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October 15, 2021

Via Email

Mr. Nicholas M. Reidenbach, P.E.
Civil/Structural Principal Specialist Engineer
DTE Energy
One Energy Plaza
Detroit, MI 48226

Subject: Five-Year Regulatory Compliance Reporting: Safety Factor Assessment
Monroe Power Plant Fly Ash Basin Facility
Monroe, MI

Dear Mr. Reidenbach:

This letter report presents Geosyntec Consultants of Michigan, Inc.'s (Geosyntec's) five-year periodic safety factor assessment for DTE Electric Company's (DTE's) Monroe Power Plant Fly Ash Basin (FAB). The periodic safety factor assessment is required under the United States Environmental Protection Agency (USEPA) Coal Combustion Residual (CCR) Rule (CCR Rule) published on 17 April 2015 (40 CFR Parts 257 and 261) [1]. Under the CCR Rule, the FAB is an "existing surface impoundment" and must meet safety factor requirements per §257.73(e)[1] of the CCR Rule

This letter report presents an executive summary followed by details of the periodic safety factor assessment.

EXECUTIVE SUMMARY

Geosyntec performed the initial safety factor assessment for the FAB and documented it in a letter report dated October 17, 2016 [2], which is also available at DTE's publicly accessible website. As part of the initial assessment, four cross-sections from the north, south, east, and west sides of the FAB that were deemed critical were evaluated for slope stability. The initial assessment concluded that the FAB met the safety factor (SF) requirements per the CCR Rule.

Four critical cross-sections were analyzed in 2016 for four directions: Station 58+75 for the north embankment, Station 75+50 for the west embankment, Station 133+00 for the south

[1] §257.73(e) – Periodic Safety Factor Assessments.

embankment, and Station 164+00 for the east embankment. The 2016 assessment concluded that each cross-section met the SF requirements per the CCR Rule. Since 2016, the embankment has been flattened from 2H:1V to 3H:1V at Stations 58+75 (north), 133+00 (south), and 164+00 (east), thereby increasing the safety factor. Therefore, the safety factor assessment has been performed qualitatively, and no new analyses have been conducted for the north, south, and east embankment.

There has been no change to the embankment geometry at Station 75+50 (the west embankment). The only change in the general area is the grade change near the top of the embankment due to ongoing dry landfilling operations within the Vertical Extension Landfill. Therefore, slope stability of the west embankment, specifically Station 75+50, which is deemed critical, has been re-analyzed.

The embankment at Station 75+50 exhibits SF higher than the required minimum values per the CCR Rule. Conseqeuntly, the FAB meets the safety factor requirements per §257.73(e) in this five year periodic assessment based on Geosyntec's assessment.

SAFETY FACTOR ASSESSMENT

Requirements of the CCR Rules

This slope stability assessment has been conducted to assess whether the FAB meets the safety factor (also referred to as "factor of safety") requirements of §257.73(e)(1) of the CCR Rule. §257.73(e)(1) requires that:

- *(i) "The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.*
- *(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.*
- *(iii) The calculated seismic factor of safety must equal or exceed 1.00*
- *(iv) For embankments constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20."*

Analysis Cross-sections

Four sections that were deemed critical for the four sides of the FAB embankment were analyzed for the initial safety factor (SF) assessment [2]. The analysis sections included Station 58+75, 75+50, 133+00, and 164+00 for the north, west, south, and east sections of the

embankment, respectively. Since 2016, these sections of the embankment have been flattened from 2H:1V to 3H:1V with the exception of Station 75+50 on the west side. No other changes to the embankment have been implemented that would make another section more critical. Flatter slopes yield higher safety factors. Therefore, no new analyses were conducted for the north, south, and east embankment.

A new set of analyses were conducted for Station 75+50, because the grade within the Vertical Extension Landfill, which is near the top of the west embankment, has increased as part of ongoing landfill operations. Hence the new analyses were performed. The analysis location is provided in Figure 1.

Summary of Method and Analyses

Analyses for Section 75+50 were conducted to calculate SF for loading conditions described in §257.73(e)(1)(i) through §257.73(e)(1)(iii) of the Rule. Analysis for liquefaction SF was not conducted per §257.73(e)(1)(iv) of the Rule because the embankment is not considered to be susceptible to liquefaction because of its stiff clayey nature. Evaluation of the liquefaction potential for the Monroe FAB embankment is documented in the initial safety factor assessment [2].

The SF values were calculated with limit equilibrium methods using the same methodology implemented for the initial safety factor assessment [2].

Analysis Results and Conclusion

The analysis results are summarized in Table 1 and provided in Figures 2 through 5 for Station 75+50.

Table 1. Analysis Summary for Station 75+50 (West Embankment).

Station #	Maximum Storage Pool Loading Condition Per §257.73(e)(1)(i) SF ≥ 1.50		Maximum Surcharge Pool Loading Condition Per §257.73(e)(1)(ii) SF ≥ 1.40		Seismic Loading Condition Per §257.73(e)(1)(iii) SF ≥ 1.00	
	SF	Figure #	SF	Figure #	SF	Figure #
75+50	1.80, 1.83[1]	2, 3	1.80	4	1.59	5

[1] Additional analysis that considers an empty toe ditch (Navarre Drain).

Based on the results of slope stability analyses for Station 75+00, and the qualitative assessment for the remaining sections of the FAB embankment, the FAB meets the safety factor assessment required per §257.73(e) of the CCR Rule.

QUALIFICATIONS OF LICENSED PROFESSIONAL ENGINEER

John Seymour is a qualified licensed professional engineer with over 40 years of experience in civil and geotechnical engineering associated with earthen structures and dams.

CERTIFICATION

I, John Seymour, am a qualified licensed professional engineer in Michigan, have evaluated the FAB, and hereby certify that the FAB meets the criteria of 40 CFR 257.73(e).

Certified by:

John Seymour Date 10/15/2021

John Seymour, P.E.
Michigan License Number 620103356
Senior Principal

Attachments: Figures 1 through 5

Copies to: Mark Green (DTE)
Chris Scieszka (DTE)
Lisa Lockwood (DTE)

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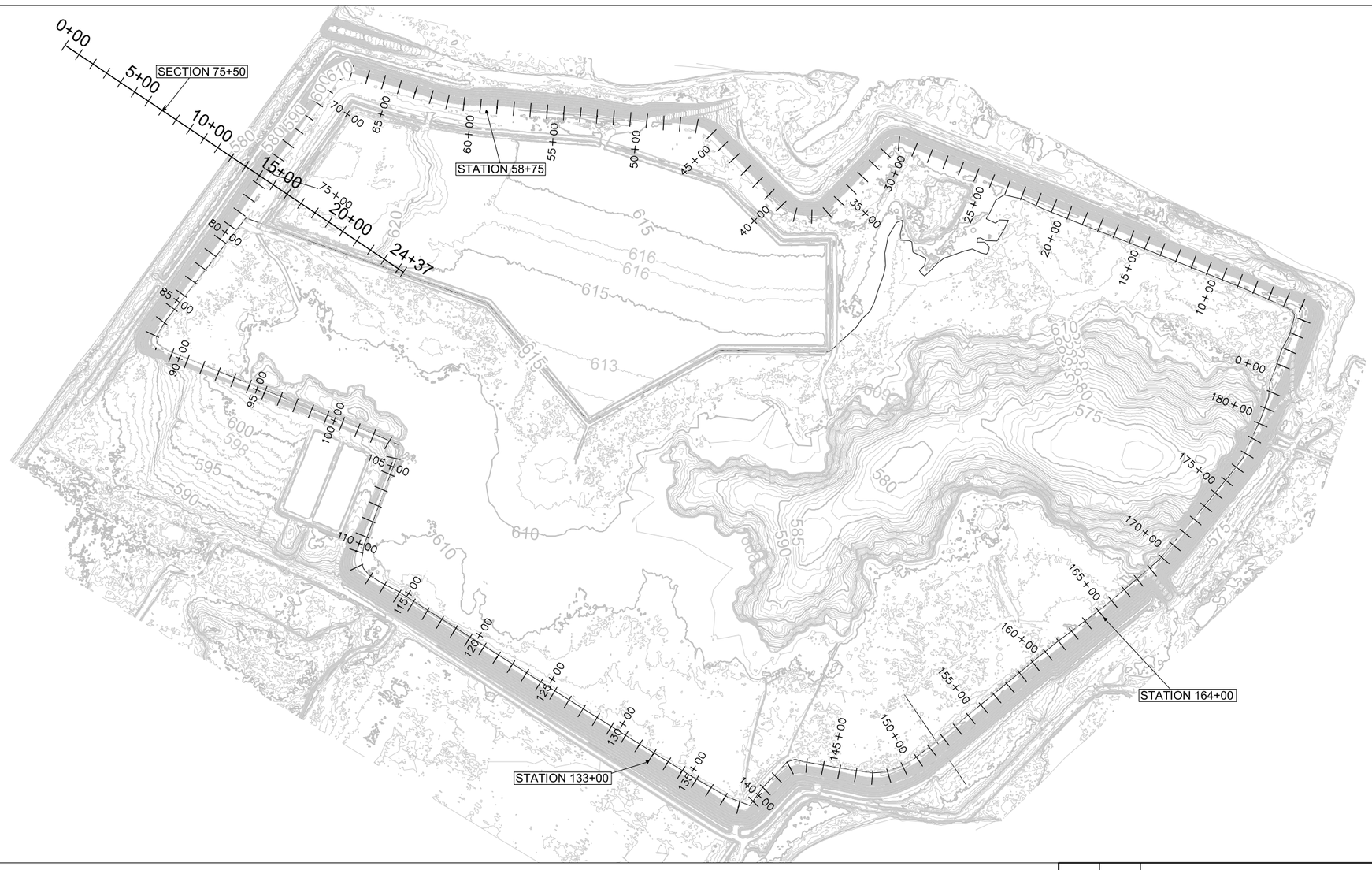
REFERENCES

[1] United States Environmental Protection Agency, "Coal Combustion Residual Rule, 40 Code of Federal Regulations Part 257," 2015.

[2] Geosyntec Consultants, "Safety Factor Assessment, Monroe Power Plant FAB Facility, Monroe, MI," Chicago, 2016.



LEGEND

610 GROUND SURFACE (MAJOR CONTOUR 5-FT INTERVAL)

608 GROUND SURFACE (MINOR CONTOUR 1-FT INTERVAL)

NOTE: THE EXISTING GRADES ARE BASED ON AERIAL SURVEY PERFORMED BY KUCERA INTERNATIONAL INC. ON JULY 3, 2021 AND BATHYMETRY SURVEY CONDUCTED BY DTE IN MAY 2021.

N

0 500 1000 Feet

REV	DATE	DESCRIPTION	DRN	APP

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134 N. LA SALLE STREET, SUITE 300
CHICAGO IL 60602 USA
TELEPHONE: 312.658.0500

DTE ENERGY
ONE ENERGY PLAZA
DETROIT, MI 48226 USA

TITLE: ANALYSIS SECTION 75+50 LOCATION

PROJECT: 5-YEAR SAFETY FACTOR ASSESSMENT

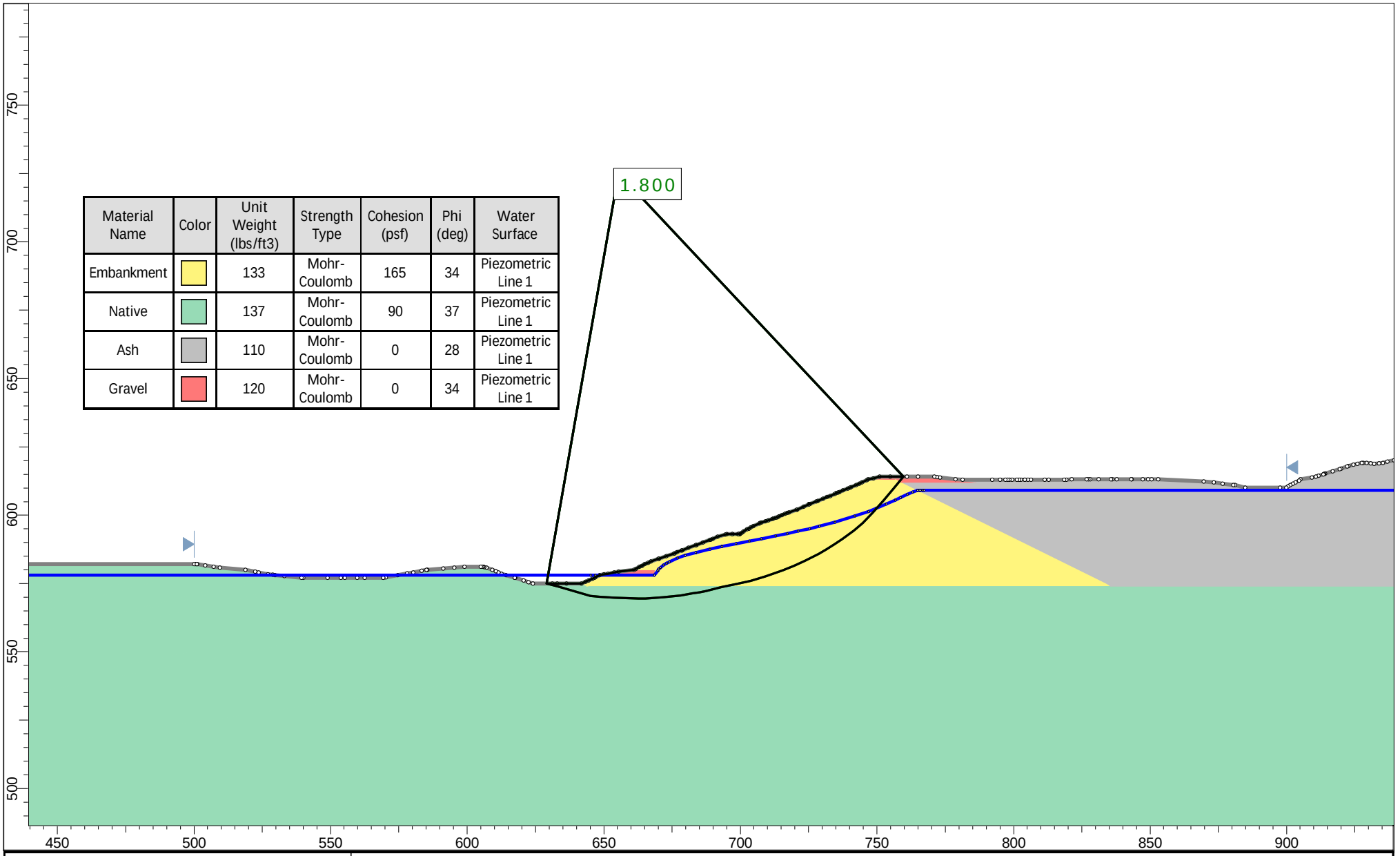
SITE: MONROE POWER PLANT, MONROE, MI

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:	DATE: OCTOBER 2021
DRAWN BY:	PROJECT NO.: CHE8242
CHECKED BY:	FILE:
REVIEWED BY:	FIGURE 1
APPROVED BY:	



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Embankment		133	Mohr-Coulomb	165	34	Piezometric Line 1
Native		137	Mohr-Coulomb	90	37	Piezometric Line 1
Ash		110	Mohr-Coulomb	0	28	Piezometric Line 1
Gravel		120	Mohr-Coulomb	0	34	Piezometric Line 1

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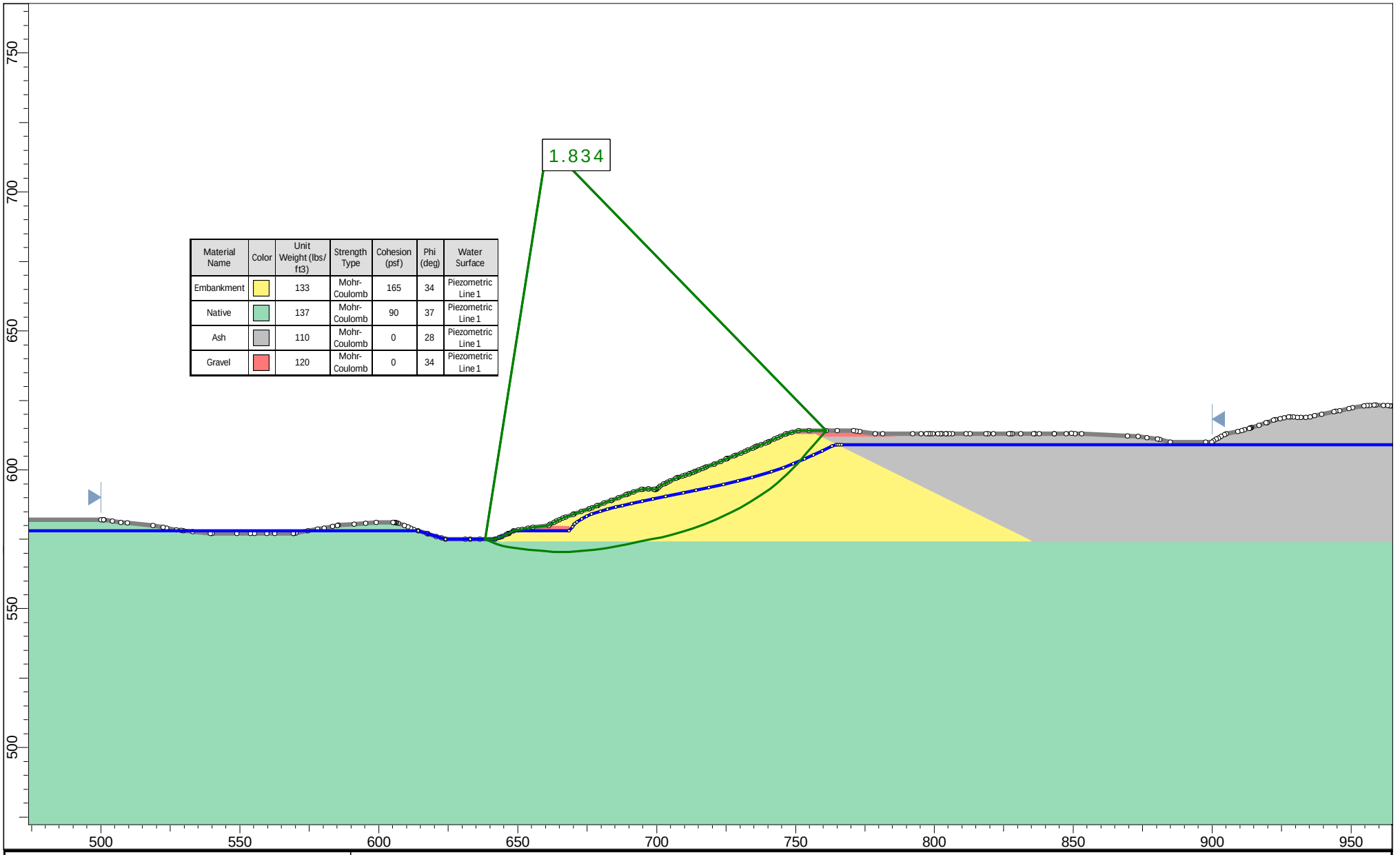
SLIDEINTERPRET 9.012

Project	5-Year Periodic Safety Factor Assessment		
Group	Long Term Maximum Storage Pool Loading	*Scenario*	Station 75+50
Drawn By	IJV	*Company*	DTE
Date	September 02, 2021	*Figure*	Figure 2



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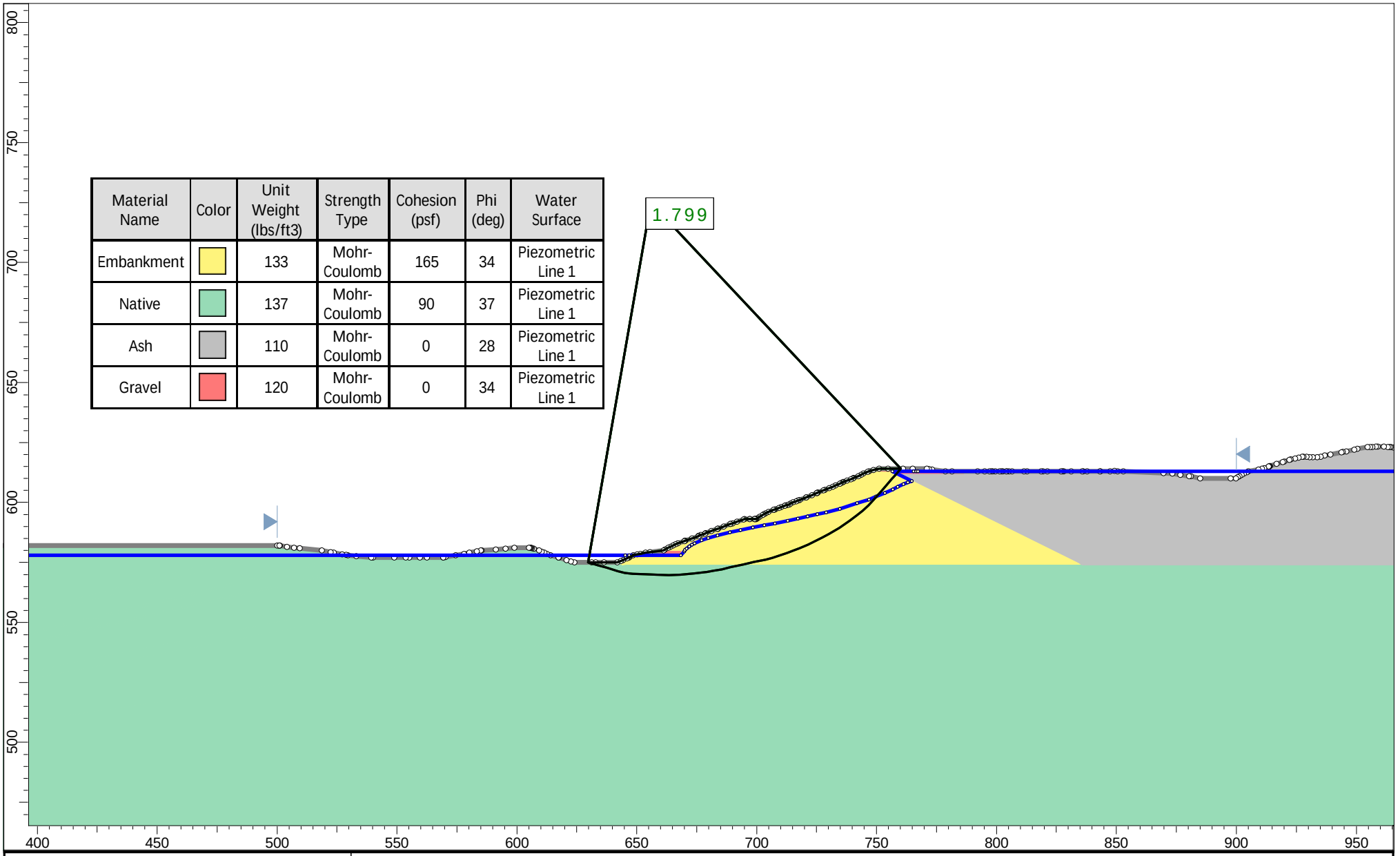
Project	5-Year Periodic Safety Factor Assessment		
Group	Long Term Maximum Storage Pool Loading (Empty Navarre Drain)	*Scenario*	Station 75+50
Drawn By	IJV	*Company*	DTE
Date	September 02, 2021	*Figure*	Figure 3



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Embankment		133	Mohr-Coulomb	165	34	Piezometric Line 1
Native		137	Mohr-Coulomb	90	37	Piezometric Line 1
Ash		110	Mohr-Coulomb	0	28	Piezometric Line 1
Gravel		120	Mohr-Coulomb	0	34	Piezometric Line 1

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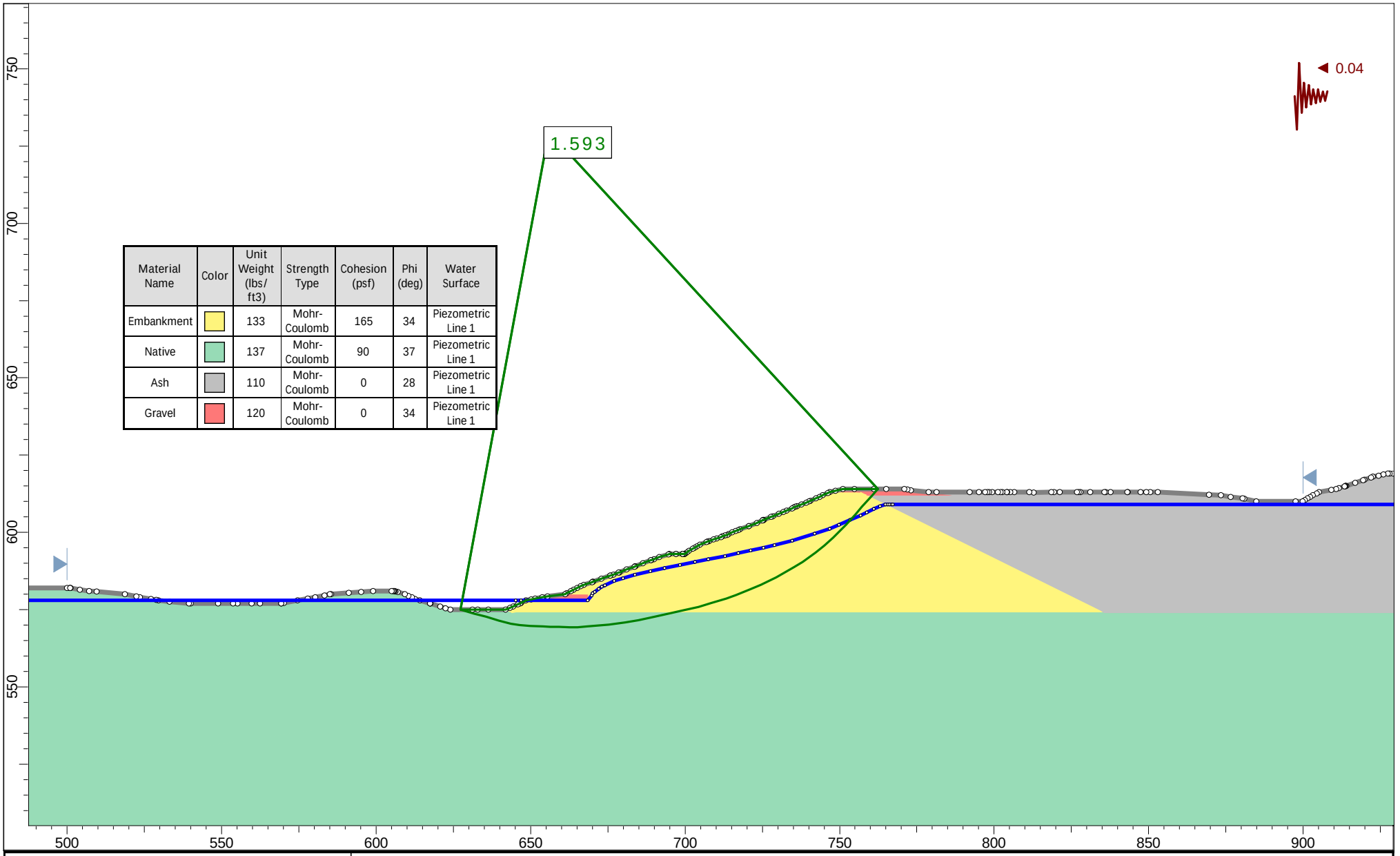
Project	5-Year Periodic Safety Factor Assessment		
Group	Maximum Surcharge Pool Loading	*Scenario*	Station 75+50
Drawn By	IJV	*Company*	DTE
Date	September 02, 2021	*Figure*	Figure 4



Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Embankment		133	Mohr-Coulomb	165	34	Piezometric Line 1
Native		137	Mohr-Coulomb	90	37	Piezometric Line 1
Ash		110	Mohr-Coulomb	0	28	Piezometric Line 1
Gravel		120	Mohr-Coulomb	0	34	Piezometric Line 1

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Project	5-Year Periodic Safety Factor Assessment		
Group	Seismic Loading (Drained)	*Scenario*	Station 75+50
Drawn By	IJV	*Company*	DTE
Date	September 02, 2021	*Figure*	Figure 5