

SAFETY FACTOR ASSESSMENT – REVISION 01
40 C.F.R. PART 257.73
CCR UNIT ASH POND 1 (AP-1)
PLANT MCDONOUGH, GEORGIA POWER COMPANY

United States Environmental Protection Agency's "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments" Final Rule (40 C.F.R. Part 257), §257.73 requires the owner or operator of an existing CCR surface impoundment to conduct initial and periodic safety factor assessments. The owner or operator of the CCR unit must conduct an assessment and document that the minimum safety factors outlined in §257.73(e)(1)(i) through (iv) for the embankment are achieved.

CCR Unit Ash Pond 1 (AP-1), owned and operated by Georgia Power Company, is located at Plant McDonough-Atkinson (Plant McDonough) in Cobb County, Georgia. AP-1 no longer receives CCR, and is in the process of obtaining a solid waste permit under the Georgia Rules for Solid Waste Management, 391-3-4-.10. Installation of the final cover system for Plant McDonough AP-1 was substantially completed Q1 2017, and AP-1 is undergoing additional closure construction in the near term in accordance with 40 C.F.R. §257.102(d), including the installation of a fully encompassing subsurface barrier wall and adjacent associated closure system upgrades.

AP-1 currently consists of 31 acres of drainage area, and stormwater is routed over the closure system through a system of downslope and perimeter channels to two outfall points: the Northwest and the South outfalls. The current conditions were evaluated for stability under four loading conditions as per 40 CFR §257.73(e):

- Storage Pool (§ 257.73(e)(i))
- Surcharge Pool (§ 257.73(e)(ii))
- Seismic Loading Conditions (§ 257.73(e)(iii))
- Post-Seismic Liquefaction Conditions (when liquefaction susceptible materials are present; § 257.73(e)(iv)).

Engineering analysis of AP-1 in its current condition were evaluated for each loading condition. Stability safety factors were evaluated for each of the loading scenarios using the computer program SLIDE (2018). As required by the EPA rule, a general limit equilibrium (GLE) method (Morgenstern and Price) was used to calculate factors of safety, and the factors of safety were calculated by dividing the resisting forces by the driving forces along the calculated critical slip surface of a given slope.

Stability was evaluated along three cross-sections for AP-1 as shown in Figure 1. Subsurface stratigraphy at each cross-section was developed based on a combination of historical site data and subsurface investigations by Golder. Material properties were developed for the dike, foundation, and impounded materials from this data. The conditions modeled in the stability analyses are reflective of the conditions for AP-1 from 2018 through the date of this submittal.

For the surcharge pool scenario, Golder considered the effects of the 100-year 24-hour rain event. This event was calculated to cause temporary water flow on top of the pond cap in drainage channels. Factors of safety for stability under seismic loading conditions were calculated based on the earthquake hazard corresponding to a probability of exceedance of 2% in 50 years (2,475-year return period). Golder used the Bray and Travarasou displacement-based seismic slope stability screening method (Bray and Travarasou 2009) to evaluate the seismic stability. Additionally, an evaluation of the liquefaction susceptibility of the site soils which will remain saturated in the long term was completed and the results incorporated into the post liquefaction stability assessments.

The table below summarizes the results of the slope stability analyses for the current conditions at AP-1, with figures displaying the stability analysis results attached to this demonstration.

2018 to Current Conditions Stability Analysis Results				
Analysis Case	Storage Pool	Surcharge Pool	Seismic	Post Liquefaction
Rule Section	§ 257.73(e)(i)	§ 257.73(e)(ii)	§ 257.73(e)(iii)	§ 257.73(e)(iv)
Target Factor of Safety	1.5	1.4	1.0	1.2
Cross-Sections	Factor of Safety			
A-A	1.6	1.6	1.5	1.6
B-B	1.6	1.6	1.3	1.6
C-C	1.5	1.5	1.4	1.5

For all cases analyzed, the calculated factors of safety are in excess of those required in Sections § 257.73(e)(i) to (iv) of the EPA Rule.

I certify that the safety factor assessment for AP-1 was conducted in accordance with 40 CFR 257.73(e).



Gregory L. Hebeler, PhD, P.E.

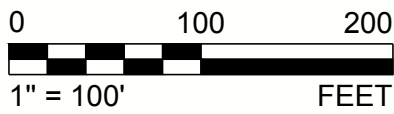
Georgia Licensed Professional Engineer No. 034749

Golder Associates Inc.



LEGEND		
	EXISTING CONTOURS	
	SOUTHERN COMPANY BOREHOLES	

- REFERENCES**
1. THE EXISTING TOPOGRAPHY SHOWN EVERYWHERE ELSE WAS PROVIDED BY SOUTHERN COMPANY SERVICES AS AN INTERIM CONSTRUCTION PROGRESS SURVEY. FLOWN ON 04-15-17 USING LIDAR.
 2. SOUTHERN COMPANY BOREHOLES COMPLETED IN JANUARY 2009.




CLIENT
GEORGIA POWER COMPANY



PROJECT
PLANT MCDONOUGH
SAFETY FACTOR ASSESSMENT

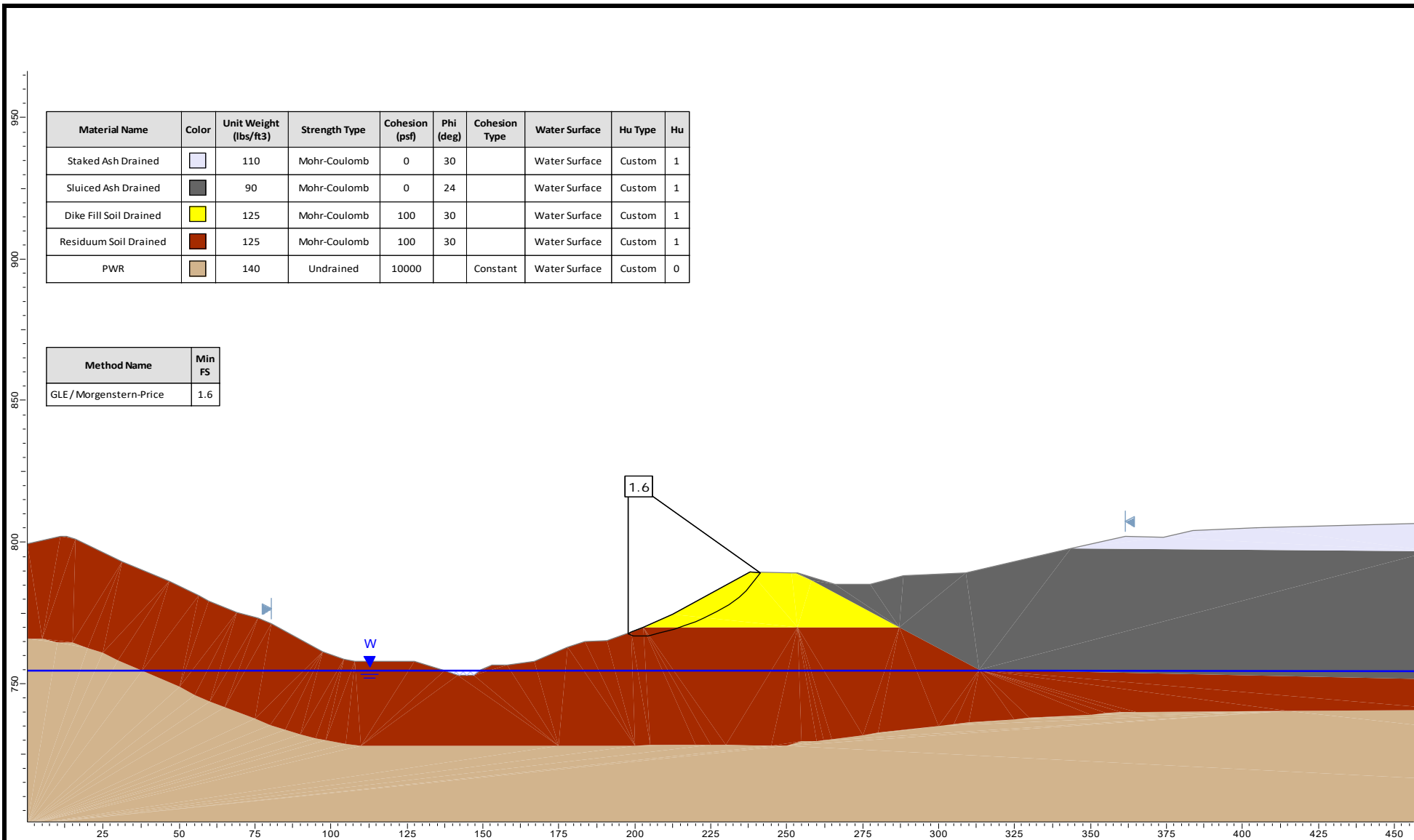
TITLE
CCR UNIT AP-1 - STABILITY SECTIONS PLAN

	CONSULTANT	YYYY-MM-DD	2018/02/15
	DESIGNED	LJ	
	PREPARED	RMS	
	REVIEWED	JGM / LS	
	APPROVED	GLH	

PROJECT NO. 1777449

REV.

SHEET 1



GOLDER

SCALE AS SHOWN

DATE Jan 2018

MADE BY LJ

CAD -

CHECK JGM

REVIEW GLH

PROJECT **State CCR Permitting Services - MCD Pond 1**

TITLE

Section A-A
Long Term, Storage Pool

FILE STABILITY

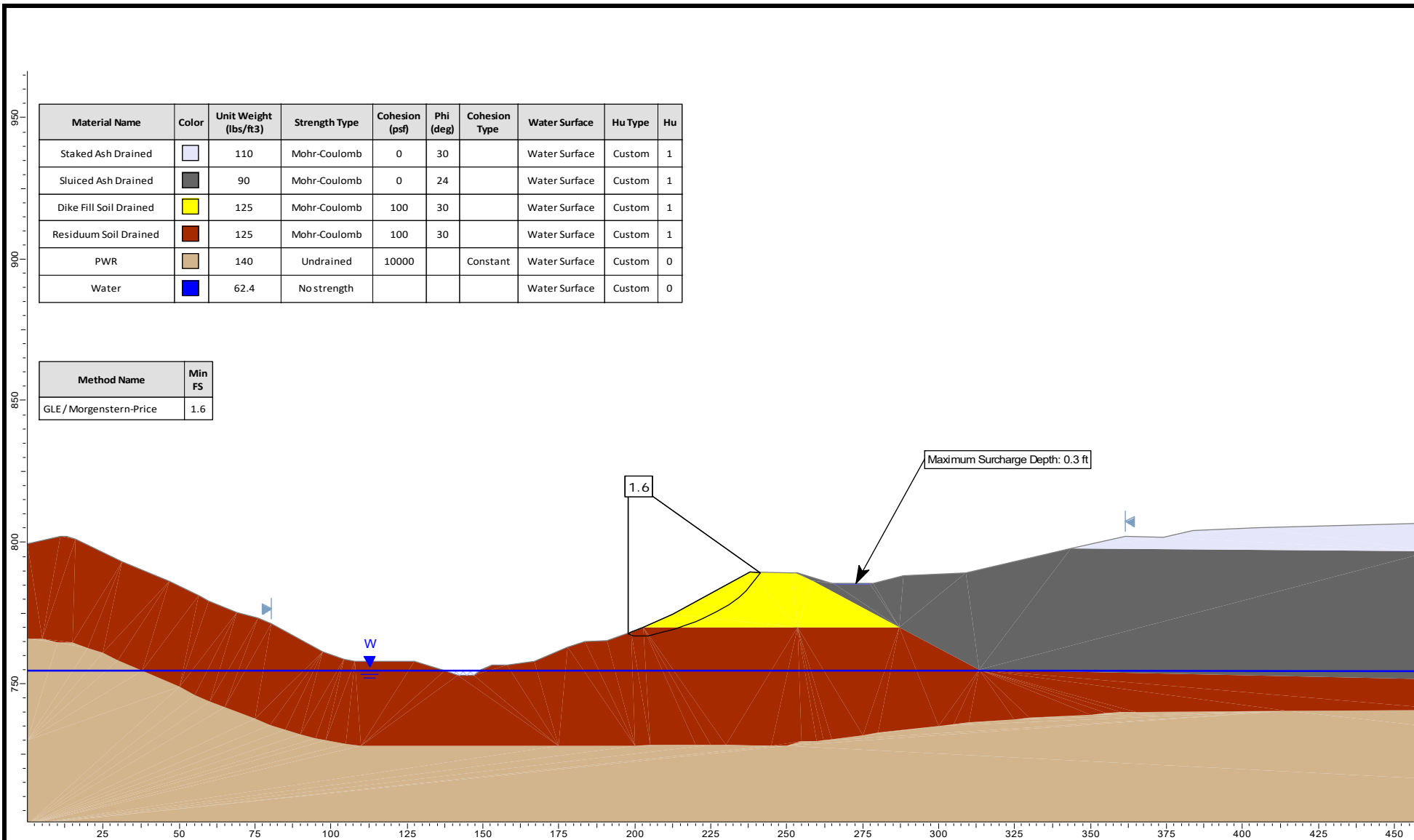
PROJECT No. 1777449 REV. 0


CLIENT






Georgia Power Company

FIGURE

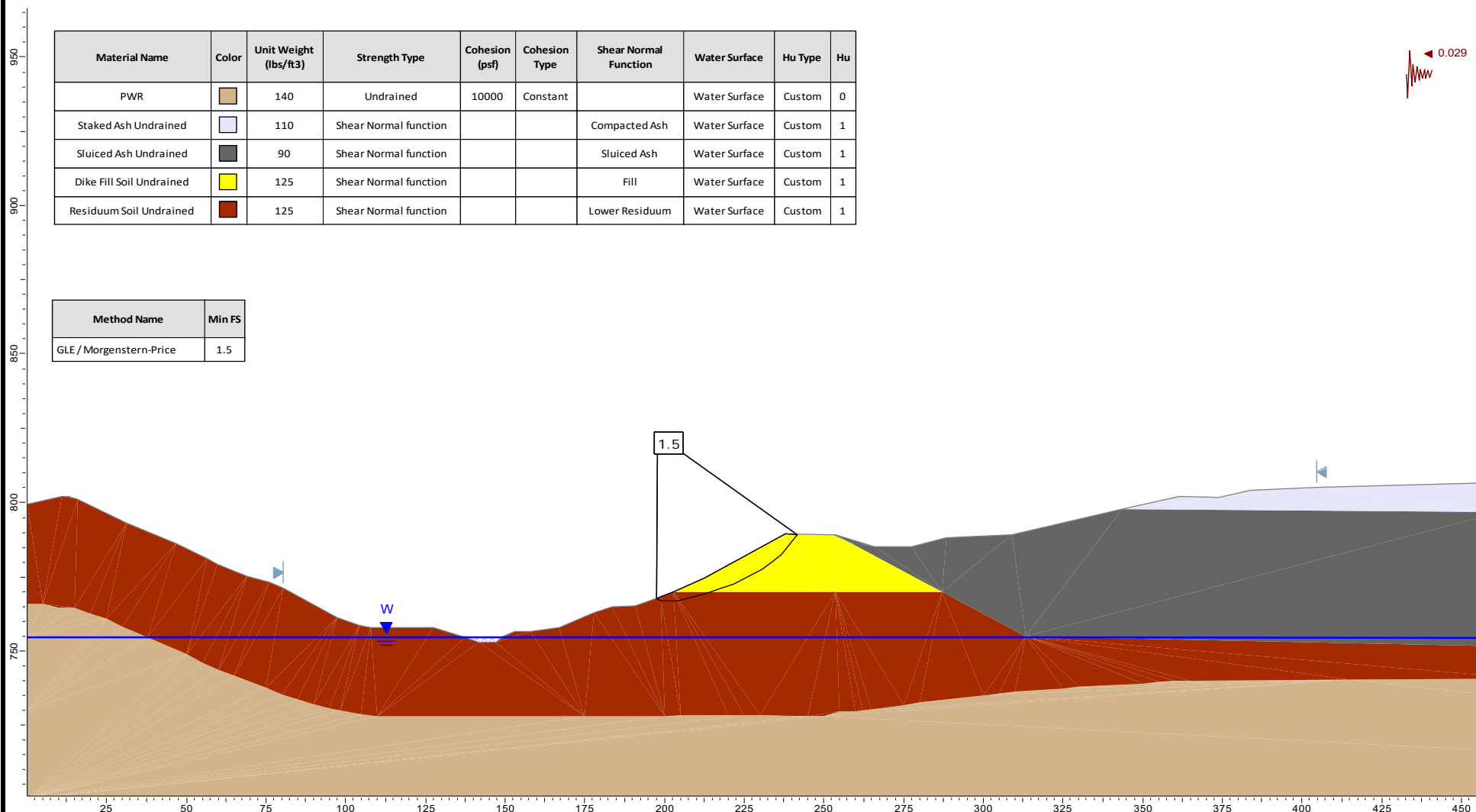
2(a)



 GOLDER	SCALE	AS SHOWN	PROJECT	State CCR Permitting Services - MCD Pond 1	
	DATE	Jan 2018	TITLE	Section A-A Surcharge Pool	
	MADE BY	LJ			
	CAD	-			
FILE	STABILITY	CHECK	JGM	CLIENT	Georgia Power Company
PROJECT No. 1777449	REV. 0	REVIEW	GLH		
				FIGURE	2(b)

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Cohesion Type	Shear Normal Function	Water Surface	Hu Type	Hu
PWR		140	Undrained	10000	Constant		Water Surface	Custom	0
Staked Ash Undrained		110	Shear Normal function			Compacted Ash	Water Surface	Custom	1
Sluiced Ash Undrained		90	Shear Normal function			Sluiced Ash	Water Surface	Custom	1
Dike Fill Soil Undrained		125	Shear Normal function			Fill	Water Surface	Custom	1
Residuuum Soil Undrained		125	Shear Normal function			Lower Residuuum	Water Surface	Custom	1

Method Name	Min FS
GLE / Morgenstern-Price	1.5



SCALE AS SHOWN

State CCR Permitting Services - MCD Pond 1

TITLE

MADE BY	LJ
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CAD	-
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TITLE

Section A-A

Seismic Screening

FILE	STABILITY
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CHECK	JGM
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PROJECT No.	1777449
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REV.	0
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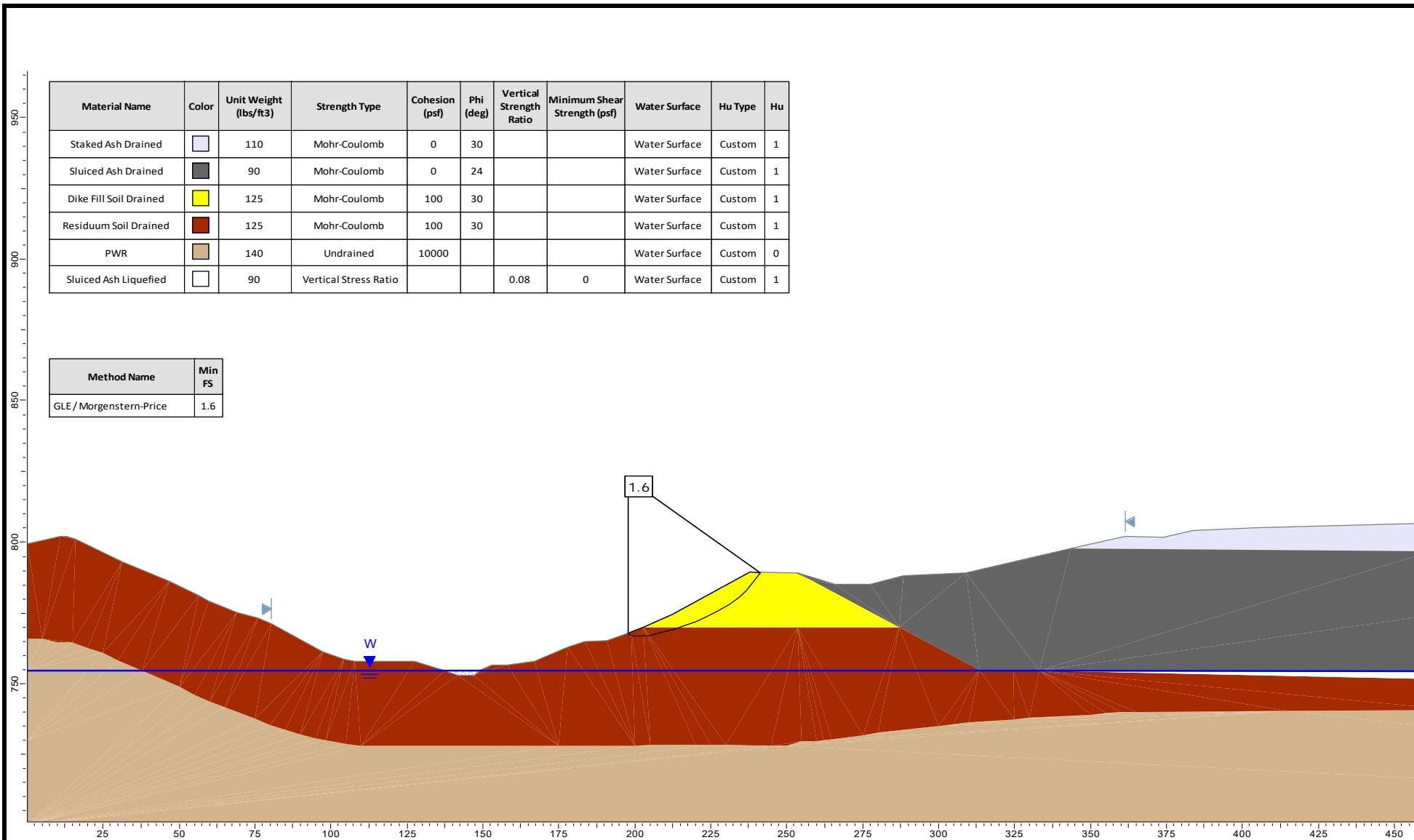
REVIEW	GLH
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CLIENT

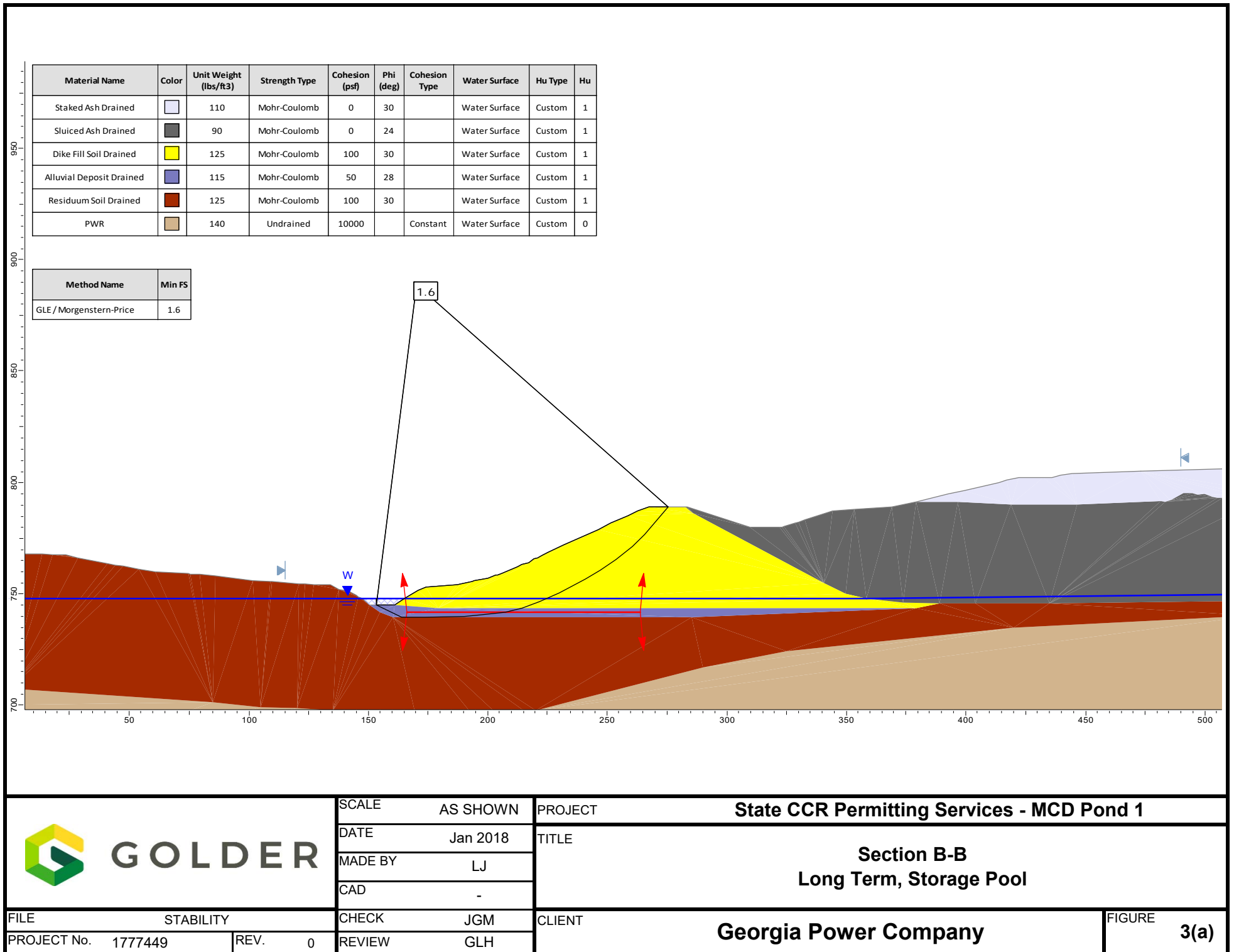
Georgia Power Company

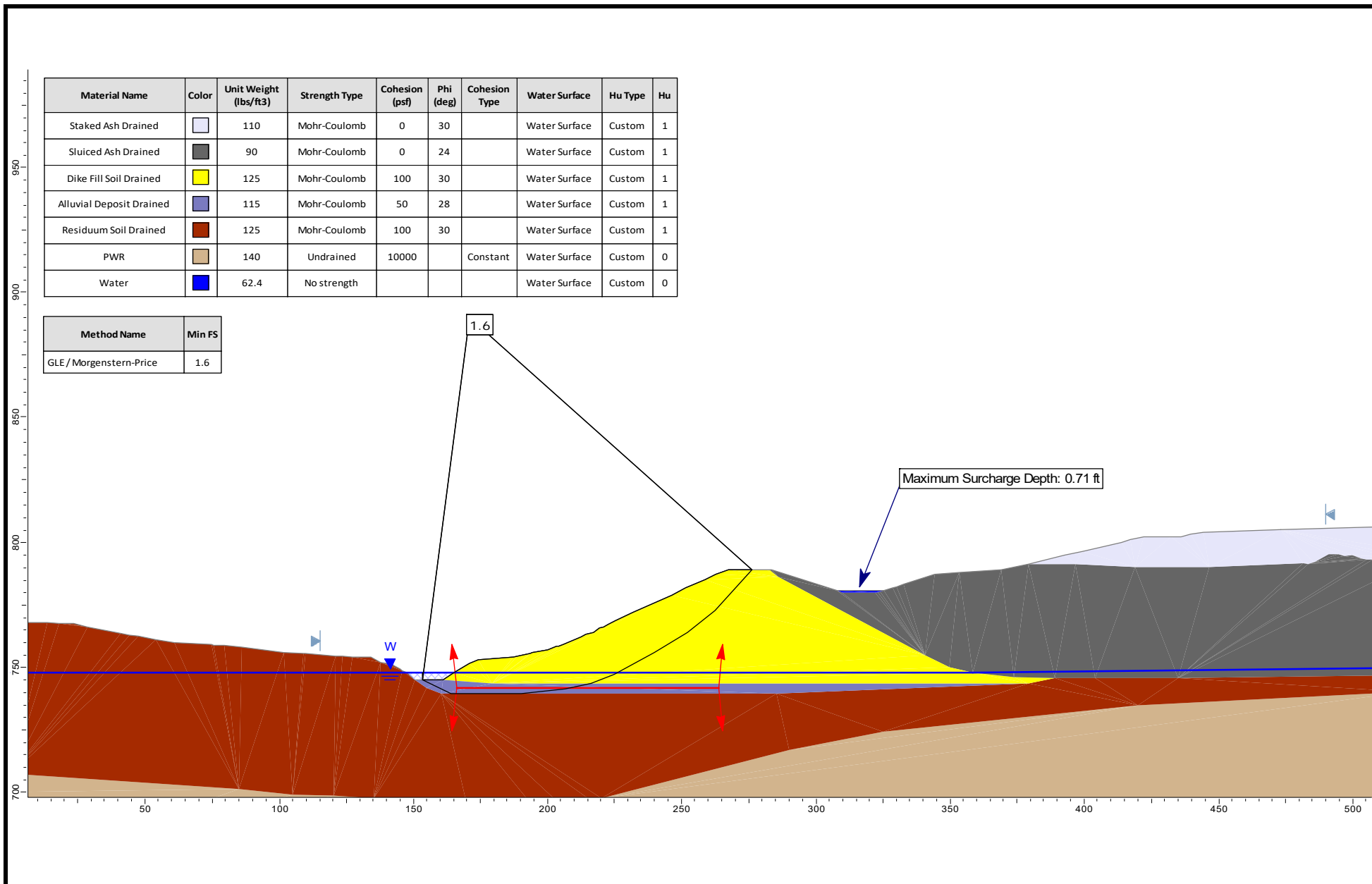
FIGURE

2(c)



 GOLDER	SCALE	AS SHOWN	PROJECT			State CCR Permitting Services - MCD Pond 1		
	DATE	Jan 2018	TITLE			Section A-A Post Liquefaction		
	MADE BY	LJ						
	CAD	-						
FILE	STABILITY	CHECK	JGM	CLIENT			FIGURE	
PROJECT No.	1777449	REV.	0	REVIEW	GLH	Georgia Power Company		2(d)





GOLDER

SCALE AS SHOWN

DATE Jan 2018

MADE BY LJ

CAD -

CHECK JGM

REVIEW GLH

PROJECT

State CCR Permitting Services - MCD Pond 1

TITLE

**Section B-B
Surcharge Pool**

FILE STABILITY








PROJECT No. 1777449 REV. 0

CLIENT

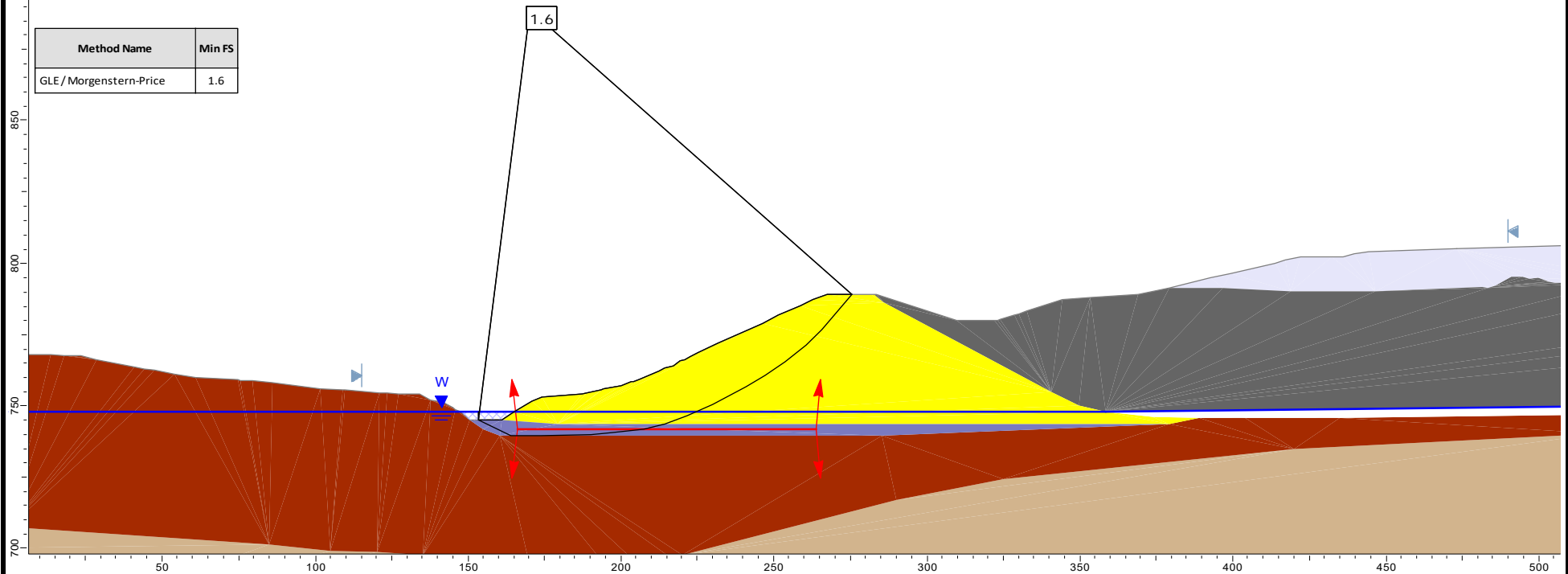
Georgia Power Company

FIGURE

3(b)

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Vertical Strength Ratio	Minimum Shear Strength (psf)	Water Surface	Hu Type	Hu
Staked Ash Drained		110	Mohr-Coulomb	0	30				Water Surface	Custom	1
Sluiced Ash Drained		90	Mohr-Coulomb	0	24				Water Surface	Custom	1
Dike Fill Soil Drained		125	Mohr-Coulomb	100	30				Water Surface	Custom	1
Alluvial Deposit Drained		115	Mohr-Coulomb	50	28				Water Surface	Custom	1
Residuum Soil Drained		125	Mohr-Coulomb	100	30				Water Surface	Custom	1
PWR		140	Undrained	10000		Constant			Water Surface	Custom	0
Sluiced Ash Liquefied		90	Vertical Stress Ratio				0.08	0	Water Surface	Custom	1

Method Name	Min FS
GLE / Morgenstern-Price	1.6



SCALE AS SHOWN

DATE	Jan 2018
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MADE BY	LJ
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CAD	-
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PROJECT

State CCR Permitting Services - MCD Pond 1

TITLE

Section B-B

Post Liquefaction

FILE	STABILITY
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PROJECT No.	1777449	REV.	0
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CHECK	JGM
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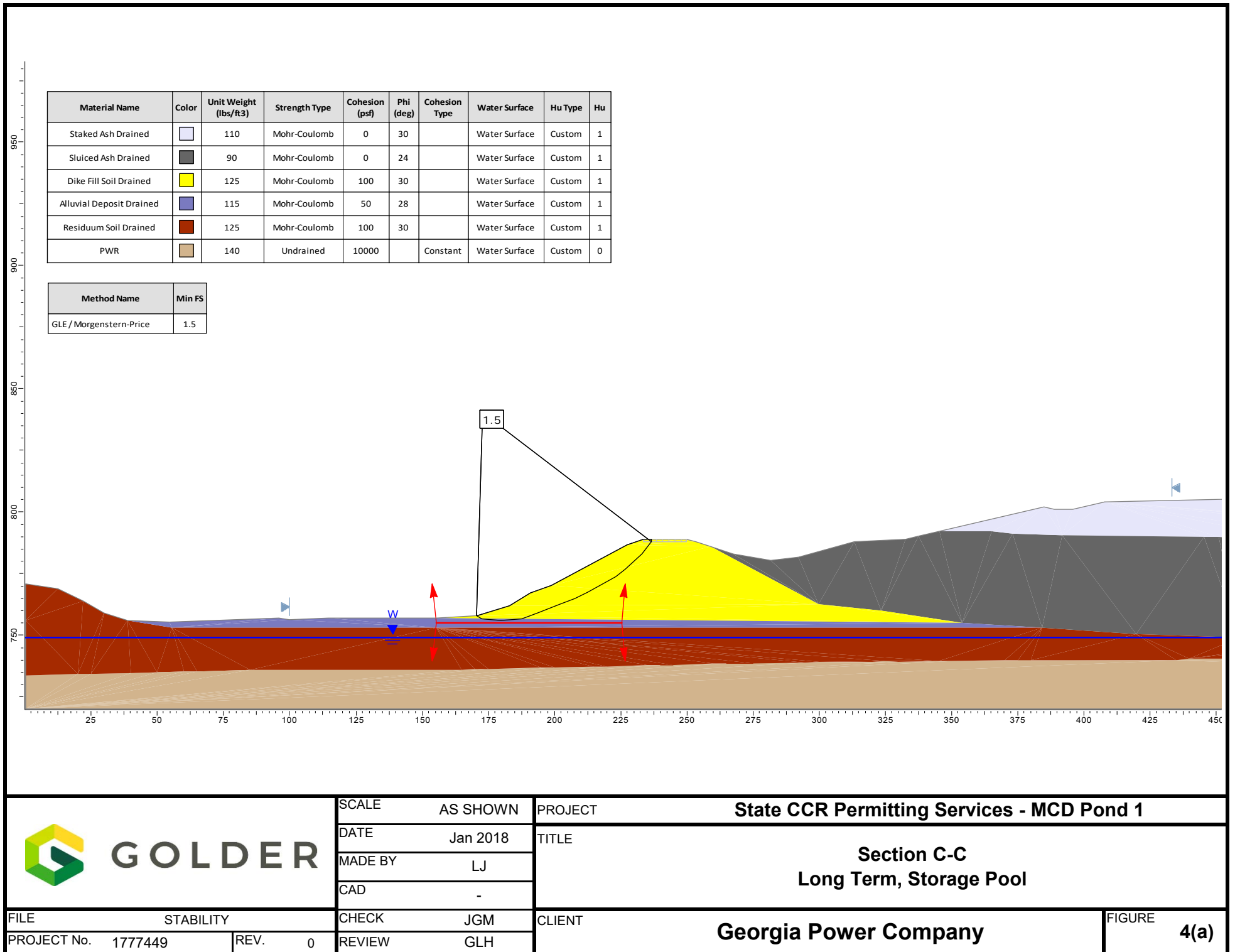
REVIEW	GLH
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CLIENT

Georgia Power Company

FIGURE

3(d)



GOLDER

SCALE AS SHOWN

DATE Jan 2018

MADE BY LJ

CAD -

CHECK JGM

REVIEW GLH

PROJECT

State CCR Permitting Services - MCD Pond 1

TITLE

Section C-C
Long Term, Storage Pool

FILE STABILITY

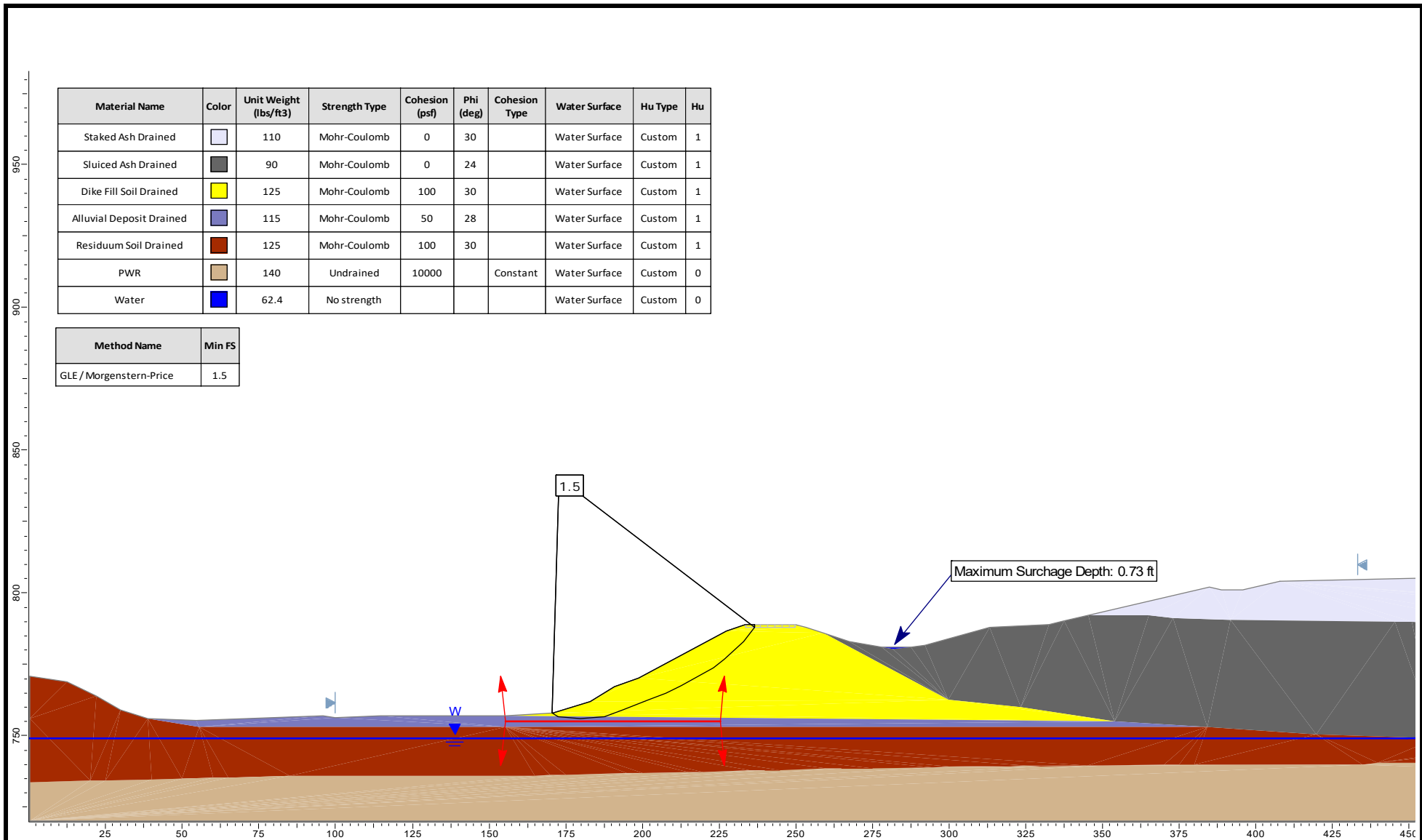
PROJECT No. 1777449 REV. 0

CLIENT

Georgia Power Company

FIGURE

4(a)



GOLDER

SCALE AS SHOWN

DATE Jan 2018

MADE BY LJ

CAD -

CHECK JGM

REVIEW GLH

PROJECT

State CCR Permitting Services - MCD Pond 1

TITLE

**Section C-C
Surcharge Pool**

FILE STABILITY

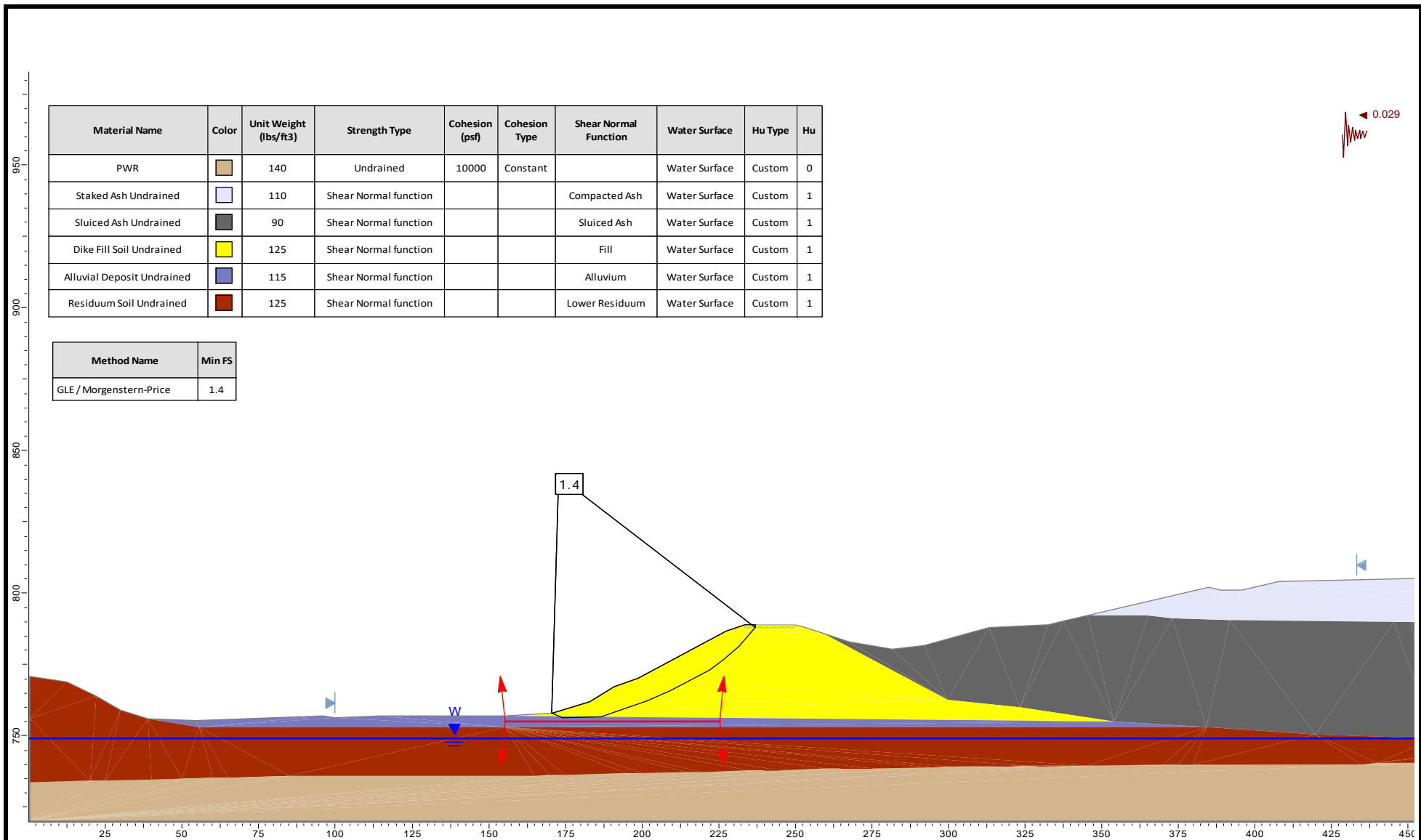
PROJECT No. 1777449 REV. 0

CLIENT

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FIGURE

4(b)



GOLDER

SCALE AS SHOWN

DATE Jan 2018

MADE BY LJ

CAD -

CHECK JGM

REVIEW GLH

PROJECT

State CCR Permitting Services - MCD Pond 1

TITLE

**Section C-C
Seismic Screening**

FILE STABILITY

PROJECT No. 1777449

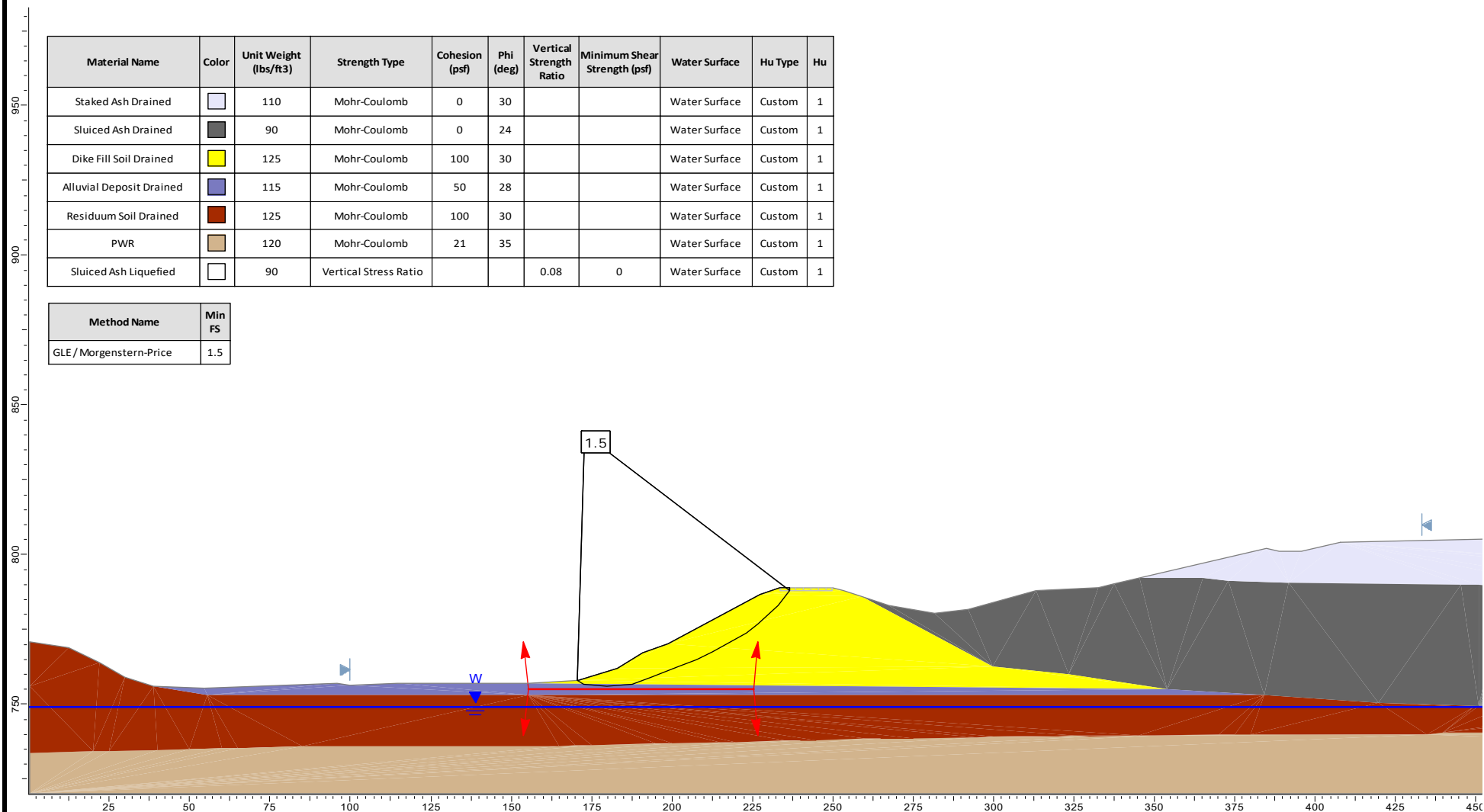
REV. 0

CLIENT

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FIGURE

4(c)



GOLDER

SCALE AS SHOWN

DATE Jan 2018

MADE BY LJ

CAD -

CHECK JGM

REVIEW GLH

PROJECT

State CCR Permitting Services - MCD Pond 1

TITLE

**Section C-C
Post Liquefaction**

FILE STABILITY

PROJECT No. 1777449 REV. 0

CLIENT

Georgia Power Company

FIGURE

4(d)