SAFETY FACTOR ASSESSMENT

SPS INSTRUCTION

OPERATING RECORD DOCUMENT
Required per §257.105(f)(12)

INTERNET POSTING Required per

§257.107(f)(11)

40 CFR Part 257.73

BMU Sikeston Power Station Bottom Ash Surface Impoundment
Periodic (5-Year) Structural Stability and Safety Factor Assessments

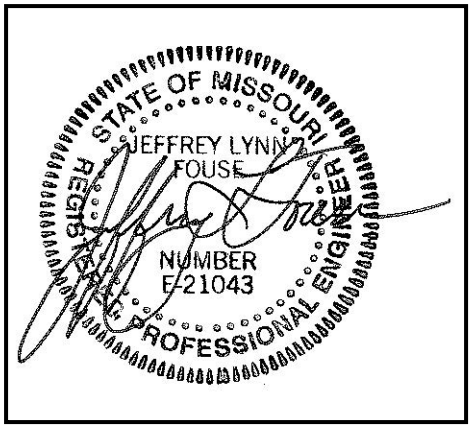
I, Jeffrey L. Fouse, P.E., certify that the BMU Sikeston Power Station Bottom Ash Surface Impoundment satisfies or exceeds the requirements of the following articles of the CCR Rule as of October 5, 2021:

1. 40 CFR Part 257.73(d)(1) Periodic Structural Stability Assessment.

2. 40 CFR Part 257.73(e)(1) Periodic Safety Factor Assessment.

REITZ & JENS, INC.

Engineer's Seal



Jeffrey L. Fouse, P.E.
Civil Engineer
Missouri License: E-21043
Date: October 5, 2021

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CONSULTING ENGINEERS

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October 5, 2021

GREDELL Engineering Resources, Inc.
1505 East High Street
Jefferson City, Missouri 65101

Attention: Mikel C. Carlson, R.G.
Principal Geologist

RE: Report of Periodic Structural Stability and Safety Factor Assessments
BMU Sikeston Power Station Bottom Ash Pond

This report summarizes our findings for the periodic structural stability and safety factor assessments for the Bottom Ash Pond at the BMU Sikeston Power Station in general accordance with the CCR Rule. This work was done in accordance with our proposal to GREDELL Engineering Resources (GER) which was accepted on August 18, 2021.

§257.73(d)(1) Periodic Structural Stability Assessment

Jeffrey Fouse, P.E. with Reitz & Jens participated with GER in a visual assessment of the current condition of the Bottom Ash Pond and appurtenances on Thursday, September 16, 2021. The purpose of this assessment was to review existing operations, maintenance and physical conditions of the embankments of the Bottom Ash Pond. No significant settlements, erosion, displacements or signs of structural weakness were observed in the embankments of the Bottom Ash Pond. There was no visual evidence of modifications to the embankments, and none were reported by GER. The topography of the CCR in the pond was somewhat changed but nothing significant which would impact the stability of the embankments. This was the judgement of Tom Gredell, P.E. and Jeff Fouse who performed the visual assessment. No topographic data was furnished to us.

Based upon our visual assessment of the Bottom Ash Pond, the structural stability assessment has not changed since our previous assessment in January 2016.

§257.73(e)(1) Periodic Safety Factor Assessment

We previously reviewed the report of the slope stability analyses by Geotechnology, Inc. which they did in 2011 for BMU Sikeston in accordance with the MDNR Dam Safety Program. Geotechnology found that the factors of safety of the embankments for both the Fly Ash Pond and the Bottom Ash Pond satisfied the requirements of the Missouri Dam Safety Program. Geotechnology did not consider liquefaction because it was beyond their scope of work.

We performed stability analyses of the embankments for the Bottom Ash Pond in accordance with the CCR Rule published on April 17, 2015, which were summarized in a memorandum to GER dated January 31, 2016. We found that the minimum static factor of safety against slope failure for the most critical section of the Bottom Ash Pond was 1.94, which exceeded the requirement in the CCR Rule. Therefore, it was not necessary to re-analyze the static factors of safety for slope stability of the Bottom Ash Pond embankment for this current assessment because no significant changes in the geometry or load conditions were observed.

The 2015 CCR Rule did not define the appropriate pseudo static Peak Horizontal Ground Acceleration (PHGA) for the seismic evaluation. We looked at the PGA from the 2014 U.S.G.S. map for the Sikeston location, which was 1.45g ("g" is standard gravity of 32.3 ft/sec^2). The general practice was to use a multiplier of 0.5 to calculate the pseudo-static PHGA from the PGA, which was 0.7g. We also looked at the 2012 UBC which stated to use a pseudo-static PHGA equal to $S_{DS}/2.5$ for geotechnical analyses in lieu of a site-specific spectral analysis. This defined the PHGA to be 0.622g. Based upon either criterion for PHGA, the seismic factor of safety was inadequate, as stated in our January 2016 memorandum.

Subsequently, Haley & Aldrich performed analyses of the slope stability of the embankment of the Bottom Ash Pond for BMU Sikeston in accordance with the CCR Rule. Haley & Aldrich found that the factors of safety satisfied the requirements of the CCR Rule if deformation of the embankment under seismic loading were permitted which allowed a reduction in the pseudo-static PHGA. Haley & Aldrich stated that the embankments of the Bottom Ash Pond are not susceptible to liquefaction even though the embankments are constructed with soils that can be susceptible to liquefaction (sands) because the soils are compacted and because the embankments are not likely to be saturated due to flooding during a design seismic event.

We performed a safety factor assessment of the Fly Ash Pond for GER in 2018. By this time, the common practice was to use the criterion from the Mine Safety and Health Administration (MSHA) *2009 Engineering and Design Manual for Coal Refuse Disposal Facilities*, which states that the maximum acceptable deformation of the dike for a surface impoundment is 25% of the freeboard. Based upon this criterion, we calculated that the pseudo-static PHGA is 0.19g for a long-duration event. (Our analyses to determine the PHGA based upon the MSHA criterion is presented in our report to GER dated March 12, 2018.)

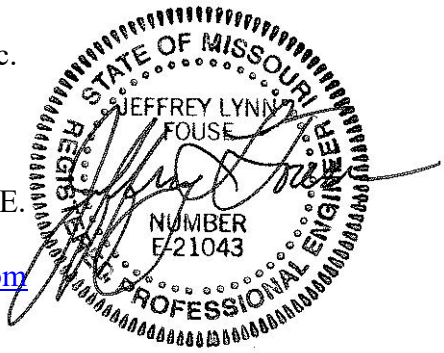
We re-analyzed the pseudo-static horizontal seismic load case for the critical section of the Bottom Ash Pond. The results of that analysis are presented in the attached figure. The minimum factor of safety is 1.24. This is satisfactory in accordance with the CCR Rule §40 CFR Part 257.73(e).

It is our judgement that liquefaction potential of the subsurface soil strata must be considered, not only the liquefaction potential of the dike itself. If such liquefaction could occur immediately following the design seismic event, then the dike may be susceptible to failure. Therefore, we evaluated the liquefaction potential of the subsurface soil strata for the post-seismic liquefaction condition. We applied a residual cohesive shear strength to those sand strata that have a potential to liquefy under the design earthquake, specifically the medium- and long-duration events. The residual shear strength is based upon published correlations. The results are presented in the attached figure. The minimum FS is 1.94, which is for a surficial slide on the downstream slope, which would have little risk of allowing discharge of the CCR and water from the pond.

Therefore, based upon our observations and findings, the safety factors for slope stability of the Bottom Ash Pond embankments satisfy the requirements of the CCR Rule.

Please let us know if you have any questions or comments regarding this summary report. We appreciate this opportunity to work with GER and the BMU Sikeston Power Station.

Sincerely,
REITZ & JENS, Inc.



Jeffrey L. Fouse, P.E.
Principal
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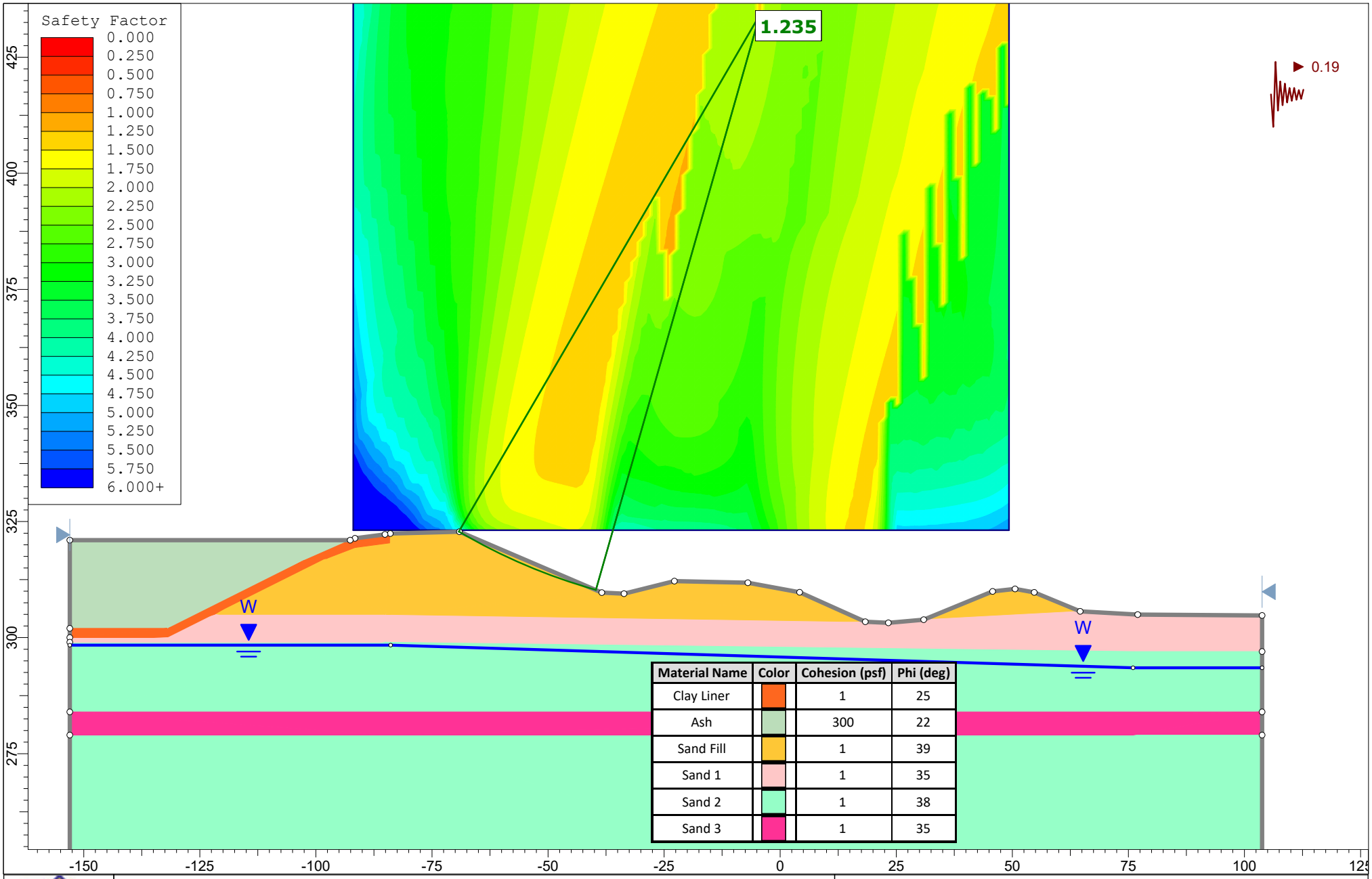
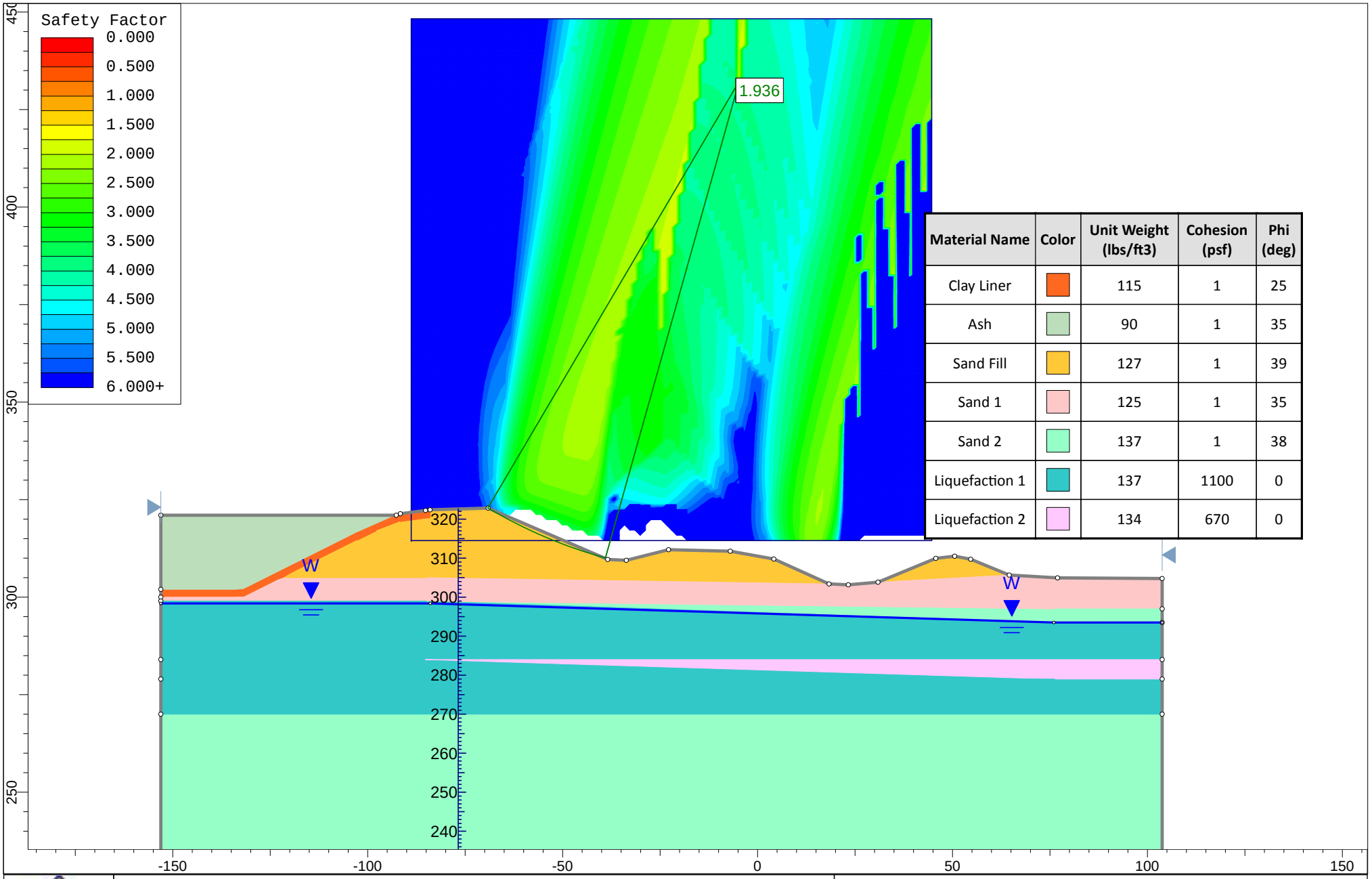
Attached: Results of Pseudo-Static Seismic Load Analyses for Bottom Ash Pond
Results of Post-Seismic Slope Stability Analyses with Residual Shear Strengths of Potential Liquefied Strata



Material Name	Color	Cohesion (psf)	Phi (deg)
Clay Liner		1	25
Ash		300	22
Sand Fill		1	39
Sand 1		1	35
Sand 2		1	38
Sand 3		1	35

Project Name: Sikeston Power Station CCR Rule Evaluation			Client: Gredell
Section Location: B-B'			Load Case: Pseudostatic 2021
Project Number: 2021120910	Analysis By: C. Cook	Checked By: J. Fouse	Figure:



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Clay Liner		115	1	25
Ash		90	1	35
Sand Fill		127	1	39
Sand 1		125	1	35
Sand 2		137	1	38
Liquefaction 1		137	1100	0
Liquefaction 2		134	670	0

Project Name: Sikeston Power Station CCR Rule Evaluation		Client: Gredell	
Section Location: B-B'		Load Case: Liquefaction	
Project Number: 20150120903	Analysis By: C. Cook	Checked By: J. Fouse	Figure: