2026 PERIODIC SAFETY FACTOR ASSESSMENT OF UNITS 3&4 EFFLUENT HOLDING POND (EHP) COAL COMBUSTION RESIDUAL (CCR) SURFACE IMPOUNDMENTS AT COLSTRIP STEAM ELECTRIC STATION

Prepared for:

Talen Montana, LLC
P.O. Box 38
Colstrip, MT 59323

Prepared by:

Hydrometrics, Inc.
3020 Bozeman Avenue
Helena, MT 59601

October 2026

TABLE OF CONTENTS

LIST OF TABLES iii
LIST OF FIGURES iii
LIST OF APPENDICES iii
1.0 INTRODUCTION 1-1
1.1 BACKGROUND 1-1
1.2 PURPOSE 1-2
1.3 REPORT ORGANIZATION 1-4
2.0 REVIEW OF EXISTING SLOPE STABILITY ANALYSES 2-1
3.0 SLOPE STABILITY ANALYSES 3-1
3.1 EMBANKMENT MATERIALS 3-1
3.2 EMBANKMENT GEOMETRY 3-2
3.3 PHREATIC SURFACE 3-4
3.4 DESCRIPTION OF ANALYSES 3-5
3.4.1 Static Factor of Safety, Long-Term, Maximum Storage Pool 3-5
3.4.2 Static Factor of Safety, Maximum Surcharge Pool 3-6
3.4.3 Seismic Factor of Safety 3-7
3.5 SEISMICITY 3-7
4.0 LIQUEFACTION EVALUATION 4-1
5.0 SUMMARY OF RESULTS 5-1
5.1 RESULTS – STATIC FACTOR OF SAFETY, LONG-TERM, MAXIMUM STORAGE POOL 5-1
5.2 STATIC FACTOR OF SAFETY, MAXIMUM SURCHARGE POOL 5-2
5.3 SEISMIC FACTOR OF SAFETY 5-2
5.4 LIQUEFACTION 5-3
6.0 CONCLUSIONS 6-1
7.0 SAFETY FACTOR ASSESSMENT CERTIFICATION 7-1
8.0 REFERENCES 8-1

LIST OF TABLES

TABLE 3-1. SOIL MATERIAL STRENGTH PARAMETERS 3-1

TABLE 5-1. RESULTS – STATIC FACTOR OF SAFETY, LONG-TERM, MAXIMUM STORAGE POOL 5-1

TABLE 5-2. RESULTS – STATIC FACTOR OF SAFETY, LONG-TERM, EXISTING CONDITIONS..... 5-1

TABLE 5-3. RESULTS – STATIC FACTOR OF SAFETY, MAXIMUM SURCHARGE POOL 5-2

TABLE 5-4. RESULTS – SEISMIC FACTOR OF SAFETY, MAXIMUM STORAGE POOL. 5-2

TABLE 5-5. RESULTS – SEISMIC FACTOR OF SAFETY, EXISTING CONDITIONS 5-3

LIST OF FIGURES

FIGURE 1-1. CCR UNITS OVERALL LOCATION MAP..... 1-3

FIGURE 3-1. UNITS 3&4 EHP MAIN AND SADDLE DAMS LOCATION OF CRITICAL SECTIONS 3-3

LIST OF APPENDICES

APPENDIX A SLOPE STABILITY MODELS

APPENDIX B SLOPE STABILITY MODEL REPORTS

2026 PERIODIC SAFETY FACTOR ASSESSMENT OF UNITS 3&4 EFFLUENT HOLDING POND (EHP) COAL COMBUSTION RESIDUAL (CCR) SURFACE IMPOUNDMENTS AT COLSTRIP STEAM ELECTRIC STATION

1.0 INTRODUCTION

1.1 BACKGROUND

The United States Environmental Protection Agency (EPA) established regulations under Subtitle D of the Resource Conservation and Recovery Act (RCRA) to address the risks associated with disposal of Coal Combustion Residuals (CCRs) generated at electric utilities as well as independent power producers. These regulations became the Disposal of Coal Combustion Residuals from Electric Utilities final rule (CCR Rule), which was signed by the EPA Administrator on December 19, 2014 and was published to the Federal Register on April 17, 2015 as Title 40 CFR §257 Subpart D (EPA, 2015). Section 257.73 paragraph (e) requires a periodic safety factor assessment for each CCR surface impoundment. A CCR surface impoundment is defined by CCR Rule §257.53 as "*…a natural topographic depression, man-made excavation, or dike area, designed to hold an accumulation of CCR and liquids, and the unit treats, stores, or disposes of CCR.*" CCR Rule §257.73 paragraph (f) specifies that the initial safety factor assessment was to be performed by October 17, 2016, with a periodic update due every five years thereafter. The initial safety factor assessments for the CCR surface impoundments at Colstrip Steam Electric Station (CSES) were completed on October 17, 2016 (Jorgensen, 2016a and 2016b). The last periodic update to the initial safety factor assessments were completed on October 14, 2021 (Jorgensen, 2021a and 2021b).

Talen Montana, LLC is the operator of the CSES located near Colstrip, Montana. Historically, CSES operated two pairs of coal-fired generating units known as Units 1&2 and Units 3&4. Units 1&2, originally placed in service in 1975, had a generating capacity of 330-megawatts-gross each (Hydrometrics, 2012). Units 1&2 owners include Talen Montana, LLC and Puget Sound Energy Inc. Units 1&2 were retired from service on January 5, 2020. Units 3&4, placed in service in 1983 and 1985, respectively, have a generating capacity of 805-megawatts-gross each (Hydrometrics, 2012). Units 3&4 owners include Talen Montana, LLC, PacifiCorp, Portland General Electric Company, and NorthWestern Energy.

CCRs produced by the generating units at CSES are handled and disposed of in a closed-loop process aimed at minimizing impacts to water resources in the area. The closed-loop system is comprised of several surface impoundments on and off the plant site that perform various functions to handle and permanently store CCRs. These surface impoundments and their associated CCR units are regulated under the CCR Rule. Units 1&2 and Units 3&4 have their own respective surface impoundments with cells dedicated for CCR handling and storage. It is also important to note that because Units 1&2 have been retired, surface impoundments associated with Units 1&2 continue to store existing CCRs but no longer accept new CCRs. The CCR units at CSES regulated by the Coal Ash Rule include:

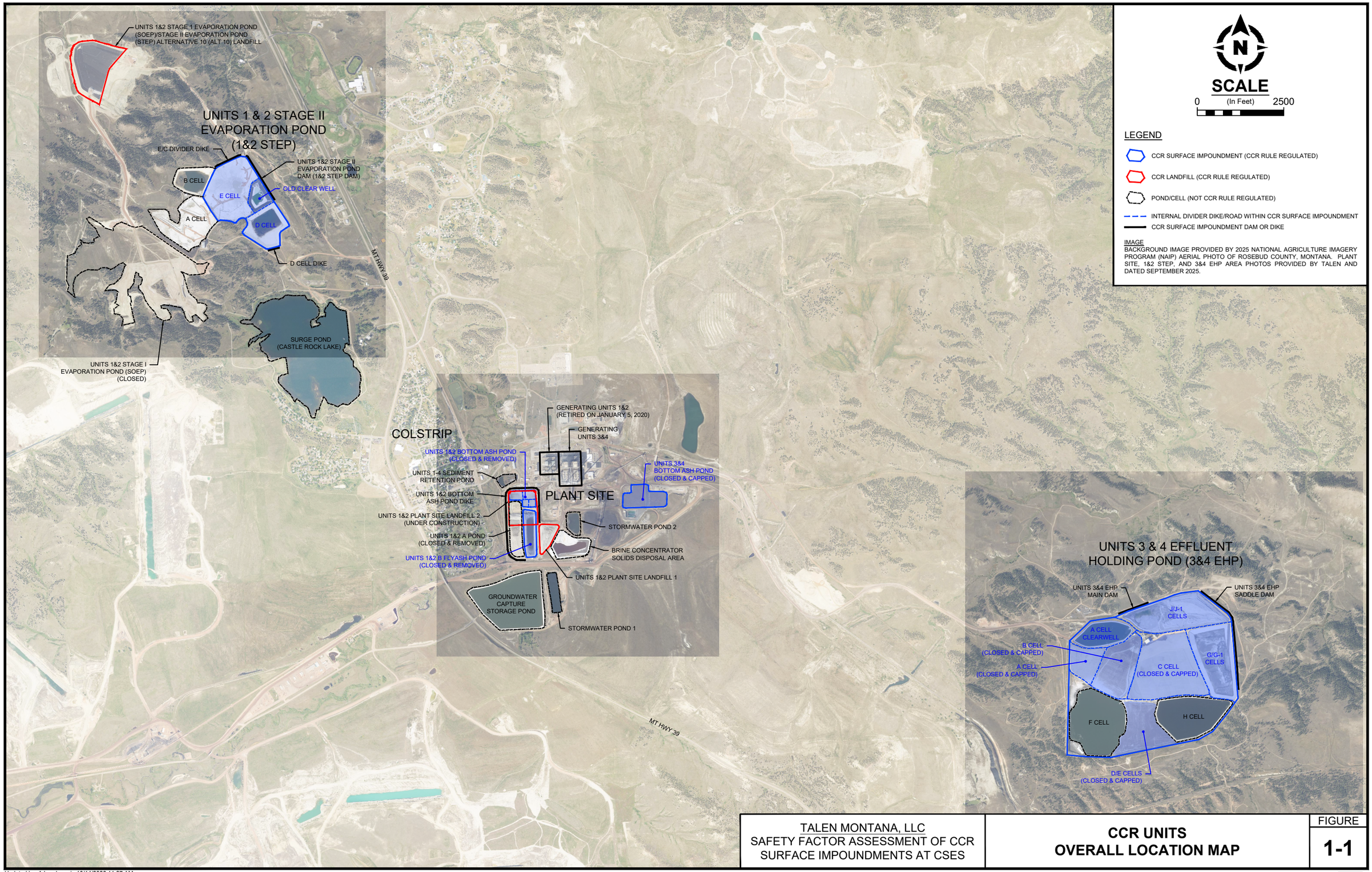
- Units 1&2 Stage II Evaporation Pond (1&2 STEP) D and E Cells and Old Clearwell;
- Units 1&2 Bottom Ash Pond (Closed);
- Units 1&2 B Flyash Pond (Closure in Progress);
- Units 3&4 Effluent Holding Pond (3&4 EHP) A (Closed), B (Closed), C (Closed), D/E (Closed), G/G-1, and J/J-1 Cells; and
- Units 3&4 Bottom Ash Pond which is incised.

Incised CCR units are exempt from the requirements of §257.73 paragraph (e)(1). Therefore, a safety factor assessment will not be performed for 3&4 Bottom Ash Pond. The locations of CCR units and their respective CCR surface impoundments are displayed on Figure 1-1.

1.2 PURPOSE

The purpose of this document is to provide a periodic safety factor assessment for the Units 3&4 Effluent Holding Pond (3&4 EHP) CCR surface impoundment in accordance with the specific requirements of 40 CFR §257.73 paragraph (e)(1). The periodic safety factor assessment for CCR surface impoundments associated with Units 3&4 is provided by a separate document (Hydrometrics, 2026a). Section 257.73 paragraph (e)(1) states that the critical cross section(s) of each CCR surface impoundment embankment must meet minimum factors of safety against failure for a range of specified loading conditions. The loading conditions specified in §257.73 paragraph (e)(1) are as follows:

- Static factor of safety for the long-term, maximum storage pool must equal or exceed 1.50 [§257.73 paragraph (e)(1)(i)].
- Static factor of safety for the maximum surcharge pool must equal or exceed 1.40 [§257.73 paragraph (e)(1)(ii)].
- The seismic factor of safety must equal or exceed 1.00 [§257.73 paragraph (e)(1)(iii)].
- For dikes constructed of soils susceptible to liquefaction, the liquefaction factor of safety must equal or exceed 1.20 [§257.73 paragraph (e)(1)(iv)].



TALEN MONTANA, LLC
SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

CCR UNITS
OVERALL LOCATION MAP

FIGURE
1-1

Updated by: AJourdonnais 10/14/2026 11:27 AM
C:\Users\ajourdonnais\Dropbox\Talen - 2026 CCR Unit Assessments\7 - CAD\DWG\2600701h002.dwg [FIGURE 1-1 (SFA)]

Hydrometrics, Inc.

As shown on Figure 1-1 above, the 3&4 EHP is impounded by Units 3&4 EHP Main Dam (Main Dam) and Units 3&4 EHP Saddle Dam (Saddle Dam). The slope stability factors of safety for the critical sections of the Main Dam and Saddle Dam will be calculated for each applicable loading condition listed above.

1.3 REPORT ORGANIZATION

This report is organized as follows:

- Section 2.0 – Review of Existing Slope Stability Analyses;
- Section 3.0 – Slope Stability Analyses;
- Section 4.0 – Liquefaction Evaluation;
- Section 5.0 – Summary of Results;
- Section 6.0 – Conclusions;
- Section 7.0 – Safety Factor Assessment Certification; and
- Section 8.0 – References.

2.0 REVIEW OF EXISTING SLOPE STABILITY ANALYSES

Design of the 3&4 EHP facility was completed in 1982 (Bechtel, 1982). The initial phase of 3&4 EHP construction was conducted in 1983 and 1984 (Bechtel, 1985), with the Main and Saddle Dams raised to their final height during Phase 2 construction in 2012 (WAI, 2012). Throughout their design, construction, and operational service, several slope stability analyses have been performed for both the Main Dam and Saddle Dam. The following list presents existing slope stability analyses that were reviewed during preparation of this document:

- Effluent Holding Pond Design Report (Bechtel, 1982);
- Effluent Holding Pond Embankments Construction Report (Bechtel, 1985);
- Units 3&4 Saddle Dam Geotechnical Report (Hydrometrics, 2000);
- Units 3&4 Saddle Dam – Remedial Measures, Preliminary Design Report (Hydrometrics, 2001);
- Geotechnical Investigation Report, EPA Recommended Corrective Measures at the Colstrip Power Plant, Units 3&4 Saddle Dam (WAI, 2009);
- Geotechnical Investigation Report, EPA Recommended Corrective Measures at the Colstrip Power Plant, Units 3&4 EHP Main Dam (WAI, 2010);
- Initial Safety Factor Assessment Report, Units 3&4 EHP Surface Impoundments, Colstrip Steam Electric Station, Colstrip, Montana (Jorgensen, 2016b); and
- 2021 Safety Factor Assessment, Units 3&4 EHP Surface Impoundments, Colstrip Steam Electric Station, Colstrip, Montana (Jorgensen, 2021b).

3.0 SLOPE STABILITY ANALYSES

Slope stability analyses conducted for this safety factor assessment were performed with Slide 6.0 software, manufactured by Rocscience. Slide 6.0 utilizes two-dimensional limit equilibrium methods to evaluate the safety and stability of slopes, embankments, and earth structures (Rocscience, 2010).

To be consistent with previous safety factor assessments, the Morgenstern-Price method was utilized to calculate factors of safety for the critical sections of the Main and Saddle Dam embankment slopes. The Morgenstern-Price method divides the potential soil mass into a series of vertical slices, satisfying both horizontal and vertical force and moment equilibrium, and accounts for both normal and shear interslice forces (Alok et al., 2024). A summary of slope stability model inputs, as well as how they were determined, are provided by the following sections.

3.1 EMBANKMENT MATERIALS

The Mohr-Coulomb strength parameters of soil and CCR materials used to construct the Main and Saddle Dam embankments, and used as slope stability model inputs, are provided in Table 3-1 below. The values presented in Table 3-1 were found in existing documentation including previous slope stability analyses and geotechnical investigations of the Main and Saddle Dams.

TABLE 3-1. SOIL MATERIAL STRENGTH PARAMETERS

Material	Moist Unit Weight (lb/ft^3)	Saturated Unit Weight (lb/ft^3)	Effective Cohesive Strength, c' (lb/ft^2)	Effective Friction Angle, ϕ' (degrees)	Source
Shell	125	130	50	33	Bechtel, 1982
Central Core	125	130	0	28.5	Bechtel, 1982
Baked Shale (Scoria)	130	135*	50	40	Jorgensen, 2016b
Drain	130	135	0	35	Bechtel, 1982
Bottom Ash Fill	90	100	50	40	Golder, 2001
Paste	102	112	0	35	Golder, 2001
Fly Ash Slurry	100	103.4	700	28	Jorgensen, 2016b
Foundation	112	124	0	31(MD)/28(SD)	Bechtel, 1982
Bedrock	Modeled as Infinite Strength				

*Not used in the slope stability models, baked shale is located above phreatic surface.

As shown in Table 3-1, effective stress parameters were used for modeling. The loading conditions required by §257.73 paragraph (e)(1)(i) through (iv) are long-term; therefore, steady state seepage was modeled and excess pore pressures are not expected to occur.

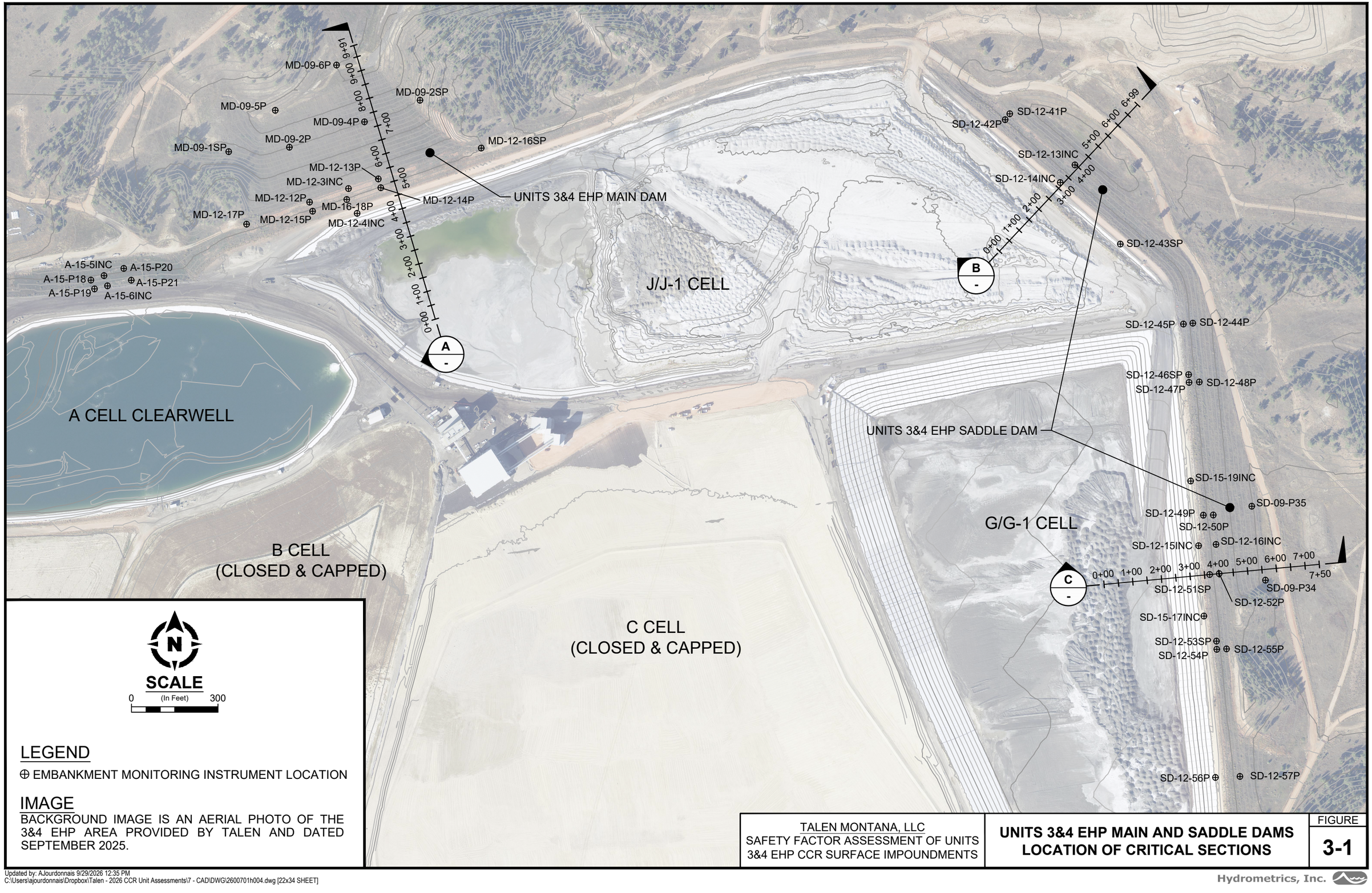
Also shown in Table 3-1, a small effective cohesive strength value of 50 pounds per square foot was added to the Shell, Baked Shale, and Bottom Ash Fill soil materials. This was done to avoid slope stability models with infinitesimally shallow critical slip surfaces, which occur when modeling cohesionless soils. Adding a small amount of cohesion to the select materials forces the critical slip surface deeper into the embankment, representing a failure surface that presents a greater, and more reasonable hazard to embankment stability. Given that embankment materials are largely composed of fine-grained clays and silts that typically exhibit much larger cohesive strength values, the small amount of applied cohesion is very likely an underestimate of actual field conditions, which is a conservative approach.

The Bedrock material shown in Table 3-1 represents mudstone, claystone, siltstone, and sandstone layers identified in existing subsurface investigations of the 3&4 EHP area. The Bedrock material was modeled as having "infinite strength," meaning that the circular critical slip surface is not permitted to penetrate this layer where it exists in the models.

A piezometric line, also known as the phreatic surface, was applied to each model and is based on the highest observed groundwater elevations recorded since monthly monitoring began with the implementation of the CCR Rule in 2015. The exceptions to this are instruments located downgradient of the geosynthetic liner systems installed in J-1 and G-1 Cells. For this case, the highest groundwater elevations, post-liner installation were used for the models. In models using effective stress conditions, the moist unit weight of each material is applied above the piezometric line, and the saturated unit weight is applied below the piezometric line. Pore water pressures are calculated as the unit weight of water times the vertical distance to the center of each slice base in the model.

3.2 EMBANKMENT GEOMETRY

The critical cross sections used in the slope stability models were located at the maximum embankment sections of the Main Dam, the northwestern portion of the Saddle Dam adjacent to J-1 Cell, and the southern portion of the Saddle Dam adjacent to G-1 Cell. The location of each of the three critical cross sections is displayed on Figure 3-1.



N

SCALE

0 (In Feet) 300

LEGEND

⊕ EMBANKMENT MONITORING INSTRUMENT LOCATION

IMAGE

BACKGROUND IMAGE IS AN AERIAL PHOTO OF THE 3&4 EHP AREA PROVIDED BY TALEN AND DATED SEPTEMBER 2025.

TALEN MONTANA, LLC
SAFETY FACTOR ASSESSMENT OF UNITS 3&4 EHP CCR SURFACE IMPOUNDMENTS

UNITS 3&4 EHP MAIN AND SADDLE DAMS LOCATION OF CRITICAL SECTIONS

FIGURE **3-1**

Updated by: AJourdonnais 9/29/2026 12:35 PM
C:\Users\ajourdonnais\Dropbox\Talen - 2026 CCR Unit Assessments\7 - CAD\DWG\2600701h004.dwg [22x34 SHEET]

Hydrometrics, Inc.

Embankment geometry used in the slope stability models of the Main and Saddle Dams was determined from a variety of sources. External embankment and abutment geometry was determined by recent survey data provided by Talen and supplemented by design drawings for the Phase 2 embankment raise in 2012 (WAI, 2012), and for the liner systems installed on the upstream slopes of Main Dam and Saddle Dam in J-1 Cell and G-1 Cell, respectively (Geosyntec, 2017 and 2024). Internal geometry, including the central core, drainage layers, foundation, deposits of CCRs, and bedrock was modeled in accordance with as-built geometry provided in the Bechtel construction report (Bechtel, 1985) and boring and test pit logs presented in previous geotechnical investigations by Bechtel (Bechtel, 1982), Hydrometrics (Hydrometrics, 2000), and Womack and Associates (WAI, 2009 and 2010). The geometry of CCR materials stored in J-1 Cell, adjacent to the Main Dam, and G-1 Cell, adjacent to the Saddle Dam, were taken from recent survey data provided by Talen and design drawings for the J-1 and G-1 Cell liner systems mentioned above (Geosyntec, 2017 and 2024).

A circular or rotational slip surface, as opposed to a translational or block failure surface, was chosen for the Main and Saddle Dam stability models. Circular slip surfaces are ideal for engineered earth embankments, such as earthen dams, where slope height and base dimensions are comparable. Circular slip surfaces are also preferable when analyzing slopes composed of homogeneous fine-grained or cohesive soils free of prominently weaker horizontal layers. Engineering judgement was used to select the entry and exit zones on the ground surface for the circular slip surface of each slope stability model. Entry and exit zones are located where the critical surface with the minimum factor of safety against failure was anticipated to occur.

Embankment geometry, specified circular slip surface entry and exit zones, and the critical slip surface locations can be found on the graphical display of each slope stability model provided in Appendix A. Additional details are provided in the model output reports presented in Appendix B.

3.3 PHREATIC SURFACE

The location of the phreatic surface within the Main and Saddle Dam embankments was determined from piezometer monitoring data for instruments located near each of the critical cross sections. The location of select piezometers installed in the Main and Saddle Dam embankments is displayed on Figure 3-1. In general, the maximum water levels observed in these piezometers since safety factors assessments of the Main and Saddle Dam began in 2016 were used. Many of the piezometers have been observed to be dry over this period. In this case, the bottom elevation of the instrument was used to provide a conservative approach to the phreatic surface location. It is also of note that operational changes at the 3&4 EHP facility, including decreased liquid storage volumes and the

installation of bottom liners in A, G-1, and J-1 Cells and cover liners on B and C Cell have contributed to a generally observed trend of decreasing groundwater levels within the Main and Saddle Dam embankments.

Generally, the phreatic surface location has a minimal, or no impact on the slope stability models as the critical slip surface is located above groundwater. The exception is the critical slip surface for the upstream Saddle Dam embankment slope adjacent to G-1 Cell. However, the impact of the phreatic surface in this case is negligible as the determined minimum factors of safety against failure (2.84 static, and 2.51 seismic) are well above the minimum requirements as can be seen in Section 5.0 below.

The location of the phreatic surface used in each slope stability model is provided by the model figures found in Appendix A.

3.4 DESCRIPTION OF ANALYSES

The following sections provide a description of the analysis of each required loading condition for the Main and Saddle Dam embankments.

3.4.1 Static Factor of Safety, Long-Term, Maximum Storage Pool

Calculation of the static factor of safety under the long-term, maximum storage pool loading condition is required by §257.73 paragraph (e)(1)(i) of the CCR Rule. The minimum factor of safety for this loading condition is 1.50. It is generally accepted practice to analyze the stability of the downstream slope of the embankment under steady-state seepage conditions with the reservoir at its maximum normal operating pool elevation for this loading condition (EPA, 2015). It is important to note that both J-1 and G-1 Cells, which are the CCR units immediately upstream of the Main and Saddle Dams, have both been lined with geosynthetic liner systems. Therefore, the contribution of these cells to steady-state seepage within the Main and Saddle Dam embankments is minimal, if any contribution at all. The maximum operating pool elevation for J-1 Cell, which receives both water and paste, and is impounded by both the Main and Saddle Dams, is at an elevation of 3285 feet above mean sea level (amsl). This corresponds to an elevation five feet below the Main and Saddle Dam crest elevations of 3290 feet amsl, and three feet below the top elevation of the J-1 Cell liner system. The approach is conservative given that the eastern two-thirds of J-1 Cell stores dry paste and the water level on the western third of the cell is limited to 12 inches above the paste elevation, which is currently 3278 feet amsl. Because G-1 Cell is currently used to store dry paste, no maximum operating pool has been established. For the purpose of this analysis,

the J-1 Cell maximum operating pool elevation of 3285 feet amsl has been assigned to G-1 Cell. G-1 Cell is impounded exclusively by the Saddle Dam.

For upstream slopes of the Main and Saddle Dams, the current existing conditions at the 3&4 EHP facility were used to calculate the static factor of safety. This presents the most conservative approach as placement of additional CCR material into J-1 and G-1 Cells effectively provides a buttress fill at the toe of the upstream slopes of the Main and Saddle Dams and will increase the factor of safety as the fill progresses upward. It is also notable that the current elevation of dry paste in the eastern two-thirds of J-1 Cell, adjacent to the north portion of the Saddle Dam, is above the crest of the Main and Saddle Dams and leaves only a small portion of the Saddle Dam upstream slope exposed.

The long-term, maximum storage pool slope stability models are presented in Appendix A. Calculated factors of safety for this loading condition are provided in Section 5.0 below.

3.4.2 Static Factor of Safety, Maximum Surcharge Pool

Calculation of the static factor of safety under the maximum surcharge pool loading condition is required by §257.73 paragraph (e)(1)(ii) of the CCR Rule. The minimum factor of safety for this loading condition is 1.40. The maximum surcharge pool loading condition is used to analyze the effects of a short-term raised water level in a CCR surface impoundment, resulting from a flood or other means, on the stability of the downstream slope (EPA, 2015). No run-on is permitted into the 3&4 EHP facility; therefore, the only water received during a storm event will be that which falls directly within the facility footprint (Hydrometrics, 2026b). For modeling of the maximum surcharge pool loading condition, the rainfall depth resulting from a 72-hour probable maximum flood (PMF) was applied as a normal load of 151 pounds per square feet, calculated as the unit weight of water times the PMF precipitation depth, applied over the maximum operating pool elevations stated in Section 3.4.1. The PMF depth for the 3&4 EHP facility is 29 inches, or 2.42 feet, resulting in maximum surcharge pool elevations of 3287.42 feet amsl in both J-1 Cell and G-1 Cell (Hydrometrics, 2026b). Because the maximum surcharge pool is considered to be a temporary condition, no adjustments were made to the steady-state phreatic surfaces within the Main and Saddle Dam embankments used for the maximum storage pool loading condition.

The maximum surcharge pool slope stability models are presented in Appendix A. Calculated factors of safety for this loading condition are provided in Section 5.0 below.

3.4.3 Seismic Factor of Safety

Calculation of the seismic factor of safety under the maximum storage pool loading condition is required by §257.73 paragraph (e)(1)(ii) of the CCR Rule. The minimum factor of safety for the seismic loading condition is 1.00. All dam embankments surrounding CCR surface impoundments must be capable of withstanding a design earthquake without damage to the foundation or embankment that would cause discharge of its contents (EPA, 2015). The CCR Rule requires a design earthquake event with a 2 percent probability of exceedance in 50 years, or an overall return period 2,475 years (EPA, 2015). As further discussed in Section 3.5 below, a peak ground acceleration (PGA) value of 0.06g was determined for the 3&4 EHP facility. Using guidance provided by Hynes-Griffin and Franklin, a horizontal seismic coefficient, k_h, equal to one half of the PGA, or 0.03g, was used for Main and Saddle Dam embankment slope stability modeling of seismic conditions (Hynes-Griffin and Franklin, 1984). The Hynes-Griffin and Franklin guidance also suggests a 20 percent reduction of soil material strength parameters, cohesion and effective friction angle, presented in Table 3-1 above. This accounts for the potential strength reduction of the embankment materials resulting from the cyclic stresses imparted during a seismic event. Model geometry from the maximum normal pool loading condition was used for analysis of the Main and Saddle Dam downstream slopes, while the existing conditions were used for analysis of the upstream slopes. The seismic force applied to the models is equal to the weight of the sliding mass multiplied by the horizontal seismic coefficient, k_h.

The seismic slope stability models are presented in Appendix A. Calculated factors of safety for this loading condition are provided in Section 5.0 below.

3.5 SEISMICITY

A peak ground acceleration (PGA) value of 0.06g was determined for the 3&4 EHP facility. This value was determined by utilization of U.S. Geological Survey's Unified Hazard Tool, available as an online web application. Unified Hazard Tool inputs included the location of the 3&4 EHP facility, assuming a soil site class of C, and a return period of 2,475 years which has a 2 percent probability of exceedance in 50 years. This value indicates that the 3&4 EHP facility is located in an area of low seismic activity.

4.0 LIQUEFACTION EVALUATION

Determination of a factor of safety for dikes constructed of soils that are susceptible to liquefaction is required by §257.73 paragraph (e)(1)(iv) of the CCR Rule. To determine if Main and Saddle Dam embankment and foundation soils are susceptible to liquefaction, an evaluation was provided in previous versions of this document prepared by Jorgensen Geotechnical, LLC (Jorgensen, 2016b and 2021b). As generally accepted in geotechnical engineering practice, and restated in the Jorgensen evaluation, three conditions are necessary for soil liquefaction to occur: loose, cohesionless soil; saturated conditions; and sufficient seismicity to create ground shaking and a corresponding increase in the pore water pressures of saturated soil materials (Jorgensen, 2021b). The Jorgensen evaluation assesses each of these requirements for liquefaction and draws the following conclusions:

- Main and Saddle Dam embankment and foundation materials are too stiff and fine-grained to be susceptible to liquefaction.
- Seepage has historically been detected in the Main and Saddle Dam embankments. However, saturated conditions only exist very low in the embankments which results in small differences between soil's total stress (σ_v) and effective stress (σ_v'), an important component of the soil's cyclic stress ratio (CSR) in liquefaction evaluation methods (Boulanger and Idriss, 2014; Idriss and Boulanger, 2008).
- The determined PGA of 0.06g represents a low level of seismicity, which would produce low values of CSR and would not be sufficient to induce liquefaction of embankment or foundation soils.

Hydrometrics reviewed the above evaluation as part of the preparation of this document and concurs with its findings. The Main and Saddle Dams at the 3&4 EHP facility are not constructed or founded on soils that are susceptible to liquefaction; therefore, factors of safety were not required to be determined for the liquefaction loading case.

5.0 SUMMARY OF RESULTS

The following sections present the results of slope stability analyses performed to satisfy the specific requirements of §257.73 paragraph (e)(1)(i) through (iv). As mentioned above, graphical displays of each slope stability model at the critical cross sections of the Main and Saddle Dams are provided in Appendix A. Detailed information for each model is provided by the analysis reports found in Appendix B.

5.1 RESULTS – STATIC FACTOR OF SAFETY, LONG-TERM, MAXIMUM STORAGE POOL

As stated in §257.73 paragraph (e)(1)(i), a minimum factor of safety of 1.50 is required for the long-term, maximum storage pool loading condition. As can be seen in Tables 5-1 and 5-2 below, the critical cross sections of the Main and Saddle Dam embankments exceed the minimum CCR rule requirements.

TABLE 5-1. RESULTS – STATIC FACTOR OF SAFETY, LONG-TERM, MAXIMUM STORAGE POOL

Embankment	Section	Direction	Calculated Factor of Safety
Main Dam	A	Downstream (North)	2.13
Saddle Dam	B	Downstream (Northeast)	2.24
	C	Downstream (East)	2.24

TABLE 5-2. RESULTS – STATIC FACTOR OF SAFETY, LONG-TERM, EXISTING CONDITIONS

Embankment	Section	Direction	Calculated Factor of Safety
Main Dam	A	Upstream (South)	3.19
Saddle Dam	B	Upstream (Southwest)	3.67
	C	Upstream (West)	2.84

5.2 STATIC FACTOR OF SAFETY, MAXIMUM SURCHARGE POOL

As stated in §257.73 paragraph (e)(1)(ii), a minimum factor of safety of 1.40 is required for the long-term, maximum storage pool loading condition. As can be seen in Table 5-3 below, the downstream slopes along the critical cross sections of the Main and Saddle Dam embankments exceed the minimum CCR rule requirement. This analysis was not run on upstream slopes of the Main and Saddle Dams as the slopes would effectively be eliminated with J-1 and G-1 Cells at the specified maximum surcharge pool elevation. Additionally, it is notable that the results seen in Table 5-1 above and Table 5-3 below are identical. Because the entry point of the critical slip surfaces for each of the maximum surcharge pool cross sections enter the Main and Saddle Dams upstream of J-1 and G-1 Cells, the surcharge load applied to these cells has no impact on the calculated minimum factor of safety for that loading condition.

TABLE 5-3. RESULTS – STATIC FACTOR OF SAFETY, MAXIMUM SURCHARGE POOL

Embankment	Section	Direction	Calculated Factor of Safety
Main Dam	A	Downstream (North)	2.13
Saddle Dam	B	Downstream (Northeast)	2.24
	C	Downstream (East)	2.24

5.3 SEISMIC FACTOR OF SAFETY

As stated in §257.73 paragraph (e)(1)(iii), a minimum factor of safety of 1.00 is required for the loading condition where a seismic load is applied to the long-term, maximum storage pool. As can be seen in Tables 5-4 and 5-5 below, the upstream and downstream slopes along the critical cross sections of the Main and Saddle Dam embankments exceed the minimum CCR rule requirement.

TABLE 5-4. RESULTS – SEISMIC FACTOR OF SAFETY, MAXIMUM STORAGE POOL

Embankment	Section	Direction	Calculated Factor of Safety
Main Dam	A	Downstream (North)	1.48
Saddle Dam	B	Downstream (Northeast)	1.55
	C	Downstream (East)	1.54

TABLE 5-5. RESULTS – SEISMIC FACTOR OF SAFETY, EXISTING CONDITIONS

Embankment	Section	Direction	Calculated Factor of Safety
Main Dam	A	Upstream (South)	2.18
Saddle Dam	B	Upstream (Southwest)	2.53
	C	Upstream (West)	2.51

5.4 LIQUEFACTION

As stated in Section 4.0 above, the embankment and foundation soils of the Main and Saddle Dams are not susceptible to liquefaction. Therefore, the liquefaction analysis described in §257.73 paragraph (e)(1)(iv) of the CCR Rules is not required for this assessment.

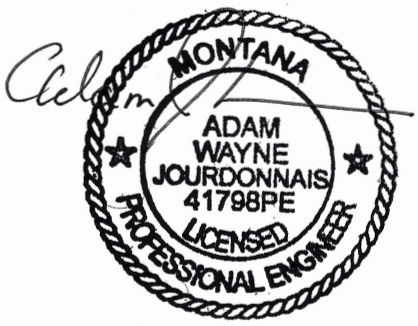
6.0 CONCLUSIONS

The Main and Saddle Dams were constructed with zoned embankments that have 3H:1V upstream and downstream slopes (Hydrometrics, 2026b). The 3H:1V slopes are conservative regarding stability and the zoned embankments with a central clay core, downstream drainage layers, and foundation cutoff wall serve to maintain a low phreatic surface on the downstream side (Hydrometrics, 2026b). Additionally, geosynthetic liner systems, installed on the upstream slopes of the Main and Saddle Dams in J-1 Cell and G-1 Cell, effectively cut off recharge of seepage water through the respective embankments. This is evidenced by the results of monthly embankment piezometer readings since 2016. Given this information and using engineering judgement, it is expected that the Main and Saddle Dam embankments would have adequate factors of safety against failure. The results of slope stability modeling, presented in Section 5.0 above, confirm that the embankments exceed the minimum factors of safety required by 40 CFR §257.73 paragraph (e)(1).

7.0 SAFETY FACTOR ASSESSMENT CERTIFICATION

CERTIFICATION

I, Adam Jourdonnais, a registered Professional Engineer in the State of Montana, certify that this ***Safety Factor Assessment Report*** for the Colstrip Steam Electric Station was conducted in accordance with the requirements of ***40 CFR 257.73(e)(1) Safety Factor Assessment.*** This certification is made in compliance with the specific requirements of §257.73(e)(2). This certification is based in part on review of reference documentation identified in Section 8.0 of this report.



10/15/2026

Adam W. Jourdonnais, P.E.

8.0 REFERENCES

Alok et al., 2024. "A Generalized Limit Equilibrium-Based Platform Incorporating Simplified Bishop, Janbu and Morgenstern-Price Methods for Soil Slope Stability Problems." Alok, A., Burman, A., Samui, P., Kaloop, M.R., and Eldessouki, M. Advances in Civil Engineering, Volume 2024. 2024.

Bechtel, 1982. "Effluent Holding Pond Design Report." Prepared by Bechtel Power Corporation. October 1982.

Bechtel, 1985. "Effluent Hold Pond Embankments Construction Report." Prepared by Bechtel Power Corporation. February 1985.

Boulanger, R and Idriss, M., 2014. "CPT and SPT-Based Liquefaction Triggering Procedures." Prepared by Center for Geotechnical Modeling. University of California at Davis. April 2014.

EPA, 2015. "Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities." https://www.epa.gov/coalash/coal-ash-rule.

Geosyntec, 2017. "Compliance Demonstration Report, J-1 Cell, Colstrip Steam Electric Station, Colstrip, Montana." Prepared by Geosyntec Consultants. October 2017.

Geosyntec, 2024. "Compliance Demonstration Report, G-1 Cell, Colstrip Power Plant, Colstrip, Montana." Prepared by Geosyntec Consultants. November 2024.

Golder, 2001. "Report on Geotechnical Characterization, Mass Balance, Water Balance, and Conceptual Deposition Plan for Paste Fly Ash Units 3&4 Effluent Holding Pond, Colstrip Steam Electric Station, Colstrip, Montana." Prepared by Golder and Associates, May 30, 2001.

Hydrometrics, Inc., 2000. "Units 3&4 Saddle Dam Geotechnical Report." Prepared by Hydrometrics, Inc. July 2000.

Hydrometrics, Inc., 2001 "Units 3&4 Saddle Dam – Remedial Measures, Preliminary Design Report." Prepared by Hydrometrics, Inc. February 2001.

Hydrometrics, Inc., 2012. "Colstrip Steam Electric Station Administrative Order on Consent: Plant Site Report." Prepared by Hydrometrics, Inc. September 2014.

Hydrometrics, Inc., 2026a. "2026 Periodic Safety Factor Assessment of Units 1&2 Coal Combustion Residual (CCR) Surface Impoundments at Colstrip Steam Electric Station." Prepared by Hydrometrics, Inc. October 2026.

Hydrometrics, Inc., 2026b. "Periodic Structural Stability Assessment of Coal Combustion Residual (CCR) Surface Impoundments at Colstrip Steam Electric Station." Prepared by Hydrometrics, Inc. October 2026.

Hynes-Griffin and Franklin, 1984. "Rationalizing the Seismic Coefficient Method." Prepared by Department of the Army, Waterways Experiment Station, Corps of Engineers. July 1984.

Idriss, M. and Boulanger, R. "Soil Liquefaction During Earthquakes." Prepared by Earthquake Engineering Research Institute, University of California at Davis. April 2008.

Jorgensen, 2016a. "Initial Safety Factor Assessment Report, Units 1&2 Surface Impoundments, Colstrip Steam Electric Station, Colstrip, Montana." Prepared by Jorgensen Geotechnical, LLC. October 17, 2016.

Jorgensen, 2016b. "Initial Safety Factor Assessment Report, Units 3&4 Surface Impoundments, Colstrip Steam Electric Station, Colstrip, Montana." Prepared by Jorgensen Geotechnical, LLC. October 17, 2016.

Jorgensen, 2021a. "2021 Safety Factor Assessment, Units 1&2 Surface Impoundments, Colstrip Steam Electric Station, Colstrip, Montana." Prepared by Jorgensen Geotechnical, LLC. October 14, 2021.

Jorgensen, 2021b. "2021 Safety Factor Assessment, Units 3&4 EHP Surface Impoundments, Colstrip Steam Electric Station, Colstrip, Montana." Prepared by Jorgensen Geotechnical, LLC. October 14, 2021.

Rocscience, 2010. "Slide 6.0 User's Manual." Prepared by Rocscience. 2010.

WAI, 2009. "Geotechnical Investigation Report, EPA Recommended Corrective Measures at the Colstrip Power Plant, Units 3&4 Saddle Dam." Prepared by Womack and Associates, Inc. December 21, 2009.

WAI, 2010. "Geotechnical Investigation Report, EPA Recommended Corrective Measures at the Colstrip Power Plant, Units 3&4 EHP Main Dam." Prepared by Womack and Associates, Inc. February 2010.

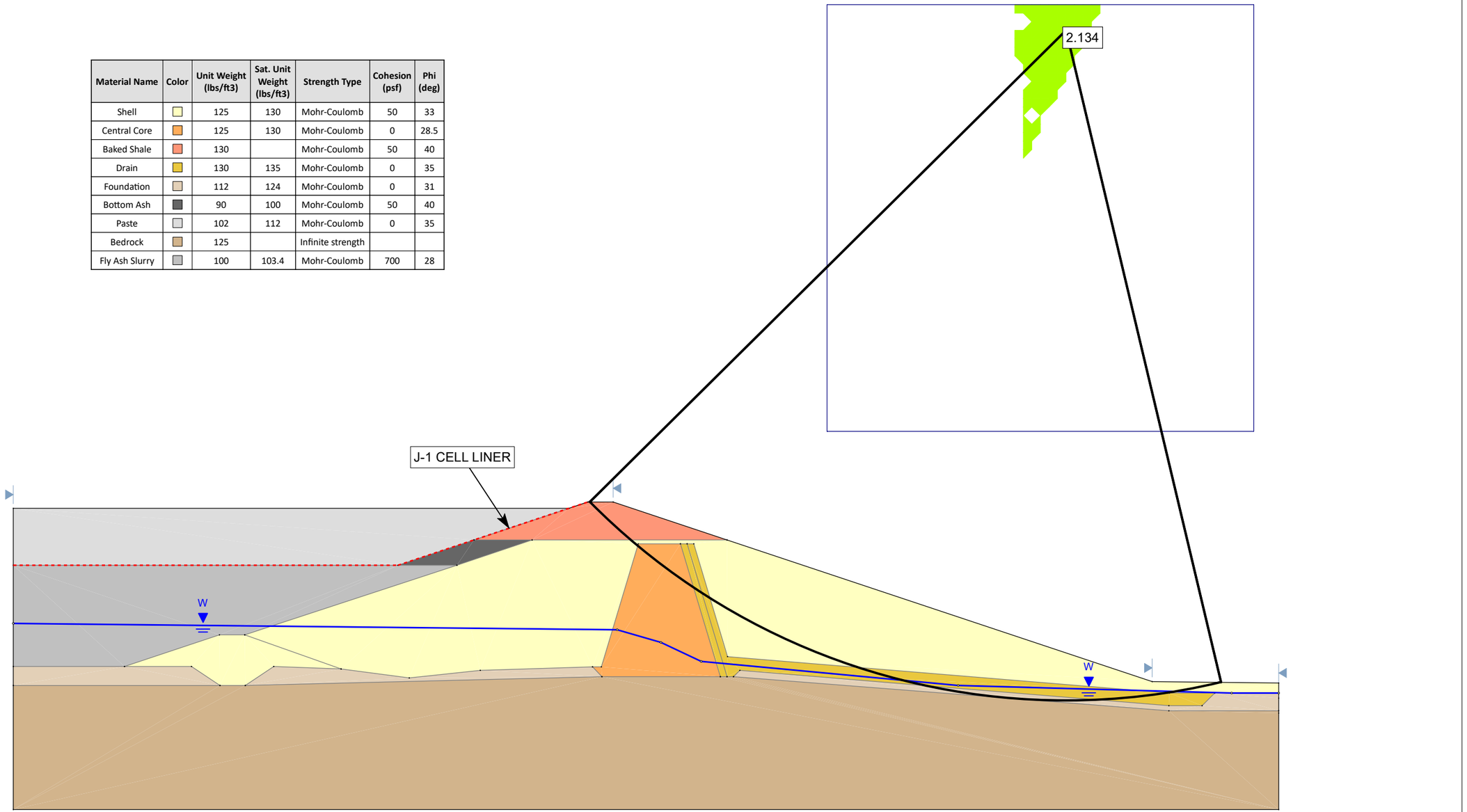
WAI, 2012. "PPL Montana – Colstrip Power Plant Units 3&4 EHP Stage 2 Dam Raise, Phase 2 Construction Drawings." Prepared by Womack and Associates, Inc. 2012.

APPENDIX A

SLOPE STABILITY MODELS

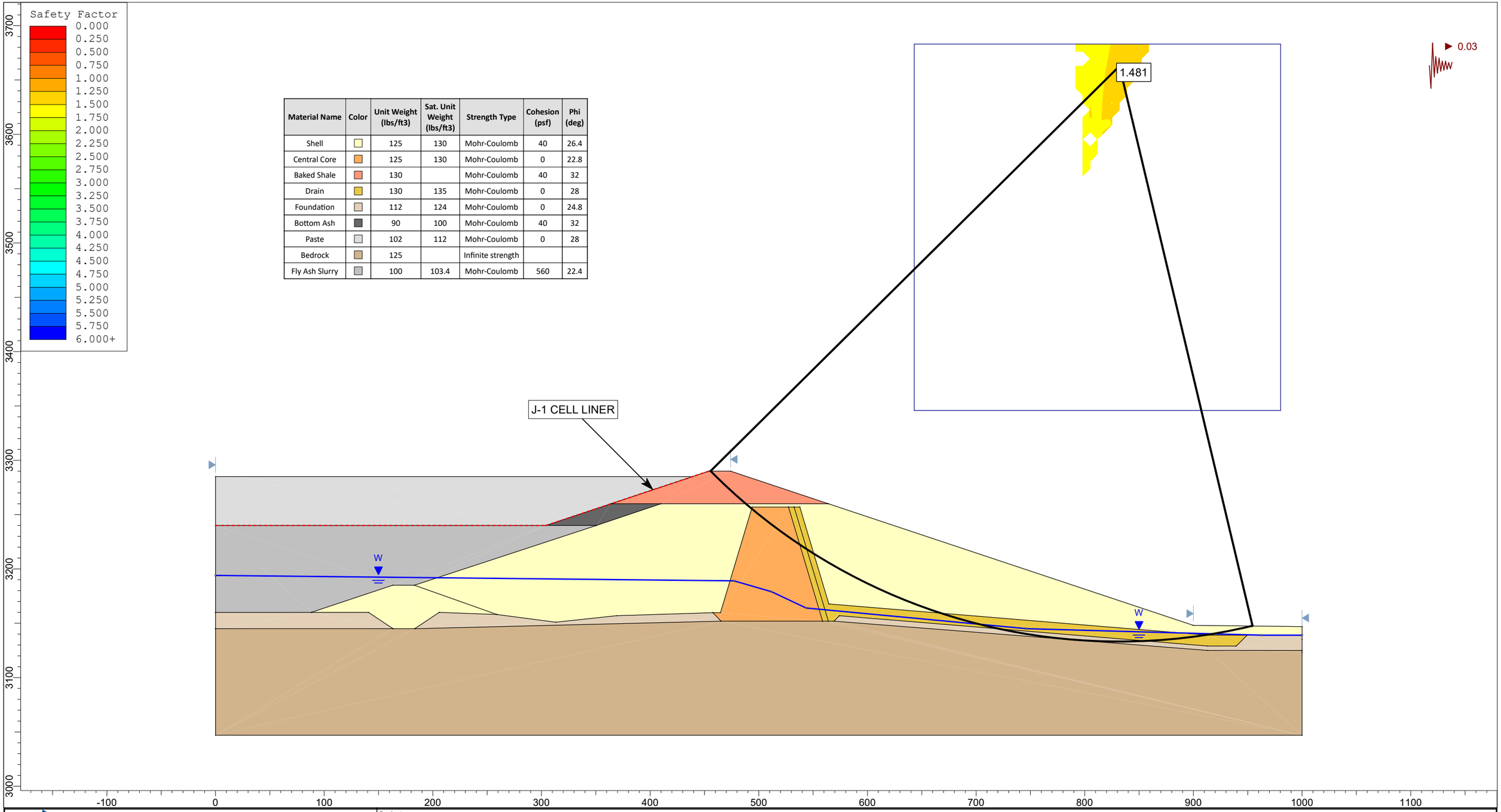
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	31
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	35
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	700	28



Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES			
Analysis Description	UNITS 3&4 EHP - MAIN DAM - MAXIMUM STORAGE POOL - STATIC ANALYSIS			
Drawn By	AWJ	Scale	1:1000	Company HYDROMETRICS, INC.
Date	9/25/2026, 4:07:52 PM			File Name 1.0 - 34 EHP Main Dam - Downstream - Static.slim

SLIDEINTERPRET 6.020



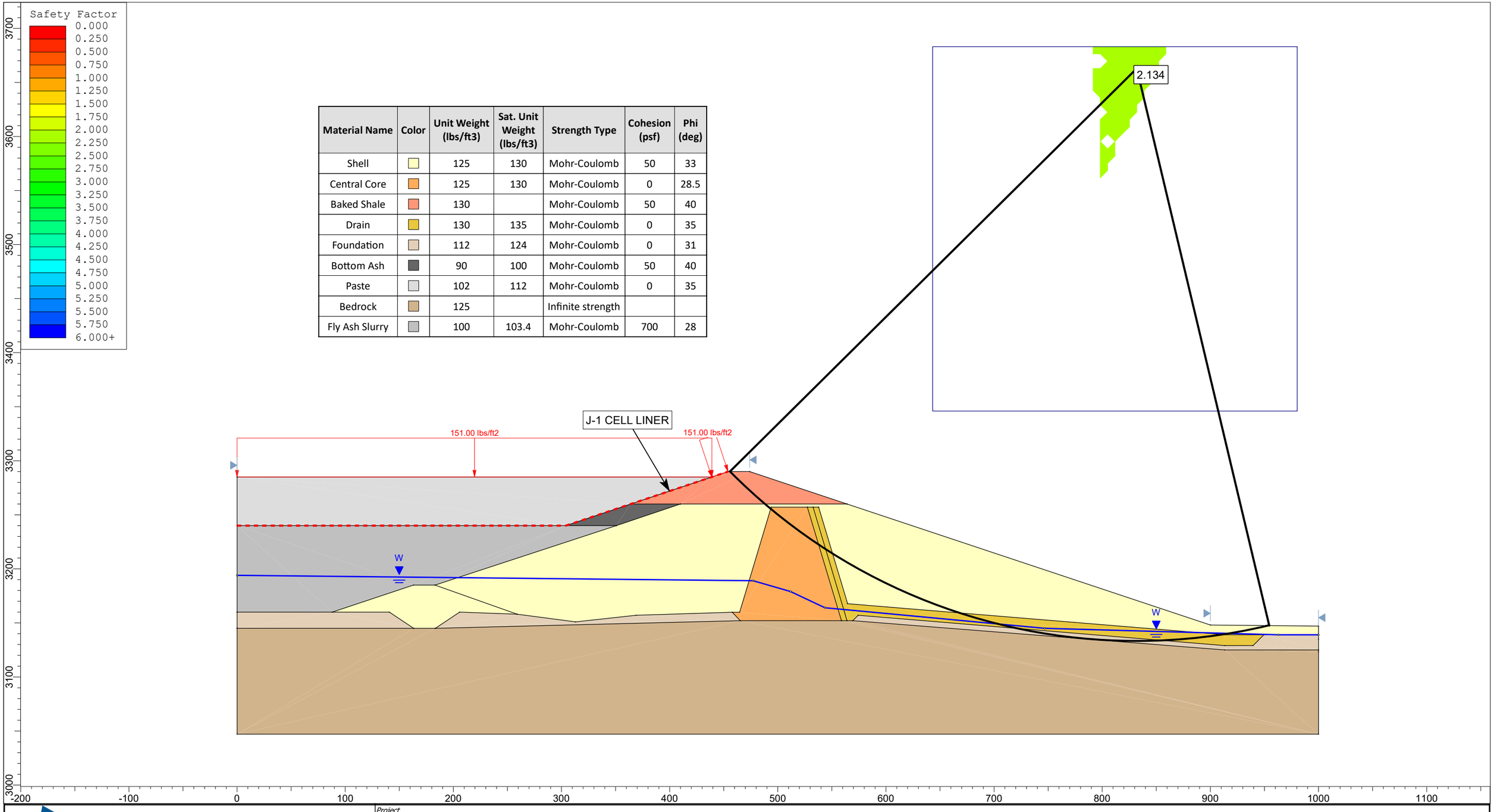
Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	40	26.4
Central Core		125	130	Mohr-Coulomb	0	22.8
Baked Shale		130		Mohr-Coulomb	40	32
Drain		130	135	Mohr-Coulomb	0	28
Foundation		112	124	Mohr-Coulomb	0	24.8
Bottom Ash		90	100	Mohr-Coulomb	40	32
Paste		102	112	Mohr-Coulomb	0	28
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	560	22.4

SLIDEINTERPRET 6.020

Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - MAIN DAM - MAXIMUM STORAGE POOL - SEISMIC ANALYSIS		
Drawn By AWJ	*Scale* 1:1000	*Company*	HYDROMETRICS, INC.
Date 9/25/2026, 4:07:52 PM		*File Name*	1.2 - 34 EHP Main Dam - Downstream - Seismic.slim

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	31
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	35
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	700	28

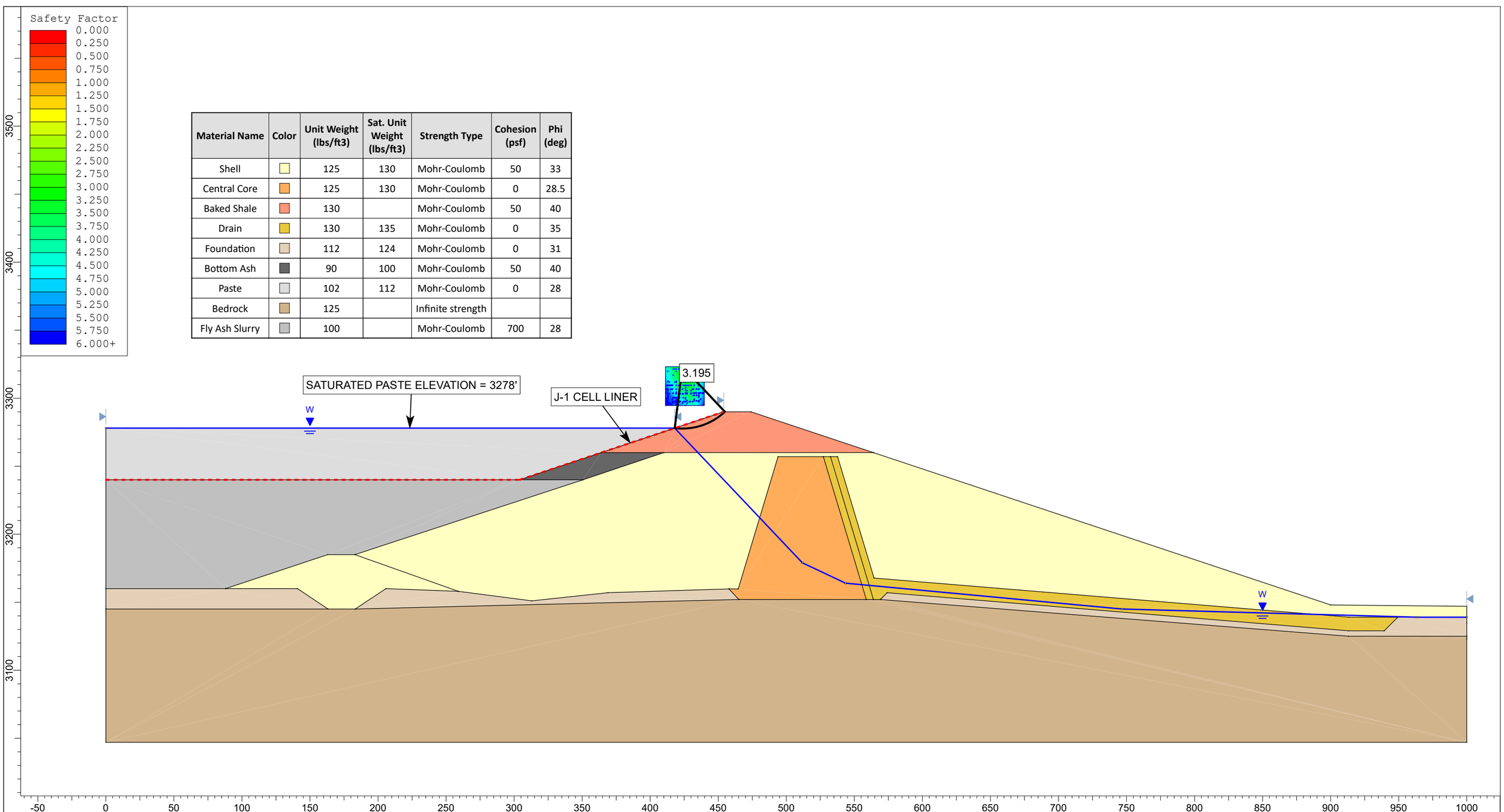


Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - MAIN DAM - MAXIMUM SURCHARGE POOL - STATIC ANALYSIS		
Drawn By: AWJ	Scale: 1:1000	Company: HYDROMETRICS, INC.	
Date: 9/25/2026, 4:07:52 PM		File Name: 1.1 - 34 EHP Main Dam - Downstream - Static - Max Surcharge.slim	

SLIDEINTERPRET 6.020

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	31
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	28
Bedrock		125		Infinite strength		
Fly Ash Slurry		100		Mohr-Coulomb	700	28



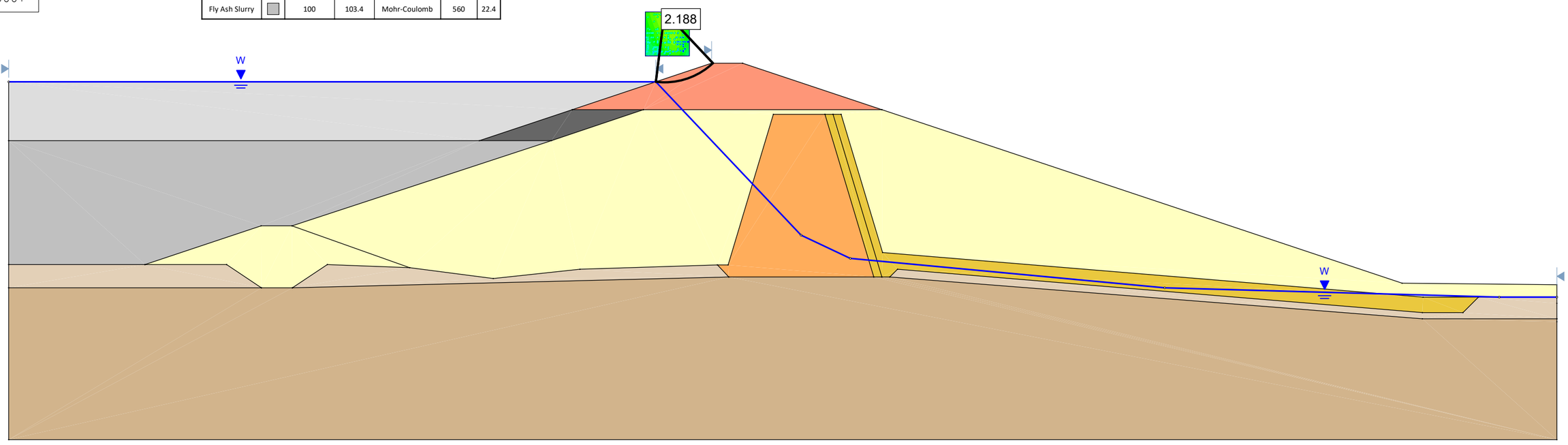
SLIDEINTERPRET 6.020

Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - MAIN DAM - EXISTING CONDITIONS - STATIC ANALYSIS - UPSTREAM SLOPE		
Drawn By: AWJ	Scale: 1:800	Company: HYDROMETRICS, INC.	
Date: 9/25/2026, 4:07:52 PM		File Name: 34 EHP Main Dam - Upstream - Static.slim	

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

0.03

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	40	26.4
Central Core		125	130	Mohr-Coulomb	0	22.8
Baked Shale		130		Mohr-Coulomb	40	32
Drain		130	135	Mohr-Coulomb	0	28
Foundation		112	124	Mohr-Coulomb	0	24.8
Bottom Ash		90	100	Mohr-Coulomb	40	32
Paste		102	112	Mohr-Coulomb	0	28
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	560	22.4

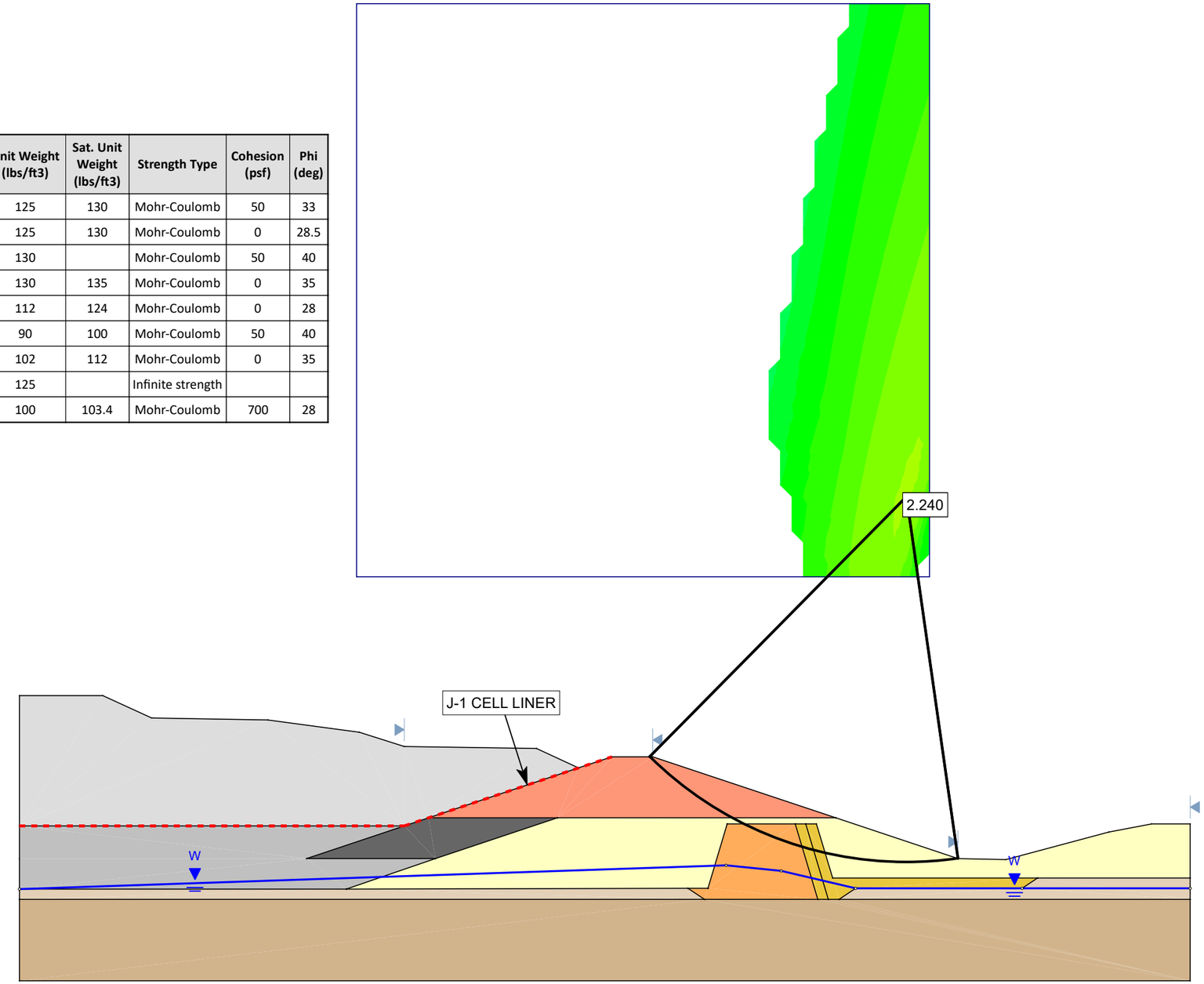


SLIDEINTERPRET 6.020

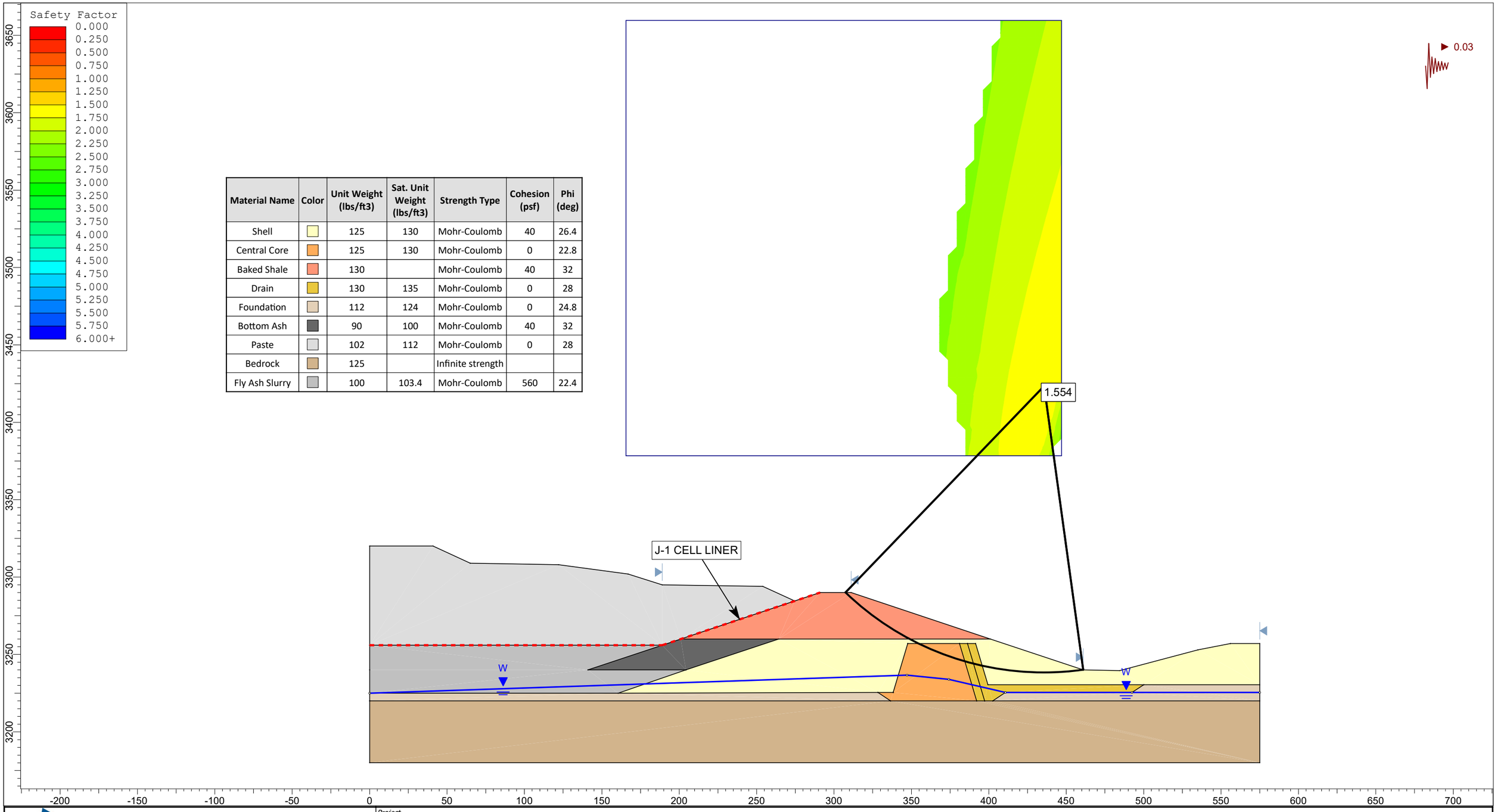
Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - MAIN DAM - EXISTING CONDITIONS - SEISMIC ANALYSIS - UPSTREAM SLOPE		
Drawn By	AWJ	*Scale* 1:800	*Company* HYDROMETRICS, INC.
Date	9/25/2026, 4:07:52 PM		*File Name* 1.4 - 34 EHP Main Dam - Upstream - Seismic.slim

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	28
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	35
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	700	28



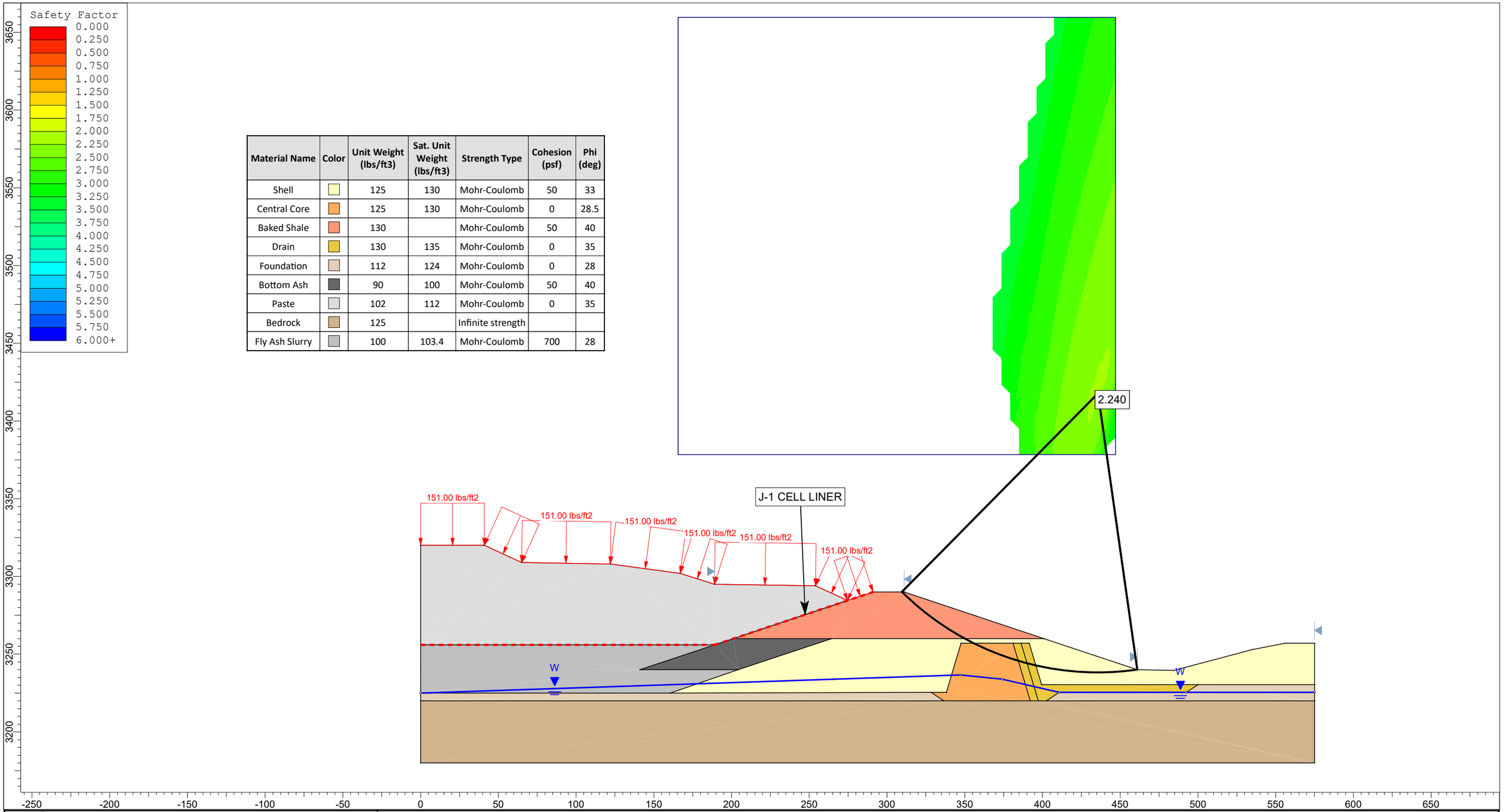
	Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
	Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION B - MAXIMUM STORAGE POOL - STATIC ANALYSIS		
SLIDEINTERPRET 6.020	Drawn By: AWJ	Scale: 1:700	Company: HYDROMETRICS, INC.	
	Date: 9/25/2026, 4:07:52 PM		File Name: 2.0 - 34 EHP Saddle Dam B - Downstream - Static.slim	



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	40	26.4
Central Core		125	130	Mohr-Coulomb	0	22.8
Baked Shale		130		Mohr-Coulomb	40	32
Drain		130	135	Mohr-Coulomb	0	28
Foundation		112	124	Mohr-Coulomb	0	24.8
Bottom Ash		90	100	Mohr-Coulomb	40	32
Paste		102	112	Mohr-Coulomb	0	28
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	560	22.4

SLIDEINTERPRET 6.020

Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION B - MAXIMUM STORAGE POOL - SEISMIC ANALYSIS		
Drawn By AWJ	*Scale* 1:700	*Company*	HYDROMETRICS, INC.
Date 9/25/2026, 4:07:52 PM		*File Name*	2.2 - 34 EHP Saddle Dam B - Downstream - Seismic.slim



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	28
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	35
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	700	28

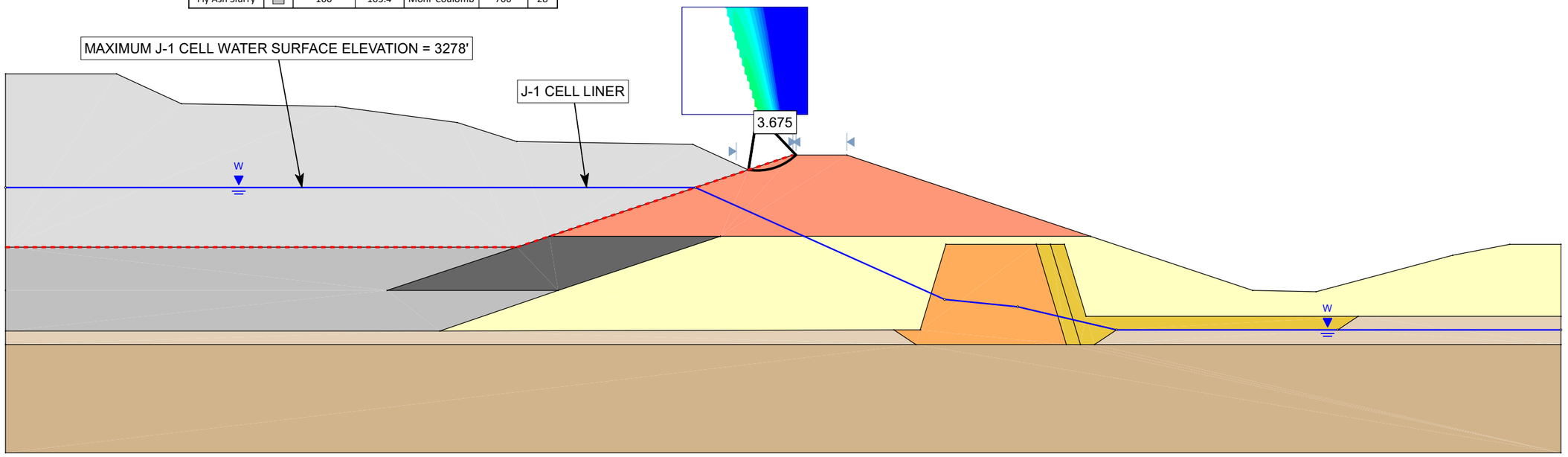
rocscience

SLIDEINTERPRET 6.020

Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION B - MAXIMUM SURCHARGE POOL - STATIC ANALYSIS		
Drawn By AWJ	*Scale* 1:700	*Company*	HYDROMETRICS, INC.
Date 9/25/2026, 4:07:52 PM		*File Name*	2.1 - 34 EHP Saddle Dam B - Max Surcharge - Downstream - Static.slim

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	28
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	35
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	700	28



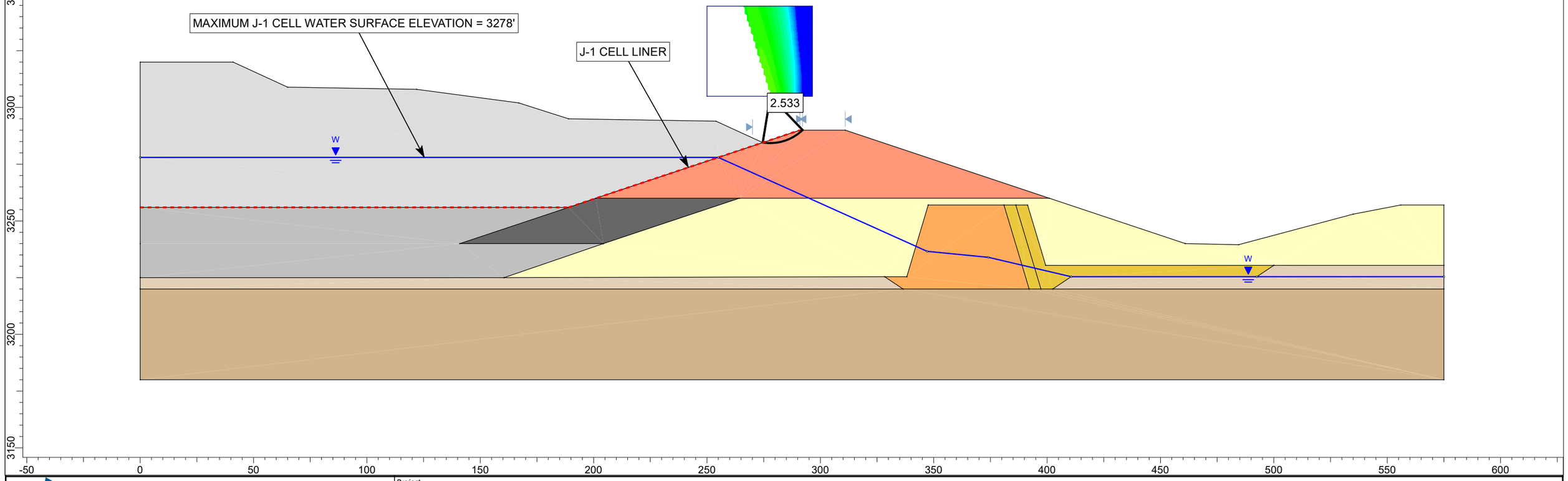
Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION B - EXISTING CONDITIONS - STATIC ANALYSIS - UPSTREAM SLOPE		
Drawn By: AWJ	Scale: 1:500	Company: HYDROMETRICS, INC.	
Date: 9/25/2026, 4:07:52 PM		File Name: 2.3 - 34 EHP Saddle Dam B - Upstream - Static.slim	

SLIDEINTERPRET 6.020

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

0.03

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	40	26.4
Central Core		125	130	Mohr-Coulomb	0	22.8
Baked Shale		130		Mohr-Coulomb	40	32
Drain		130	135	Mohr-Coulomb	0	28
Foundation		112	124	Mohr-Coulomb	0	22.4
Bottom Ash		90	100	Mohr-Coulomb	40	32
Paste		102	112	Mohr-Coulomb	0	28
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	560	22.4

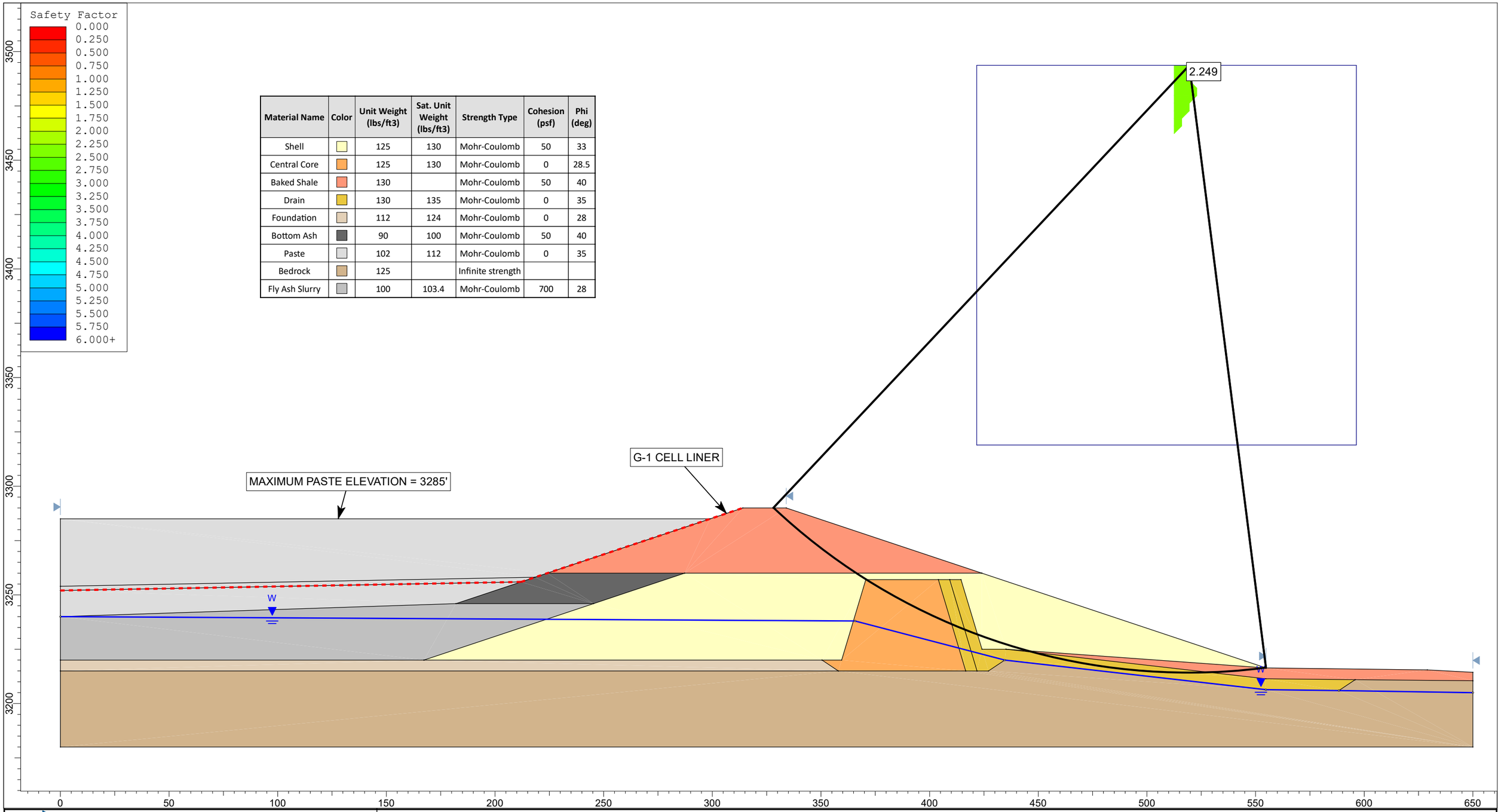


Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION B - EXISTING CONDITIONS - SEISIMC ANALYSIS - UPSTREAM SLOPE		
Drawn By	AWJ	Scale	1:500
Company	HYDROMETRICS, INC.		
Date	9/25/2026, 4:07:52 PM	File Name	2.4 - 34 EHP Saddle Dam B - Upstream - Seismic.slim

SLIDEINTERPRET 6.020

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	28
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	35
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	700	28

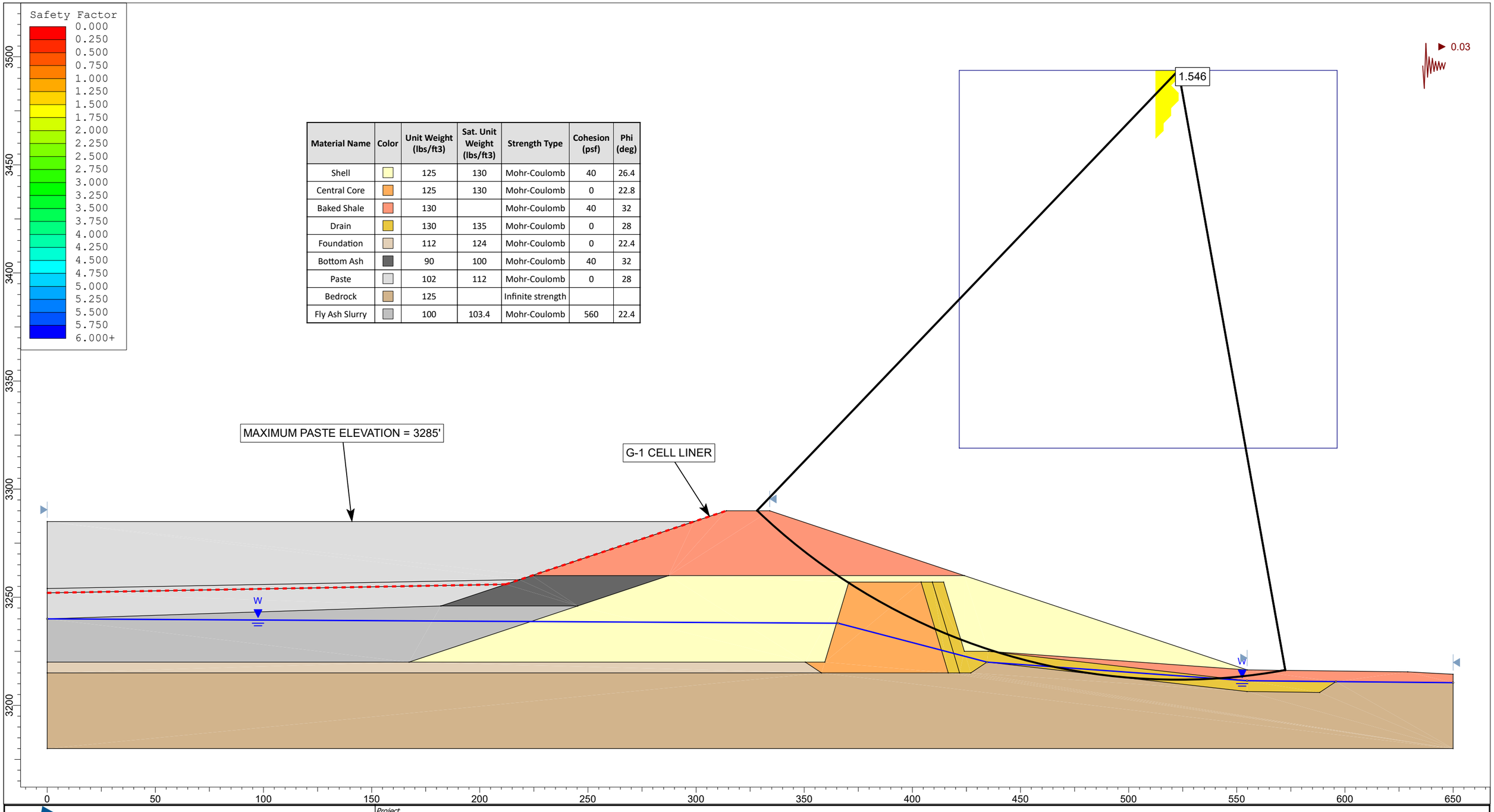


SLIDEINTERPRET 6.020

Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION C - MAXIMUM STORAGE POOL - STATIC ANALYSIS		
Drawn By	AWJ	Scale 1:500	Company HYDROMETRICS, INC.
Date	9/25/2026, 4:07:52 PM		File Name 3.0 - 34 EHP Saddle Dam C - Downstream - Static.slim

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	40	26.4
Central Core		125	130	Mohr-Coulomb	0	22.8
Baked Shale		130		Mohr-Coulomb	40	32
Drain		130	135	Mohr-Coulomb	0	28
Foundation		112	124	Mohr-Coulomb	0	22.4
Bottom Ash		90	100	Mohr-Coulomb	40	32
Paste		102	112	Mohr-Coulomb	0	28
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	560	22.4

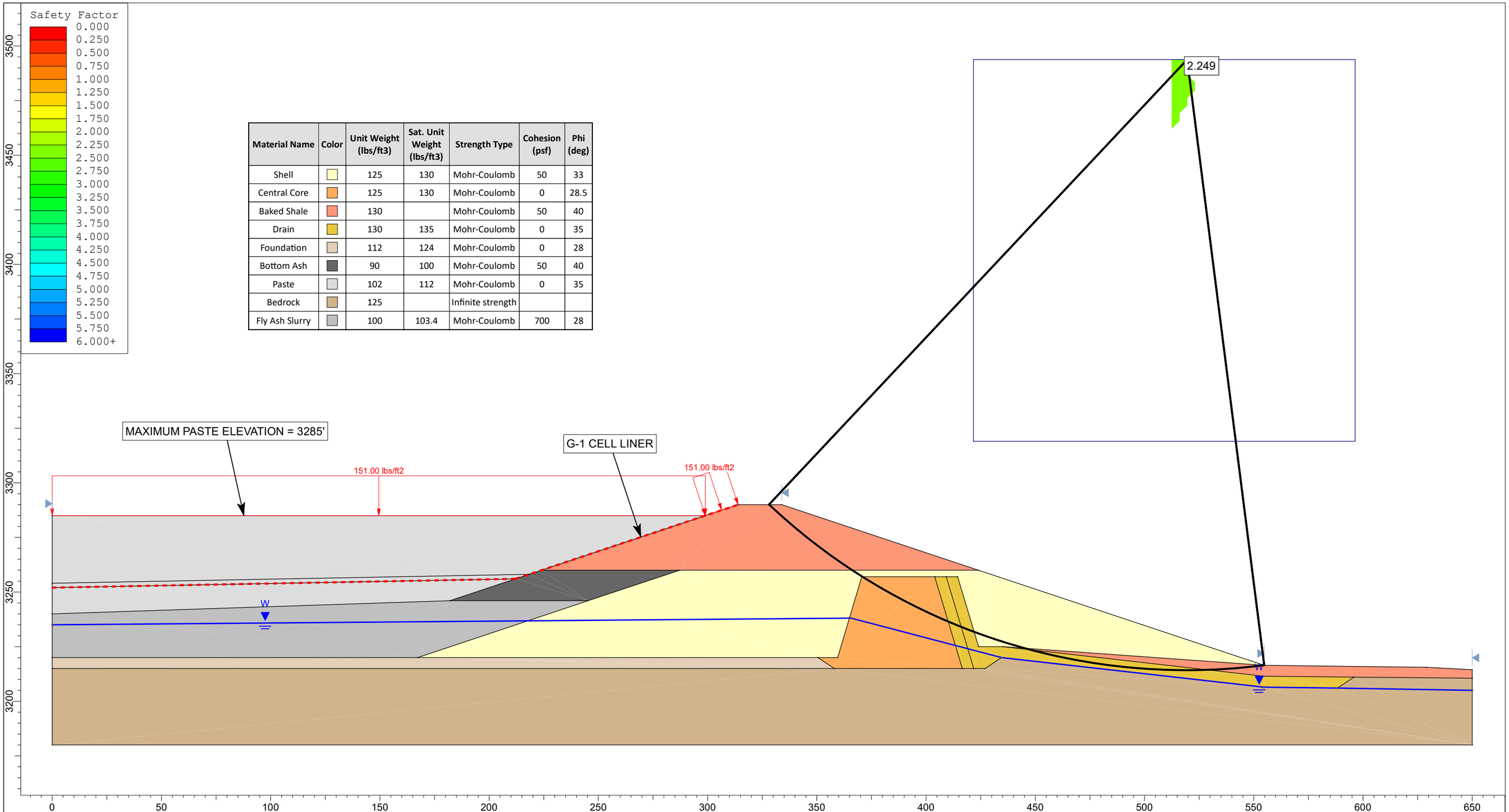


Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION C - MAXIMUM STORAGE POOL - SEISMIC ANALYSIS		
Drawn By	AWJ	Scale	1:500
Company	HYDROMETRICS, INC.		
Date	9/25/2026, 4:07:52 PM	File Name	3.2 - 34 EHP Saddle Dam C - Downstream - Seismic.slim

SLIDEINTERPRET 6.020

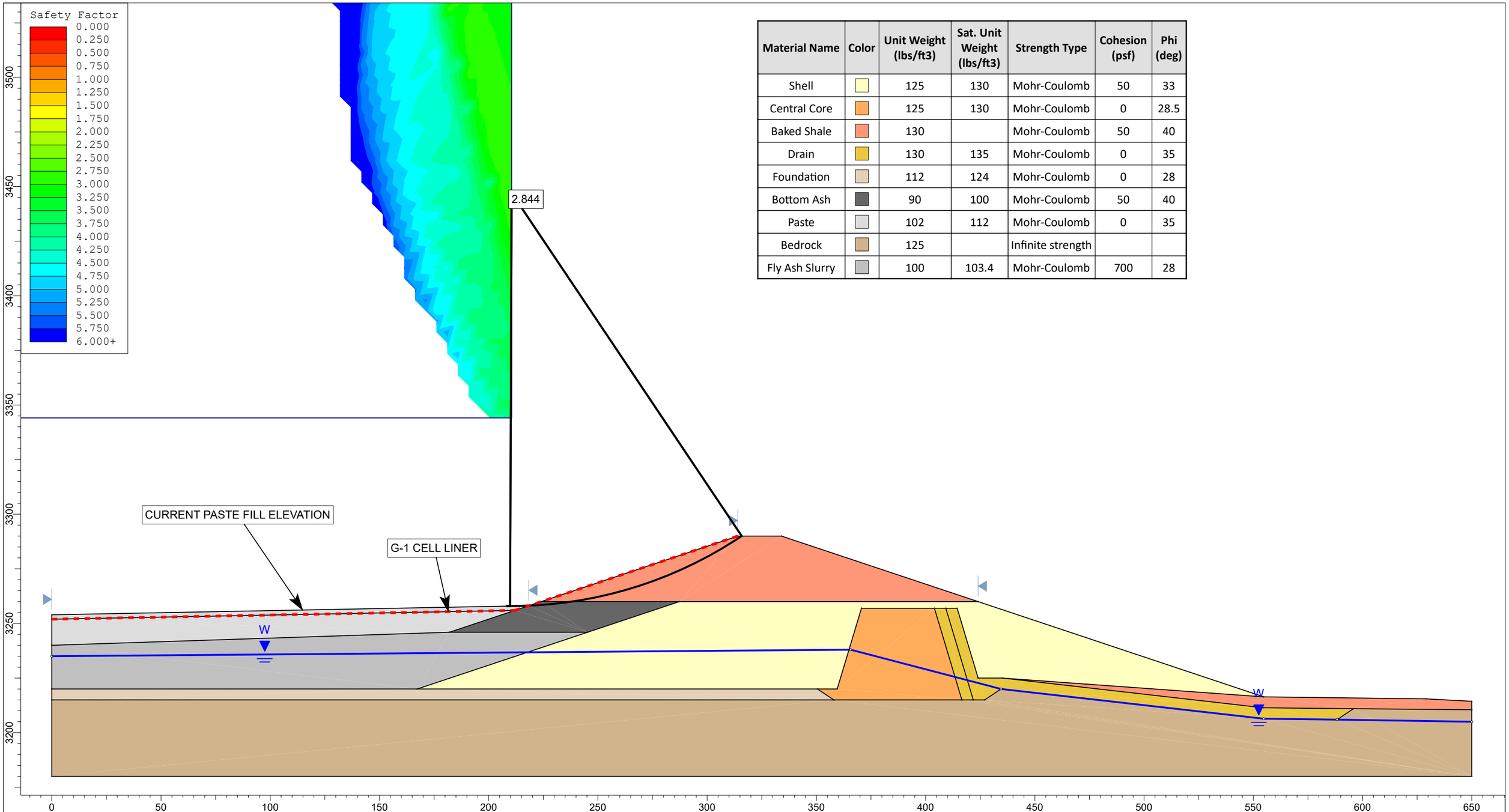
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	28
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	35
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	700	28



Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES			
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION C - MAXIMUM SURCHARGE POOL - STATIC ANALYSIS			
Drawn By	AWJ	Scale	1:500	Company HYDROMETRICS, INC.
Date	9/25/2026, 4:07:52 PM			File Name 3.1 - 34 EHP Saddle Dam C - Max Surcharge - Downstream - Static.slim

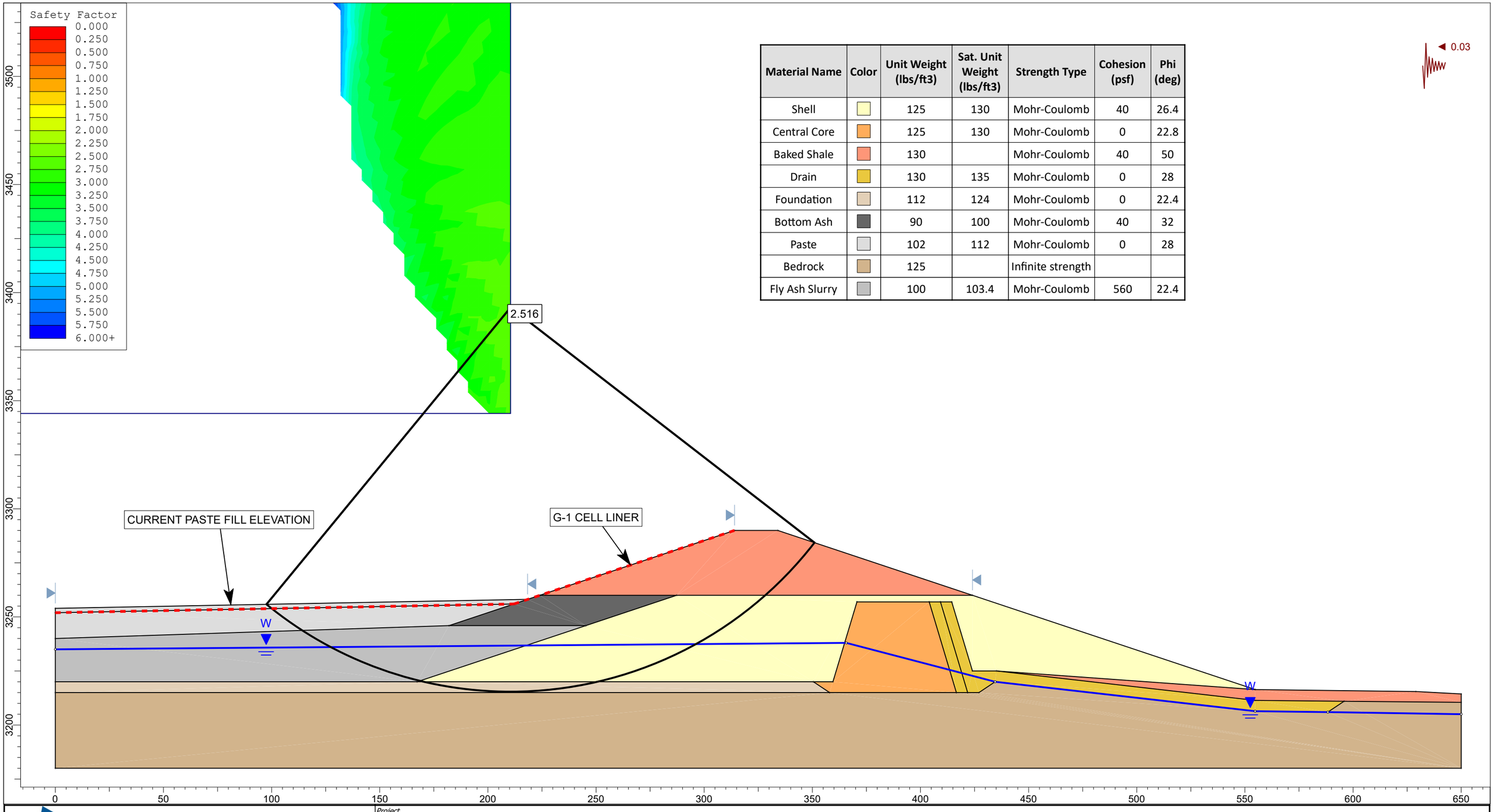
SLIDEINTERPRET 6.020



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	50	33
Central Core		125	130	Mohr-Coulomb	0	28.5
Baked Shale		130		Mohr-Coulomb	50	40
Drain		130	135	Mohr-Coulomb	0	35
Foundation		112	124	Mohr-Coulomb	0	28
Bottom Ash		90	100	Mohr-Coulomb	50	40
Paste		102	112	Mohr-Coulomb	0	35
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	700	28

SLIDEINTERPRET 6.020

Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION C - EXISTING CONDITIONS - STATIC ANALYSIS - UPSTREAM SLOPE		
Drawn By AWJ	*Scale* 1:500	*Company*	HYDROMETRICS, INC.
Date 9/25/2026, 4:07:52 PM		*File Name*	3.3 - 34 EHP Saddle Dam C - Upstream - Static.slim



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Shell		125	130	Mohr-Coulomb	40	26.4
Central Core		125	130	Mohr-Coulomb	0	22.8
Baked Shale		130		Mohr-Coulomb	40	50
Drain		130	135	Mohr-Coulomb	0	28
Foundation		112	124	Mohr-Coulomb	0	22.4
Bottom Ash		90	100	Mohr-Coulomb	40	32
Paste		102	112	Mohr-Coulomb	0	28
Bedrock		125		Infinite strength		
Fly Ash Slurry		100	103.4	Mohr-Coulomb	560	22.4

rocscience

SLIDEINTERPRET 6.020

Project	2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES		
Analysis Description	UNITS 3&4 EHP - SADDLE DAM SECTION C - EXISTING CONDITIONS - SEISMIC ANALYSIS - UPSTREAM SLOPE		
Drawn By	AWJ	Scale	1:500
Company	HYDROMETRICS, INC.		
Date	9/25/2026, 4:07:52 PM	File Name	3.4 - 34 EHP Saddle Dam C - Upstream - Seismic.slim

APPENDIX B

SLOPE STABILITY MODEL REPORTS

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 1.0 - 34 EHP Main Dam - Downstream - Static.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - MAIN DAM - MAXIMUM STORAGE POOL - STATIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	31	40	35	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.133990
Center: 831.914, 3662.818
Radius: 529.727
Left Slip Surface Endpoint: 455.593, 3290.000
Right Slip Surface Endpoint: 954.440, 3147.456
Resisting Moment=8.73744e+008 lb-ft
Driving Moment=4.09442e+008 lb-ft
Total Slice Area=21308.2 ft2

Method: janbu simplified

FS: 2.023190
Center: 825.171, 3635.845
Radius: 502.083
Left Slip Surface Endpoint: 461.194, 3290.000
Right Slip Surface Endpoint: 942.147, 3147.579
Resisting Horizontal Force=1.48879e+006 lb
Driving Horizontal Force=735865 lb
Total Slice Area=20731 ft2

Method: gle/morgenstern-price

FS: 2.135740
Center: 831.914, 3662.818
Radius: 529.727
Left Slip Surface Endpoint: 455.593, 3290.000
Right Slip Surface Endpoint: 954.440, 3147.456
Resisting Moment=8.74461e+008 lb-ft
Driving Moment=4.09442e+008 lb-ft
Resisting Horizontal Force=1.53898e+006 lb
Driving Horizontal Force=720586 lb
Total Slice Area=21308.2 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.13399

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	16.1515	16404.8	Baked Shale	50	40	306.348	653.743	719.515	0	719.515
2	16.1515	43716.4	Baked Shale	50	40	805.894	1719.77	1989.95	0	1989.95
3	5.51136	19116.6	Shell	50	33	858.95	1832.99	2745.57	0	2745.57
4	22.1511	94111.6	Central Core	0	28.5	900.791	1922.28	3540.4	0	3540.4
5	22.1511	119516	Central Core	0	28.5	1163.99	2483.94	4574.86	0	4574.86
6	12.9563	80092.2	Drain	0	35	1673.36	3570.94	5099.83	0	5099.83
7	23.3194	156200	Shell	50	33	1747.51	3729.17	5665.41	0	5665.41
8	23.3194	171349	Shell	50	33	1948.3	4157.65	6325.2	0	6325.2
9	23.3194	182319	Shell	50	33	2105.51	4493.13	6841.8	0	6841.8
10	23.3194	189268	Shell	50	33	2218.76	4734.82	7213.98	0	7213.98
11	23.3194	192442	Shell	50	33	2289.02	4884.75	7444.85	0	7444.85
12	17.8052	147118	Drain	0	35	2462.72	5255.42	7505.52	0	7505.52
13	17.8052	145677	Drain	0	35	2466.44	5263.36	7516.86	0	7516.86
14	17.8052	142810	Drain	0	35	2420.46	5165.24	7457.36	80.6383	7376.72
15	22.6648	174970	Foundation	0	31	2001.37	4270.91	7335.71	227.729	7107.98
16	22.6648	164454	Foundation	0	31	1862.11	3973.72	6981.61	368.241	6613.37
17	22.6648	151227	Foundation	0	31	1686.92	3599.88	6497.69	506.478	5991.21
18	22.6648	135228	Foundation	0	31	1490.44	3180.59	5876.54	583.153	5293.39
19	22.6648	116486	Foundation	0	31	1272.24	2714.94	5117.33	598.914	4518.42
20	22.6648	95014.5	Foundation	0	31	1031.72	2201.69	4218.3	554.067	3664.23
21	18.377	59189.2	Drain	0	35	924.109	1972.04	3280.13	463.77	2816.36
22	18.377	41204.9	Drain	0	35	645.762	1378.05	2306.26	338.198	1968.06
23	18.377	24427	Drain	0	35	397.174	847.565	1382.67	172.223	1210.45
24	21.3209	18081.2	Shell	50	33	297.187	634.195	899.583	0	899.583
25	21.3209	6423.66	Shell	50	33	123.213	262.935	327.892	0	327.892

Global Minimum Query (janbu simplified) - Safety Factor: 2.02319

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	15.5339	15636.1	Baked Shale	50	40	312.121	631.48	692.981	0	692.981
2	15.5339	39023.8	Baked Shale	50	40	771.613	1561.12	1800.88	0	1800.88
3	3.41798	11013	Shell	50	33	826.625	1672.42	2498.32	0	2498.32
4	20.6547	81620.8	Central Core	0	28.5	868.841	1757.83	3237.53	0	3237.53
5	20.6547	105612	Central Core	0	28.5	1145.36	2317.29	4267.94	0	4267.94
6	13.1058	77855.9	Drain	0	35	1666.16	3370.96	4814.23	0	4814.23
7	23.3614	152369	Shell	50	33	1769.02	3579.06	5434.28	0	5434.28
8	23.3614	169073	Shell	50	33	1999.15	4044.67	6151.27	0	6151.27
9	23.3614	181232	Shell	50	33	2180.64	4411.85	6716.68	0	6716.68
10	23.3614	189051	Shell	50	33	2313.14	4679.92	7129.43	0	7129.43
11	23.3614	192821	Shell	50	33	2397.76	4851.12	7393.08	0	7393.08
12	17.5546	145336	Drain	0	35	2586.74	5233.46	7474.15	0	7474.15
13	17.5546	144074	Drain	0	35	2596.27	5252.74	7501.68	0	7501.68
14	17.5546	141365	Drain	0	35	2552.48	5164.15	7457.07	81.8805	7375.19
15	21.5404	167266	Foundation	0	31	2118.52	4286.17	7358.64	225.236	7133.4
16	21.5404	157768	Foundation	0	31	1984.71	4015.45	7032.08	349.237	6682.85
17	21.5404	145824	Foundation	0	31	1812.1	3666.23	6582.39	480.772	6101.62
18	21.5404	131373	Foundation	0	31	1617.97	3273.46	6001.57	553.639	5447.93
19	21.5404	114437	Foundation	0	31	1401.8	2836.1	5288.52	568.456	4720.07
20	21.5404	95029.7	Foundation	0	31	1162.98	2352.93	4441.44	525.516	3915.92
21	18.1251	62895.4	Drain	0	35	1073.92	2172.74	3540	437.006	3102.99
22	18.1251	45321.5	Drain	0	35	785.304	1588.82	2580.2	311.137	2269.07
23	18.1251	26325.2	Drain	0	35	475.684	962.399	1518.21	143.767	1374.44
24	19.4815	15304.9	Shell	50	33	293.57	593.948	837.605	0	837.605
25	19.4815	5424.22	Shell	50	33	122.674	248.192	305.189	0	305.189

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.13574

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	16.1515	16404.8	Baked Shale	50	40	301.871	644.717	708.755	0	708.755
2	16.1515	43716.4	Baked Shale	50	40	780.011	1665.9	1925.76	0	1925.76
3	5.51136	19116.6	Shell	50	33	816.153	1743.09	2607.13	0	2607.13
4	22.1511	94111.6	Central Core	0	28.5	834.184	1781.6	3281.29	0	3281.29
5	22.1511	119516	Central Core	0	28.5	1055.86	2255.05	4153.27	0	4153.27
6	12.9563	80092.2	Drain	0	35	1526.08	3259.32	4654.79	0	4654.79
7	23.3194	156200	Shell	50	33	1587.62	3390.75	5144.28	0	5144.28
8	23.3194	171349	Shell	50	33	1779.87	3801.33	5776.55	0	5776.55
9	23.3194	182319	Shell	50	33	1947.75	4159.89	6328.67	0	6328.67
10	23.3194	189268	Shell	50	33	2090.72	4465.24	6798.87	0	6798.87
11	23.3194	192442	Shell	50	33	2207.25	4714.11	7182.09	0	7182.09
12	17.8052	147118	Drain	0	35	2447.12	5226.42	7464.08	0	7464.08
13	17.8052	145677	Drain	0	35	2503.85	5347.57	7637.13	0	7637.13
14	17.8052	142810	Drain	0	35	2507.64	5355.67	7729.32	80.6383	7648.69
15	22.6648	174970	Foundation	0	31	2084.14	4451.18	7635.72	227.729	7408
16	22.6648	164454	Foundation	0	31	1985.62	4240.77	7426.05	368.241	7057.81
17	22.6648	151227	Foundation	0	31	1837.1	3923.56	7036.35	506.478	6529.88
18	22.6648	135228	Foundation	0	31	1650.99	3526.08	6451.54	583.153	5868.39
19	22.6648	116486	Foundation	0	31	1425.3	3044.07	5665.11	598.914	5066.19
20	22.6648	95014.5	Foundation	0	31	1160.93	2479.44	4680.56	554.067	4126.49
21	18.377	59189.2	Drain	0	35	1047.47	2237.13	3658.72	463.77	3194.95
22	18.377	41204.9	Drain	0	35	724.929	1548.26	2549.34	338.198	2211.14
23	18.377	24427	Drain	0	35	439.732	939.153	1513.47	172.223	1341.25
24	21.3209	18081.2	Shell	50	33	315.905	674.692	961.941	0	961.941
25	21.3209	6423.66	Shell	50	33	126.468	270.102	338.928	0	338.928

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.13399

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	455.593	3290	0	0	0
2	471.744	3274.37	6298.57	0	0
3	487.896	3260	21895.1	0	0
4	493.407	3255.36	29910.5	0	0
5	515.558	3237.93	71672.2	0	0
6	537.709	3222.3	117403	0	0
7	550.666	3213.92	138488	0	0
8	573.985	3200.13	175907	0	0
9	597.304	3187.88	207988	0	0
10	620.624	3177.05	232975	0	0

11	643.943	3167.56	249737	0	0
12	667.263	3159.33	257692	0	0
13	685.068	3153.85	254989	0	0
14	702.873	3149.05	247208	0	0
15	720.678	3144.9	235066	0	0
16	743.343	3140.55	221674	0	0
17	766.008	3137.21	202826	0	0
18	788.672	3134.86	179876	0	0
19	811.337	3133.49	154159	0	0
20	834.002	3133.09	127369	0	0
21	856.667	3133.67	101578	0	0
22	875.044	3134.85	80737	0	0
23	893.421	3136.67	64671.2	0	0
24	911.798	3139.15	53955.3	0	0
25	933.119	3142.85	44295.4	0	0
26	954.44	3147.46	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.02319

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	461.194	3290	0	0	0
2	476.728	3274.35	6005.45	0	0
3	492.262	3260	19899.2	0	0
4	495.68	3257	24575.7	0	0
5	516.335	3239.98	61772	0	0
6	536.99	3224.7	103387	0	0
7	550.095	3215.82	124361	0	0
8	573.457	3201.42	161404	0	0
9	596.818	3188.7	193069	0	0
10	620.18	3177.52	217345	0	0
11	643.541	3167.77	232947	0	0
12	666.903	3159.36	239218	0	0
13	684.457	3153.88	234849	0	0
14	702.012	3149.1	225255	0	0
15	719.566	3144.99	211190	0	0
16	741.107	3140.85	196163	0	0
17	762.647	3137.67	175873	0	0
18	784.188	3135.44	151631	0	0
19	805.728	3134.14	124660	0	0
20	827.268	3133.77	96506.6	0	0
21	848.809	3134.32	69063.5	0	0
22	866.934	3135.5	45457.6	0	0
23	885.059	3137.35	26499.2	0	0
24	903.184	3139.86	14082.6	0	0
25	922.666	3143.32	5480.17	0	0
26	942.147	3147.58	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.13574

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	455.593	3290	0	0	0
2	471.744	3274.37	6199.01	239.892	2.21615
3	487.896	3260	21281	1638.56	4.40288
4	493.407	3255.36	28886	2596.93	5.13724
5	515.558	3237.93	67592.3	9498.51	7.9992
6	537.709	3222.3	109110	20558.5	10.6706
7	550.666	3213.92	128356	27570.1	12.1226
8	573.985	3200.13	162286	41958.6	14.4962
9	597.304	3187.88	191538	56836.5	16.5276
10	620.624	3177.05	214613	70508.3	18.1873
11	643.943	3167.56	230382	81385.5	19.4564
12	667.263	3159.33	238039	88166.3	20.3239
13	685.068	3153.85	235354	88988.1	20.7118
14	702.873	3149.05	227451	86675.3	20.8605
15	720.678	3144.9	214851	81483.3	20.7695
16	743.343	3140.55	200855	74328.2	20.3074
17	766.008	3137.21	180660	63834.1	19.4603
18	788.672	3134.86	155542	51240.1	18.2334
19	811.337	3133.49	126947	37934.2	16.6372
20	834.002	3133.09	96882.2	25396	14.6886
21	856.667	3133.67	67879.3	14941.3	12.4137
22	875.044	3134.85	44311.2	8096.39	10.3547
23	893.421	3136.67	26337.9	3762.99	8.13103
24	911.798	3139.15	14510.5	1467.29	5.77408

25	933.119	3142.85	4216.02	215.096	2.92063
26	954.44	3147.46	0	0	0

List Of Coordinates

Water Table

X	Y
0	3194
477.2	3189
511.8	3179
543.6	3164
746.7	3145
962.8	3139
1000	3139

External Boundary

X	Y
0	3240
0	3160
0	3145
0	3047
1000	3047
1000	3123.2
1000	3125
1000	3135
1000	3139
1000	3147
900	3148
564	3260
474	3290
454	3290
439	3285
0	3285

Material Boundary

X	Y
364	3260
439	3285

Material Boundary

X	Y
364	3260
410	3260
564	3260

Material Boundary

X	Y
0	3240
304	3240
364	3260

Material Boundary

X	Y
304	3240
350.6	3240
410	3260

Material Boundary

X	Y
0	3160
88	3160
163	3185
183	3185
259	3158
313	3151
369	3157
457.82	3159.78
464.73	3159.78

493.9	3257
527.3	3257
532.52	3257
537.74	3257
564.5	3167.81
913.6	3139
949.4	3139
1000	3139

Material Boundary

X	Y
183	3185
350.6	3240

Material Boundary

X	Y
457.82	3159.78
465.2	3152
558.8	3152
564	3152
569.2	3152
574.2	3157
913.2	3129
939.4	3129
949.4	3139

Material Boundary

X	Y
532.52	3257
564	3152

Material Boundary

X	Y
527.3	3257
558.8	3152

Material Boundary

X	Y
88	3160
140.8	3160
163.3	3145
183.3	3145
205.8	3160
259	3158

Material Boundary

X	Y
183.3	3145
465.2	3152

Material Boundary

X	Y
0	3145
163.3	3145

Material Boundary

X	Y
569.2	3152
913.2	3125
1000	3125

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 1.2 - 34 EHP Main Dam - Downstream - Seismic.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - MAIN DAM - MAXIMUM STORAGE POOL - SEISMIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.03

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	40	0	40	0	0	40	0	
Friction Angle [deg]	26.4	22.8	32	28	24.8	32	28	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	560
Friction Angle [deg]	22.4
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 1.481380
Center: 831.914, 3662.818
Radius: 529.727
Left Slip Surface Endpoint: 455.593, 3290.000
Right Slip Surface Endpoint: 954.440, 3147.456
Resisting Moment=6.62391e+008 lb-ft
Driving Moment=4.47145e+008 lb-ft
Total Slice Area=21308.2 ft2

Method: janbu simplified

FS: 1.404020
Center: 825.171, 3635.845
Radius: 502.083
Left Slip Surface Endpoint: 461.194, 3290.000
Right Slip Surface Endpoint: 942.147, 3147.579
Resisting Horizontal Force=1.12834e+006 lb
Driving Horizontal Force=803647 lb
Total Slice Area=20731 ft2

Method: gle/morgenstern-price

FS: 1.484390
Center: 831.914, 3662.818
Radius: 529.727
Left Slip Surface Endpoint: 455.593, 3290.000
Right Slip Surface Endpoint: 954.440, 3147.456
Resisting Moment=6.63737e+008 lb-ft
Driving Moment=4.47145e+008 lb-ft
Resisting Horizontal Force=1.1684e+006 lb
Driving Horizontal Force=787123 lb
Total Slice Area=21308.2 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.48138

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	16.1515	16404.8	Baked Shale	40	32	323.603	479.379	703.153	0	703.153
2	16.1515	43716.4	Baked Shale	40	32	850.126	1259.36	1951.39	0	1951.39
3	5.51136	19116.6	Shell	40	26.4	927.865	1374.52	2688.37	0	2688.37
4	22.1511	94111.6	Central Core	0	22.8	985.878	1460.46	3474.3	0	3474.3
5	22.1511	119516	Central Core	0	22.8	1276.02	1890.27	4496.77	0	4496.77
6	12.9563	80092.2	Drain	0	28	1801.23	2668.31	5018.36	0	5018.36
7	23.3194	156200	Shell	40	26.4	1896.37	2809.24	5578.6	0	5578.6
8	23.3194	171349	Shell	40	26.4	2117.23	3136.42	6237.7	0	6237.7
9	23.3194	182319	Shell	40	26.4	2291.17	3394.1	6756.77	0	6756.77
10	23.3194	189268	Shell	40	26.4	2417.62	3581.41	7134.14	0	7134.14
11	23.3194	192442	Shell	40	26.4	2497.41	3699.61	7372.22	0	7372.22
12	17.8052	147118	Drain	0	28	2671.24	3957.12	7442.23	0	7442.23
13	17.8052	145677	Drain	0	28	2677.83	3966.88	7460.63	0	7460.63
14	17.8052	142810	Drain	0	28	2630.41	3896.63	7409.11	80.6383	7328.47
15	22.6648	174970	Foundation	0	24.8	2205.03	3266.49	7297.06	227.729	7069.34
16	22.6648	164454	Foundation	0	24.8	2054.09	3042.89	6953.63	368.241	6585.39
17	22.6648	151227	Foundation	0	24.8	1863.12	2759.99	6479.65	506.478	5973.18
18	22.6648	135228	Foundation	0	24.8	1648.15	2441.54	5867.12	583.153	5283.96
19	22.6648	116486	Foundation	0	24.8	1408.63	2086.71	5115	598.914	4516.08
20	22.6648	95014.5	Foundation	0	24.8	1143.81	1694.41	4221.11	554.067	3667.04
21	18.377	59189.2	Drain	0	28	1012.89	1500.48	3285.76	463.77	2821.99
22	18.377	41204.9	Drain	0	28	708.603	1049.71	2312.42	338.198	1974.22
23	18.377	24427	Drain	0	28	436.334	646.377	1387.88	172.223	1215.66

24	21.3209	18081.2	Shell	40	26.4	330.355	489.382	905.272	0	905.272
25	21.3209	6423.66	Shell	40	26.4	137.932	204.329	331.039	0	331.039

Global Minimum Query (janbu simplified) - Safety Factor: 1.40402

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	15.5339	15636.1	Baked Shale	40	32	329.026	461.959	675.274	0	675.274
2	15.5339	39023.8	Baked Shale	40	32	812.488	1140.75	1761.57	0	1761.57
3	3.41798	11013	Shell	40	26.4	891.198	1251.26	2440.07	0	2440.07
4	20.6547	81620.8	Central Core	0	22.8	949.061	1332.5	3169.89	0	3169.89
5	20.6547	105612	Central Core	0	22.8	1253.34	1759.72	4186.21	0	4186.21
6	13.1058	77855.9	Drain	0	28	1790.37	2513.72	4727.61	0	4727.61
7	23.3614	152369	Shell	40	26.4	1916.79	2691.21	5340.82	0	5340.82
8	23.3614	169073	Shell	40	26.4	2169.66	3046.25	6056.05	0	6056.05
9	23.3614	181232	Shell	40	26.4	2370.34	3328	6623.62	0	6623.62
10	23.3614	189051	Shell	40	26.4	2518.18	3535.58	7041.81	0	7041.81
11	23.3614	192821	Shell	40	26.4	2614.19	3670.37	7313.33	0	7313.33
12	17.5546	145336	Drain	0	28	2804.16	3937.09	7404.59	0	7404.59
13	17.5546	144074	Drain	0	28	2817.53	3955.87	7439.9	0	7439.9
14	17.5546	141365	Drain	0	28	2772.99	3893.33	7404.15	81.8805	7322.27
15	21.5404	167266	Foundation	0	24.8	2333.69	3276.55	7316.33	225.236	7091.1
16	21.5404	157768	Foundation	0	24.8	2189.19	3073.67	7001.27	349.237	6652.03
17	21.5404	145824	Foundation	0	24.8	2001.46	2810.09	6562.35	480.772	6081.58
18	21.5404	131373	Foundation	0	24.8	1789.45	2512.43	5991.05	553.639	5437.41
19	21.5404	114437	Foundation	0	24.8	1552.51	2179.75	5285.88	568.456	4717.42
20	21.5404	95029.7	Foundation	0	24.8	1289.82	1810.94	4444.76	525.516	3919.24
21	18.1251	62895.4	Drain	0	28	1177.74	1653.57	3546.92	437.006	3109.92
22	18.1251	45321.5	Drain	0	28	862.338	1210.74	2588.22	311.137	2277.08
23	18.1251	26325.2	Drain	0	28	523.052	734.375	1524.92	143.767	1381.16
24	19.4815	15304.9	Shell	40	26.4	326.756	458.772	843.609	0	843.609
25	19.4815	5424.22	Shell	40	26.4	137.564	193.142	308.502	0	308.502

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.48439

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	16.1515	16404.8	Baked Shale	40	32	317.924	471.923	691.219	0	691.219
2	16.1515	43716.4	Baked Shale	40	32	818.552	1215.05	1880.48	0	1880.48
3	5.51136	19116.6	Shell	40	26.4	875.579	1299.7	2537.65	0	2537.65
4	22.1511	94111.6	Central Core	0	22.8	903.994	1341.88	3192.2	0	3192.2
5	22.1511	119516	Central Core	0	22.8	1143.1	1696.8	4036.52	0	4036.52
6	12.9563	80092.2	Drain	0	28	1622.21	2407.99	4528.76	0	4528.76
7	23.3194	156200	Shell	40	26.4	1700.64	2524.42	5004.84	0	5004.84
8	23.3194	171349	Shell	40	26.4	1909.63	2834.63	5629.75	0	5629.75
9	23.3194	182319	Shell	40	26.4	2094.95	3109.73	6183.93	0	6183.93
10	23.3194	189268	Shell	40	26.4	2256.23	3349.13	6666.21	0	6666.21
11	23.3194	192442	Shell	40	26.4	2391.7	3550.22	7071.3	0	7071.3
12	17.8052	147118	Drain	0	28	2645.31	3926.67	7385.01	0	7385.01
13	17.8052	145677	Drain	0	28	2716.94	4033	7584.97	0	7584.97
14	17.8052	142810	Drain	0	28	2730.87	4053.67	7704.49	80.6383	7623.85
15	22.6648	174970	Foundation	0	24.8	2302.68	3418.08	7625.11	227.729	7397.38

16	22.6648	164454	Foundation	0	24.8	2203.24	3270.47	7446.18	368.241	7077.93
17	22.6648	151227	Foundation	0	24.8	2046.52	3037.84	7080.94	506.478	6574.46
18	22.6648	135228	Foundation	0	24.8	1845.75	2739.81	6512.63	583.153	5929.47
19	22.6648	116486	Foundation	0	24.8	1598.16	2372.3	5733.04	598.914	5134.13
20	22.6648	95014.5	Foundation	0	24.8	1304.68	1936.66	4745.4	554.067	4191.33
21	18.377	59189.2	Drain	0	28	1165.72	1730.39	3718.17	463.77	3254.4
22	18.377	41204.9	Drain	0	28	807.456	1198.58	2592.4	338.198	2254.2
23	18.377	24427	Drain	0	28	490.471	728.05	1541.48	172.223	1369.26
24	21.3209	18081.2	Shell	40	26.4	355.349	527.477	982.016	0	982.016
25	21.3209	6423.66	Shell	40	26.4	143.669	213.261	349.032	0	349.032

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.48138

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	455.593	3290	0	0	0
2	471.744	3274.37	6261.95	0	0
3	487.896	3260	21915.8	0	0
4	493.407	3255.36	29864.9	0	0
5	515.558	3237.93	71437	0	0
6	537.709	3222.3	117082	0	0
7	550.666	3213.92	138256	0	0
8	573.985	3200.13	175740	0	0
9	597.304	3187.88	208003	0	0
10	620.624	3177.05	233268	0	0
11	643.943	3167.56	250374	0	0
12	667.263	3159.33	258708	0	0
13	685.068	3153.85	256411	0	0
14	702.873	3149.05	249018	0	0
15	720.678	3144.9	237273	0	0
16	743.343	3140.55	224401	0	0
17	766.008	3137.21	206093	0	0
18	788.672	3134.86	183690	0	0
19	811.337	3133.49	158484	0	0
20	834.002	3133.09	132131	0	0
21	856.667	3133.67	106677	0	0
22	875.044	3134.85	85993.7	0	0
23	893.421	3136.67	70012.1	0	0
24	911.798	3139.15	59305.2	0	0
25	933.119	3142.85	49467.3	0	0
26	954.44	3147.46	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 1.40402

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	461.194	3290	0	0	0
2	476.728	3274.35	5924.43	0	0
3	492.262	3260	19763.7	0	0

4	495.68	3257	24369	0	0
5	516.335	3239.98	61167.4	0	0
6	536.99	3224.7	102421	0	0
7	550.095	3215.82	123287	0	0
8	573.457	3201.42	160014	0	0
9	596.818	3188.7	191455	0	0
10	620.18	3177.52	215587	0	0
11	643.541	3167.77	231099	0	0
12	666.903	3159.36	237309	0	0
13	684.457	3153.88	233004	0	0
14	702.012	3149.1	223455	0	0
15	719.566	3144.99	209445	0	0
16	741.107	3140.85	194528	0	0
17	762.647	3137.67	174376	0	0
18	784.188	3135.44	150302	0	0
19	805.728	3134.14	123490	0	0
20	827.268	3133.77	95457.4	0	0
21	848.809	3134.32	68077.1	0	0
22	866.934	3135.5	44426.1	0	0
23	885.059	3137.35	25385.7	0	0
24	903.184	3139.86	12864.9	0	0
25	922.666	3143.32	4042.05	0	0
26	942.147	3147.58	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.48439

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	455.593	3290	0	0	0
2	471.744	3274.37	6150.89	264.737	2.46451
3	487.896	3260	21253	1820.02	4.89463
4	493.407	3255.36	28774.8	2877.21	5.71006
5	515.558	3237.93	67178.1	10499.6	8.88318
6	537.709	3222.3	108490	22735.4	11.8358
7	550.666	3213.92	127809	30532.8	13.4358
8	573.985	3200.13	161811	46530	16.043
9	597.304	3187.88	191319	63141.5	18.2646
10	620.624	3177.05	214798	78487.1	20.0723
11	643.943	3167.56	231054	90781.5	21.4499
12	667.263	3159.33	239195	98535.1	22.3889
13	685.068	3153.85	236897	99622	22.8082
14	702.873	3149.05	229254	97164.8	22.9687
15	720.678	3144.9	216794	91445.9	22.8705
16	743.343	3140.55	202977	83541.6	22.3712
17	766.008	3137.21	182783	71830.7	21.454
18	788.672	3134.86	157496	57705.4	20.1225
19	811.337	3133.49	128570	42730.1	18.3842
20	834.002	3133.09	98059.4	28588.8	16.2538
21	856.667	3133.67	68571.3	16787.1	13.7562
22	875.044	3134.85	44506.3	9044.49	11.4871
23	893.421	3136.67	26153.7	4155.95	9.02909

24	911.798	3139.15	14045.1	1579.58	6.4168
25	933.119	3142.85	3367.43	191.079	3.24767
26	954.44	3147.46	0	0	0

List Of Coordinates

Water Table

X	Y
0	3194
477.2	3189
511.8	3179
543.6	3164
746.7	3145
962.8	3139
1000	3139

External Boundary

X	Y
0	3240
0	3160
0	3145
0	3047
1000	3047
1000	3123.2
1000	3125
1000	3135
1000	3139
1000	3147
900	3148
564	3260
474	3290
454	3290
439	3285
0	3285

Material Boundary

X	Y
364	3260
439	3285

Material Boundary

X	Y
364	3260
410	3260
564	3260

Material Boundary

X	Y
0	3240
304	3240
364	3260

Material Boundary

X	Y
304	3240
350.6	3240
410	3260

Material Boundary

X	Y
0	3160
88	3160
163	3185
183	3185
259	3158
313	3151
369	3157
457.82	3159.78
464.73	3159.78
493.9	3257
527.3	3257
532.52	3257
537.74	3257
564.5	3167.81
913.6	3139
949.4	3139
1000	3139

Material Boundary

X	Y
183	3185
350.6	3240

Material Boundary

X	Y
457.82	3159.78
465.2	3152
558.8	3152
564	3152
569.2	3152
574.2	3157
913.2	3129

939.4	3129
949.4	3139

Material Boundary

X	Y
532.52	3257
564	3152

Material Boundary

X	Y
527.3	3257
558.8	3152

Material Boundary

X	Y
88	3160
140.8	3160
163.3	3145
183.3	3145
205.8	3160
259	3158

Material Boundary

X	Y
183.3	3145
465.2	3152

Material Boundary

X	Y
0	3145
163.3	3145

Material Boundary

X	Y
569.2	3152
913.2	3125
1000	3125

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 1.1 - 34 EHP Main Dam - Downstream - Static - Max Surcharge.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - MAIN DAM - MAXIMUM SURCHARGE POOL - STATIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 151
Orientation: Normal to boundary

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								

Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	31	40	35	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.133990
Center: 831.914, 3662.818
Radius: 529.727
Left Slip Surface Endpoint: 455.593, 3290.000
Right Slip Surface Endpoint: 954.440, 3147.456
Resisting Moment=8.73744e+008 lb-ft
Driving Moment=4.09442e+008 lb-ft
Total Slice Area=21308.2 ft2

Method: janbu simplified

FS: 2.023190
Center: 825.171, 3635.845
Radius: 502.083
Left Slip Surface Endpoint: 461.194, 3290.000
Right Slip Surface Endpoint: 942.147, 3147.579
Resisting Horizontal Force=1.48879e+006 lb
Driving Horizontal Force=735865 lb
Total Slice Area=20731 ft2

Method: gle/morgenstern-price

FS: 2.135750
Center: 831.914, 3662.818
Radius: 529.727
Left Slip Surface Endpoint: 455.593, 3290.000
Right Slip Surface Endpoint: 954.440, 3147.456
Resisting Moment=8.74465e+008 lb-ft
Driving Moment=4.09442e+008 lb-ft
Resisting Horizontal Force=1.53898e+006 lb
Driving Horizontal Force=720582 lb
Total Slice Area=21308.2 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.13399

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	16.1515	16404.8	Baked Shale	50	40	306.348	653.743	719.515	0	719.515
2	16.1515	43716.4	Baked Shale	50	40	805.894	1719.77	1989.95	0	1989.95
3	5.51136	19116.6	Shell	50	33	858.95	1832.99	2745.57	0	2745.57
4	22.1511	94111.6	Central Core	0	28.5	900.791	1922.28	3540.4	0	3540.4
5	22.1511	119516	Central Core	0	28.5	1163.99	2483.94	4574.86	0	4574.86
6	12.9563	80092.2	Drain	0	35	1673.36	3570.94	5099.83	0	5099.83
7	23.3194	156200	Shell	50	33	1747.51	3729.17	5665.41	0	5665.41
8	23.3194	171349	Shell	50	33	1948.3	4157.65	6325.2	0	6325.2
9	23.3194	182319	Shell	50	33	2105.51	4493.13	6841.8	0	6841.8
10	23.3194	189268	Shell	50	33	2218.76	4734.82	7213.98	0	7213.98
11	23.3194	192442	Shell	50	33	2289.02	4884.75	7444.85	0	7444.85
12	17.8052	147118	Drain	0	35	2462.72	5255.42	7505.52	0	7505.52
13	17.8052	145677	Drain	0	35	2466.44	5263.36	7516.86	0	7516.86
14	17.8052	142810	Drain	0	35	2420.46	5165.24	7457.36	80.6383	7376.72
15	22.6648	174970	Foundation	0	31	2001.37	4270.91	7335.71	227.729	7107.98
16	22.6648	164454	Foundation	0	31	1862.11	3973.72	6981.61	368.241	6613.37
17	22.6648	151227	Foundation	0	31	1686.92	3599.88	6497.69	506.478	5991.21

18	22.6648	135228	Foundation	0	31	1490.44	3180.59	5876.54	583.153	5293.39
19	22.6648	116486	Foundation	0	31	1272.24	2714.94	5117.33	598.914	4518.42
20	22.6648	95014.5	Foundation	0	31	1031.72	2201.69	4218.3	554.067	3664.23
21	18.377	59189.2	Drain	0	35	924.109	1972.04	3280.13	463.77	2816.36
22	18.377	41204.9	Drain	0	35	645.762	1378.05	2306.26	338.198	1968.06
23	18.377	24427	Drain	0	35	397.174	847.565	1382.67	172.223	1210.45
24	21.3209	18081.2	Shell	50	33	297.187	634.195	899.583	0	899.583
25	21.3209	6423.66	Shell	50	33	123.213	262.935	327.892	0	327.892

Global Minimum Query (janbu simplified) - Safety Factor: 2.02319

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	15.5339	15636.1	Baked Shale	50	40	312.121	631.48	692.981	0	692.981
2	15.5339	39023.8	Baked Shale	50	40	771.613	1561.12	1800.88	0	1800.88
3	3.41798	11013	Shell	50	33	826.625	1672.42	2498.32	0	2498.32
4	20.6547	81620.8	Central Core	0	28.5	868.841	1757.83	3237.53	0	3237.53
5	20.6547	105612	Central Core	0	28.5	1145.36	2317.29	4267.94	0	4267.94
6	13.1058	77855.9	Drain	0	35	1666.16	3370.96	4814.23	0	4814.23
7	23.3614	152369	Shell	50	33	1769.02	3579.06	5434.28	0	5434.28
8	23.3614	169073	Shell	50	33	1999.15	4044.67	6151.27	0	6151.27
9	23.3614	181232	Shell	50	33	2180.64	4411.85	6716.68	0	6716.68
10	23.3614	189051	Shell	50	33	2313.14	4679.92	7129.43	0	7129.43
11	23.3614	192821	Shell	50	33	2397.76	4851.12	7393.08	0	7393.08
12	17.5546	145336	Drain	0	35	2586.74	5233.46	7474.15	0	7474.15
13	17.5546	144074	Drain	0	35	2596.27	5252.74	7501.68	0	7501.68
14	17.5546	141365	Drain	0	35	2552.48	5164.15	7457.07	81.8805	7375.19
15	21.5404	167266	Foundation	0	31	2118.52	4286.17	7358.64	225.236	7133.4
16	21.5404	157768	Foundation	0	31	1984.71	4015.45	7032.08	349.237	6682.85
17	21.5404	145824	Foundation	0	31	1812.1	3666.23	6582.39	480.772	6101.62
18	21.5404	131373	Foundation	0	31	1617.97	3273.46	6001.57	553.639	5447.93
19	21.5404	114437	Foundation	0	31	1401.8	2836.1	5288.52	568.456	4720.07
20	21.5404	95029.7	Foundation	0	31	1162.98	2352.93	4441.44	525.516	3915.92
21	18.1251	62895.4	Drain	0	35	1073.92	2172.74	3540	437.006	3102.99
22	18.1251	45321.5	Drain	0	35	785.304	1588.82	2580.2	311.137	2269.07
23	18.1251	26325.2	Drain	0	35	475.684	962.399	1518.21	143.767	1374.44
24	19.4815	15304.9	Shell	50	33	293.57	593.948	837.605	0	837.605
25	19.4815	5424.22	Shell	50	33	122.674	248.192	305.189	0	305.189

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.13575

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	16.1515	16404.8	Baked Shale	50	40	301.869	644.717	708.755	0	708.755
2	16.1515	43716.4	Baked Shale	50	40	780.007	1665.9	1925.76	0	1925.76
3	5.51136	19116.6	Shell	50	33	816.144	1743.08	2607.12	0	2607.12
4	22.1511	94111.6	Central Core	0	28.5	834.171	1781.58	3281.27	0	3281.27
5	22.1511	119516	Central Core	0	28.5	1055.85	2255.03	4153.24	0	4153.24
6	12.9563	80092.2	Drain	0	35	1526.06	3259.29	4654.75	0	4654.75
7	23.3194	156200	Shell	50	33	1587.6	3390.72	5144.25	0	5144.25
8	23.3194	171349	Shell	50	33	1779.84	3801.29	5776.48	0	5776.48
9	23.3194	182319	Shell	50	33	1947.73	4159.86	6328.63	0	6328.63
10	23.3194	189268	Shell	50	33	2090.7	4465.21	6798.83	0	6798.83
11	23.3194	192442	Shell	50	33	2207.23	4714.09	7182.05	0	7182.05
12	17.8052	147118	Drain	0	35	2447.11	5226.42	7464.08	0	7464.08
13	17.8052	145677	Drain	0	35	2503.84	5347.58	7637.13	0	7637.13
14	17.8052	142810	Drain	0	35	2507.64	5355.69	7729.38	80.6383	7648.74
15	22.6648	174970	Foundation	0	31	2084.14	4451.2	7635.77	227.729	7408.04
16	22.6648	164454	Foundation	0	31	1985.63	4240.8	7426.1	368.241	7057.86
17	22.6648	151227	Foundation	0	31	1837.1	3923.59	7036.44	506.478	6529.96
18	22.6648	135228	Foundation	0	31	1650.99	3526.11	6451.59	583.153	5868.43
19	22.6648	116486	Foundation	0	31	1425.31	3044.11	5665.15	598.914	5066.24
20	22.6648	95014.5	Foundation	0	31	1160.94	2479.47	4680.6	554.067	4126.54
21	18.377	59189.2	Drain	0	35	1047.48	2237.15	3658.76	463.77	3194.99
22	18.377	41204.9	Drain	0	35	724.93	1548.27	2549.36	338.198	2211.16
23	18.377	24427	Drain	0	35	439.734	939.162	1513.49	172.223	1341.27
24	21.3209	18081.2	Shell	50	33	315.906	674.696	961.946	0	961.946
25	21.3209	6423.66	Shell	50	33	126.468	270.103	338.929	0	338.929

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.13399

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	455.593	3290	0	0	0

2	471.744	3274.37	6298.57	0	0
3	487.896	3260	21895.1	0	0
4	493.407	3255.36	29910.5	0	0
5	515.558	3237.93	71672.2	0	0
6	537.709	3222.3	117403	0	0
7	550.666	3213.92	138488	0	0
8	573.985	3200.13	175907	0	0
9	597.304	3187.88	207988	0	0
10	620.624	3177.05	232975	0	0
11	643.943	3167.56	249737	0	0
12	667.263	3159.33	257692	0	0
13	685.068	3153.85	254989	0	0
14	702.873	3149.05	247208	0	0
15	720.678	3144.9	235066	0	0
16	743.343	3140.55	221674	0	0
17	766.008	3137.21	202826	0	0
18	788.672	3134.86	179876	0	0
19	811.337	3133.49	154159	0	0
20	834.002	3133.09	127369	0	0
21	856.667	3133.67	101578	0	0
22	875.044	3134.85	80737	0	0
23	893.421	3136.67	64671.2	0	0
24	911.798	3139.15	53955.3	0	0
25	933.119	3142.85	44295.4	0	0
26	954.44	3147.46	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.02319

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	461.194	3290	0	0	0
2	476.728	3274.35	6005.45	0	0
3	492.262	3260	19899.2	0	0
4	495.68	3257	24575.7	0	0
5	516.335	3239.98	61772	0	0
6	536.99	3224.7	103387	0	0
7	550.095	3215.82	124361	0	0
8	573.457	3201.42	161404	0	0
9	596.818	3188.7	193069	0	0
10	620.18	3177.52	217345	0	0
11	643.541	3167.77	232947	0	0
12	666.903	3159.36	239218	0	0
13	684.457	3153.88	234849	0	0
14	702.012	3149.1	225255	0	0
15	719.566	3144.99	211190	0	0
16	741.107	3140.85	196163	0	0
17	762.647	3137.67	175873	0	0
18	784.188	3135.44	151631	0	0
19	805.728	3134.14	124660	0	0
20	827.268	3133.77	96506.6	0	0
21	848.809	3134.32	69063.5	0	0
22	866.934	3135.5	45457.6	0	0
23	885.059	3137.35	26499.2	0	0
24	903.184	3139.86	14082.6	0	0
25	922.666	3143.32	5480.17	0	0
26	942.147	3147.58	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.13575

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	455.593	3290	0	0	0
2	471.744	3274.37	6199.04	239.917	2.21637
3	487.896	3260	21281	1638.73	4.40334
4	493.407	3255.36	28886	2597.19	5.13775
5	515.558	3237.93	67592.2	9499.44	7.99998
6	537.709	3222.3	109110	20560.5	10.6716
7	550.666	3213.92	128356	27572.7	12.1237
8	573.985	3200.13	162285	41962.6	14.4976
9	597.304	3187.88	191538	56841.9	16.5291
10	620.624	3177.05	214613	70515.1	18.1889
11	643.943	3167.56	230381	81393.5	19.4583
12	667.263	3159.33	238039	88175	20.3258
13	685.068	3153.85	235354	88997	20.7137
14	702.873	3149.05	227451	86684	20.8624
15	720.678	3144.9	214852	81491.6	20.7713

16	743.343	3140.55	200855	74335.9	20.3094
17	766.008	3137.21	180661	63840.7	19.462
18	788.672	3134.86	155543	51245.4	18.2351
19	811.337	3133.49	126947	37938.2	16.6388
20	834.002	3133.09	96882.8	25398.7	14.69
21	856.667	3133.67	67879.7	14942.8	12.4149
22	875.044	3134.85	44311.4	8097.23	10.3557
23	893.421	3136.67	26338	3763.37	8.1318
24	911.798	3139.15	14510.6	1467.44	5.77462
25	933.119	3142.85	4216.01	215.117	2.92092
26	954.44	3147.46	0	0	0

List Of Coordinates

Water Table

X	Y
0	3194
477.2	3189
511.8	3179
543.6	3164
746.7	3145
962.8	3139
1000	3139

Line Load

X	Y
454	3290
439	3285
0	3285

External Boundary

X	Y
0	3240
0	3160
0	3145
0	3047
1000	3047
1000	3123.2
1000	3125
1000	3135
1000	3139
1000	3147
900	3148
564	3260
474	3290
454	3290
439	3285
0	3285

Material Boundary

X	Y
364	3260
439	3285

Material Boundary

X	Y
364	3260
410	3260
564	3260

Material Boundary

X	Y
0	3240
304	3240
364	3260

Material Boundary

X	Y

304	3240
350.6	3240
410	3260

Material Boundary

X	Y
0	3160
88	3160
163	3185
183	3185
259	3158
313	3151
369	3157
457.82	3159.78
464.73	3159.78
493.9	3257
527.3	3257
532.52	3257
537.74	3257
564.5	3167.81
913.6	3139
949.4	3139
1000	3139

Material Boundary

X	Y
183	3185
350.6	3240

Material Boundary

X	Y
457.82	3159.78
465.2	3152
558.8	3152
564	3152
569.2	3152
574.2	3157
913.2	3129
939.4	3129
949.4	3139

Material Boundary

X	Y
532.52	3257
564	3152

Material Boundary

X	Y
527.3	3257
558.8	3152

Material Boundary

X	Y
88	3160
140.8	3160
163.3	3145
183.3	3145
205.8	3160
259	3158

Material Boundary

X	Y
183.3	3145
465.2	3152

Material Boundary

X	Y

0	3145
163.3	3145

Material Boundary

X	Y
569.2	3152
913.2	3125
1000	3125

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 1.3 - 34 EHP Main Dam - Upstream - Static.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - MAIN DAM - EXISTING CONDITIONS - STATIC ANALYSIS - UPSTREAM SLOPE
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	31	40	28	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 3.195350
Center: 423.754, 3323.215
Radius: 45.580
Left Slip Surface Endpoint: 418.000, 3278.000
Right Slip Surface Endpoint: 454.967, 3290.000
Resisting Moment=670983 lb-ft
Driving Moment=209988 lb-ft
Total Slice Area=119.447 ft2

Method: janbu simplified

FS: 3.056650
Center: 425.463, 3318.087

Radius: 40.775
Left Slip Surface Endpoint: 418.000, 3278.000
Right Slip Surface Endpoint: 455.023, 3290.000
Resisting Horizontal Force=15342.9 lb
Driving Horizontal Force=5019.51 lb
Total Slice Area=135.805 ft2

Method: gle/morgenstern-price

FS: 3.194030
Center: 423.754, 3323.215
Radius: 45.580
Left Slip Surface Endpoint: 418.000, 3278.000
Right Slip Surface Endpoint: 454.967, 3290.000
Resisting Moment=670708 lb-ft
Driving Moment=209988 lb-ft
Resisting Horizontal Force=13770.5 lb
Driving Horizontal Force=4311.32 lb
Total Slice Area=119.447 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 3.19535

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.47868	63.1073	Baked Shale	50	40	27.659	88.3803	45.7399	0	45.7399
2	1.47868	184.648	Baked Shale	50	40	49.45	158.01	128.722	0	128.722
3	1.47868	296.878	Baked Shale	50	40	69.1915	221.091	203.898	0	203.898
4	1.47868	399.851	Baked Shale	50	40	86.9473	277.827	271.514	0	271.514
5	1.47868	493.595	Baked Shale	50	40	102.772	328.394	331.777	0	331.777
6	1.47868	578.107	Baked Shale	50	40	116.712	372.936	384.859	0	384.859
7	1.47868	653.352	Baked Shale	50	40	128.804	411.573	430.906	0	430.906
8	1.47868	719.27	Baked Shale	50	40	139.077	444.401	470.028	0	470.028
9	1.47868	775.767	Baked Shale	50	40	147.557	471.495	502.317	0	502.317
10	1.47868	822.718	Baked Shale	50	40	154.258	492.907	527.836	0	527.836
11	1.47868	859.961	Baked Shale	50	40	159.191	508.672	546.624	0	546.624
12	1.47868	887.301	Baked Shale	50	40	162.362	518.803	558.697	0	558.697
13	1.47868	904.497	Baked Shale	50	40	163.768	523.295	564.05	0	564.05
14	1.47868	911.267	Baked Shale	50	40	163.401	522.122	562.653	0	562.653
15	1.47868	907.276	Baked Shale	50	40	161.247	515.241	554.453	0	554.453
16	1.47868	892.129	Baked Shale	50	40	157.287	502.587	539.372	0	539.372
17	1.47868	865.367	Baked Shale	50	40	151.492	484.071	517.306	0	517.306
18	1.47868	826.449	Baked Shale	50	40	143.829	459.585	488.125	0	488.125
19	1.47868	774.743	Baked Shale	50	40	134.255	428.993	451.667	0	451.667
20	1.47868	709.503	Baked Shale	50	40	122.72	392.133	407.739	0	407.739
21	1.47868	629.846	Baked Shale	50	40	109.163	348.813	356.111	0	356.111
22	1.47868	534.722	Baked Shale	50	40	93.5128	298.806	296.516	0	296.516
23	1.47868	422.863	Baked Shale	50	40	75.6881	241.85	228.638	0	228.638
24	1.47868	292.732	Baked Shale	50	40	55.5933	177.64	152.116	0	152.116
25	1.47868	122.163	Baked Shale	50	40	30.2077	96.5241	55.4451	0	55.4451

Global Minimum Query (janbu simplified) - Safety Factor: 3.05665

				Base	Base	Shear	Shear	Base	Pore	Effective

Number	[ft]	[lbs]	Material	Cohesion [psf]	Friction Angle [degrees]	Stress [psf]	Strength [psf]	Normal Stress [psf]	Pressure [psf]	Normal Stress [psf]
1	1.48092	71.3515	Baked Shale	50	40	31.0088	94.7829	53.3702	0	53.3702
2	1.48092	208.703	Baked Shale	50	40	57.0785	174.469	148.336	0	148.336
3	1.48092	335.428	Baked Shale	50	40	80.5872	246.327	233.974	0	233.974
4	1.48092	451.656	Baked Shale	50	40	101.645	310.694	310.683	0	310.683
5	1.48092	557.472	Baked Shale	50	40	120.344	367.849	378.797	0	378.797
6	1.48092	652.918	Baked Shale	50	40	136.76	418.026	438.596	0	438.596
7	1.48092	737.996	Baked Shale	50	40	150.955	461.417	490.308	0	490.308
8	1.48092	812.667	Baked Shale	50	40	162.982	498.178	534.118	0	534.118
9	1.48092	876.849	Baked Shale	50	40	172.878	528.429	570.17	0	570.17
10	1.48092	930.417	Baked Shale	50	40	180.676	552.262	598.572	0	598.572
11	1.48092	973.197	Baked Shale	50	40	186.392	569.736	619.397	0	619.397
12	1.48092	1004.97	Baked Shale	50	40	190.04	580.885	632.684	0	632.684
13	1.48092	1025.46	Baked Shale	50	40	191.62	585.715	638.441	0	638.441
14	1.48092	1034.32	Baked Shale	50	40	191.126	584.204	636.64	0	636.64
15	1.48092	1031.15	Baked Shale	50	40	188.54	576.302	627.222	0	627.222
16	1.48092	1015.46	Baked Shale	50	40	183.839	561.931	610.095	0	610.095
17	1.48092	986.662	Baked Shale	50	40	176.985	540.98	585.127	0	585.127
18	1.48092	944.062	Baked Shale	50	40	167.932	513.308	552.149	0	552.149
19	1.48092	886.826	Baked Shale	50	40	156.621	478.736	510.947	0	510.947
20	1.48092	813.948	Baked Shale	50	40	142.982	437.045	461.262	0	461.262
21	1.48092	724.211	Baked Shale	50	40	126.927	387.971	402.778	0	402.778
22	1.48092	616.126	Baked Shale	50	40	108.354	331.199	335.12	0	335.12
23	1.48092	487.841	Baked Shale	50	40	87.1398	266.356	257.843	0	257.843
24	1.48092	337.02	Baked Shale	50	40	63.1423	193.004	170.426	0	170.426
25	1.48092	137.974	Baked Shale	50	40	32.8962	100.552	60.2455	0	60.2455

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 3.19403

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.47868	63.1073	Baked Shale	50	40	28.0889	89.7169	47.3328	0	47.3328
2	1.47868	184.648	Baked Shale	50	40	51.4093	164.203	136.102	0	136.102
3	1.47868	296.878	Baked Shale	50	40	73.3547	234.297	219.637	0	219.637
4	1.47868	399.851	Baked Shale	50	40	93.5276	298.73	296.425	0	296.425
5	1.47868	493.595	Baked Shale	50	40	111.563	356.334	365.075	0	365.075
6	1.47868	578.107	Baked Shale	50	40	127.163	406.161	424.456	0	424.456
7	1.47868	653.352	Baked Shale	50	40	140.125	447.563	473.798	0	473.798
8	1.47868	719.27	Baked Shale	50	40	150.354	480.236	512.735	0	512.735
9	1.47868	775.767	Baked Shale	50	40	157.862	504.215	541.312	0	541.312
10	1.47868	822.718	Baked Shale	50	40	162.755	519.843	559.937	0	559.937
11	1.47868	859.961	Baked Shale	50	40	165.216	527.705	569.307	0	569.307
12	1.47868	887.301	Baked Shale	50	40	165.479	528.546	570.309	0	570.309
13	1.47868	904.497	Baked Shale	50	40	163.801	523.184	563.918	0	563.918
14	1.47868	911.267	Baked Shale	50	40	160.431	512.421	551.092	0	551.092
15	1.47868	907.276	Baked Shale	50	40	155.595	496.975	532.684	0	532.684
16	1.47868	892.129	Baked Shale	50	40	149.472	477.419	509.379	0	509.379
17	1.47868	865.367	Baked Shale	50	40	142.185	454.144	481.64	0	481.64
18	1.47868	826.449	Baked Shale	50	40	133.792	427.335	449.69	0	449.69
19	1.47868	774.743	Baked Shale	50	40	124.281	396.956	413.486	0	413.486
20	1.47868	709.503	Baked Shale	50	40	113.569	362.743	372.713	0	372.713

21	1.47868	629.846	Baked Shale	50	40	101.497	324.185	326.761	0	326.761
22	1.47868	534.722	Baked Shale	50	40	87.8179	280.493	274.691	0	274.691
23	1.47868	422.863	Baked Shale	50	40	72.1797	230.544	215.165	0	215.165
24	1.47868	292.732	Baked Shale	50	40	54.1028	172.806	146.354	0	146.354
25	1.47868	122.163	Baked Shale	50	40	30.0313	95.9209	54.7261	0	54.7261

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 3.19535

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	418	3278	0	0	0
2	419.479	3277.84	48.3861	0	0
3	420.957	3277.72	136.318	0	0
4	422.436	3277.65	252.253	0	0
5	423.915	3277.64	385.916	0	0
6	425.393	3277.66	528.19	0	0
7	426.872	3277.74	671.022	0	0
8	428.351	3277.87	807.352	0	0
9	429.829	3278.04	931.057	0	0
10	431.308	3278.27	1036.91	0	0
11	432.787	3278.54	1120.56	0	0
12	434.266	3278.86	1178.5	0	0
13	435.744	3279.24	1208.11	0	0
14	437.223	3279.67	1207.64	0	0
15	438.702	3280.16	1176.26	0	0
16	440.18	3280.7	1114.11	0	0
17	441.659	3281.3	1022.39	0	0
18	443.138	3281.96	903.438	0	0
19	444.616	3282.69	760.896	0	0
20	446.095	3283.49	599.876	0	0
21	447.574	3284.35	427.205	0	0
22	449.052	3285.3	251.732	0	0
23	450.531	3286.33	84.7539	0	0
24	452.01	3287.45	-59.4303	0	0
25	453.488	3288.67	-162.745	0	0
26	454.967	3290	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 3.05665

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	418	3278	0	0	0
2	419.481	3277.75	59.1834	0	0
3	420.962	3277.56	172.281	0	0
4	422.443	3277.42	323.85	0	0
5	423.924	3277.34	500.306	0	0
6	425.405	3277.31	689.709	0	0
7	426.886	3277.34	881.585	0	0
8	428.366	3277.41	1066.8	0	0

9	429.847	3277.55	1237.43	0	0
10	431.328	3277.74	1386.73	0	0
11	432.809	3277.98	1509.03	0	0
12	434.29	3278.28	1599.72	0	0
13	435.771	3278.64	1655.25	0	0
14	437.252	3279.05	1673.13	0	0
15	438.733	3279.53	1651.97	0	0
16	440.214	3280.07	1591.56	0	0
17	441.695	3280.68	1492.94	0	0
18	443.176	3281.36	1358.55	0	0
19	444.657	3282.11	1192.42	0	0
20	446.138	3282.94	1000.45	0	0
21	447.618	3283.86	790.712	0	0
22	449.099	3284.86	573.973	0	0
23	450.58	3285.97	364.343	0	0
24	452.061	3287.18	180.214	0	0
25	453.542	3288.52	45.6245	0	0
26	455.023	3290	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 3.19403

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	418	3278	0	0	0
2	419.479	3277.84	49.2633	2.28632	2.6572
3	420.957	3277.72	140.907	12.9759	5.26144
4	422.436	3277.65	263.999	35.9869	7.7624
5	423.915	3277.64	407.796	72.747	10.1146
6	425.393	3277.66	562.018	122.325	12.2791
7	426.872	3277.74	717.156	181.788	14.224
8	428.351	3277.87	864.743	246.726	15.9244
9	429.829	3278.04	997.574	311.892	17.3619
10	431.308	3278.27	1109.84	371.854	18.5235
11	432.787	3278.54	1197.15	421.602	19.4008
12	434.266	3278.86	1256.53	457.043	19.9881
13	435.744	3279.24	1286.26	475.355	20.2825
14	437.223	3279.67	1285.78	475.179	20.2825
15	438.702	3280.16	1255.51	456.675	19.9882
16	440.18	3280.7	1196.7	421.444	19.4008
17	441.659	3281.3	1111.35	372.362	18.5236
18	443.138	3281.96	1002.19	313.334	17.3618
19	444.616	3282.69	872.682	248.991	15.9243
20	446.095	3283.49	727.22	184.339	14.224
21	447.574	3284.35	571.361	124.359	12.2791
22	449.052	3285.3	412.251	73.5417	10.1146
23	450.531	3286.33	259.26	35.3408	7.76238
24	452.01	3287.45	124.931	11.5047	5.26144
25	453.488	3288.67	26.4016	1.2253	2.65719
26	454.967	3290	0	0	0

List Of Coordinates

Water Table

X	Y
0	3278
418	3278
511.8	3179
543.6	3164
746.7	3145
962.8	3139
1000	3139

External Boundary

X	Y
0	3240
0	3160
0	3145
0	3047
1000	3047
1000	3123.2
1000	3125
1000	3135
1000	3139
1000	3147
900	3148
564	3260
474	3290
454	3290
439	3285
418	3278
0	3278

Material Boundary

X	Y
364	3260
418	3278

Material Boundary

X	Y
364	3260
410	3260
564	3260

Material Boundary

X	Y
0	3240
304	3240

364	3260

Material Boundary

X	Y
304	3240
350.6	3240
410	3260

Material Boundary

X	Y
0	3160
88	3160
163	3185
183	3185
259	3158
313	3151
369	3157
457.82	3159.78
464.73	3159.78
493.9	3257
527.3	3257
532.52	3257
537.74	3257
564.5	3167.81
913.6	3139
949.4	3139
1000	3139

Material Boundary

X	Y
183	3185
350.6	3240

Material Boundary

X	Y
457.82	3159.78
465.2	3152
558.8	3152
564	3152
569.2	3152
574.2	3157
913.2	3129
939.4	3129
949.4	3139

Material Boundary

X	Y
532.52	3257
564	3152

Material Boundary

X	Y
527.3	3257
558.8	3152

Material Boundary

X	Y
88	3160
140.8	3160
163.3	3145
183.3	3145
205.8	3160
259	3158

Material Boundary

X	Y
183.3	3145
465.2	3152

Material Boundary

X	Y
0	3145
163.3	3145

Material Boundary

X	Y
569.2	3152
913.2	3125
1000	3125

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 1.4 - 34 EHP Main Dam - Upstream - Seismic.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - MAIN DAM - EXISTING CONDITIONS - SEISMIC ANALYSIS - UPSTREAM SLOPE
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.03

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	40	0	40	0	0	40	0	
Friction Angle [deg]	26.4	22.8	32	28	24.8	32	28	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	560
Friction Angle [deg]	22.4
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.188140
Center: 423.754, 3323.215
Radius: 45.580
Left Slip Surface Endpoint: 418.000, 3278.000
Right Slip Surface Endpoint: 454.967, 3290.000
Resisting Moment=500968 lb-ft
Driving Moment=228947 lb-ft
Total Slice Area=119.447 ft2

Method: janbu simplified

FS: 2.088640
Center: 426.033, 3316.947
Radius: 39.767
Left Slip Surface Endpoint: 418.000, 3278.000
Right Slip Surface Endpoint: 455.278, 3290.000
Resisting Horizontal Force=12058.8 lb
Driving Horizontal Force=5773.49 lb
Total Slice Area=143.858 ft2

Method: gle/morgenstern-price

FS: 2.188000
Center: 423.754, 3323.215
Radius: 45.580
Left Slip Surface Endpoint: 418.000, 3278.000
Right Slip Surface Endpoint: 454.967, 3290.000
Resisting Moment=500936 lb-ft
Driving Moment=228947 lb-ft
Resisting Horizontal Force=10288.8 lb
Driving Horizontal Force=4702.37 lb
Total Slice Area=119.447 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.18814

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.47868	63.1073	Baked Shale	40	32	31.4619	68.8431	46.1586	0	46.1586
2	1.47868	184.648	Baked Shale	40	32	55.1657	120.71	129.163	0	129.163
3	1.47868	296.878	Baked Shale	40	32	76.6025	167.617	204.23	0	204.23
4	1.47868	399.851	Baked Shale	40	32	95.849	209.731	271.626	0	271.626
5	1.47868	493.595	Baked Shale	40	32	112.969	247.192	331.577	0	331.577
6	1.47868	578.107	Baked Shale	40	32	128.018	280.121	384.273	0	384.273
7	1.47868	653.352	Baked Shale	40	32	141.04	308.615	429.874	0	429.874
8	1.47868	719.27	Baked Shale	40	32	152.073	332.756	468.508	0	468.508
9	1.47868	775.767	Baked Shale	40	32	161.146	352.609	500.279	0	500.279
10	1.47868	822.718	Baked Shale	40	32	168.28	368.22	525.261	0	525.261
11	1.47868	859.961	Baked Shale	40	32	173.491	379.623	543.51	0	543.51
12	1.47868	887.301	Baked Shale	40	32	176.787	386.835	555.052	0	555.052
13	1.47868	904.497	Baked Shale	40	32	178.17	389.861	559.895	0	559.895
14	1.47868	911.267	Baked Shale	40	32	177.635	388.69	558.021	0	558.021
15	1.47868	907.276	Baked Shale	40	32	175.17	383.297	549.391	0	549.391
16	1.47868	892.129	Baked Shale	40	32	170.758	373.643	533.94	0	533.94
17	1.47868	865.367	Baked Shale	40	32	164.372	359.67	511.579	0	511.579
18	1.47868	826.449	Baked Shale	40	32	155.981	341.308	482.194	0	482.194
19	1.47868	774.743	Baked Shale	40	32	145.543	318.468	445.642	0	445.642
20	1.47868	709.503	Baked Shale	40	32	133.007	291.039	401.747	0	401.747
21	1.47868	629.846	Baked Shale	40	32	118.317	258.894	350.304	0	350.304
22	1.47868	534.722	Baked Shale	40	32	101.402	221.881	291.07	0	291.07
23	1.47868	422.863	Baked Shale	40	32	82.1803	179.822	223.761	0	223.761

24	1.47868	292.732	Baked Shale	40	32	60.5597	132.513	148.052	0	148.052
25	1.47868	122.163	Baked Shale	40	32	33.3201	72.909	52.6656	0	52.6656

Global Minimum Query (janbu simplified) - Safety Factor: 2.08864

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.49112	75.1206	Baked Shale	40	32	36.2456	75.7041	57.1384	0	57.1384
2	1.49112	219.713	Baked Shale	40	32	66.1511	138.166	157.099	0	157.099
3	1.49112	353.1	Baked Shale	40	32	93.029	194.304	246.938	0	246.938
4	1.49112	475.446	Baked Shale	40	32	117.029	244.431	327.158	0	327.158
5	1.49112	586.862	Baked Shale	40	32	138.276	288.809	398.177	0	398.177
6	1.49112	687.412	Baked Shale	40	32	156.874	327.653	460.341	0	460.341
7	1.49112	777.114	Baked Shale	40	32	172.909	361.145	513.939	0	513.939
8	1.49112	855.939	Baked Shale	40	32	186.451	389.428	559.203	0	559.203
9	1.49112	923.814	Baked Shale	40	32	197.555	412.621	596.319	0	596.319
10	1.49112	980.614	Baked Shale	40	32	206.264	430.812	625.43	0	625.43
11	1.49112	1026.17	Baked Shale	40	32	212.61	444.065	646.639	0	646.639
12	1.49112	1060.24	Baked Shale	40	32	216.61	452.42	660.011	0	660.011
13	1.49112	1082.55	Baked Shale	40	32	218.274	455.895	665.573	0	665.573
14	1.49112	1092.74	Baked Shale	40	32	217.599	454.485	663.311	0	663.311
15	1.49112	1090.37	Baked Shale	40	32	214.57	448.16	653.192	0	653.192
16	1.49112	1074.92	Baked Shale	40	32	209.165	436.871	635.128	0	635.128
17	1.49112	1045.77	Baked Shale	40	32	201.347	420.541	608.993	0	608.993
18	1.49112	1002.16	Baked Shale	40	32	191.065	399.067	574.628	0	574.628
19	1.49112	943.178	Baked Shale	40	32	178.259	372.319	531.821	0	531.821
20	1.49112	867.734	Baked Shale	40	32	162.85	340.134	480.314	0	480.314
21	1.49112	774.486	Baked Shale	40	32	144.742	302.313	419.789	0	419.789
22	1.49112	661.775	Baked Shale	40	32	123.822	258.62	349.866	0	349.866
23	1.49112	527.529	Baked Shale	40	32	99.9564	208.773	270.093	0	270.093
24	1.49112	369.098	Baked Shale	40	32	72.9848	152.439	179.94	0	179.94
25	1.49112	147.635	Baked Shale	40	32	37.2954	77.8966	60.6474	0	60.6474

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.188

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.47868	63.1073	Baked Shale	40	32	32.0104	70.0388	48.0722	0	48.0722
2	1.47868	184.648	Baked Shale	40	32	57.6236	126.081	137.758	0	137.758
3	1.47868	296.878	Baked Shale	40	32	81.7697	178.912	222.305	0	222.305
4	1.47868	399.851	Baked Shale	40	32	103.96	227.465	300.006	0	300.006
5	1.47868	493.595	Baked Shale	40	32	123.747	270.758	369.29	0	369.29
6	1.47868	578.107	Baked Shale	40	32	140.767	307.998	428.886	0	428.886
7	1.47868	653.352	Baked Shale	40	32	154.776	338.649	477.939	0	477.939
8	1.47868	719.27	Baked Shale	40	32	165.665	362.475	516.068	0	516.068
9	1.47868	775.767	Baked Shale	40	32	173.46	379.53	543.362	0	543.362
10	1.47868	822.718	Baked Shale	40	32	178.306	390.134	560.331	0	560.331
11	1.47868	859.961	Baked Shale	40	32	180.441	394.806	567.808	0	567.808
12	1.47868	887.301	Baked Shale	40	32	180.164	394.199	566.838	0	566.838
13	1.47868	904.497	Baked Shale	40	32	177.797	389.019	558.548	0	558.548
14	1.47868	911.267	Baked Shale	40	32	173.652	379.95	544.034	0	544.034
15	1.47868	907.276	Baked Shale	40	32	168.005	367.594	524.259	0	524.259

16	1.47868	892.129	Baked Shale	40	32	161.07	352.422	499.98	0	499.98
17	1.47868	865.367	Baked Shale	40	32	152.994	334.75	471.698	0	471.698
18	1.47868	826.449	Baked Shale	40	32	143.837	314.715	439.636	0	439.636
19	1.47868	774.743	Baked Shale	40	32	133.583	292.279	403.731	0	403.731
20	1.47868	709.503	Baked Shale	40	32	122.129	267.218	363.625	0	363.625
21	1.47868	629.846	Baked Shale	40	32	109.286	239.117	318.654	0	318.654
22	1.47868	534.722	Baked Shale	40	32	94.7655	207.347	267.811	0	267.811
23	1.47868	422.863	Baked Shale	40	32	78.1636	171.022	209.679	0	209.679
24	1.47868	292.732	Baked Shale	40	32	58.9299	128.939	142.331	0	142.331
25	1.47868	122.163	Baked Shale	40	32	33.2128	72.6696	52.2825	0	52.2825

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.18814

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	418	3278	0	0	0
2	419.479	3277.84	52.1542	0	0
3	420.957	3277.72	142.996	0	0
4	422.436	3277.65	260.931	0	0
5	423.915	3277.64	395.671	0	0
6	425.393	3277.66	538.111	0	0
7	426.872	3277.74	680.239	0	0
8	428.351	3277.87	815.055	0	0
9	429.829	3278.04	936.516	0	0
10	431.308	3278.27	1039.49	0	0
11	432.787	3278.54	1119.73	0	0
12	434.266	3278.86	1173.86	0	0
13	435.744	3279.24	1199.39	0	0
14	437.223	3279.67	1194.69	0	0
15	438.702	3280.16	1159.1	0	0
16	440.18	3280.7	1092.9	0	0
17	441.659	3281.3	997.43	0	0
18	443.138	3281.96	875.2	0	0
19	444.616	3282.69	729.998	0	0
20	446.095	3283.49	567.081	0	0
21	447.574	3284.35	393.412	0	0
22	449.052	3285.3	217.96	0	0
23	450.531	3286.33	52.1131	0	0
24	452.01	3287.45	-89.7743	0	0
25	453.488	3288.67	-189.629	0	0
26	454.967	3290	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.08864

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	418	3278	0	0	0
2	419.491	3277.72	67.6922	0	0
3	420.982	3277.5	194.285	0	0

4	422.473	3277.34	362.552	0	0
5	423.964	3277.23	557.453	0	0
6	425.456	3277.18	765.854	0	0
7	426.947	3277.19	976.308	0	0
8	428.438	3277.25	1178.88	0	0
9	429.929	3277.37	1365.02	0	0
10	431.42	3277.55	1527.44	0	0
11	432.911	3277.78	1660.09	0	0
12	434.402	3278.07	1758.03	0	0
13	435.893	3278.42	1817.51	0	0
14	437.385	3278.83	1835.9	0	0
15	438.876	3279.31	1811.75	0	0
16	440.367	3279.85	1744.87	0	0
17	441.858	3280.46	1636.41	0	0
18	443.349	3281.15	1488.99	0	0
19	444.84	3281.91	1306.97	0	0
20	446.331	3282.75	1096.64	0	0
21	447.822	3283.68	866.682	0	0
22	449.313	3284.71	628.66	0	0
23	450.805	3285.84	397.773	0	0
24	452.296	3287.09	193.924	0	0
25	453.787	3288.47	43.2874	0	0
26	455.278	3290	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.188

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	418	3278	0	0	0
2	419.479	3277.84	53.2985	2.74214	2.9452
3	420.957	3277.72	148.799	15.1902	5.82887
4	422.436	3277.65	275.629	41.6512	8.59314
5	423.915	3277.64	422.954	83.6422	11.1863
6	425.393	3277.66	580.298	140.016	13.5652
7	426.872	3277.74	737.908	207.354	15.6955
8	428.351	3277.87	887.084	280.577	17.5517
9	429.829	3278.04	1020.44	353.678	19.116
10	431.308	3278.27	1132.09	420.489	20.3764
11	432.787	3278.54	1217.66	475.381	21.3259
12	434.266	3278.86	1274.3	513.827	21.9604
13	435.744	3279.24	1300.49	532.79	22.2781
14	437.223	3279.67	1295.94	530.926	22.2781
15	438.702	3280.16	1261.36	508.609	21.9604
16	440.18	3280.7	1198.29	467.819	21.3259
17	441.659	3281.3	1109.03	411.925	20.3764
18	443.138	3281.96	996.528	345.389	19.1159
19	444.616	3282.69	864.443	273.416	17.5517
20	446.095	3283.49	717.301	201.564	15.6955
21	447.574	3284.35	560.745	135.298	13.5652
22	449.052	3285.3	401.959	79.4904	11.1863
23	450.531	3286.33	250.311	37.8254	8.59316

24	452.01	3287.45	118.313	12.078	5.82886
25	453.488	3288.67	23.0635	1.18659	2.9452
26	454.967	3290	0	0	0

List Of Coordinates

Water Table

X	Y
0	3278
418	3278
511.8	3179
543.6	3164
746.7	3145
962.8	3139
1000	3139

External Boundary

X	Y
0	3240
0	3160
0	3145
0	3047
1000	3047
1000	3123.2
1000	3125
1000	3135
1000	3139
1000	3147
900	3148
564	3260
474	3290
454	3290
418	3278
0	3278

Material Boundary

X	Y
364	3260
418	3278

Material Boundary

X	Y
364	3260
410	3260
564	3260

Material Boundary

X	Y
0	3240
304	3240
364	3260

Material Boundary

X	Y
304	3240
350.6	3240
410	3260

Material Boundary

X	Y
0	3160
88	3160
163	3185
183	3185
259	3158
313	3151
369	3157
457.82	3159.78
464.73	3159.78
493.9	3257
527.3	3257
532.52	3257
537.74	3257
564.5	3167.81
913.6	3139
949.4	3139
1000	3139

Material Boundary

X	Y
183	3185
350.6	3240

Material Boundary

X	Y
457.82	3159.78
465.2	3152
558.8	3152
564	3152
569.2	3152
574.2	3157
913.2	3129

939.4	3129
949.4	3139

Material Boundary

X	Y
532.52	3257
564	3152

Material Boundary

X	Y
527.3	3257
558.8	3152

Material Boundary

X	Y
88	3160
140.8	3160
163.3	3145
183.3	3145
205.8	3160
259	3158

Material Boundary

X	Y
183.3	3145
465.2	3152

Material Boundary

X	Y
0	3145
163.3	3145

Material Boundary

X	Y
569.2	3152
913.2	3125
1000	3125

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 2.0 - 34 EHP Saddle Dam B - Downstream - Static.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION B - MAXIMUM STORAGE POOL - STATIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	28	40	35	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.240090
Center: 435.679, 3417.723
Radius: 179.518
Left Slip Surface Endpoint: 309.530, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Moment=3.12672e+007 lb-ft
Driving Moment=1.3958e+007 lb-ft
Total Slice Area=2042.36 ft2

Method: janbu simplified

FS: 2.127220
Center: 424.425, 3383.962

Radius: 148.536
Left Slip Surface Endpoint: 309.387, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Horizontal Force=194473 lb
Driving Horizontal Force=91421.4 lb
Total Slice Area=2553.91 ft2

Method: gle/morgenstern-price

FS: 2.239700
Center: 435.679, 3423.350
Radius: 185.090
Left Slip Surface Endpoint: 307.320, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Moment=3.32968e+007 lb-ft
Driving Moment=1.48667e+007 lb-ft
Resisting Horizontal Force=167354 lb
Driving Horizontal Force=74721.8 lb
Total Slice Area=2110.29 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.24009

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	5.77372	1646.02	Baked Shale	50	40	95.3832	213.667	195.051	0	195.051
2	5.77372	4171.99	Baked Shale	50	40	221.283	495.694	531.159	0	531.159
3	5.77372	6326.96	Baked Shale	50	40	333.537	747.153	830.834	0	830.834
4	5.77372	8190.05	Baked Shale	50	40	434.716	973.804	1100.95	0	1100.95
5	5.77372	9787.26	Baked Shale	50	40	525.126	1176.33	1342.31	0	1342.31
6	5.77372	11139.8	Baked Shale	50	40	605.047	1355.36	1555.66	0	1555.66
7	5.77372	12265.3	Baked Shale	50	40	674.709	1511.41	1741.64	0	1741.64
8	5.76549	13115.9	Shell	50	33	592.525	1327.31	1966.89	0	1966.89
9	5.73639	13674	Central Core	0	28.5	518.1	1160.59	2137.54	0	2137.54
10	5.73639	14117.5	Central Core	0	28.5	539.867	1209.35	2227.35	0	2227.35
11	5.73639	14390.6	Central Core	0	28.5	555.237	1243.78	2290.76	0	2290.76
12	5.73639	14500.4	Central Core	0	28.5	564.326	1264.14	2328.26	0	2328.26
13	5.73639	14549.3	Central Core	0	28.5	570.999	1279.09	2355.8	0	2355.8
14	5.6678	14429	Drain	0	35	731.707	1639.09	2340.86	0	2340.86
15	5.6678	13981.5	Drain	0	35	716.194	1604.34	2291.23	0	2291.23
16	6.52705	15234	Shell	50	33	659.094	1476.43	2196.51	0	2196.51
17	6.52705	14445.6	Shell	50	33	632.698	1417.3	2105.45	0	2105.45
18	6.52705	13478	Shell	50	33	597.954	1339.47	1985.61	0	1985.61
19	6.52705	12311.5	Shell	50	33	553.786	1240.53	1833.26	0	1833.26
20	6.52705	10948.5	Shell	50	33	500.056	1120.17	1647.91	0	1647.91
21	6.52705	9390.69	Shell	50	33	436.559	977.932	1428.89	0	1428.89
22	6.52705	7638.96	Shell	50	33	363.06	813.287	1175.36	0	1175.36
23	6.52705	5693.4	Shell	50	33	279.258	625.563	886.291	0	886.291
24	6.52705	3553.32	Shell	50	33	184.792	413.95	560.433	0	560.433
25	6.52705	1217.26	Shell	50	33	79.2272	177.476	196.296	0	196.296

Global Minimum Query (janbu simplified) - Safety Factor: 2.12722

				Base	Base	Shear	Shear	Base	Pore	Effective

Number	[ft]	[lbs]	Material	Cohesion [psf]	Friction Angle [degrees]	Stress [psf]	Strength [psf]	Normal Stress [psf]	Pressure [psf]	Normal Stress [psf]
1	6.64172	2728.96	Baked Shale	50	40	127.901	272.073	264.657	0	264.657
2	6.64172	7023.28	Baked Shale	50	40	315.779	671.732	740.952	0	740.952
3	6.64172	10523.8	Baked Shale	50	40	480.572	1022.28	1158.73	0	1158.73
4	6.64172	13406.9	Baked Shale	50	40	625.577	1330.74	1526.33	0	1526.33
5	6.64172	15757.9	Baked Shale	50	40	751.723	1599.08	1846.12	0	1846.12
6	4.96356	13001.7	Shell	50	33	689.976	1467.73	2183.12	0	2183.12
7	6.39874	17902.7	Central Core	0	28.5	623.203	1325.69	2441.61	0	2441.61
8	6.39874	18890.9	Central Core	0	28.5	667.002	1418.86	2613.22	0	2613.22
9	6.39874	19567	Central Core	0	28.5	700.172	1489.42	2743.17	0	2743.17
10	6.39874	19951.9	Central Core	0	28.5	723.066	1538.12	2832.86	0	2832.86
11	6.39874	20062.2	Central Core	0	28.5	735.97	1565.57	2883.43	0	2883.43
12	6.39874	20116	Central Core	0	28.5	746.669	1588.33	2925.34	0	2925.34
13	5.60281	17600.3	Drain	0	35	956.112	2033.86	2904.64	0	2904.64
14	5.60281	16894.8	Drain	0	35	929.297	1976.82	2823.2	0	2823.2
15	5.80393	16586.4	Shell	50	33	852.629	1813.73	2715.91	0	2715.91
16	5.80393	15785.9	Shell	50	33	822.205	1749.01	2616.24	0	2616.24
17	5.80393	14829.1	Shell	50	33	782.895	1665.39	2487.47	0	2487.47
18	5.80393	13705.8	Shell	50	33	733.92	1561.21	2327.06	0	2327.06
19	5.80393	12417.3	Shell	50	33	675.055	1435.99	2134.23	0	2134.23
20	5.80393	10964	Shell	50	33	606.012	1289.12	1908.08	0	1908.08
21	5.80393	9345.88	Shell	50	33	526.443	1119.86	1647.44	0	1647.44
22	5.80393	7561.78	Shell	50	33	435.917	927.292	1350.91	0	1350.91
23	5.80393	5609.97	Shell	50	33	333.91	710.299	1016.77	0	1016.77
24	5.80393	3487.86	Shell	50	33	219.79	467.541	642.957	0	642.957
25	5.80393	1191.92	Shell	50	33	92.7972	197.4	226.978	0	226.978

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.2397

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	5.90345	1980.71	Baked Shale	50	40	108.76	243.589	230.71	0	230.71
2	5.90345	4767.82	Baked Shale	50	40	239.274	535.901	579.074	0	579.074
3	5.90345	6935.3	Baked Shale	50	40	341.882	765.714	852.954	0	852.954
4	5.90345	8807.92	Baked Shale	50	40	433.021	969.837	1096.22	0	1096.22
5	5.90345	10411	Baked Shale	50	40	514.681	1152.73	1314.18	0	1314.18
6	5.90345	11765.3	Baked Shale	50	40	588.338	1317.7	1510.79	0	1510.79
7	5.90345	12888.1	Baked Shale	50	40	655.034	1467.08	1688.81	0	1688.81
8	5.88086	13695.7	Shell	50	33	564.946	1265.31	1871.41	0	1871.41
9	5.98569	14566.5	Central Core	0	28.5	487.19	1091.16	2009.67	0	2009.67
10	5.98569	15005.8	Central Core	0	28.5	511.671	1145.99	2110.65	0	2110.65
11	5.98569	15259.3	Central Core	0	28.5	532.263	1192.11	2195.6	0	2195.6
12	5.98569	15334.8	Central Core	0	28.5	548.654	1228.82	2263.2	0	2263.2
13	5.98569	15338.1	Central Core	0	28.5	563.986	1263.16	2326.45	0	2326.45
14	5.65179	14499.4	Drain	0	35	752.779	1686	2407.85	0	2407.85
15	5.65179	14015.5	Drain	0	35	748.618	1676.68	2394.54	0	2394.54
16	6.52434	15276.1	Shell	50	33	696.169	1559.21	2323.98	0	2323.98
17	6.52434	14456.3	Shell	50	33	678.287	1519.16	2262.32	0	2262.32
18	6.52434	13464	Shell	50	33	648.386	1452.19	2159.2	0	2159.2
19	6.52434	12279.3	Shell	50	33	604.71	1354.37	2008.55	0	2008.55
20	6.52434	10904.5	Shell	50	33	547.011	1225.14	1809.57	0	1809.57

21	6.52434	9341.08	Shell	50	33	475.644	1065.3	1563.42	0	1563.42
22	6.52434	7589.79	Shell	50	33	391.583	877.029	1273.51	0	1273.51
23	6.52434	5650.75	Shell	50	33	296.372	663.784	945.144	0	945.144
24	6.52434	3523.33	Shell	50	33	191.962	429.937	585.051	0	585.051
25	6.52434	1206.2	Shell	50	33	80.4983	180.292	200.632	0	200.632

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.24009

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	309.53	3290	0	0	0
2	315.304	3284.54	513.938	0	0
3	321.078	3279.54	1893.18	0	0
4	326.852	3274.95	3784.24	0	0
5	332.625	3270.73	5924.89	0	0
6	338.399	3266.85	8108.4	0	0
7	344.173	3263.28	10172.3	0	0
8	349.947	3260	11989.9	0	0
9	355.712	3257	14477.8	0	0
10	361.448	3254.27	17341.2	0	0
11	367.185	3251.79	19783.6	0	0
12	372.921	3249.53	21763.7	0	0
13	378.658	3247.5	23256.9	0	0
14	384.394	3245.69	24261.1	0	0
15	390.062	3244.1	23837.5	0	0
16	395.73	3242.71	22969.5	0	0
17	402.257	3241.34	21665.4	0	0
18	408.784	3240.23	19882.3	0	0
19	415.311	3239.36	17704.7	0	0
20	421.838	3238.74	15239.2	0	0
21	428.365	3238.35	12613.6	0	0
22	434.892	3238.21	9977.55	0	0
23	441.419	3238.3	7504.35	0	0
24	447.946	3238.62	5392.91	0	0
25	454.473	3239.19	3870.27	0	0
26	461	3240	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.12722

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	309.387	3290	0	0	0
2	316.028	3282.41	1158.98	0	0
3	322.67	3275.76	3991.23	0	0
4	329.312	3269.87	7613.76	0	0
5	335.953	3264.65	11430.9	0	0
6	342.595	3260	15019.7	0	0
7	347.559	3256.86	18443	0	0
8	353.957	3253.21	23380.6	0	0

9	360.356	3249.95	27607.7	0	0
10	366.755	3247.08	31014	0	0
11	373.154	3244.56	33532.9	0	0
12	379.552	3242.37	35134.5	0	0
13	385.951	3240.5	35827.8	0	0
14	391.554	3239.11	34495.9	0	0
15	397.157	3237.95	32557.7	0	0
16	402.961	3236.99	30229	0	0
17	408.765	3236.25	27368.1	0	0
18	414.569	3235.75	24067.3	0	0
19	420.373	3235.48	20439.2	0	0
20	426.176	3235.44	16615.7	0	0
21	431.98	3235.62	12749.9	0	0
22	437.784	3236.03	9018.29	0	0
23	443.588	3236.67	5623.54	0	0
24	449.392	3237.54	2798.14	0	0
25	455.196	3238.65	809.038	0	0
26	461	3240	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.2397

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	307.32	3290	0	0	0
2	313.223	3284.56	612.862	26.5666	2.48213
3	319.126	3279.57	2091.05	179.969	4.91912
4	325.03	3274.97	3987.52	508.537	7.26782
5	330.933	3270.75	6061.2	1013.09	9.4889
6	336.837	3266.86	8131.31	1661.41	11.5479
7	342.74	3263.29	10059.7	2399.53	13.416
8	348.644	3260	11738.6	3160.84	15.0705
9	354.525	3257	14028.8	4152.42	16.4884
10	360.51	3254.21	16716.1	5329.21	17.6826
11	366.496	3251.68	19002.8	6401.14	18.6162
12	372.482	3249.38	20848.6	7294.11	19.2829
13	378.467	3247.32	22223.3	7947.9	19.679
14	384.453	3245.49	23112.7	8322.11	19.8023
15	390.105	3243.96	22543.3	8057.36	19.6678
16	395.757	3242.62	21523	7533.08	19.2901
17	402.281	3241.3	20042.9	6727.38	18.5543
18	408.805	3240.22	18051.3	5692.17	17.5018
19	415.33	3239.38	15631	4523.86	16.1413
20	421.854	3238.78	12898.7	3332.5	14.4861
21	428.378	3238.4	10002.9	2227.78	12.5556
22	434.903	3238.26	7120.64	1303.88	10.3766
23	441.427	3238.35	4452.86	624.55	7.98412
24	447.951	3238.67	2217.62	210.481	5.42187
25	454.476	3239.22	642.989	30.7874	2.74133
26	461	3240	0	0	0

List Of Coordinates

Water Table

X	Y
0	3225
347.11	3236.65
374.12	3233.95
410.65	3225.41
492.5	3225.41
575	3225.41

External Boundary

X	Y
0	3320
0	3256
0	3240
0	3225
0	3220
0	3180
575	3180
575	3220
575	3230.41
575	3257
556	3257
535	3253
484.5	3239.5
461	3240
401	3260
311	3290
291	3290
274.58	3284.52
254	3294
189	3295
167	3302
122	3308
65	3309
41	3320

Material Boundary

X	Y
0	3256
189	3256
201	3260
274.58	3284.52

Material Boundary

X	Y
201	3260

264.3	3260
401	3260

Material Boundary

X	Y
0	3225
160.52	3225
204.3	3240
264.3	3260

Material Boundary

X	Y
189	3256
141	3240
204.3	3240

Material Boundary

X	Y
338.12	3225.41
328.39	3225.41
336.5	3220
392.1	3220
397.32	3220
402.54	3220
410.65	3225.41
492.5	3225.41
500	3230.41
399.42	3230.41
391.44	3257
386.22	3257
381	3257
347.6	3257

Material Boundary

X	Y
338.12	3225.41
347.6	3257

Material Boundary

X	Y
381	3257
392.1	3220

Material Boundary

X	Y

386.22	3257
397.32	3220

Material Boundary

X	Y
160.52	3225
328.39	3225.41

Material Boundary

X	Y
0	3220
336.5	3220

Material Boundary

X	Y
402.54	3220
575	3220

Material Boundary

X	Y
500	3230.41
575	3230.41

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 2.2 - 34 EHP Saddle Dam B - Downstream - Seismic.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION B - MAXIMUM STORAGE POOL - SEISMIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.03

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	40	0	40	0	0	40	0	
Friction Angle [deg]	26.4	22.8	32	28	24.8	32	28	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None

Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	560
Friction Angle [deg]	22.4
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 1.554440
Center: 435.679, 3423.350
Radius: 185.090
Left Slip Surface Endpoint: 307.320, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Moment=2.51736e+007 lb-ft
Driving Moment=1.61947e+007 lb-ft
Total Slice Area=2110.29 ft2

Method: janbu simplified

FS: 1.477240
Center: 424.425, 3383.962
Radius: 148.536
Left Slip Surface Endpoint: 309.387, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Horizontal Force=147527 lb
Driving Horizontal Force=99866.6 lb
Total Slice Area=2553.91 ft2

Method: gle/morgenstern-price

FS: 1.550370
Center: 441.306, 3440.231
Radius: 201.197
Left Slip Surface Endpoint: 307.474, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Moment=2.51074e+007 lb-ft
Driving Moment=1.61944e+007 lb-ft
Resisting Horizontal Force=116822 lb
Driving Horizontal Force=75350.7 lb
Total Slice Area=1920.78 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.55444

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	5.90345	1980.71	Baked Shale	40	32	117.269	182.288	227.708	0	227.708
2	5.90345	4767.82	Baked Shale	40	32	261.651	406.721	586.877	0	586.877
3	5.90345	6935.3	Baked Shale	40	32	379.611	590.083	880.317	0	880.317
4	5.90345	8807.92	Baked Shale	40	32	486.026	755.499	1145.04	0	1145.04
5	5.90345	10411	Baked Shale	40	32	581.164	903.385	1381.7	0	1381.7
6	5.90345	11765.3	Baked Shale	40	32	665.265	1034.11	1590.92	0	1590.92
7	5.90345	12888.1	Baked Shale	40	32	738.536	1148.01	1773.19	0	1773.19
8	5.88086	13695.7	Shell	40	26.4	661.886	1028.86	1992.04	0	1992.04
9	5.98569	14566.5	Central Core	0	22.8	584.617	908.752	2161.84	0	2161.84
10	5.98569	15005.8	Central Core	0	22.8	608.43	945.768	2249.89	0	2249.89
11	5.98569	15259.3	Central Core	0	22.8	624.844	971.282	2310.6	0	2310.6
12	5.98569	15334.8	Central Core	0	22.8	633.974	985.474	2344.36	0	2344.36
13	5.98569	15338.1	Central Core	0	22.8	640.054	994.926	2366.83	0	2366.83
14	5.65179	14499.4	Drain	0	28	803.273	1248.64	2348.34	0	2348.34
15	5.65179	14015.5	Drain	0	28	784.688	1219.75	2294.01	0	2294.01
16	6.52434	15276.1	Shell	40	26.4	726.667	1129.56	2194.9	0	2194.9
17	6.52434	14456.3	Shell	40	26.4	696.695	1082.97	2101.05	0	2101.05
18	6.52434	13464	Shell	40	26.4	657.8	1022.51	1979.25	0	1979.25
19	6.52434	12279.3	Shell	40	26.4	608.786	946.322	1825.78	0	1825.78
20	6.52434	10904.5	Shell	40	26.4	549.469	854.116	1640.03	0	1640.03
21	6.52434	9341.08	Shell	40	26.4	479.615	745.532	1421.29	0	1421.29
22	6.52434	7589.79	Shell	40	26.4	398.937	620.123	1168.65	0	1168.65
23	6.52434	5650.75	Shell	40	26.4	307.087	477.349	881.035	0	881.035

24	6.52434	3523.33	Shell	40	26.4	203.653	316.567	557.141	0	557.141
25	6.52434	1206.2	Shell	40	26.4	88.1434	137.014	195.434	0	195.434

Global Minimum Query (janbu simplified) - Safety Factor: 1.47724

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	6.64172	2728.96	Baked Shale	40	32	135.453	200.096	256.206	0	256.206
2	6.64172	7023.28	Baked Shale	40	32	333.256	492.299	723.83	0	723.83
3	6.64172	10523.8	Baked Shale	40	32	507.389	749.535	1135.49	0	1135.49
4	6.64172	13406.9	Baked Shale	40	32	661.138	976.659	1498.97	0	1498.97
5	6.64172	15757.9	Baked Shale	40	32	795.341	1174.91	1816.23	0	1816.23
6	4.96356	13001.7	Shell	40	26.4	748.443	1105.63	2146.71	0	2146.71
7	6.39874	17902.7	Central Core	0	22.8	684.879	1011.73	2406.81	0	2406.81
8	6.39874	18890.9	Central Core	0	22.8	734.045	1084.36	2579.59	0	2579.59
9	6.39874	19567	Central Core	0	22.8	771.574	1139.8	2711.48	0	2711.48
10	6.39874	19951.9	Central Core	0	22.8	797.832	1178.59	2803.75	0	2803.75
11	6.39874	20062.2	Central Core	0	22.8	813.084	1201.12	2857.36	0	2857.36
12	6.39874	20116	Central Core	0	22.8	825.919	1220.08	2902.45	0	2902.45
13	5.60281	17600.3	Drain	0	28	1038.27	1533.78	2884.61	0	2884.61
14	5.60281	16894.8	Drain	0	28	1010.23	1492.35	2806.7	0	2806.7
15	5.80393	16586.4	Shell	40	26.4	935.163	1381.46	2702.36	0	2702.36
16	5.80393	15785.9	Shell	40	26.4	902.859	1333.74	2606.21	0	2606.21
17	5.80393	14829.1	Shell	40	26.4	860.734	1271.51	2480.85	0	2480.85
18	5.80393	13705.8	Shell	40	26.4	807.899	1193.46	2323.63	0	2323.63
19	5.80393	12417.3	Shell	40	26.4	744.077	1099.18	2133.7	0	2133.7
20	5.80393	10964	Shell	40	26.4	668.913	988.145	1910.03	0	1910.03
21	5.80393	9345.88	Shell	40	26.4	581.978	859.721	1651.32	0	1651.32
22	5.80393	7561.78	Shell	40	26.4	482.744	713.129	1356.01	0	1356.01
23	5.80393	5609.97	Shell	40	26.4	370.578	547.433	1022.22	0	1022.22
24	5.80393	3487.86	Shell	40	26.4	244.716	361.504	647.665	0	647.665
25	5.80393	1191.92	Shell	40	26.4	104.235	153.98	229.612	0	229.612

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.55037

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	6.34362	2062.6	Baked Shale	40	32	115.443	178.979	222.413	0	222.413
2	6.34362	4878.97	Baked Shale	40	32	247.693	384.016	550.541	0	550.541
3	6.34362	7085.27	Baked Shale	40	32	352.511	546.523	810.606	0	810.606
4	6.34362	8980.19	Baked Shale	40	32	445.287	690.36	1040.79	0	1040.79
5	6.34362	10587.9	Baked Shale	40	32	528.067	818.699	1246.18	0	1246.18
6	6.34362	11928.3	Baked Shale	40	32	602.342	933.853	1430.47	0	1430.47
7	6.34362	13018.4	Baked Shale	40	32	669.101	1037.35	1596.1	0	1596.1
8	6.31986	13771.8	Shell	40	26.4	588.323	912.119	1756.88	0	1756.88
9	6.41988	14536.1	Central Core	0	22.8	508.682	788.645	1876.11	0	1876.11
10	6.41988	14875.6	Central Core	0	22.8	532.047	824.87	1962.28	0	1962.28
11	6.41988	15011.1	Central Core	0	22.8	550.648	853.708	2030.89	0	2030.89
12	6.41988	15019.2	Central Core	0	22.8	566.539	878.345	2089.5	0	2089.5
13	5.67402	13308.4	Drain	0	28	742.861	1151.71	2166.05	0	2166.05
14	5.67402	12908.4	Drain	0	28	740.817	1148.54	2160.09	0	2160.09
15	5.97937	12884.8	Shell	40	26.4	698.304	1082.63	2100.37	0	2100.37
16	5.97937	12276.7	Shell	40	26.4	683.385	1059.5	2053.78	0	2053.78
17	5.97937	11556.4	Shell	40	26.4	659.23	1022.05	1978.33	0	1978.33
18	5.97937	10698.3	Shell	40	26.4	623.745	967.035	1867.5	0	1867.5
19	5.97937	9704.09	Shell	40	26.4	576.589	893.926	1720.23	0	1720.23
20	5.97937	8575.17	Shell	40	26.4	517.818	802.809	1536.67	0	1536.67
21	5.97937	7312.49	Shell	40	26.4	447.907	694.422	1318.33	0	1318.33
22	5.97937	5916.67	Shell	40	26.4	367.748	570.146	1067.97	0	1067.97
23	5.97937	4387.95	Shell	40	26.4	278.577	431.897	789.471	0	789.471
24	5.97937	2726.22	Shell	40	26.4	181.874	281.972	487.45	0	487.45
25	5.97937	931.037	Shell	40	26.4	79.215	122.813	166.824	0	166.824

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.55444

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	307.32	3290	0	0	0
2	313.223	3284.56	607.789	0	0
3	319.126	3279.57	2140.48	0	0
4	325.03	3274.97	4154.59	0	0
5	330.933	3270.75	6394.39	0	0
6	336.837	3266.86	8657.12	0	0
7	342.74	3263.29	10782.6	0	0

8	348.644	3260	12645.4	0	0
9	354.525	3257	15149.7	0	0
10	360.51	3254.21	18125.7	0	0
11	366.496	3251.68	20647.1	0	0
12	372.482	3249.38	22671.2	0	0
13	378.467	3247.32	24173.7	0	0
14	384.453	3245.49	25153.3	0	0
15	390.105	3243.96	24656	0	0
16	395.757	3242.62	23730.8	0	0
17	402.281	3241.3	22354.1	0	0
18	408.805	3240.22	20516.2	0	0
19	415.33	3239.38	18300.3	0	0
20	421.854	3238.78	15811.3	0	0
21	428.378	3238.4	13174.3	0	0
22	434.903	3238.26	10535.6	0	0
23	441.427	3238.35	8064.6	0	0
24	447.951	3238.67	5955.41	0	0
25	454.476	3239.22	4429.53	0	0
26	461	3240	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 1.47724

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	309.387	3290	0	0	0
2	316.028	3282.41	1127.6	0	0
3	322.67	3275.76	3943.13	0	0
4	329.312	3269.87	7570.56	0	0
5	335.953	3264.65	11416	0	0
6	342.595	3260	15054.9	0	0
7	347.559	3256.86	18468.2	0	0
8	353.957	3253.21	23426	0	0
9	360.356	3249.95	27686.9	0	0
10	366.755	3247.08	31137.8	0	0
11	373.154	3244.56	33709.3	0	0
12	379.552	3242.37	35368.2	0	0
13	385.951	3240.5	36121.2	0	0
14	391.554	3239.11	34835.9	0	0
15	397.157	3237.95	32938.5	0	0
16	402.961	3236.99	30621.5	0	0
17	408.765	3236.25	27764.8	0	0
18	414.569	3235.75	24459.6	0	0
19	420.373	3235.48	20817.7	0	0
20	426.176	3235.44	16971.1	0	0
21	431.98	3235.62	13073.2	0	0
22	437.784	3236.03	9301.97	0	0
23	443.588	3236.67	5862.26	0	0
24	449.392	3237.54	2990.05	0	0
25	455.196	3238.65	957.323	0	0
26	461	3240	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.55037

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	307.474	3290	0	0	0
2	313.818	3284.58	534.376	25.5415	2.73648
3	320.161	3279.59	1853.71	175.712	5.41485
4	326.505	3275	3551.64	497.893	7.98011
5	332.849	3270.77	5398.42	989.127	10.3829
6	339.192	3266.87	7219.42	1611.24	12.5812
7	345.536	3263.29	8879.51	2303.18	14.541
8	351.88	3260	10272.3	2991.48	16.2365
9	358.199	3257	12235.3	3891.56	17.6438
10	364.619	3254.22	14615.7	4967.7	18.7723
11	371.039	3251.7	16586.6	5902.49	19.5886
12	377.459	3249.43	18108.9	6622.4	20.0874
13	383.879	3247.4	19160.4	7074.66	20.2658
14	389.553	3245.8	18806.6	6903.16	20.1562
15	395.227	3244.38	18059.7	6500.51	19.7961
16	401.206	3243.07	17021.6	5910.01	19.1473
17	407.186	3241.95	15605.6	5138.51	18.2253
18	413.165	3241.01	13860.4	4247.09	17.0361
19	419.144	3240.26	11856.1	3307.64	15.5882
20	425.124	3239.69	9681.81	2395.02	13.8945
21	431.103	3239.29	7444.43	1578.71	11.9731

22	437.083	3239.08	5266.46	914.191	9.84769
23	443.062	3239.04	3282.61	434.992	7.54852
24	449.041	3239.18	1635.93	146.349	5.11203
25	455.021	3239.5	473.826	21.3536	2.58036
26	461	3240	0	0	0

List Of Coordinates

Water Table

X	Y
0	3225
347.11	3236.65
374.12	3233.95
410.65	3225.41
492.5	3225.41
575	3225.41

External Boundary

X	Y
0	3320
0	3256
0	3240
0	3225
0	3220
0	3180
575	3180
575	3220
575	3230.41
575	3257
556	3257
535	3253
484.5	3239.5
461	3240
401	3260
311	3290
291	3290
274.58	3284.52
254	3294
189	3295
167	3302
122	3308
65	3309
41	3320

Material Boundary

X	Y
0	3256
189	3256
201	3260
274.58	3284.52

Material Boundary

X	Y
201	3260
264.3	3260
401	3260

Material Boundary

X	Y
0	3225
160.52	3225
204.3	3240
264.3	3260

Material Boundary

X	Y
189	3256
141	3240
204.3	3240

Material Boundary

X	Y
338.12	3225.41
328.39	3225.41
336.5	3220
392.1	3220
397.32	3220
402.54	3220
410.65	3225.41
492.5	3225.41
500	3230.41
399.42	3230.41
391.44	3257
386.22	3257
381	3257
347.6	3257

Material Boundary

X	Y
338.12	3225.41
347.6	3257

Material Boundary

X	Y
381	3257
392.1	3220

Material Boundary

X	Y
386.22	3257
397.32	3220

Material Boundary

X	Y
160.52	3225
328.39	3225.41

Material Boundary

X	Y
0	3220
336.5	3220

Material Boundary

X	Y
402.54	3220
575	3220

Material Boundary

X	Y
500	3230.41
575	3230.41

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 2.1 - 34 EHP Saddle Dam B - Max Surcharge - Downstream - Static.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION B - MAXIMUM SURCHARGE POOL - STATIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 151
Orientation: Normal to boundary

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								

Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	28	40	35	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.240090
Center: 435.679, 3417.723
Radius: 179.518
Left Slip Surface Endpoint: 309.530, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Moment=3.12672e+007 lb-ft
Driving Moment=1.3958e+007 lb-ft
Total Slice Area=2042.36 ft2

Method: janbu simplified

FS: 2.127220
Center: 424.425, 3383.962
Radius: 148.536
Left Slip Surface Endpoint: 309.387, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Horizontal Force=194473 lb
Driving Horizontal Force=91421.4 lb
Total Slice Area=2553.91 ft2

Method: gle/morgenstern-price

FS: 2.239690
Center: 435.679, 3423.350
Radius: 185.090
Left Slip Surface Endpoint: 307.320, 3290.000
Right Slip Surface Endpoint: 461.000, 3240.000
Resisting Moment=3.32967e+007 lb-ft
Driving Moment=1.48667e+007 lb-ft
Resisting Horizontal Force=167354 lb
Driving Horizontal Force=74722.1 lb
Total Slice Area=2110.29 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.24009

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	5.77372	1646.02	Baked Shale	50	40	95.3832	213.667	195.051	0	195.051
2	5.77372	4171.99	Baked Shale	50	40	221.283	495.694	531.159	0	531.159
3	5.77372	6326.96	Baked Shale	50	40	333.537	747.153	830.834	0	830.834
4	5.77372	8190.05	Baked Shale	50	40	434.716	973.804	1100.95	0	1100.95
5	5.77372	9787.26	Baked Shale	50	40	525.126	1176.33	1342.31	0	1342.31
6	5.77372	11139.8	Baked Shale	50	40	605.047	1355.36	1555.66	0	1555.66
7	5.77372	12265.3	Baked Shale	50	40	674.709	1511.41	1741.64	0	1741.64
8	5.76549	13115.9	Shell	50	33	592.525	1327.31	1966.89	0	1966.89
9	5.73639	13674	Central Core	0	28.5	518.1	1160.59	2137.54	0	2137.54
10	5.73639	14117.5	Central Core	0	28.5	539.867	1209.35	2227.35	0	2227.35
11	5.73639	14390.6	Central Core	0	28.5	555.237	1243.78	2290.76	0	2290.76
12	5.73639	14500.4	Central Core	0	28.5	564.326	1264.14	2328.26	0	2328.26
13	5.73639	14549.3	Central Core	0	28.5	570.999	1279.09	2355.8	0	2355.8
14	5.6678	14429	Drain	0	35	731.707	1639.09	2340.86	0	2340.86
15	5.6678	13981.5	Drain	0	35	716.194	1604.34	2291.23	0	2291.23
16	6.52705	15234	Shell	50	33	659.094	1476.43	2196.51	0	2196.51
17	6.52705	14445.6	Shell	50	33	632.698	1417.3	2105.45	0	2105.45

18	6.52705	13478	Shell	50	33	597.954	1339.47	1985.61	0	1985.61
19	6.52705	12311.5	Shell	50	33	553.786	1240.53	1833.26	0	1833.26
20	6.52705	10948.5	Shell	50	33	500.056	1120.17	1647.91	0	1647.91
21	6.52705	9390.69	Shell	50	33	436.559	977.932	1428.89	0	1428.89
22	6.52705	7638.96	Shell	50	33	363.06	813.287	1175.36	0	1175.36
23	6.52705	5693.4	Shell	50	33	279.258	625.563	886.291	0	886.291
24	6.52705	3553.32	Shell	50	33	184.792	413.95	560.433	0	560.433
25	6.52705	1217.26	Shell	50	33	79.2272	177.476	196.296	0	196.296

Global Minimum Query (janbu simplified) - Safety Factor: 2.12722

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	6.64172	2728.96	Baked Shale	50	40	127.901	272.073	264.657	0	264.657
2	6.64172	7023.28	Baked Shale	50	40	315.779	671.732	740.952	0	740.952
3	6.64172	10523.8	Baked Shale	50	40	480.572	1022.28	1158.73	0	1158.73
4	6.64172	13406.9	Baked Shale	50	40	625.577	1330.74	1526.33	0	1526.33
5	6.64172	15757.9	Baked Shale	50	40	751.723	1599.08	1846.12	0	1846.12
6	4.96356	13001.7	Shell	50	33	689.976	1467.73	2183.12	0	2183.12
7	6.39874	17902.7	Central Core	0	28.5	623.203	1325.69	2441.61	0	2441.61
8	6.39874	18890.9	Central Core	0	28.5	667.002	1418.86	2613.22	0	2613.22
9	6.39874	19567	Central Core	0	28.5	700.172	1489.42	2743.17	0	2743.17
10	6.39874	19951.9	Central Core	0	28.5	723.066	1538.12	2832.86	0	2832.86
11	6.39874	20062.2	Central Core	0	28.5	735.97	1565.57	2883.43	0	2883.43
12	6.39874	20116	Central Core	0	28.5	746.669	1588.33	2925.34	0	2925.34
13	5.60281	17600.3	Drain	0	35	956.112	2033.86	2904.64	0	2904.64
14	5.60281	16894.8	Drain	0	35	929.297	1976.82	2823.2	0	2823.2
15	5.80393	16586.4	Shell	50	33	852.629	1813.73	2715.91	0	2715.91
16	5.80393	15785.9	Shell	50	33	822.205	1749.01	2616.24	0	2616.24
17	5.80393	14829.1	Shell	50	33	782.895	1665.39	2487.47	0	2487.47
18	5.80393	13705.8	Shell	50	33	733.92	1561.21	2327.06	0	2327.06
19	5.80393	12417.3	Shell	50	33	675.055	1435.99	2134.23	0	2134.23
20	5.80393	10964	Shell	50	33	606.012	1289.12	1908.08	0	1908.08
21	5.80393	9345.88	Shell	50	33	526.443	1119.86	1647.44	0	1647.44
22	5.80393	7561.78	Shell	50	33	435.917	927.292	1350.91	0	1350.91
23	5.80393	5609.97	Shell	50	33	333.91	710.299	1016.77	0	1016.77
24	5.80393	3487.86	Shell	50	33	219.79	467.541	642.957	0	642.957
25	5.80393	1191.92	Shell	50	33	92.7972	197.4	226.978	0	226.978

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.23969

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	5.90345	1980.71	Baked Shale	50	40	108.76	243.589	230.711	0	230.711
2	5.90345	4767.82	Baked Shale	50	40	239.276	535.903	579.077	0	579.077
3	5.90345	6935.3	Baked Shale	50	40	341.886	765.718	852.96	0	852.96
4	5.90345	8807.92	Baked Shale	50	40	433.026	969.843	1096.23	0	1096.23
5	5.90345	10411	Baked Shale	50	40	514.687	1152.74	1314.19	0	1314.19
6	5.90345	11765.3	Baked Shale	50	40	588.345	1317.71	1510.8	0	1510.8
7	5.90345	12888.1	Baked Shale	50	40	655.042	1467.09	1688.82	0	1688.82
8	5.88086	13695.7	Shell	50	33	564.953	1265.32	1871.43	0	1871.43
9	5.98569	14566.5	Central Core	0	28.5	487.197	1091.17	2009.68	0	2009.68
10	5.98569	15005.8	Central Core	0	28.5	511.678	1146	2110.68	0	2110.68
11	5.98569	15259.3	Central Core	0	28.5	532.27	1192.12	2195.61	0	2195.61
12	5.98569	15334.8	Central Core	0	28.5	548.656	1228.82	2263.22	0	2263.22
13	5.98569	15338.1	Central Core	0	28.5	563.993	1263.17	2326.47	0	2326.47
14	5.65179	14499.4	Drain	0	35	752.778	1685.99	2407.85	0	2407.85
15	5.65179	14015.5	Drain	0	35	748.617	1676.67	2394.54	0	2394.54
16	6.52434	15276.1	Shell	50	33	696.168	1559.2	2323.97	0	2323.97
17	6.52434	14456.3	Shell	50	33	678.286	1519.15	2262.29	0	2262.29
18	6.52434	13464	Shell	50	33	648.384	1452.18	2159.17	0	2159.17
19	6.52434	12279.3	Shell	50	33	604.709	1354.36	2008.54	0	2008.54
20	6.52434	10904.5	Shell	50	33	547.009	1225.13	1809.54	0	1809.54
21	6.52434	9341.08	Shell	50	33	475.642	1065.29	1563.4	0	1563.4
22	6.52434	7589.79	Shell	50	33	391.581	877.02	1273.5	0	1273.5
23	6.52434	5650.75	Shell	50	33	296.371	663.779	945.137	0	945.137
24	6.52434	3523.33	Shell	50	33	191.961	429.934	585.048	0	585.048
25	6.52434	1206.2	Shell	50	33	80.4982	180.291	200.631	0	200.631

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.24009

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	309.53	3290	0	0	0

2	315.304	3284.54	513.938	0	0
3	321.078	3279.54	1893.18	0	0
4	326.852	3274.95	3784.24	0	0
5	332.625	3270.73	5924.89	0	0
6	338.399	3266.85	8108.4	0	0
7	344.173	3263.28	10172.3	0	0
8	349.947	3260	11989.9	0	0
9	355.712	3257	14477.8	0	0
10	361.448	3254.27	17341.2	0	0
11	367.185	3251.79	19783.6	0	0
12	372.921	3249.53	21763.7	0	0
13	378.658	3247.5	23256.9	0	0
14	384.394	3245.69	24261.1	0	0
15	390.062	3244.1	23837.5	0	0
16	395.73	3242.71	22969.5	0	0
17	402.257	3241.34	21665.4	0	0
18	408.784	3240.23	19882.3	0	0
19	415.311	3239.36	17704.7	0	0
20	421.838	3238.74	15239.2	0	0
21	428.365	3238.35	12613.6	0	0
22	434.892	3238.21	9977.55	0	0
23	441.419	3238.3	7504.35	0	0
24	447.946	3238.62	5392.91	0	0
25	454.473	3239.19	3870.27	0	0
26	461	3240	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.12722

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	309.387	3290	0	0	0
2	316.028	3282.41	1158.98	0	0
3	322.67	3275.76	3991.23	0	0
4	329.312	3269.87	7613.76	0	0
5	335.953	3264.65	11430.9	0	0
6	342.595	3260	15019.7	0	0
7	347.559	3256.86	18443	0	0
8	353.957	3253.21	23380.6	0	0
9	360.356	3249.95	27607.7	0	0
10	366.755	3247.08	31014	0	0
11	373.154	3244.56	33532.9	0	0
12	379.552	3242.37	35134.5	0	0
13	385.951	3240.5	35827.8	0	0
14	391.554	3239.11	34495.9	0	0
15	397.157	3237.95	32557.7	0	0
16	402.961	3236.99	30229	0	0
17	408.765	3236.25	27368.1	0	0
18	414.569	3235.75	24067.3	0	0
19	420.373	3235.48	20439.2	0	0
20	426.176	3235.44	16615.7	0	0
21	431.98	3235.62	12749.9	0	0
22	437.784	3236.03	9018.29	0	0
23	443.588	3236.67	5623.54	0	0
24	449.392	3237.54	2798.14	0	0
25	455.196	3238.65	809.038	0	0
26	461	3240	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.23969

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	307.32	3290	0	0	0
2	313.223	3284.56	612.859	26.5632	2.48182
3	319.126	3279.57	2091.04	179.946	4.91851
4	325.03	3274.97	3987.52	508.474	7.26693
5	330.933	3270.75	6061.2	1012.96	9.48771
6	336.837	3266.86	8131.31	1661.21	11.5465
7	342.74	3263.29	10059.7	2399.23	13.4144
8	348.644	3260	11738.6	3160.44	15.0687
9	354.525	3257	14028.7	4151.91	16.4866
10	360.51	3254.21	16716.1	5328.56	17.6806
11	366.496	3251.68	19002.8	6400.36	18.6141
12	372.482	3249.38	20848.6	7293.22	19.2808
13	378.467	3247.32	22223.3	7946.93	19.6768
14	384.453	3245.49	23112.7	8321.08	19.8
15	390.105	3243.96	22543.3	8056.36	19.6655

16	395.757	3242.62	21522.9	7532.14	19.288
17	402.281	3241.3	20042.9	6726.53	18.5521
18	408.805	3240.22	18051.3	5691.45	17.4997
19	415.33	3239.38	15630.9	4523.29	16.1395
20	421.854	3238.78	12898.6	3332.08	14.4845
21	428.378	3238.4	10002.9	2227.5	12.5541
22	434.903	3238.26	7120.63	1303.71	10.3753
23	441.427	3238.35	4452.85	624.473	7.98316
24	447.951	3238.67	2217.63	210.456	5.42121
25	454.476	3239.22	642.999	30.7841	2.74099
26	461	3240	0	0	0

List Of Coordinates

Water Table

X	Y
0	3225
347.11	3236.65
374.12	3233.95
410.65	3225.41
492.5	3225.41
575	3225.41

Line Load

X	Y
291	3290
274.58	3284.52
254	3294
189	3295
167	3302
122	3308
65	3309
41	3320
0	3320

External Boundary

X	Y
0	3320
0	3256
0	3240
0	3225
0	3220
0	3180
575	3180
575	3220
575	3230.41
575	3257
556	3257
535	3253
484.5	3239.5
461	3240
401	3260
311	3290
291	3290
274.58	3284.52
254	3294
189	3295
167	3302
122	3308
65	3309
41	3320

Material Boundary

X	Y
0	3256
189	3256
201	3260
274.58	3284.52

Material Boundary

X	Y
201	3260
264.3	3260
401	3260

Material Boundary

X	Y
0	3225
160.52	3225
204.3	3240
264.3	3260

Material Boundary

X	Y
189	3256
141	3240
204.3	3240

Material Boundary

X	Y
338.12	3225.41
328.39	3225.41
336.5	3220
392.1	3220
397.32	3220
402.54	3220
410.65	3225.41
492.5	3225.41
500	3230.41
399.42	3230.41
391.44	3257
386.22	3257
381	3257
347.6	3257

Material Boundary

X	Y
338.12	3225.41
347.6	3257

Material Boundary

X	Y
381	3257
392.1	3220

Material Boundary

X	Y
386.22	3257
397.32	3220

Material Boundary

X	Y
160.52	3225
328.39	3225.41

Material Boundary

X	Y
0	3220
336.5	3220

Material Boundary

X	Y
402.54	3220
575	3220

Material Boundary

X	Y
500	3230.41
575	3230.41

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 2.3 - 34 EHP Saddle Dam B - Upstream - Static.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION B - EXISTING CONDITIONS - STATIC ANALYSIS - UPSTREAM SLOPE
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	28	40	35	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 3.674950
Center: 277.918, 3304.982
Radius: 20.712
Left Slip Surface Endpoint: 274.622, 3284.534
Right Slip Surface Endpoint: 292.218, 3290.000
Resisting Moment=86499.6 lb-ft
Driving Moment=23537.6 lb-ft
Total Slice Area=30.1283 ft2

Method: janbu simplified

FS: 3.516810
Center: 277.918, 3304.982
Radius: 20.712
Left Slip Surface Endpoint: 274.622, 3284.534
Right Slip Surface Endpoint: 292.218, 3290.000
Resisting Horizontal Force=3880.19 lb
Driving Horizontal Force=1103.32 lb
Total Slice Area=30.1283 ft2

Method: gle/morgenstern-price

FS: 3.672990
Center: 277.918, 3304.982
Radius: 20.712
Left Slip Surface Endpoint: 274.622, 3284.534
Right Slip Surface Endpoint: 292.218, 3290.000
Resisting Moment=86453.5 lb-ft
Driving Moment=23537.6 lb-ft
Resisting Horizontal Force=3900.43 lb
Driving Horizontal Force=1061.92 lb
Total Slice Area=30.1283 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 3.67495

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	0.703843	15.3702	Baked Shale	50	40	19.222	70.6399	24.5976	0	24.5976
2	0.703843	44.9899	Baked Shale	50	40	28.9188	106.275	67.0662	0	67.0662
3	0.703843	72.3803	Baked Shale	50	40	37.7267	138.644	105.641	0	105.641
4	0.703843	97.5624	Baked Shale	50	40	45.6746	167.852	140.45	0	140.45
5	0.703843	120.549	Baked Shale	50	40	52.7868	193.989	171.599	0	171.599
6	0.703843	141.345	Baked Shale	50	40	59.0833	217.128	199.176	0	199.176
7	0.703843	159.949	Baked Shale	50	40	64.5807	237.331	223.253	0	223.253
8	0.703843	176.35	Baked Shale	50	40	69.2918	254.644	243.886	0	243.886
9	0.703843	190.53	Baked Shale	50	40	73.2263	269.103	261.116	0	261.116
10	0.703843	202.464	Baked Shale	50	40	76.3904	280.731	274.974	0	274.974
11	0.703843	212.116	Baked Shale	50	40	78.7877	289.541	285.475	0	285.475
12	0.703843	219.442	Baked Shale	50	40	80.4193	295.537	292.62	0	292.62
13	0.703843	224.389	Baked Shale	50	40	81.2827	298.71	296.402	0	296.402
14	0.703843	226.89	Baked Shale	50	40	81.3728	299.041	296.795	0	296.795
15	0.703843	226.869	Baked Shale	50	40	80.6814	296.5	293.767	0	293.767
16	0.703843	224.231	Baked Shale	50	40	79.1973	291.046	287.267	0	287.267
17	0.703843	218.868	Baked Shale	50	40	76.9053	282.623	277.229	0	277.229
18	0.703843	210.651	Baked Shale	50	40	73.7869	271.163	263.572	0	263.572
19	0.703843	199.428	Baked Shale	50	40	69.8197	256.584	246.198	0	246.198
20	0.703843	185.017	Baked Shale	50	40	64.9764	238.785	224.985	0	224.985
21	0.703843	167.204	Baked Shale	50	40	59.2242	217.646	199.793	0	199.793
22	0.703843	145.729	Baked Shale	50	40	52.5251	193.027	170.453	0	170.453
23	0.703843	120.278	Baked Shale	50	40	44.833	164.759	136.765	0	136.765
24	0.703843	84.7226	Baked Shale	50	40	34.5292	126.893	91.6377	0	91.6377
25	0.703843	29.3517	Baked Shale	50	40	19.1432	70.3504	24.2527	0	24.2527

Global Minimum Query (janbu simplified) - Safety Factor: 3.51681

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	0.703843	15.3702	Baked Shale	50	40	20.117	70.7477	24.7261	0	24.7261
2	0.703843	44.9899	Baked Shale	50	40	30.2539	106.397	67.2114	0	67.2114
3	0.703843	72.3803	Baked Shale	50	40	39.4537	138.751	105.77	0	105.77
4	0.703843	97.5624	Baked Shale	50	40	47.7484	167.922	140.533	0	140.533
5	0.703843	120.549	Baked Shale	50	40	55.1639	194.001	171.613	0	171.613
6	0.703843	141.345	Baked Shale	50	40	61.7227	217.067	199.102	0	199.102
7	0.703843	159.949	Baked Shale	50	40	67.4427	237.183	223.076	0	223.076
8	0.703843	176.35	Baked Shale	50	40	72.3377	254.398	243.593	0	243.593
9	0.703843	190.53	Baked Shale	50	40	76.4193	268.752	260.699	0	260.699
10	0.703843	202.464	Baked Shale	50	40	79.6944	280.27	274.426	0	274.426
11	0.703843	212.116	Baked Shale	50	40	82.1679	288.969	284.792	0	284.792
12	0.703843	219.442	Baked Shale	50	40	83.841	294.853	291.805	0	291.805
13	0.703843	224.389	Baked Shale	50	40	84.7123	297.917	295.455	0	295.455
14	0.703843	226.89	Baked Shale	50	40	84.7768	298.144	295.727	0	295.727
15	0.703843	226.869	Baked Shale	50	40	84.027	295.507	292.583	0	292.583
16	0.703843	224.231	Baked Shale	50	40	82.4514	289.966	285.98	0	285.98
17	0.703843	218.868	Baked Shale	50	40	80.0359	281.471	275.856	0	275.856
18	0.703843	210.651	Baked Shale	50	40	76.7613	269.955	262.133	0	262.133
19	0.703843	199.428	Baked Shale	50	40	72.6059	255.341	244.715	0	244.715
20	0.703843	185.017	Baked Shale	50	40	67.5413	237.53	223.49	0	223.49
21	0.703843	167.204	Baked Shale	50	40	61.5356	216.409	198.319	0	198.319
22	0.703843	145.729	Baked Shale	50	40	54.5503	191.843	169.041	0	169.041
23	0.703843	120.278	Baked Shale	50	40	46.5393	163.67	135.466	0	135.466
24	0.703843	84.7226	Baked Shale	50	40	35.8247	125.989	90.5597	0	90.5597
25	0.703843	29.3517	Baked Shale	50	40	19.8503	69.8096	23.6082	0	23.6082

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 3.67299

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	0.703843	15.3702	Baked Shale	50	40	19.4715	71.5188	25.6452	0	25.6452
2	0.703843	44.9899	Baked Shale	50	40	29.9347	109.95	71.4455	0	71.4455
3	0.703843	72.3803	Baked Shale	50	40	39.7776	146.103	114.531	0	114.531
4	0.703843	97.5624	Baked Shale	50	40	48.827	179.341	154.143	0	154.143
5	0.703843	120.549	Baked Shale	50	40	56.9258	209.088	189.593	0	189.593
6	0.703843	141.345	Baked Shale	50	40	63.9476	234.879	220.331	0	220.331
7	0.703843	159.949	Baked Shale	50	40	69.808	256.404	245.983	0	245.983
8	0.703843	176.35	Baked Shale	50	40	74.4688	273.523	266.385	0	266.385
9	0.703843	190.53	Baked Shale	50	40	77.9379	286.265	281.57	0	281.57
10	0.703843	202.464	Baked Shale	50	40	80.264	294.809	291.753	0	291.753
11	0.703843	212.116	Baked Shale	50	40	81.5287	299.454	297.288	0	297.288
12	0.703843	219.442	Baked Shale	50	40	81.8339	300.575	298.624	0	298.624
13	0.703843	224.389	Baked Shale	50	40	81.291	298.581	296.247	0	296.247
14	0.703843	226.89	Baked Shale	50	40	80.0095	293.874	290.639	0	290.639
15	0.703843	226.869	Baked Shale	50	40	78.0871	286.813	282.222	0	282.222
16	0.703843	224.231	Baked Shale	50	40	75.6016	277.684	271.343	0	271.343
17	0.703843	218.868	Baked Shale	50	40	72.6065	266.683	258.232	0	258.232
18	0.703843	210.651	Baked Shale	50	40	69.1271	253.903	243.002	0	243.002
19	0.703843	199.428	Baked Shale	50	40	65.1589	239.328	225.632	0	225.632
20	0.703843	185.017	Baked Shale	50	40	60.6658	222.825	205.965	0	205.965
21	0.703843	167.204	Baked Shale	50	40	55.5779	204.137	183.694	0	183.694
22	0.703843	145.729	Baked Shale	50	40	49.7848	182.859	158.335	0	158.335
23	0.703843	120.278	Baked Shale	50	40	43.1286	158.411	129.199	0	129.199
24	0.703843	84.7226	Baked Shale	50	40	33.8577	124.359	88.6175	0	88.6175
25	0.703843	29.3517	Baked Shale	50	40	19.1294	70.2622	24.1477	0	24.1477

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 3.67495

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	274.622	3284.53	0	0	0
2	275.326	3284.43	16.0152	0	0
3	276.03	3284.36	41.5043	0	0
4	276.734	3284.3	73.5868	0	0
5	277.438	3284.28	109.708	0	0
6	278.142	3284.27	147.608	0	0
7	278.845	3284.29	185.293	0	0
8	279.549	3284.33	221.019	0	0
9	280.253	3284.4	253.271	0	0
10	280.957	3284.49	280.757	0	0

11	281.661	3284.61	302.396	0	0
12	282.365	3284.75	317.316	0	0
13	283.068	3284.92	324.855	0	0
14	283.772	3285.12	324.562	0	0
15	284.476	3285.34	316.209	0	0
16	285.18	3285.59	299.801	0	0
17	285.884	3285.86	275.598	0	0
18	286.588	3286.17	244.139	0	0
19	287.292	3286.51	206.28	0	0
20	287.995	3286.89	163.235	0	0
21	288.699	3287.3	116.646	0	0
22	289.403	3287.75	68.6599	0	0
23	290.107	3288.24	22.0426	0	0
24	290.811	3288.77	-19.6688	0	0
25	291.515	3289.36	-49.0389	0	0
26	292.218	3290	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 3.51681

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	274.622	3284.53	0	0	0
2	275.326	3284.43	16.6581	0	0
3	276.03	3284.36	43.0979	0	0
4	276.734	3284.3	76.4027	0	0
5	277.438	3284.28	113.986	0	0
6	278.142	3284.27	153.559	0	0
7	278.845	3284.29	193.103	0	0
8	279.549	3284.33	230.851	0	0
9	280.253	3284.4	265.267	0	0
10	280.957	3284.49	295.038	0	0
11	281.661	3284.61	319.067	0	0
12	282.365	3284.75	336.463	0	0
13	283.068	3284.92	346.546	0	0
14	283.772	3285.12	348.85	0	0
15	284.476	3285.34	343.129	0	0
16	285.18	3285.59	329.371	0	0
17	285.884	3285.86	307.817	0	0
18	286.588	3286.17	278.986	0	0
19	287.292	3286.51	243.71	0	0
20	287.995	3286.89	203.181	0	0
21	288.699	3287.3	159.011	0	0
22	289.403	3287.75	113.313	0	0
23	290.107	3288.24	68.8132	0	0
24	290.811	3288.77	28.9982	0	0
25	291.515	3289.36	1.17121	0	0
26	292.218	3290	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 3.67299

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	274.622	3284.53	0	0	0
2	275.326	3284.43	16.2891	0.712887	2.50593
3	276.03	3284.36	42.8168	3.71818	4.96307
4	276.734	3284.3	76.7926	9.87125	7.32488
5	277.438	3284.28	115.501	19.4299	9.54905
6	278.142	3284.27	156.37	32.0945	11.5987
7	278.845	3284.29	197.04	47.0995	13.4435
8	279.549	3284.33	235.427	63.3424	15.059
9	280.253	3284.4	269.77	79.5359	16.427
10	280.957	3284.49	298.658	94.3622	17.5341
11	281.661	3284.61	321.032	106.614	18.3712
12	282.365	3284.75	336.172	115.308	18.9321
13	283.068	3284.92	343.667	119.767	19.2133
14	283.772	3285.12	343.378	119.667	19.2134
15	284.476	3285.34	335.396	115.041	18.932
16	285.18	3285.59	320.008	106.274	18.3712
17	285.884	3285.86	297.677	94.0521	17.5341
18	286.588	3286.17	269.029	79.3174	16.427
19	287.292	3286.51	234.87	63.1926	15.059
20	287.995	3286.89	196.22	46.9035	13.4435
21	288.699	3287.3	154.378	31.6857	11.5987
22	289.403	3287.75	111.03	18.6777	9.54901
23	290.107	3288.24	68.4068	8.79331	7.32488
24	290.811	3288.77	29.5319	2.56453	4.96308

25	291.515	3289.36	1.4448	0.0632314	2.50594
26	292.218	3290	0	0	0

List Of Coordinates

Water Table

X	Y
0	3278
255.01	3278
347.11	3236.65
374.12	3233.95
410.65	3225.41
492.5	3225.41
575	3225.41

External Boundary

X	Y
0	3320
0	3256
0	3240
0	3225
0	3220
0	3180
575	3180
575	3220
575	3230.41
575	3257
556	3257
535	3253
484.5	3239.5
461	3240
401	3260
311	3290
291	3290
274.58	3284.52
254	3294
189	3295
167	3302
122	3308
65	3309
41	3320

Material Boundary

X	Y
0	3256
189	3256
201	3260
274.58	3284.52

Material Boundary

X	Y
201	3260
264.3	3260
401	3260

Material Boundary

X	Y
0	3225
160.52	3225
204.3	3240
264.3	3260

Material Boundary

X	Y
189	3256
141	3240
204.3	3240

Material Boundary

X	Y
338.12	3225.41
328.39	3225.41
336.5	3220
392.1	3220
397.32	3220
402.54	3220
410.65	3225.41
492.5	3225.41
500	3230.41
399.42	3230.41
391.44	3257
386.22	3257
381	3257
347.6	3257

Material Boundary

X	Y
338.12	3225.41
347.6	3257

Material Boundary

X	Y
381	3257
392.1	3220

Material Boundary

X	Y
386.22	3257
397.32	3220

Material Boundary

X	Y
160.52	3225
328.39	3225.41

Material Boundary

X	Y
0	3220
336.5	3220

Material Boundary

X	Y
402.54	3220
575	3220

Material Boundary

X	Y
500	3230.41
575	3230.41

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 2.4 - 34 EHP Saddle Dam B - Upstream - Seismic.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION B - EXISTING CONDITIONS - SEISIMC ANALYSIS - UPSTREAM SLOPE
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.03

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	40	0	40	0	0	40	0	
Friction Angle [deg]	26.4	22.8	32	28	22.4	32	28	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None

Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	560
Friction Angle [deg]	22.4
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.533270
Center: 277.918, 3304.982
Radius: 20.712
Left Slip Surface Endpoint: 274.622, 3284.534
Right Slip Surface Endpoint: 292.218, 3290.000
Resisting Moment=65089.9 lb-ft
Driving Moment=25694 lb-ft
Total Slice Area=30.1283 ft2

Method: janbu simplified

FS: 2.422440
Center: 277.918, 3304.982
Radius: 20.712
Left Slip Surface Endpoint: 274.622, 3284.534
Right Slip Surface Endpoint: 292.218, 3290.000
Resisting Horizontal Force=2919.42 lb
Driving Horizontal Force=1205.16 lb
Total Slice Area=30.1283 ft2

Method: gle/morgenstern-price

FS: 2.532800
Center: 277.918, 3304.982
Radius: 20.712
Left Slip Surface Endpoint: 274.622, 3284.534
Right Slip Surface Endpoint: 292.218, 3290.000
Resisting Moment=65077.8 lb-ft
Driving Moment=25694 lb-ft
Resisting Horizontal Force=2936.75 lb
Driving Horizontal Force=1159.49 lb
Total Slice Area=30.1283 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.53327

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	0.703843	15.3702	Baked Shale	40	32	21.9535	55.6141	24.9877	0	24.9877
2	0.703843	44.9899	Baked Shale	40	32	32.4263	82.1445	67.4453	0	67.4453
3	0.703843	72.3803	Baked Shale	40	32	41.9244	106.206	105.951	0	105.951
4	0.703843	97.5624	Baked Shale	40	32	50.4813	127.883	140.642	0	140.642
5	0.703843	120.549	Baked Shale	40	32	58.1253	147.247	171.632	0	171.632
6	0.703843	141.345	Baked Shale	40	32	64.8802	164.359	199.016	0	199.016
7	0.703843	159.949	Baked Shale	40	32	70.7647	179.266	222.873	0	222.873
8	0.703843	176.35	Baked Shale	40	32	75.7949	192.009	243.265	0	243.265
9	0.703843	190.53	Baked Shale	40	32	79.982	202.616	260.24	0	260.24
10	0.703843	202.464	Baked Shale	40	32	83.3342	211.108	273.83	0	273.83
11	0.703843	212.116	Baked Shale	40	32	85.8574	217.5	284.06	0	284.06
12	0.703843	219.442	Baked Shale	40	32	87.5532	221.796	290.934	0	290.934
13	0.703843	224.389	Baked Shale	40	32	88.4205	223.993	294.45	0	294.45
14	0.703843	226.89	Baked Shale	40	32	88.4548	224.08	294.59	0	294.59
15	0.703843	226.869	Baked Shale	40	32	87.6488	222.038	291.322	0	291.322
16	0.703843	224.231	Baked Shale	40	32	85.9916	217.84	284.603	0	284.603
17	0.703843	218.868	Baked Shale	40	32	83.4684	211.448	274.374	0	274.374
18	0.703843	210.651	Baked Shale	40	32	80.0613	202.817	260.561	0	260.561
19	0.703843	199.428	Baked Shale	40	32	75.7472	191.888	243.072	0	243.072
20	0.703843	185.017	Baked Shale	40	32	70.4986	178.592	221.793	0	221.793
21	0.703843	167.204	Baked Shale	40	32	64.2829	162.846	196.594	0	196.594
22	0.703843	145.729	Baked Shale	40	32	57.0614	144.552	167.318	0	167.318
23	0.703843	120.278	Baked Shale	40	32	48.7885	123.594	133.779	0	133.779

24	0.703843	84.7226	Baked Shale	40	32	37.7398	95.6052	88.9869	0	88.9869
25	0.703843	29.3517	Baked Shale	40	32	21.2922	53.9388	22.3068	0	22.3068

Global Minimum Query (janbu simplified) - Safety Factor: 2.42244

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	0.703843	15.3702	Baked Shale	40	32	22.9976	55.7102	25.1414	0	25.1414
2	0.703843	44.9899	Baked Shale	40	32	33.9538	82.251	67.6158	0	67.6158
3	0.703843	72.3803	Baked Shale	40	32	43.881	106.299	106.101	0	106.101
4	0.703843	97.5624	Baked Shale	40	32	52.8158	127.943	140.738	0	140.738
5	0.703843	120.549	Baked Shale	40	32	60.7891	147.258	171.649	0	171.649
6	0.703843	141.345	Baked Shale	40	32	67.8267	164.306	198.932	0	198.932
7	0.703843	159.949	Baked Shale	40	32	73.9502	179.14	222.67	0	222.67
8	0.703843	176.35	Baked Shale	40	32	79.1764	191.8	242.931	0	242.931
9	0.703843	190.53	Baked Shale	40	32	83.5183	202.318	259.764	0	259.764
10	0.703843	202.464	Baked Shale	40	32	86.9863	210.719	273.208	0	273.208
11	0.703843	212.116	Baked Shale	40	32	89.5861	217.017	283.287	0	283.287
12	0.703843	219.442	Baked Shale	40	32	91.3207	221.219	290.011	0	290.011
13	0.703843	224.389	Baked Shale	40	32	92.1901	223.325	293.381	0	293.381
14	0.703843	226.89	Baked Shale	40	32	92.1901	223.325	293.382	0	293.382
15	0.703843	226.869	Baked Shale	40	32	91.3145	221.204	289.986	0	289.986
16	0.703843	224.231	Baked Shale	40	32	89.5519	216.934	283.154	0	283.154
17	0.703843	218.868	Baked Shale	40	32	86.8888	210.483	272.83	0	272.83
18	0.703843	210.651	Baked Shale	40	32	83.3069	201.806	258.944	0	258.944
19	0.703843	199.428	Baked Shale	40	32	78.7834	190.848	241.407	0	241.407
20	0.703843	185.017	Baked Shale	40	32	73.291	177.543	220.116	0	220.116
21	0.703843	167.204	Baked Shale	40	32	66.7975	161.813	194.941	0	194.941
22	0.703843	145.729	Baked Shale	40	32	59.2638	143.563	165.736	0	165.736
23	0.703843	120.278	Baked Shale	40	32	50.6446	122.684	132.321	0	132.321
24	0.703843	84.7226	Baked Shale	40	32	39.1533	94.8464	87.7726	0	87.7726
25	0.703843	29.3517	Baked Shale	40	32	22.076	53.4777	21.5688	0	21.5688

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.5328

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	0.703843	15.3702	Baked Shale	40	32	22.2734	56.414	26.2679	0	26.2679
2	0.703843	44.9899	Baked Shale	40	32	33.7099	85.3804	72.6237	0	72.6237
3	0.703843	72.3803	Baked Shale	40	32	44.4809	112.661	116.282	0	116.282
4	0.703843	97.5624	Baked Shale	40	32	54.375	137.721	156.386	0	156.386
5	0.703843	120.549	Baked Shale	40	32	63.2004	160.074	192.157	0	192.157
6	0.703843	141.345	Baked Shale	40	32	70.8042	179.333	222.979	0	222.979
7	0.703843	159.949	Baked Shale	40	32	77.0874	195.247	248.446	0	248.446
8	0.703843	176.35	Baked Shale	40	32	82.0073	207.708	268.389	0	268.389
9	0.703843	190.53	Baked Shale	40	32	85.58	216.757	282.87	0	282.87
10	0.703843	202.464	Baked Shale	40	32	87.8719	222.562	292.16	0	292.16
11	0.703843	212.116	Baked Shale	40	32	88.9885	225.39	296.687	0	296.687
12	0.703843	219.442	Baked Shale	40	32	89.0599	225.571	296.975	0	296.975
13	0.703843	224.389	Baked Shale	40	32	88.2249	223.456	293.591	0	293.591
14	0.703843	226.89	Baked Shale	40	32	86.6192	219.389	287.083	0	287.083
15	0.703843	226.869	Baked Shale	40	32	84.3608	213.669	277.928	0	277.928
16	0.703843	224.231	Baked Shale	40	32	81.5426	206.531	266.505	0	266.505
17	0.703843	218.868	Baked Shale	40	32	78.2261	198.131	253.062	0	253.062
18	0.703843	210.651	Baked Shale	40	32	74.439	188.539	237.712	0	237.712
19	0.703843	199.428	Baked Shale	40	32	70.1733	177.735	220.423	0	220.423
20	0.703843	185.017	Baked Shale	40	32	65.3853	165.608	201.015	0	201.015
21	0.703843	167.204	Baked Shale	40	32	59.9913	151.946	179.151	0	179.151
22	0.703843	145.729	Baked Shale	40	32	53.8647	136.428	154.318	0	154.318
23	0.703843	120.278	Baked Shale	40	32	46.8236	118.595	125.778	0	125.778
24	0.703843	84.7226	Baked Shale	40	32	36.9877	93.6825	85.9101	0	85.9101
25	0.703843	29.3517	Baked Shale	40	32	21.2913	53.9267	22.2874	0	22.2874

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.53327

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	274.622	3284.53	0	0	0
2	275.326	3284.43	17.5056	0	0
3	276.03	3284.36	44.1275	0	0
4	276.734	3284.3	76.9895	0	0
5	277.438	3284.28	113.549	0	0
6	278.142	3284.27	151.562	0	0
7	278.845	3284.29	189.06	0	0

8	279.549	3284.33	224.323	0	0
9	280.253	3284.4	255.868	0	0
10	280.957	3284.49	282.436	0	0
11	281.661	3284.61	302.982	0	0
12	282.365	3284.75	316.675	0	0
13	283.068	3284.92	322.893	0	0
14	283.772	3285.12	321.229	0	0
15	284.476	3285.34	311.5	0	0
16	285.18	3285.59	293.758	0	0
17	285.884	3285.86	268.311	0	0
18	286.588	3286.17	235.747	0	0
19	287.292	3286.51	196.972	0	0
20	287.995	3286.89	153.251	0	0
21	288.699	3287.3	106.275	0	0
22	289.403	3287.75	58.2385	0	0
23	290.107	3288.24	11.9523	0	0
24	290.811	3288.77	-29.0071	0	0
25	291.515	3289.36	-57.1244	0	0
26	292.218	3290	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.42244

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	274.622	3284.53	0	0	0
2	275.326	3284.43	18.2748	0	0
3	276.03	3284.36	46.0126	0	0
4	276.734	3284.3	80.2955	0	0
5	277.438	3284.28	118.544	0	0
6	278.142	3284.27	158.482	0	0
7	278.845	3284.29	198.111	0	0
8	279.549	3284.33	235.685	0	0
9	280.253	3284.4	269.698	0	0
10	280.957	3284.49	298.867	0	0
11	281.661	3284.61	322.128	0	0
12	282.365	3284.75	338.629	0	0
13	283.068	3284.92	347.728	0	0
14	283.772	3285.12	349	0	0
15	284.476	3285.34	342.242	0	0
16	285.18	3285.59	327.488	0	0
17	285.884	3285.86	305.024	0	0
18	286.588	3286.17	275.416	0	0
19	287.292	3286.51	239.545	0	0
20	287.995	3286.89	198.649	0	0
21	288.699	3287.3	154.387	0	0
22	289.403	3287.75	108.917	0	0
23	290.107	3288.24	65.0058	0	0
24	290.811	3288.77	26.1754	0	0
25	291.515	3289.36	-0.203651	0	0
26	292.218	3290	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.5328

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	274.622	3284.53	0	0	0
2	275.326	3284.43	17.8653	0.867637	2.78041
3	276.03	3284.36	45.7943	4.41298	5.50433
4	276.734	3284.3	81.0057	11.5551	8.11822
5	277.438	3284.28	120.762	22.5433	10.574
6	278.142	3284.27	162.449	36.9997	12.8309
7	278.845	3284.29	203.661	54.0224	14.856
8	279.549	3284.33	242.274	72.3353	16.6239
9	280.253	3284.4	276.507	90.4648	18.1165
10	280.957	3284.49	304.948	106.919	19.3214
11	281.661	3284.61	326.565	120.348	20.2302
12	282.365	3284.75	340.688	129.676	20.8383
13	283.068	3284.92	346.974	134.184	21.1428
14	283.772	3285.12	345.359	133.56	21.1429
15	284.476	3285.34	336.019	127.898	20.8382
16	285.18	3285.59	319.321	117.678	20.2301
17	285.884	3285.86	295.801	103.712	19.3214
18	286.588	3286.17	266.148	87.0758	18.1166
19	287.292	3286.51	231.22	69.0349	16.6239
20	287.995	3286.89	192.076	50.9495	14.856
21	288.699	3287.3	150.045	34.1747	12.831

22	289.403	3287.75	106.833	19.9432	10.5741
23	290.107	3288.24	64.6865	9.22722	8.1182
24	290.811	3288.77	26.6423	2.56739	5.50432
25	291.515	3289.36	-0.193193	-0.00938252	2.78042
26	292.218	3290	0	0	0

List Of Coordinates

Water Table

X	Y
0	3278
255.015	3278
347.11	3236.65
374.12	3233.95
410.65	3225.41
492.5	3225.41
575	3225.41

External Boundary

X	Y
0	3320
0	3278
0	3256
0	3240
0	3225
0	3220
0	3180
575	3180
575	3220
575	3230.41
575	3257
556	3257
535	3253
484.5	3239.5
461	3240
401	3260
311	3290
291	3290
274.58	3284.52
254	3294
189	3295
167	3302
122	3308
65	3309
41	3320

Material Boundary

X	Y
0	3256
189	3256
201	3260
255.015	3278
274.58	3284.52

Material Boundary

X	Y
201	3260
264.3	3260
401	3260

Material Boundary

X	Y
0	3225
160.52	3225
204.3	3240
264.3	3260

Material Boundary

X	Y

189	3256
141	3240
204.3	3240

Material Boundary

X	Y
338.12	3225.41
328.39	3225.41
336.5	3220
392.1	3220
397.32	3220
402.54	3220
410.65	3225.41
492.5	3225.41
500	3230.41
399.42	3230.41
391.44	3257
386.22	3257
381	3257
347.6	3257

Material Boundary

X	Y
338.12	3225.41
347.6	3257

Material Boundary

X	Y
381	3257
392.1	3220

Material Boundary

X	Y
386.22	3257
397.32	3220

Material Boundary

X	Y
160.52	3225
328.39	3225.41

Material Boundary

X	Y
0	3220
336.5	3220

Material Boundary

X	Y
402.54	3220
575	3220

Material Boundary

X	Y
500	3230.41
575	3230.41

Material Boundary

X	Y
0	3278
255.015	3278

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 3.0 - 34 EHP Saddle Dam C - Downstream - Static.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION C - MAXIMUM STORAGE POOL - STATIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	28	40	35	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.248870
Center: 519.510, 3493.720
Radius: 279.556
Left Slip Surface Endpoint: 328.069, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Moment=1.06771e+008 lb-ft
Driving Moment=4.74776e+007 lb-ft
Total Slice Area=4492.52 ft2

Method: janbu simplified

FS: 2.150350
Center: 516.015, 3479.740
Radius: 266.181
Left Slip Surface Endpoint: 329.331, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Horizontal Force=363987 lb
Driving Horizontal Force=169269 lb
Total Slice Area=4619.41 ft2

Method: gle/morgenstern-price

FS: 2.260240
Center: 519.510, 3493.720
Radius: 279.556
Left Slip Surface Endpoint: 328.069, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Moment=1.07311e+008 lb-ft
Driving Moment=4.74776e+007 lb-ft
Resisting Horizontal Force=359630 lb
Driving Horizontal Force=159111 lb
Total Slice Area=4492.52 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.24887

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.51437	5003.13	Baked Shale	50	40	163.669	368.071	379.062	0	379.062
2	9.51437	11946.7	Baked Shale	50	40	375.881	845.307	947.807	0	947.807
3	9.51437	17258.1	Baked Shale	50	40	546.328	1228.62	1404.62	0	1404.62
4	9.51437	21784.4	Baked Shale	50	40	697.977	1569.66	1811.06	0	1811.06
5	4.67175	12119.2	Shell	50	33	650.767	1463.49	2176.58	0	2176.58
6	9.84303	27917.2	Central Core	0	28.5	598.189	1345.25	2477.64	0	2477.64
7	9.84303	30658.1	Central Core	0	28.5	664.471	1494.31	2752.17	0	2752.17
8	9.84303	32766.8	Central Core	0	28.5	717.898	1614.46	2973.47	0	2973.47
9	9.84303	34598.9	Central Core	0	28.5	765.896	1722.4	3172.26	0	3172.26
10	11.8656	43399.1	Drain	0	35	1013.27	2278.72	3254.34	0	3254.34
11	11.4517	41556.1	Shell	50	33	972.6	2187.25	3291.08	0	3291.08
12	11.4517	41395.6	Shell	50	33	981.168	2206.52	3320.75	0	3320.75
13	2.60928	9346.82	Baked Shale	50	40	1233.87	2774.82	3247.31	0	3247.31
14	9.04841	31936	Drain	0	35	1020.04	2293.93	3276.06	0	3276.06
15	9.04841	30955	Drain	0	35	998.799	2246.17	3207.85	0	3207.85
16	9.04841	29605.3	Drain	0	35	964.898	2169.93	3098.98	0	3098.98
17	9.04841	27894.1	Drain	0	35	918.234	2064.99	2949.11	0	2949.11
18	9.04841	25827.2	Drain	0	35	858.676	1931.05	2757.82	0	2757.82
19	9.04841	23408.9	Drain	0	35	786.03	1767.68	2524.5	0	2524.5
20	9.04841	20642.6	Drain	0	35	700.063	1574.35	2248.41	0	2248.41
21	9.04841	17530.4	Drain	0	35	600.488	1350.42	1928.61	0	1928.61
22	9.04841	14073.4	Drain	0	35	486.956	1095.1	1563.96	0	1563.96
23	8.60536	9864.91	Baked Shale	50	40	458.4	1030.88	1168.97	0	1168.97
24	8.60536	6128.63	Baked Shale	50	40	296.856	667.59	736.015	0	736.015
25	8.60536	2092.96	Baked Shale	50	40	117.885	265.107	256.355	0	256.355

Global Minimum Query (janbu simplified) - Safety Factor: 2.15035

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.11561	4641.62	Baked Shale	50	40	162.44	349.302	356.695	0	356.695
2	9.11561	11204.7	Baked Shale	50	40	377.005	810.692	906.558	0	906.558
3	9.11561	16447.6	Baked Shale	50	40	557.309	1198.41	1368.62	0	1368.62
4	9.11561	20930.7	Baked Shale	50	40	718.706	1545.47	1782.23	0	1782.23
5	4.7537	12444	Shell	50	33	677.187	1456.19	2165.33	0	2165.33
6	9.98536	28805.2	Central Core	0	28.5	629.577	1353.81	2493.4	0	2493.4
7	9.98536	31863.8	Central Core	0	28.5	705.494	1517.06	2794.07	0	2794.07
8	9.98536	34214.1	Central Core	0	28.5	766.819	1648.93	3036.94	0	3036.94
9	9.98536	36254.1	Central Core	0	28.5	821.987	1767.56	3255.44	0	3255.44
10	11.8874	44963.4	Drain	0	35	1088.59	2340.86	3343.09	0	3343.09
11	8.80353	33089.3	Shell	50	33	1045.93	2249.12	3386.34	0	3386.34
12	8.80353	33117.5	Shell	50	33	1058.02	2275.11	3426.37	0	3426.37
13	1.12361	4214.53	Baked Shale	50	40	1333.08	2866.59	3356.68	0	3356.68
14	9.05564	33686.7	Drain	0	35	1112.01	2391.22	3415.01	0	3415.01
15	9.05564	32964.2	Drain	0	35	1100.47	2366.4	3379.57	0	3379.57
16	9.05564	31847.8	Drain	0	35	1075.06	2311.76	3301.54	0	3301.54
17	9.05564	30346.2	Drain	0	35	1035.7	2227.11	3180.64	0	3180.64
18	9.05564	28466.9	Drain	0	35	982.221	2112.12	3016.42	0	3016.42
19	9.05564	26215.4	Drain	0	35	914.446	1966.38	2808.28	0	2808.28
20	9.05564	23596	Drain	0	35	832.102	1789.31	2555.41	0	2555.41
21	9.05564	20611.7	Drain	0	35	734.876	1580.24	2256.81	0	2256.81
22	9.05564	17264.2	Drain	0	35	622.359	1338.29	1911.28	0	1911.28
23	9.05564	13553.6	Drain	0	35	494.092	1062.47	1517.36	0	1517.36
24	11.5684	11313.4	Baked Shale	50	40	418.048	898.95	1011.74	0	1011.74
25	11.5684	3899.21	Baked Shale	50	40	162.713	349.89	357.395	0	357.395

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.26024

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.51437	5003.13	Baked Shale	50	40	160.663	363.136	373.18	0	373.18
2	9.51437	11946.7	Baked Shale	50	40	361.312	816.652	913.658	0	913.658
3	9.51437	17258.1	Baked Shale	50	40	516.498	1167.41	1331.67	0	1331.67
4	9.51437	21784.4	Baked Shale	50	40	653.125	1476.22	1699.7	0	1699.7
5	4.67175	12119.2	Shell	50	33	597.667	1350.87	2003.17	0	2003.17
6	9.84303	27917.2	Central Core	0	28.5	538.443	1217.01	2241.46	0	2241.46
7	9.84303	30658.1	Central Core	0	28.5	596.308	1347.8	2482.33	0	2482.33
8	9.84303	32766.8	Central Core	0	28.5	646.706	1461.71	2692.13	0	2692.13
9	9.84303	34598.9	Central Core	0	28.5	696.886	1575.13	2901.03	0	2901.03
10	11.8656	43399.1	Drain	0	35	959.053	2167.69	3095.78	0	3095.78
11	11.4517	41556.1	Shell	50	33	939.117	2122.63	3191.57	0	3191.57
12	11.4517	41395.6	Shell	50	33	972.459	2197.99	3307.62	0	3307.62
13	2.60928	9346.82	Baked Shale	50	40	1279.17	2891.23	3386.05	0	3386.05
14	9.04841	31936	Drain	0	35	1047.92	2368.54	3382.63	0	3382.63
15	9.04841	30955	Drain	0	35	1046.87	2366.17	3379.23	0	3379.23
16	9.04841	29605.3	Drain	0	35	1029.42	2326.73	3322.92	0	3322.92
17	9.04841	27894.1	Drain	0	35	993.948	2246.56	3208.42	0	3208.42
18	9.04841	25827.2	Drain	0	35	939.259	2122.95	3031.89	0	3031.89
19	9.04841	23408.9	Drain	0	35	864.775	1954.6	2791.45	0	2791.45
20	9.04841	20642.6	Drain	0	35	770.644	1741.84	2487.6	0	2487.6
21	9.04841	17530.4	Drain	0	35	657.82	1486.83	2123.41	0	2123.41
22	9.04841	14073.4	Drain	0	35	528.015	1193.44	1704.41	0	1704.41
23	8.60536	9864.91	Baked Shale	50	40	491.678	1111.31	1264.82	0	1264.82
24	8.60536	6128.63	Baked Shale	50	40	310.363	701.495	776.422	0	776.422
25	8.60536	2092.96	Baked Shale	50	40	119.838	270.863	263.214	0	263.214

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.24887

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	328.069	3290	0	0	0
2	337.583	3281.46	1681.13	0	0
3	347.097	3273.66	5498.97	0	0
4	356.612	3266.53	10324.5	0	0
5	366.126	3260	15513.1	0	0
6	370.798	3257	19005.1	0	0
7	380.641	3251.09	27753	0	0
8	390.484	3245.72	36009.6	0	0
9	400.327	3240.84	43452.6	0	0
10	410.17	3236.43	49906.7	0	0

11	422.036	3231.71	53271.8	0	0
12	433.487	3227.73	55240.6	0	0
13	444.939	3224.29	55419.8	0	0
14	447.548	3223.58	54503.9	0	0
15	456.597	3221.33	52651.2	0	0
16	465.645	3219.4	49821	0	0
17	474.693	3217.78	46125.9	0	0
18	483.742	3216.46	41711.2	0	0
19	492.79	3215.44	36754.6	0	0
20	501.839	3214.72	31467.6	0	0
21	510.887	3214.3	26096.1	0	0
22	519.936	3214.16	20922.9	0	0
23	528.984	3214.32	16269.6	0	0
24	537.589	3214.75	11831.7	0	0
25	546.195	3215.44	8770.41	0	0
26	554.8	3216.4	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.15035

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	329.331	3290	0	0	0
2	338.447	3281.44	1571.28	0	0
3	347.562	3273.64	5205.24	0	0
4	356.678	3266.52	9877.06	0	0
5	365.794	3260	14940.5	0	0
6	370.547	3256.82	18596.8	0	0
7	380.533	3250.62	27783.9	0	0
8	390.518	3245	36435.6	0	0
9	400.503	3239.93	44178.9	0	0
10	410.489	3235.37	50810.1	0	0
11	422.376	3230.57	53905.4	0	0
12	431.18	3227.44	55306.6	0	0
13	439.983	3224.65	55554.8	0	0
14	441.107	3224.32	55171.8	0	0
15	450.163	3221.83	53580.7	0	0
16	459.218	3219.69	50861.1	0	0
17	468.274	3217.88	47113	0	0
18	477.329	3216.39	42472.6	0	0
19	486.385	3215.21	37112	0	0
20	495.441	3214.36	31239.6	0	0
21	504.496	3213.81	25101.3	0	0
22	513.552	3213.57	18982.8	0	0
23	522.608	3213.64	13212	0	0
24	531.663	3214.02	8162.55	0	0
25	543.232	3214.95	2380.17	0	0
26	554.8	3216.4	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.26024

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	328.069	3290	0	0	0
2	337.583	3281.46	1658.93	81.056	2.79727
3	347.097	3273.66	5347.72	518.048	5.53313
4	356.612	3266.53	9934.69	1422.69	8.14959
5	366.126	3260	14820.4	2772.16	10.5948
6	370.798	3257	18039	3741.94	11.719
7	380.641	3251.09	25977.9	6428.11	13.8984
8	390.484	3245.72	33452.4	9462.35	15.7941
9	400.327	3240.84	40221.1	12590	17.3812
10	410.17	3236.43	46155.5	15571.4	18.6428
11	422.036	3231.71	49410	17706.4	19.7155
12	433.487	3227.73	51362.1	18975.8	20.2768
13	444.939	3224.29	51591.7	19154.2	20.3682
14	447.548	3223.58	50654.9	18761.1	20.3232
15	456.597	3221.33	48786.3	17735.3	19.9777
16	465.645	3219.4	45849.3	16092.4	19.3403
17	474.693	3217.78	41930.9	13959.9	18.414
18	483.742	3216.46	37170.2	11509.5	17.2048
19	492.79	3215.44	31760.9	8940.69	15.7219
20	501.839	3214.72	25951.5	6460.29	13.9789
21	510.887	3214.3	20041.3	4258.1	11.995
22	519.936	3214.16	14373.4	2481.72	9.79614
23	528.984	3214.32	9324.67	1213.55	7.41503
24	537.589	3214.75	4558.37	400.239	5.01788

25	546.195	3215.44	1352.03	59.7807	2.53171
26	554.8	3216.4	0	0	0

List Of Coordinates

Water Table

X	Y
0	3240
365.71	3238
434.54	3220
554.7	3206.4
588.32	3206
650	3205

External Boundary

X	Y
0	3254
0	3252
0	3240
0	3220
0	3215
0	3180
650	3180
650	3210.5
650	3214.4
629	3215.5
554.8	3216.4
424	3260
334	3290
314	3290
299	3285
0	3285

Material Boundary

X	Y
0	3240
182	3246
212	3256
218.36	3258.12
224	3260
299	3285

Material Boundary

X	Y
0	3254
218.36	3258.12

Material Boundary

X	Y
0	3252
212	3256

Material Boundary

X	Y
224	3260
287.3	3260
424	3260

Material Boundary

X	Y
370.6	3257
404	3257
409.22	3257
414.44	3257
424.05	3225
435.1	3225
554.7	3211.4
595.82	3211

588.32	3206
554.7	3206.4
434.54	3220
427.04	3215
421.82	3215
416.6	3215
358	3215
350.5	3220
359.5	3220
370.6	3257

Material Boundary

X	Y
404	3257
416.6	3215

Material Boundary

X	Y
409.22	3257
421.82	3215

Material Boundary

X	Y
595.82	3211
650	3210.5

Material Boundary

X	Y
0	3220
167.3	3220
350.5	3220

Material Boundary

X	Y
0	3215
358	3215

Material Boundary

X	Y
182	3246
245.3	3246
287.3	3260

Material Boundary

X	Y
167.3	3220
245.3	3246

Material Boundary

X	Y
435.1	3225
554.8	3216.4

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 3.2 - 34 EHP Saddle Dam C - Downstream - Seismic.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION C - MAXIMUM STORAGE POOL - SEISMIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.03

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	40	0	40	0	0	40	0	
Friction Angle [deg]	26.4	22.8	32	28	22.4	32	28	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None

Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	560
Friction Angle [deg]	22.4
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 1.556860
Center: 519.510, 3493.720
Radius: 279.556
Left Slip Surface Endpoint: 328.069, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Moment=8.05544e+007 lb-ft
Driving Moment=5.17415e+007 lb-ft
Total Slice Area=4492.52 ft2

Method: janbu simplified

FS: 1.487640
Center: 516.015, 3479.740
Radius: 266.181
Left Slip Surface Endpoint: 329.331, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Horizontal Force=274695 lb
Driving Horizontal Force=184652 lb
Total Slice Area=4619.41 ft2

Method: gle/morgenstern-price

FS: 1.565440
Center: 519.510, 3493.720
Radius: 279.556
Left Slip Surface Endpoint: 328.069, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Moment=8.09981e+007 lb-ft
Driving Moment=5.17415e+007 lb-ft
Resisting Horizontal Force=271657 lb
Driving Horizontal Force=173534 lb
Total Slice Area=4492.52 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.55686

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.51437	5003.13	Baked Shale	40	32	174.151	271.129	369.883	0	369.883
2	9.51437	11946.7	Baked Shale	40	32	398.772	620.832	929.525	0	929.525
3	9.51437	17258.1	Baked Shale	40	32	579.681	902.482	1380.26	0	1380.26
4	9.51437	21784.4	Baked Shale	40	32	741.03	1153.68	1782.25	0	1782.25
5	4.67175	12119.2	Shell	40	26.4	708.163	1102.51	2140.4	0	2140.4
6	9.84303	27917.2	Central Core	0	22.8	659.25	1026.36	2441.6	0	2441.6
7	9.84303	30658.1	Central Core	0	22.8	733.142	1141.4	2715.27	0	2715.27
8	9.84303	32766.8	Central Core	0	22.8	792.968	1234.54	2936.86	0	2936.86
9	9.84303	34598.9	Central Core	0	22.8	846.884	1318.48	3136.55	0	3136.55
10	11.8656	43399.1	Drain	0	28	1099.89	1712.37	3220.49	0	3220.49
11	11.4517	41556.1	Shell	40	26.4	1064.99	1658.04	3259.52	0	3259.52
12	11.4517	41395.6	Shell	40	26.4	1075.63	1674.61	3292.9	0	3292.9
13	2.60928	9346.82	Baked Shale	40	32	1319.89	2054.88	3224.48	0	3224.48
14	9.04841	31936	Drain	0	28	1111.26	1730.07	3253.8	0	3253.8
15	9.04841	30955	Drain	0	28	1089.1	1695.58	3188.92	0	3188.92
16	9.04841	29605.3	Drain	0	28	1053.07	1639.49	3083.44	0	3083.44
17	9.04841	27894.1	Drain	0	28	1003.06	1561.62	2936.97	0	2936.97
18	9.04841	25827.2	Drain	0	28	938.845	1461.65	2748.96	0	2748.96
19	9.04841	23408.9	Drain	0	28	860.206	1339.22	2518.7	0	2518.7
20	9.04841	20642.6	Drain	0	28	766.838	1193.86	2245.32	0	2245.32
21	9.04841	17530.4	Drain	0	28	658.383	1025.01	1927.77	0	1927.77
22	9.04841	14073.4	Drain	0	28	534.416	832.011	1564.78	0	1564.78
23	8.60536	9864.91	Baked Shale	40	32	495.599	771.578	1170.76	0	1170.76

24	8.60536	6128.63	Baked Shale	40	32	321.895	501.146	737.987	0	737.987
25	8.60536	2092.96	Baked Shale	40	32	129.077	200.955	257.582	0	257.582

Global Minimum Query (janbu simplified) - Safety Factor: 1.48764

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.11561	4641.62	Baked Shale	40	32	172.697	256.911	347.13	0	347.13
2	9.11561	11204.7	Baked Shale	40	32	399.611	594.478	887.353	0	887.353
3	9.11561	16447.6	Baked Shale	40	32	590.836	878.952	1342.6	0	1342.6
4	9.11561	20930.7	Baked Shale	40	32	762.449	1134.25	1751.17	0	1751.17
5	4.7537	12444	Shell	40	26.4	736.314	1095.37	2126.04	0	2126.04
6	9.98536	28805.2	Central Core	0	22.8	693.4	1031.53	2453.91	0	2453.91
7	9.98536	31863.8	Central Core	0	22.8	778.038	1157.44	2753.44	0	2753.44
8	9.98536	34214.1	Central Core	0	22.8	846.724	1259.62	2996.53	0	2996.53
9	9.98536	36254.1	Central Core	0	22.8	908.741	1351.88	3215.99	0	3215.99
10	11.8874	44963.4	Drain	0	28	1181.54	1757.71	3305.77	0	3305.77
11	8.80353	33089.3	Shell	40	26.4	1145.14	1703.55	3351.2	0	3351.2
12	8.80353	33117.5	Shell	40	26.4	1159.53	1724.96	3394.33	0	3394.33
13	1.12361	4214.53	Baked Shale	40	32	1425.43	2120.53	3329.55	0	3329.55
14	9.05564	33686.7	Drain	0	28	1210.94	1801.44	3388.01	0	3388.01
15	9.05564	32964.2	Drain	0	28	1199.57	1784.53	3356.22	0	3356.22
16	9.05564	31847.8	Drain	0	28	1173.05	1745.07	3282.01	0	3282.01
17	9.05564	30346.2	Drain	0	28	1131.23	1682.86	3164.99	0	3164.99
18	9.05564	28466.9	Drain	0	28	1073.9	1597.58	3004.61	0	3004.61
19	9.05564	26215.4	Drain	0	28	1000.82	1488.86	2800.13	0	2800.13
20	9.05564	23596	Drain	0	28	911.639	1356.19	2550.62	0	2550.62
21	9.05564	20611.7	Drain	0	28	805.961	1198.98	2254.95	0	2254.95
22	9.05564	17264.2	Drain	0	28	683.297	1016.5	1911.76	0	1911.76
23	9.05564	13553.6	Drain	0	28	543.063	807.882	1519.4	0	1519.4
24	11.5684	11313.4	Baked Shale	40	32	453.041	673.962	1014.56	0	1014.56
25	11.5684	3899.21	Baked Shale	40	32	177.796	264.497	359.271	0	359.271

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.56544

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.51437	5003.13	Baked Shale	40	32	170.622	267.098	363.433	0	363.433
2	9.51437	11946.7	Baked Shale	40	32	381.757	597.618	892.377	0	892.377
3	9.51437	17258.1	Baked Shale	40	32	544.738	852.755	1300.68	0	1300.68
4	9.51437	21784.4	Baked Shale	40	32	688.241	1077.4	1660.18	0	1660.18
5	4.67175	12119.2	Shell	40	26.4	644.756	1009.33	1952.7	0	1952.7
6	9.84303	27917.2	Central Core	0	22.8	586.741	918.508	2185.04	0	2185.04
7	9.84303	30658.1	Central Core	0	22.8	650.073	1017.65	2420.89	0	2420.89
8	9.84303	32766.8	Central Core	0	22.8	705.782	1104.86	2628.36	0	2628.36
9	9.84303	34598.9	Central Core	0	22.8	761.901	1192.71	2837.34	0	2837.34
10	11.8656	43399.1	Drain	0	28	1033.27	1617.53	3042.13	0	3042.13
11	11.4517	41556.1	Shell	40	26.4	1023.44	1602.14	3146.91	0	3146.91
12	11.4517	41395.6	Shell	40	26.4	1064.13	1665.83	3275.21	0	3275.21
13	2.60928	9346.82	Baked Shale	40	32	1370.92	2146.09	3370.45	0	3370.45
14	9.04841	31936	Drain	0	28	1143.71	1790.41	3367.28	0	3367.28
15	9.04841	30955	Drain	0	28	1146.36	1794.56	3375.07	0	3375.07
16	9.04841	29605.3	Drain	0	28	1130.72	1770.08	3329.04	0	3329.04
17	9.04841	27894.1	Drain	0	28	1094.74	1713.75	3223.09	0	3223.09
18	9.04841	25827.2	Drain	0	28	1036.87	1623.15	3052.7	0	3052.7
19	9.04841	23408.9	Drain	0	28	956.325	1497.07	2815.58	0	2815.58
20	9.04841	20642.6	Drain	0	28	853.255	1335.72	2512.13	0	2512.13
21	9.04841	17530.4	Drain	0	28	728.811	1140.91	2145.75	0	2145.75
22	9.04841	14073.4	Drain	0	28	585.094	915.93	1722.62	0	1722.62
23	8.60536	9864.91	Baked Shale	40	32	536.195	839.381	1279.27	0	1279.27
24	8.60536	6128.63	Baked Shale	40	32	338.873	530.485	784.94	0	784.94
25	8.60536	2092.96	Baked Shale	40	32	132.207	206.962	267.195	0	267.195

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.55686

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	328.069	3290	0	0	0
2	337.583	3281.46	1655.54	0	0
3	347.097	3273.66	5476.95	0	0
4	356.612	3266.53	10337.1	0	0
5	366.126	3260	15592	0	0
6	370.798	3257	19075.7	0	0
7	380.641	3251.09	27857	0	0

8	390.484	3245.72	36169.9	0	0
9	400.327	3240.84	43690	0	0
10	410.17	3236.43	50239.9	0	0
11	422.036	3231.71	53738.6	0	0
12	433.487	3227.73	55788.6	0	0
13	444.939	3224.29	56050.5	0	0
14	447.548	3223.58	55179.5	0	0
15	456.597	3221.33	53424.2	0	0
16	465.645	3219.4	50683.6	0	0
17	474.693	3217.78	47067.7	0	0
18	483.742	3216.46	42719.8	0	0
19	492.79	3215.44	37816.2	0	0
20	501.839	3214.72	32567.7	0	0
21	510.887	3214.3	27220.3	0	0
22	519.936	3214.16	22057.9	0	0
23	528.984	3214.32	17404.4	0	0
24	537.589	3214.75	12947.9	0	0
25	546.195	3215.44	9857.69	0	0
26	554.8	3216.4	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 1.48764

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	329.331	3290	0	0	0
2	338.447	3281.44	1535.82	0	0
3	347.562	3273.64	5151.48	0	0
4	356.678	3266.52	9827.83	0	0
5	365.794	3260	14920.7	0	0
6	370.547	3256.82	18545.9	0	0
7	380.533	3250.62	27717.5	0	0
8	390.518	3245	36375.5	0	0
9	400.503	3239.93	44145.6	0	0
10	410.489	3235.37	50822	0	0
11	422.376	3230.57	53987.7	0	0
12	431.18	3227.44	55402.2	0	0
13	439.983	3224.65	55664.8	0	0
14	441.107	3224.32	55296.2	0	0
15	450.163	3221.83	53757.1	0	0
16	459.218	3219.69	51083.2	0	0
17	468.274	3217.88	47372	0	0
18	477.329	3216.39	42757.7	0	0
19	486.385	3215.21	37410.9	0	0
20	495.441	3214.36	31539.3	0	0
21	504.496	3213.81	25389.3	0	0
22	513.552	3213.57	19247.9	0	0
23	522.608	3213.64	13445.6	0	0
24	531.663	3214.02	8360.46	0	0
25	543.232	3214.95	2512.12	0	0
26	554.8	3216.4	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.56544

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	328.069	3290	0	0	0
2	337.583	3281.46	1629.43	87.0892	3.05941
3	347.097	3273.66	5312.53	562.956	6.04892
4	356.612	3266.53	9922.34	1554.32	8.90295
5	366.126	3260	14863.1	3041.15	11.5637
6	370.798	3257	18070.9	4100.49	12.7846
7	380.641	3251.09	26033.1	7046.57	15.1457
8	390.484	3245.72	33561.8	10384.6	17.193
9	400.327	3240.84	40414.1	13838.2	18.9017
10	410.17	3236.43	46458.5	17145.1	20.2561
11	422.036	3231.71	49868.8	19548.6	21.4052
12	433.487	3227.73	51912.7	20979.9	22.0055
13	444.939	3224.29	52211.3	21204.1	22.1031
14	447.548	3223.58	51300.9	20784.2	22.055
15	456.597	3221.33	49479	19675.9	21.6858
16	465.645	3219.4	46552.3	17873.1	21.0036
17	474.693	3217.78	42605.4	15516.2	20.0108
18	483.742	3216.46	37779.2	12796.4	18.712
19	492.79	3215.44	32273.6	9938	17.1152
20	501.839	3214.72	26347.1	7174.57	15.2328
21	510.887	3214.3	20311.7	4720.73	13.0841

22	519.936	3214.16	14524	2743.16	10.6955
23	528.984	3214.32	9372.93	1334.35	8.1023
24	537.589	3214.75	4508.85	433.059	5.48623
25	546.195	3215.44	1232.31	59.6029	2.76906
26	554.8	3216.4	0	0	0

List Of Coordinates

Water Table

X	Y
0	3235
365.71	3238
434.54	3220
554.7	3206.4
588.32	3206
650	3205

External Boundary

X	Y
0	3254
0	3252
0	3240
0	3220
0	3215
0	3180
650	3180
650	3210.5
650	3214.4
629	3215.5
554.8	3216.4
424	3260
334	3290
314	3290
299	3285
0	3285

Material Boundary

X	Y
0	3240
182	3246
212	3256
218.36	3258.12
224	3260
299	3285

Material Boundary

X	Y
0	3254
218.36	3258.12

Material Boundary

X	Y
0	3252
212	3256

Material Boundary

X	Y
224	3260
287.3	3260
424	3260

Material Boundary

X	Y
370.6	3257
404	3257
409.22	3257
414.44	3257
424.05	3225

435.1	3225
554.7	3211.4
595.82	3211
588.32	3206
554.7	3206.4
434.54	3220
427.04	3215
421.82	3215
416.6	3215
358	3215
350.5	3220
359.5	3220
370.6	3257

Material Boundary

X	Y
404	3257
416.6	3215

Material Boundary

X	Y
409.22	3257
421.82	3215

Material Boundary

X	Y
595.82	3211
650	3210.5

Material Boundary

X	Y
0	3220
167.3	3220
350.5	3220

Material Boundary

X	Y
0	3215
358	3215

Material Boundary

X	Y
182	3246
245.3	3246
287.3	3260

Material Boundary

X	Y
167.3	3220
245.3	3246

Material Boundary

X	Y
435.1	3225
554.8	3216.4

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 3.1 - 34 EHP Saddle Dam C - Max Surcharge - Downstream - Static.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION C - MAXIMUM SURCHARGE POOL - STATIC ANALYSIS
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 151
Orientation: Normal to boundary

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								

Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	28	40	35	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.248870
Center: 519.510, 3493.720
Radius: 279.556
Left Slip Surface Endpoint: 328.069, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Moment=1.06771e+008 lb-ft
Driving Moment=4.74776e+007 lb-ft
Total Slice Area=4492.52 ft2

Method: janbu simplified

FS: 2.150350
Center: 516.015, 3479.740
Radius: 266.181
Left Slip Surface Endpoint: 329.331, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Horizontal Force=363987 lb
Driving Horizontal Force=169269 lb
Total Slice Area=4619.41 ft2

Method: gle/morgenstern-price

FS: 2.260240
Center: 519.510, 3493.720
Radius: 279.556
Left Slip Surface Endpoint: 328.069, 3290.000
Right Slip Surface Endpoint: 554.800, 3216.400
Resisting Moment=1.07311e+008 lb-ft
Driving Moment=4.74776e+007 lb-ft
Resisting Horizontal Force=359630 lb
Driving Horizontal Force=159111 lb
Total Slice Area=4492.52 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.24887

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.51437	5003.13	Baked Shale	50	40	163.669	368.071	379.062	0	379.062
2	9.51437	11946.7	Baked Shale	50	40	375.881	845.307	947.807	0	947.807
3	9.51437	17258.1	Baked Shale	50	40	546.328	1228.62	1404.62	0	1404.62
4	9.51437	21784.4	Baked Shale	50	40	697.977	1569.66	1811.06	0	1811.06
5	4.67175	12119.2	Shell	50	33	650.767	1463.49	2176.58	0	2176.58
6	9.84303	27917.2	Central Core	0	28.5	598.189	1345.25	2477.64	0	2477.64
7	9.84303	30658.1	Central Core	0	28.5	664.471	1494.31	2752.17	0	2752.17
8	9.84303	32766.8	Central Core	0	28.5	717.898	1614.46	2973.47	0	2973.47
9	9.84303	34598.9	Central Core	0	28.5	765.896	1722.4	3172.26	0	3172.26
10	11.8656	43399.1	Drain	0	35	1013.27	2278.72	3254.34	0	3254.34
11	11.4517	41556.1	Shell	50	33	972.6	2187.25	3291.08	0	3291.08
12	11.4517	41395.6	Shell	50	33	981.168	2206.52	3320.75	0	3320.75
13	2.60928	9346.82	Baked Shale	50	40	1233.87	2774.82	3247.31	0	3247.31
14	9.04841	31936	Drain	0	35	1020.04	2293.93	3276.06	0	3276.06
15	9.04841	30955	Drain	0	35	998.799	2246.17	3207.85	0	3207.85
16	9.04841	29605.3	Drain	0	35	964.898	2169.93	3098.98	0	3098.98
17	9.04841	27894.1	Drain	0	35	918.234	2064.99	2949.11	0	2949.11

18	9.04841	25827.2	Drain	0	35	858.676	1931.05	2757.82	0	2757.82
19	9.04841	23408.9	Drain	0	35	786.03	1767.68	2524.5	0	2524.5
20	9.04841	20642.6	Drain	0	35	700.063	1574.35	2248.41	0	2248.41
21	9.04841	17530.4	Drain	0	35	600.488	1350.42	1928.61	0	1928.61
22	9.04841	14073.4	Drain	0	35	486.956	1095.1	1563.96	0	1563.96
23	8.60536	9864.91	Baked Shale	50	40	458.4	1030.88	1168.97	0	1168.97
24	8.60536	6128.63	Baked Shale	50	40	296.856	667.59	736.015	0	736.015
25	8.60536	2092.96	Baked Shale	50	40	117.885	265.107	256.355	0	256.355

Global Minimum Query (janbu simplified) - Safety Factor: 2.15035

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.11561	4641.62	Baked Shale	50	40	162.44	349.302	356.695	0	356.695
2	9.11561	11204.7	Baked Shale	50	40	377.005	810.692	906.558	0	906.558
3	9.11561	16447.6	Baked Shale	50	40	557.309	1198.41	1368.62	0	1368.62
4	9.11561	20930.7	Baked Shale	50	40	718.706	1545.47	1782.23	0	1782.23
5	4.7537	12444	Shell	50	33	677.187	1456.19	2165.33	0	2165.33
6	9.98536	28805.2	Central Core	0	28.5	629.577	1353.81	2493.4	0	2493.4
7	9.98536	31863.8	Central Core	0	28.5	705.494	1517.06	2794.07	0	2794.07
8	9.98536	34214.1	Central Core	0	28.5	766.819	1648.93	3036.94	0	3036.94
9	9.98536	36254.1	Central Core	0	28.5	821.987	1767.56	3255.44	0	3255.44
10	11.8874	44963.4	Drain	0	35	1088.59	2340.86	3343.09	0	3343.09
11	8.80353	33089.3	Shell	50	33	1045.93	2249.12	3386.34	0	3386.34
12	8.80353	33117.5	Shell	50	33	1058.02	2275.11	3426.37	0	3426.37
13	1.12361	4214.53	Baked Shale	50	40	1333.08	2866.59	3356.68	0	3356.68
14	9.05564	33686.7	Drain	0	35	1112.01	2391.22	3415.01	0	3415.01
15	9.05564	32964.2	Drain	0	35	1100.47	2366.4	3379.57	0	3379.57
16	9.05564	31847.8	Drain	0	35	1075.06	2311.76	3301.54	0	3301.54
17	9.05564	30346.2	Drain	0	35	1035.7	2227.11	3180.64	0	3180.64
18	9.05564	28466.9	Drain	0	35	982.221	2112.12	3016.42	0	3016.42
19	9.05564	26215.4	Drain	0	35	914.446	1966.38	2808.28	0	2808.28
20	9.05564	23596	Drain	0	35	832.102	1789.31	2555.41	0	2555.41
21	9.05564	20611.7	Drain	0	35	734.876	1580.24	2256.81	0	2256.81
22	9.05564	17264.2	Drain	0	35	622.359	1338.29	1911.28	0	1911.28
23	9.05564	13553.6	Drain	0	35	494.092	1062.47	1517.36	0	1517.36
24	11.5684	11313.4	Baked Shale	50	40	418.048	898.95	1011.74	0	1011.74
25	11.5684	3899.21	Baked Shale	50	40	162.713	349.89	357.395	0	357.395

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.26024

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.51437	5003.13	Baked Shale	50	40	160.663	363.136	373.18	0	373.18
2	9.51437	11946.7	Baked Shale	50	40	361.312	816.652	913.658	0	913.658
3	9.51437	17258.1	Baked Shale	50	40	516.498	1167.41	1331.67	0	1331.67
4	9.51437	21784.4	Baked Shale	50	40	653.125	1476.22	1699.7	0	1699.7
5	4.67175	12119.2	Shell	50	33	597.667	1350.87	2003.17	0	2003.17
6	9.84303	27917.2	Central Core	0	28.5	538.443	1217.01	2241.46	0	2241.46
7	9.84303	30658.1	Central Core	0	28.5	596.308	1347.8	2482.33	0	2482.33
8	9.84303	32766.8	Central Core	0	28.5	646.706	1461.71	2692.13	0	2692.13
9	9.84303	34598.9	Central Core	0	28.5	696.886	1575.13	2901.03	0	2901.03
10	11.8656	43399.1	Drain	0	35	959.053	2167.69	3095.78	0	3095.78
11	11.4517	41556.1	Shell	50	33	939.117	2122.63	3191.57	0	3191.57
12	11.4517	41395.6	Shell	50	33	972.459	2197.99	3307.62	0	3307.62
13	2.60928	9346.82	Baked Shale	50	40	1279.17	2891.23	3386.05	0	3386.05
14	9.04841	31936	Drain	0	35	1047.92	2368.54	3382.63	0	3382.63
15	9.04841	30955	Drain	0	35	1046.87	2366.17	3379.23	0	3379.23
16	9.04841	29605.3	Drain	0	35	1029.42	2326.73	3322.92	0	3322.92
17	9.04841	27894.1	Drain	0	35	993.948	2246.56	3208.42	0	3208.42
18	9.04841	25827.2	Drain	0	35	939.259	2122.95	3031.89	0	3031.89
19	9.04841	23408.9	Drain	0	35	864.775	1954.6	2791.45	0	2791.45
20	9.04841	20642.6	Drain	0	35	770.644	1741.84	2487.6	0	2487.6
21	9.04841	17530.4	Drain	0	35	657.82	1486.83	2123.41	0	2123.41
22	9.04841	14073.4	Drain	0	35	528.015	1193.44	1704.41	0	1704.41
23	8.60536	9864.91	Baked Shale	50	40	491.678	1111.31	1264.82	0	1264.82
24	8.60536	6128.63	Baked Shale	50	40	310.363	701.495	776.422	0	776.422
25	8.60536	2092.96	Baked Shale	50	40	119.838	270.863	263.214	0	263.214

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.24887

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	328.069	3290	0	0	0

2	337.583	3281.46	1681.13	0	0
3	347.097	3273.66	5498.97	0	0
4	356.612	3266.53	10324.5	0	0
5	366.126	3260	15513.1	0	0
6	370.798	3257	19005.1	0	0
7	380.641	3251.09	27753	0	0
8	390.484	3245.72	36009.6	0	0
9	400.327	3240.84	43452.6	0	0
10	410.17	3236.43	49906.7	0	0
11	422.036	3231.71	53271.8	0	0
12	433.487	3227.73	55240.6	0	0
13	444.939	3224.29	55419.8	0	0
14	447.548	3223.58	54503.9	0	0
15	456.597	3221.33	52651.2	0	0
16	465.645	3219.4	49821	0	0
17	474.693	3217.78	46125.9	0	0
18	483.742	3216.46	41711.2	0	0
19	492.79	3215.44	36754.6	0	0
20	501.839	3214.72	31467.6	0	0
21	510.887	3214.3	26096.1	0	0
22	519.936	3214.16	20922.9	0	0
23	528.984	3214.32	16269.6	0	0
24	537.589	3214.75	11831.7	0	0
25	546.195	3215.44	8770.41	0	0
26	554.8	3216.4	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.15035

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	329.331	3290	0	0	0
2	338.447	3281.44	1571.28	0	0
3	347.562	3273.64	5205.24	0	0
4	356.678	3266.52	9877.06	0	0
5	365.794	3260	14940.5	0	0
6	370.547	3256.82	18596.8	0	0
7	380.533	3250.62	27783.9	0	0
8	390.518	3245	36435.6	0	0
9	400.503	3239.93	44178.9	0	0
10	410.489	3235.37	50810.1	0	0
11	422.376	3230.57	53905.4	0	0
12	431.18	3227.44	55306.6	0	0
13	439.983	3224.65	55554.8	0	0
14	441.107	3224.32	55171.8	0	0
15	450.163	3221.83	53580.7	0	0
16	459.218	3219.69	50861.1	0	0
17	468.274	3217.88	47113	0	0
18	477.329	3216.39	42472.6	0	0
19	486.385	3215.21	37112	0	0
20	495.441	3214.36	31239.6	0	0
21	504.496	3213.81	25101.3	0	0
22	513.552	3213.57	18982.8	0	0
23	522.608	3213.64	13212	0	0
24	531.663	3214.02	8162.55	0	0
25	543.232	3214.95	2380.17	0	0
26	554.8	3216.4	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.26024

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	328.069	3290	0	0	0
2	337.583	3281.46	1658.93	81.056	2.79727
3	347.097	3273.66	5347.72	518.048	5.53313
4	356.612	3266.53	9934.69	1422.69	8.14959
5	366.126	3260	14820.4	2772.16	10.5948
6	370.798	3257	18039	3741.94	11.719
7	380.641	3251.09	25977.9	6428.11	13.8984
8	390.484	3245.72	33452.4	9462.35	15.7941
9	400.327	3240.84	40221.1	12590	17.3812
10	410.17	3236.43	46155.5	15571.4	18.6428
11	422.036	3231.71	49410	17706.4	19.7155
12	433.487	3227.73	51362.1	18975.8	20.2768
13	444.939	3224.29	51591.7	19154.2	20.3682
14	447.548	3223.58	50654.9	18761.1	20.3232
15	456.597	3221.33	48786.3	17735.3	19.9777

16	465.645	3219.4	45849.3	16092.4	19.3403
17	474.693	3217.78	41930.9	13959.9	18.414
18	483.742	3216.46	37170.2	11509.5	17.2048
19	492.79	3215.44	31760.9	8940.69	15.7219
20	501.839	3214.72	25951.5	6460.29	13.9789
21	510.887	3214.3	20041.3	4258.1	11.995
22	519.936	3214.16	14373.4	2481.72	9.79614
23	528.984	3214.32	9324.67	1213.55	7.41503
24	537.589	3214.75	4558.37	400.239	5.01788
25	546.195	3215.44	1352.03	59.7807	2.53171
26	554.8	3216.4	0	0	0

List Of Coordinates

Water Table

X	Y
0	3235
365.71	3238
434.54	3220
554.7	3206.4
588.32	3206
650	3205

Line Load

X	Y
314	3290
299	3285
0	3285

External Boundary

X	Y
0	3254
0	3252
0	3240
0	3220
0	3215
0	3180
650	3180
650	3210.5
650	3214.4
629	3215.5
554.8	3216.4
424	3260
334	3290
314	3290
299	3285
0	3285

Material Boundary

X	Y
0	3240
182	3246
212	3256
218.36	3258.12
224	3260
299	3285

Material Boundary

X	Y
0	3254
218.36	3258.12

Material Boundary

X	Y
0	3252
212	3256

Material Boundary

X	Y
224	3260
287.3	3260
424	3260

Material Boundary

X	Y
370.6	3257
404	3257
409.22	3257
414.44	3257
424.05	3225
435.1	3225
554.7	3211.4
595.82	3211
588.32	3206
554.7	3206.4
434.54	3220
427.04	3215
421.82	3215
416.6	3215
358	3215
350.5	3220
359.5	3220
370.6	3257

Material Boundary

X	Y
404	3257
416.6	3215

Material Boundary

X	Y
409.22	3257
421.82	3215

Material Boundary

X	Y
595.82	3211
650	3210.5

Material Boundary

X	Y
0	3220
167.3	3220
350.5	3220

Material Boundary

X	Y
0	3215
358	3215

Material Boundary

X	Y
182	3246
245.3	3246
287.3	3260

Material Boundary

X	Y
167.3	3220
245.3	3246

Material Boundary

X	Y
435.1	3225

554.8	3216.4

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 3.3 - 34 EHP Saddle Dam C - Upstream - Static.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION C - EXISTING CONDITIONS - STATIC ANALYSIS - UPSTREAM SLOPE
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	50	0	50	0	0	50	0	
Friction Angle [deg]	33	28.5	40	35	28	40	35	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None
Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	700
Friction Angle [deg]	28
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.843920
Center: 210.509, 3447.146
Radius: 189.188
Left Slip Surface Endpoint: 209.795, 3257.958
Right Slip Surface Endpoint: 315.854, 3290.000
Resisting Moment=1.10705e+007 lb-ft
Driving Moment=3.89267e+006 lb-ft
Total Slice Area=515.107 ft2

Method: janbu simplified

FS: 2.797470
Center: 210.509, 3447.146
Radius: 189.188
Left Slip Surface Endpoint: 209.795, 3257.958
Right Slip Surface Endpoint: 315.854, 3290.000
Resisting Horizontal Force=55070 lb
Driving Horizontal Force=19685.6 lb
Total Slice Area=515.107 ft2

Method: gle/morgenstern-price

FS: 2.843750
Center: 210.509, 3447.146
Radius: 189.188
Left Slip Surface Endpoint: 209.795, 3257.958
Right Slip Surface Endpoint: 315.854, 3290.000
Resisting Moment=1.10698e+007 lb-ft
Driving Moment=3.89267e+006 lb-ft
Resisting Horizontal Force=55215.8 lb
Driving Horizontal Force=19416.5 lb
Total Slice Area=515.107 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.84392

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	4.28267	10.5944	Paste	0	35	0.607946	1.72895	2.46919	0	2.46919
2	4.28267	10.5944	Paste	0	35	0.604581	1.71938	2.45553	0	2.45553
3	3.97543	200.025	Bottom Ash	50	40	31.9362	90.824	48.652	0	48.652
4	3.97543	620.642	Bottom Ash	50	40	62.2985	177.172	151.558	0	151.558
5	3.97543	1167.77	Bottom Ash	50	40	101.425	288.444	284.166	0	284.166
6	3.97543	1703.07	Bottom Ash	50	40	139.223	395.939	412.276	0	412.276
7	3.97543	2207.87	Bottom Ash	50	40	174.38	495.922	531.431	0	531.431
8	4.31206	2869.82	Baked Shale	50	40	204.304	581.023	632.848	0	632.848
9	4.31206	3260.07	Baked Shale	50	40	228.272	649.186	714.082	0	714.082
10	4.31206	3592.4	Baked Shale	50	40	248.166	705.764	781.509	0	781.509
11	4.31206	3865.99	Baked Shale	50	40	264.008	750.819	835.203	0	835.203
12	4.31206	4079.95	Baked Shale	50	40	275.814	784.394	875.216	0	875.216
13	4.31206	4233.22	Baked Shale	50	40	283.592	806.513	901.577	0	901.577
14	4.31206	4324.65	Baked Shale	50	40	287.344	817.182	914.292	0	914.292
15	4.31206	4352.9	Baked Shale	50	40	287.064	816.387	913.345	0	913.345
16	4.31206	4316.5	Baked Shale	50	40	282.742	804.097	898.697	0	898.697
17	4.31206	4213.79	Baked Shale	50	40	274.36	780.258	870.288	0	870.288
18	4.31206	4042.94	Baked Shale	50	40	261.893	744.803	828.034	0	828.034
19	4.31206	3801.86	Baked Shale	50	40	245.309	697.64	771.827	0	771.827
20	4.31206	3488.26	Baked Shale	50	40	224.57	638.66	701.537	0	701.537
21	4.31206	3099.55	Baked Shale	50	40	199.63	567.731	617.008	0	617.008
22	4.31206	2632.85	Baked Shale	50	40	170.434	484.702	518.057	0	518.057
23	4.31206	2084.91	Baked Shale	50	40	136.923	389.397	404.478	0	404.478
24	4.31206	1452.07	Baked Shale	50	40	99.0256	281.621	276.035	0	276.035
25	4.31206	655.718	Baked Shale	50	40	52.3884	148.988	117.97	0	117.97

Global Minimum Query (janbu simplified) - Safety Factor: 2.79747

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	4.28267	10.5944	Paste	0	35	0.618023	1.7289	2.46912	0	2.46912
2	4.28267	10.5944	Paste	0	35	0.614552	1.71919	2.45525	0	2.45525
3	3.97543	200.025	Bottom Ash	50	40	32.4591	90.8034	48.6277	0	48.6277
4	3.97543	620.642	Bottom Ash	50	40	63.3129	177.116	151.491	0	151.491
5	3.97543	1167.77	Bottom Ash	50	40	103.067	288.327	284.028	0	284.028
6	3.97543	1703.07	Bottom Ash	50	40	141.465	395.743	412.041	0	412.041
7	3.97543	2207.87	Bottom Ash	50	40	177.172	495.633	531.084	0	531.084
8	4.31206	2869.82	Baked Shale	50	40	207.556	580.631	632.381	0	632.381
9	4.31206	3260.07	Baked Shale	50	40	231.883	648.686	713.487	0	713.487
10	4.31206	3592.4	Baked Shale	50	40	252.068	705.153	780.78	0	780.78
11	4.31206	3865.99	Baked Shale	50	40	268.134	750.097	834.342	0	834.342
12	4.31206	4079.95	Baked Shale	50	40	280.098	783.565	874.228	0	874.228
13	4.31206	4233.22	Baked Shale	50	40	287.969	805.584	900.47	0	900.47
14	4.31206	4324.65	Baked Shale	50	40	291.75	816.162	913.075	0	913.075
15	4.31206	4352.9	Baked Shale	50	40	291.438	815.288	912.034	0	912.034
16	4.31206	4316.5	Baked Shale	50	40	287.022	802.935	897.313	0	897.313
17	4.31206	4213.79	Baked Shale	50	40	278.485	779.054	868.853	0	868.853
18	4.31206	4042.94	Baked Shale	50	40	265.804	743.578	826.573	0	826.573
19	4.31206	3801.86	Baked Shale	50	40	248.947	696.421	770.375	0	770.375
20	4.31206	3488.26	Baked Shale	50	40	227.877	637.478	700.129	0	700.129
21	4.31206	3099.55	Baked Shale	50	40	202.547	566.62	615.684	0	615.684
22	4.31206	2632.85	Baked Shale	50	40	172.907	483.701	516.865	0	516.865
23	4.31206	2084.91	Baked Shale	50	40	138.893	388.55	403.467	0	403.467
24	4.31206	1452.07	Baked Shale	50	40	100.439	280.975	275.266	0	275.266
25	4.31206	655.718	Baked Shale	50	40	53.13	148.63	117.542	0	117.542

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.84375

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	4.28267	10.5944	Paste	0	35	0.615033	1.749	2.49784	0	2.49784
2	4.28267	10.5944	Paste	0	35	0.624295	1.77534	2.53544	0	2.53544
3	3.97543	200.025	Bottom Ash	50	40	33.1733	94.3365	52.8381	0	52.8381
4	3.97543	620.642	Bottom Ash	50	40	65.4365	186.085	162.179	0	162.179
5	3.97543	1167.77	Bottom Ash	50	40	107.249	304.99	303.885	0	303.885
6	3.97543	1703.07	Bottom Ash	50	40	147.819	420.36	441.378	0	441.378
7	3.97543	2207.87	Bottom Ash	50	40	185.348	527.083	568.565	0	568.565
8	4.31206	2869.82	Baked Shale	50	40	216.774	616.451	675.071	0	675.071
9	4.31206	3260.07	Baked Shale	50	40	241.033	685.437	757.284	0	757.284
10	4.31206	3592.4	Baked Shale	50	40	259.994	739.357	821.543	0	821.543
11	4.31206	3865.99	Baked Shale	50	40	273.778	778.556	868.26	0	868.26
12	4.31206	4079.95	Baked Shale	50	40	282.626	803.717	898.244	0	898.244
13	4.31206	4233.22	Baked Shale	50	40	286.858	815.752	912.588	0	912.588
14	4.31206	4324.65	Baked Shale	50	40	286.836	815.69	912.514	0	912.514
15	4.31206	4352.9	Baked Shale	50	40	282.921	804.558	899.247	0	899.247
16	4.31206	4316.5	Baked Shale	50	40	275.44	783.283	873.892	0	873.892
17	4.31206	4213.79	Baked Shale	50	40	264.653	752.608	837.336	0	837.336
18	4.31206	4042.94	Baked Shale	50	40	250.735	713.028	790.167	0	790.167
19	4.31206	3801.86	Baked Shale	50	40	233.757	664.746	732.626	0	732.626
20	4.31206	3488.26	Baked Shale	50	40	213.678	607.647	664.578	0	664.578
21	4.31206	3099.55	Baked Shale	50	40	190.336	541.269	585.472	0	585.472
22	4.31206	2632.85	Baked Shale	50	40	163.44	464.782	494.317	0	494.317
23	4.31206	2084.91	Baked Shale	50	40	132.561	376.97	389.667	0	389.667
24	4.31206	1452.07	Baked Shale	50	40	97.1235	276.195	269.57	0	269.57
25	4.31206	655.718	Baked Shale	50	40	52.123	148.225	117.06	0	117.06

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.84392

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	209.795	3257.96	0	0	0
2	214.077	3257.99	2.52386	0	0
3	218.36	3258.12	4.79554	0	0
4	222.335	3258.33	121.683	0	0
5	226.311	3258.62	325.232	0	0
6	230.286	3258.99	621.735	0	0
7	234.262	3259.45	985.382	0	0
8	238.237	3260	1388.46	0	0
9	242.549	3260.69	1832.86	0	0
10	246.861	3261.48	2251.26	0	0

11	251.173	3262.38	2620.72	0	0
12	255.485	3263.38	2922.22	0	0
13	259.797	3264.49	3140.65	0	0
14	264.11	3265.71	3264.9	0	0
15	268.422	3267.04	3287.94	0	0
16	272.734	3268.48	3206.97	0	0
17	277.046	3270.04	3023.61	0	0
18	281.358	3271.72	2744.16	0	0
19	285.67	3273.53	2379.83	0	0
20	289.982	3275.46	1947.21	0	0
21	294.294	3277.52	1468.6	0	0
22	298.606	3279.72	972.627	0	0
23	302.918	3282.06	494.858	0	0
24	307.23	3284.55	78.599	0	0
25	311.542	3287.19	-224.159	0	0
26	315.854	3290	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.79747

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	209.795	3257.96	0	0	0
2	214.077	3257.99	2.56283	0	0
3	218.36	3258.12	4.87307	0	0
4	222.335	3258.33	123.64	0	0
5	226.311	3258.62	330.842	0	0
6	230.286	3258.99	633.277	0	0
7	234.262	3259.45	1005.05	0	0
8	238.237	3260	1418.3	0	0
9	242.549	3260.69	1875.63	0	0
10	246.861	3261.48	2308.49	0	0
11	251.173	3262.38	2693.7	0	0
12	255.485	3263.38	3012.02	0	0
13	259.797	3264.49	3248.11	0	0
14	264.11	3265.71	3390.61	0	0
15	268.422	3267.04	3432.28	0	0
16	272.734	3268.48	3370.06	0	0
17	277.046	3270.04	3205.36	0	0
18	281.358	3271.72	2944.2	0	0
19	285.67	3273.53	2597.56	0	0
20	289.982	3275.46	2181.72	0	0
21	294.294	3277.52	1718.72	0	0
22	298.606	3279.72	1236.85	0	0
23	302.918	3282.06	771.354	0	0
24	307.23	3284.55	365.157	0	0
25	311.542	3287.19	69.8414	0	0
26	315.854	3290	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.84375

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	209.795	3257.96	0	0	0
2	214.077	3257.99	2.55356	0.122936	2.75626
3	218.36	3258.12	4.8996	0.467972	5.4559
4	222.335	3258.33	125.851	17.3833	7.86428
5	226.311	3258.62	338.81	60.5879	10.1388
6	230.286	3258.99	651.106	141.322	12.2461
7	234.262	3259.45	1035.58	261.243	14.1584
8	238.237	3260	1462.06	415.21	15.854
9	242.549	3260.69	1931.21	606.282	17.4291
10	246.861	3261.48	2370.5	803.062	18.715
11	251.173	3262.38	2755.18	986.6	19.7019
12	255.485	3263.38	3065.81	1139.16	20.3835
13	259.797	3264.49	3288.19	1246.22	20.7566
14	264.11	3265.71	3413.23	1297.88	20.8193
15	268.422	3267.04	3436.57	1289.77	20.5715
16	272.734	3268.48	3358.22	1223.24	20.0143
17	277.046	3270.04	3182.21	1105.05	19.15
18	281.358	3271.72	2916.38	946.692	17.9841
19	285.67	3273.53	2572.37	763.155	16.5242
20	289.982	3275.46	2165.73	571.542	14.7835
21	294.294	3277.52	1716.48	389.353	12.7803
22	298.606	3279.72	1249.86	232.557	10.5403
23	302.918	3282.06	797.573	113.47	8.09708
24	307.23	3284.55	399.424	38.4061	5.49232

25	311.542	3287.19	105.601	5.11868	2.77506
26	315.854	3290	0	0	0

List Of Coordinates

Water Table

X	Y
0	3235
365.71	3238
434.54	3220
554.7	3206.4
588.32	3206
650	3205

External Boundary

X	Y
0	3254
0	3252
0	3240
0	3220
0	3215
0	3180
650	3180
650	3210.5
650	3214.4
629	3215.5
554.8	3216.4
424	3260
334	3290
314	3290
224	3260
218.36	3258.12

Material Boundary

X	Y
0	3240
182	3246
212	3256
218.36	3258.12

Material Boundary

X	Y
0	3252
212	3256

Material Boundary

X	Y
224	3260
287.3	3260
424	3260

Material Boundary

X	Y
370.6	3257
404	3257
409.22	3257
414.44	3257
424.05	3225
435.1	3225
554.7	3211.4
595.82	3211
588.32	3206
554.7	3206.4
434.54	3220
427.04	3215
421.82	3215
416.6	3215
358	3215
350.5	3220

359.5	3220
370.6	3257

Material Boundary

X	Y
404	3257
416.6	3215

Material Boundary

X	Y
409.22	3257
421.82	3215

Material Boundary

X	Y
595.82	3211
650	3210.5

Material Boundary

X	Y
0	3220
167.3	3220
350.5	3220

Material Boundary

X	Y
0	3215
358	3215

Material Boundary

X	Y
182	3246
245.3	3246
287.3	3260

Material Boundary

X	Y
167.3	3220
245.3	3246

Material Boundary

X	Y
435.1	3225
554.8	3216.4

Slide Analysis Information

2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES

Project Summary

File Name: 3.4 - 34 EHP Saddle Dam C - Upstream - Seismic.slim
Slide Modeler Version: 6.02
Project Title: 2026 SAFETY FACTOR ASSESSMENT OF CCR SURFACE IMPOUNDMENTS AT CSES
Analysis: UNITS 3&4 EHP - SADDLE DAM SECTION C - EXISTING CONDITIONS - SEISMIC ANALYSIS - UPSTREAM SLOPE
Author: AWJ
Company: HYDROMETRICS, INC.
Date Created: 9/25/2026, 4:07:52 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.03

Material Properties

Property	Shell	Central Core	Baked Shale	Drain	Foundation	Bottom Ash	Paste	Bedrock
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unsaturated Unit Weight [lbs/ft3]	125	125		130	112	90	102	
Saturated Unit Weight [lbs/ft3]	130	130		135	124	100	112	
Cohesion [psf]	40	0	40	0	0	40	0	
Friction Angle [deg]	26.4	22.8	50	28	22.4	32	28	
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	None

Hu Value	1	1	1	1	1	1	0	
Ru Value								0

Property	Fly Ash Slurry
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	100
Saturated Unit Weight [lbs/ft3]	103.4
Cohesion [psf]	560
Friction Angle [deg]	22.4
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 2.527430
Center: 210.509, 3368.652
Radius: 151.899
Left Slip Surface Endpoint: 108.560, 3256.048
Right Slip Surface Endpoint: 339.361, 3288.213
Resisting Moment=6.76372e+007 lb-ft
Driving Moment=2.67612e+007 lb-ft
Total Slice Area=7777.96 ft2

Method: janbu simplified

FS: 2.256900
Center: 210.509, 3344.123
Radius: 128.009
Left Slip Surface Endpoint: 117.457, 3256.216
Right Slip Surface Endpoint: 326.514, 3290.000
Resisting Horizontal Force=338132 lb
Driving Horizontal Force=149821 lb
Total Slice Area=7017.89 ft2

Method: gle/morgenstern-price

FS: 2.515690
Center: 210.509, 3393.181
Radius: 177.785
Left Slip Surface Endpoint: 97.614, 3255.842
Right Slip Surface Endpoint: 351.062, 3284.313
Resisting Moment=8.77545e+007 lb-ft
Driving Moment=3.48828e+007 lb-ft
Resisting Horizontal Force=443091 lb
Driving Horizontal Force=176131 lb
Total Slice Area=8954.92 ft2

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.52743

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	7.51856	2499.12	Paste	0	28	85.1074	215.103	404.55	0	404.55
2	7.51856	7199.17	Paste	0	28	238.844	603.661	1135.32	0	1135.32
3	9.73071	15295.6	Fly Ash Slurry	560	22.4	533.832	1349.22	1914.8	0	1914.8
4	9.73071	21119.1	Fly Ash Slurry	560	22.4	620.706	1568.79	2506.61	59.0927	2447.51
5	9.73071	26156.1	Fly Ash Slurry	560	22.4	648.061	1637.93	2981.2	365.959	2615.24
6	9.73071	30368.1	Fly Ash Slurry	560	22.4	669.787	1692.84	3369.56	621.081	2748.48
7	9.73071	33815.1	Fly Ash Slurry	560	22.4	686.282	1734.53	3678.38	828.763	2849.61
8	7.02041	26525.4	Shell	40	26.4	593.935	1501.13	3917.91	974.482	2943.43
9	8.9252	36254.2	Foundation	0	22.4	500.944	1266.1	4151.73	1079.94	3071.79
10	8.9252	38281.6	Foundation	0	22.4	519.12	1312.04	4350.6	1167.36	3183.24
11	8.9252	39700.3	Foundation	0	22.4	531.326	1342.89	4479.39	1221.3	3258.09
12	8.9252	40534.3	Foundation	0	22.4	538.045	1359.87	4541.56	1242.26	3299.3
13	8.9252	41268.3	Foundation	0	22.4	548.122	1385.34	4591.52	1230.43	3361.09
14	8.9252	43786.3	Foundation	0	22.4	595.209	1504.35	4835.47	1185.64	3649.83
15	8.9252	46435.7	Foundation	0	22.4	648.916	1640.09	5086.52	1107.35	3979.17
16	9.36408	50886.9	Shell	40	26.4	847.964	2143.17	5227.81	991	4236.81
17	9.36408	52523.1	Shell	40	26.4	898.648	2271.27	5328.22	833.35	4494.87
18	9.36408	53369.3	Shell	40	26.4	939.492	2374.5	5336.94	634.119	4702.82
19	9.36408	53346.1	Shell	40	26.4	969.534	2450.43	5246.12	390.33	4855.79
20	9.36408	52370	Shell	40	26.4	987.909	2496.87	5047.28	97.9483	4949.33
21	9.36408	49885.2	Shell	40	26.4	941.89	2380.56	4715.03	0	4715.03
22	9.36408	45937.9	Shell	40	26.4	851.671	2152.54	4255.68	0	4255.68
23	9.36408	40473.3	Shell	40	26.4	734.976	1857.6	3661.52	0	3661.52

24	11.3506	35127.2	Baked Shale	40	50	973.946	2461.58	2031.95	0	2031.95
25	11.3506	13689.3	Baked Shale	40	50	352.696	891.414	714.421	0	714.421

Global Minimum Query (janbu simplified) - Safety Factor: 2.2569

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	6.45956	2138.52	Paste	0	28	101.557	229.203	431.068	0	431.068
2	6.45956	6145.07	Paste	0	28	280.888	633.936	1192.25	0	1192.25
3	8.47257	13223.1	Fly Ash Slurry	560	22.4	615.973	1390.19	2014.19	0	2014.19
4	8.47257	18260.4	Fly Ash Slurry	560	22.4	713.957	1611.33	2597.5	46.7745	2550.72
5	8.47257	22615.1	Fly Ash Slurry	560	22.4	741.473	1673.43	3053.72	352.347	2701.37
6	8.47257	26271.5	Fly Ash Slurry	560	22.4	763.25	1722.58	3428.1	607.472	2820.63
7	8.47257	29290.8	Fly Ash Slurry	560	22.4	779.676	1759.65	3727.81	817.223	2910.58
8	6.46877	24387.5	Shell	40	26.4	675.271	1524.02	3959.04	969.509	2989.54
9	8.94321	36500.4	Foundation	0	22.4	568.568	1283.2	4203.14	1089.87	3113.27
10	8.94321	38825	Foundation	0	22.4	590.026	1331.63	4424.48	1193.7	3230.78
11	8.94321	40418.1	Foundation	0	22.4	603.474	1361.98	4561.65	1257.23	3304.42
12	8.94321	41311	Foundation	0	22.4	609.588	1375.78	4619.26	1281.36	3337.9
13	8.94321	41995.2	Foundation	0	22.4	618.392	1395.65	4652.49	1266.39	3386.1
14	8.94321	44359.6	Foundation	0	22.4	667.322	1506.08	4866.04	1212.01	3654.03
15	8.94321	46731.4	Foundation	0	22.4	721.986	1629.45	5070.69	1117.34	3953.35
16	8.14813	44002.7	Shell	40	26.4	929.328	2097.4	5133.32	988.719	4144.6
17	8.14813	44833.8	Shell	40	26.4	968.9	2186.71	5152.29	827.774	4324.52
18	8.14813	45021.5	Shell	40	26.4	998.157	2252.74	5085.27	627.73	4457.54
19	8.14813	44487.5	Shell	40	26.4	1015.85	2292.68	4923.16	385.172	4537.99
20	8.14813	43156.2	Shell	40	26.4	1021.03	2304.36	4656.93	95.4089	4561.52
21	8.14813	40998.9	Shell	40	26.4	967.145	2182.75	4316.53	0	4316.53
22	8.14813	37300.7	Shell	40	26.4	859.303	1939.36	3826.24	0	3826.24
23	8.14813	32204.7	Shell	40	26.4	721.379	1628.08	3199.16	0	3199.16
24	9.75897	28927.5	Baked Shale	40	50	938.11	2117.22	1743	0	1743
25	9.75897	10960.6	Baked Shale	40	50	315.87	712.886	564.62	0	564.62

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.51569

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	8.27634	2769.26	Paste	0	28	86.0356	216.439	407.062	0	407.062
2	8.27634	7999.15	Paste	0	28	247.923	623.697	1173	0	1173
3	10.8774	17379.7	Fly Ash Slurry	560	22.4	555.826	1398.28	2033.84	0	2033.84
4	10.8774	24168.5	Fly Ash Slurry	560	22.4	655.252	1648.41	2735.99	95.3196	2640.67
5	10.8774	30056.5	Fly Ash Slurry	560	22.4	696.505	1752.19	3307.95	415.464	2892.48
6	10.8774	34987.4	Fly Ash Slurry	560	22.4	728.075	1831.61	3767.38	682.216	3085.16
7	10.8774	39026.8	Fly Ash Slurry	560	22.4	749.619	1885.81	4116.17	899.513	3216.66
8	1.75877	6666.41	Shell	40	26.4	656.567	1651.72	4256.5	1009.7	3246.8
9	10.0494	40266.2	Foundation	0	22.4	542.984	1365.98	4403.18	1089.06	3314.12
10	10.0494	43371.4	Foundation	0	22.4	565.654	1423.01	4654.77	1202.29	3452.48
11	10.0494	45492.6	Foundation	0	22.4	574.51	1445.29	4785.44	1278.9	3506.54
12	10.0494	46891.3	Foundation	0	22.4	574.944	1446.38	4828.79	1319.6	3509.19
13	10.0494	47655.3	Foundation	0	22.4	569.394	1432.42	4800.05	1324.75	3475.3
14	10.0494	50136.6	Foundation	0	22.4	596.969	1501.79	4937.95	1294.33	3643.62
15	10.0494	53852.4	Foundation	0	22.4	649.035	1632.77	5189.4	1228.01	3961.39
16	10.0494	56964.7	Foundation	0	22.4	696.385	1751.89	5375.47	1125.07	4250.4
17	11.0821	65703.3	Shell	40	26.4	905.855	2278.85	5485.2	975.065	4510.13
18	11.0821	67642.4	Shell	40	26.4	952.347	2395.81	5517.69	771.94	4745.75
19	11.0821	68406.7	Shell	40	26.4	990.587	2492.01	5457.47	517.931	4939.54
20	11.0821	67554.5	Shell	40	26.4	1015.21	2553.96	5273.36	209.023	5064.34
21	11.0821	64434.4	Shell	40	26.4	988.886	2487.73	4930.92	0	4930.92
22	11.0821	59702.6	Shell	40	26.4	904.567	2275.61	4503.6	0	4503.6
23	11.0821	49476.6	Shell	40	26.4	742.858	1868.8	3684.09	0	3684.09
24	11.3904	35570.1	Baked Shale	40	50	1007.51	2534.58	2093.2	0	2093.2
25	11.3904	12656.1	Baked Shale	40	50	346.072	870.61	696.966	0	696.966

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.52743

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	108.56	3256.05	0	0	0
2	116.079	3249.67	3144.07	0	0
3	123.597	3244.07	11079.1	0	0
4	133.328	3237.82	27784.8	0	0
5	143.059	3232.55	46406	0	0
6	152.789	3228.15	65053.6	0	0
7	162.52	3224.53	82836.4	0	0

8	172.251	3221.65	99102.9	0	0
9	179.271	3220	108942	0	0
10	188.196	3218.4	118963	0	0
11	197.121	3217.34	127044	0	0
12	206.047	3216.82	132948	0	0
13	214.972	3216.82	136534	0	0
14	223.897	3217.34	137774	0	0
15	232.822	3218.4	136662	0	0
16	241.747	3220	132926	0	0
17	251.112	3222.28	127418	0	0
18	260.476	3225.21	118664	0	0
19	269.84	3228.82	106577	0	0
20	279.204	3233.17	91209.4	0	0
21	288.568	3238.34	72791.3	0	0
22	297.932	3244.43	51407.7	0	0
23	307.296	3251.58	27580	0	0
24	316.66	3260	2421.22	0	0
25	328.011	3272.39	-12752.3	0	0
26	339.361	3288.21	0	0	0

Global Minimum Query (janbu simplified) - Safety Factor: 2.2569

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	117.457	3256.22	0	0	0
2	123.917	3249.85	3336.67	0	0
3	130.376	3244.3	11579.5	0	0
4	138.849	3238.05	28975.8	0	0
5	147.322	3232.8	48119.7	0	0
6	155.794	3228.4	67150.1	0	0
7	164.267	3224.76	85292.9	0	0
8	172.739	3221.81	101991	0	0
9	179.208	3220	112799	0	0
10	188.151	3218.08	124845	0	0
11	197.094	3216.82	134537	0	0
12	206.038	3216.19	141573	0	0
13	214.981	3216.19	145778	0	0
14	223.924	3216.82	147125	0	0
15	232.867	3218.08	145610	0	0
16	241.811	3220	140929	0	0
17	249.959	3222.34	135136	0	0
18	258.107	3225.29	126487	0	0
19	266.255	3228.89	114964	0	0
20	274.403	3233.2	100675	0	0
21	282.551	3238.31	83889	0	0
22	290.699	3244.34	64485.5	0	0
23	298.847	3251.48	43053.3	0	0
24	306.996	3260	20701.4	0	0
25	316.755	3272.72	6803.3	0	0
26	326.514	3290	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.51569

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	97.6135	3255.84	0	0	0
2	105.89	3249.44	3235.76	48.8759	0.865382
3	114.166	3243.76	11701.8	351.651	1.72128
4	125.044	3237.29	30397.6	1495.23	2.81606
5	135.921	3231.8	51809.9	3493.76	3.85786
6	146.798	3227.2	73682.4	6222.88	4.82748
7	157.676	3223.43	94774.5	9472.1	5.70739
8	168.553	3220.42	114145	12968.9	6.48202
9	170.312	3220	116877	13515.8	6.59645
10	180.361	3217.97	130058	16402.9	7.18819
11	190.411	3216.54	141119	19001	7.66848
12	200.46	3215.68	149619	21108.8	8.0305
13	210.509	3215.4	155361	22579.4	8.26919
14	220.559	3215.68	158286	23321.1	8.38139
15	230.608	3216.54	158555	23315.7	8.36546
16	240.657	3217.97	156011	22542	8.22176
17	250.707	3220	150390	21007.7	7.95209
18	261.789	3222.95	142261	18762.5	7.51326
19	272.871	3226.69	130145	15825.8	6.9332
20	283.953	3231.28	114054	12434.9	6.22218
21	295.035	3236.77	94271.6	8898.81	5.39248

22	306.117	3243.29	71155.9	5549.21	4.45928
23	317.2	3250.97	44819.9	2694.06	3.43983
24	328.282	3260	18287.9	751.599	2.35343
25	339.672	3271.02	5635.12	116.96	1.18903
26	351.062	3284.31	0	0	0

List Of Coordinates

Water Table

X	Y
0	3235
365.71	3238
434.54	3220
554.7	3206.4
588.32	3206
650	3205

External Boundary

X	Y
0	3254
0	3252
0	3240
0	3220
0	3215
0	3180
650	3180
650	3210.5
650	3214.4
629	3215.5
554.8	3216.4
424	3260
334	3290
314	3290
224	3260
218.36	3258.12

Material Boundary

X	Y
0	3240
182	3246
212	3256
218.36	3258.12

Material Boundary

X	Y
0	3252
212	3256

Material Boundary

X	Y
224	3260
287.3	3260
424	3260

Material Boundary

X	Y
370.6	3257
404	3257
409.22	3257
414.44	3257
424.05	3225
435.1	3225
554.7	3211.4
595.82	3211
588.32	3206
554.7	3206.4
434.54	3220
427.04	3215
421.82	3215

416.6	3215
358	3215
350.5	3220
359.5	3220
370.6	3257

Material Boundary

X	Y
404	3257
416.6	3215

Material Boundary

X	Y
409.22	3257
421.82	3215

Material Boundary

X	Y
595.82	3211
650	3210.5

Material Boundary

X	Y
0	3220
167.3	3220
350.5	3220

Material Boundary

X	Y
0	3215
358	3215

Material Boundary

X	Y
182	3246
245.3	3246
287.3	3260

Material Boundary

X	Y
167.3	3220
245.3	3246

Material Boundary

X	Y
435.1	3225
554.8	3216.4