Pond Weir Seis.gsz

Directory: T:\ESEE MAJOR PROJECTS\PROJECTS\CRIST\2012\Attorney-Client Privilege EPA Sub\Slope Stability\Ash Pond\Sect 4 - Weir\

Project Settings

Length(L) Units: feet

Time(t) Units: Seconds

Force(F) Units: lbf

Pressure(p) Units: psf

Strength Units: psf

Unit Weight of Water: 62.4 pcf

View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W

Method: Morgenstern-Price

Settings

Apply Phreatic Correction: No

Side Function

Interslice force function option: Half-Sine

PWP Conditions Source: Piezometric Line

Use Staged Rapid Drawdown: No

Slip Surface

Direction of movement: Right to Left

Use Passive Mode: No

Slip Surface Option: Grid and Radius

Critical slip surfaces saved: 1

Optimize Critical Slip Surface Location: No

Tension Crack

Tension Crack Option: (none)

FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Clayey Sand

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 34 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Clayey Silt

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 625 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silt & Clay

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 308 psf
Phi: 10 °
Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Fly Ash

Model: Mohr-Coulomb

Unit Weight: 80 pcf

Cohesion: 0 psf

Phi: 18 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Sand

Model: Mohr-Coulomb

Unit Weight: 120 pcf

Cohesion: 0 psf

Phi: 36 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Slip Surface Grid

Upper Left: (86.15504, 176.11368) ft

Lower Left: (87.39043, 86.75088) ft

Lower Right: (184.16177, 86.75088) ft

Grid Horizontal Increment: 10

Grid Vertical Increment: 10

Left Projection Angle: 0 °

Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (40.30484, 83.07451) ft

Upper Right Coordinate: (415.91114, 79.38624) ft

Lower Left Coordinate: (40.03712, 37.88703) ft

Lower Right Coordinate: (417.95208, 39.58782) ft

Number of Increments: 10

Left Projection: No

Left Projection Angle: 135 °

Right Projection: No

Right Projection Angle: 45 °

Slip Surface Limits

Left Coordinate: (50, 75) ft

Right Coordinate: (336.4, 54.4) ft

Piezometric Lines

Piezometric Line 1

Coordinates

X (ft) Y (ft)

50 87.03

175 87.03

258 72

354 72

Seismic Loads

Horz Seismic Load: 0.03

Vert Seismic Load: 0.03

Ignore seismic load in strength: No

Reinforcements

Reinforcement 1

Type: Pile

Outside Point: (254.9, 75.5) ft

Inside Point: (254.9, 30) ft

Total Length: 45.5 ft

Reinforcement Direction: 90 °

Applied Load Option: Variable

F of S Dependent: No

Pile Spacing: 1 ft

Shear Capacity: 50000 lbs

Shear Safety Factor: 1

Shear Load Used: 50000 lbs

Shear Option: Parallel to Slip

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	17,22,19,18	297
Region 2	Clayey Sand	20,17,22,16,15,1,2,4,5,21	1899.4478
Region 3	Clayey Silt	21,23,24,18,17,20	1309.8555
Region 4	Silty Sand	7,26,23,24,25,6	2030.5737
Region 5	Silt & Clay	28,10,9,8,7,6,25,27	3943.755
Region 6	Sand	29,27,28,30	5728

Points

X (ft)	Y (ft)
--------	--------

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Point 1	223.5	84
Point 2	237.2	83
Point 3	248	78.4
Point 4	254.9	75.5
Point 5	256.5	73.6
Point 6	272.5	54.8
Point 7	294.2	52.4
Point 8	306.3	52.1
Point 9	326.1	54.2
Point 10	336.4	54.4
Point 11	355	71.7
Point 12	368.2	74.6
Point 13	382.5	76.6
Point 14	394.7	79.6
Point 15	200	90.7
Point 16	182	90
Point 17	146	72
Point 18	50	72
Point 19	50	75
Point 20	136	67
Point 21	262.02279	67.02087
Point 22	152	75
Point 23	265.46836	63.01394
Point 24	50	63
Point 25	50	53
Point 26	271.01531	57.65273
Point 27	50	40
Point 28	336.4	40
Point 29	50	20
Point 30	336.4	20

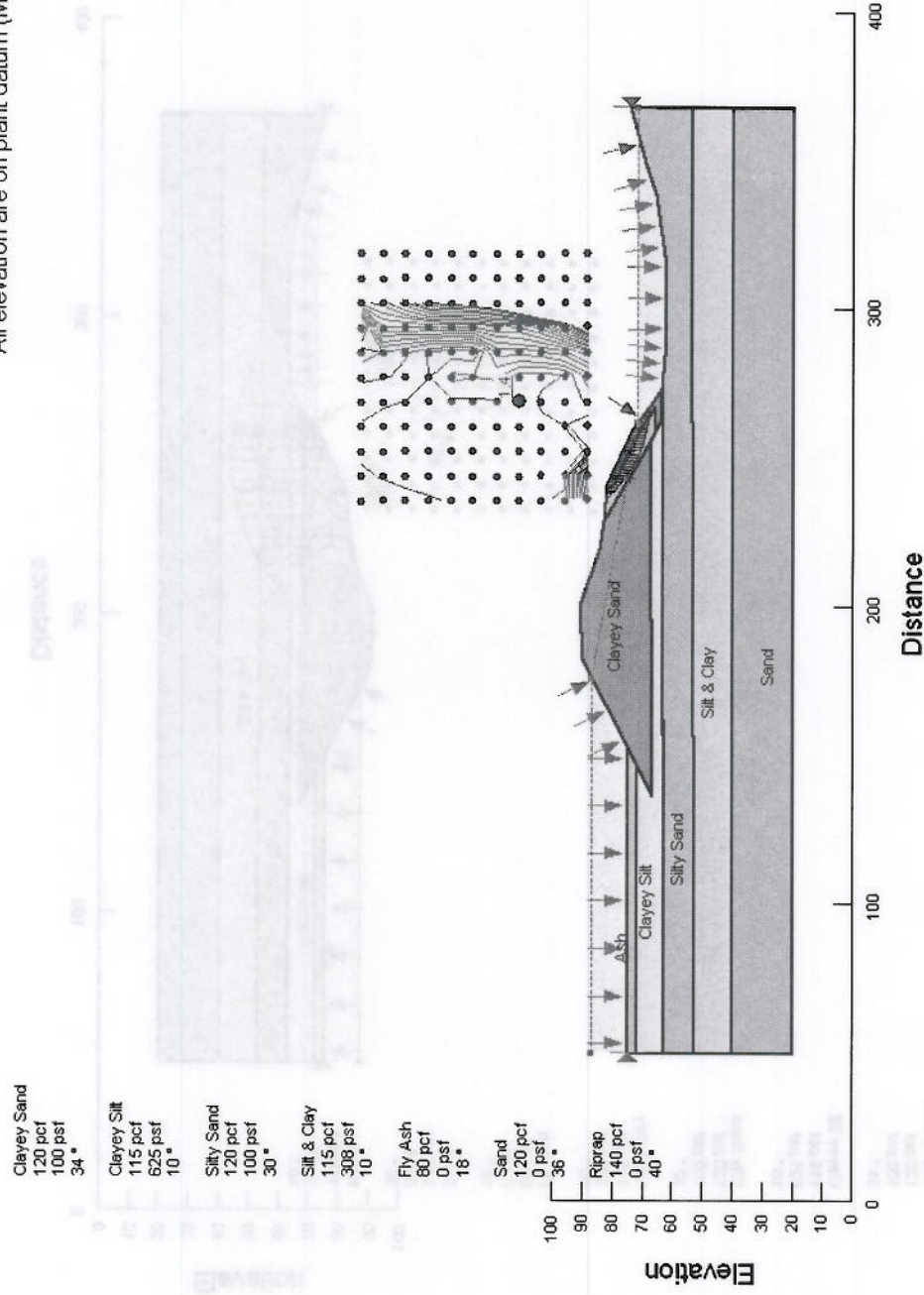
Section 4 – West Dike South of Discharge Canal Weir

Rev. 0
8/17/2012

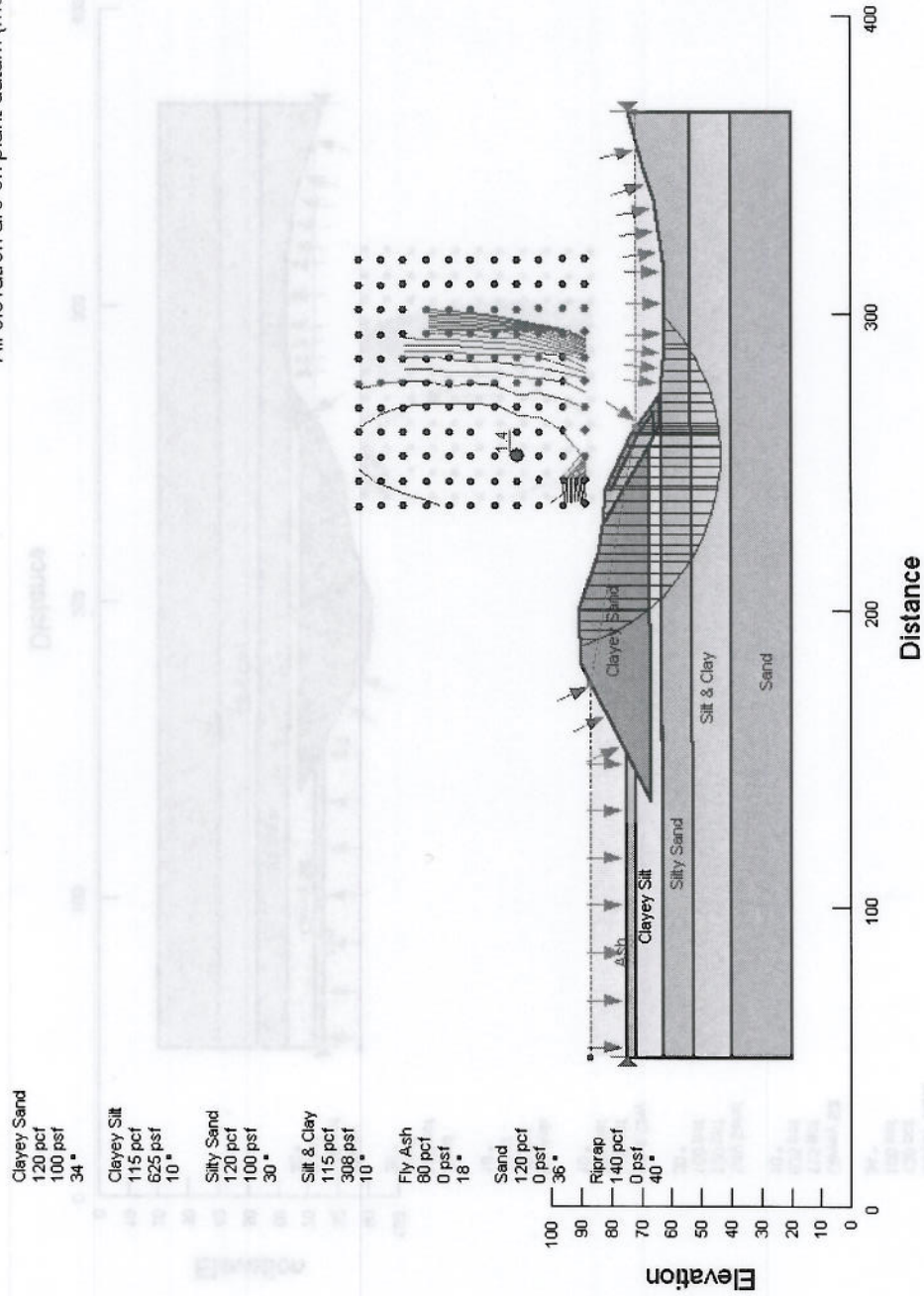
Page 47 of 90

CONFIDENTIAL BUSINESS INFORMATION

Plant Crist Ash Pond dike
 Section 4 - Discharge Canal South
 Steady State
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

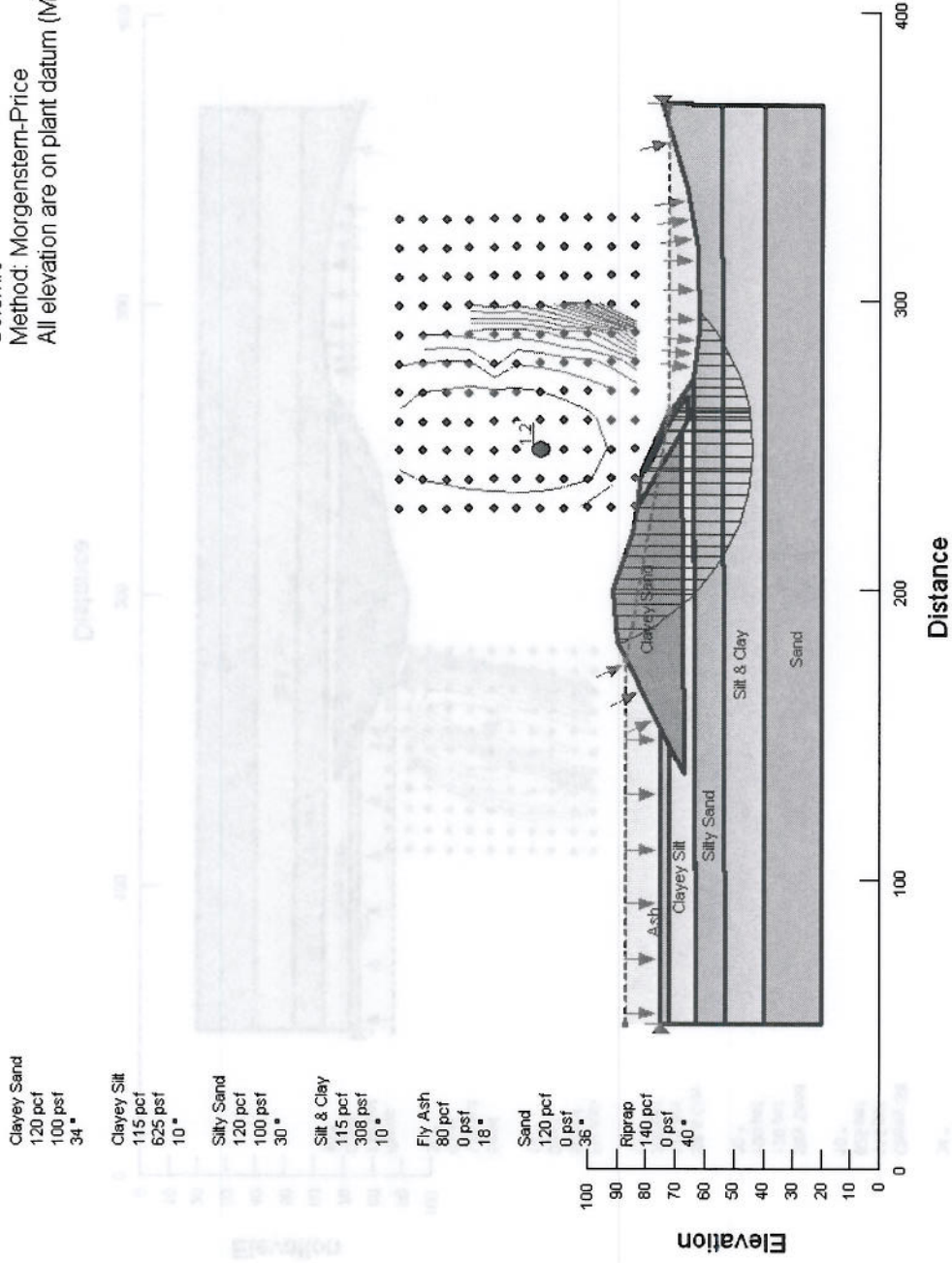


Plant Crist Ash Pond dike
 Section 4 - Discharge Canal South
 Steady State
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

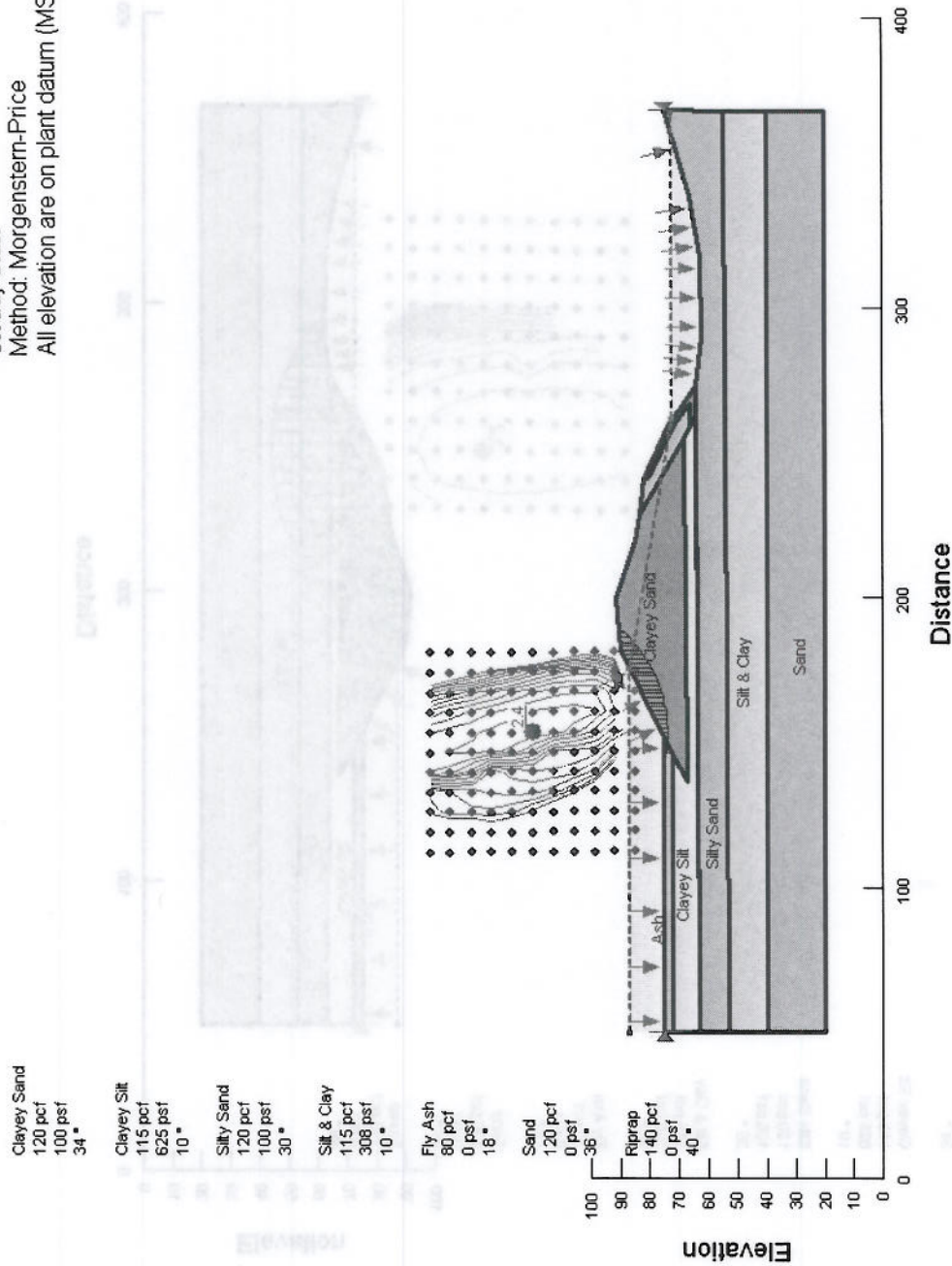


Plant Crist Ash Pond dike
Section 4 - Discharge Canal South
Seismic

Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)

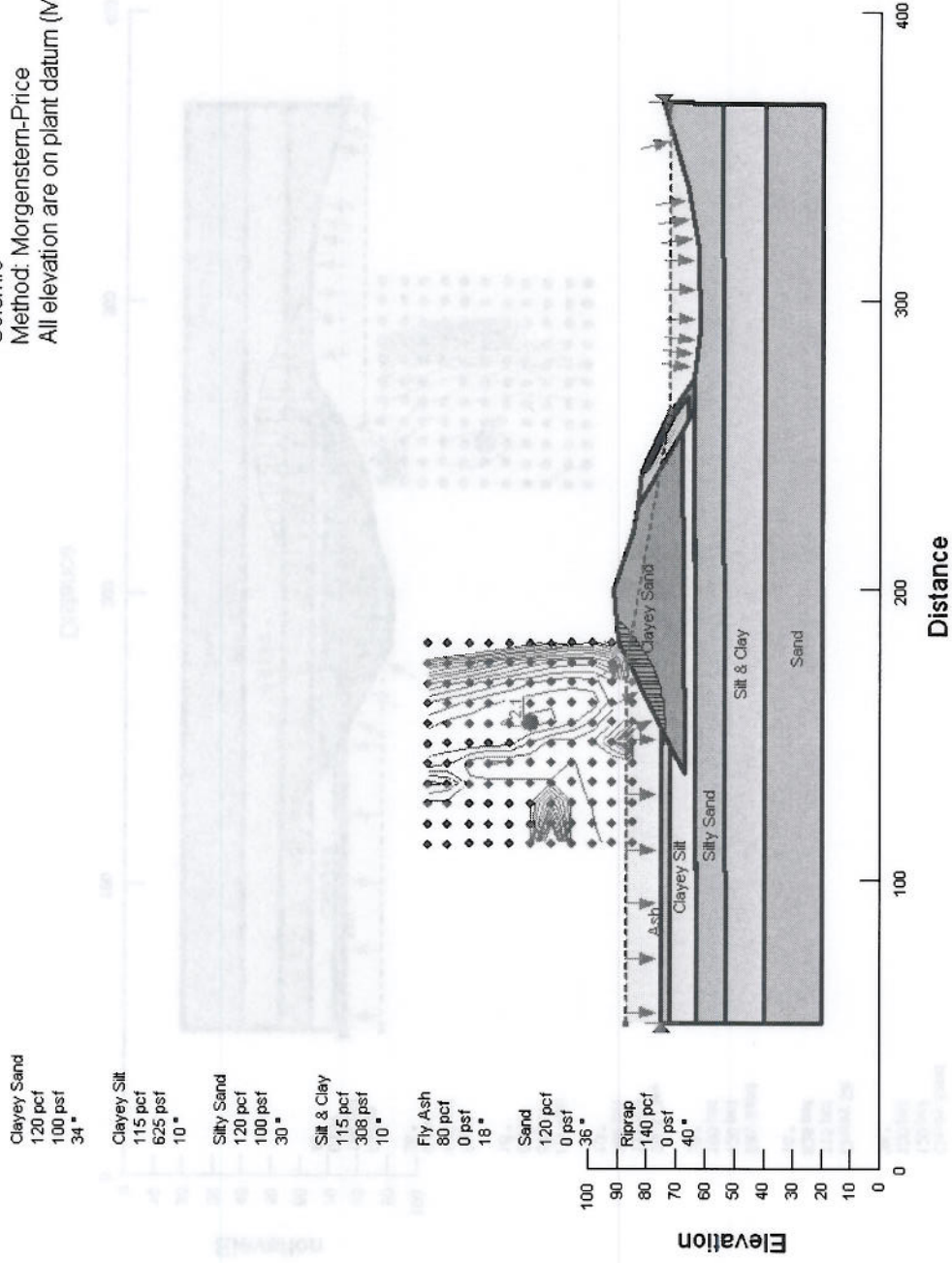


Plant Crist Ash Pond dike
 Section 4 - Discharge Canal South
 Steady State
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

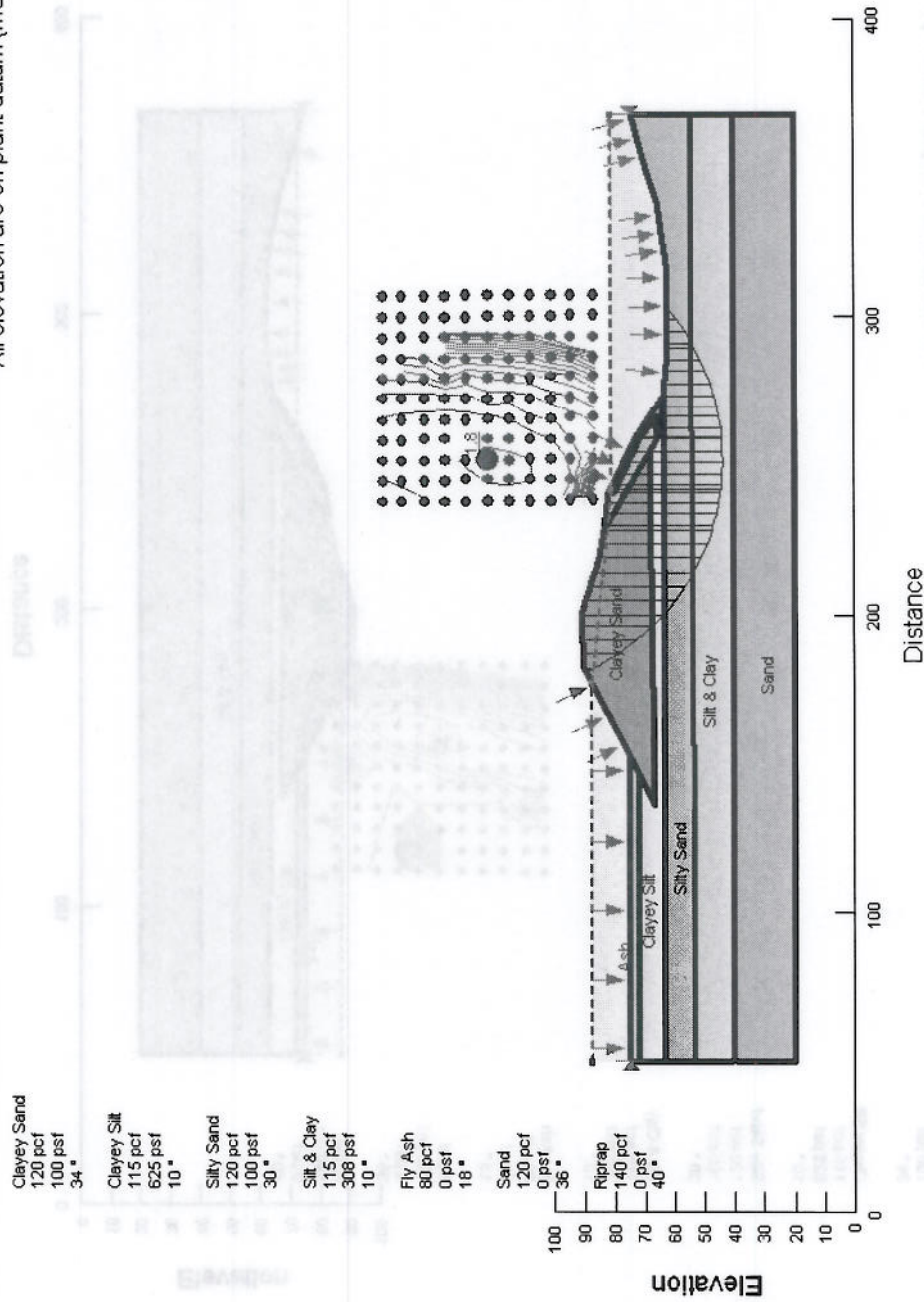


Plant Crist Ash Pond dike
Section 4 - Discharge Canal South
Seismic

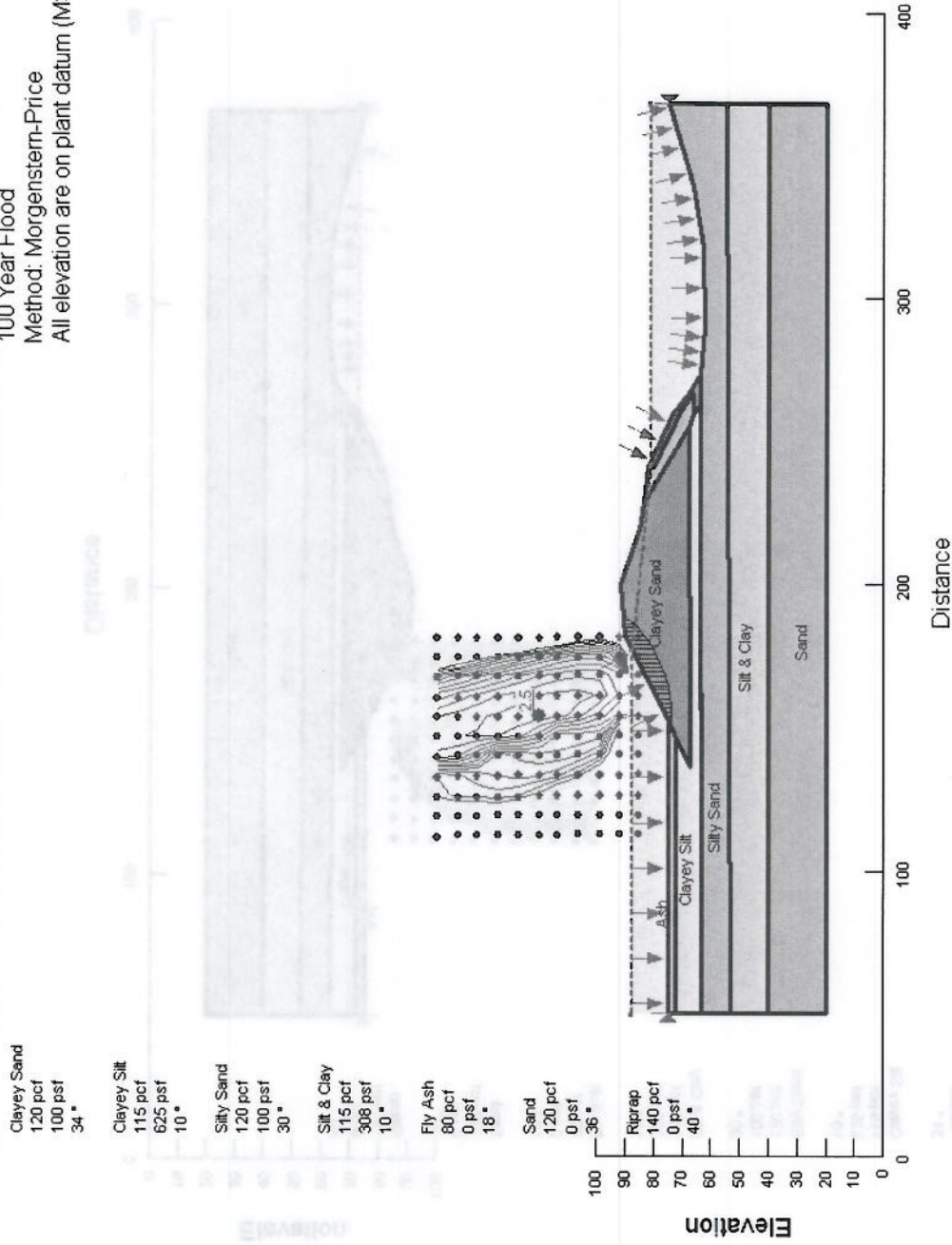
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)



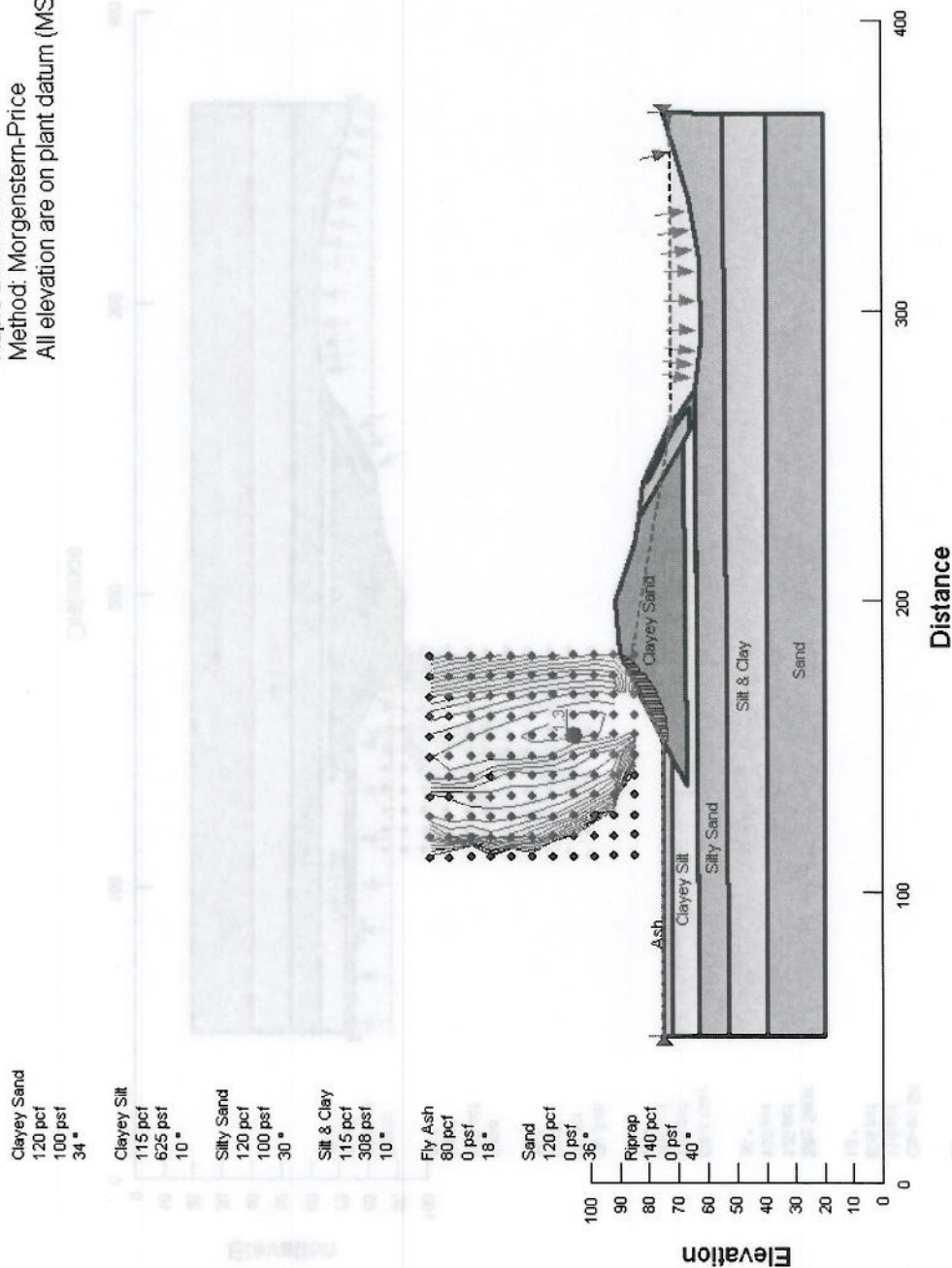
Plant Crist Ash Pond dike
 Section 4 - Discharge Canal South
 100 Year Flood
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



Plant Crist Ash Pond dike
 Section 4 - Discharge Canal South
 100 Year Flood
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



Plant Crist Ash Pond Dike
 Section 4 - Discharge Canal South
 Rapid Draw Down
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



SLOPE/W Analysis

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File Information

Created By: Hartsfield, Terri H.
Revision Number: 39
Last Edited By: Hartsfield, Terri H.
Date: 8/15/2012
Time: 12:38:40 PM
File Name: Crist Ash Pond Disc South.gsz
Directory: T:\ESEE MAJOR PROJECTS\PROJECTS\CRIST\2012\Attorney-Client Privilege EPA Sub\Slope Stability\Ash Pond\Sect 4 - Discharge S\
Last Solved Date: 8/15/2012
Last Solved Time: 12:38:44 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
 Apply Phreatic Correction: No
 Side Function
 Interslice force function option: Half-Sine
 PWP Conditions Source: Piezometric Line
 Use Staged Rapid Drawdown: No
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Grid and Radius
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Clayey Sand

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 34 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Clayey Silt

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 625 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silt & Clay

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 308 psf

Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fly Ash

Model: Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 0 psf
Phi: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sand

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 36 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Riprap

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Grid

Upper Left: (235.12413, 164.0137) ft
Lower Left: (236.18235, 88.77793) ft
Lower Right: (319.07563, 88.77793) ft
Grid Horizontal Increment: 10
Grid Vertical Increment: 10
Left Projection Angle: 0 °
Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (44.41235, 75.09635) ft
Upper Right Coordinate: (410.9588, 70.85019) ft
Lower Left Coordinate: (44.15109, 23.07379) ft
Lower Right Coordinate: (412.95051, 25.03184) ft

Number of Increments: 10
 Left Projection: No
 Left Projection Angle: 135 °
 Right Projection: No
 Right Projection Angle: 45 °

Slip Surface Limits

Left Coordinate: (50, 75) ft
 Right Coordinate: (368.2, 74.6) ft

Piezometric Lines

Piezometric Line 1

Coordinates

X (ft) Y (ft)

50 87.03
 176 87
 262 72
 368 72

Seismic Loads

Horz Seismic Load: 0
 Vert Seismic Load: 0

Regions

Material	Points	Area (ft ²)
Region 1 Fly Ash	12,16,14,13	297
Region 2 Sand	21,19,20,22	6360
Region 3 Silty Sand	17,18,7,9,8,6,5,25,23	3290.03
Region 4 Silt & Clay	18,19,20,7	4356.6
Region 5 Clayey Sand	15,12,16,11,10,1,2,26	1684.598
Region 6 Clayey Silt	13,17,27,31,26,15,12	1252
Region 7 Sand	31,30,29,28,3,2,26	147.0305
Region 8 Riprap	31,27,23,24,4,3,28,29,30	79.879

Points

X (ft) Y (ft)
 Point 1 219.3 84.7
 Point 2 228.7 83.1
 Point 3 241.01 82.1
 Point 4 259.9 73.2

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Point 5	317.6	62.8
Point 6	338.6	66
Point 7	368	54.4
Point 8	349.3	69.4
Point 9	368.2	74.6
Point 10	200	91.32
Point 11	182	90
Point 12	146	72
Point 13	50	72
Point 14	50	75
Point 15	136	67
Point 16	152	75
Point 17	50	63
Point 18	50	53
Point 19	50	40
Point 20	368	40
Point 21	50	20
Point 22	368	20
Point 23	273.4	63.9
Point 24	267	68
Point 25	290	62
Point 26	255	68
Point 27	263	64
Point 28	241	80
Point 29	260	71
Point 30	267	66
Point 31	259	66

Critical Slip Surfaces

Slip Surface FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1 392	1.4 (252.444, 111.349)	67.762	(187.988, 90.4391)	(299.161, 62.2655)

Slices of Slip Surface: 392

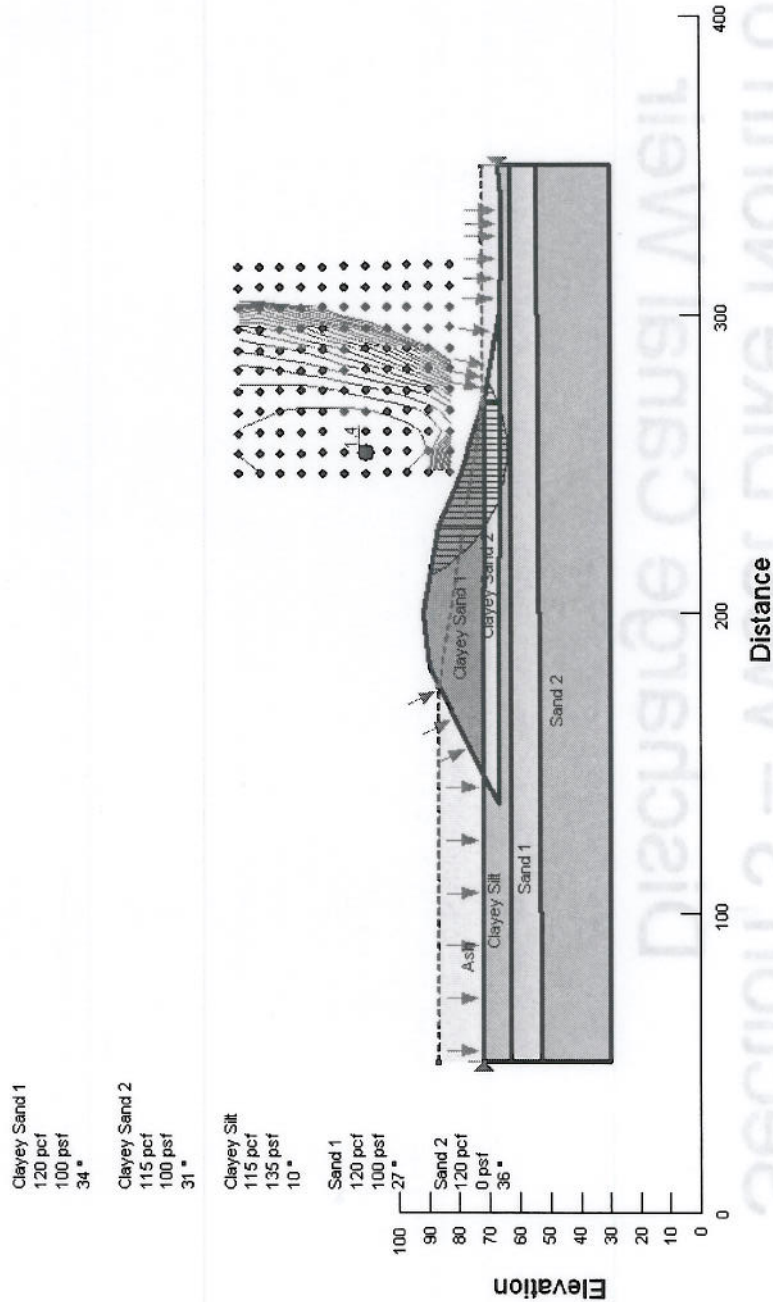
Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1 392	189.1035	87.479555	172.54007	77.526047	52.291979	100
2 392	191.849	81.239225	186.98173	586.56306	269.52101	100
3 392	195.1094	75.36127	518.27243	1180.1643	446.45169	100
4 392	198.3698	70.600735	779.84745	1677.6439	605.57132	100
5 392	200.3719	67.990735	920.88319	1946.8013	691.99047	100

6	392	202.54245	65.63434	1044.3417	2160.1944	196.75493	625
7	392	206.41335	61.70055	1247.6675	2482.9847	713.2107	100
8	392	210.5578	58.14781	1424.2515	2757.8082	769.92937	100
9	392	214.70225	55.12527	1567.7538	2987.5809	819.73758	100
10	392	218.03725	52.989765	1664.7281	3257.9962	880.93615	308
11	392	220.86665	51.419815	1731.8904	3384.2706	921.3592	308
12	392	224	49.869505	1794.5347	3537.2218	970.28275	308
13	392	227.13335	48.51362	1845.0398	3677.054	1000.03353	308
14	392	230.75	47.189415	1888.2973	3842.1673	1044.51999	308
15	392	234.85	45.94482	1921.334	4030.3852	1082.88263	308
16	392	238.955	44.97575	1937.1189	4198.6051	1115.76102	308
17	392	241.47435	44.48195	1940.5251	4314.3559	1142.57042	308
18	392	243.57135	44.190085	1935.9138	4286.3779	1144.45023	308
19	392	246.8367	43.838805	1922.2899	4228.8241	1140.70421	308
20	392	250.10205	43.64674	1898.7406	4149.3344	1136.84042	308
21	392	253.36735	43.61254	1865.3409	4045.4762	1128.41668	308
22	392	255.2464	43.64501	1842.8645	3976.9722	1119.30077	308
23	392	257.2464	43.779855	1812.6818	3893.0537	1109.82569	308
24	392	259.45	43.951285	1777.9739	3799.3029	1099.41485	308
25	392	259.95	44.00364	1769.2431	3777.9034	1094.18102	308
26	392	260.6971	44.09476	1755.4576	3721.5729	1086.67918	308
27	392	261.6971	44.222065	1736.5974	3657.1564	1078.64637	308
28	392	262.5	44.33886	1726.0715	3631.9297	1070.05422	308
29	392	265	44.79121	1697.8254	3525.5591	1055.27878	308
30	392	268.6	45.56146	1649.7587	3318.2725	1024.20401	308
31	392	271.8	46.431475	1595.4615	3082.4545	982.262197	308
32	392	275.3023	47.59057	1523.154	2834.4193	921.231145	308
33	392	279.1069	49.08725	1429.7574	2633.6047	842.2127076	308
34	392	282.9115	50.8601	1319.1315	2385.9155	748.18810281	308
35	392	286.71615	52.934405	1189.6989	2090.7634	648.15888198	308
36	392	289.30925	54.498465	1092.0718	1936.8454	587.48773027	100
37	392	292.29035	56.61376	960.09274	1603.2373	507.3713197	100
38	392	296.871	60.273325	731.74693	1035.6793	375.17547542	100

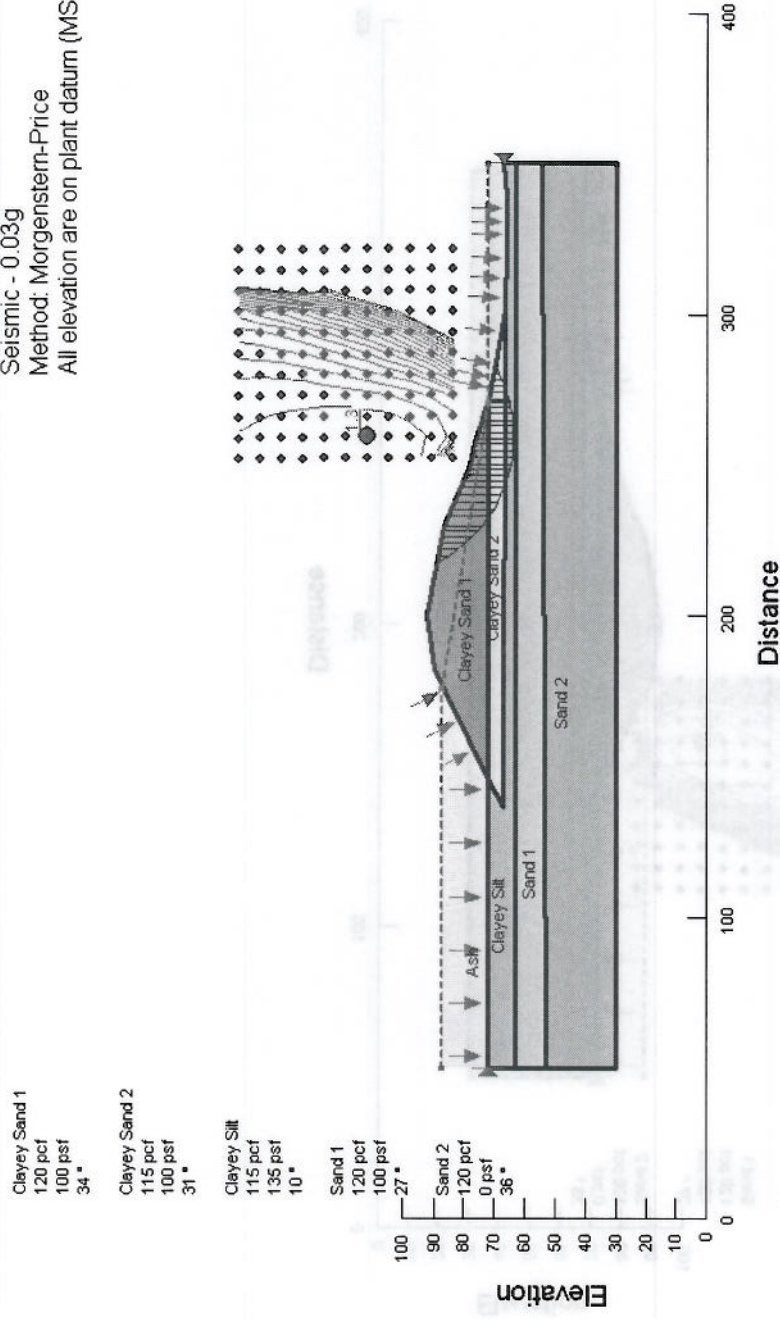
Section 3 – West Dike North of the Discharge Canal Weir



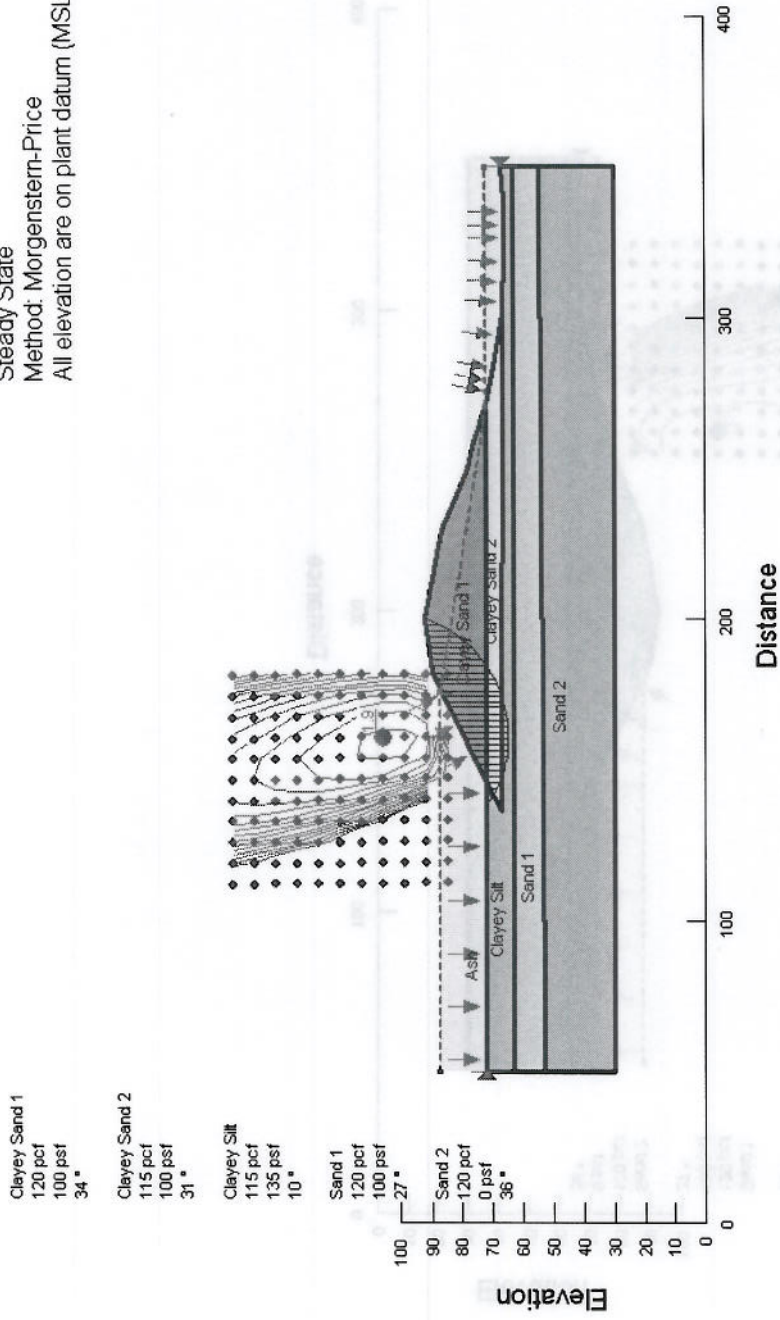
Plant Crist Ash Pond dike
 Section 5 - Discharge Canal North
 Steady State
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



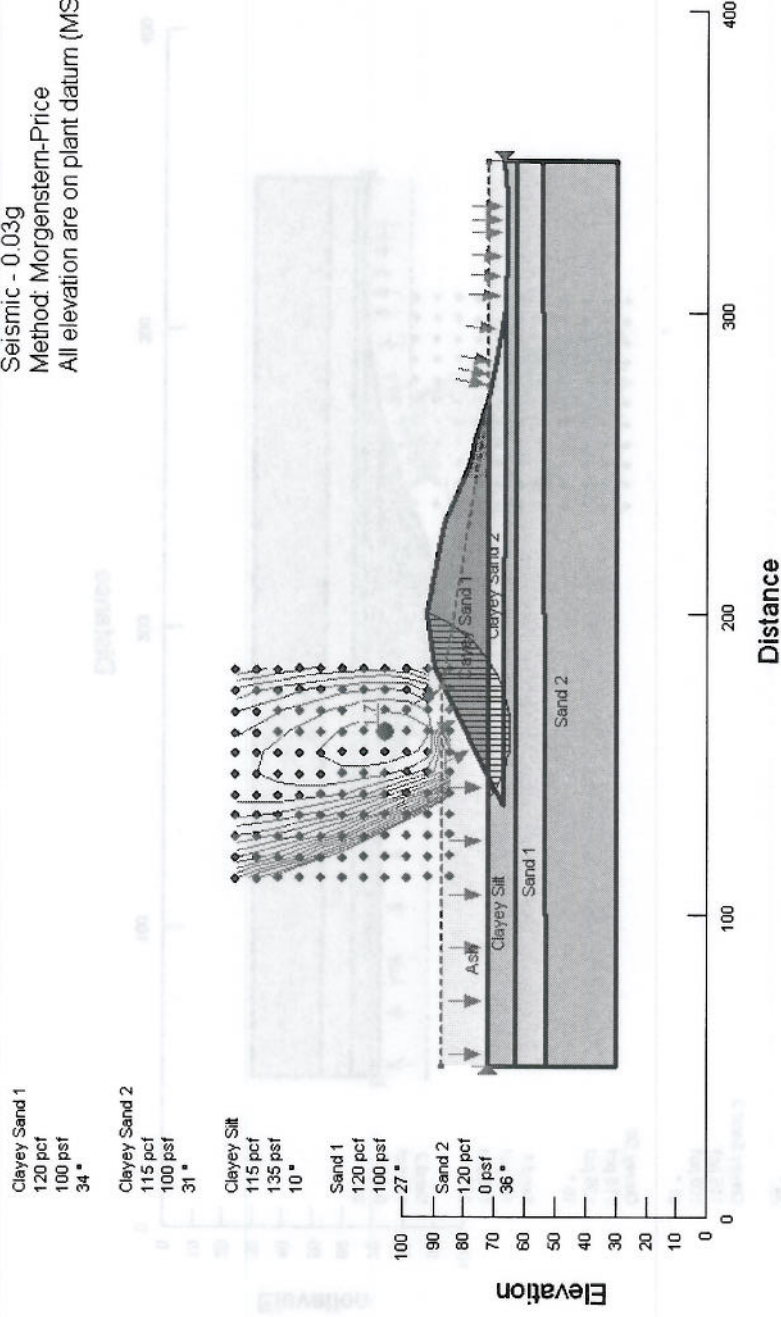
Plant Crist Ash Pond dike
 Section 5 - Discharge Canal North
 Seismic - 0.03g
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



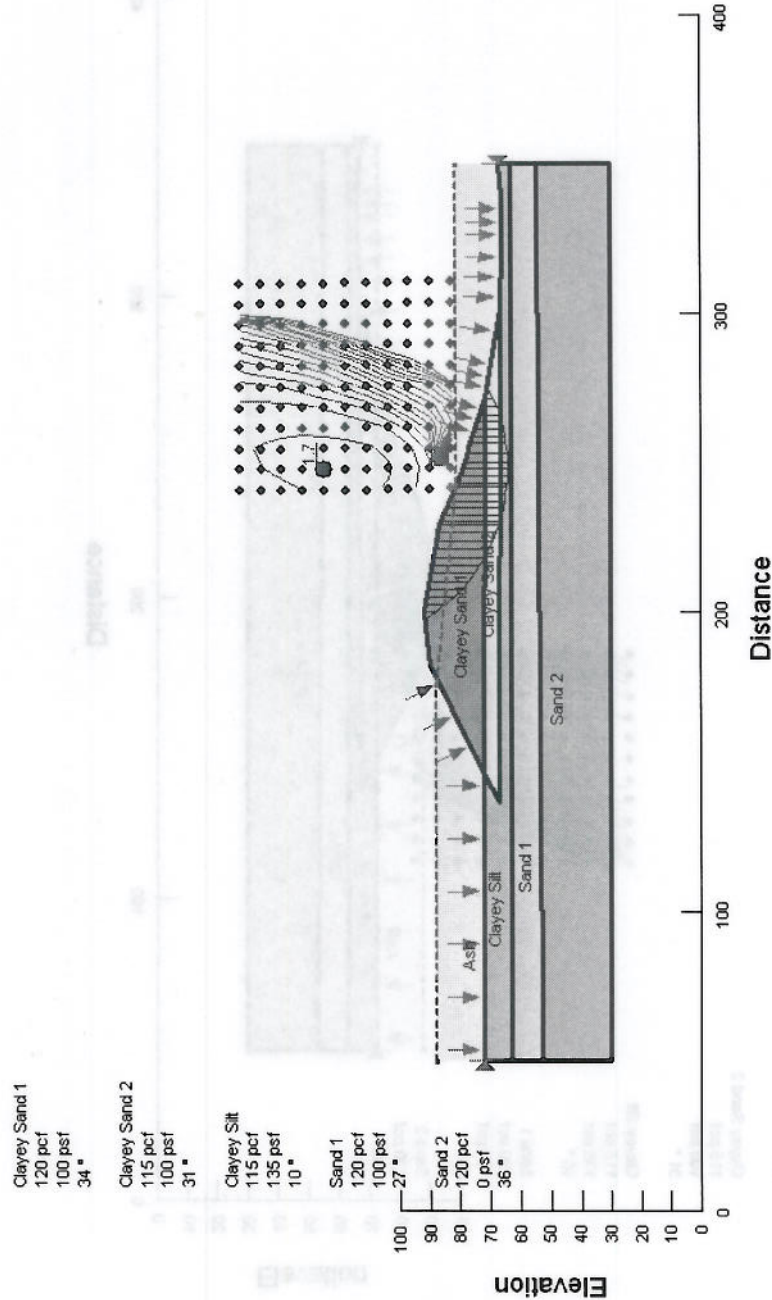
Plant Crist Ash Pond dike
 Section 5 - Discharge Canal North
 Steady State
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



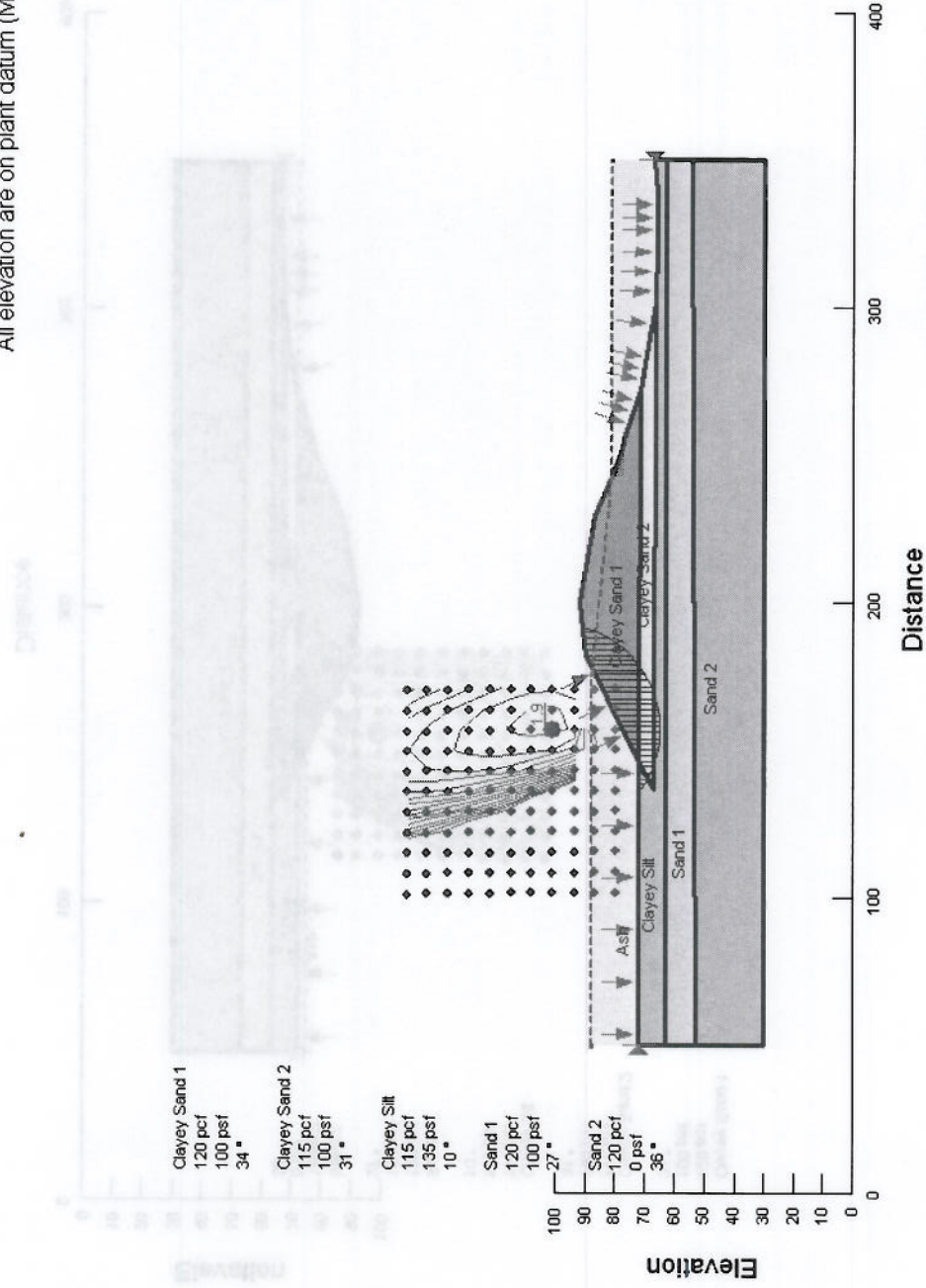
Plant Crist Ash Pond dike
 Section 5 - Discharge Canal North
 Seismic - 0.03g
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



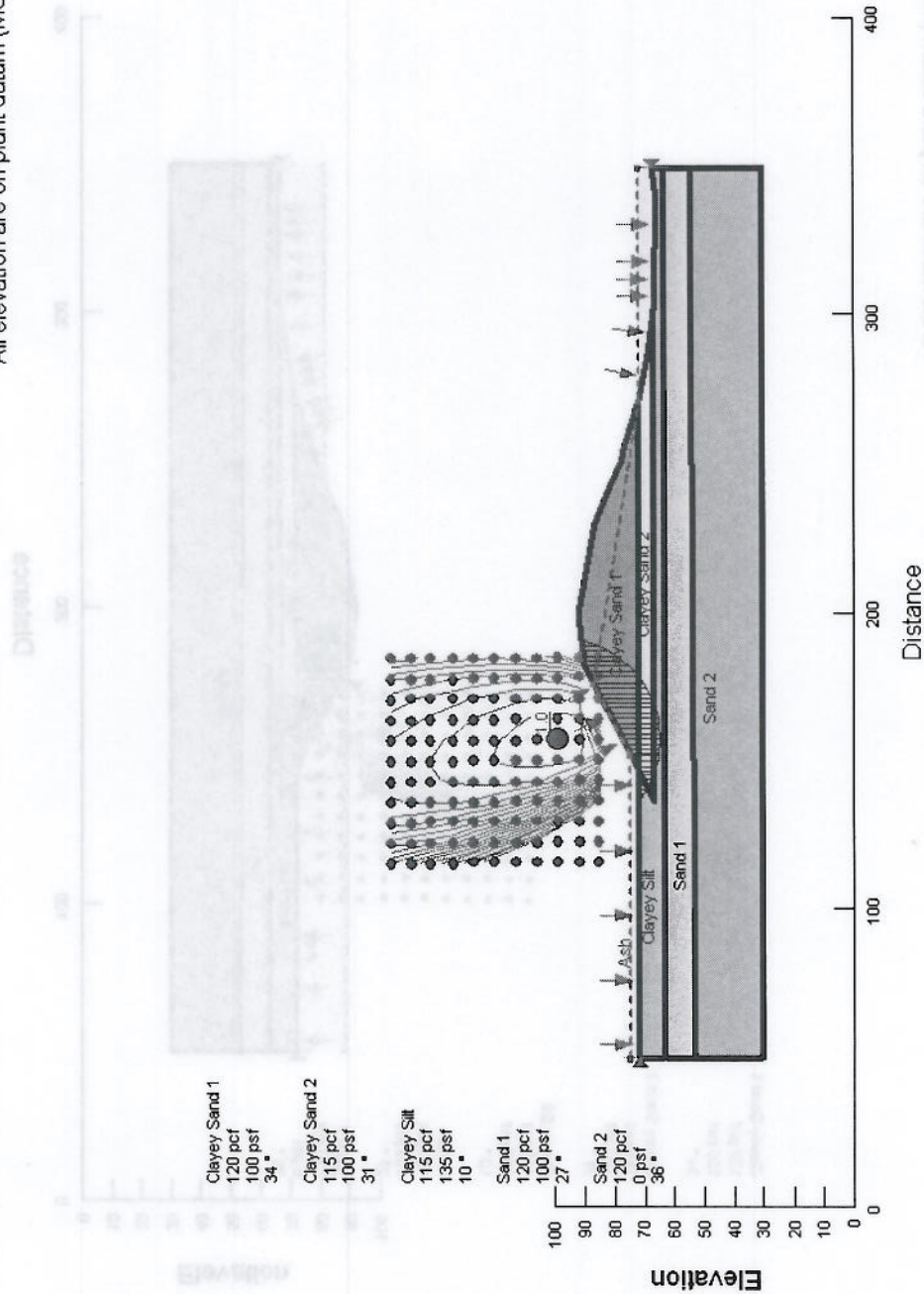
Plant Crist Ash Pond dike
 Section 5 - Discharge Canal North
 100 Year Flood
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



Plant Crist Ash Pond dike
 Section 5 - Discharge Canal North
 100 Year Flood
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



Plant Crist Ash Pond dike
 Section 5 - Discharge Canal North
 Rapid Draw Down
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



SLOPE/W Analysis

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File Information

Created By: Hartsfield, Terri H.
Revision Number: 44
Last Edited By: Hartsfield, Terri H.
Date: 8/15/2012
Time: 1:51:45 PM
File Name: Crist Ash Pond Disc North.gsz
Directory: T:\ESEE MAJOR PROJECTS\PROJECTS\CRIST\2012\Attorney-Client Privilege EPA Sub\Slope Stability\Ash Pond\Sect 4 - Discharge N\
Last Solved Date: 8/15/2012
Last Solved Time: 1:51:53 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
 Apply Phreatic Correction: No
 Side Function
 Interslice force function option: Half-Sine
 PWP Conditions Source: Piezometric Line
 Use Staged Rapid Drawdown: No
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Grid and Radius
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Clayey Sand 1

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 34 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Clayey Sand 2

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 100 psf
Phi: 31 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Clayey Silt

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 135 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sand 1

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf

Phi: 27 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Sand 2

Model: Mohr-Coulomb

Unit Weight: 120 pcf

Cohesion: 0 psf

Phi: 36 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Slip Surface Grid

Upper Left: (112.03625, 154.96093) ft

Lower Left: (112.91943, 84.78302) ft

Lower Right: (182.10104, 84.78302) ft

Grid Horizontal Increment: 10

Grid Vertical Increment: 10

Left Projection Angle: 0 °

Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (40.41235, 81.09635) ft

Upper Right Coordinate: (406.9588, 76.85019) ft

Lower Left Coordinate: (40.15109, 29.07379) ft

Lower Right Coordinate: (408.95051, 31.03184) ft

Number of Increments: 10

Left Projection: No

Left Projection Angle: 135 °

Right Projection: No

Right Projection Angle: 45 °

Slip Surface Limits

Left Coordinate: (50, 72) ft

Right Coordinate: (350, 67.2) ft

Piezometric Lines**Piezometric Line 1****Coordinates**

X (ft) Y (ft)

50 87.03

176 87.03

271 72

350 72

Seismic Loads

Horz Seismic Load: 0

Vert Seismic Load: 0

Regions

Material	Points	Area (ft²)
Region 1 Sand 2	17,18,19,6	7110
Region 2	13,15,11,12	297
Region 3 Clayey Silt	14,11,12,16,23,8,7,5,4	1606.8705
Region 4 Sand 1	17,16,23,6	2790
Region 5 Clayey Sand 2	14,11,20,22,4	721.1455
Region 6 Clayey Sand 1	11,15,10,9,1,2,3,21,20	1470.8655

Points

	X (ft)	Y (ft)
Point 1	229.7	86.6
Point 2	242.3	81.4
Point 3	250.4	78.1
Point 4	301.69	66.8
Point 5	322.4	66.1
Point 6	350	54.4
Point 7	339	66
Point 8	350	67.2
Point 9	200	91.93
Point 10	182	90
Point 11	146	72
Point 12	50	72
Point 13	50	75
Point 14	136	67
Point 15	152	75
Point 16	50	63
Point 17	50	53
Point 18	50	30
Point 19	350	30
Point 20	271.8	71.8
Point 21	256.8	76.5
Point 22	286.9	68.9

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8/17/2012

Point 23 350 63

Critical Slip Surfaces

Slip Surface FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1 444	1.9 (161.082, 105.836)	41.13	(199.781, 91.9065)	(137.698, 72)

Slices of Slip Surface: 444

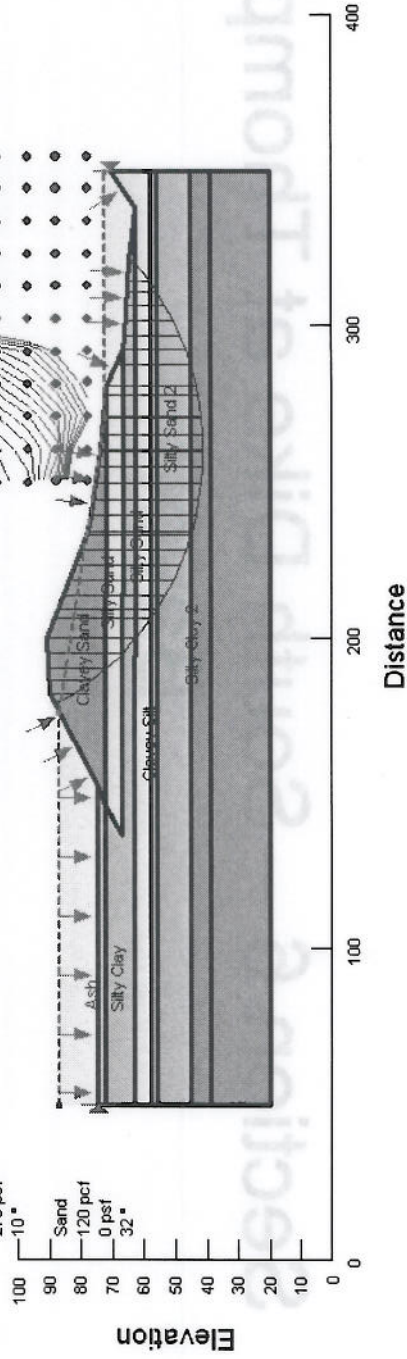
Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1 444	138.6286	71.393425	975.7022	1065.1922	15.779503	135
2 444	140.4896	70.24845	1047.1825	1209.1784	28.56424	135
3 444	142.56505	69.13243	1116.79	1370.8009	152.62512	100
4 444	144.855	68.062955	1183.5253	1509.5695	195.90713	100
5 444	146.7892	67.27856	1232.4828	1658.8351	256.17826	100
6 444	148.6838	66.636415	1272.5484	1765.1019	86.850467	135
7 444	150.8946	66.00411	1312.0335	1906.8745	104.88653	135
8 444	153.0223	65.51706	1342.3945	2022.1766	119.86392	135
9 444	155.06695	65.16154	1364.5774	2113.4403	132.04473	135
10 444	157.1116	64.9112	1380.2239	2186.6079	142.18727	135
11 444	159.1562	64.764105	1389.3835	2242.4384	150.41658	135
12 444	161.20085	64.719145	1392.1746	2281.8653	156.87649	135
13 444	163.2455	64.775985	1388.6399	2305.9179	161.74085	135
14 444	165.2901	64.93505	1378.7389	2315.575	165.18947	135
15 444	167.33475	65.197545	1362.3551	2311.7934	167.41157	135
16 444	169.3794	65.5655	1339.3933	2295.4253	168.57424	135
17 444	171.424	66.041845	1309.6439	2267.345	168.86854	135
18 444	173.46865	66.63054	1272.9345	2227.9968	168.40325	135
19 444	175.2455	67.230355	1235.488	2139.0075	542.88926	100
20 444	177.0152	67.933945	1181.5675	2105.0643	554.8929	100
21 444	179.0228	68.842005	1105.0803	2080.3725	586.01468	100
22 444	181.0076	69.873145	1021.1524	2041.2912	612.96123	100
23 444	183.18825	71.180995	918.02353	1933.4261	610.11541	100
24 444	185.3339	72.63841	805.87041	1752.0829	638.22837	100
25 444	187.24875	74.127925	694.01787	1585.3656	601.22164	100
26 444	189.1636	75.813535	569.96987	1399.7139	559.6694	100
27 444	191.0784	77.730885	431.41418	1190.7988	512.21141	100
28 444	192.9932	79.93216	275.14384	952.33111	456.76858	100
29 444	194.908	82.49934	96.04634	674.75031	390.34075	100
30 444	196.8443	85.618635	-117.71395	381.47877	257.31068	100

31 444 198.8021 89.628355 -387.2437 77.555614 52.311922 100

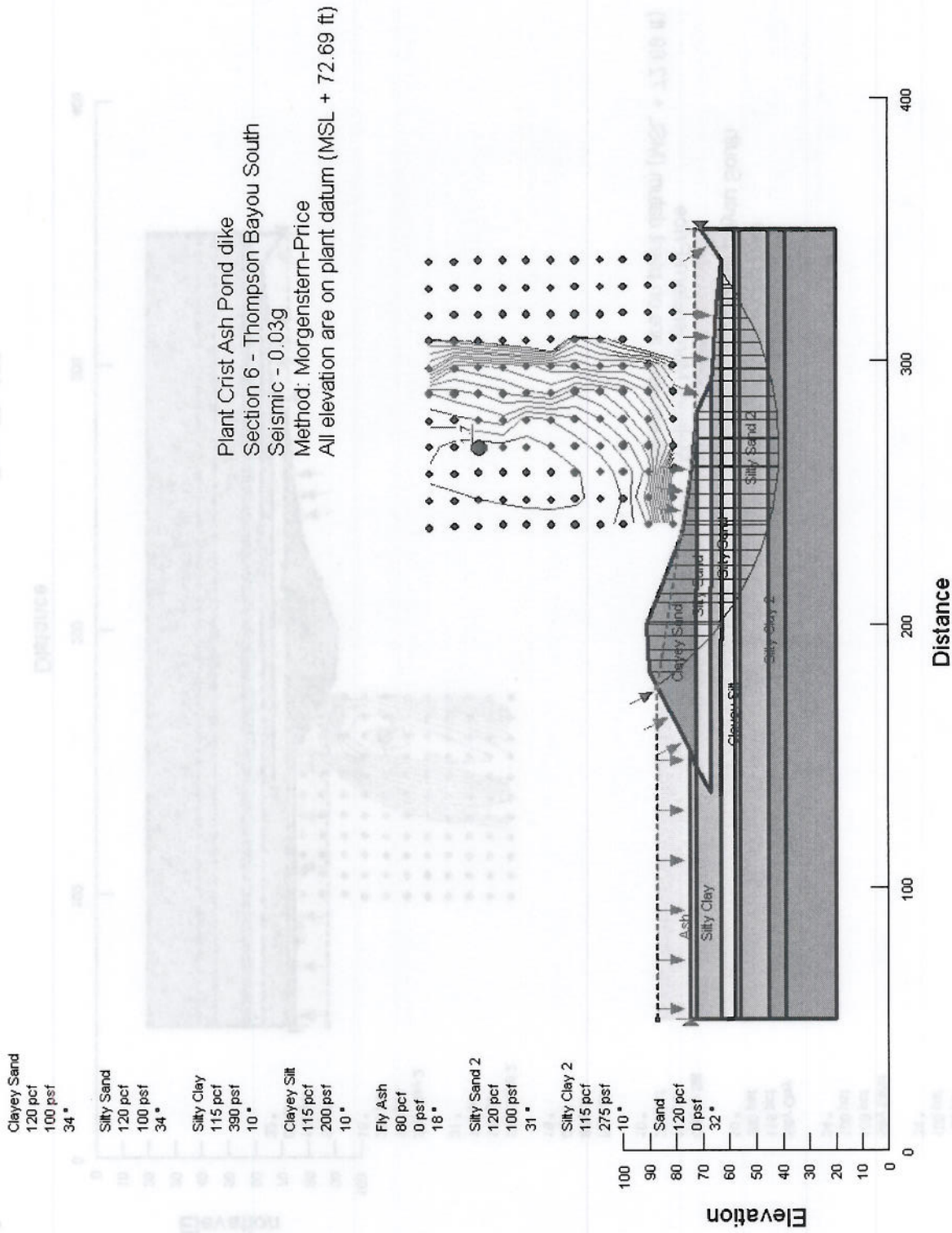
Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	198.8021	89.628355	-387.2437	77.555614	52.311922	100
2	198.8021	89.628355	-387.2437	77.555614	52.311922	100
3	198.8021	89.628355	-387.2437	77.555614	52.311922	100
4	198.8021	89.628355	-387.2437	77.555614	52.311922	100
5	198.8021	89.628355	-387.2437	77.555614	52.311922	100
6	198.8021	89.628355	-387.2437	77.555614	52.311922	100
7	198.8021	89.628355	-387.2437	77.555614	52.311922	100
8	198.8021	89.628355	-387.2437	77.555614	52.311922	100
9	198.8021	89.628355	-387.2437	77.555614	52.311922	100
10	198.8021	89.628355	-387.2437	77.555614	52.311922	100
11	198.8021	89.628355	-387.2437	77.555614	52.311922	100
12	198.8021	89.628355	-387.2437	77.555614	52.311922	100
13	198.8021	89.628355	-387.2437	77.555614	52.311922	100
14	198.8021	89.628355	-387.2437	77.555614	52.311922	100
15	198.8021	89.628355	-387.2437	77.555614	52.311922	100
16	198.8021	89.628355	-387.2437	77.555614	52.311922	100
17	198.8021	89.628355	-387.2437	77.555614	52.311922	100
18	198.8021	89.628355	-387.2437	77.555614	52.311922	100
19	198.8021	89.628355	-387.2437	77.555614	52.311922	100
20	198.8021	89.628355	-387.2437	77.555614	52.311922	100
21	198.8021	89.628355	-387.2437	77.555614	52.311922	100
22	198.8021	89.628355	-387.2437	77.555614	52.311922	100
23	198.8021	89.628355	-387.2437	77.555614	52.311922	100
24	198.8021	89.628355	-387.2437	77.555614	52.311922	100
25	198.8021	89.628355	-387.2437	77.555614	52.311922	100
26	198.8021	89.628355	-387.2437	77.555614	52.311922	100
27	198.8021	89.628355	-387.2437	77.555614	52.311922	100
28	198.8021	89.628355	-387.2437	77.555614	52.311922	100
29	198.8021	89.628355	-387.2437	77.555614	52.311922	100
30	198.8021	89.628355	-387.2437	77.555614	52.311922	100

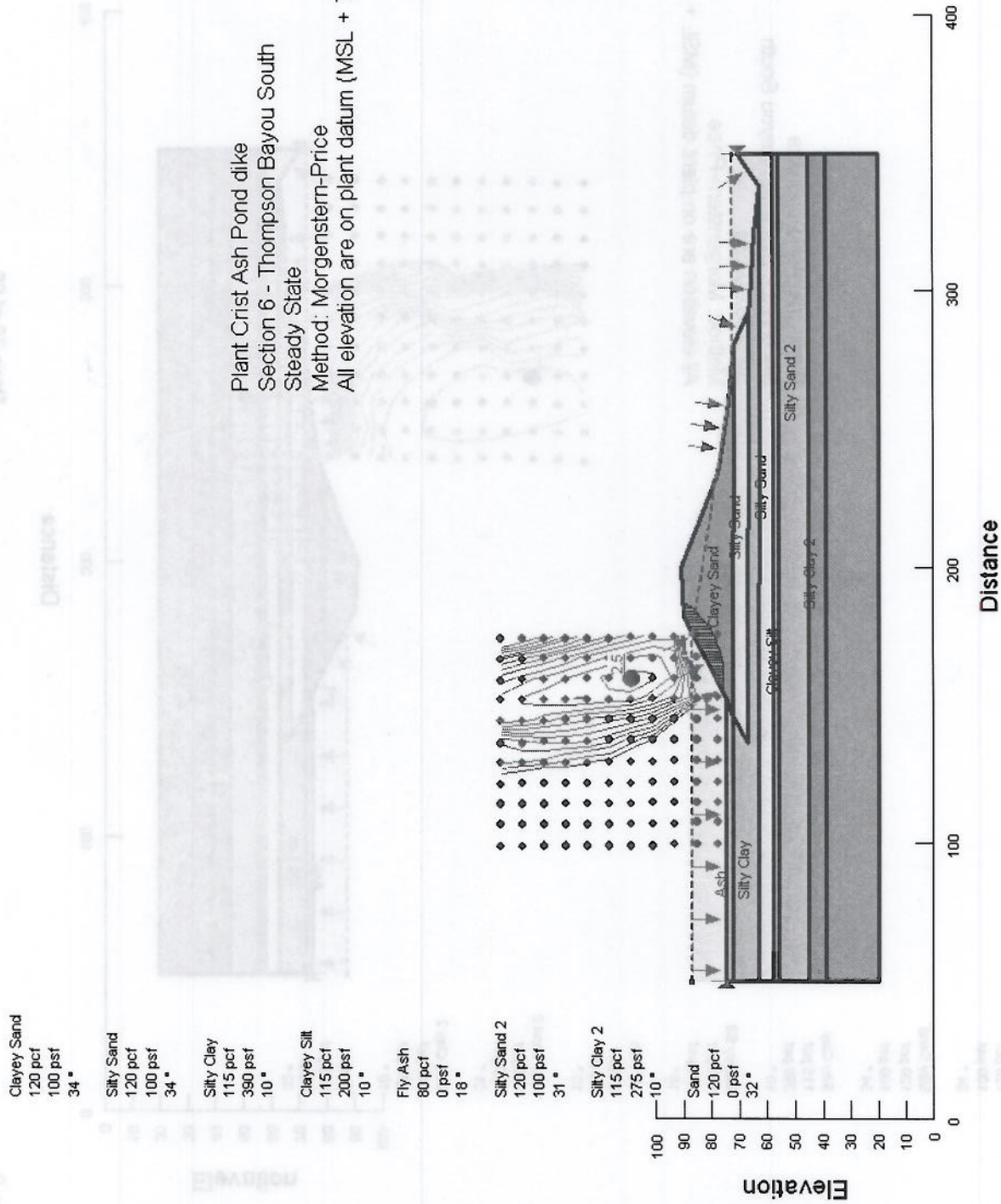
Section 6 – South Dike at Thompson Bayou

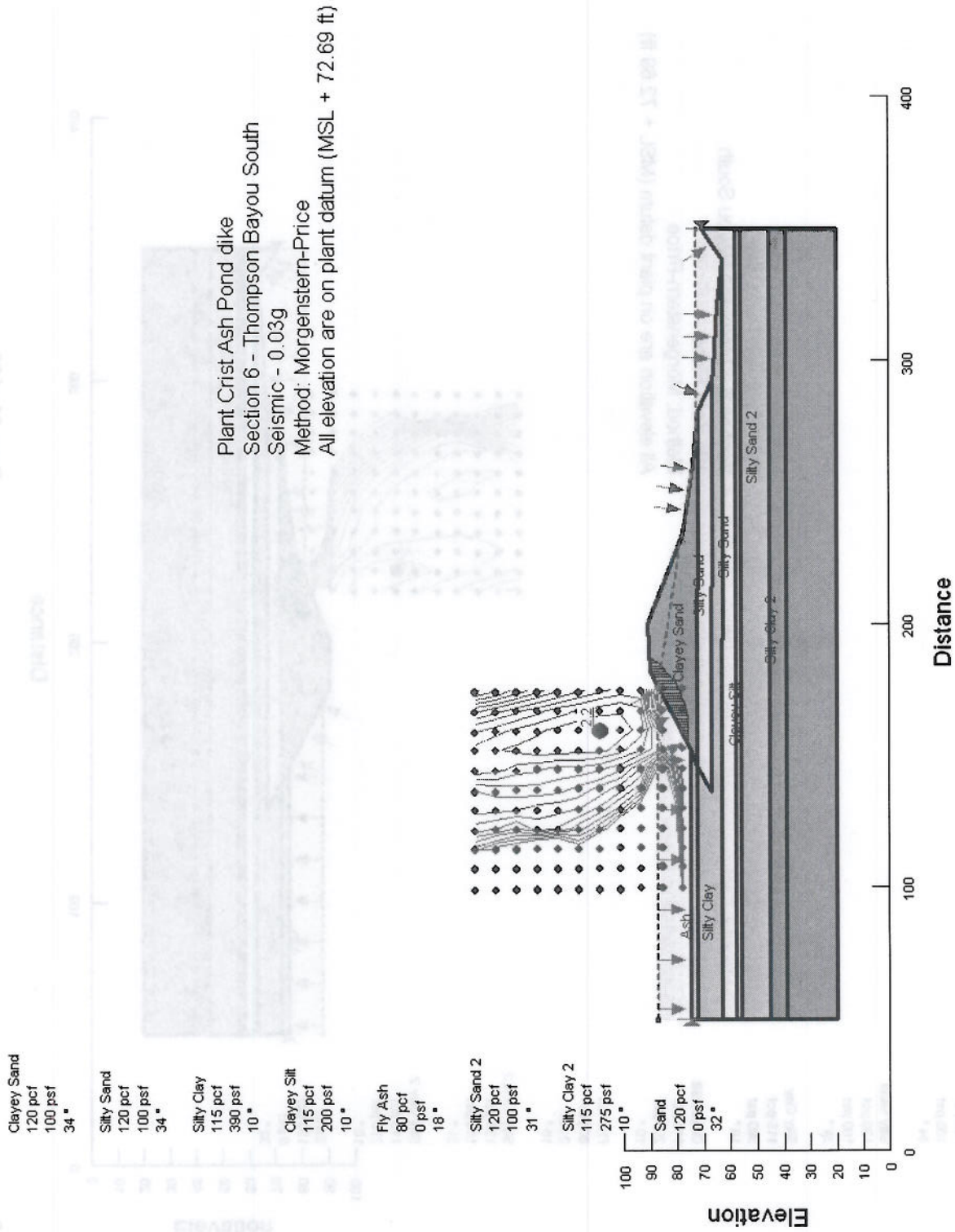
Clayey Sand
120 pcf
100 psf
34°
Silty Sand
120 pcf
100 psf
34°
Silty Clay
115 pcf
350 psf
10°
Clayey Silt
115 pcf
200 psf
10°
Fly Ash
80 pcf
0 psf
18°
Silty Sand 2
120 pcf
100 psf
31°
Silty Clay 2
115 pcf
275 psf
10°

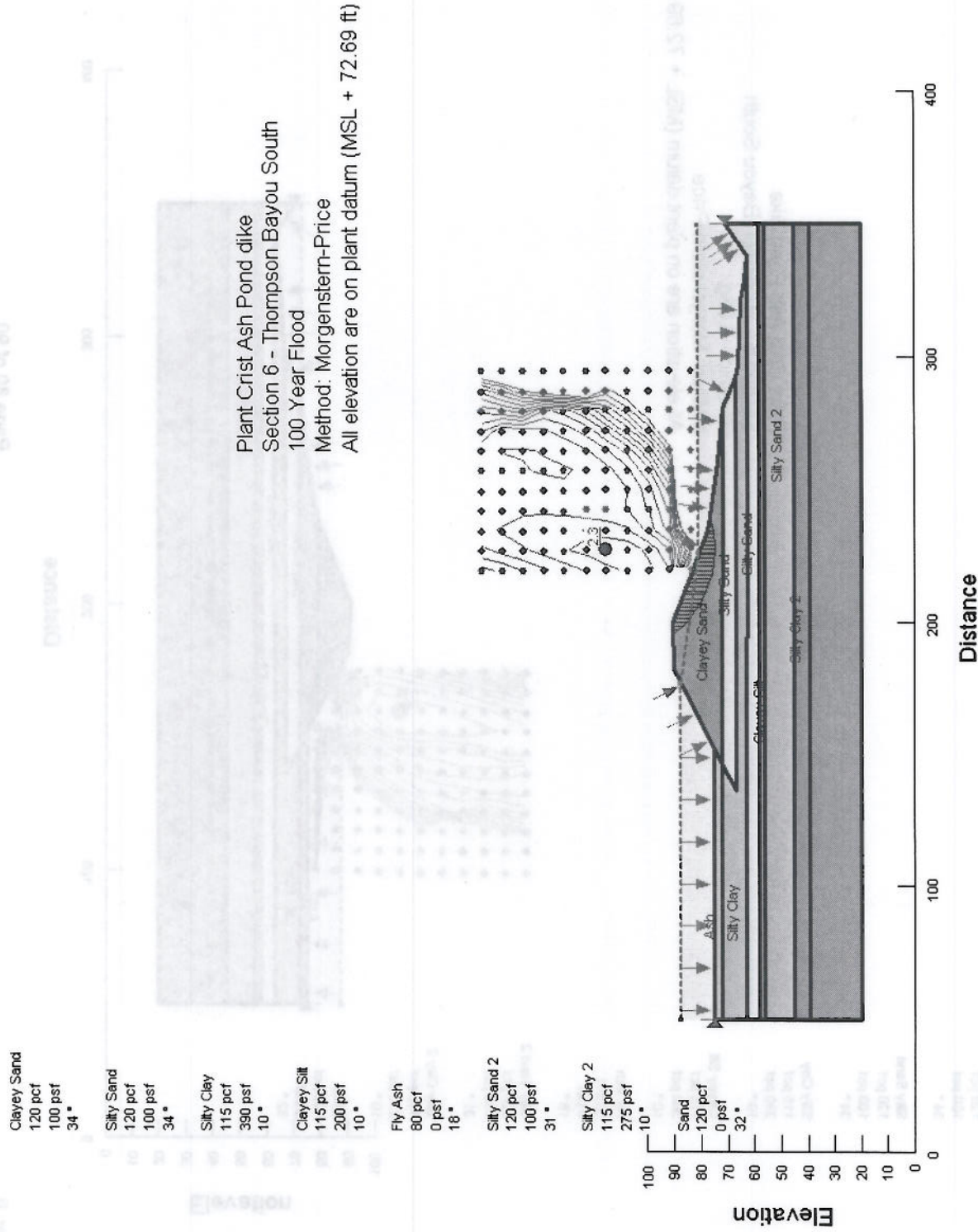


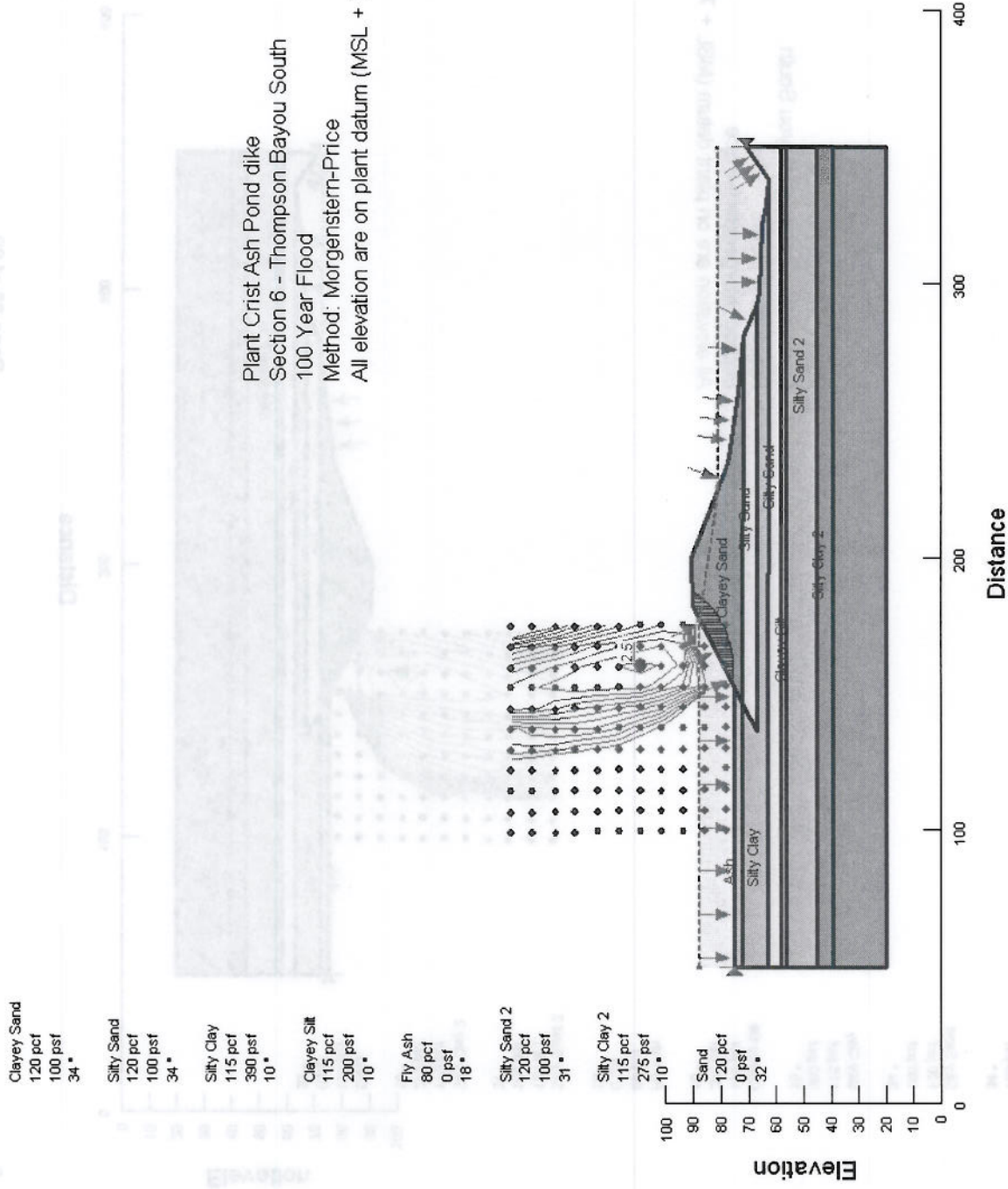
Plant Crist Ash Pond dike
 Section 6 - Thompson Bayou South
 Steady State
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

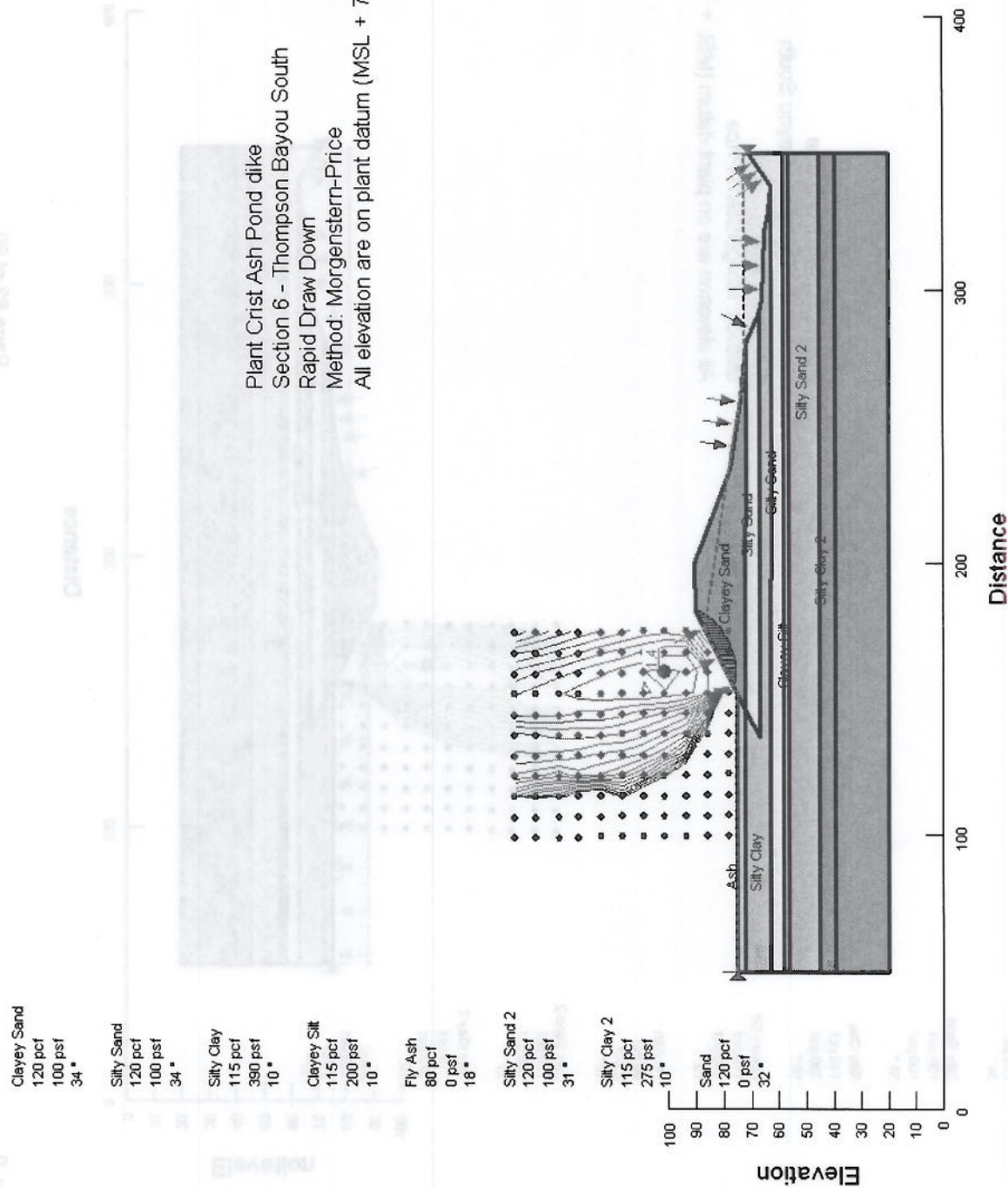












SLOPE/W Analysis

Report generated using GeoStudio 2007, version 7.17. Copyright © 1991-2010 GEO-SLOPE International Ltd.

File Information

Created By: Hartsfield, Terri H.
Revision Number: 53
Last Edited By: Hartsfield, Terri H.
Date: 8/15/2012
Time: 2:45:22 PM
File Name: Crist Ash Pond Bayou.gsz
Directory: T:\ESEE MAJOR PROJECTS\PROJECTS\CRIST\2012\Attorney-Client Privilege EPA Sub\Slope Stability\Ash Pond\Sect 3 - Bayou\
Last Solved Date: 8/15/2012
Last Solved Time: 2:45:27 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
 Apply Phreatic Correction: No
 Side Function
 Interslice force function option: Half-Sine
 PWP Conditions Source: Piezometric Line
 Use Staged Rapid Drawdown: No
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Grid and Radius
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)

FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30

Optimization Tolerance: 0.01

Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 2000

Optimization Convergence Tolerance: 1e-007

Starting Optimization Points: 8

Ending Optimization Points: 16

Complete Passes per Insertion: 1

Driving Side Maximum Convex Angle: 5 °

Resisting Side Maximum Convex Angle: 1 °

Materials

Clayey Sand

Model: Mohr-Coulomb

Unit Weight: 120 pcf

Cohesion: 100 psf

Phi: 34 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Silty Sand

Model: Mohr-Coulomb

Unit Weight: 120 pcf

Cohesion: 100 psf

Phi: 34 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Silty Clay

Model: Mohr-Coulomb

Unit Weight: 115 pcf

Cohesion: 390 psf

Phi: 10 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Clayey Silt

Model: Mohr-Coulomb

Unit Weight: 115 pcf

Cohesion: 200 psf
 Phi: 10 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Fly Ash

Model: Mohr-Coulomb
 Unit Weight: 80 pcf
 Cohesion: 0 psf
 Phi: 18 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Silty Sand 2

Model: Mohr-Coulomb
 Unit Weight: 120 pcf
 Cohesion: 100 psf
 Phi: 31 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Silty Clay 2

Model: Mohr-Coulomb
 Unit Weight: 115 pcf
 Cohesion: 275 psf
 Phi: 10 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Sand

Model: Mohr-Coulomb
 Unit Weight: 120 pcf
 Cohesion: 0 psf
 Phi: 32 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Grid

Upper Left: (99.08672, 155.84778) ft
 Lower Left: (100.04696, 77.76695) ft
 Lower Right: (175.26482, 77.76695) ft

Grid Horizontal Increment: 10

Grid Vertical Increment: 10

Left Projection Angle: 0 °

Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (44.35387, 82.09635) ft

Upper Right Coordinate: (351.30105, 77.85019) ft

Lower Left Coordinate: (44.13509, 30.07379) ft

Lower Right Coordinate: (352.96891, 32.03184) ft

Number of Increments: 10

Left Projection: No

Left Projection Angle: 135 °

Right Projection: No

Right Projection Angle: 45 °

Slip Surface Limits

Left Coordinate: (50, 75) ft

Right Coordinate: (350, 70.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	50	87.03
	176	87.03
	271	72
	350	72

Seismic Loads

Horz Seismic Load: 0

Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Clayey Silt	17,18,19,6	600
Region 2	Fly Ash	13,15,11,12	297
Region 3	Clayey Sand	11,15,10,9,1,2,3,21,20	1200.28
Region 4	Silty Sand	14,11,20,22	727.525
Region 5	Silty Clay	12,11,14,22,4,5,7,8,16	1523.365

Region 6	Silty Sand	16,17,6,23,8	1500.43
Region 7	Silty Sand 2	18,19,25,24	3300
Region 8	Silty Clay 2	24,25,27,26	1800
Region 9	Sand	26,27,29,28	5700

Points

	X (ft)	Y (ft)
Point 1	234.3	77.7
Point 2	239.3	76.7
Point 3	260.3	73.7
Point 4	296.8	65.7
Point 5	321.3	64.7
Point 6	350	58
Point 7	329	63.7
Point 8	338.2	62.7
Point 9	200	90.7
Point 10	182	90
Point 11	146	72
Point 12	50	72
Point 13	50	75
Point 14	136	67
Point 15	152	75
Point 16	50	63
Point 17	50	58
Point 18	50	56
Point 19	350	56
Point 20	280.8	71.7
Point 21	270.3	72.7
Point 22	292.3	66.7
Point 23	350	70.7
Point 24	50	45
Point 25	350	45
Point 26	50	39
Point 27	350	39
Point 28	50	20
Point 29	350	20

Critical Slip Surfaces

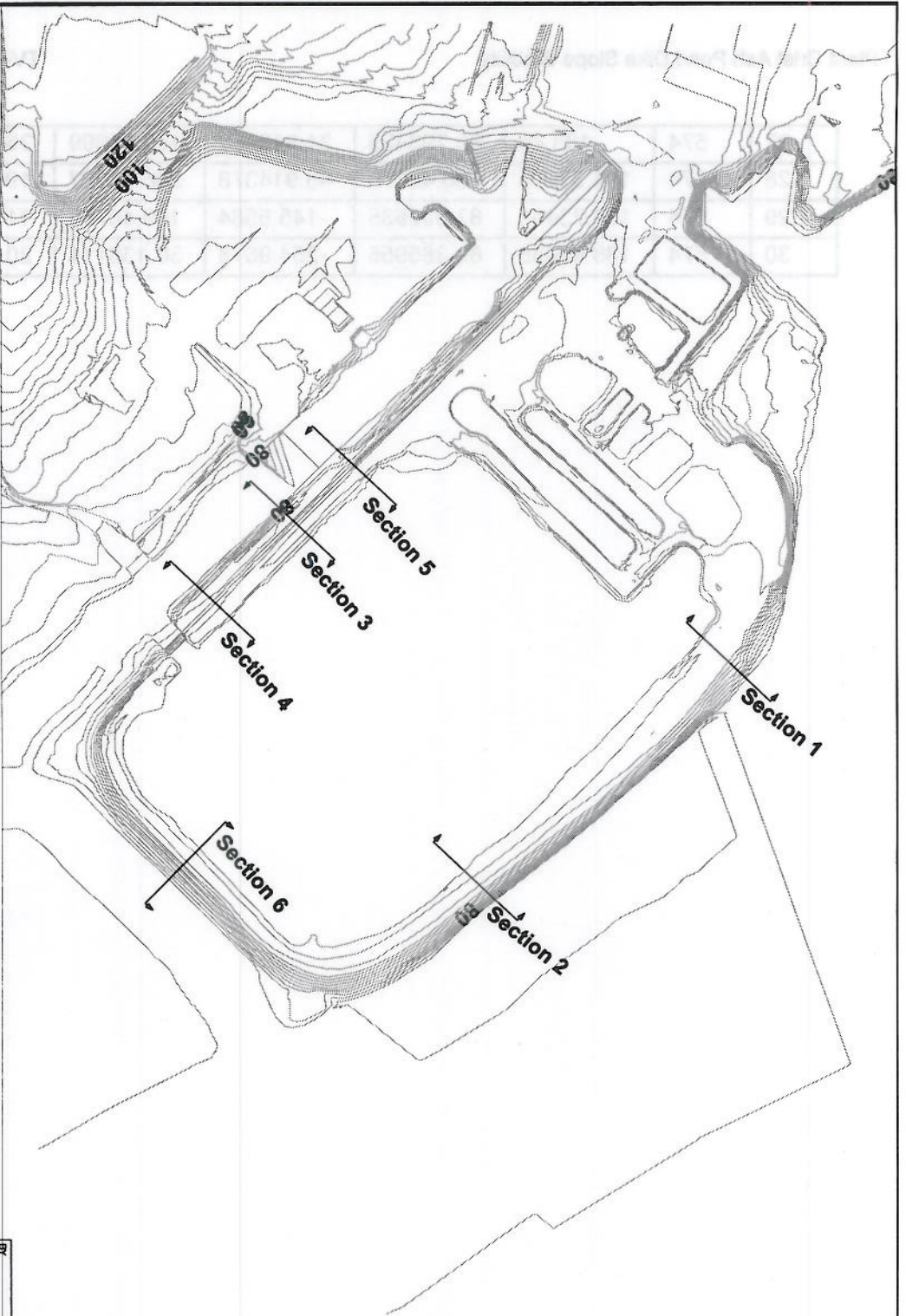
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	574	2.5	(159.837, 108.999)	33.466	(187.535, 90.2152)	(154.068, 76.0339)

Slices of Slip Surface: 574

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	574	154.6162	75.947315	691.55696	728.23488	24.739563	100
2	574	155.7128	75.7926	701.20919	793.80363	62.455736	100
3	574	156.8094	75.67468	708.57596	852.20193	96.876938	100
4	574	157.906	75.593165	713.65885	903.00044	127.71252	100
5	574	159.0026	75.54779	716.48728	945.8963	154.73834	100
6	574	160.0992	75.538405	717.07149	980.72204	177.83454	100
7	574	161.1958	75.56498	715.41749	1007.5507	197.04634	100
8	574	162.2924	75.6276	711.51385	1026.3094	212.33224	100
9	574	163.389	75.72647	705.34385	1037.3237	223.92324	100
10	574	164.4856	75.86192	696.89212	1040.9583	232.07559	100
11	574	165.5822	76.034395	686.12399	1037.698	237.13964	100
12	574	166.6788	76.24448	673.01392	1027.9628	239.41604	100
13	574	167.7754	76.492905	657.5109	1012.2844	239.29773	100
14	574	168.87205	76.78056	639.56822	991.21176	237.18657	100
15	574	169.9687	77.108515	619.10262	965.22127	233.45998	100
16	574	171.0653	77.47802	596.04794	934.88452	228.54816	100
17	574	172.1619	77.890555	570.30149	900.52512	222.73865	100
18	574	173.2585	78.347865	541.76374	862.31452	216.21423	100
19	574	174.3551	78.851995	510.30326	820.64579	209.32868	100
20	574	175.4517	79.40534	475.77646	775.44038	202.12587	100
21	574	176.61825	80.05305	429.25542	738.09542	208.31521	100
22	574	177.8319	80.79131	371.20992	710.47806	228.83925	100
23	574	179.02275	81.58792	309.74091	676.33369	247.26995	100
24	574	180.21365	82.461885	243.45133	634.3468	263.66232	100
25	574	181.40455	83.421165	171.83326	583.30996	277.54453	100
26	574	182.48335	84.367615	102.12987	507.69458	273.55685	100

27	574	183.45	85.293425	34.813258	408.57699	252.10682	100
28	574	184.53355	86.43173	-46.914378	296.06237	199.69659	100
29	574	185.73405	87.822635	-145.5584	169.48768	114.32089	100
30	574	186.93455	89.385955	-254.9618	30.136111	20.327064	100

Project Name: Plant Crist Ash Pond Dike Slope Stability		Project Number: TV-CR-FPC30795-001	
Client: TV-CR-FPC30795-001		Date: 8/17/2012	
Project Manager: [Name]		Project Engineer: [Name]	
Project Location: [Location]		Project Status: [Status]	
Project Description: [Description]		Project Budget: [Budget]	
Project Schedule: [Schedule]		Project Risk: [Risk]	
Project Deliverables: [Deliverables]		Project Milestones: [Milestones]	
Project Team: [Team]		Project Stakeholders: [Stakeholders]	
Project Approval: [Approval]		Project Sign-off: [Sign-off]	



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PLANT CRIST ASH POND
CALC # TV-CR-FPC30795-001
LOCATION OF CROSS SECTIONS

**Southern Company Generation
Engineering and Construction Services
FOR**

Gulf Power Company

SCALE	DRAWING NUMBER	SHEET	CONTD	REV
NONE	FIGURE 1	1	FINAL	0

ANSI B: 17x11 CIVIL 2010

Southern Company Services, Inc.
Soil Boring Log



Project: PLANT CRIST		HOLE No. APD-4	
Location: ASH POND DIKE		SHEET 1 OF 1	
Purpose: STABILITY ANALYSIS			
Position: E 1,112,743.6 N 578,242.1		Surface Elevation: 90.50	
Rig Type: MOBILE	Contractor: PENSACOLA TESTING	Driller: MATT AND ROBERT	
Drilling Method: WASH BORING		Boring Depth: 46.0	No. SPT: 8 No. UD Samples: 0
Date Started: 2/4/92	Date Completed: 2/4/92	Logged By: JOEL MILLER	Date Logged: 2/4/92
Hole Closure: GROUT			

WATER TABLE	DEPTH AND ELEV. (FT)	SYMBOLIC LOG	SOIL DESCRIPTION	SAMPLE		COMMENTS	TEST RESULTS					
				NUMBER	LEGEND		RECOVERY (%)	SPT VALUES BLOWS/6" (N)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	K (cm/s)
	90.50											
	5		Red-brown slightly clayey fine SAND.				6/13/21 (34)					
	84.50											
	10		Red-brown clayey fine SAND.				4/4/6/8 (14)					
	79.50											
	15		Red-tan-gray clayey fine SAND.				10/13/17/17 (34)					
	74.50											
	20		Tan-brown slightly clayey fine to medium SAND				4/3/4/5 (9)					
	67.50											
	25		Brown-gray slightly silty fine to medium SAND (5" wood fragments at top of spoon).				2/8/11/12 (23)					
	30		Brown-gray slightly silty fine to medium SAND with no wood fragments				4/6/7/7 (14)					
	58.50		Bottom of Dike Fill At 32'									
	35		Soft Organic CLAY and SILT.									
	53.50											
	40		Medium gray clayey fine SAND				1/1/1/1 (2)					
	46.50		12" medium gray fine sandy CLAY.				WH/1/1/10 (11)					
	45.50		12" light gray silty CLAY.									
	44.90		3" orange-tan slightly clayey fine SAND. Bottom of Hole @ 46'									

SS = Split Spoon; ST = Shelby Tube;
D = Dennison; P = Pitcher; O = Other

☒ while drilling
☐ after drilling

☒ after 24 hours

Hole No.
APD-4

Southern Company Services, Inc. Soil Boring Log



Project: PLANT CRIST		HOLE No. APD-6	
Location: ASH POND DIKE			
Purpose: STABILITY ANALYSIS		SHEET 1 OF 1	
Position: E 1,112,893.9 N 578,922.7		Surface Elevation: 91.00	
Rig Type: MOBLIE	Contractor: PENSACOLA TESTING	Driller: MATT & ROBERT	
Drilling Method: WASH BORING	Boring Depth: 46.0	No. SPT: 8	No. UD Samples: 0
Date Started: 2/4/92	Date Completed: 2/4/92	Logged By: JOEL MILLER	Date Logged: 2/4/92
Hole Closure: GROUT			

WATER TABLE	DEPTH AND ELEV. (FT)	SYMBOLIC LOG	SOIL DESCRIPTION	SAMPLE			COMMENTS	TEST RESULTS				
				NUMBER	LEGEND	RECOVERY (%)		SPT VALUES BLOWS/6" (N)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	K (cm/s)
	91.00		Red-brown clayey fine SAND with occasional clay lense									
	5						4/7/6/7 (13)					
	85.00						DIKE FILL					
	10		Brown-gray slightly clayey fine to medium SAND with occasional clay lense.				3/6/17/26 (43)					
							OCCASIONAL CLAY LENSES					
	15						10/13/14/18 (32)					
	20						8/9/11/15 (26)					
	69.00		Tan-Medium gray clayey fine to medium SAND (may be very slightly organic).				3/5/3/3 (6)					
	25						CLAY LENSE @ 25'					
	64.00		Bottom of Dike Fill At 27'									
	30		Soft Organic CLAY and SILT									
	59.00		Medium gray clayey fine SAND to sandy CLAY with few wood fragments.				WH/1/1/2 (3)					
	35						UD ATTEMPT @ 36-38'. NO SAMPLE.					
	52.00		Medium gray slightly clayey to slightly silty fine to medium SAND with very few wood fragments				2/1/2 (3)					
	45						11/4/2/4 (6)					
			Bottom of Hole @ 46'									
							BOTTOM 8" OF HOLE SHOWED ORGANICS AND WOOD FRAGMENTS.					

SS = Split Spoon; ST = Shelby Tube; D = Dennison; P = Pitcher; O = Other		☐ while drilling ☒ after 24 hours	Hole No. APD-6
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Southern Company Services, Inc.

Soil Boring Log



Project: PLANT CRIST		HOLE No. APD-7	
Location: ASH POND DIKE			
Purpose: STABILITY ANALYSIS		SHEET 1 OF 1	
Position: E 1,112,664.4 N 579,207.2		Surface Elevation: 91.00	
Rig Type: MOBILE	Contractor: PENSACOLA TESTING	Driller: MATT & ROBERT	
Drilling Method: WASH BORING		Boring Depth: 46.0	No. SPT: 8 No. UD Samples: 1
Date Started: 2/3/92		Date Completed: 2/3/92	Logged By: JOEL MILLER Date Logged: 2/3/92
Hole Closure: GROUT			

WATER TABLE	DEPTH AND ELEV. (FT)	SYMBOLIC LOG	SOIL DESCRIPTION	SAMPLE				COMMENTS	TEST RESULTS				
				NUMBER	LEGEND	RECOVERY (%)	SPT VALUES BLOWS/6" (N)		MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	K (cm/s)	
	91.00		Red-brown slightly clayey Fine to medium grained SAND.										
	5						4/7/10/10 (20)	DIKE FILL					
	85.00		Red-brown clayey SAND to sandy CLAY with some plastic clay lenses				7/8/14/19 (33)						
	10							UD ATTEMPT @ 11'. MATERIAL TOO HARD. NO SAMPLE					
	80.00		Red-brown slightly clayey fine to medium grained SAND to tan clean SAND				8/9/9/8 (17)						
	15							UD ATTEMPT @ 16'. OBTAINED 14-16" OF SAMPLE	14	NP	NP	SM	
	76.00		Red-tan-gray slightly silty medium grained SAND with few small shells.				2/1/2/2 (4)						
	20												
	70.00		Medium gray slightly silty fine to medium grained SAND with lense of wood fragments				3/4/3/5 (8)						
	25							UD ATTEMPT @27.5'. TOO HARD (WOOD?). NO SAMPLE					
	64.00		^Bottom of Dike Fill at 27'					UD ATTEMPT @29-31'. TOO SOFT. NO SAMPLE					
	30		Soft Organic CLAY and SILT					REDRILL HOLE TO 32'					
	57.00						1/2/1/0 (1)	UD ATTEMPT 32-34'. TOO SOFT. NO SAMPLE					
	35		Medium gray silty clayey fine SAND				0/1/2/3 (5)						
	40												
	50.00		Medium gray clayey fine to medium SAND				2/2/4/5 (9)						
	45												
			Bottom of Hole @ 46'										

SS = Split Spoon; ST = Shelby Tube;
D = Dennison; P = Pitcher; O = Other

while drilling
 8.0 after drilling

☒ after 24 hours

Hole No.
APD-7

GULF POWER COMPANY
FILE NAME: PLANT CRIST ASH POND DAM
FILE NUMBER: CRIST1D.DAT

TEST NO. 1D-1

RECORD OF DILATOMETER TEST NO. 1D-1
USING DATA REDUCTION PROCEDURES IN MARCHETTI (ASCE, J-SED, MARCH 80)
KO IN SANDS DETERMINED USING SCHMERTMANN METHOD (1983)
PHI ANGLE CALCULATION BASED ON DURGUNDU AND MITCHELL (ASCE, RALEIGH CONF, JUNE 75)
PHI ANGLE NORMALIZED TO 2.72 BARS USING BALISH'S EXPRESSION (ASCE, J-SED, NOV 76)
MODIFIED MAYNE AND KULHAWY FORMULA USED FOR OCR IN SANDS (ASCE, J-SED, JUNE 82)

LOCATION: ASH POND DAM
PERFORMED - DATE: 18 MARCH 1992
BY: GILLIAM

CALIBRATION INFORMATION:
DELTA A = .01 BARS DELTA B = .45 BARS GAGE 0 = .15 BARS SWT DEPTH = 1.85 M
ROD DIA. = 3.70 CM FR. RED. DIA. = 5.40 CM ROD WT. = 6.50 KG/M DELTA/PHI = .50 BLADE T = 15.00 MM

1 BAR = 1.019 KG/CM2 = 1.044 TSF = 14.51 PSI

ANALYSIS USES H2O UNIT WEIGHT = 1.000 T/M3

DEPTH (ft)	Z (M)	THRUST (KG)	A (BAR)	B (BAR)	ED (BAR)	ID	KD	UO (BAR)	GAMMA (T/M3)	SV (BAR)	PC (BAR)	OCR	KO	CU (BAR)	PHI (DEG)	M (BAR)	SOIL TYPE
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
20.5'	6.30	125.	.60	1.80	26.	31.76	.39	.437	1.700	.060	.00	.08	.11		36.6	21.6	SAND
	6.60	110.	.90	3.00	60.	8.13	2.63	.466	1.700	.081	.13	1.64	.53	1.20	31.4	20.0	SAND $\phi=31^\circ$
	6.90	225.	1.15	4.50	105.	8.20	3.65	.496	1.700	.101	.23	2.33	.61		33.9	171.2	SAND C=0 psi
	7.20	300.	1.85	4.05	63.	1.66	9.12	.525	1.600	.120	1.45	12.05	1.34		30.9	152.9	SANDY SILT
	7.50	750.	2.20	6.80	151.	3.35	9.21	.554	1.800	.141	1.41	16.02	1.20		27.2	356.0	SAND
27.3'	8.40	300.	1.00	1.75	11.	1.50	1.02	.643	1.500	.198	.11	.57	.32		33.9	9.0	MUD
	8.70	200.	1.30	2.10	12.	.76	2.19	.672	1.600	.215	.25	1.16	.50	.053		11.9	CLAYEY SILT
	9.00	220.	1.80	2.70	16.	.49	4.03	.702	1.600	.232	.59	2.99	.99	.123		25.2	SILTY CLAY
	9.30	220.	1.80	2.80	20.	.63	3.61	.731	1.600	.250	.63	2.51	.91	.115		28.7	CLAYEY SILT
31.2'	9.60	250.	2.30	3.20	16.	.34	5.15	.761	1.600	.268	1.17	4.37	1.19	.192		29.2	CLAY C=135ps
	10.20	2000.	2.80	14.20	399.	8.88	4.19	.819	1.800	.309	.42	1.37	.41		42.6	695.3	SAND
	10.50	220.	1.40	2.20	12.	.91	1.20	.849	1.600	.329	.15	.45	.30			10.5	SILT
	10.80	140.	1.10	2.35	29.	19.66	.12	.878	1.700	.349	.20	.56	.40		26.5	24.5	SAND $\phi=27^\circ$
	11.10	150.	1.10	2.10	20.	22.46	.07	.908	1.700	.369	.20	.54	.39		26.6	16.7	SAND C=0 psi
	11.40	200.	1.10	2.75	41.	52.18	.06	.937	1.700	.390	.19	.48	.35	2.15	28.1	35.1	SAND
38.0'	11.70	500.	3.75	11.40	262.	3.31	5.53	.967	1.900	.413	2.48	6.00	1.01		29.2	520.0	SAND
	12.00	1650.	4.20	11.00	231.	2.42	6.25	.996	1.900	.440	2.32	5.27	.88		37.6	479.0	SILTY SAND
	12.30	1600.	4.70	12.55	269.	2.45	6.79	1.026	1.900	.466	2.98	6.39	.98		36.7	578.8	SILTY SAND
41.9'	12.60	1200.	3.75	9.00	175.	2.17	4.70	1.055	1.900	.493	1.81	3.67	.76		35.4	314.7	SILTY SAND $\phi=36^\circ$
	12.90	2600.	4.50	17.50	457.	4.97	5.10	1.084	1.900	.519	1.57	3.02	.65		40.7	375.1	SAND C=0 ps
END OF SOUNDING																	

GOLF POWER COMPANY
FILE NAME: PLANT CRIST ASH POND DAM
FILE NUMBER: CRIST20.DAT

TEST NO. 20-1

RECORD OF DILATOMETER TEST NO. 20-1
USING DATA REDUCTION PROCEDURES IN MARCHETTI (ASCE, J-GED, MARCH 80)
K₀ IN SANDS DETERMINED USING SCHMERTMANN METHOD (1983)
PHI ANGLE CALCULATION BASED ON DURGUNOGLU AND MITCHELL (ASCE, RALEIGH CONF. JUNE 75)
PHI ANGLE NORMALIZED TO 2.72 BARS USING BALIGH'S EXPRESSION (ASCE, J-GED, NOV 76)
MODIFIED MAYNE AND KULHAWY FORMULA USED FOR OCR IN SANDS (ASCE, J-GED, JUNE 82)

LOCATION: ASH POND DAM
PERFORMED - DATE: 18 MARCH 1992
BY: GILLIAM

CALIBRATION INFORMATION:

DELTA A = .01 BARS DELTA B = .45 BARS GAGE 0 = .15 BARS GWT DEPTH = 1.85 M
ROD DIA. = 3.70 CM FR. RED. DIA. = 5.40 CM ROD WT. = 6.50 KG/M DELTA/PHI = .50 BLADE T = 15.00 MM

1 BAR = 1.019 KG/CM² = 1.044 TSF = 14.51 PSI

ANALYSIS USES H₂O UNIT WEIGHT = 1.000 T/M³

DEPTH (ft)	Z (M)	THRUST (KG)	A (BAR)	B (BAR)	ED (BAR)	ID	KD	UO (BAR)	GAMMA (T/M ³)	SV (BAR)	PC (BAR)	OCR	KO	CU (BAR)	PHI (DEG)	N (BAR)	SOIL TYPE
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
20.5'	6.30	190.	1.00	2.95	54.	4.49	5.81	.437	1.700	.060	.27	4.55	.82		34.7	110.1	SAND $\phi=34^\circ$
	6.60	360.	1.65	5.50	124.	4.07	10.85	.466	1.700	.081	1.17	14.54	1.44		34.5	318.3	SAND $C=0\text{psf}$
	6.90	525.	1.75	5.30	113.	3.38	9.35	.496	1.800	.103	1.07	10.38	1.22		36.5	274.9	SAND
23.4'	7.20	375.	1.55	4.60	94.	3.60	6.05	.525	1.700	.125	.65	5.22	.89		34.5	194.8	SAND
	7.50	200.	1.35	3.10	47.	2.29	4.07	.554	1.700	.145	.48	3.32	.76		30.0	78.8	SILTY SAND $\phi=25^\circ$
	7.80	135.	1.55	2.20	7.	.24	5.01	.584	1.500	.163	.68	4.19	1.16	.113		12.4	MUD
	8.10	125.	1.45	2.95	38.	1.69	3.60	.613	1.600	.179	.60	3.38	.81		25.1	57.8	SANDY SILT $C=0\text{psf}$
27.3'	8.40	305.	1.80	4.20	71.	2.21	4.64	.643	1.700	.198	.80	4.05	.83		30.5	126.8	SILTY SAND
	8.70	660.	2.15	5.45	103.	2.49	5.42	.672	1.800	.220	.96	4.33	.81		35.5	201.6	SILTY SAND
	9.00	725.	2.00	5.00	93.	2.59	4.25	.702	1.700	.243	.67	2.78	.65		36.4	160.5	SILTY SAND
	9.30	825.	2.80	8.50	191.	3.30	6.30	.731	1.800	.265	1.50	5.68	.93		35.4	400.7	SAND $\phi=35^\circ$
31.2'	9.60	900.	4.40	11.05	226.	2.04	11.01	.761	1.900	.290	4.91	16.95	1.56		32.7	584.4	SILTY SAND $C=0\text{psf}$
	9.90	1200.	6.25	10.00	120.	.67	16.38	.790	1.800	.315	8.37	26.60	2.48	.959		35.7	CLAYEY SILT
	10.20	520.	3.75	9.35	187.	2.13	7.46	.819	1.900	.340	3.27	9.62	1.23		28.4	417.4	SILTY SAND $\phi=29^\circ$
	10.50	745.	3.90	11.60	264.	2.98	6.96	.849	1.900	.366	2.85	7.79	1.11		31.7	576.4	SILTY SAND
	10.80	950.	2.80	7.65	160.	2.95	3.99	.878	1.800	.391	1.08	2.77	.66		35.6	271.9	SILTY SAND $C=0\text{psf}$
	11.10	500.	2.35	4.70	69.	1.64	2.93	.908	1.600	.412	.92	2.22	.64		30.9	91.3	SANDY SILT
36.1'	11.40	350.	3.15	4.75	42.	.59	4.68	.937	1.700	.431	1.62	3.76	1.11	.274		71.5	SILTY CLAY
	11.70	240.	2.70	4.60	52.	.99	3.38	.967	1.600	.450	1.02	2.27	.86			74.3	SILT
	12.00	230.	2.65	4.10	36.	.71	3.13	.996	1.600	.468	.94	2.01	.81	.180		47.5	CLAYEY SILT
	12.30	275.	3.20	5.05	51.	.74	4.04	1.026	1.700	.487	1.46	2.99	.99	.258		79.9	CLAYEY SILT
	12.60	210.	3.25	4.80	40.	.57	3.94	1.055	1.700	.507	1.46	2.88	.97	.261		61.4	SILTY CLAY
	12.90	190.	3.50	4.55	21.	.28	4.27	1.084	1.600	.527	1.72	3.26	1.03	.299		35.0	CLAY $C=275\text{ps}$
	13.20	195.	3.85	5.20	32.	.37	4.68	1.114	1.700	.546	2.05	3.76	1.11	.347		55.8	SILTY CLAY
	13.50	200.	3.95	5.25	31.	.34	4.63	1.143	1.700	.566	2.10	3.71	1.10	.356		52.4	CLAY
45.8'	13.80	400.	3.35	5.15	49.	.71	3.36	1.173	1.700	.587	1.32	2.24	.86	.247		67.8	CLAYEY SILT
	14.10	2100.	2.00	11.50	329.	46.11	.34	1.202	1.700	.608						280.0	SAND
END OF SOUNDING																	

FILE NAME: PLANT CRIST ASH POND DAM
FILE NUMBER: CRISTSD.DAT

TEST NO. 3D-1

RECORD OF DILATOMETER TEST NO. 3D-1
USING DATA REDUCTION PROCEDURES IN MARCHETTI (ASCE, J-GED, MARCH 80)
KO IN SANDS DETERMINED USING SCHMERTMANN METHOD (1983)
PHI ANGLE CALCULATION BASED ON DURGUNGSLU AND MITCHELL (ASCE, RALEIGH CONF, JUNE 75)
PHI ANGLE NORMALIZED TO 2.72 BARS USING BALIGH'S EXPRESSION (ASCE, J-GED, NOV 76)
MODIFIED MAYNE AND KULHAWY FORMULA USED FOR OCR IN SANDS (ASCE, J-GED, JUNE 82)

LOCATION: ASH POND DAM
PERFORMED - DATE: 17 MARCH 1992
BY: GILLIAM

CALIBRATION INFORMATION:
DELTA A = .02 BARS DELTA B = .35 BARS SAGE 0 = .15 BARS SGT DEPTH= 2.00 M
ROD DIA.= 3.70 CM FR.RED.DIA.= 5.40 CM ROD WT.= 6.50 KG/M DELTA/PHI= .50 BLADE T=15.00 MM

1 BAR = 1.019 KG/CM2 = 1.044 TSF = 14.51 PSI ANALYSIS USES H2O UNIT WEIGHT = 1.000 T/M3

DEPTH Z (ft)	THRUST (KG)	A (BAR)	B (BAR)	ED (BAR)	ID	KD	UO (BAR)	GAMMA (T/M3)	SV (BAR)	PC (BAR)	OCR	KO	CU (BAR)	PHI (DEG)	M (BAR)	SOIL TYPE
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
19.5'	6.00	75.	.60	1.70	27.	18.71	.68	.393	1.700	.060	.02	.34	.24	33.1	22.6	SAND
	6.30	400.	1.25	4.65	110.	5.82	6.78	.422	1.700	.081	.43	5.32	.86	37.4	238.7	SAND $\phi=33^\circ$
	6.60	380.	1.60	5.15	116.	3.88	8.49	.451	1.700	.101	.95	9.36	1.17	34.5	273.2	SAND C=0 psf
	6.90	710.	1.45	4.65	103.	4.26	5.73	.481	1.700	.122	.60	4.96	.88	33.4	207.8	SAND
	7.20	305.	1.30	4.25	94.	5.10	3.73	.510	1.700	.142	.36	2.50	.64	33.7	154.4	SAND
	7.50	195.	1.20	3.62	75.	5.03	2.62	.540	1.700	.163	.30	1.84	.58	30.3	99.9	SAND
23.4'	7.80	450.	1.65	4.75	99.	3.52	4.43	.569	1.700	.184	.59	3.23	.71	34.4	178.4	SAND
	8.10	600.	6.15	9.90	123.	.68	25.53	.599	1.800	.206	10.93	53.14	3.19	1.092	417.2	CLAYEY SILT
	8.40	300.	4.25	5.70	39.	.33	15.09	.628	1.700	.228	5.33	23.40	2.36	.627	113.7	CLAY C=625ps
28.3'	8.70	230.	4.10	5.95	54.	.48	13.04	.658	1.700	.248	4.63	18.62	2.16	.569	148.3	SILTY CLAY
	9.00	720.	1.80	8.20	220.	9.29	2.52	.687	1.800	.271	.32	1.20	.43	37.0	286.2	SAND
	9.30	1100.	2.90	10.00	245.	4.12	5.84	.716	1.800	.294	1.35	4.60	.83	37.3	498.4	SAND
	9.60	1060.	2.70	9.55	236.	4.54	4.72	.746	1.800	.318	1.03	3.23	.70	37.2	436.4	SAND $\phi=37^\circ$
	9.90	975.	2.45	8.58	210.	4.81	3.68	.775	1.800	.341	.76	2.22	.59	36.9	342.6	SAND C=0 psf
33.2'	10.20	700.	2.05	5.95	129.	3.95	2.57	.805	1.800	.365	.56	1.54	.51	34.8	169.9	SAND
	10.50	575.	2.35	7.05	158.	3.89	3.01	.834	1.800	.388	.84	2.16	.62	32.3	230.0	SAND
	10.80	560.	2.20	5.95	123.	3.42	2.52	.864	1.800	.412	.72	1.74	.57	32.2	160.4	SAND $\phi=30^\circ$
	11.10	450.	2.05	5.25	103.	3.36	2.04	.893	1.700	.434	.65	1.49	.54	30.6	115.4	SAND C=0 psf
	11.40	435.	2.15	5.35	103.	3.11	2.10	.922	1.700	.455	.72	1.58	.57	29.9	118.2	SILTY SAND
38.0'	11.70	400.	2.15	4.10	58.	1.68	2.09	.952	1.600	.474	.78	1.65	.59	29.0	57.8	SANDY SILT
	12.00	320.	2.40	3.55	28.	.66	2.54	.981	1.600	.491	.71	1.46	.68	.146	31.3	CLAYEY SILT
	12.30	255.	3.15	4.55	38.	.55	3.85	1.011	1.600	.509	1.41	2.77	.96	.254	57.1	SILTY CLAY C=340ps
	12.60	255.	3.45	4.45	23.	.29	4.27	1.040	1.600	.527	1.72	3.26	1.03	.299	37.4	CLAY
	12.90	215.	4.00	5.60	45.	.47	5.02	1.070	1.700	.546	2.29	4.20	1.16	.379	90.4	SILTY CLAY
	13.20	245.	4.15	6.00	54.	.55	5.03	1.099	1.700	.566	2.38	4.21	1.17	.394	96.8	SILTY CLAY
3.9'	13.50	275.	3.95	5.60	47.	.51	4.48	1.129	1.700	.587	2.06	3.51	1.07	.354	78.2	SILTY CLAY
	13.80	390.	3.20	6.40	103.	1.68	2.91	1.158	1.700	.608	1.70	2.79	.78	25.7	136.4	SANDY SILT
	14.10	2100.	3.50	10.60	245.	3.83	2.92	1.187	1.900	.631	.84	1.34	.44	39.5	351.2	SAND

END OF SOUNDING

RECORD OF DILATOMETER TEST NO. SD-1
USING DATA REDUCTION PROCEDURES IN MARCHETTI (ASCE, J-GED, MARCH 80)
K₀ IN SANDS DETERMINED USING SCHMERTMANN METHOD (1983)
PHI ANGLE CALCULATION BASED ON DURGUNOGLU AND MITCHELL (ASCE, RALEIGH CONF, JUNE 75)
PHI ANGLE NORMALIZED TO 2.72 BARS USING BALIGH'S EXPRESSION (ASCE, J-GED, NOV 76)
MODIFIED MAYNE AND KULHAWY FORMULA USED FOR OCR IN SANDS (ASCE, J-GED, JUNE 82)

LOCATION: ASH POND DAM
PERFORMED - DATE: 17 MARCH 1992
BY: GILLIAM

CALIBRATION INFORMATION:
DELTA A = .02 BARS DELTA B = .35 BARS SAGE O = .15 BARS GWT DEPTH = 2.00 M
ROD DIA. = 3.70 CM FR. RED. DIA. = 5.40 CM ROD WT. = 6.50 KG/M DELTA/PHI = .50 BLADE T = 15.00 MM

1 BAR = 1.019 KG/CM² = 1.044 TSF = 14.51 PSI ANALYSIS USES H₂O UNIT WEIGHT = 1.000 T/M³

DEPTH (ft)	Z (M)	THRUST (KG)	A (BAR)	B (BAR)	ED (BAR)	ID	KD	UO (BAR)	GAMMA (T/M ³)	SV (BAR)	PC (BAR)	OCR	K ₀	CU (BAR)	PHI (DEG)	M (BAR)	SOIL TYPE
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
19.5'	6.00	1350.	6.80	12.80	205.	.99	99.93	.393	1.950	.060	26.80	*****	6.60			959.9	SILT
	6.30	1700.	5.85	17.50	411.	2.50	53.37	.422	2.000	.089	28.24	*****	6.52		35.9	1879.1	SILTY SAND
	6.60	950.	4.35	10.30	203.	1.68	30.29	.451	1.800	.115	13.20	*****	3.83		33.3	721.6	SANDY SILT
	6.90	1500.	1.60	4.60	96.	3.22	6.25	.481	1.700	.137	.25	1.85	.46		44.3	200.4	SILTY SAND
	7.20	325.	2.80	5.05	68.	.96	13.08	.510	1.700	.158	2.96	18.73	2.17			198.7	SILT
24.4'	7.50	550.	2.50	4.95	76.	1.27	9.67	.540	1.700	.178	2.32	12.97	1.38		32.8	187.0	SANDY SILT
	7.80	700.	3.31	5.10	52.	.59	12.76	.569	1.700	.199	3.58	18.00	2.13	.444		141.3	SILTY CLAY
26.3'	8.10	375.	2.85	4.40	43.	.60	9.39	.599	1.700	.220	2.45	11.16	1.77	.334		104.7	CLAYEY SILT
	8.40	1070.	4.05	13.10	316.	3.19	11.75	.628	1.900	.243	4.28	17.59	1.59		35.2	838.9	SILTY SAND
	8.70	1075.	3.35	10.00	229.	2.93	8.34	.658	1.900	.270	2.44	9.05	1.15		36.2	535.7	SILTY SAND
	9.00	1000.	4.25	11.00	232.	2.15	10.51	.687	1.900	.296	4.47	15.09	1.48		33.7	592.1	SILTY SAND
	9.30	935.	3.10	8.60	187.	2.70	6.22	.716	1.800	.321	1.83	5.69	.93		35.1	388.3	SILTY SAND
31.2'	9.60	805.	2.80	8.30	187.	3.23	4.84	.746	1.800	.345	1.34	3.89	.79		34.4	349.3	SILTY SAND
	9.90	740.	3.75	9.20	185.	2.06	7.00	.775	1.900	.370	2.93	7.92	1.12		31.5	401.4	SILTY SAND
33.2'	10.20	465.	2.20	4.75	79.	1.98	2.94	.805	1.700	.393	.88	2.25	.65		30.5	107.6	SILTY SAND
	10.50	310.	2.50	3.95	39.	.77	3.59	.834	1.600	.413	1.03	2.49	.91	.189		57.5	CLAYEY SILT
35.1'	10.80	250.	2.40	3.60	30.	.64	3.17	.864	1.600	.430	.88	2.05	.82	.168		40.1	CLAYEY SILT
	11.10	285.	1.55	2.85	34.	2.03	1.07	.893	1.700	.449	.45	1.00	.49		28.0	28.8	SILTY SAND
	11.40	380.	1.50	3.30	52.	3.99	.80	.922	1.700	.470	.34	.73	.40		30.3	44.3	SAND
	11.70	700.	1.70	6.00	143.	9.79	.86	.952	1.700	.491	.27	.55	.32		34.5	121.7	SAND
	12.00	1050.	4.25	10.60	218.	2.21	5.52	.981	1.900	.514	2.65	5.15	.91		33.3	425.7	SILTY SAND
	12.30	960.	3.90	9.90	205.	2.39	4.58	1.011	1.900	.541	2.11	3.91	.81		32.9	367.4	SILTY SAND
	12.60	920.	3.45	9.23	197.	2.83	3.54	1.040	1.900	.567	1.52	2.68	.68		33.1	312.8	SILTY SAND
	12.90	760.	3.05	7.95	165.	2.93	2.74	1.070	1.800	.592	1.19	2.01	.61		32.0	226.2	SILTY SAND
43.9'	13.20	650.	3.05	7.70	156.	2.80	2.61	1.099	1.800	.616	1.24	2.01	.63		30.5	205.1	SILTY SAND
	13.50	400.	2.20	4.85	83.	2.89	1.30	1.129	1.700	.638	.76	1.19	.54		27.9	70.6	SILTY SAND
	13.80	500.	2.35	3.60	32.	.91	1.55	1.158	1.600	.657	.44	.67	.42			27.3	SILT
	14.10	530.	3.40	5.00	45.	.64	2.99	1.187	1.700	.676	1.27	1.87	.78	.246		56.7	CLAYEY SILT
	14.40	310.	3.40	4.50	27.	.38	2.90	1.217	1.600	.695	1.24	1.79	.76	.243		32.8	SILTY CLAY
	14.70	255.	3.65	4.85	30.	.39	3.13	1.246	1.600	.713	1.43	2.01	.81	.275		39.6	SILTY CLAY
49.7'	15.00	350.	3.70	5.20	41.	.53	3.06	1.276	1.700	.732	1.42	1.94	.80	.274		52.9	SILTY CLAY
	15.30	375.	3.80	5.20	38.	.47	3.07	1.305	1.700	.753	1.47	1.96	.80	.283		48.4	SILTY CLAY
	15.60	1030.	4.45	13.00	298.	3.33	3.32	1.335	1.900	.776	2.02	2.61	.69		32.1	459.6	SAND
52.7'	15.90	1025.	4.30	13.00	304.	3.66	2.98	1.364	1.900	.803	1.82	2.26	.65		32.1	439.3	SAND
	16.20	750.	2.80	5.80	96.	2.41	1.38	1.394	1.800	.828	.89	1.07	.48		31.1	81.5	SILTY SAND

END OF SOUNDING

FILE NAME: PLANT CRIST ASH POND DAM
FILE NUMBER: CRIST7D.DAT

RECORD OF DILATOMETER TEST NO. 7D-1
USING DATA REDUCTION PROCEDURES IN MARCHETTI (ASCE, J-GEO, MARCH 80)
K₀ IN SANDS DETERMINED USING SCHMERTMANN METHOD (1983)
PHI ANGLE CALCULATION BASED ON DURGUNOGLU AND MITCHELL (ASCE, RALEIGH CONF. JUNE 75)
PHI ANGLE NORMALIZED TO 2.72 BARS USING BALIGH'S EXPRESSION (ASCE, J-GEO, NOV 76)
MODIFIED MAYNE AND KULHAWY FORMULA USED FOR OCR IN SANDS (ASCE, J-GEO, JUNE 82)

LOCATION: ASH POND DAM
PERFORMED - DATE: 16 MARCH 1992
BY: GILLIAM

CALIBRATION INFORMATION:
DELTA A = .02 BARS DELTA B = .35 BARS GAGE 0 = .15 BARS SWT DEPTH = 2.00 M
ROD DIA. = 3.70 CM FR. RED. DIA. = 5.40 CM ROD WT. = 6.50 KG/M DELTA/PHI = .50 BLADE T = 15.00 MM

1 BAR = 1.019 KG/CM² = 1.044 TSF = 14.51 PSF

ANALYSIS USES H₂O UNIT WEIGHT = 1.000 T/M³

DEPTH Z (ft)	THRUST (KG)	A (BAR)	B (BAR)	ED (BAR)	ID	KD	UO (BAR)	SANMA (T/M ³)	SV (BAR)	PC (BAR)	OCR	K ₀	CU (BAR)	PHI (DEG)	M (BAR)	SOIL TYPE
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
13.0'	4.00	130.	.70	3.45	87.	9.81	4.25	.196	1.700	.060	.18	2.98	.69	32.5	152.3	SAND
	4.30	145.	.60	2.15	43.	5.69	2.30	.226	1.700	.081	.10	1.25	.46	33.0	52.6	SAND
	4.60	1000.	3.81	11.20	256.	2.40	29.51	.255	1.900	.104	10.71	*****	3.70	34.7	901.5	SILTY SAND
	4.90	1925.	12.00	40.05	1009.	2.85	75.94	.285	2.150	.134	*****	*****	9.38	36.6	4457.1	SILTY SAND
	5.20	1100.	3.95	10.70	232.	2.10	19.37	.314	1.900	.165	7.44	45.19	2.49	35.1	726.7	SILTY SAND
17.9'	5.50	650.	2.25	7.75	187.	3.54	8.02	.343	1.800	.190	1.66	8.76	1.14	34.6	431.4	SAND
	5.80	200.	1.05	2.20	28.	1.61	2.42	.373	1.600	.210	.39	1.84	.60	28.4	12.4	SANDY SILT
	6.10	300.	1.05	4.30	105.	8.09	1.63	.402	1.700	.229	.24	1.04	.44	31.9	97.0	SAND
	6.40	285.	.70	4.12	106.	22.07	.55	.432	1.700	.250	.12	.48	.31	32.2	90.0	SAND
								P01 =	.42	P0 =	.57	P1 =	3.62			
21.8'	6.70	250.	.87	4.14	106.	22.76	.49	.461	1.700	.271	.14	.52	.34	30.8	89.8	SAND
	7.00	650.	1.05	8.45	256.	94.85	.27	.491	1.700	.291	.04	.12	.14	37.8	217.7	SAND
	7.30	900.	1.05	4.05	96.	10.29	.86	.520	1.700	.312	.06	.19	.17	39.2	81.5	SAND
	7.60	1200.	3.70	13.00	325.	3.64	7.68	.550	1.900	.335	2.68	8.00	1.09	35.9	738.7	SAND
25.7'	7.90	650.	2.10	8.55	222.	5.87	3.02	.579	1.800	.360	.73	2.82	.59	33.7	323.2	SAND
	8.20	450.	2.90	4.65	50.	.69	5.47	.608	1.700	.382	1.84	4.81	1.24	.296	94.8	CLAYEY SILT
	8.50	350.	3.40	5.09	48.	.54	6.37	.638	1.700	.403	2.45	6.09	1.37	.377	98.0	SILTY CLAY
	8.80	325.	4.00	5.85	54.	.50	7.39	.667	1.700	.424	3.25	7.68	1.52	.477	118.1	SILTY CLAY
	9.10	335.	3.45	4.85	38.	.42	5.79	.697	1.700	.444	2.33	5.25	1.29	.369	72.8	SILTY CLAY
30.6'	9.40	340.	3.45	4.50	25.	.28	5.52	.726	1.600	.463	2.26	4.88	1.25	.363	46.9	CLAY
	9.70	320.	2.40	3.25	17.	.34	3.10	.756	1.600	.481	.95	1.98	.81	.183	22.7	CLAY
	10.00	335.	1.90	2.65	14.	.41	1.94	.785	1.600	.499	.47	.95	.53	.105	11.8	SILTY CLAY
	10.30	370.	2.05	2.70	10.	.27	2.12	.815	1.500	.515	.56	1.10	.58	.122	9.3	MUD
24.5'	10.60	360.	1.80	2.41	9.	.31	1.54	.844	1.500	.530	.35	.66	.41	.084	7.4	MUD
	10.90	465.	1.25	2.15	19.	2.53	.40	.873	1.700	.547	.29	.52	.34	31.2	16.4	SILTY SAND
	11.20	500.	1.20	2.35	28.	6.39	.23	.903	1.700	.568	.25	.43	.31	31.8	24.2	SAND
	11.50	575.	1.24	1.95	12.	2.22	.27	.932	1.700	.588	.25	.42	.30	32.5	10.5	SILTY SAND
	11.80	650.	1.30	3.80	78.	21.98	.17	.962	1.700	.609	.22	.35	.28	33.4	66.0	SAND
	12.10	1030.	3.75	10.40	229.	2.85	3.66	.991	1.900	.633	1.78	2.82	.70	33.1	370.0	SILTY SAND
	12.40	1130.	3.50	9.80	216.	3.03	3.11	1.021	1.900	.659	1.43	2.17	.62	34.1	321.2	SILTY SAND
	12.70	1170.	3.65	10.10	222.	2.95	3.16	1.050	1.900	.686	1.53	2.23	.62	34.1	331.2	SILTY SAND
	13.00	1240.	3.60	9.90	216.	2.97	2.94	1.079	1.900	.712	1.42	1.99	.59	34.5	310.0	SILTY SAND
	13.30	1210.	3.45	9.72	215.	3.23	2.59	1.109	1.900	.739	1.26	1.71	.55	34.4	285.5	SILTY SAND
	13.60	1185.	3.60	10.10	223.	3.18	2.65	1.138	1.900	.765	1.38	1.80	.57	33.9	300.5	SILTY SAND
	13.90	1120.	3.50	9.65	211.	3.17	2.42	1.168	1.800	.790	1.31	1.66	.55	33.5	267.1	SILTY SAND
46.2'	14.20	1070.	3.50	9.65	211.	3.22	2.32	1.197	1.800	.814	1.31	1.62	.55	33.0	258.8	SILTY SAND
END OF SOUNDING																

Southern Company Services
Soil Testing for Plant Crist
Fill Material

April 20, 1992

Mr. Joel Miller

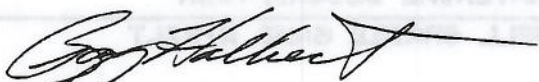
Mr. Ray Halbert
Alabama Power Company
PGTS - Civil

Enclosed are the test results for the soil sample delivered to the Central Laboratory on March 30, 1992. Performed test included gradation, hydrometer, specific gravity, Atterberg Limits, soil classification and Consolidated-Undrained (R) triaxial test.

Laboratory soil sample #1, represents fill material from location APD-7 from a depth of 16.0' to 18.0'. This sample was classified as a light brown well graded sand with silt or SW-SM by the Unified Soil Classification System. Specific gravity was 2.62. Atterberg Limits were non-applicable. Consolidated-Undrained (R) triaxial test were performed on UD sample with 1 and 2.5 ksf load. The total stress angle of internal friction was 24.5 degrees with a cohesion factor of .3 ksf and the effective stress angle of internal friction was 35.5 degrees with a cohesion of 0.0 ksf. Gradation for the sample was as follows:

<u>Sieve Size:</u>	<u>% Passing:</u>
3/4 in.	100.0
3/8 in.	98.9
#4	94.6
#8	91.0
#10	90.0
#16	88.3
#30	82.8
#50	35.1
#100	16.9
#200	10.5

If you have any questions about the test performed or if we can be of any further assistance to you please contact me at extension 8-255-6266.



Ray Halbert
Alabama Power Company
Supervisor/Concrete and Soils

DATE: 04/16/92

ALABAMA POWER COMPANY
 TRIAXIAL SHEAR TEST DATA
 CONSOLIDATED-UNDRAINED (R) TEST

Project PLANT CRIST

Lab No. 1

Job FILL MATERIAL

Job Date 03/30/92

Sample Location APD-7

Depth

SOIL DESCRIPTION: LIGHT BROWN WELL GRADED SAND W/SILT

SOIL CLASSIFICATION: SW-SM LL = NP PI = NP SPECIFIC GRAVITY = 2.62

RECEIVED ON 03/30/92

REPORTED ON 04/16/92

REMARKS:

MINOR PRINCIPAL STRESS (KSF)	0.99	2.51	0.00
INITIAL CONDITIONS			
WATER CONTENT (%)	14.0	14.6	0.0
DRY DENSITY (PCF)	104.1	109.7	0.0
SATURATION (%)	64.2	78.0	0.0
VOID RATIO	0.571	0.491	0.000
DIAMETER (IN.)	1.400	1.400	0.000
HEIGHT (IN.)	3.000	3.000	0.000
BEFORE SHEAR			
WATER CONTENT (%)	21.8	18.7	0.0
DRY DENSITY (PCF)	104.8	115.3	0.0
SATURATION (%)	100.0	100.0	0.0
VOID RATIO	0.561	0.418	0.000
BACK PRESSURE (KSF)	12.96	12.96	0.00
RATE OF STRAIN (%/MIN)	0.130	0.130	0.000

INITIAL CONDITIONS

WATER CONTENT (%)	14.0	14.6	0.0
DRY DENSITY (PCF)	104.1	109.7	0.0
SATURATION (%)	64.2	78.0	0.0
VOID RATIO	0.571	0.491	0.000
DIAMETER (IN.)	1.400	1.400	0.000
HEIGHT (IN.)	3.000	3.000	0.000

BEFORE SHEAR

WATER CONTENT (%)	21.8	18.7	0.0
DRY DENSITY (PCF)	104.8	115.3	0.0
SATURATION (%)	100.0	100.0	0.0
VOID RATIO	0.561	0.418	0.000
BACK PRESSURE (KSF)	12.96	12.96	0.00
RATE OF STRAIN (%/MIN)	0.130	0.130	0.000

TOTAL
STRESS

EFFECTIVE
STRESS
(MOHR)

EFFECTIVE
STRESS
(P-Q)

COHESION C (KSF) =

.3

0.0

ANGLE OF INTERNAL FRICTION (DEGREES)

24.5

35.5

ALABAMA POWER COMPANY

CONSOLIDATED-UNDRAINED (R) TRIAXIAL TEST DATA

STRAIN %	DEVIATOR STRESS KSF	INDUCED PORE PRESSURE KSF	MAJOR PRINCIPAL STRESS KSF	EFFECTIVE PRINCIPAL STRESS major KSF	EFFECTIVE PRINCIPAL STRESS minor KSF	EFFECTIVE PRINCIPAL STRESS RATIO	P KSF	Q KSF
MINOR	PRINCIPAL	STRESS, KSF:	0.99					
0.0	0.00	0.00	0.99	0.99	0.99	1.00	0.99	0.00
0.2	0.80	0.14	1.80	1.65	0.84	1.95	1.25	0.40
0.3	1.05	0.20	2.04	1.84	0.79	2.33	1.32	0.53
0.7	1.30	0.26	2.29	2.03	0.73	2.76	1.38	0.65
1.7	1.58	0.33	2.58	2.24	0.66	3.39	1.45	0.79
2.7	1.73	0.24	2.72	2.47	0.74	3.31	1.61	0.86
3.7	1.85	0.27	2.84	2.56	0.72	3.56	1.64	0.92
5.0	1.98	0.23	2.97	2.74	0.76	3.59	1.75	0.99
6.7	2.10	0.19	3.09	2.90	0.80	3.60	1.86	1.05
8.3	2.19	0.13	3.18	3.05	0.86	3.53	1.96	1.09
10.0	2.27	0.17	3.27	3.09	0.82	3.77	1.96	1.14
11.7	2.33	0.12	3.32	3.20	0.87	3.65	2.04	1.16
13.4	2.36	0.12	3.35	3.23	0.87	3.68	2.06	1.18
15.0	2.41	0.10	3.40	3.29	0.89	3.70	2.10	1.20

MINOR PRINCIPAL STRESS, KSF: 2.51

0.0	0.00	0.00	2.51	2.50	2.50	1.00	2.51	0.00
0.2	0.50	0.09	3.01	2.92	2.41	1.21	2.67	0.25
0.3	0.95	0.23	3.45	3.22	2.27	1.42	2.75	0.47
0.7	1.36	0.58	3.86	3.28	1.92	1.70	2.61	0.68
1.7	2.19	0.62	4.69	4.07	1.88	2.16	2.98	1.09
2.7	2.40	0.94	4.90	3.96	1.56	2.53	2.77	1.20
3.7	2.34	1.12	4.85	3.72	1.38	2.70	2.55	1.17
5.0	2.34	1.24	4.85	3.60	1.26	2.85	2.44	1.17
6.7	2.91	1.35	5.41	4.06	1.15	3.52	2.61	1.45
8.4	3.21	1.28	5.72	4.43	1.22	3.62	2.83	1.61
10.0	3.77	1.09	6.27	5.17	1.41	3.67	3.29	1.88
11.7	3.80	1.11	6.31	5.19	1.39	3.72	3.30	1.90
13.4	4.24	0.89	6.75	5.85	1.61	3.63	3.73	2.12
15.0	4.54	0.81	7.05	6.23	1.69	3.67	3.97	2.27

BEFORE STRAIN
WATER CONTENT (%)
DRY DENSITY (pcf)
SATURATION (%)
VOID RATIO
BACK PRESSURE (psf)
RATE OF STRAIN (in/min)

EFFECTIVE
STRESS
(2-3)

EFFECTIVE
STRESS
(1-2)

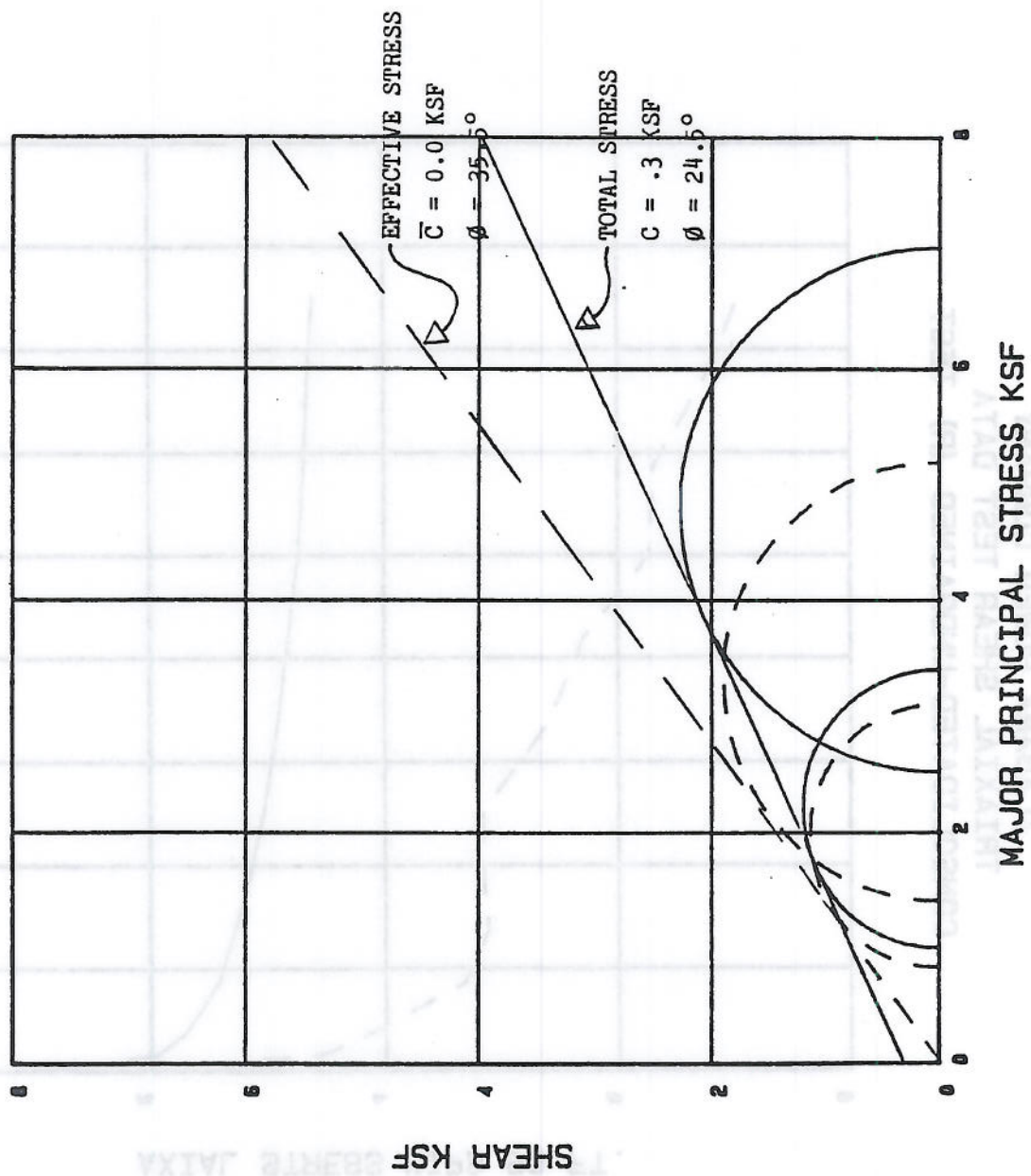
TOTAL
STRESS

0.0
32.5

8.
34.5

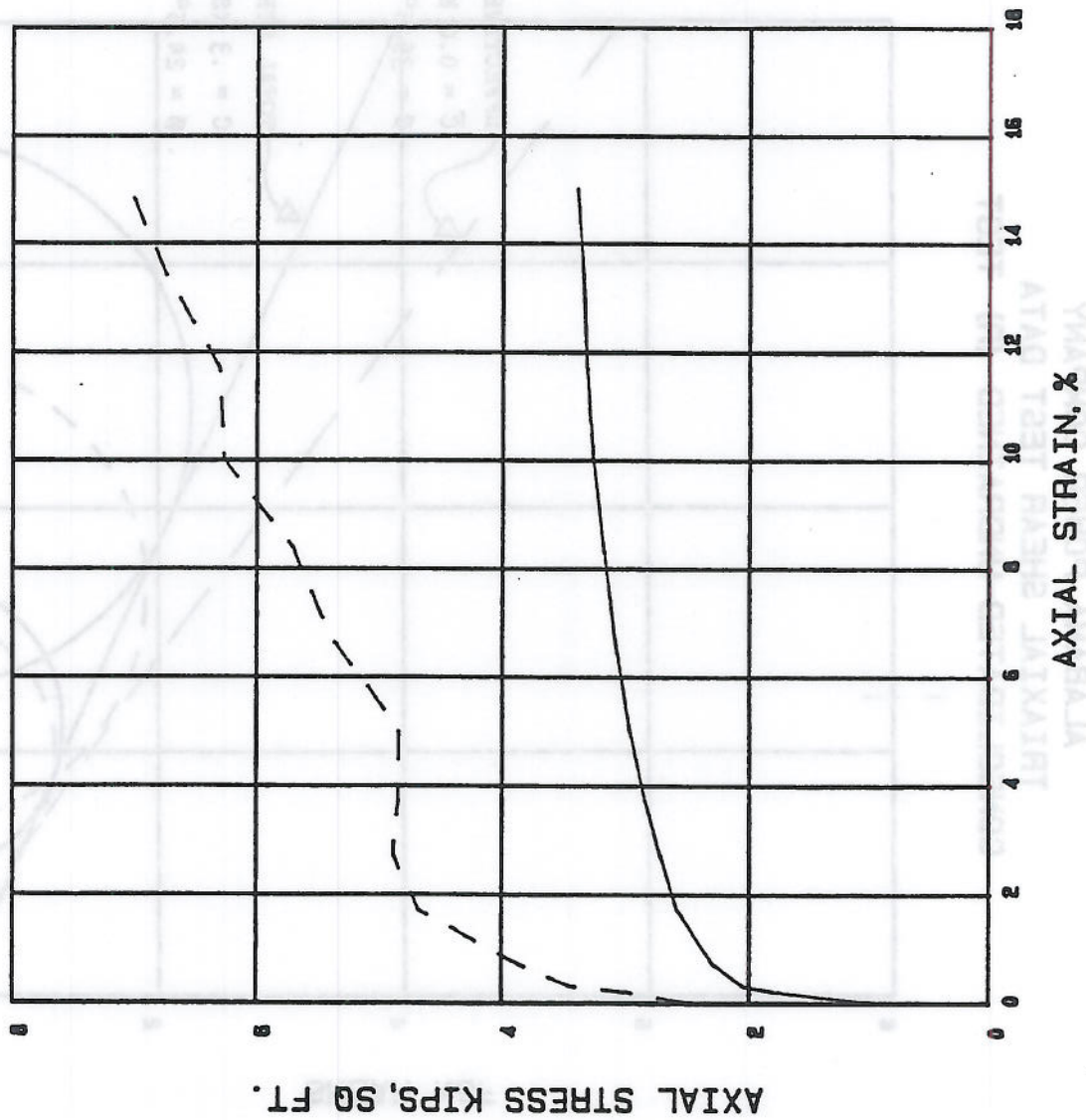
CONVERSION C (KSF) =
KIP/IN² (POUNDS)

ALABAMA POWER COMPANY
 TRIAXIAL SHEAR TEST DATA
 CONSOLIDATED-UNDRAINED (R) TEST



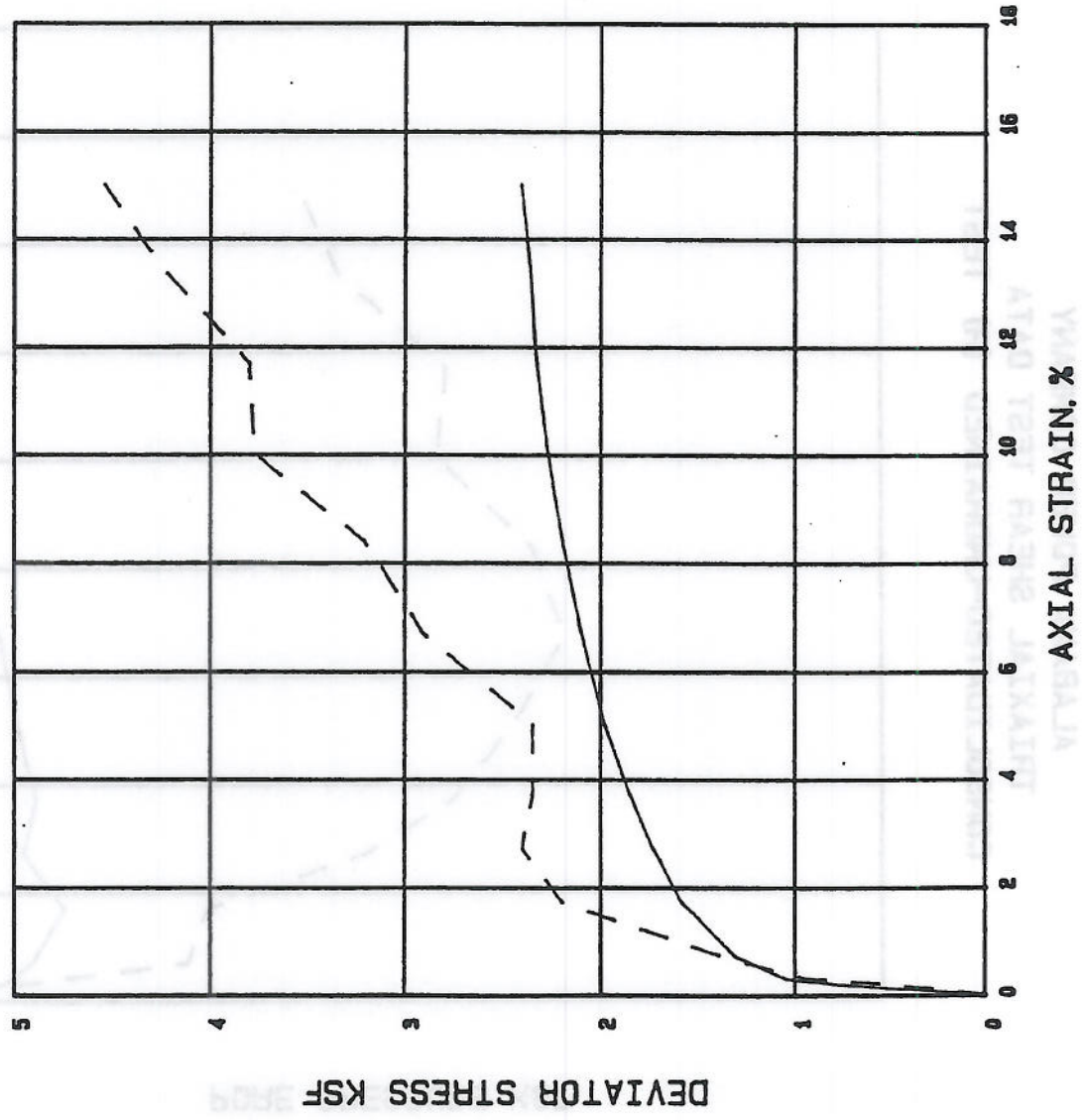
SAMPLE NUMBER 1

ALABAMA POWER COMPANY
TRIAXIAL SHEAR TEST DATA
CONSOLIDATED-UNDRAINED (R) TEST



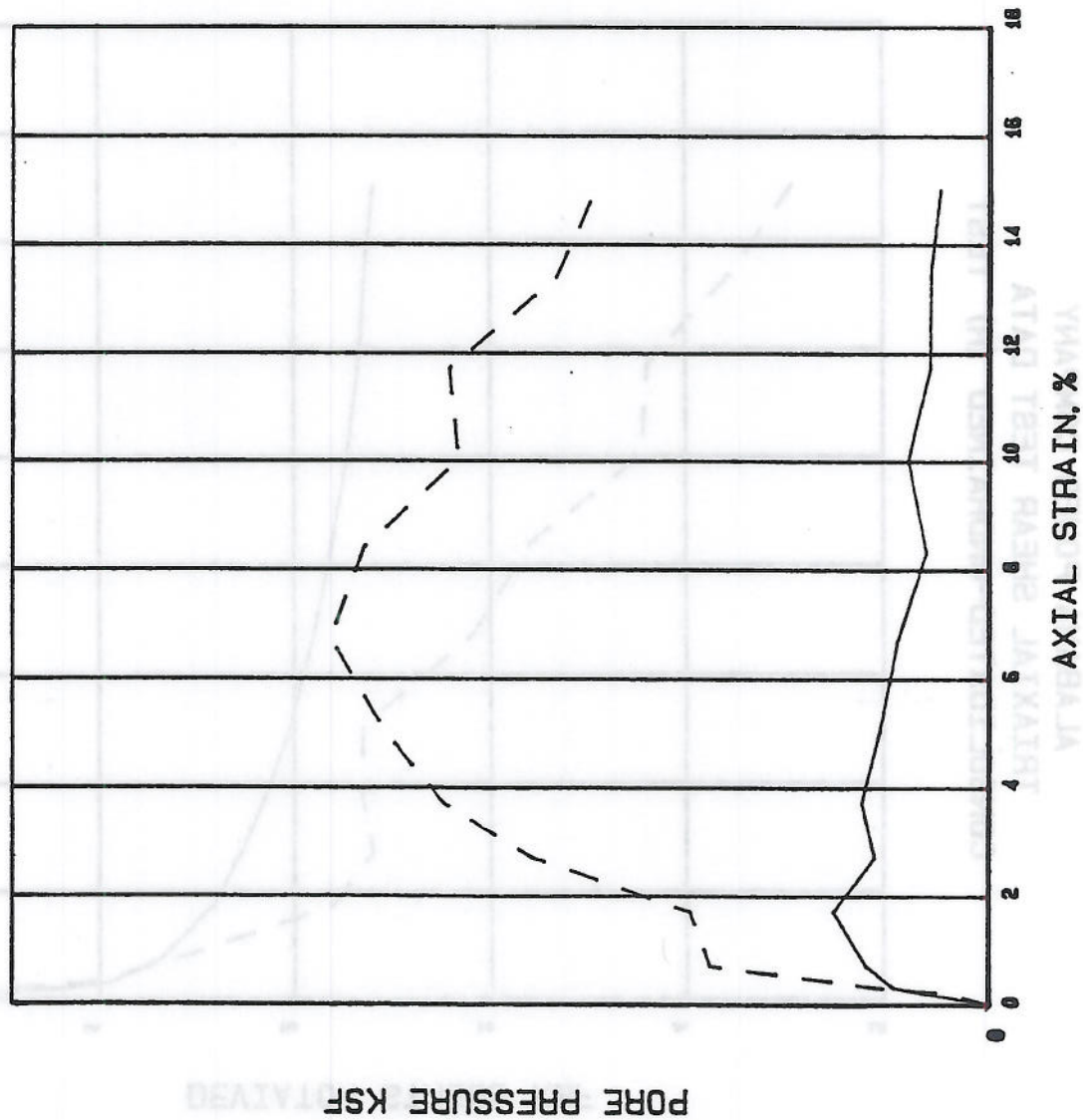
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ALABAMA POWER COMPANY
TRIAXIAL SHEAR TEST DATA
CONSOLIDATED-UNDRAINED (R) TEST



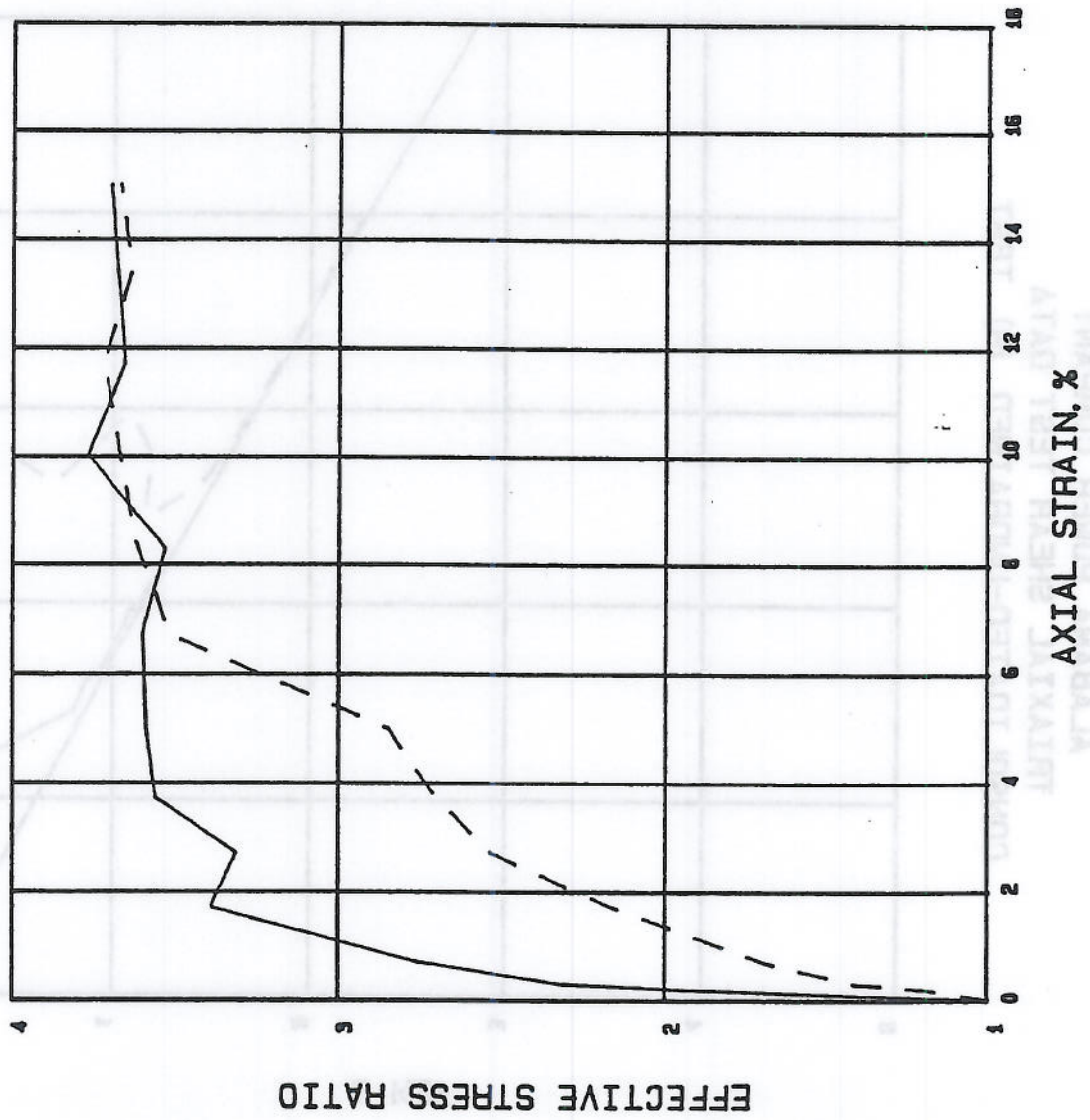
SAMPLE NUMBER 1

ALABAMA POWER COMPANY
TRIAXIAL SHEAR TEST DATA
CONSOLIDATED-UNDRAINED (R) TEST



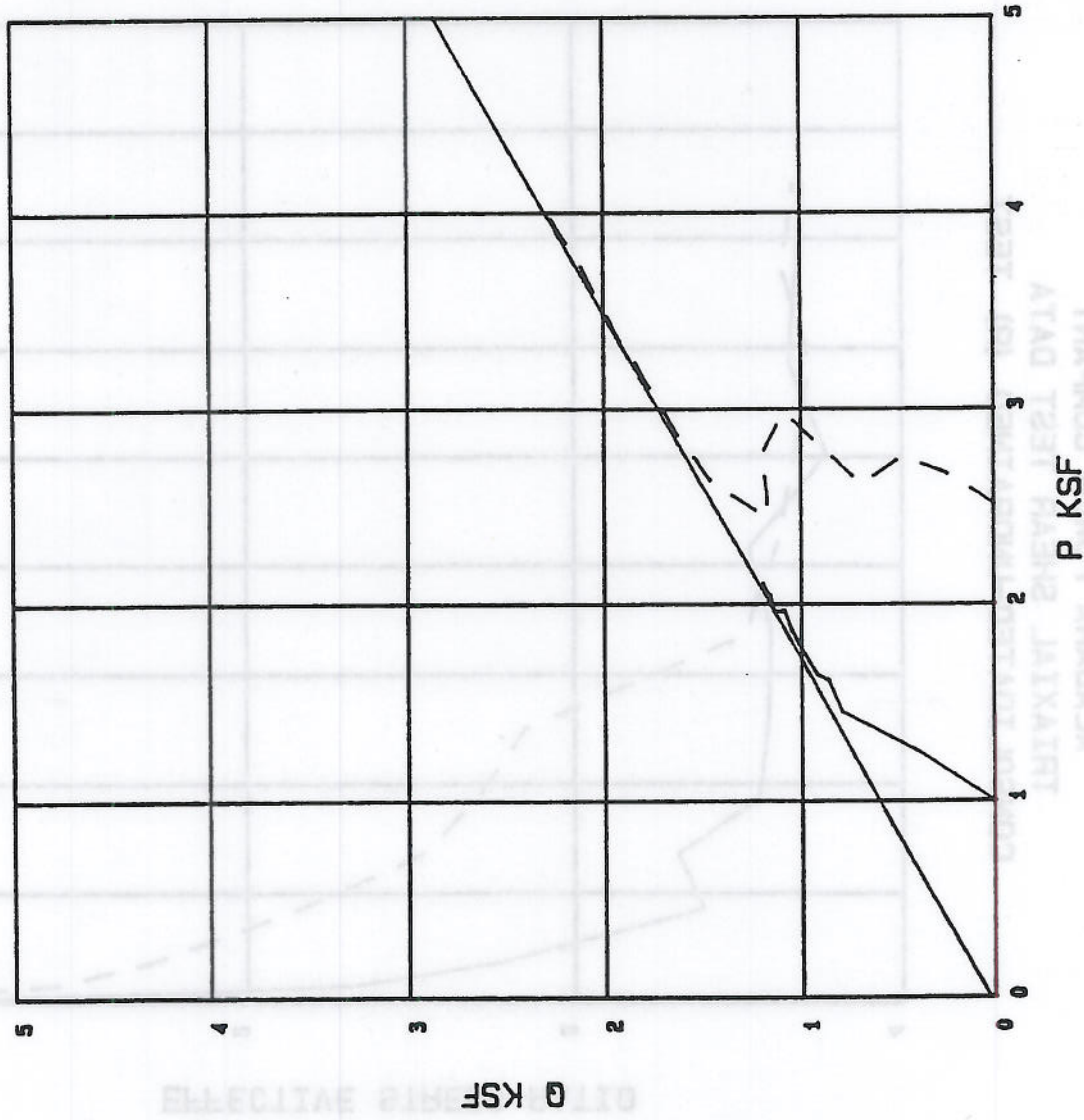
SAMPLE NUMBER 1

ALABAMA POWER COMPANY
TRIAXIAL SHEAR TEST DATA
CONSOLIDATED-UNDRAINED (R) TEST



SAMPLE NUMBER 1

ALABAMA POWER COMPANY
 TRIAXIAL SHEAR TEST DATA
 CONSOLIDATED-UNDRAINED (R) TEST



SAMPLE NUMBER 1
 ALPHA: 29.6 THETA: 34.6
 A: 0.03 C: 0.03

DN-1.txt

"Output file from SITELOG
SoundID: B05-102.DN-1

"-----
"Developed by: FOUNDATION ALTERNATIVES FOR SESI
" Program: Piezocone Interpretation - STRENGHT ONLY
"

"Interpreter Name: DOM/SHS
"

"SUMMARY SHEET
"-----

"'a' for calculating Qt: 0.800
"Value for Water Table (in m): 0
"Valid Zone Classification based on: Rf
"Method for calculating Su: Nkt, Su calculated for SBT 1-5 only
"Value of the constant Nkt: 18.000
"Define Zone 6 for Sand Parameters? YES
"Method for Friction Angle: KULHAWY AND MAYNE (1990), Phi Calculated
for SBT 6-9 only

"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"-----

"Zone #1=Sensitive fine grained Zone #7 =Sand with some silt
"Zone #2=Organic material Zone #8 =Fine sand
"Zone #3=Clay Zone #9 =Sand
"Zone #4=Silty clay Zone #10=Gravelly sand
"Zone #5=Clayey silt Zone #11=Very stiff fine grained *
"Zone #6=Silty sand Zone #12=Sand to clayey sand *
" * Overconsolidated and/or cemented
"

"NOTE: DATA PRESENTED IS BASED ON GENERALLY ACCEPTED ENGINEERING CORRELATIONS.
IT IS THE RESPONSIBILITY OF THE USER TO EVALUATE THE DATA AND METHODS USED
FOR APPLICATION TO SPECIFIC PROJECTS. AVERAGING OF DATA WILL CAUSE DISTORTION
OF DATA IN LAYERED PROFILES.

Note: --- = NOT A NUMBER - CALCULATION NOT VALID FOR SOIL BEHAVIOR TYPE)

SoundID: B05-102.DN-1
D tot: 14.042 (ft)

"depth "(feet)	q_tAvg (tsf)	f_sAvg (tsf)	u_2Avg (psi)	Phi (deg)	Su (psf)
0.7	89.229	0.474	0.018	40	---
1.0	103.606	0.617	0.029	40	---
2.0	45.963	0.799	0.027	40	---
3.0	66.227	0.478	0.051	40	---
4.0	73.275	0.483	0.044	40	---
5.0	112.290	0.974	-0.062	40	---
6.0	167.107	0.778	-0.198	40	---
7.0	138.770	1.212	-0.241	40	---
8.0	73.686	0.368	-0.289	40	---
9.0	52.878	0.176	-0.306	40	---
10.0	43.453	0.170	-0.312	39	---
11.0	33.460	0.280	-0.300	37	---
12.0	20.429	0.477	-0.274	---	2189.711
13.0	23.424	1.144	-0.246	---	2516.268
13.5	52.547	0.998	-0.235	---	5748.622

DN-2.txt

Output file from SITELOG

SoundID: B05-102.DN-2

"=====

"Developed by: FOUNDATION ALTERNATIVES FOR SESI
" Program: Piezocone Interpretation - STRENGTH ONLY

"Interpreter Name: DOM/SHS

"SUMMARY SHEET

"'a' for calculating qt: 0.800
"Value for water Table (in m): 0
"Valid Zone Classification based on: Rf
"Method for calculating Su: Nkt, su calculated for SBT 1-5 only
"Value of the constant Nkt: 18.000
"Define Zone 6 for Sand Parameters? YES
"Method for Friction Angle: KULHAWY AND MAYNE (1990), Phi calculated
for SBT 6-9 only

"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification

"Zone #1=Sensitive fine grained Zone #7 =Sand with some silt
"Zone #2=Organic material Zone #8 =Fine sand
"Zone #3=Clay Zone #9 =Sand
"Zone #4=Silty clay Zone #10=Gravelly sand
"Zone #5=Clayey silt Zone #11=Very stiff fine grained *
"Zone #6=Silty sand Zone #12=Sand to clayey sand *
" * Overconsolidated and/or cemented

"NOTE: DATA PRESENTED IS BASED ON GENERALLY ACCEPTED ENGINEERING CORRELATIONS.
IT IS THE RESPONSIBILITY OF THE USER TO EVALUATE THE DATA AND METHODS USED
FOR APPLICATION TO SPECIFIC PROJECTS. AVERAGING OF DATA WILL CAUSE DISTORTION
OF DATA IN LAYERED PROFILES.

Note: --- = NOT A NUMBER - CALCULATION NOT VALID FOR SOIL BEHAVIOR TYPE)

SoundID: B05-102.DN-2

D tot: 13.9108 (ft)

"depth "(feet)	q_tAvg (tsf)	f_sAvg (tsf)	u_2Avg (psi)	Phi (deg)	Su (psf)
0.7	79.624	0.355	0.036	40	---
1.0	111.867	0.633	0.031	40	---
2.0	61.725	1.053	-0.043	40	---
3.0	20.326	0.419	-0.097	---	2238.996
4.0	7.463	0.215	-0.101	---	803.604
5.0	10.637	0.169	-0.096	---	1150.009
6.0	5.526	0.074	-0.015	---	576.292
7.0	3.877	0.013	0.003	---	386.662
8.0	24.462	0.064	0.032	37	---
9.0	21.765	0.122	0.030	36	---
10.0	26.079	0.197	0.053	36	---
11.0	21.429	0.257	0.084	35	---
12.0	15.584	0.528	0.139	---	1655.436
13.0	17.656	0.537	0.177	---	1879.470
13.4	95.458	0.697	0.162	40	---

"Output file from SITELOG
SoundID: B05-102.DN-3

"Developed by: FOUNDATION ALTERNATIVES FOR SESI
" Program: Piezocone Interpretation - STRENGHT ONLY

"Interpreter Name: DOM/SHS

"SUMMARY SHEET

"'a' for calculating Qt: 0.800
"Value for water Table (in m): 0
"Valid Zone Classification based on: Rf
"Method for calculating Su: Nkt, Su calculated for SBT 1-5 only
"Value of the constant Nkt: 18.000
"Define Zone 6 for Sand Parameters? YES
"Method for Friction Angle: KULHAWY AND MAYNE (1990), Phi Calculated
for SBT 6-9 only

"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification

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"Zone #2=Organic material Zone #8 =Fine sand
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"Zone #4=Silty clay Zone #10=Gravelly sand
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OF DATA IN LAYERED PROFILES.

Note: --- = NOT A NUMBER - CALCULATION NOT VALID FOR SOIL BEHAVIOR TYPE)

SoundID: B05-102.DN-3
D tot: 13.9764 (ft)

"depth (feet)	q_tAvg (tsf)	f_sAvg (tsf)	u_2Avg (psi)	Phi (deg)	Su (psf)
0.7	95.475	0.684	-0.020	40	---
1.0	80.464	0.853	-0.028	40	---
2.0	22.836	0.568	-0.032	---	2524.338
3.0	6.990	0.245	-0.044	---	757.019
4.0	5.186	0.113	0.001	---	550.452
5.0	43.480	0.191	0.031	40	---
6.0	136.467	0.577	-0.317	40	---
7.0	116.322	0.870	-0.271	40	---
8.0	99.586	0.316	-0.417	40	---
9.0	32.077	0.298	-0.443	37	---
10.0	31.974	0.116	-0.282	37	---
11.0	25.654	0.156	-0.049	36	---
12.0	9.271	0.242	0.472	---	951.361
13.0	8.736	0.411	-0.459	---	885.773
13.5	75.971	0.444	-0.441	40	---

DS-1.txt

"Output file from SITELOG
SoundID: B05-102.DS-1

"=====

"Developed by: FOUNDATION ALTERNATIVES FOR SESI
" Program: Piezocone Interpretation - STRENGTH ONLY

"Interpreter Name: DOM/SHS

"SUMMARY SHEET

"'a' for calculating Qt: 0.800
"Value for Water Table (in m): 0
"Valid Zone Classification based on: Rf
"Method for calculating Su: Nkt, su calculated for SBT 1-5 only
"Value of the constant Nkt: 18.000
"Define Zone 6 for Sand Parameters? YES
"Method for Friction Angle: KULHAWY AND MAYNE (1990), Phi calculated
for SBT 6-9 only

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"For Rf Zone & Bq Zone Classification

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OF DATA IN LAYERED PROFILES.

Note: --- = NOT A NUMBER - CALCULATION NOT VALID FOR SOIL BEHAVIOR TYPE)

SoundID: B05-102.DS-1

D tot: 46.7848 (ft)

"depth "(feet)	q_tAvg (tsf)	f_sAvg (tsf)	u_2Avg (psi)	Phi (deg)	Su (psf)
0.7	116.633	0.673	0.038	40	---
1.0	134.666	0.983	0.048	40	---
2.0	74.317	1.401	0.025	40	---
3.0	60.068	0.715	-0.026	40	---
4.0	26.528	0.584	-0.030	39	---
5.0	21.377	0.198	-0.038	37	---
6.0	13.863	0.083	-0.023	35	---
7.0	8.634	0.070	-0.022	---	914.194
8.0	44.570	0.147	-0.084	39	---
9.0	39.441	0.135	-0.150	39	---
10.0	37.590	0.169	-0.147	38	---
11.0	16.689	0.248	-0.095	34	---
12.0	15.844	0.362	-0.027	---	1682.855
13.0	28.733	0.456	0.000	36	---
14.0	145.997	0.667	-0.034	40	---
15.0	148.807	0.875	-0.101	40	---

DS-1.txt				
16.0	171.849	0.757	-0.088	40
17.0	146.894	0.841	-0.089	40
18.0	105.014	0.576	-0.090	40
19.0	57.566	0.333	-0.085	38
20.0	53.698	0.277	-0.087	38
21.0	34.171	0.428	-0.077	36
22.0	31.583	0.248	-0.012	35
23.0	35.108	0.261	0.073	36
24.0	28.510	0.143	0.125	35
25.0	23.375	0.148	0.153	34
26.0	18.840	0.151	0.194	32
27.0	19.019	0.763	0.455	---
28.0	13.076	0.845	0.771	---
29.0	7.162	0.419	1.085	---
30.0	25.648	0.260	0.949	34
31.0	46.702	0.315	0.626	36
32.0	46.595	0.237	0.571	36
33.0	55.040	0.256	0.581	37
34.0	64.296	0.273	0.597	38
35.0	43.485	0.325	0.613	36
36.0	18.425	0.268	0.652	32
37.0	10.155	0.152	0.747	---
38.0	13.595	0.078	0.842	30
39.0	12.747	0.115	0.976	30
40.0	9.868	0.104	1.107	---
41.0	6.619	0.104	1.267	---
42.0	6.667	0.102	1.501	---
43.0	8.303	0.175	1.674	---
44.0	6.726	0.118	1.853	---
45.0	7.198	0.202	2.076	---
46.0	6.994	0.134	2.304	---
46.3	21.698	0.159	2.266	---

1936.516
1269.588
606.433
886.747
835.661
468.390
467.556
643.111
461.321
507.569
478.726
2110.602

"Output file from SITELOG
"=====

"Developed by: FOUNDATION ALTERNATIVES FOR SESI
" Program: Piezocone Interpretation - STRENGHT ONLY
"

"Interpreter Name: DOM/SHS
"

"SUMMARY SHEET
"-----

"'a' for calculating Qt: 0.800
"Value for water Table (in m): 0
"Valid Zone Classification based on: Rf
"Method for calculating Su: Nkt, Su calculated for SBT 1-5 only
"Value of the constant Nkt: 18.000
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"Note: --- = NOT A NUMBER - CALCULATION NOT VALID FOR SOIL BEHAVIOR TYPE)
"
"

"depth "(feet)	q_tAvg (tsf)	f_sAvg (tsf)	u_2Avg (psi)	Phi (deg)	Su (psf)
0.7	105.090	0.714	0.029	40	---
1.0	137.331	1.082	0.038	40	---
2.0	151.789	1.352	0.026	40	---
3.0	116.090	1.101	-0.005	40	---
4.0	129.881	0.690	-0.015	40	---
5.0	61.369	0.632	-0.043	40	---
6.0	32.060	0.323	-0.070	38	---
7.0	4.806	0.150	-0.012	---	487.563
8.0	3.297	0.134	0.027	---	314.828
9.0	12.657	0.096	0.051	33	---
10.0	9.190	0.095	0.071	---	957.759
11.0	5.282	0.081	0.094	---	516.921
12.0	7.842	0.122	0.125	---	795.207
13.0	9.079	0.137	0.169	---	926.468
14.0	6.346	0.154	0.223	---	616.587
15.0	13.976	0.116	0.245	---	1457.730
16.0	54.784	0.207	0.260	39	---
17.0	95.423	0.385	0.281	40	---
18.0	117.052	0.634	0.292	40	---

DS-2.txt					
19.0	100.647	0.569	0.295	40	---
20.0	79.166	0.502	0.295	40	---
21.0	66.548	0.385	0.297	39	---
22.0	50.988	0.293	0.306	38	---
23.0	37.938	0.212	0.316	36	---
24.0	26.665	0.131	0.325	34	---
25.0	15.655	0.269	0.381	---	1577.622
26.0	7.453	0.347	0.519	---	660.204
27.0	7.430	0.282	0.587	---	651.610
28.0	7.539	0.370	0.666	---	657.160
29.0	31.055	0.241	0.662	35	---
30.0	51.046	0.322	0.578	37	---
31.0	71.632	0.264	0.585	38	---
32.0	67.212	0.253	0.590	38	---
33.0	61.795	0.236	0.594	38	---
34.0	58.659	0.242	0.599	37	---
35.0	24.676	0.220	0.600	33	---
36.0	11.285	0.143	0.629	---	1020.732
37.0	10.580	0.080	0.690	---	936.144
38.0	9.941	0.077	0.794	---	858.899
39.0	8.719	0.113	0.923	---	716.910
40.0	7.121	0.114	1.032	---	532.683
41.0	6.804	0.111	1.149	---	491.213
42.0	7.261	0.138	1.405	---	535.796
43.0	7.210	0.139	1.558	---	523.916
44.0	6.787	0.218	1.668	---	470.207
45.0	7.138	0.187	1.794	---	503.110
45.9	103.538	0.360	1.432	39	---

DS-4.txt

"Output file from SITELOG
SoundID: B05-102.DS-4

"Developed by: FOUNDATION ALTERNATIVES FOR SESI
" Program: Piezocone Interpretation - STRENGHT ONLY

"Interpreter Name: DOM/SHS

"SUMMARY SHEET

"'a' for calculating Qt: 0.800
"Value for water Table (in m): 0
"Valid Zone Classification based on: Rf
"Method for calculating Su: Nkt, Su calculated for SBT 1-5 only
"Value of the constant Nkt: 18.000
"Define Zone 6 for Sand Parameters? YES
"Method for Friction Angle: KULHAWY AND MAYNE (1990), Phi calculated
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Note: --- = NOT A NUMBER - CALCULATION NOT VALID FOR SOIL BEHAVIOR TYPE)

SoundID: B05-102.DS-4

D tot: 6.95538 (ft)

"depth "(feet)	q_tAvg (tsf)	f_sAvg (tsf)	u_2Avg (psi)	Phi (deg)	Su (psf)
0.7	116.517	0.647	0.032	40	---
1.0	125.252	0.778	0.033	40	---
2.0	42.784	0.570	0.049	40	---
3.0	56.870	0.428	0.072	40	---
4.0	64.152	0.405	0.071	40	---
5.0	55.823	0.311	0.067	40	---
6.0	79.968	0.569	0.076	40	---
6.5	113.015	0.648	0.085	40	---

"Output file from SITELOG
SoundID: B05-102.DS-4A

"=====

"Developed by: FOUNDATION ALTERNATIVES FOR SESI
" Program: Piezocone Interpretation - STRENGTH ONLY

"Interpreter Name: DOM/SHS

"SUMMARY SHEET

"'a' for calculating Qt: 0.800
"Value for Water Table (in m): 0
"Valid Zone Classification based on: Rf
"Method for calculating Su: Nkt, Su calculated for SBT 1-5 only
"Value of the constant Nkt: 18.000
"Define Zone 6 for Sand Parameters? YES
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Note: --- = NOT A NUMBER - CALCULATION NOT VALID FOR SOIL BEHAVIOR TYPE)

SoundID: B05-102.DS-4A
D tot: 47.769 (ft)

"depth "(feet)	q_tAvg (tsf)	f_sAvg (tsf)	u_2Avg (psi)	Phi (deg)	Su (psf)
0.7	136.114	0.774	0.031	40	---
1.0	173.599	1.004	0.054	40	---
2.0	96.471	1.457	0.061	40	---
3.0	74.098	1.206	0.038	40	---
4.0	68.051	0.777	0.009	40	---
5.0	58.760	0.531	0.005	40	---
6.0	43.788	0.314	-0.009	40	---
7.0	62.485	0.465	-0.010	40	---
8.0	66.508	0.493	-0.010	40	---
9.0	46.631	0.271	-0.018	39	---
10.0	29.425	0.284	-0.050	37	---
11.0	23.825	0.136	-0.070	36	---
12.0	37.267	0.169	-0.064	37	---
13.0	35.447	0.318	-0.050	37	---
14.0	15.681	0.330	-0.023	---	1650.067
15.0	14.039	0.360	0.004	---	1461.077

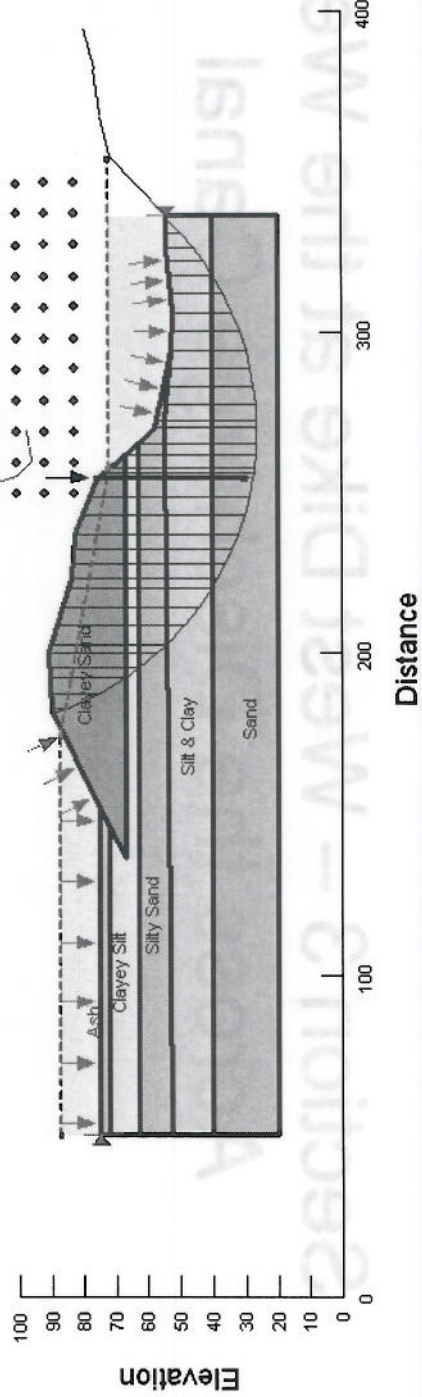
DS-4A.txt

16.0	34.758	0.322	0.033	36	---
17.0	124.324	0.366	0.026	40	---
18.0	144.124	0.892	0.006	40	---
19.0	128.513	0.424	-0.046	40	---
20.0	140.519	0.572	-0.042	40	---
21.0	129.982	0.543	-0.048	40	---
22.0	162.034	0.664	-0.034	40	---
23.0	183.852	0.784	-0.022	40	---
24.0	125.592	0.525	-0.030	40	---
25.0	72.991	0.426	-0.032	39	---
26.0	61.262	0.335	-0.019	38	---
27.0	43.782	0.258	-0.006	36	---
28.0	25.318	0.188	0.011	34	---
29.0	21.144	0.517	0.041	---	2156.379
30.0	25.730	1.638	0.125	---	2659.876
31.0	6.361	0.353	0.169	---	502.273
32.0	3.808	0.339	0.232	---	213.293
33.0	4.200	0.300	0.266	---	251.439
34.0	4.195	0.276	0.295	---	245.167
35.0	4.448	0.239	0.347	---	267.243
36.0	4.627	0.223	0.381	---	280.693
37.0	5.641	0.174	0.401	---	387.228
38.0	5.219	0.153	0.425	---	334.261
39.0	5.013	0.142	0.461	---	305.164
40.0	4.778	0.152	0.500	---	272.622
41.0	4.598	0.147	0.558	---	246.585
42.0	5.073	0.166	0.647	---	293.345
43.0	5.294	0.171	0.693	---	311.892
44.0	6.920	0.214	0.743	---	485.985
45.0	5.748	0.349	0.852	---	349.877
46.0	5.547	0.167	0.903	---	321.477
47.0	8.693	0.190	0.955	---	664.893
47.2	29.223	0.218	0.971	---	2944.489

Section 3 – West Dike at the Weir Across the Discharge Canal

Clayey Sand
120 pcf
100 psf
34 °
Clayey Silt
115 pcf
625 psf
10 °
Silty Sand
120 pcf
100 psf
30 °
Silt & Clay
115 pcf
308 psf
10 °
Fly Ash
80 pcf
0 psf
18 °
Sand
120 pcf
0 psf
36 °

Plant Crist Ash Pond dike
 Section 3 - Weir
 Steady State
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)

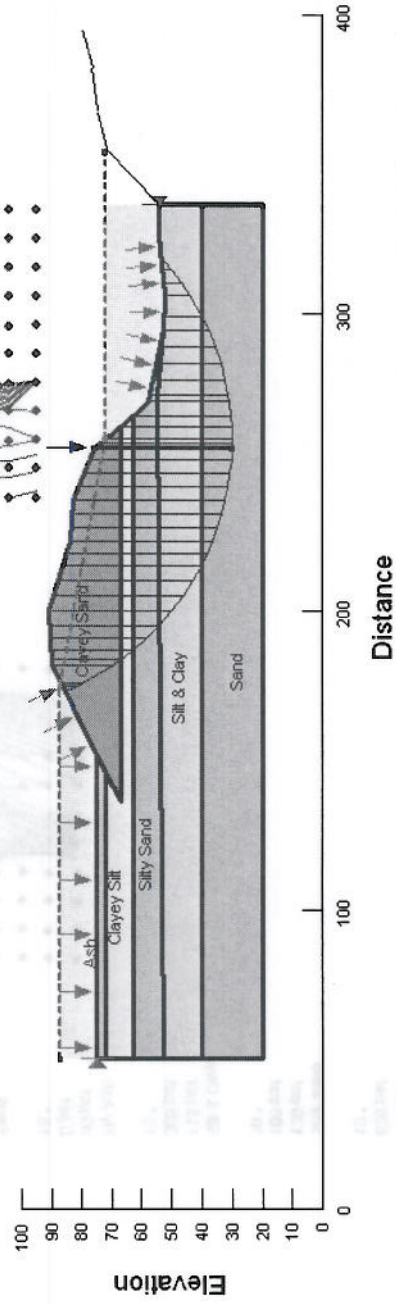


Plant Crist Ash Pond Dike Slope Stability

TV-CR-FPC30795-001

Clayey Sand
120 pcf
100 psf
34°
Clayey Silt
115 pcf
625 psf
10°
Silty Sand
120 pcf
100 psf
30°
Silt & Clay
115 pcf
308 psf
10°
Fly Ash
80 pcf
0 psf
18°
Sand
120 pcf
0 psf
36°

Plant Crist Ash Pond dike
Section 3 - Weir
Seismic - 0.03g
Method: Morgenstern-Price
All elevation are on plant datum (MSL + 72.69 ft)

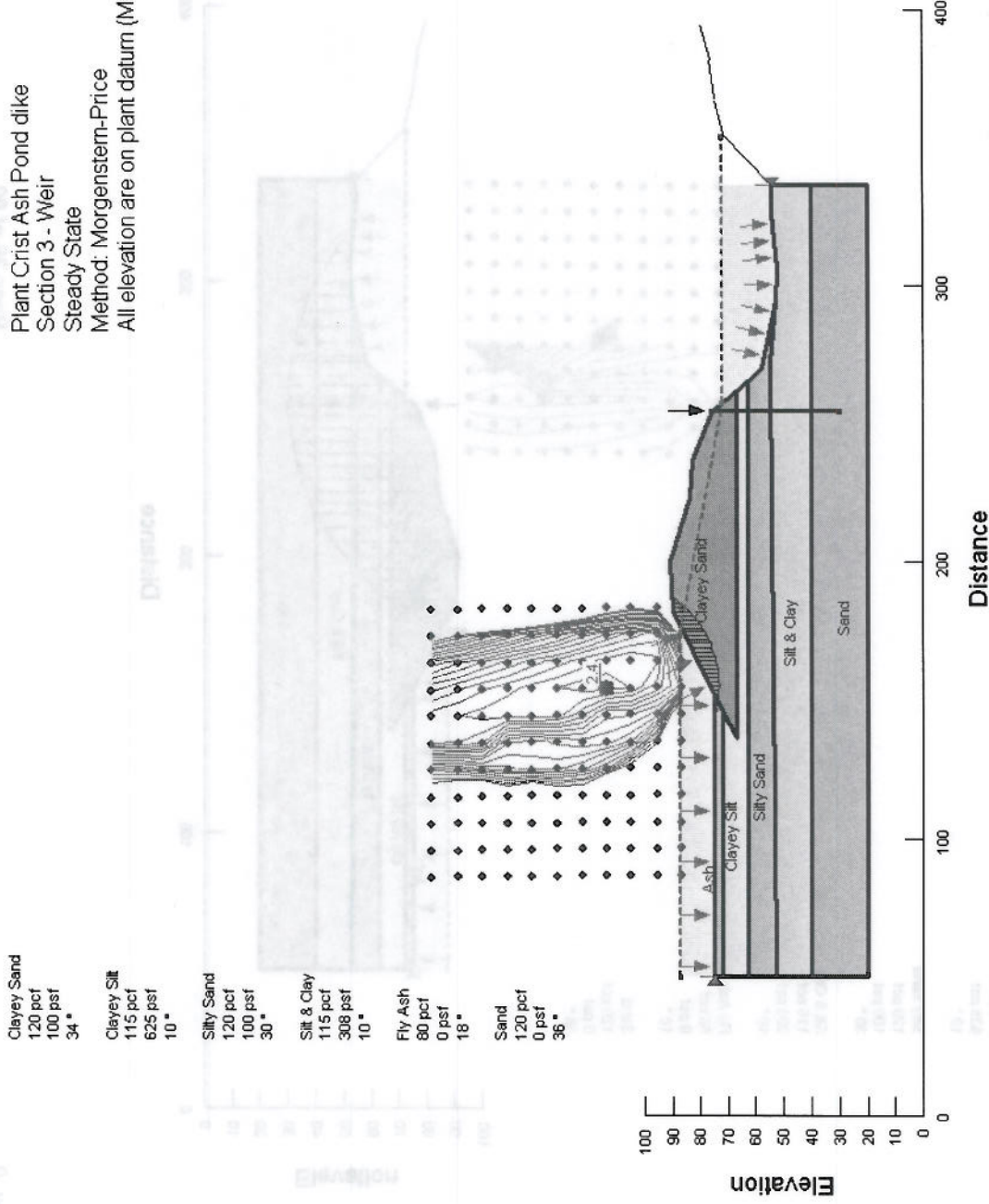


Rev. 0
8/17/2012

Page 36 of 90

CONFIDENTIAL BUSINESS INFORMATION

Plant Crist Ash Pond dike
 Section 3 - Weir
 Steady State
 Method: Morgenstern-Price
 All elevation are on plant datum (MSL + 72.69 ft)



Engineering and Construction Services Calculation

Calculation Number:
TV-CR-FPC30795-003



Project/Plant: Plant Crist CCB Facilities		Unit(s): Common	Discipline/Area: Geotechnical
Title/Subject: Analysis of Liquefaction Potential for Stormwater Pond Dike and Gypsum Storage Area			
Purpose/Objective: Evaluate the potential for dike and foundation soils to liquefy under earthquake shaking			
System or Equipment Tag Numbers: NA		Originator: Benjamin J. Gallagher, P.E.	

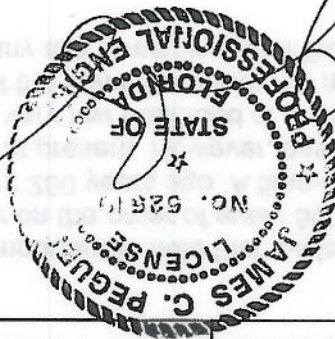
Contents

Topic	Page	Attachments (Computer Printouts, Tech. Papers, Sketches, Correspondence)	# of Pages
Purpose of Calculation	2	Attachment A: Liquefaction Potential Summary	1
Summary of Conclusions	2	Attachment B: USGS Probabilistic Hazard Data	2
Methodology	3		
Criteria and Assumptions	3		
Design Inputs/References	4		
Body of Calculation	4		
Total # of pages including cover sheet & attachments:	7		

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	BJG/09-07-12	JCP/09-07-12	JCP/09-07-12
1	Updated for GSA Ponds	BJG/1-26-2014	JCP/1-27-2014	JCP/1-27-2014

Notes:



Purpose of Calculation

Plant Crist is a coal-fired steam plant. Pollution controls installed at the plant produce solid materials including ash and scrubber waste (gypsum). The ash is presently stored in a dry stack landfill, and the gypsum is sluiced to a storage multi-cell storage facility where it is dried and stacked. In past times, ash was sluiced to a pond. This pond has been dredged to remove the majority of the ash, and the remaining ash is currently being dredged. This pond is presently used as part of the wastewater treatment process, and is referred to as the Stormwater Pond.

Both the Stormwater Pond and the Gypsum Storage Area are surrounded by dikes made of compacted earth bearing on native soils. The purpose of this calculation is to evaluate the potential for liquefaction of the dikes and foundation soils to occur during earthquake shaking.

Summary of Conclusions

The USGS online map of Quaternary Fault and Fold Database indicates Plant Crist is located within the area of Gulf-margin normal faults. The USGS report indicates there is little evidence of Quaternary slip on these faults, and states that it is not clear that slip on these faults would occur seismically. They have a "strikingly low historical seismicity."

At the Gypsum Storage Area, the analysis indicates liquefaction of the foundation soils beneath Cell 2, Process Sedimentation Pond, and Return Water Pond is not likely during either of the scenario earthquakes.

At the Stormwater Pond, liquefaction does not appear to be threat during the CEUS scenario earthquake. The CEUS comprises nearly 90 percent of the USGS-considered earthquake hazard. However, during the less-likely NMSZ scenario earthquake, some of the soft natural soils encountered immediately beneath the dike exhibited factors of safety between 0.9 and 1.4, when considering phreatic conditions on the inboard side of the dike. This suggests some of the natural soils may be vulnerable to liquefaction and strength loss could potential occur in this stratum due to earthquake-induced pore pressure buildup.

However, it is important to note that evidence suggests the major earthquakes at the NMSZ recur on the order of every 500 years, with last major events happening about 200 years ago. A time-dependent model for the NMSZ hazard is not available at present. However, based on our current understanding of NMSZ, there is very low likelihood of an NMSZ earthquake occurring over the remaining life of the plant. Furthermore, much of the ash has been removed from the pond, and any ash remaining after the latest dredging (2011) is in the

process of being removed now. Therefore, in the unlikely event of a release of water due to deformation of the embankments during a NMSZ seismic event, there would be no release of ash.

In addition to the uncertainty of time dependence, our recent experience has indicated that the USGS map data may not be especially well suited for these sorts of very distant events (600+ km). Recent liquefaction remediation work at another facility located approximately 250 miles north of Pensacola revealed appreciably lower ground motions when a site-specific seismic analysis was completed.

Given this low likelihood of a NMSZ event, the relatively conservative nature of the USGS mapped data, and the fact that the pond will soon be cleaned of ash, it is our opinion that neither additional study nor modifications to the pond are warranted.

Methodology

Liquefaction potential was assessed using procedures outlined in the 2004 paper by Idriss and Boulanger titled, "Semi-Empirical Procedures for Evaluating Liquefaction Potential During Earthquakes".

The SPT test data collected for was used to evaluate liquefaction potential. Supplemental information regarding SPT correction factors was obtained from the 2001 paper by Youd and Idriss "Liquefaction Resistance of Soils: Summary Report From The 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils" and ASTM D 6066-04. The reported factor of safety is the ratio of the cyclic resistance ratio (CRR) to the cyclic stress ratio (CSR).

The deaggregation of the published 2008 PSHA data for the site indicates the nearly 90% of the seismic hazard for Plant Crist is derived from the Central and Eastern US random faulting source (CEUS), and about 11% percent of the hazard is attributed to the distant New Madrid Source Zone. Two scenarios were evaluated for potential liquefaction, the average magnitude and acceleration from the CEUS random source and the distant M7.8 NMSZ event.

Criteria and Assumptions

Based on the historical SPT data (1971 and 1992 borings), the subsurface conditions at the Stormwater Pond are considered consistent with Site Class E, Soft Soils. Based on the SPT data, the subsurface conditions at the Gypsum Storage Area are considered consistent with Site Class D, Stiff Soils.

The deaggregation of the USGS PSHA data (2% chance of exceedance over 50 years) for the Plant Crist indicated an average earthquake of M5.8 at 100km for

the CUES source and a M7.8 at 630km for the NMSZ. The corresponding site-modified zero period accelerations (PGA) are 0.066g (CEUS) and 0.039g (NMSZ) for the Stormwater Pond (Site Class E) and 0.042g (CEUS) and 0.025g (NMSZ) for Gypsum Storage Area (Site Class D).

A topographic amplification factor of 1.42 was applied to the site-modified PGA values to determine the acceleration at the crest of the Stormwater Pond Dike.

At the Gypsum Storage Area, the borings predate the construction and the liquefaction analysis considers the foundation soils only. Because the gypsum and dikes are drained, they will not be subject to liquefaction. The overburden pressure of the dikes and gypsum will increase as gypsum is stored, enhancing the liquefaction resistance of the foundation soils.

SPT testing was generally performed at 5-foot increments throughout the borings. The liquefaction potential was analyzed at each SPT test and the results are summarized on the attached table. Liquefaction potential is evaluated as the CRR divided by CSR. Values of less than 1.1 are considered at risk of liquefaction during a design earthquake event, values between 1.1 and 1.4 are considered to have the potential for some pore-pressure induced strength loss, and values greater than 1.4 are considered not likely to liquefy.

Design Inputs/References

1. Southern Company SPT Test Borings APD-6 and APD-7 (1992)
2. Law Engineering SPT Test Boring B-110 (1971)
3. Southern Company SPT Test Borings GYP-1S, GYP-4S, GYP-5, GYP-16
4. USGS Probabilistic Earthquake Hazard Data Interactive Deaggregation (2008 data; 2% exceedance over 50 years)

Body of Calculation

Attached

Plant Crist CCB Facilities
Simplified Evaluation of Liquefaction Potential in SPT Test Borings

updated by Ben Gallagher, 1/25/2014

Stormwater Pond Dike Centerline					
APD-6			B-110		
Depth	SPT N-value	Factor of Safety, New Madrid CEUS	Factor of Safety, New Madrid CEUS	SPT N-value	Factor of Safety, New Madrid CEUS
5	13	>5	2.2	20	>5
10	43	>5	5	33	>5
15	22	>5	5	17	>5
20	26	>5	5	4	1.8
25	6	1.8	1.7	1.5	1.8
30	5	clay	1.2	5	clay
35	3	1.9	1.1	0.9	1.2
40	3	1.4	1.0	1.2	1.7
45	6	1.7	1.2	9	2.2
50			>5		
55					

Water at 3 feet below top of dike

Reported N-values are uncorrected field values

Factor of Safety = Cyclic Resistance Ratio (CRR) divided by the Cyclic Shear Stress Ratio (CSR)

This evaluation was performed following the using the "Simplified" procedures described by Idriss and Boulanger in the paper titled "Semi-empirical procedures for evaluating liquefaction potential during earthquakes" dated January 2004 and the journal article titled "Liquefaction Resistance of Soils: Summary report from the 1996 NCEER and 1998 NCEER/NSF Workshops on evaluation of liquefaction resistance of soils" by Youd and Idriss dated April 2001.

The ground motions were selected based on sources identified using the interactive designation of the USGS-published 2008 PSHA data. For comparison, two earthquake sources were considered, the CEUS gridded random source (88% the hazard) with a average magnitudes of 5.8 and distance of 100.6 km and the New Madrid Source Zone (11% of the hazard) with a magnitude of 6.27 km. The site-modified zero period accelerations (PGA) are 0.042g (CEUS) and 0.025g (NM62) for Gypsum Storage Area (Site Class D) and 0.066g and 0.039g (NM62) for the Stormwater Pond dike (Site Class B). A topographic amplification factor of 1.42 was applied to the site-modified PGA values to determine the acceleration at the crest of the ash pond dike.

Gypsum Storage Area Foundation											
GY-1S				GY-4S				GY-5			
Depth	SPT N-value	Factor of Safety, New Madrid CEUS	Factor of Safety, New Madrid CEUS	Depth	SPT N-value	Factor of Safety, New Madrid CEUS	Factor of Safety, New Madrid CEUS	Depth	SPT N-value	Factor of Safety, New Madrid CEUS	Factor of Safety, New Madrid CEUS
5	11	Excavated	Excavated	10	8	>5	>5	10	16	Excavated	Excavated
10	8	>5	>5	15	10	>5	>5	15	14	>5	>5
15	10	>5	>5	20	15	>5	>5	20	19	>5	>5
20	15	>5	>5	25	21	>5	>5	25	23	>5	>5
25	21	>5	>5	30	19	>5	>5	30	33	>5	>5
30	19	>5	>5	35	13	>5	>5	35	23	>5	>5
35	13	>5	>5	40	21	>5	>5	40	18	>5	>5
40	21	>5	>5	45	31	>5	>5	45	10	>5	>5
45	31	>5	>5	50	40	>5	>5	50	23	>5	>5
50	40	>5	>5	55	47	>5	>5	55	9	>5	>5
55	47	>5	>5	60	15	>5	>5	60	27	>5	>5
60	15	>5	>5	65	5	>5	>5	65	29	>5	>5
65	5	>5	>5	70				70			
70				75				75			
75				80				80			
80				85				85			

Water at Elev. 87

GY-1S (Return Water Pond)

GY-5 (Cell 2)

GY-4S (Process Sediment Pond)

GY-16 (Cell 1)

Page 1 of 19

DIST (KM)	MAG (MW)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
13.5	4.60	1.510	0.042	0.250	0.628	0.517	0.071	0.002
34.4	4.60	2.564	0.199	1.165	1.148	0.052	0.000	0.000
61.3	4.61	0.861	0.336	0.525	0.000	0.000	0.000	0.000
88.4	4.61	0.175	0.172	0.004	0.000	0.000	0.000	0.000
116.6	4.61	0.112	0.112	0.000	0.000	0.000	0.000	0.000
13.6	4.79	2.627	0.069	0.412	1.034	0.947	0.160	0.004
34.8	4.80	5.239	0.327	1.956	2.695	0.260	0.000	0.000
61.7	4.80	2.100	0.554	1.514	0.032	0.000	0.000	0.000
88.6	4.81	0.500	0.387	0.112	0.000	0.000	0.000	0.000
118.2	4.81	0.393	0.392	0.001	0.000	0.000	0.000	0.000
13.8	5.03	1.792	0.045	0.266	0.668	0.666	0.141	0.007
35.5	5.03	4.375	0.211	1.263	2.450	0.451	0.000	0.000
62.2	5.03	2.265	0.357	1.608	0.299	0.000	0.000	0.000
88.8	5.04	0.651	0.269	0.382	0.000	0.000	0.000	0.000
119.5	5.04	0.622	0.529	0.094	0.000	0.000	0.000	0.000
166.5	5.05	0.123	0.123	0.000	0.000	0.000	0.000	0.000
13.9	5.21	0.662	0.016	0.095	0.239	0.239	0.069	0.004
35.9	5.21	1.852	0.076	0.452	1.035	0.289	0.000	0.000
62.6	5.21	1.148	0.128	0.720	0.300	0.000	0.000	0.000
88.9	5.21	0.376	0.096	0.280	0.000	0.000	0.000	0.000
120.3	5.21	0.407	0.249	0.158	0.000	0.000	0.000	0.000
168.4	5.21	0.110	0.110	0.000	0.000	0.000	0.000	0.000
13.9	5.39	0.978	0.023	0.138	0.346	0.346	0.117	0.007
36.3	5.39	3.059	0.110	0.655	1.619	0.666	0.009	0.000
63.0	5.40	2.233	0.185	1.106	0.942	0.000	0.000	0.000
89.0	5.40	0.834	0.140	0.672	0.022	0.000	0.000	0.000
121.1	5.40	1.025	0.382	0.642	0.000	0.000	0.000	0.000
169.7	5.41	0.352	0.335	0.017	0.000	0.000	0.000	0.000
217.3	5.41	0.070	0.070	0.000	0.000	0.000	0.000	0.000
14.0	5.61	0.468	0.011	0.065	0.163	0.163	0.062	0.004
36.7	5.61	1.643	0.052	0.309	0.775	0.490	0.018	0.000
63.4	5.62	1.444	0.087	0.522	0.822	0.014	0.000	0.000
89.2	5.62	0.625	0.066	0.393	0.167	0.000	0.000	0.000
121.9	5.62	0.878	0.180	0.678	0.020	0.000	0.000	0.000
170.7	5.62	0.379	0.262	0.116	0.000	0.000	0.000	0.000
219.7	5.62	0.112	0.112	0.000	0.000	0.000	0.000	0.000
14.0	5.80	0.407	0.009	0.056	0.141	0.141	0.056	0.005
36.9	5.80	1.526	0.045	0.266	0.668	0.514	0.033	0.000
63.7	5.80	1.502	0.075	0.450	0.906	0.071	0.000	0.000
89.3	5.81	0.714	0.057	0.338	0.319	0.000	0.000	0.000
122.6	5.81	1.108	0.155	0.802	0.150	0.000	0.000	0.000
171.4	5.81	0.561	0.255	0.306	0.000	0.000	0.000	0.000
220.6	5.82	0.198	0.194	0.004	0.000	0.000	0.000	0.000
269.4	5.82							

379.7	7.39	0.693	0.175	0.454	0.065	0.000	0.000	0.000
624.2	7.45	0.826	0.457	0.369	0.000	0.000	0.000	0.000
628.2	7.42	1.042	0.829	0.213	0.000	0.000	0.000	0.000
721.4	7.39	0.822	0.822	0.000	0.000	0.000	0.000	0.000
126.1	7.59	0.050	0.001	0.008	0.020	0.020	0.001	0.000
176.2	7.59	0.068	0.002	0.012	0.031	0.022	0.000	0.000
224.4	7.59	0.077	0.003	0.018	0.044	0.012	0.000	0.000
274.0	7.59	0.061	0.003	0.019	0.039	0.000	0.000	0.000
380.5	7.59	0.125	0.019	0.077	0.029	0.000	0.000	0.000
✓ 627.4	7.70	5.490	2.354	3.135	0.000	0.000	0.000	0.000
✓ 627.0	8.00	4.181	1.331	2.230	0.619	0.000	0.000	0.000

Summary statistics for above PSHA PGA deaggregation, R=distance, e=epsilon:

Contribution from this GMPE(%): 100.0

Mean src-site R= 164.0 km; M= 6.03; eps0= -0.01. Mean calculated for all sources.

Modal src-site R= 627.4 km; M= 7.70; eps0= 1.51 from peak (R,M) bin

MODE R*= 626.9km; M*= 7.70; EPS.INTERVAL: 1 to 2 sigma % CONTRIB.= 3.135

Principal sources (faults, subduction, random seismicity having > 3% contribution)

Source Category: % contr. R(km) M epsilon0 (mean values).

New Madrid SZ no clustering 10.99 627.0 7.78 1.42

CEUS gridded 88.12 100.6 5.80 -0.21

Individual fault hazard details if its contribution to mean hazard > 2%:

Fault ID % contr. Rcd(km) M epsilon0 Site-to-src azimuth(d)

New Madrid FZ, central 7.61 628.6 7.78 1.43 -30.6

#####End of deaggregation corresponding to Mean Hazard w/all GMPEs #####

PSHA Deaggregation. %contributions. site: Crist_CCB_Facil long: 87.233 W., lat: 30.568 N.

Vs30(m/s)= 760.0 CEUS atten. model site cl BC(firm) or A(hard).

NSHMP 2007-08 See USGS OFR 2008-1128. dM=0.2 below

Return period: 2475 yrs. Exceedance PGA =0.04419 g. Weight * Computed_Rate_Ex 0.938E-04

#Pr[at least one eq with median motion=PGA in 50 yrs]=0.01155

#This deaggregation corresponds to Toro et al. 1997

DIST(KM)	MAG(MW)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
13.7	4.60	0.412	0.042	0.250	0.120	0.000	0.000	0.000
35.0	4.60	0.891	0.199	0.679	0.013	0.000	0.000	0.000
61.9	4.61	0.411	0.298	0.112	0.000	0.000	0.000	0.000
88.2	4.61	0.087	0.087	0.000	0.000	0.000	0.000	0.000
115.6	4.61	0.046	0.046	0.000	0.000	0.000	0.000	0.000
13.8	4.79	0.690	0.069	0.412	0.209	0.000	0.000	0.000
35.3	4.80	1.630	0.328	1.256	0.047	0.000	0.000	0.000
62.2	4.80	0.843	0.515	0.328	0.000	0.000	0.000	0.000
88.3	4.81	0.199	0.198	0.001	0.000	0.000	0.000	0.000
116.9	4.81	0.122	0.122	0.000	0.000	0.000	0.000	0.000
13.9	5.03	0.463	0.045	0.266	0.153	0.000	0.000	0.000
35.9	5.03	1.321	0.211	1.022	0.087	0.000	0.000	0.000
62.7	5.03	0.855	0.357	0.498	0.000	0.000	0.000	0.000
88.5	5.04	0.241	0.212	0.029	0.000	0.000	0.000	0.000
118.4	5.04	0.182	0.182	0.000	0.000	0.000	0.000	0.000
166.7	5.05	0.035	0.035	0.000	0.000	0.000	0.000	0.000
13.9	5.21	0.169	0.016	0.095	0.058	0.000	0.000	0.000
36.3	5.21	0.545	0.076	0.413	0.057	0.000	0.000	0.000
63.0	5.21	0.412	0.128	0.284	0.000	0.000	0.000	0.000
88.7	5.21	0.132	0.093	0.039	0.000	0.000	0.000	0.000
119.2	5.21	0.113	0.111	0.002	0.000	0.000	0.000	0.000
168.9	5.21	0.030	0.030	0.000	0.000	0.000	0.000	0.000
14.0	5.39	0.248	0.023	0.138	0.087	0.000	0.000	0.000
36.6	5.39	0.879	0.110	0.636	0.133	0.000	0.000	0.000
63.4	5.39	0.761	0.185	0.576	0.000	0.000	0.000	0.000
88.8	5.40	0.273	0.140	0.134	0.000	0.000	0.000	0.000
119.9	5.40	0.264	0.238	0.026	0.000	0.000	0.000	0.000
170.2	5.40	0.089	0.089	0.000	0.000	0.000	0.000	0.000
217.5	5.40	0.020	0.020	0.000	0.000	0.000	0.000	0.000
14.0	5.61	0.118	0.011	0.065	0.042	0.000	0.000	0.000



SOUTHERN COMPANY GENERATION

EMERGENCY ACTION PLAN

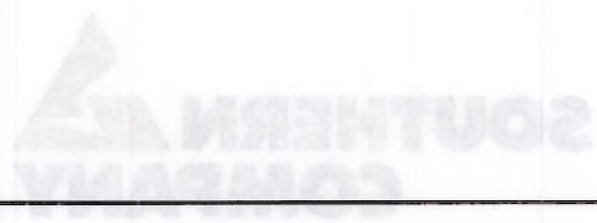
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Approved *Mark J. Lewis*
Facility Manager

Date 12-13-12

Approved *Jimmy L. Wright*
Compliance & Support Manager

Date 12-11-12



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Approved: _____
Date: 12-12-12

Approved: _____
Date: 12-11-12

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- **Weather Events**

- **Hurricanes**

- **Departmental Hurricane Checklists – prior June 1**

- **Departmental Hurricane Checklists – 72 hr**

- **Post Storm Evaluation Form**

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- **Combine Cycle Severe Weather Checklist**

- **Fuel Department Severe Weather Checklist**

- **Tornadoes**

- **Post Storm Evaluation Form**

- **Workplace Violence**

PURPOSE:

In an effort to provide direction during an emergency, it is necessary to establish a written plan that gives specific actions that can lead to successful outcomes thereby reducing the potential for loss of life or property. The Emergency Action Plan is designed to cope with a wide variety of emergencies that may threaten personnel, property, production, and/or the environment. This plan is to be used as a quick reference for employees, contractors, and guests in the event of an actual emergency.

When events occur caused by fire, explosion, chemical releases, natural disasters, threats, etc., there are resulting problems that can be anticipated through sound logic. The use of common terminology, component organization, communications, pre-determined incident planning, and resource management are all components of an effective Emergency Action Plan.

The purpose of this plan is to:

- Identify the procedures for reporting a fire or emergency
- Train employees and visitors on emergency notifications and proper evacuation
- Establish responsibility for critical operations during emergencies
- Establish accountability
- Determine proper response, rescue and care to the sick and injured
- Establish responsibility to minimize loss and harm to personnel and property, and
- Accurately report to those in authority.

Emergency Action Plans are located in the following areas: Control Rooms, Compliance, and Security offices.

Site specific attachments should be reviewed annually by Compliance personnel and updated as necessary. Contact your site's Compliance Department for further information or explanation of duties under this plan.

REPORTING EMERGENCIES

It is the responsibility of all facility personnel to recognize and report emergency situations. Telephone stations and SoLinc phones are provided within buildings.

Anyone discovering a dangerous situation should report it by calling the in-house

Emergency Number

The operator receiving the call will immediately notify the Operations Shift Team Leader. The Operations Shift Team Leader will, upon receiving the report, immediately investigate and

decide upon the appropriate actions. If an emergency evacuation/response is required, the Operations Shift Team Leader will direct an appropriate alarm to be sounded for at least 30 seconds and provide general instructions as to the alarm over the public address system. The Operations Shift Team Leader may activate the emergency response team and/or call for outside agencies as well. Decisions will be made for possible outside assistance, ie: 9-1-1.

DEFINITIONS:

Emergency – A sudden, generally unexpected occurrence or set of circumstances demanding an immediate planned action.

Incident Command Post – A physical location where decision making related to the emergency will occur. The Incident Commander is located here.

Incident Commander – The person responsible for all decisions relating to the management of the emergency. The Incident Commander is typically the designated Operations Shift Team Leader. ([Incident Commander Responsibilities](#))

Emergency Response Team – A group of designated trained individuals in response to specific type of emergencies. ([Matrix and listing of members](#))

NOTIFICATION & ACCOUNTABILITY:

Southern Company facilities are equipped with distinct audible emergency Alarm Tones. When an alarm is activated and it is safe to do so, all personnel should move to the closest rally point as determined by the specific alarm. Care must be taken to keep the exit discharge doors clear to avoid hampering emergency operations. Employees must make contact with their Team Leader/Roll Call Officer for accountability and await further instructions.

If the emergency requires further evacuation, personnel will be notified to report to one of the [Safe Refuge Areas](#) as directed by the Incident Commander and await further instructions.

The public address (PA) system and SoLinc will be the primary means of communication for the Incident Commander to communicate with designated site personnel during an emergency. No other employees should utilize the SoLinc unless the Incident Commander is communicating with them directly during the emergency.

Each facility is responsible for contacting their respective Safety & Health Departments as soon as is safely possible. Additional assistance is also available by activating Corporate IRT.

When all employees have been accounted for and the emergency is over, the Incident Commander will direct the “all clear” alarm tone to be activated, followed by verbal directions over the PA system and SoLinc. Once the “all clear” has been announced, all personnel can resume their normal work duties.

ERT MEMBER NOTIFICATION

Emergency Response Team (ERT) members are trained to respond to various emergency medical situations, hazardous materials events, and specialized technical confined space rescues. Members are equipped with SOLinc radios for emergency notification and communication purposes.

When alerted, the ERT members on site will verbally acknowledge they have received the communication. The Emergency Response Team members are under the control of the Emergency Response Team Leader and will report to him/her during a state of emergency. Once the ERT is assembled, the Emergency Response Team Leader will report to the Incident Commander that ERT is ready for further instruction/assignments.

EVACUATION ROUTES/RALLY POINTS:

During a declared emergency, all employees and visitors, not assigned to the emergency, shall report to the nearest [Rally Point](#) and await further instruction. Head counts will be performed by the Team Leaders at the rally points.

If a site evacuation is ordered, the evacuation route/s and Off-site Assembly Point will be communicated and appropriate alarms sounded.

Current evacuation routes are shown in the Plant Site Plan. Head counts will be performed by the Team Leaders at Safe Refuge Area/s, and the information will be relayed to the Incident Commander on the scene.

Special care may be needed to assist injured or handicapped persons in evacuation.

TRAINING:

Emergency Action Plan training will be conducted when one of the following conditions occur:

- When the plan is revised
- When the employee's responsibilities or designated actions under the plan change
- A new or transferred employee begins working at the site (covered in new employee or transfer orientation)
- Annually to all personnel during Compliance Training

Other employees and non-escorted visitors to the site shall be informed of the emergency alarm system, reporting procedures, evacuation procedures, and rally points by site Security or through the Contractor Orientation Program.

DRILLS:

An emergency action drill, including evacuation procedures, will be organized by the Safety Specialist at least annually for each shift, and documented to determine the effectiveness of the Emergency Action Plan and accountability methods.

EMERGENCY INCIDENTS:

The following list of emergency incidents has been identified as most likely to have cause for implementation and will be discussed in detail further in the plan:

- Bomb Threats
- Pandemic Threats
- Fire and/or Explosion
- Floods
- Hazardous Material Releases
- Hurricanes
- Tornadoes
- Catastrophe
- Workplace Violence
- Medical Treatment (Extreme/Severe)
- Rescue

The above incidents are not all-inclusive and could involve more than one event at a given time. If additional incidents need to be included in this document, contact your site Compliance personnel.

Catastrophic Events:

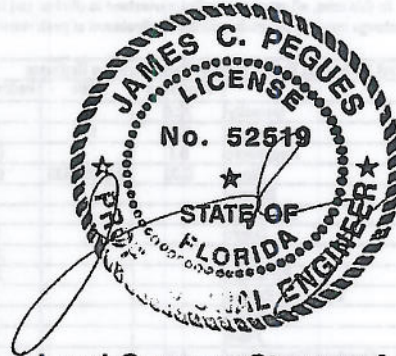
During major catastrophic events, each operating company has plans in place to handle events with company-wide implications. Geographically defined, statewide Incident Response Teams may be activated as well as the Southern Company Incident Response Team. This is documented in the Business Assurance Model and includes charts for each operating company as well as a crisis management team for various sites.

Site Specific Plans Follow

[Plant Crist Safety & Health Programs \(Policies and Guidelines\)](#)
[Process Safety Management](#)
[2012 Emergency Response Guidebook](#)



Date: January 27, 2014
 To: Mike Markey, Gulf Power
 From: Ben Gallagher, PE
 Jim Pegues, PE



Subject: $\frac{1}{2}$ PMP Analysis for Former Ash Pond and Gypsum Storage Area

We reviewed the hydrology of the Ash Pond and Gypsum Storage Area with respect to $\frac{1}{2}$ PMP rainfall. Probable Maximum Precipitation (PMP) values are generalized estimates of theoretical maximum precipitation values for specific locations and durations. These values were published by the National Weather Service for use in hydrological evaluation.

At the Gypsum Storage Area (GSA), we found the active cell (Cell 2), process sedimentation pond, and return water pond each have adequate freeboard during a $\frac{1}{2}$ PMP event. In the case of the return water pond, extreme conditions could result in freeboards less than 1 foot. However, this pond is lined with HDPE and the top of the dike is covered by gravel. Based on the small area of the pond and the protection provided by liner and gravel road, the freeboard is considered adequate, especially considering the overall capacity of the armored embankment spillway.

A summary of the results of our GSA review is present in the following table:

Area	Minimum Freeboard	Notes
Cell 2 – GSA	2.5 ft	
Process Sed. Pond – GSA	0.9 ft	Pond is lined and dike is gravel topped, and has emergency spillway
Return Water Pond - GSA	0.5 ft	Pond is lined and dike is gravel topped, and has emergency spillway.

We reviewed the previous hydrologic calculation for the former ash pond. In that calculation, the minimum freeboard was found to be 2.4 feet for the 100-year, 24-hour storm (14 inches total rainfall). Assuming no additional discharge, $\frac{1}{2}$ PMP storm (23.6 inches total) will result in a 14-inch increase in water to a freeboard 1.3 feet, based on total drainage area to pond area ratio of 1.4 (that is, 1.4 times 9.6 inches, the difference between 23.6 inches and 14 inches.) A freeboard of 1.4 feet is adequate for this relatively small pond size.

**Plant Crist Gypsum Storage Area Hydrologic and Hydraulic Analysis
Cell 2 Worst Case Rational Method Runoff**

By: BJB

21-Jan-14

The gypsum storage facility consists of a constructed, operating storage cell (Cell 2) and two ponds. Cell 1 is planned, if needed in the future, but has not been constructed. Cell 2 is drained by a concrete drop inlet decant structure connected to a 30" dia. HDPE pipe and a concrete box culvert and chute spillway. As Cell 2 is filled with gypsum, storage capacity is decreased and contributory area to the decant structure is reduced. The worst case stormwater condition is when Cell 2 is nearing completion, and there is negligible storage volume in the cell. In this case, all storm water flows overland to ditches and is discharged through the spillway. Use rational method to determine peak runoff and compare with spillway discharge curve to determine minimum freeboard at peak storm flow. Cell 2 phase II drawing E4C39039. Spillway drawing E4C39053.

Cell 2 Phase II Full - Time of Concentration Estimate				
	Sheetflow	Rills	Perimeter ditch	
Intensity	22.0			in/hr
Length	210	175	1500	ft
Roughness	0.1		0.018	
Slope	0.03	0.33333333	0.004	
Bottom		12	ft	
Side Slope		1.5		
Depth		2.34	ft	
Area		36.29	sf	
Perimeter		20.44	ft	
Hydraulic Radius		1.78		
Velocity		7.67	fps	
Flow		278	cfs	
Overland Travel Time	4.8		min	
Shallow Channel Travel Time		3.1	min	
Main Ditch Travel Time		3.3	min	
Total Time of Concentration		11.2	min	

Cell 2 Rainfall Intensity		
60-minute, 1-sq mile PMP (HMR 52 Fig 24)		19.4 in
5 minute to 60 minute ratio (HMR 52 Fig 36)		0.319
15 minute to 60 minute ratio (HMR 52 Fig 37)		0.49
Interpolated ratio for time of concentration:	11.2 min	0.43
PMP (inches) for time of concentration:	11.2 min	8.2 in
PMP Intensity		44 in/hr
1/2 PMP Intensity		22.1 in/hr

Rational Method Peak Runoff - Cell 2 Phase II Full		
Runoff Coefficient	0.9 (relatively impervious)	
Rainfall Intensity	22 in/hr	
Area	14 acres	
Peak Runoff at Cell 2 Spillway	278 cfs	

Cell 2 Spillway Discharge Curve Spillway is a 7x5' concrete box culvert Control is as broadcrested weir Roughness 0.012 Slope 0.003			
Elevation	Depth ft	Discharge cfs	Min. Freeboard ft
115.73	0		
115.93	0.2	15	
116.13	0.4	30	
116.33	0.6	45	
116.53	0.8	60	
116.73	1	75	
116.93	1.2	90	
117.13	1.4	106	
117.33	1.6	121	
117.53	1.8	136	
117.73	2	151	
117.93	2.2	166	
118.13	2.4	181	
118.33	2.6	196	
118.53	2.8	211	
118.73	3	226	
118.93	3.2	241	
119.13	3.4	256	
119.33	3.6	271	
119.53	3.8	286	2.5
119.73	4	301	
119.93	4.2	317	
120.13	4.4	332	
120.33	4.6	347	
120.53	4.8	362	
120.73	5	377	

Cell 2 Spillway can discharge the peak flow from 1/2 PMP event with a minimum freeboard of 2.5 feet.

Notes	Minimum Freeboard	Area
Pond is lined and dike is gravel topped, and has emergency spillway	0.5 ft	Cell 2 - GSA
Pond is lined and dike is gravel topped, and has emergency spillway	0.5 ft	Pond 3rd - GSA
Pond is lined and dike is gravel topped, and has emergency spillway	0.5 ft	Return Water Pond - GSA

We reviewed the previous hydrologic calculation for the former ash pond. In that calculation, the minimum freeboard was found to be 2.4 feet for the 100-year, 24-hour storm (14 inches total rainfall). Assuming no additional discharge, 1/2 PMP storm (22.1 inches total) will result in a 14-inch increase in water to a freeboard of 3.8 feet, based on total drainage area to pond area ratio of 1.4 (that is, 1.4 times 9.8 inches, the difference between 22.1 inches and 14 inches). A freeboard of 1.4 feet is adequate for this relatively small pond size.

**Plant Crist Gypsum Process Sedimentation Pond
Storage Routing Analysis**

Calculation Number:

date: 1-24-2014 by: BJG

The gypsum storage facility consists of a constructed, operating storage cell (Cell 2) and two ponds. Cell 1 is planned, if needed in the future, but has not been constructed. The process sedimentation pond and return water pond manage all stormwater runoff for the gypsum storage area. The combined ponds are sized to zero discharge back to back 100-year, 24-hour storm flows from entire facility, including potential future Cell 1

Process Pond:

Receives runoff from Gypsum Storage Area Cell 2 via box culvert and concrete chute spillway

Primary discharge is concrete drop inlet with 36" HDPE to Return Water Pond

Water level in process pond is normally controlled by pumping from return water pond

For events in excess of design, overtopping control provided by gravel covered broad crest spillway

Process Pond Storage Curve (from as-built data)			
Notes	Water Elevation	Incremental Volume	Total Volume
		1000 cf	1000 cf
Top of Dike	119	206	4305
	118	205	4099
Spillway	117	202	3894
	116	197	3692
	115	192	3495
	114	187	3304
	113	182	3117
	112	177	2935
	111	172	2758
	110	167	2586
	109	162	2419
	108	158	2257
	107	153	2099
	106	149	1946
	105	144	1797
	104	140	1653
	103	135	1513
	102	131	1378
	101	127	1247
	100	122	1121
	99	118	998
	98	114	880
	97	110	766
	96	106	656
	95	102	549
	94	98	447
	93	94	349
	92	91	255
	91	87	164
	90	55	77
	89	22	22
Bottom of Pond	88	0	0

Process Pond Overtopping Control Broadcrested Spillway Curve (SCS TR39 spillway from Haan, Barfield, Hayes 1994)		
Freeboard	Head	Discharge
Feet	Feet	cfs
0	2	177
0.1	1.9	161
0.2	1.8	145
0.3	1.7	131
0.4	1.6	117
0.5	1.5	104
0.6	1.4	92
0.7	1.3	80
0.8	1.2	69
0.9	1.1	59
1	1	50
1.1	0.9	41
1.2	0.8	33
1.3	0.7	25
1.4	0.6	19
1.5	0.5	14
1.6	0.4	9.4
1.7	0.3	5.4
1.8	0.2	2.3
1.9	0.1	0.2

HMR 52 Data, 1-sq mile, 1/2 PMP			
Duration	Rainfall	Intensity	Notes
min	in	in/hr	
5	3.1	37.1	
11.2	4.1	22.1	by interpolation
15	4.8	19.0	
30	7.1	14.2	
45	8.4	11.2	by interpolation
60	9.7	9.7	
120	11.0	5.5	by interpolation
240	13.6	3.4	by interpolation
360	16.2	2.7	HMR51, 10-sq mile

**Plant Crist Gypsum Process Sedimentation Pond
Storage Routing Analysis**

Calculation Number:

date: 1-24-2014

by: BJG

Cell 2 Worst Case Peak Flow is 278 cfs based on Rational Method Analysis of 1/2 PMP rain with time of concentration of 11.2 min for peak of storm.
Use modified rational triangle hydrograph and storage routing to evaluate process pond spillway flow during peak. Spillway design from drawing E4C39049.

Assumptions:

Drop inlet is plugged (no flow to Return Water Pond)

Peak occurs when pond is holding water from in back to back 100-year, 24-hour events

Beginning water elevation is at the spillway (EI 117), 2 feet below low point of dike (EI 119).

Time	Inflow		Pond				Outflow	
	Incremental Cell 2 Discharge	Incremental Pond Rainfall	Additional Stored Volume	Water Elevation	Freeboard	Head	Spillway Discharge	Incremental Volume Discharged
minutes	cf	cf	cf		ft	ft	cfs	cf
0	0	0	0	116.0	3.0	0	0	0
2	2979	6000	8979	117.0	2.0	0.0	0	0
4	8936	6000	23914	117.1	1.9	0.1	0	0
6	14893	6000	44669	117.2	1.8	0.2	2.3	138
8	20850	6000	71057	117.3	1.7	0.3	5.4	462
10	26807	6000	102700	117.5	1.5	0.5	14	1164
11.2	18944	3600	124056	117.6	1.4	0.6	19	1188
13	28579	5400	155227	117.8	1.2	0.8	33	2808
15	27086	6000	183873	117.9	1.1	0.9	41	4440
17	20297	6000	204710	118.0	1.0	1.0	50	5460
19	13115	6000	217285	118.1	0.9	1.1	59	6540
21	7128	6000	223333	118.1	0.9	1.1	59	7080
23	3147	6000	225400	118.1	0.9	1.1	59	7080
25	1070	6000	225391	118.1	0.9	1.1	59	7080
27	257	6000	224567	118.1	0.9	1.1	59	7080
29	36	6000	223523	118.1	0.9	1.1	59	7080
29.9	1	2700	223038	118.1	0.9	1.1	59	3186
30	0	300	222984	118.1	0.9	1.1	59	354
40	0	0	190284	117.9	1.1	0.9	50	32700
50	0	0	162984	117.8	1.2	0.8	41	27300
60	0	0	143184	117.7	1.3	0.7	25	19800
70	0	0	129984	117.6	1.4	0.6	19	13200
80	0	0	118584	117.6	1.4	0.6	19	11400
90	0	0	108684	117.5	1.5	0.5	14	9900
180	0	0	56304	117.3	1.7	0.3	5.4	52380
360	0	0	14724	117.1	1.9	0.1	2.3	41580
540	0	0	2304	117.0	2.0	0.0	0	12420

-min. freeboard

**Plant Crist Gypsum Return Water Pond
Inflow and Outflow Capacity Comparison**

Calculation Number:

date: 1-24-2014

by: BJG

The gypsum storage facility consists of a constructed, operating storage cell (Cell 2) and two ponds. Cell 1 is planned, if needed in the future, but has not been constructed. The process sedimentation pond and return water pond manage all stormwater runoff for the gypsum storage area. The combined ponds are sized to zero discharge back to back 100-year, 24-hour storm flows from entire facility, including potential future Cell 1

Return Pond:

Receives runoff from the process sedimentation pond and dewatering area via 30"/42" HDPE pipe system

Primary drainage from pond is recycle to plant via pumps

For events in excess of design, overtopping control provided by gravel covered broad crest spillway

Flow of stormwater into return water pond is limited by hydraulic capacity of HDPE pipe system from the process sediment pond and dewatering area. Worst case condition is process sediment pond flooded to 1.4 foot of freeboard (see process sedimentation pond analysis), return water pond is already flooded to spillway due to previous storms, and the gate valve between ponds is open. *The gate valve between ponds is normally closed before the return pond reaches spillway elevation to maximize storage capacity. Closing the valve would significant reduce needed spillway capacity in the return pond, making this analysis conservative.* Compare discharge curve for HDPE pipe system with broad-crested spillway discharge curve to determine minimum freeboard. Process sediment pond discharge pipe from drawings E4C39050 through E4C39054. Spillway design from drawing E4C39049. Storage capacity of return water pond is ignored. Normal capacity of recycle pumps is negligible (5 cfs) and is ignored.

Process Sediment Pond and Dewatering Area Discharge Curve (Darcy-Weisbach pipe flow with minor losses for junction boxes by FHWA approximate method)			
Process Pond Water Elev.	Return Water Elev.	Pipe Velocity (42-inch HDPE) fps	Discharge cfs
118.1	108	9.9	96
118.1	107.9	10.0	96
118.1	107.8	10.0	96
118.1	107.7	10.1	97
118.1	107.6	10.1	97
118.1	107.5	10.2	98
118.1	107.4	10.2	98
118.1	107.3	10.2	99
118.1	107.2	10.3	99
118.1	107.1	10.3	99
118.1	107	10.4	100
118.1	106.9	10.4	100
118.1	106.8	10.5	101
118.1	106.7	10.5	101
118.1	106.6	10.5	101
118.1	106.5	10.6	102
118.1	106.4	10.6	102
118.1	106.3	10.7	103
118.1	106.2	10.7	103
118.1	106.1	10.7	103

- minimum freeboard -

Return Pond Overtopping Control Broadcrested Spillway Curve (SCS TR39 spillway from Haan, Barfield, Hayes 1994)		
Freeboard	Head	Discharge
Feet	Feet	cfs
0	2	177
0.1	1.9	161
0.2	1.8	145
0.3	1.7	131
0.4	1.6	117
0.5	1.5	104
0.6	1.4	92
0.7	1.3	80
0.8	1.2	69
0.9	1.1	59
1	1	50
1.1	0.9	41
1.2	0.8	33
1.3	0.7	25
1.4	0.6	19
1.5	0.5	14
1.6	0.4	9.4
1.7	0.3	5.4
1.8	0.2	2.3
1.9	0.1	0.2

Design Calculations

Southern Company Services, Inc.

Calculation Number

TV-CR-FPC104829-001

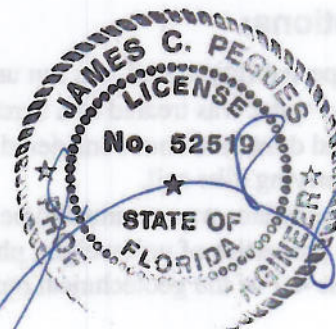
Project Plant Crist – Gypsum Storage Facility	Discipline Civil/Geotechnical
Objective Determine factor of safety of the Sedimentation and Return Water Ponds	Job Number FPC104829
Subject/Title Slope Stability Analysis of Gypsum Facility – Sedimentation and Return Water Ponds	
Design Engineer's Signature Gerrad Wilson	Date 1/24/14
	Last Page Number 7

Contents

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Assumptions	2		
Equation Sources/Derivation Methods	3		
Summary of Conclusions	3		
References	3		
Body of Calculations	3-7		

Record of Revisions

Rev. No.	Description	Originator / Date	Reviewer / Date	Supervisor / Date
0	Approved	GW/1/24/14	BJG/1-28-2014	JCP/1-28-2014



Soil Type	Unit Weight, pcf	cohesion, psf	Phi Angle, deg
in-place Silty Sand	110	100	30
Compacted Embankment	110	100	32

Design Calculations

Southern Company Services, Inc.

Project Plant Crist – Gypsum Storage Facility	Calculation Number TV-CR-FPC104829-001
Subject/Title Slope Stability Analysis of Gypsum Facility –Sedimentation/Return Water Pond(s)	Sheet 2 of 7

Purpose/Scope:

While operating as a fossil-fuel power station, Gulf Power Company's Plant Crist utilizes a flue gas desulfurization system (FGD scrubber) on Units 4 through 7 to remove sulfur dioxide (SO₂) from the exhaust flue gases. Through this process, gypsum is produced as a by-product and sluiced to an on-site storage facility for dewatering and long term storage. The Gypsum Storage Facility's clear water ponds were constructed with a compacted soil perimeter berm and a composite liner system, including a full underdrain system. This calculation is intended to calculate the stability of the perimeter berms of the clear water ponds.

Criteria:

The slope stability analyses were based on the most recent design and as-built drawings available at the time of this calculation. Soil and gypsum properties were obtained from the June 2007 *Plant Crist Gypsum Storage Area Hydrogeological and Geotechnical Investigation Report* by the Earth Science and Environmental Engineering (ES&EE) group of Southern Company Generation.

The following scenarios were evaluated for the maximum dike sections at the spillways. The locations of the stability sections are sketched on Figure 1

1. Steady State – Surcharge water elevation based ½ PMP.
2. Seismic Loading – Surcharge water elevation (½ PMP) plus pseudostatic horizontal seismic acceleration based on the USGS 2% probability of exceedance in 50 years hazard map.

Assumptions:

The slope stability model was run using the following assumptions:

- Pond water was treated as a surcharge load on the HDPE liner.
- Rapid drawdown not considered due to the interior HDPE liner preventing saturation of the underlying dike soil.
- Groundwater was assumed to be immediately below the liner.
- The properties of unit weight, phi angle, and cohesion of the soil and gypsum were taken from Table 4-7 of the geotechnical report.

Material properties are as follows:

Soil Type	Unit Weight, pcf	Cohesion, psf	Phi Angle, deg
In-place Silty Sand	110	100	30
Compacted Embankment	110	100	32

Design Calculations

Southern Company Services, Inc.

Project Plant Crist – Gypsum Storage Facility	Calculation Number TV-CR-FPC104829-001
Subject/Title Slope Stability Analysis of Gypsum Facility –Sedimentation/Return Water Pond(s)	Sheet 3 of 7

Equation Sources/Derivation Methods:

The calculation was performed using the following method and software:

GeoStudio 2012, Version 8.12.2.7663, Copyright 1991-2013 GEO-SLOPE International Ltd., Calgary, Alberta, Canada, using the Morgenstern-Price method.

Summary of Conclusions:

The results of the analyses are summarized below. Output graphics are located in the body of the calculations. The analyses indicate that the exterior pond dikes have adequate factors of safety for all analyzed cases.

Condition	Calculated Factor of Safety	Reference Factor of Safety
Sedimentation Pond - Steady State	2.07	1.5 ¹
Sedimentation Pond - Seismic	1.85	1.1
Return Water Pond - Steady State	3.03	1.5 ¹
Return Water Pond - Seismic	2.67	1.1

¹ US Army Corps of Engineers criteria for new earthen embankments (EM 1110-2-1902)

References:

Southern Company Services, Inc., 2007, *Plant Crist Gypsum Storage Area, Hydrogeological and Geotechnical Investigation Report*, Birmingham, AL

Design and Operation Plan (D&O) Drawings E4C39037, E4C39039, and E4C39048

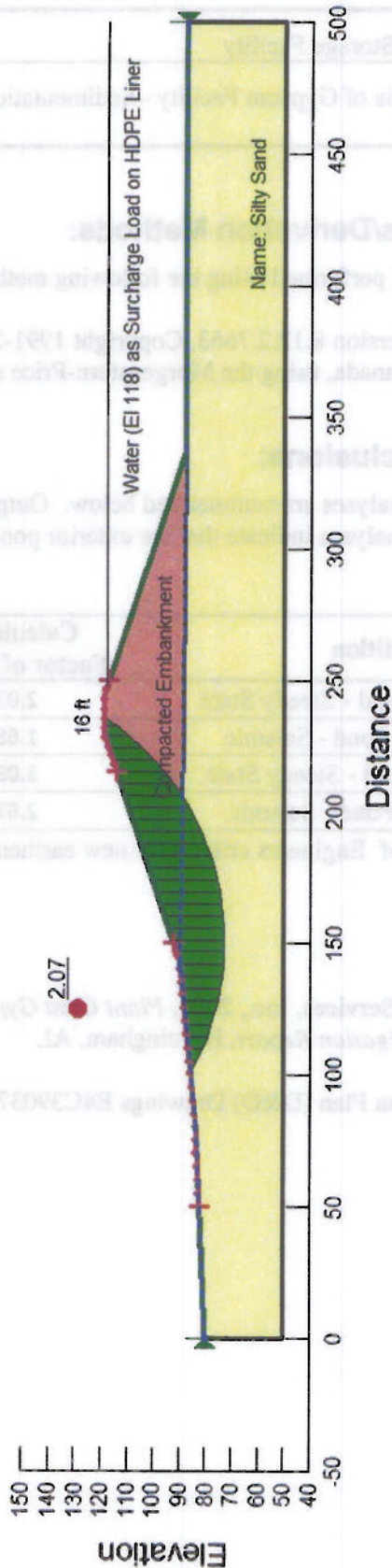
Calculation:

Design Calculations

Southern Company Services, Inc.

Project	Plant Crist – Gypsum Storage Facility	Calculation Number	TV-CR-FPC104829-001
Subject/Title	Slope Stability Analysis of Gypsum Facility –Sedimentation/Return Water Pond(s)	Sheet	4 of 7

Description: Plant Crist Gypsum Storage Facility
Comments: Process Sedimentation Pond
File Name: Crist ProcessSedimentation Pond Rev.gs2
Analysis Scenario: Steady State, 1' Freeboard
Analysis Method: Morgenstern-Price
Seismic Coefficient: horz: 0, vert: 0



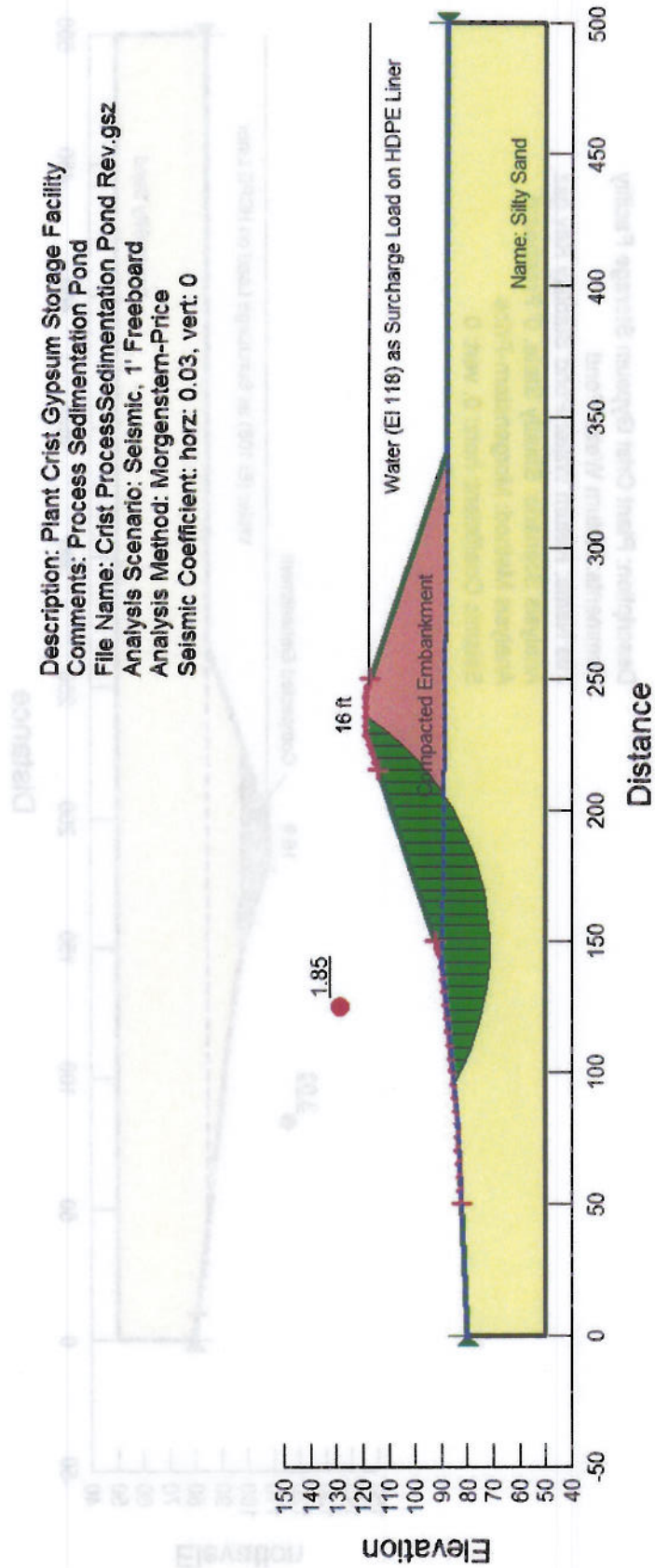
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Name: Silty Sand Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 100 psf Phi: 30 °

Design Calculations

Southern Company Services, Inc.

Project	Plant Crist - Gypsum Storage Facility	Calculation Number	TV-CR-FPC104829-001
Subject/Title	Slope Stability Analysis of Gypsum Facility - Sedimentation/Return Water Pond(s)	Sheet	5 of 7

Description: Plant Crist Gypsum Storage Facility
Comments: Process Sedimentation Pond
File Name: Crist ProcessSedimentation Pond Rev.gsz
Analysis Scenario: Seismic, 1' Freeboard
Analysis Method: Morgenstern-Price
Seismic Coefficient: horz: 0.03, vert: 0



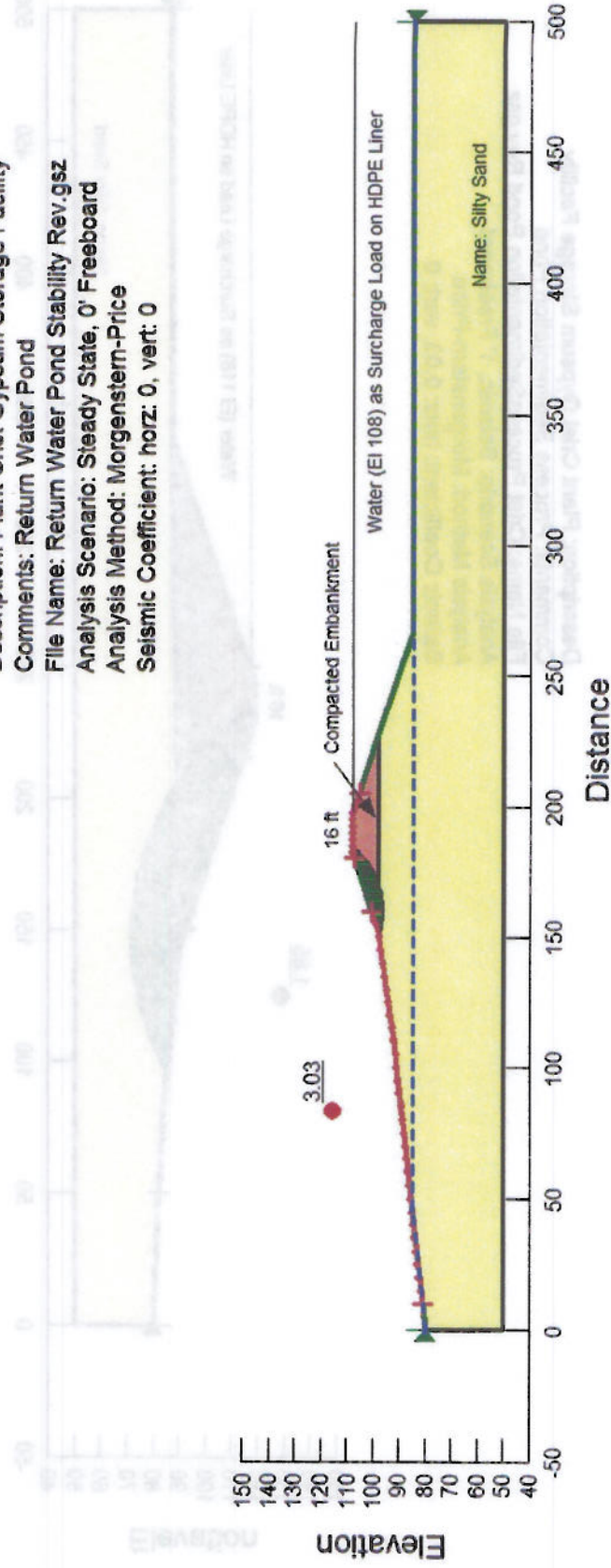
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Name: Silty Sand Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 100 psf Phi: 30 °

Design Calculations

Southern Company Services, Inc.

Project	Plant Crist - Gypsum Storage Facility
Calculation Number	TV-CR-FPC104829-001
Sheet	6 of 7
Subject/Title	Slope Stability Analysis of Gypsum Facility -Sedimentation/Return Water Pond(s)

Description: Plant Crist Gypsum Storage Facility
Comments: Return Water Pond
File Name: Return Water Pond Stability Rev.gs2
Analysis Scenario: Steady State, 0' Freeboard
Analysis Method: Morgenstern-Price
Seismic Coefficient: horz: 0, vert: 0



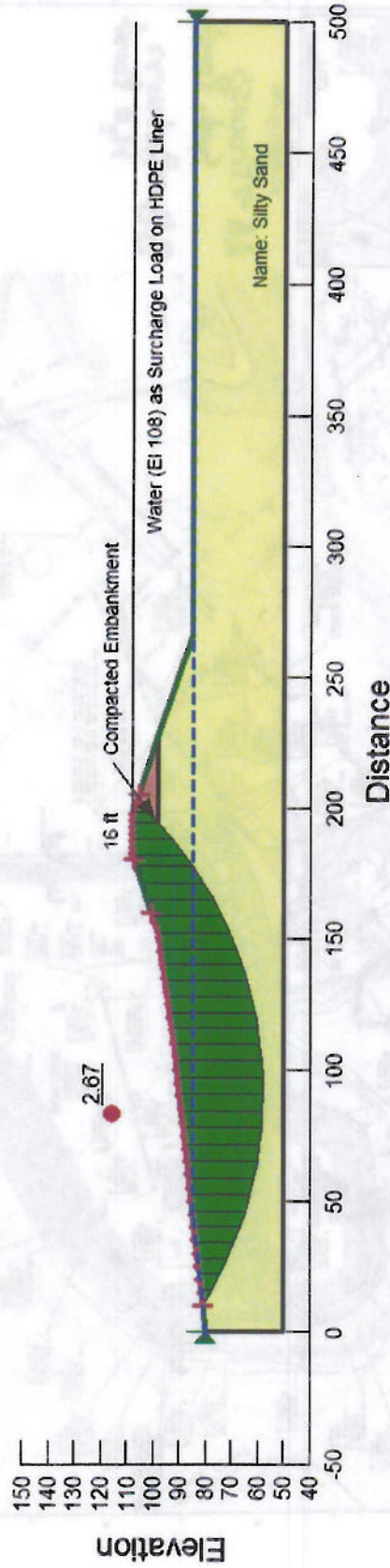
Name: Compacted Embankment Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 100 psf Phi: 32 °
Name: Silty Sand Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 100 psf Phi: 30 °

Design Calculations

Southern Company Services, Inc.

Project	Plant Crist – Gypsum Storage Facility	Calculation Number	TV-CR-FPC104829-001
Subject/Title	Slope Stability Analysis of Gypsum Facility – Sedimentation/Return Water Pond(s)	Sheet	7 of 7

Description: Plant Crist Gypsum Storage Facility
 Comments: Return Water Pond
 File Name: Return Water Pond Stability Rev.gsz
 Analysis Scenario: Seismic, 0' Freeboard
 Analysis Method: Morgenstern-Price
 Seismic Coefficient: horz: 0.03, vert: 0



Name: Compacted Embankment Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 100 psf Phi: 32 °
 Name: Silty Sand Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 100 psf Phi: 30 °

