Comments on Mississippi Power's Jack Watson Plant:

EPA: None.

State: None.

Company: See letter dated October 29, 2010

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MISSISSIPPI POWER
A SOUTHERN COMPANY

VIA OVERNIGHT DELIVERY

October 29, 2010

Mr. Stephen Hoffman
U.S. Environmental Protection Agency
2733 South Crystal Drive
Fifth Floor, N-5237
Arlington, Virginia 22202

Re: Draft Dam Safety Inspection Report for Plant Watson

Dear Mr. Hoffman:

On September 30, 2010, the U.S. Environmental Protection Agency ("EPA") provided to Mississippi Power Company ("MPC") a Dam Safety Assessment of CCW Impoundments- Plant Watson ("Draft Report") regarding MPC's Plant Watson coal ash management unit. The Draft Report was prepared by O'Brien & Gere Engineers, Inc., and was dated July 30, 2010. This letter provides MPC's comments with regard to the conclusions of that report.

MPC is concerned that the Draft Report fails to reflect the actual condition of the Plant Watson Ash Management Unit. While the report concludes that the unit is rated as "fair", MPC believes that the facility should be rated "satisfactory", the most favorable category. We also understand the potential hazard rating to be based exclusively on the consequences of a failure of a structure, not the likelihood of such an event. MPC contends that the stability and soundness of the facility was demonstrated as it successfully withstood Hurricane Katrina's storm surge, winds, and wave impacts in 2005. While some erosion of a portion of the outer slopes was experienced during this event (evidence of this erosion was shared with O'Brien & Gere representatives at the time of their visit), this erosion did not adversely affect the structural integrity of the impoundment embankments; there was no breach of the embankment; and no loss of stored ash from the impoundment occurred.

The Draft Report includes recommendations regarding maintenance and operating items. MPC concurs with the recommendations, which are consistent with MPC's existing and ongoing practices and procedures. MPC will continue to identify maintenance items as they arise through our regular inspections and will address them promptly.

MPC provides the following responses to the draft recommendations and clarifications on various issues addressed within the report:

Responses to Recommendations

Recommendation 1: The brush and trees growing on the outboard slope of the outboard bench should be cut and the slope surface turfed. This action will assist in detection of seepage during future inspections and high pool elevations.

Response: As can be seen from the attached photographs (Attachment 1), additional work related to the clearing of vegetation near the toe of the east and south outboard slope has been performed. This clearing of vegetation will facilitate access to this area so that personnel can travel by foot closer to the toe for observations. You may also note in the photographs that a gravel travel path has been added to the outboard bench to allow for inspection and maintenance traffic to traverse this area with minimal impact on surface soils (i.e. no rutting) following periods of increased precipitation.

Recommendation 2: Periodic water level measurements within the four piezometers should be instituted on a regular basis. Plotting of this data against pool elevations should demonstrate the overall effectiveness of the slurry wall and help to establish the source of the minor seeps.

Response: Historical information has been researched on the noted piezometers and wells. It appears that these piezometers and/or wells may have been installed at various times for differing purposes. After the historical records search, personnel visited the site to measure the depths of the wells and determine the static water level in the wells. It has been determined that of those wells that can be considered functional, the depth of the well and the measured water levels indicate these wells will not be suitable for the recommended purpose. In other words, the wells are installed in deeper water bearing units, and the measured water levels do not correspond to water levels that would be associated with any phreatic surface from the pond. Furthermore, samples of slight surface seepage noted at or near the lower bench of the downstream embankment have been collected and analyzed to determine basic chemical characteristics. This testing indicates the noted seepage does not have the chemical characteristics of water from an ash pond, and thus the assumption can be made that the noted minor seepage is not associated with seepage from the pond, but is likely associated with surficial runoff and seepage (associated with precedent precipitation) from further upslope on the downstream embankment face, as originally suspected. Thus, it remains our opinion that the minor seepage is related to precedent precipitation (see Response to Recommendation 3).

Recommendation 3: Seepage observations should be recorded together with recent precipitation to demonstrate whether near-surface drainage is the source of the seeps. Establishing the precise seepage locations by survey or GPS should be considered.

Response: Plant Jack Watson has an on-site weather station, and precipitation prior to and at the time of future inspections will be recorded on inspection documents. Also, any noted seepage areas will be identified by hand-held GPS coordinates to document their location. We note that in the 48 hours preceding the site inspection by O'Brien & Gere, Plant Watson and other weather recording stations in the Gulfport area indicate that rainfall in excess of 3 inches had occurred. It is our position that the minor seepage noted by O'Brien & Gere during their walkover was related to this precedent rainfall event.

Recommendation 4: Additional studies – the utility should undertake a more formal evaluation of the noted seepage as described above; and it should also re-visit its slope stability calculations and compare same to MDEQ criteria for normal pool with steady state seepage, maximum surcharge pool, and seismic loading conditions.

Response: Seepage observations will continue to be performed, as noted in the prior responses. With regards to slope stability, additional analyses have been performed. This was accomplished by obtaining current outboard slope topographic information at select cross-sections along the embankment, preparing a model similar to that used at the time of the most recent dike raise design, and using current state-of-the-art slope stability analysis software. Results of these analyses (see Attachment 2) were compared to the current MDEQ requirements for slope stability factors of safety. All calculated factors of safety for steady state seepage, full pool/flood elevation, and seismic loading are at or above the minimum factors of safety as outlined in the MDEQ requirements. As reported to O'Brien & Gere in a supplemental submittal after their site visit, MDEQ regulations indicate that seismic analysis during slope stability is not required for embankments constructed south of U.S. Highway 82 (located approximately 200 miles north of Gulfport). Therefore, seismic analysis of the Plant Watson embankments is not applicable. The results of our seismic analyses have been included in our formal calculation for information purposes only.

Points of Clarification

Subsequent to review of the Draft Report MPC has the following clarifications to make regarding inaccuracies found in the description of Plant Watson and its related facilities. Please refer to the page, section and paragraph references below to identify areas of the Draft Report requiring clarification.

Page	Section	Paragraph	Comment
3	2	1	• Replace "Lorraine Boulevard" with "Lorraine Road" • Replace the "coal-fired power station" with "electric generating plant". The entire plant produces nominally 1,051 MW. The coal-fired portion of the plant produces nominally 750 MW. • Replace "1,000 MW" with "1,051 MW or "about 1,000 MW" • Change commercial operation date to 1957. Commercial operation of the first coal unit (250 MW) began in 1968. • A more complete description would include "The plant has 2 coal-fired units (Units 4 & 5) which produce 750 MW. Unit 4 started up in 1968 and Unit 5 in 1973".
3	2.1	3	• A more complete and accurate description would include replacing "The Ash Pond was built" with "The base of the northern and southern legs of the Ash Pond dike were formed in 1955 from material dredged during the construction of the intake and discharge canals. The Ash Pond was constructed and enclosed on the southern side in the late 1960s when construction of the first coal-fired unit made the ash pond necessary." • Note that the ash pond was not an ash pond until 1968. • Replace "1997" with "1999"
5	2.3.1	1	• Replace"1955" with "1968"
6	Table 3.1 bottom		• Replace "Undated" with "1995"; and "Mississippi Power" with "Southern Company"
6	3.1	1st bullet	• A more complete and accurate description would include replacing "The ash pond was originally constructed in 1955 with the northern and southern dikes constructed of dredge spoil from the excavation of the intake and discharge canals connected to Big lake" with "The ash pond was originally constructed in 1968, with the northern and southern dike base constructed in 1957, of dredge spoils from excavation of the intake and discharge canals connected to Big Lake".
8	3.1.2	2	• Replace "1995" with "1994" – that is when the analyses here were done. Tensar's were done in 1995. • A more complete and accurate description would include replacing "The ash pond was originally constructed in 1955

		with the northern and southern dikes constructed of dredge spoil from the excavation of the intake and discharge canals connected to Big lake" with "The ash pond was originally constructed in 1968, with the northern and southern dike base constructed in 1957, of dredge spoils from excavation of the intake and discharge canals connected to Big Lake".
8	**3.1.4**	• Section should be renumbered to Section 3.1.3

Based upon the structural integrity of Plant Watson's ash management unit, the slope stability analyses, the aforementioned justifications, and MPC's robust inspection and maintenance programs, MPC proposes that the appropriate rating for this management unit should be "Satisfactory". Accordingly, the final safety assessment of Plant Watson's ash management unit should reflect a "Satisfactory" rating.

Thank you for your consideration and contact me at (228) 897-6420 if additional explanation or clarification is necessary.

Sincerely,

for

C.R. Berry, Manager Environmental Quality Department

Attachments

Cc: Donald Creel
Ann Dauer
Bradley Ennis
Ron Herring
Jim Pegues
Valerie Wade
Herman Williams

ATTACHMENT 1A

ATTACHMENT 1B

SOUTHERN COMPANY

Engineering and Construction Services Calculation

Calculation Number: TV-WO-5377QI-001

Project/Plant: Plant Watson Ash Pond Dike	**Unit(s):** Units 4 & 5	**Discipline/Area:** ES&EE
Title/Subject: Slope Stability Analyses of the Ash Pond Dike		
Purpose/Objective: Analyze slope stability of Ash Pond Dike		
System or Equipment Tag Numbers: NA	**Originator:** Terri H. Hartsfield	

Contents

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	THH/10-28-10	JAL/10-28-10	JCP/10-28-10

Notes:

Purpose of Calculation

Mississippi Power Company's Plant Watson has one ash pond. The pond was commissioned in 1968 at the start-up of Unit 4, Plant Watson's first coal-fired unit. The pond is approximately 105 acres and is enclosed by an approximate 10,000 foot long ring dike. The north dike is bounded by the plant intake canal, the southwest dike is bounded by the plant discharge canal and the eastern dike is bounded by wetlands associated with Big Lake. Currently, ash is sluiced to the ash pond, excavated and dry stacked at the permitted solid waste disposal facility west of the pond.

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

Methodology

The calculation was performed using the following methods and software:
GeoStudio 2007 (Version 7.16, Build 4840), Copyright 1991-2010, GEO-SLOPE International, Ltd.
Bishop, Ordinary, Janbu and Morgenstern-Price analytical methods were run. Morgenstern-Price was reported.

Criteria and Assumptions

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

- Current geometry of the dike was obtained from cross sectional surveys performed in October 2010 (Attachments A & B). The locations of the sections were selected as the "worst case" sections during design and construction in 1995.
- As shown on the USGS "Map for Peak Acceleration with a 2% Exceedance in 50 Years" for the vicinity of Plant Watson, the ground motion having a 2% probability of exceedance in 50 years is 0.05 g (Attachment C).
- The current required minimum criteria (factors of safety) were taken from the Mississippi Department of Environmental Quality, Dam Safety Division, Guidance for the Design of Dams, Plans, Specifications & Engineering Reports, supplemented by the US Corps of Engineers (COE) Manual EM 1110-2-1902, October 2003.
- The soil properties of unit weight, phi angle, and cohesion were obtained from cone penetrometer testing and triaxial shear testing performed on UD samples of the fill and foundation soils obtained during drilling in 1993 for design of the dike raise. The testing was performed according to ASTM D 4767.
- Properties for ash were based on laboratory testing performed on undisturbed and remolded samples of ash from various plants and on engineering judgment.
- Strength of Tensar geogrid was obtained from the company's product specification sheets (Attachment D).
- Layout for the geogrid for Sections 1 and 11 were obtained from the Tensar proposal "Design of Reinforced Dike Slopes" (pertinent pages are shown in Attachment E).

- Geology of the dike and underlying soils were obtained from the Southern Company Services internal report, Ash Pond Dike Stability and Upgrade (see References).
- The COE EM 1110-2-1902, October 2003, allows the use of the phreatic surface established for the maximum storage condition (normal pool) in the analysis for the maximum surcharge loading condition. This is based on the short term duration of the surcharge loading relative to the permeability of the embankment and the foundation materials. This method is used in the analysis for the impoundments at this facility with surcharge loading.
- Normal operating pool was obtained from plant personnel and maximum surcharge pool was obtained from Hydraulic Capacity Calculation No. TS-WO-ECS3346-001 (see References).

A. Tensar Strength Data

Tensar grids are specified as Type 1 through 5 in the proposal document (see References and Attachment E). The following table gives the grid designation and the design strength data for each of the grids that were used in these areas of the dike raise that were used in this calculation.

Design Call Out	Geogrid Designation	Tensile Strength at 5% Strain (lb/ft)
Type 1	UX1400	2,130
Type 3	UX1700	5,140
Type 4	BX1200	1,340
Type 5	BX1100	920

B. Soil Input Data

The following soil properties were used in the analyses. This data was obtained during drilling in 1993 for the design of the dike upgrade and dike raises performed in 1995 and 1999. These original soil properties were used, and should be considered conservative. The installation of a cement-bentonite slurry wall installed in the dike has resulted in significantly reduced seepage and drier conditions on the downstream side of the dike. Additionally, the soil properties do not account for any consolidation that has taken place in the soil since construction of the approximate 7-foot raise

Soil Description	Moist Unit Weight, pcf	Effective Stress Parameters	
		Cohesion, psf	Phi Angle, degrees
Section 1			
Fill 1	120	0	28
Fill 2	120	50	33
Fill 3	125	50	25
Peat	75	50	5
Clay 1	110	50	25
Clay 2	95	450	11
Clay 3	95	1500	11
Clay 4	95	604	11
Sand	130	0	38
Bottom Ash	90	0	22
Cement/Bentonite Wall	140	4320	0
Section 11			
Dike Fill 1	120	0	28
Dike Fill 2	120	50	25
Clay 1	100	50	20
Clay 2	110	50	25
Clay 3	90	500	11
Clay 4	105	2000	11
Sand	135	0	38
Ash	95	0	15
Cement/Bentonite Wall	140	4320	0

C. Hydrologic Considerations

The following hydrologic information, based on SCG calculation TS-WO-ECS3346-001, dated July 9, 2010 was utilized in the stability analyses. The calculation states that the Ash Pond can handle one-half the Probably Maximum Precipitation event with 3.65 feet of freeboard. For this analysis, a normal pool elevation of 24 feet MSL and a maximum pool surcharge elevation of 27 feet MSL was used.

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

Failure Condition (Load Case)	Computed Factor of Safety	Required Minimum Factor of Safety[1]
Section 1 – Section A-A'		
Downstream Steady State	1.62	1.5
Downstream Seismic	1.41	1.0/1.1[1]
Downstream Max Pool Surcharge	1.57	1.3
Ash Pond 2 – Section B-B'		
Downstream Steady State	1.68	1.5
Downstream Seismic	1.49	1.0/1.1[1]
Downstream Max Pool Surcharge	1.68	1.3

Note 1 – 1.0/1.1 indicates Mississippi Dam Safety requirements/Corps of Engineer requirements

Design Inputs/References

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

Plant Jack Watson, Ash Pond Dike Stability and Upgrade, 1995, Southern Company Services Internal Report.

Mississippi Power Company, Plant Jack Watson Electric Generating Plant, Coal Ash Pond Upgrade, Proposal Number SS-95-308, Design of Reinforced Dike Slopes, March 17, 1995, prepared by Tensar Environmental Systems.

Plant Watson Ash Pond Storm Event Hydraulic Capacity, Calculation No. TS-WO-ECS3346-001, prepared by Southern Company Engineering and Construction Services.

Body of Calculation

Calculation consists of Slope-W modeling attached.

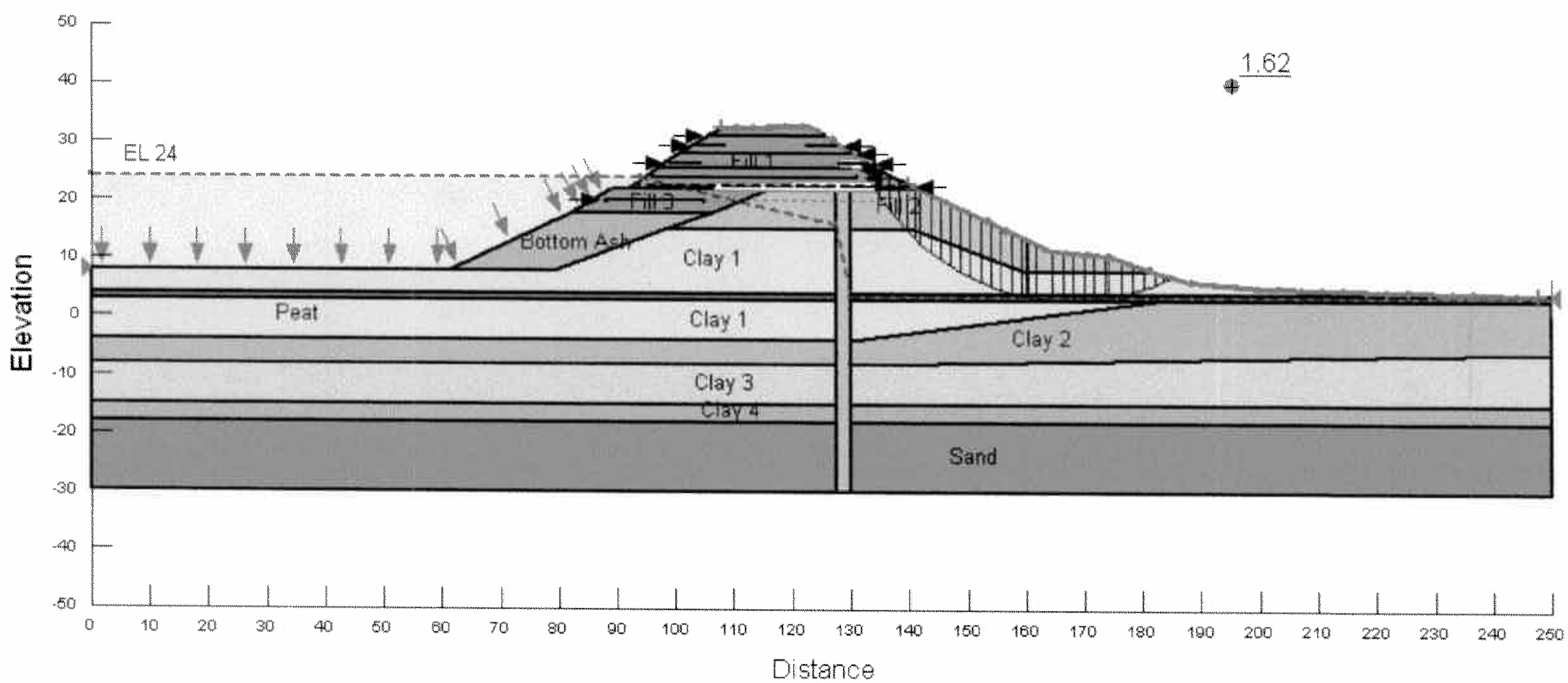
Attachments

Slope W computer runs

Section 1

Plant Watson Ash Pond Dike
Section 1
Steady State
Method: Morgenstern-Price

Fill 1: 120 pcf, Cohesion: 0 psf, Phi: 28 °
Fill 2: 120 pcf, Cohesion: 50 psf, Phi: 33 °
Fill 3: 125 pcf, Cohesion: 50 psf, Phi: 25 °
Peat: 75 pcf, Cohesion: 50 psf, Phi: 5 °
Clay 1: 110 pcf, Cohesion: 50 psf, Phi: 25 °
Clay 2: 95 pcf, Cohesion: 450 psf, Phi: 11 °
Clay 3: 95 pcf, Cohesion: 1500 psf, Phi: 11 °
Clay 4: 95 pcf, Cohesion: 604 psf, Phi: 11 °
Sand: 130 pcf, Cohesion: 0 psf, Phi: 38 °
Bottom Ash: 90 pcf, Cohesion: 0 psf, Phi: 22 °
Cement/Bent Wall: 140 pcf, Cohesion: 4320 psf, Phi: 0 °



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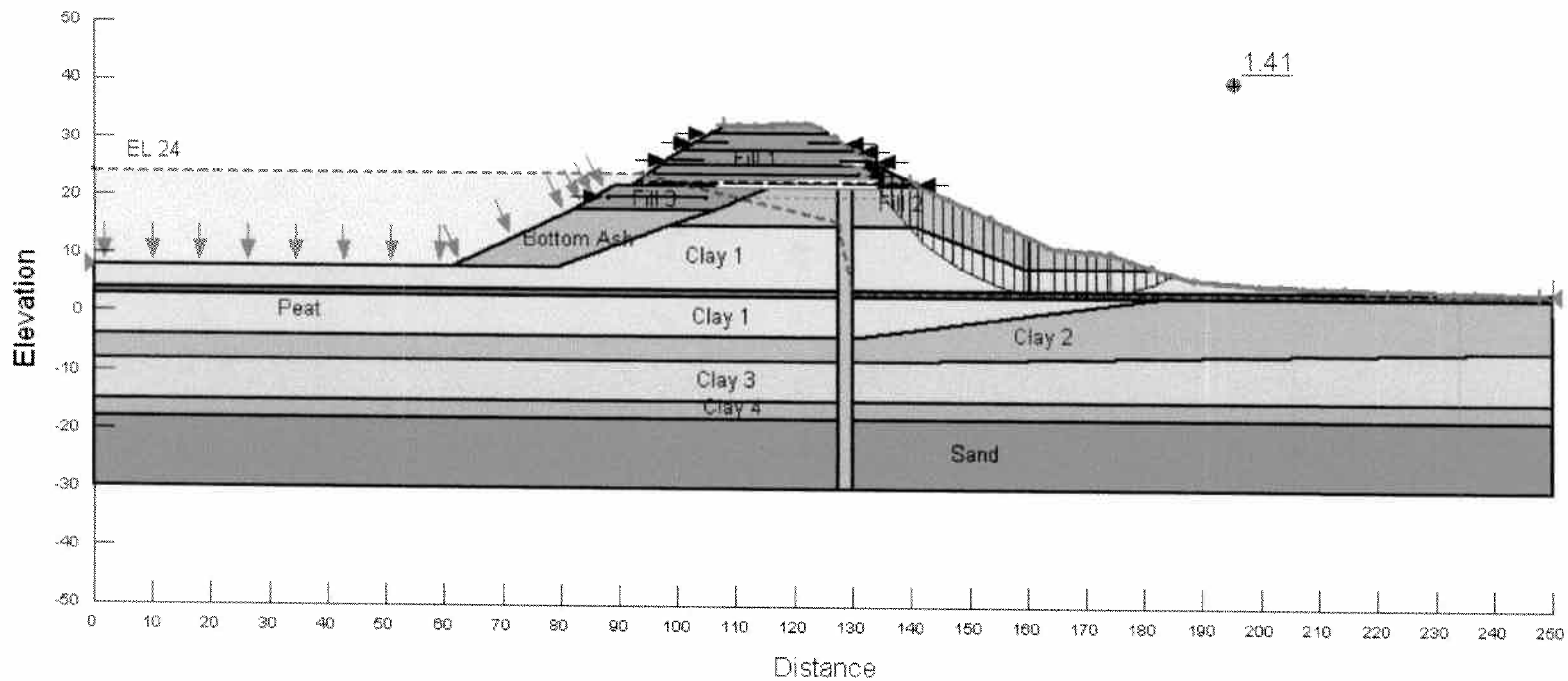
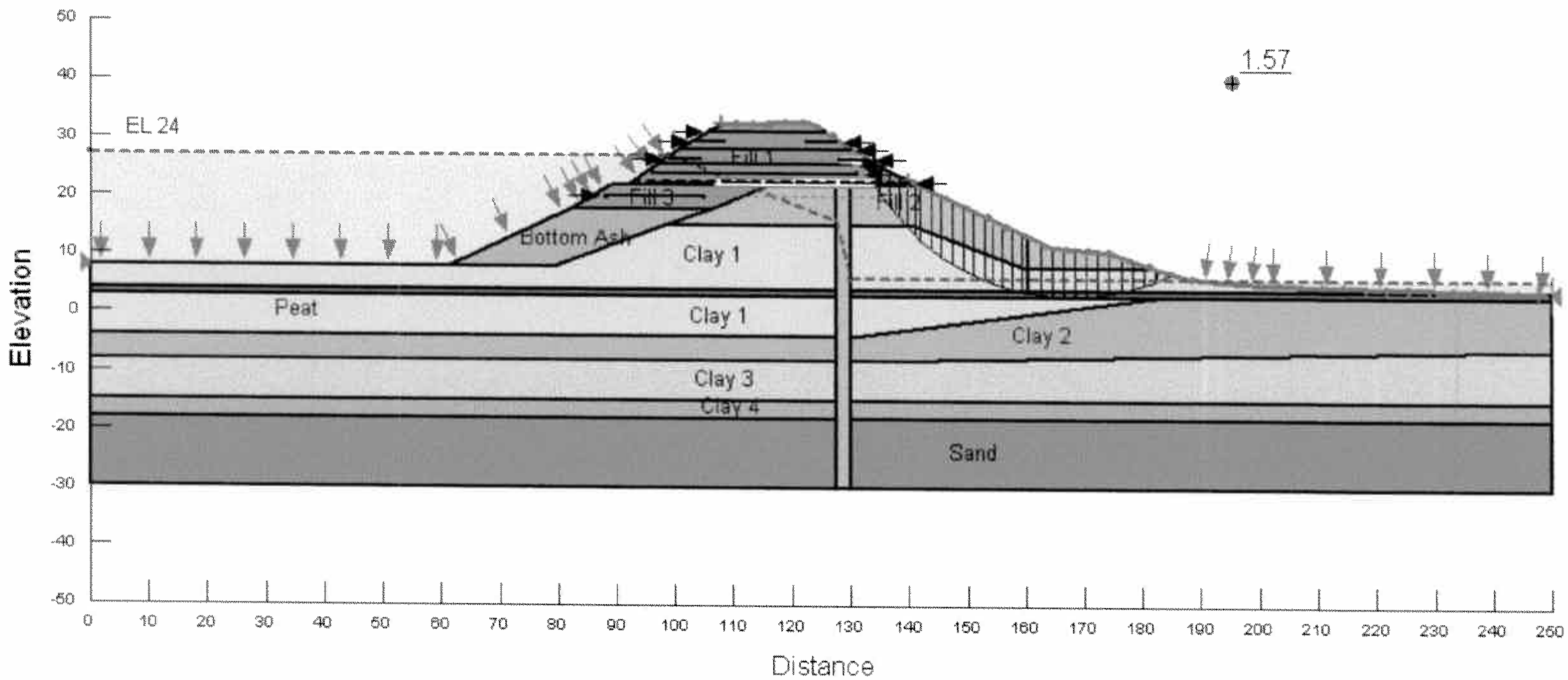
Plant Watson Ash Pond Dike
Section 1
Seismic Load - 0.05g
Method: Morgenstern-Price

Fill 1: 120 pcf, Cohesion: 0 psf, Phi: 28 °
Fill 2: 120 pcf, Cohesion: 50 psf, Phi: 33 °
Fill 3: 125 pcf, Cohesion: 50 psf, Phi: 25 °
Peat: 75 pcf, Cohesion: 50 psf, Phi: 5 °
Clay 1: 110 pcf, Cohesion: 50 psf, Phi: 25 °
Clay 2: 95 pcf, Cohesion: 450 psf, Phi: 11 °
Clay 3: 95 pcf, Cohesion: 1500 psf, Phi: 11 °
Clay 4: 95 pcf, Cohesion: 604 psf, Phi: 11 °
Sand: 130 pcf, Cohesion: 0 psf, Phi: 38 °
Bottom Ash: 90 pcf, Cohesion: 0 psf, Phi: 22 °
Cement/Bent Wall: 140 pcf, Cohesion: 4320 psf, Phi: 0 °



Plant Watson Ash Pond Dike
Section 1
Maximum Surcharge
Method: Morgenstern-Price

Fill 1: 120 pcf; Cohesion: 0 psf; Phi: 28 °
Fill 2: 120 pcf; Cohesion: 50 psf; Phi: 33 °
Fill 3: 125 pcf; Cohesion: 50 psf; Phi: 25 °
Peat: 75 pcf; Cohesion: 50 psf; Phi: 5 °
Clay 1: 110 pcf; Cohesion: 50 psf; Phi: 25 °
Clay 2: 95 pcf, Cohesion: 450 psf; Phi: 11 °
Clay 3: 95 pcf, Cohesion: 1500 psf; Phi: 11 °
Clay 4: 95 pcf, Cohesion: 604 psf; Phi: 11 °
Sand: 130 pcf, Cohesion: 0 psf; Phi: 38 °
Bottom Ash: 90 pcf, Cohesion: 0 psf; Phi: 22 °
Cement/Bent Wall: 140 pcf; Cohesion: 4320 psf; Phi: 0 °



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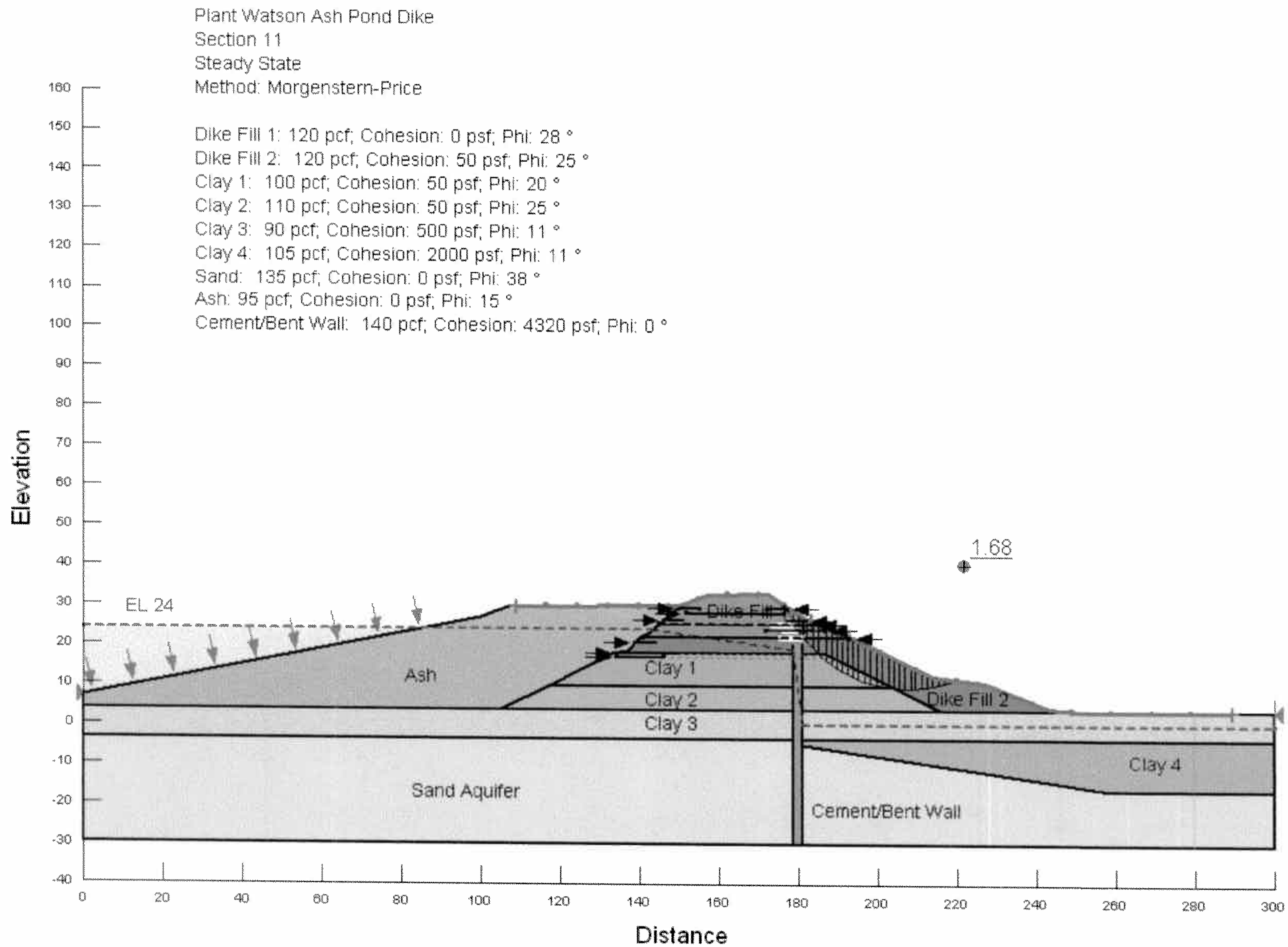
Section 11



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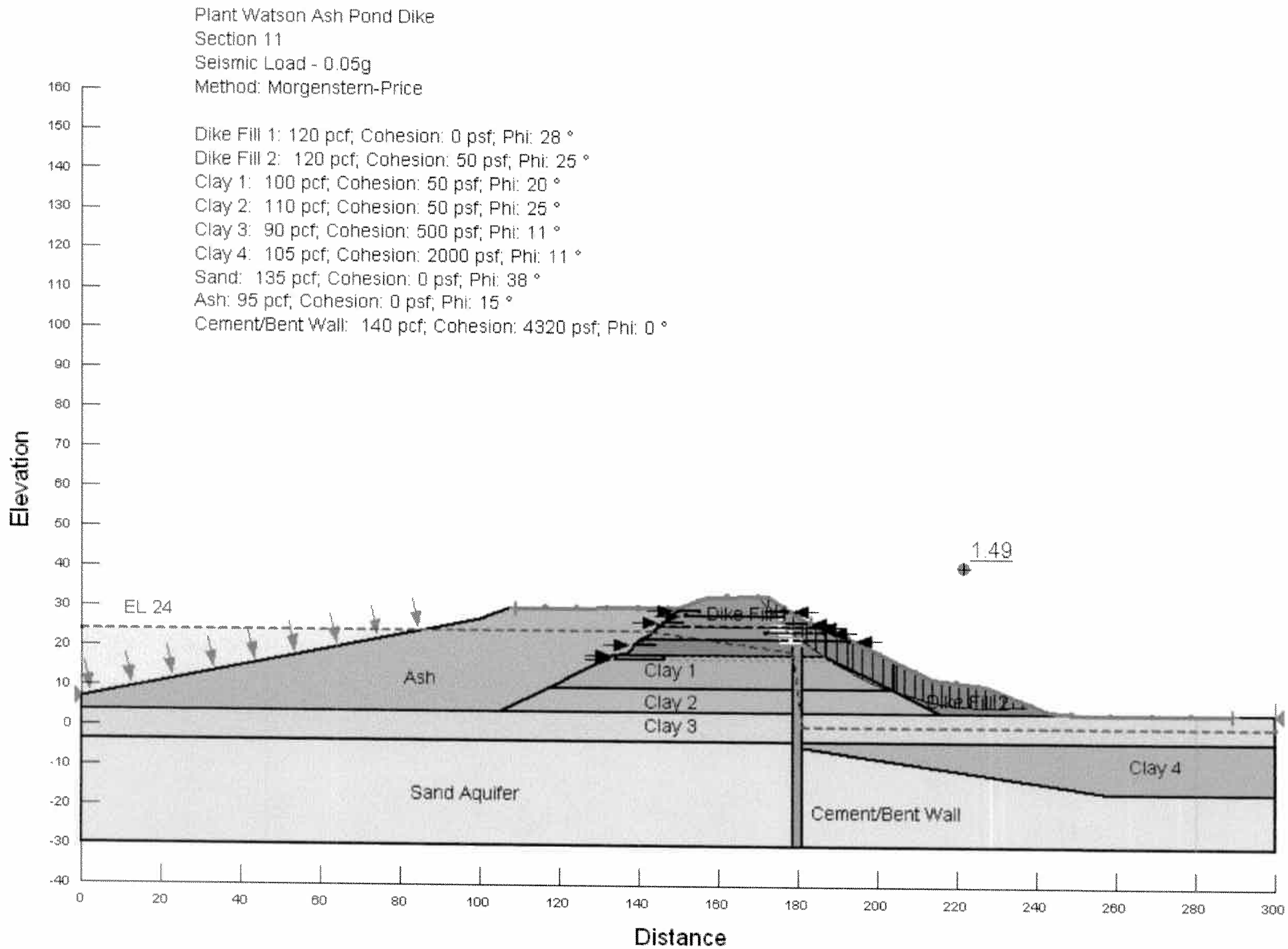

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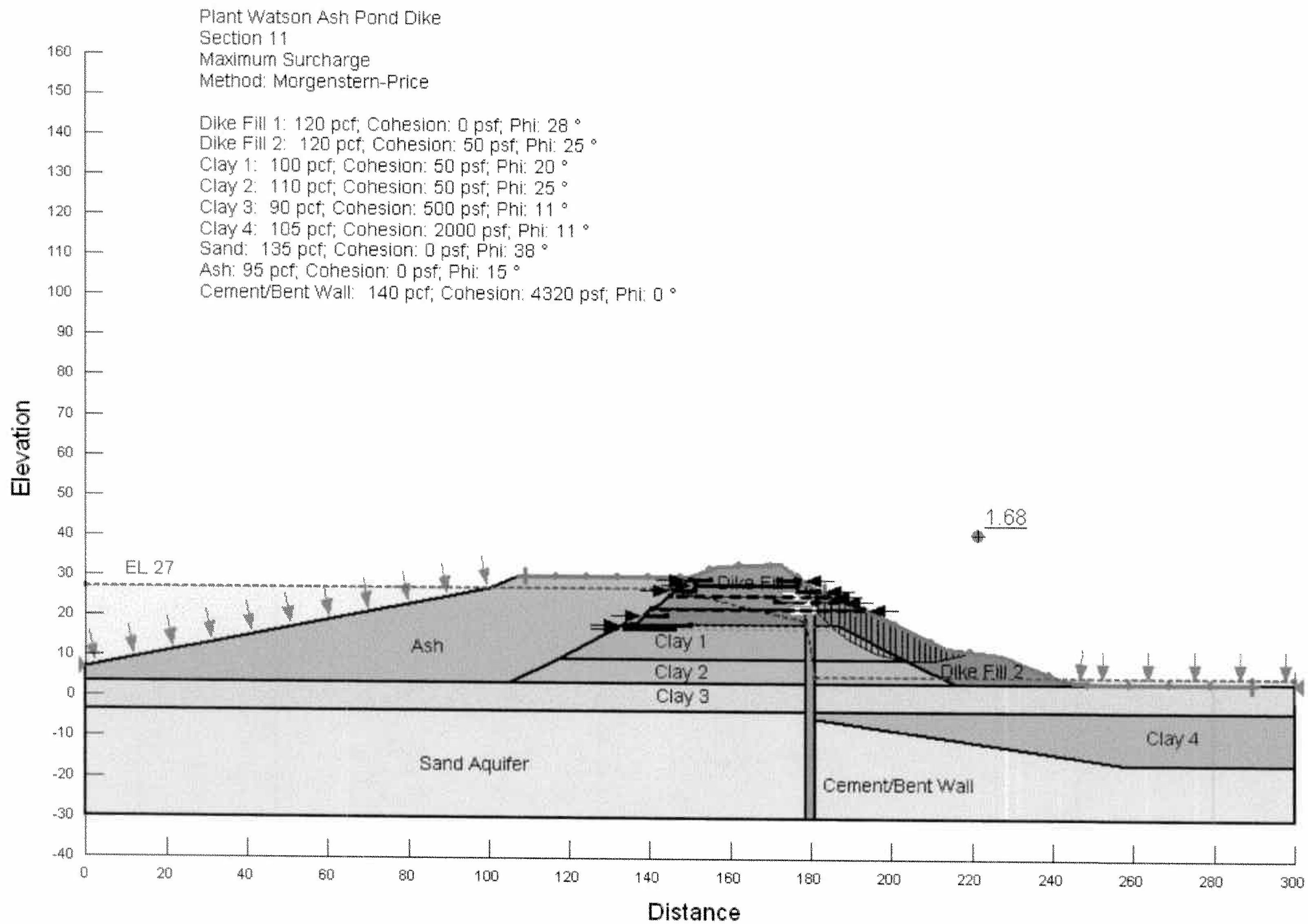

CONFIDENTIAL BUSINESS INFORMATION

Plant Watson
Attachment A
Ash Pond Dike Slope Stability – Cross Sections
Calc# TV-WO-5377QI-001

Southern Company Generation
Engineering and Construction Services
FOR
Mississippi Power Company

PROJ I.D.	DRAWING NUMBER	SHEET	CONT'D	REV
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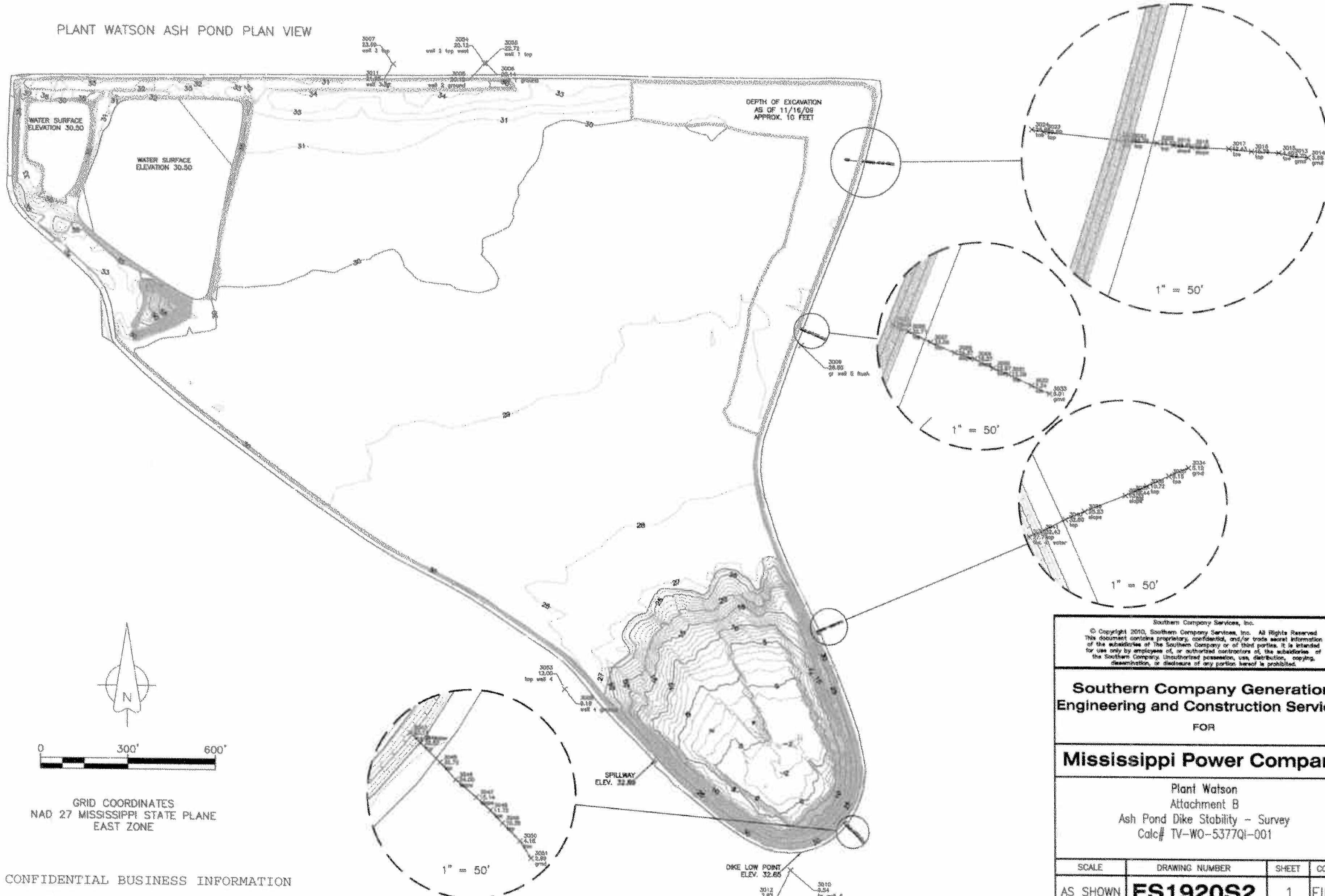


Southern Company Generation Engineering and Construction Services

FOR

Mississippi Power Company

Plant Watson
Attachment B
Ash Pond Dike Stability - Survey
Calc# TV-WO-5377QI-001

SCALE	DRAWING NUMBER	SHEET	CONT'D
AS SHOWN	ES1920S2	1	FINAL

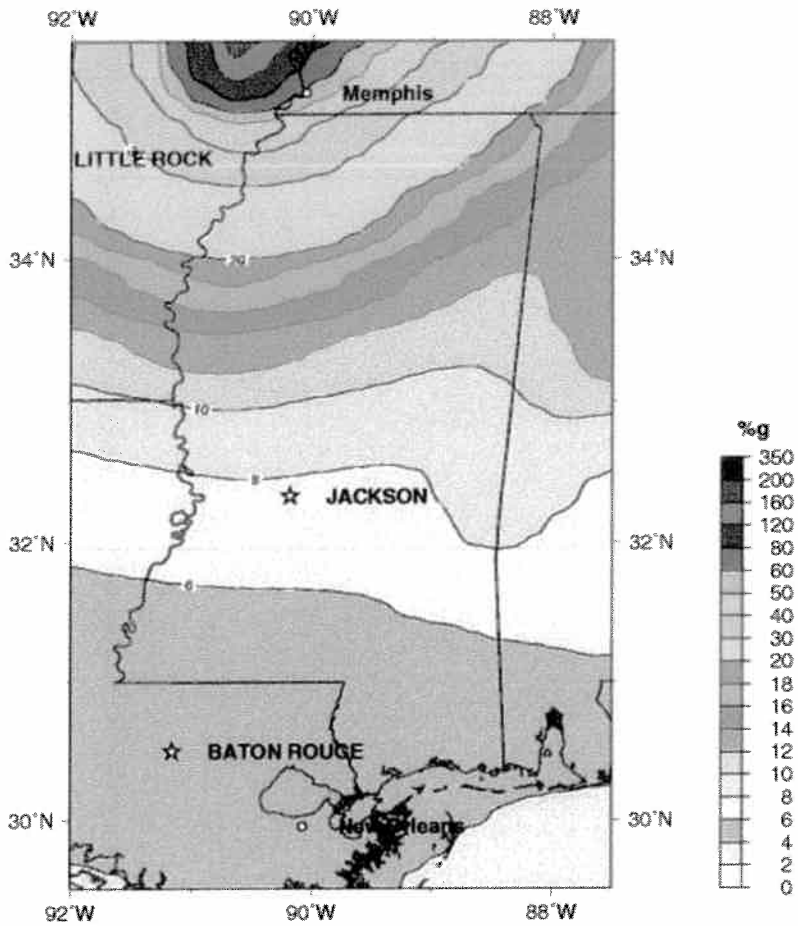
ANSI B: 17x11 Acad2006
Drawing name: T:\ESEE MAJOR PROJECTS\PROJECTS\Watson\2010\ES1920 EPA Inspection Documents\DWG\ES1920S1 S2.dwg Oct 27, 2010 - 2:07pm

Earthquake Hazards Program

Attachment C
Calc # TV-WO-5377QI-001
Page 1 of 1

Mississippi

Seismic Hazard Map



Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary
National Seismic Hazard Mapping Project (2008)

USGS National Seismic Hazard Maps

SHARE

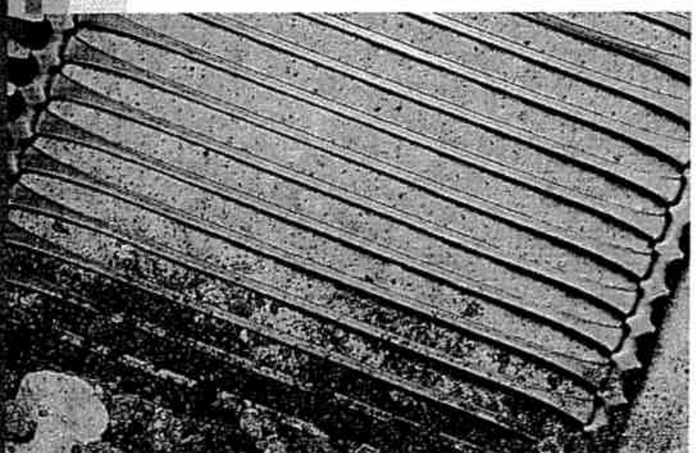
CONFIDENTIAL BUSINESS INFORMATION

Tensar
INTERNATIONAL

Tensar® Uniaxial Geogrids for Soil Reinforcement

The Engineered Advantage®

Tensar®Uniaxial (UX) Geogrids are manufactured using select grades of high-density polyethylene (HDPE) resins that are highly oriented and resist elongation (creep) when subjected to high tensile loads for long periods of time. Geogrids manufactured from HDPE provide high resistance to installation damage and chemical or biological long-term degradation. In fact, Tensar UX Geogrids have shown no degradation in pH situations as high as 12 and can be used in both dry and wet-cast environments.



A high-density polyethylene, homogeneous product that does not require weaving, coating or welding to maintain the product's integrity.

Tensile Strength

Tensar UX Geogrids can carry high tensile loads applied in one direction (along the roll). Their open aperture structure interlocks with fill material to provide superior load transfer from the soil to the geogrid. Tensar UX Geogrids achieve their strength by punching and drawing a homogenous polymer sheet to provide a uniform, consistent product that does not require weaving, coating or welding to maintain the product's integrity. This unique process provides superior junction strength allowing high strength connections to other rolls of geogrid or facing components.

Tensar Geogrids are used for high strength soil reinforcement in wall and slope applications. Over 100-million square feet of retaining structures in service today are reinforced with Tensar UX Geogrid.

Experience You Can Rely On

Tensar International Corporation, the leader in geosynthetic soil reinforcement, offers a variety of solutions for foundation, retaining wall and roadway projects. Our products and technologies, backed by the most thorough quality assurance practices, are at the forefront of the industry. Highly adaptable, cost-effective and installation friendly, they provide exceptional, long-term performance under the most demanding conditions. Our support services include site evaluation, design consulting and site construction assistance. For innovative solutions to your engineering challenges, rely on the experience, resources and expertise that have set the industry standard for more than two decades.

For more information on Uniaxial Geogrid or other Tensar Systems, visit www.tensar-international.com, call 800-TENSAR-1, or e-mail info@tensarcorp.com.

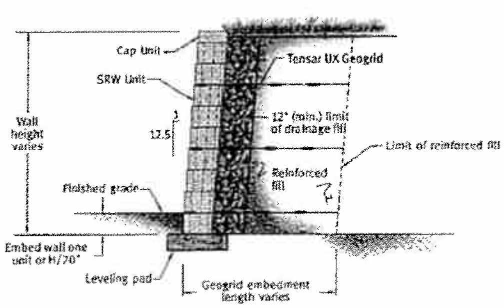
Tensar UX Geogrids install easily in stand alone applications as well as in conjunction with one of our proprietary soil stabilization systems.

PROPERTY SPECIFICATIONS FOR TENSAR® UNIAXIAL GEOGRIDS*

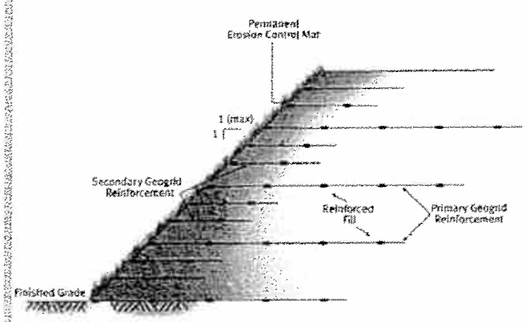
Index Properties							
GEOGRID PROPERTIES	LH800	UX1000	UX1100	UX1400	UX1500	UX1600	UX1700
Tensile Strength @ 5% Strain (kN/m (lb/ft))	14 (960)	23 (1,570)	27 (1,850)	31 (2,130)	52 (3,560)	58 (3,980)	75 (5,140)
Ultimate Tensile Strength (kN/m (lb/ft))	38 (2,600)	46 (3,150)	58 (3,970)	70 (4,800)	114 (7,810)	144 (9,870)	175 (11,990)
Junction Strength (kN/m (lb/ft))	32.5 (2,230)	43 (2,950)	54 (3,690)	66 (4,520)	105 (7,200)	135 (9,250)	160 (10,970)
Flexural Stiffness (mg-cm)	350,000	400,000	500,000	730,000	5,100,000	6,000,000	9,075,000
Load Capacity							
GEOGRID PROPERTIES	LH800	UX1000	UX1100	UX1400	UX1500	UX1600	UX1700
Maximum Allowable (Design) Strength (kN/m (lb/ft))	12.2 (835)	16.8 (1,150)	21.2 (1,450)	25.6 (1,760)	41.8 (2,860)	52.7 (3,620)	64.1 (4,390)
Recommended Allowable Strength Reduction Factors							
GEOGRID PROPERTIES	LH800	UX1000	UX1100	UX1400	UX1500	UX1600	UX1700
Minimum Reduction Factor for Installation Damange (RF_{ID})	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Reduction Factor for Creep for 120 yr design life (RF_{CR})	2.96	2.60	2.60	2.60	2.60	2.60	2.60
Minimum Reduction Factor for Durability (RF_D)	1.00	1.00	1.00	1.00	1.00	1.00	1.00

* Tensar International Corporation (Tensar) reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance. Tensar warrants that at the time of delivery the geogrid furnished hereunder shall meet its published specifications as of the date of manufacture of the product. NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE, IF PROVIDED AND ANY AND ALL SUCH OTHER WARRANTIES ARE SPECIFICALLY EXCLUDED. The sole remedy to the purchaser or user of our products for breech of the above-mentioned warranty is the replacement of the geogrid material. Notification of any such breech shall be made within three (3) months of product delivery and prior to installation. The applicable product specification supersedes all prior specifications for the product. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759. Brief descriptions of test procedures are given in the notes found online at www.tensar-international.com. Call 800-TENSAR-1 for a complete list of property specifications and notes associated with these Tensar® UX Geogrid properties.

SRW Typical Cross-Section



RSS Typical Cross-Section



Tensar INTERNATIONAL
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Product Specification - Biaxial Geogrid BX1100

Tensar Earth Technologies, Inc. reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance. Please contact Tensar Earth Technologies, Inc. at 800-836-7271 for assistance

Product Type:	**Integrally Formed Biaxial Geogrid**
Polymer:	**Polypropylene**
Load Transfer Mechanism:	**Positive Mechanical Interlock**
Primary Applications:	**Spectra System (Base Reinforcement, Subgrade Improvement)**

Product Properties

Index Properties	Units	MD Values[1]	XMD Values[1]
▪ Aperture Dimensions[2]	mm (in)	25 (1.0)	33 (1.3)
▪ Minimum Rib Thickness[2]	mm (in)	0.76 (0.03)	0.76 (0.03)
▪ Tensile Strength @ 2% Strain[3]	kN/m (lb/ft)	4.1 (280)	6.6 (450)
▪ Tensile Strength @ 5% Strain[3]	kN/m (lb/ft)	8.5 (580)	13.4 (920)
▪ Ultimate Tensile Strength[3]	kN/m (lb/ft)	12.4 (850)	19.0 (1,300)
Structural Integrity			
▪ Junction Efficiency[4]	%	93	
▪ Flexural Stiffness[5]	mg-cm	250,000	
▪ Aperture Stability[6]	m-N/deg	0.32	
Durability			
▪ Resistance to Installation Damage[7]	%SC / %SW / %GP	95 / 93 / 90	
▪ Resistance to Long Term Degradation[8]	%	100	
▪ Resistance to UV Degradation[9]	%	100	

Dimensions and Delivery

The biaxial geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 3.0 meters (9.8 feet) or 4.0 meters (13.1 feet) in width and 75.0 meters (246 feet) in length. A typical truckload quantity is 185 to 250 rolls.

Notes

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759. Brief descriptions of test procedures are given in the following notes. Complete descriptions of test procedures are available on request from Tensar Earth Technologies, Inc.
2. Nominal dimensions.
3. True resistance to elongation when initially subjected to a load determined in accordance with ASTM D6637 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties.
4. Load transfer capability determined in accordance with GRI-GG2-87 and expressed as a percentage of ultimate tensile strength.
5. Resistance to bending force determined in accordance with ASTM D5732-95, using specimens of width two ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs (as a "ladder"), and of length sufficiently long to enable measurement of the overhang dimension. The overall Flexural Stiffness is calculated as the square root of the product of MD and XMD Flexural Stiffness values.
6. Resistance to in-plane rotational movement measured by applying a 20 kg-cm (2 m-N) moment to the central junction of a 9 inch x 9 inch specimen restrained at its perimeter in accordance with U.S. Army Corps of Engineers Methodology for measurement of Torsional Rigidity.
7. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in clayey sand (SC), well graded sand (SW), and crushed stone classified as poorly graded gravel (GP). The geogrid shall be sampled in accordance with ASTM D5818 and load capacity shall be determined in accordance with ASTM D6637.
8. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
9. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355.

This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped prior to August 1, 2005

Product Specification - Structural Geogrid BX1200

The structural geogrid shall be an integrally formed grid structure manufactured of a stress resistant polypropylene material with molecular weight and molecular characteristics which impart: (a) high resistance to loss of load capacity or structural integrity when the geogrid is subjected to mechanical stress in installation; (b) high resistance to deformation when the geogrid is subjected to applied force in use; and (c) high resistance to loss of load capacity or structural integrity when the geogrid is subjected to long-term environmental stress.

The structural geogrid shall accept applied force in use by positive mechanical interlock (i.e. by direct mechanical keying) with: (a) compacted soil or construction fill materials; (b) contiguous sections of itself when overlapped and embedded in compacted soil or construction fill materials; and (c) rigid mechanical connectors such as bodkins, pins or hooks. The structural geogrid shall possess sufficient cross sectional profile to present a substantial abutment interface to compacted soil or particulate construction fill materials and to resist movement relative to such materials when subject to applied force. The structural geogrid shall possess sufficient true initial modulus to cause applied force to be transferred to the geogrid at low strain levels without material deformation of the reinforced structure. The structural geogrid shall possess complete continuity of all properties throughout its structure and shall be suitable for reinforcement of compacted soil or particulate construction fill materials to improve their long term stability in structural load bearing applications such as earth retention systems. The structural geogrid shall otherwise have the following characteristics:

Product Type: **Integrally Formed Structural Geogrid**
Load Transfer Mechanism: **Positive Mechanical Interlock**

Product Properties

Index Properties	**Units**	**MD Values[1]**	**XMD Values[1]**
• Aperture Dimensions[2]	mm (in)	25 (1.0)	33 (1.3)
• Minimum Rib Thickness[2]	mm (in)	1.27 (0.05)	1.27 (0.05)
Load Capacity			
• True Initial Modulus in Use[3]	kN/m(lb/ft)	400 (27,420)	650 (44,550)
• True Tensile Strength @2% Strain[3]	kN/m(lb/ft)	6.0 (410)	9.0 (620)
• True Tensile Strength @5% Strain[3]	kN/m(lb/ft)	11.8 (810)	19.6 (1,340)
Structural Integrity			
• Junction Efficiency[4]	%	93	
• Flexural Stiffness[5]	mg-cm	750,000	
• Aperture Stability[6]	kg-cm/deg	6.5	
Durability			
• Resistance to Installation Damage[7]	%SC / %SW / %GP	95 / 89 / 86	
• Resistance to Long Term Degradation[8]	%	100	

Dimensions and Delivery

The structural geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 3.0 meters (9.8 feet) or 4.0 meters (13.1 feet) in width and 50.0 meters (164 feet) in length. A typical truckload quantity is 165 to 220 rolls. On special request, the structural geogrid may also be custom cut to specific lengths or widths to suit site specific engineering designs.

Notes

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D-4759. Brief descriptions of test procedures are given in the following notes. Complete descriptions of test procedures are available on request from Tensar Earth Technologies, Inc.
2. Nominal Dimensions.
3. True resistance to elongation when initially subjected to a load measured via ASTM D6637 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties.
4. Load transfer capability measured via GRI-GG2-87. Expressed as a percentage of ultimate tensile strength.
5. Resistance to bending force measured via ASTM D-5732-95, using specimens of width two ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs (as a "ladder"), and of length sufficiently long to enable measurement of the overhang dimension. The overall Flexural Stiffness is calculated as the square root of the product of machine-and cross-machine-direction Flexural Stiffness values.
6. Resistance to in-plane rotational movement measured by applying a 20 kg-cm moment to the central junction of a 9 inch x 9 inch specimen restrained at its perimeter (U.S. Army Corps of Engineers Methodology for measurement of Torsional Rigidity).
7. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in clayey sand (SC), well graded sand (SW), and crushed stone classified as poorly graded gravel (GP). The geogrid shall be sampled in accordance with ASTM D5818 and load capacity shall be measured in accordance with ASTM D6637.
8. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments measured via EPA 9090 immersion testing.

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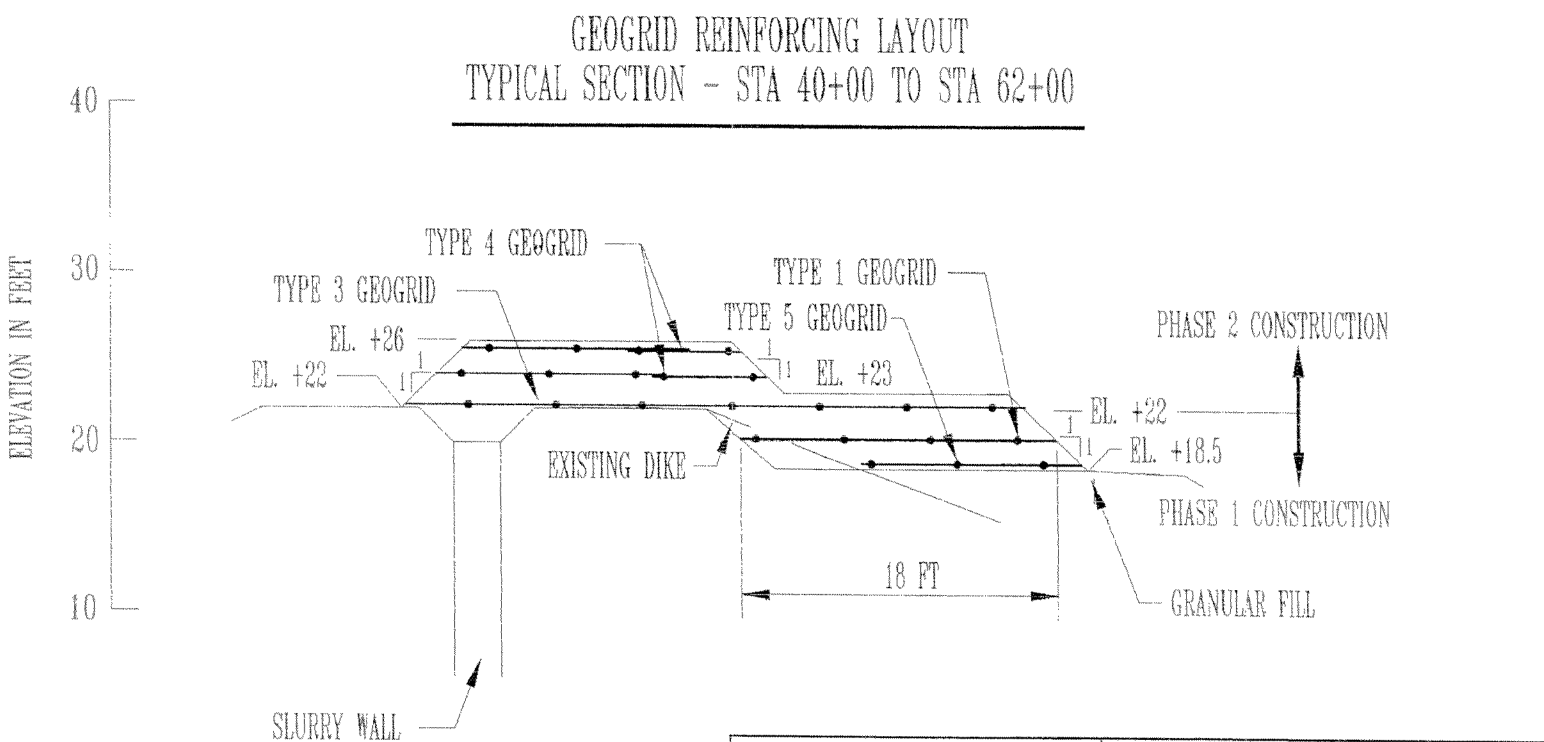
February 1, 2003
This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped to jobsite prior to February 1, 2003.

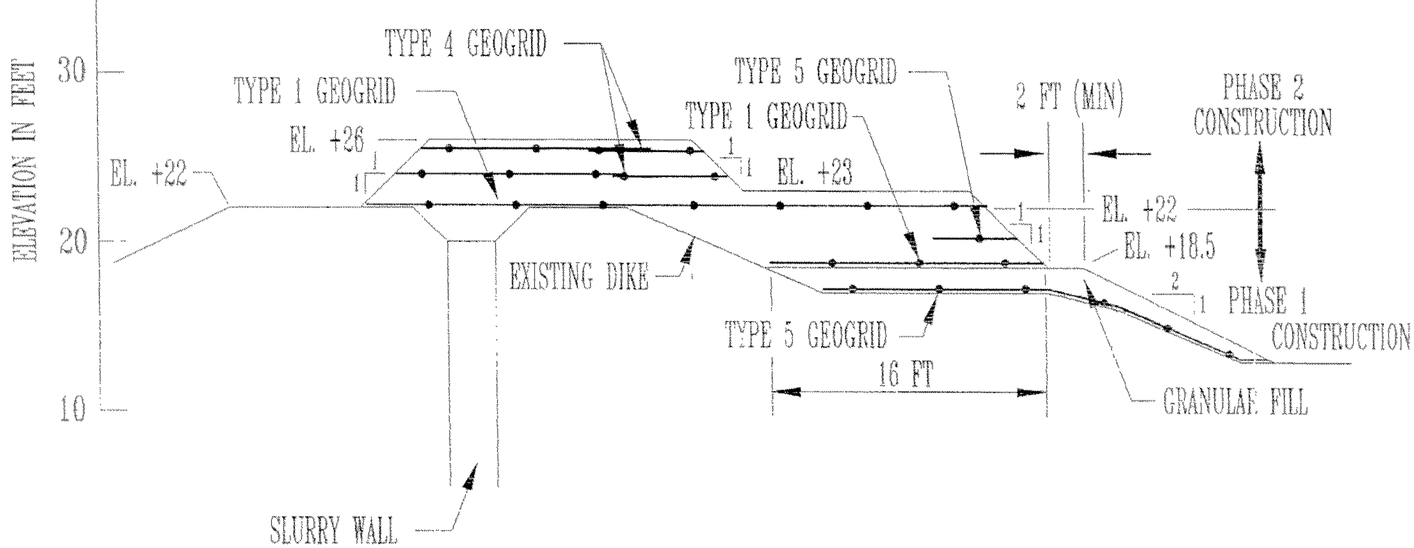
Section 1



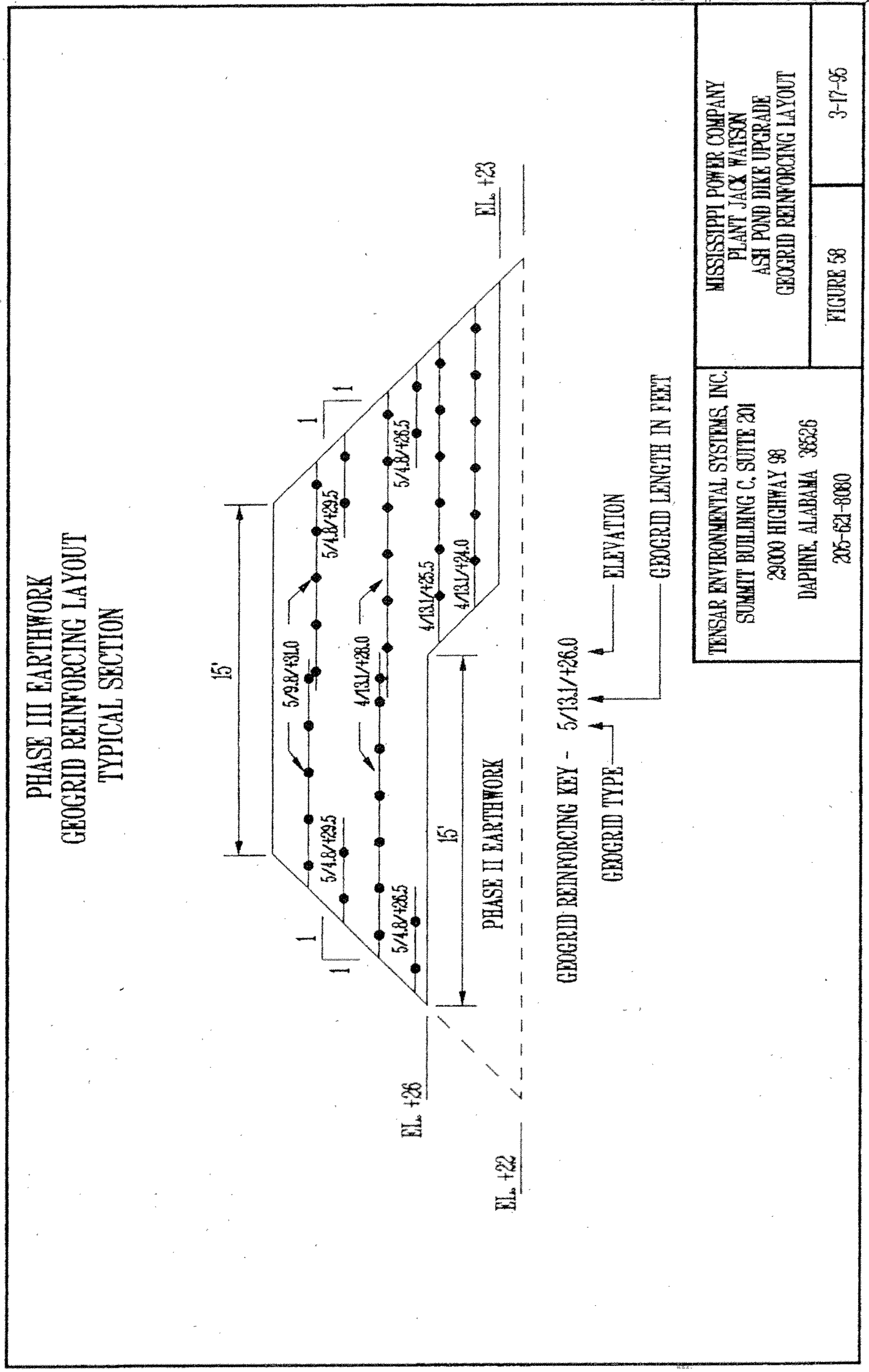
TENSAR ENVIRONMENTAL SYSTEMS, INC. SUMMIT BUILDING C, SUITE 201 29000 HIGHWAY 98 DAPHNE, ALABAMA 36526 334-621-8080	MISSISSIPPI POWER COMPANY PLANT JACK WATSON ASH POND DIKE UPGRADE TYPICAL SECTION-STA 40+00 TO STA 62+00 FIGURE 44 3-17-95

Section 11

GEOGRID REINFORCING LAYOUT
TYPICAL SECTION - STA 29+00 TO STA 40+00



TENSAR ENVIRONMENTAL SYSTEMS, INC. SUMMIT BUILDING C, SUITE 201 29000 HIGHWAY 98 DAPHNE, ALABAMA 36526 334-621-8080	MISSISSIPPI POWER COMPANY PLANT JACK WATSON ASH POND DIKE UPGRADE TYPICAL SECTION-STA 29+00 TO 40+00	
	FIGURE 36	3-17-95


PHASE III EARTHWORK
GEOGRID REINFORCING LAYOUT
TYPICAL SECTION
15'
15'
5/9.8/+31.0
4/13.1/+28.0
5/4.8/+29.5
5/4.8/+29.5
5/4.8/+26.5
5/4.8/+26.5
4/13.1/+25.5
4/13.1/+24.0
1
1
1
1
PHASE II EARTHWORK
EL. +23
EL. +26
EL. +22
GEOGRID REINFORCING KEY - 5/13.1/+26.0
ELEVATION
GEOGRID LENGTH IN FEET
GEOGRID TYPE
MISSISSIPPI POWER COMPANY
PLANT JACK WATSON
ASH POND DIKE UPGRADE
GEOGRID REINFORCING LAYOUT
3-17-95
FIGURE 58
TENSAR ENVIRONMENTAL SYSTEMS, INC.
SUMMIT BUILDING C, SUITE 201
29000 HIGHWAY 98
DAPHNE, ALABAMA 36526
205-621-8080