STATE OF COLORADO

Eschberger - DNR, Amy <amy.eschberger@state.co.us>

Young Ranch Resource - Geotechnical Stability Exhibits

Ben Langenfeld <benl@lewicki.biz> Mon, Feb 7, 2022 at 10:40 AM
To: "Eschberger - DNR, Amy" <amy.eschberger@state.co.us>, "Trujillo - DNR, Zach" <zach.trujillo@state.co.us>
Cc: Katie Todt <katie@lewicki.biz>

Amy & Zach

Following up on my conversation with Zach, it looks like I did not get all of the geotechnical stability exhibit edits into the adequacy response. I have attached the geotech exhibit that was supposed to be in there, for your review.

Zach: you will notice figures that show the GALENA profile locations liked you asked, information on the source of the seismic coefficient, and a better table of the slope stability results. The other figures you asked for from GALENA, that show the final safety factor but with the orange constraint lines encompassing the whole slope, will come as part of the next adequacy response you mentioned.

Amy: if you want a hard copy of this document, just let me know and I will send it to you.

My apologies for the confusion.

Ben Langenfeld, P.E.

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YRR Geotech Exhibit 211217 STAMPED.pdf
6521K

RULE 6.5: GEOTECHNICAL STABILITY EXHIBIT

Two categories of geotechnical stability exist for the Young Ranch Resource: the impact of area faults on the mining highwalls and the slope stability of the mining areas and waste rock landform in their final condition.

1. Area Faults

United States Geologic Survey mapping for the Black Hawk quadrangle shows an unnamed fault passing through the eastern mining area. This fault is shown in Figure GS-1. The fault is not visible on the surface within the mining area. According to the USGS quadrangle it appears to be a vertical fault. In such case, the primary risk to slope stability would be if the fault orientation was parallel to the anticipated hard rock benches. In this case, the fault strikes at a roughly NW-SE orientation, which is at an angle to the southern highwall during Phase 1 and does not intersect any Phase 2 highwalls. Phase 3 highwalls, shown in Figure GS-2 intersect and even run parallel to the anticipated fault. Initial stripping in Phase 1 will expose any observable portion of this fault. At that point, a geotechnical analysis of the fault and its orientation with regards to Phase 1 mining can be produced and its insights incorporated into the permit.

A technical revision will be submitted to the CDRMS at the time that the fault is exposed and measured that will incorporate the appropriate slope stability analysis into the permit.

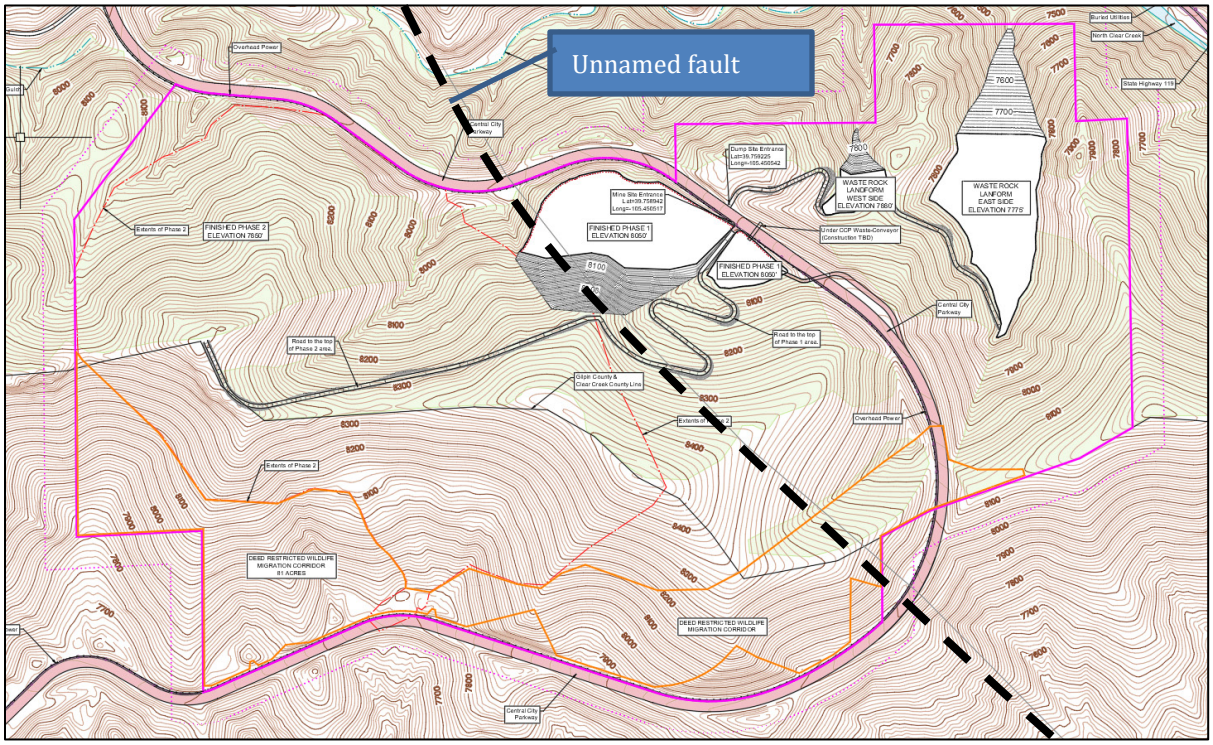


Figure GS-1 USGS Fault Location – Phase 1

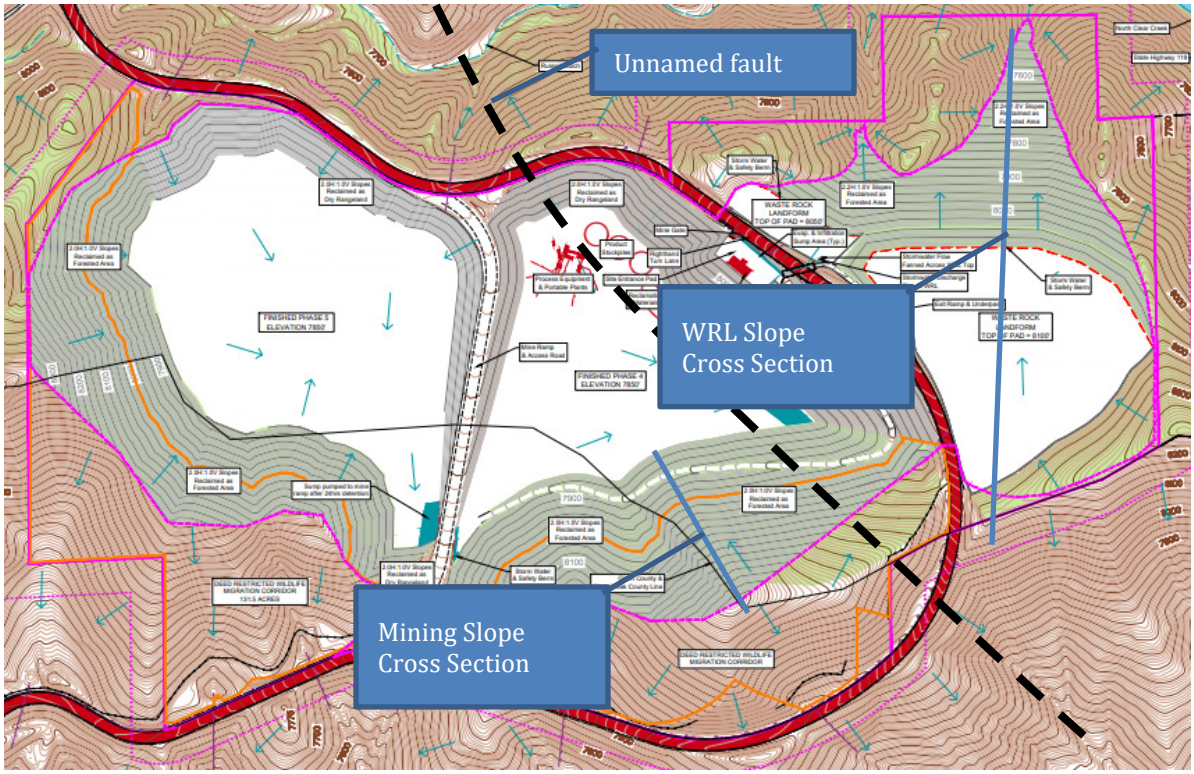


Figure GS-2 USGS Fault Location – Phase 3.

Since the exact fault location onsite is not determinable until mining commences, this slope stability analysis is confined to the post mine slopes of the mining areas and the waste rock landform (WRL).

2. Slopes stability

Based on a slope stability analysis, buildings or other structures within 200' of the affected (permit) area will not be affected by mining excavation. Sufficient buffers will be maintained to neighboring property lines to ensure all activity is contained within the affected area. Maps C-2 through F-2 show these buffers. Map C-3, C-4, and C-5 show the mining slopes and while Maps F-1 and F-2 shows the reclamation slopes of the mine. Disturbance limits will be clearly staked onsite from GPS coordinates for operational controls.

For the purposes of slope stability analysis, the tallest mining highwall (500', Figure GS-1) and tallest waste rock landform (600', Figure GS-2) scenarios were modelled.

The mining highwall in both maximum mining condition and reclamation condition was modelled. The WRL at construction slopes and final slopes was also modeled. Both were analyzed using Bishop's Method of Slices in GALENA software. The phreatic surface from a local water table was assumed to be well below the excavation and reclamation slopes.

2.1. Analyses Conducted

For each slope (mining highwall and WRL) four stability analysis are conducted:

1. Active slope: when mining or backfilling is taking place before final reclamation grades are established.
2. Active slope: pseudo static analysis: when mining or backfilling is taking place, before final reclamation grades are established, under seismic conditions.
3. Reclaimed slope: after final reclamation grades are established.
4. Reclaimed slope: after final reclamation grades are established, under seismic conditions.

Seismic conditions are modelled using the implementation of a seismic coefficient in the GALENA models. The quarry is located within the Zone 1 of the seismic zone map of the United States. On the modified Mercalli scale, this is a V and VI area with a typical seismic coefficient of between 0.03 and 0.07. For the purpose of analysis, the median of 0.05 is used in all pseudo static analysis.[1]

Blasting generates high frequency energy waves over a very short period of time that die out rapidly. Earthquake's energy waves are low frequency, long wavelength, that transmit substantially more energy due to the longer time period they occur over. Furthermore,

[1] Huang, Yang H. *Stability Analysis of Earth Slope*s. 1983. New York.

earthquakes energy waves' long wavelength is much more likely to be similar to the dimensions of a structure or embankment and thus have the higher risk of resonance. Therefore, earthquake based analysis of slope stability using the appropriate seismic coefficient is appropriate for design. During mining, blast monitoring will include a seismograph at the nearest point of the WRL to the quarry highwall to confirm that blasts are not creating ongoing stability risks.

2.2. Impact of Surface Water Infiltration

Within both the mining area and the WRL, infiltration of surface water runoff is expected and encouraged. Runoff will infiltrate through the backfill and drain down along the bottom of backfill or lower. In the mining area, infiltrated surface water will be captured within the backfilled benches and be a source of water for vegetation during reclamation. Some portion of the surface water flows will drain along the gneiss contact and potentially seep out of the toe of the reclaimed slope. Any such seep will discharge onto the reclaimed mine floor. Since the gniess contact is near the surface, and there is no groundwater aquifer near the mining bottom, no piezometric surface is modeled for the mining bench slope stability analysis.

On the WRL, surface water runoff that infiltrates will pass through the talus cap created during reclamation, then pass into the underlying coarse waste material, and then pass down into the natural talus material below the WRL. Given the depth of soil in the WRL area, and the fact that is classified by the NRCS as well draining soil, a portion of the infiltrated runoff will not reappear as any seep or spring. Some portion of that water may appear as a spring at the toe of the WRL in each drainage. This is expected; the WRL is designed to be a well draining embankment that acts as a large scale filter for water flows. The bottom of the talus within the WRL footprint is estimated to be 24 inches down, based on the NRCS soil data available. A piezometric surface at the top of the talus is assumed in the GALENA model for the WRL to the presence of infiltrated water within the embankment.

2.3. Material Definitions

Three materials are present within the Young Ranch Resource slope stability analyses:

1. Quartenary colluvium present atop the bedrock within the quarry
2. Gniess bedrock
3. Crusher waste fine

Each material and its pertinent slope stability properties as listed in Table GS-1. Material properties are principally derived from Table 2.5 in the SME Reference Handbook.

Table GS-1. Material Properties

Material	Description	Unit Weight (pcf)	Cohesion	Friction Angle (°)
Colluvium	Sand and gravel mixed grain size	110	0.0	45
Gniess bedrock	Igneous bedrock	160	400000	30

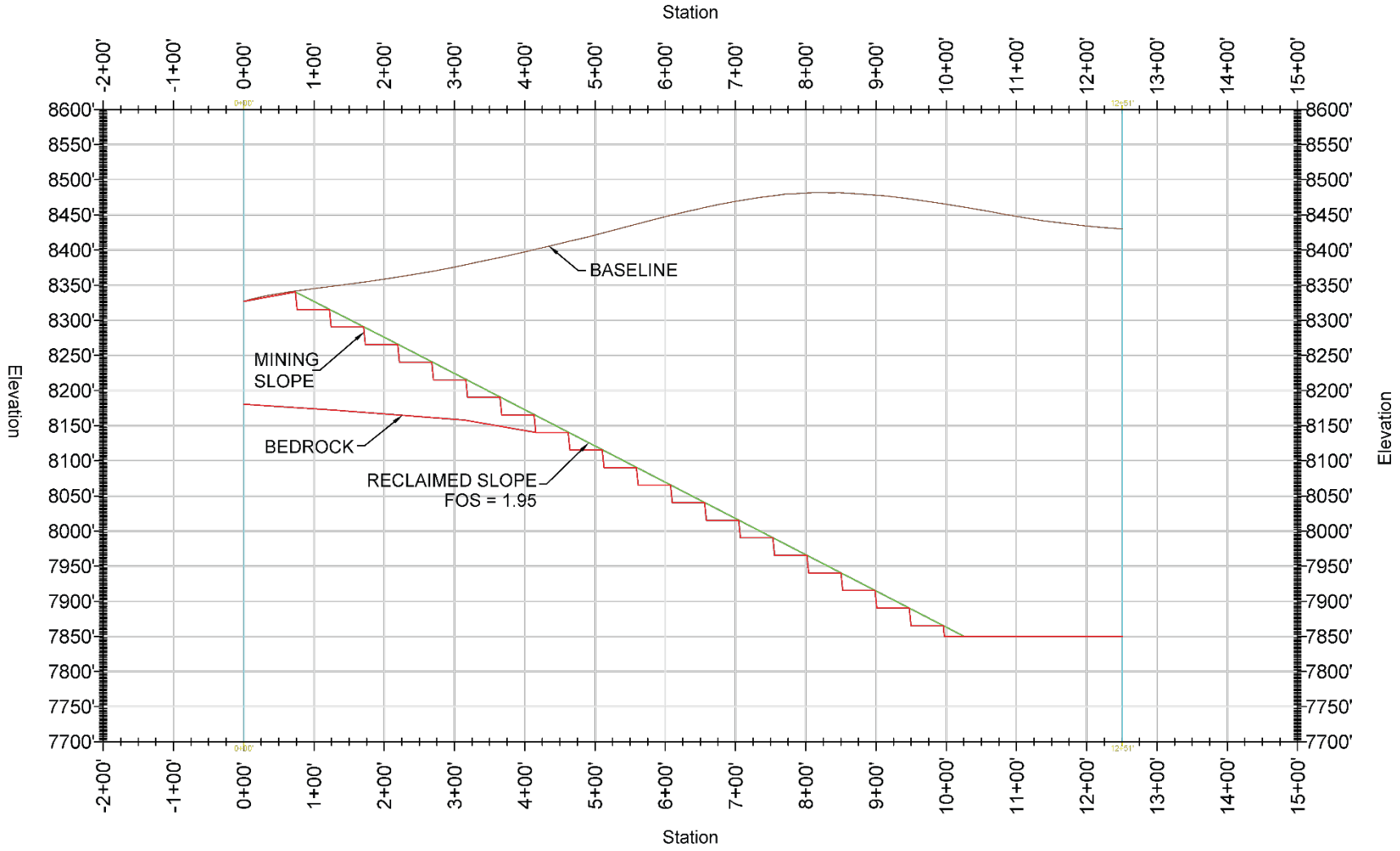
Crusher waste fines	Intermixed coarse sandy fines produced from the crushing/screening plant	116.9	0.03	34

3. Mining Highwall

The mining highwall slope was modeled in two conditions: at the end of mining and following reclamation (Figure 13). At the end of mining, this highwall will exist in a combination of large size colluvium and competent gneiss bedrock. The highwall will have an overall slope angle of 2H:1V, with maximum individual bench angles of 0.1H:1V, or near vertical. The colluvium covers the gneiss at an average depth of 160 feet. Therefore, geotechnical information such as joint orientation will not be obtained until over 10 years into the life of the mine (Phase 2). At that stage, the Young Ranch Resource quarry will begin submitting geotechnical reports as required by the Division as do other quarries in the state. Until that time, the geotechnical stability of the gneiss will be based on textual values as those used in this analysis.

The second condition of the mining highwall is when it has been backfilled with crusher fines and reclaimed. At that stage, it will have an overall slope of 2H:1V and a localized slope of the same amount. The crusher fines material properties are based on GLA experience with crushed rock in this area.

Profile View of Alignment - MINING SLOPE STABILITY



4. Waste Rock Landform

The WRL slope stability is analyzed in two conditions: during construction and following reclamation (Figure 14). The construction of the WRL will be via standard “tip-to” methods that create a set of staggered benches (1H:1V) via truck dumping. Once construction of several levels of the WRL are complete, they will be graded to the final overall slope of 2.2H:1V for topsoiling and revegetation. Both conditions were modelled and analyzed using the same crusher fines data as the highwall backfill.

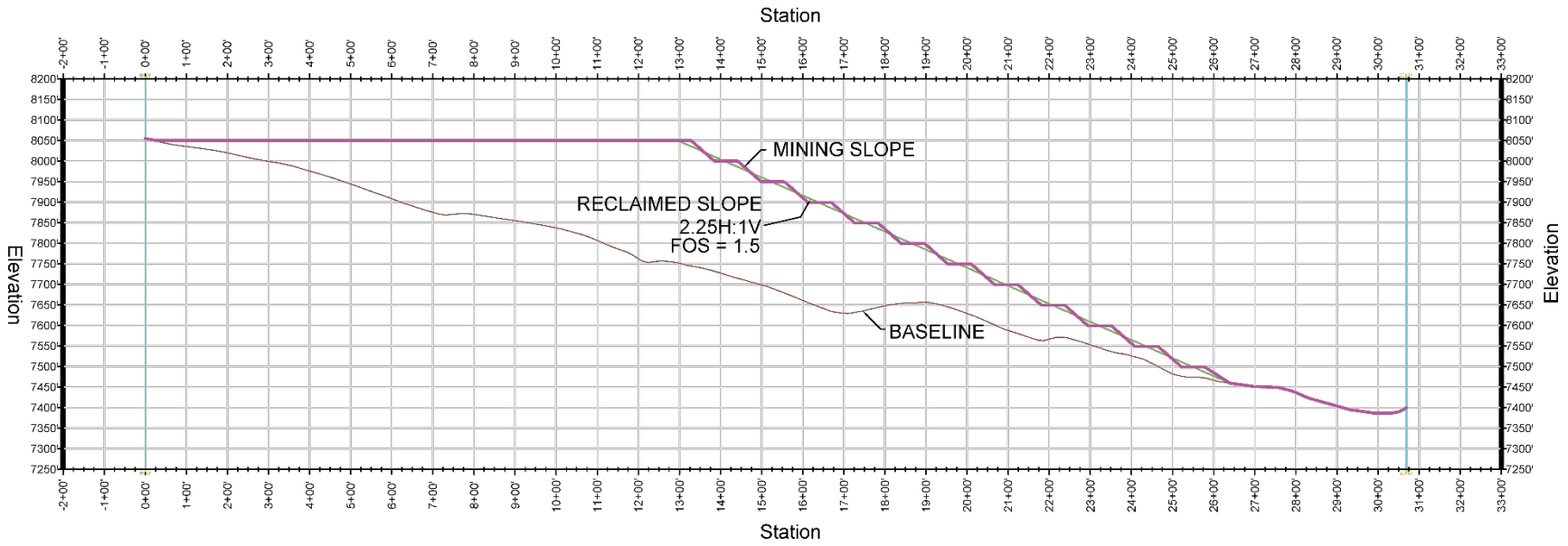


Figure 2. WRL slope stability.

5. Monitoring

During mining operations the mining highwall will be visually monitored for any signs of sloughing or movement on active mine slopes during regular operations. Once bedrock is exposed, annual evaluation of the geologic structure of the bedrock and the mining plan will be provided to the CDRMS. This annual report will be conducted by a qualified person in the field of mining or geotechnical engineering. The WRL will be visually monitored during construction for any signs of sloughing or movement in the active areas.

Piezometers will be installed on every two lifts during construction of the WRL. These piezometers will extend to the base of WRL. They will allow for monitoring of both water levels within the WRL, to ensure that it is freely draining, and settling or slope movement over time. The piezometers will be GPS located and measured annually.

6. Conclusion

The GALENA models show multiple iterations of the analyses conducted (Appendix GS-1). This is standard procedure for the Bishop's Method of Slices. The results of this analysis are shown in Table GS-2. GALENA data tables and analysis result figures are attached as Appendix GS-1.

All permanent case factors of safety are greater than 1.5 (1.1 for seismic) which is the DRMS minimum for this type of design.

The slope stability analysis in this permit has been prepared according to appropriate engineering standards and practices.

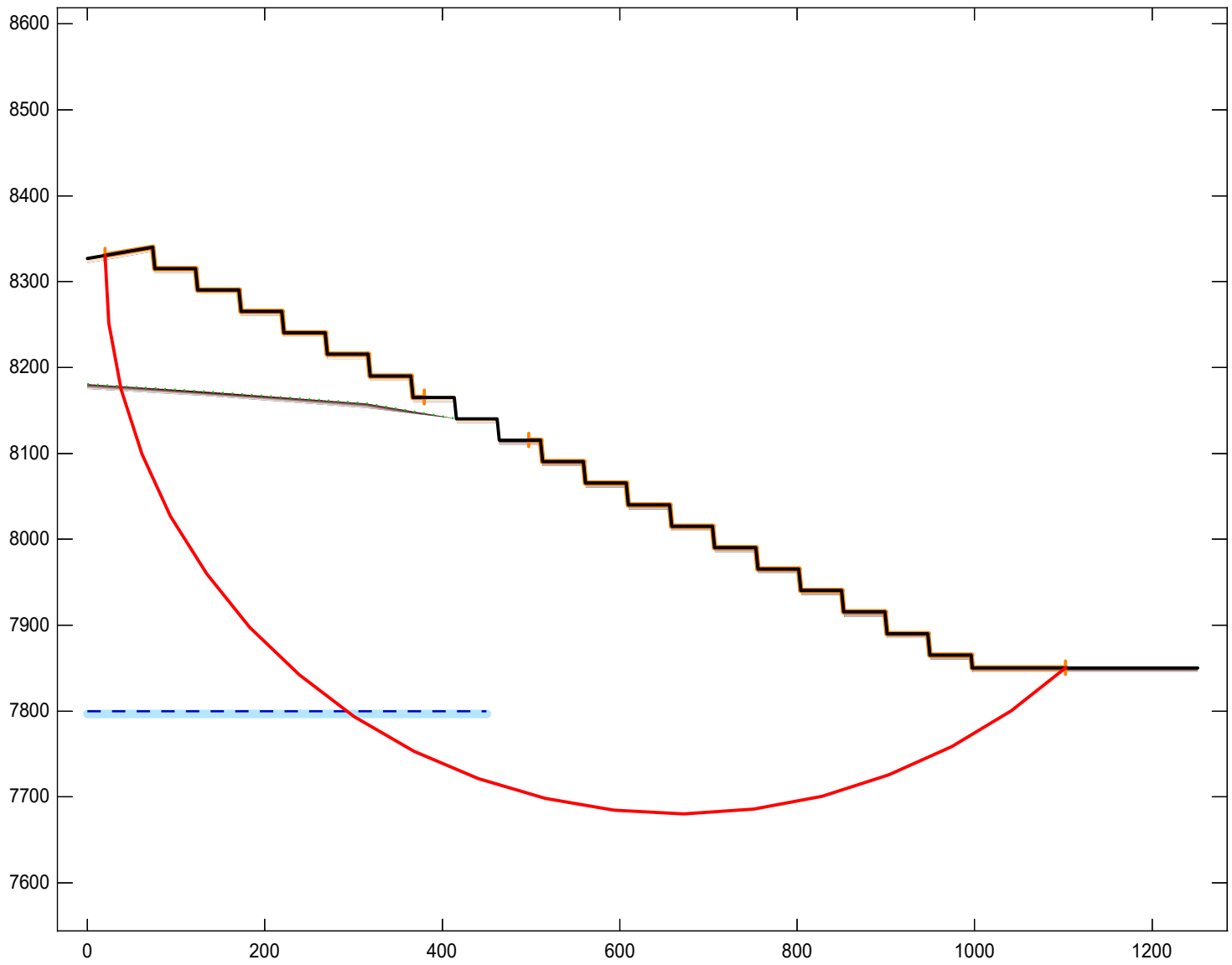
Ben Langenfeld, P.E.

P.E.# 0047151

Table GS-2. Factors of Safety for Slope Stability

GALENA Analysis	Lowest Factor of Safety	Condition	Comments
Mining Highwall			
1	41.61	Mining condition of the highwall (immediate highwall)	Failure circle used in as starting point in the following analyses.
2	54.22	Mining condition of the highwall (immediate highwall)	Failure circle used in as starting point in the following analyses.
3	1.93	Mining condition of the highwall (immediate highwall)	Failure circle used in as starting point in the following analyses.
4	0.32	Mining condition of the highwall (immediate highwall)	Localized slope failure within a bench of colluvium
5	*0.27*	Mining condition of the highwall (immediate highwall) under seismic conditions	Localized slope failure within a bench of colluvium
6	40.51	Reclaimed condition of the highwall	Failure circle used in as starting point in the following analyses.
7	1.94	Reclaimed condition of the highwall	Lowest SF for this condition (non-seismic)
8	*1.72*	Reclaimed condition of the highwall under seismic conditions	Lowest SF for this condition (seismic)
Waste Rock Landform (WRL)			
1	1.53	Mining condition of the WRL	Failure circle used in as starting point in the following analyses. Localized slope failure on a single bench; repaired during operations.
2	0.77	Mining condition of the WRL	Localized slope failure on a single bench; repaired during operations.
3	*0.70*	Mining condition of the WRL under seismic conditions	Localized slope failure on a single bench; repaired during operations.
4	1.54	Reclaimed condition of the WRL	Lowest SF for this condition (non-seismic)
5	*1.35*	Reclaimed condition of the WRL under seismic conditions	Lowest SF for this condition (seismic)

APPENDIX GS-1 – GALENA INFORMATION



GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

2: Gniess

3: Quartenary colluvium

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

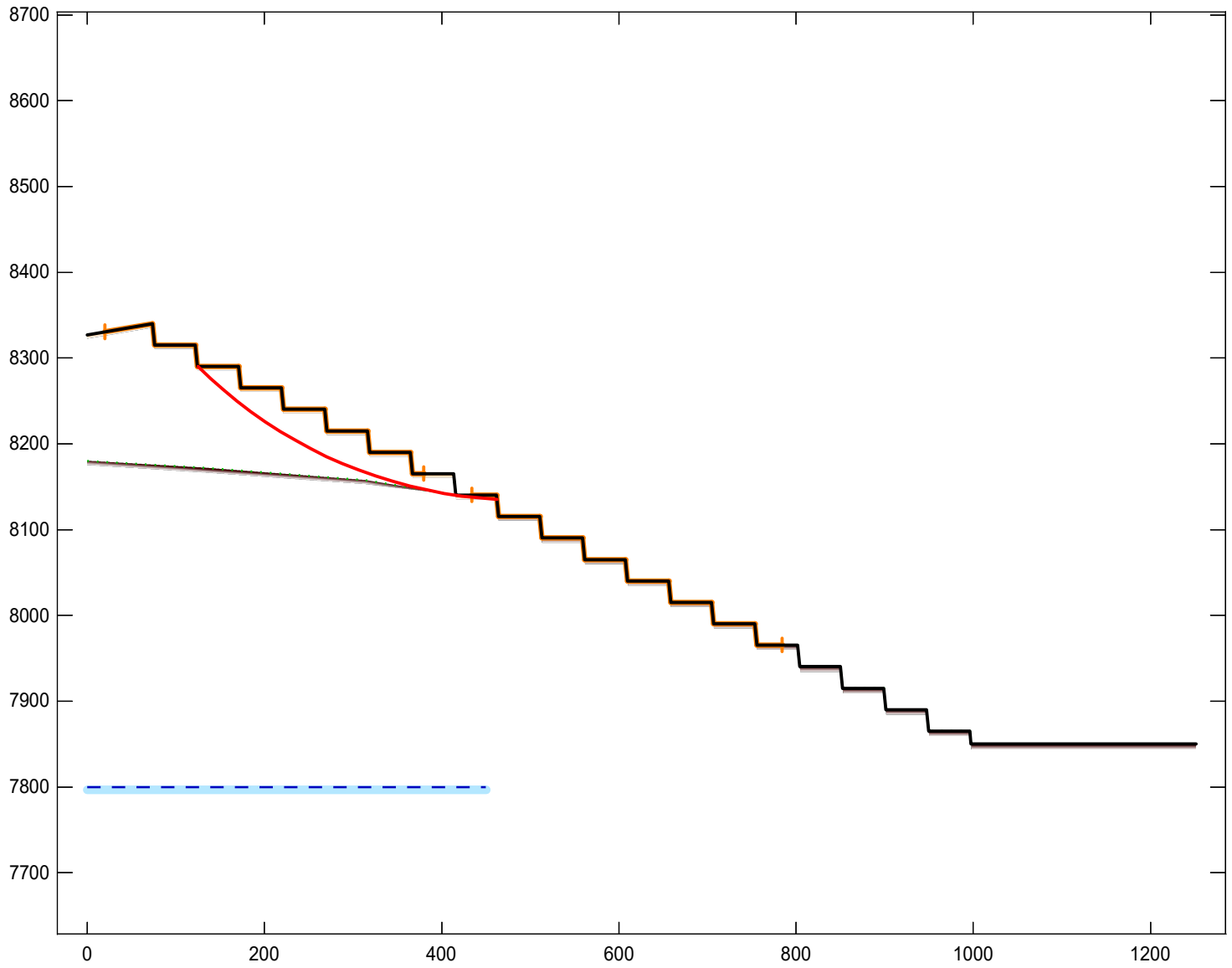
Critical Factor of Safety: 41.61

Project RidgeTop Quarry - Mining Highwall at Bedrock
Active Mined Bench Slope

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

Edited: 20 Oct 2021
Processed: 20 Oct 2021

Greg Lewicki And Associates, PLLC



GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

2: Gniess

3: Quartenary colluvium

Analysis 2

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 54.22

Project RidgeTop Quarry - Mining Highwall at Bedrock
Active Mined Bench Slope

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

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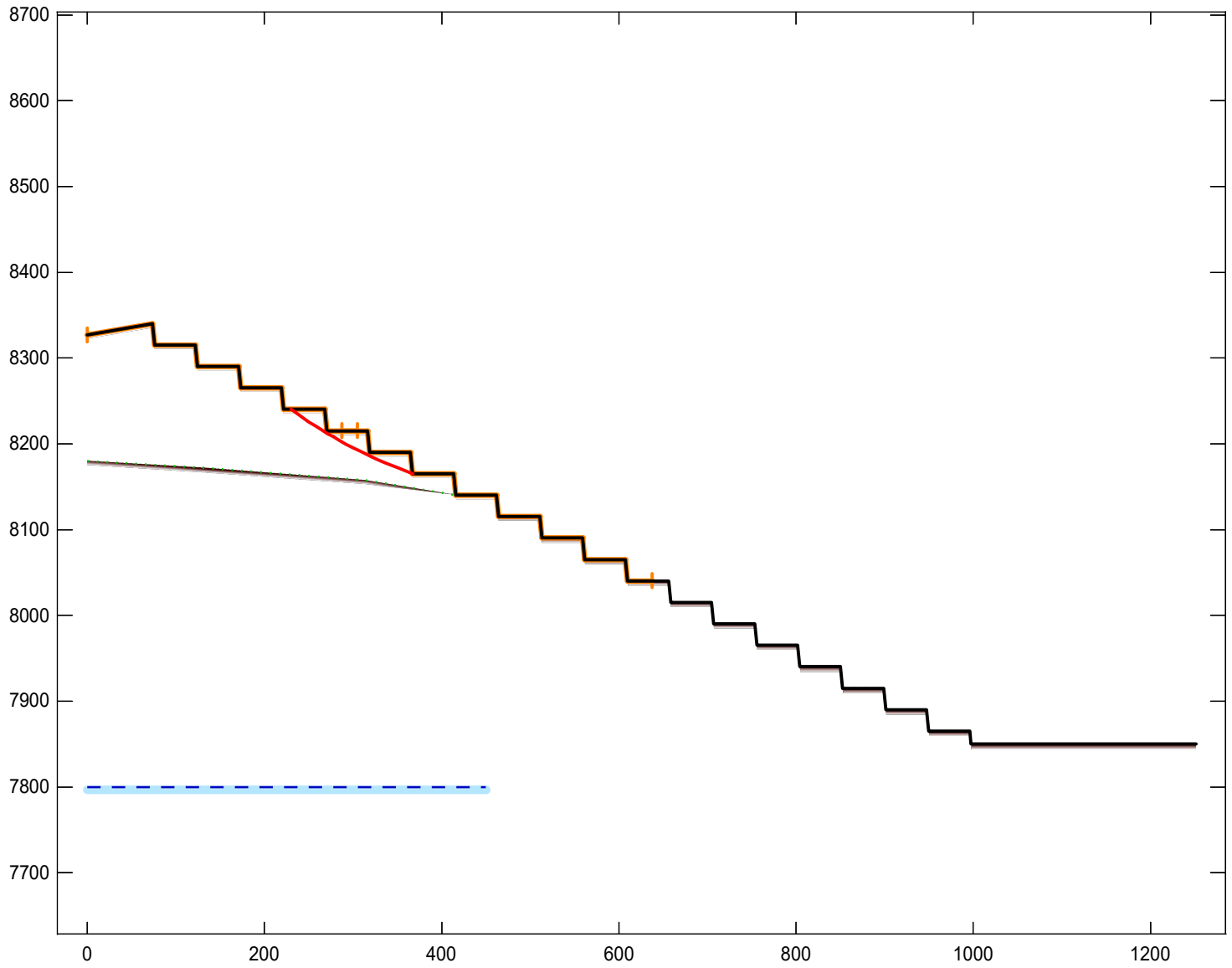

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

2: Gniess

3: Quartenary colluvium

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 1.93

Project RidgeTop Quarry - Mining Highwall at Bedrock
Active Mined Bench Slope

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

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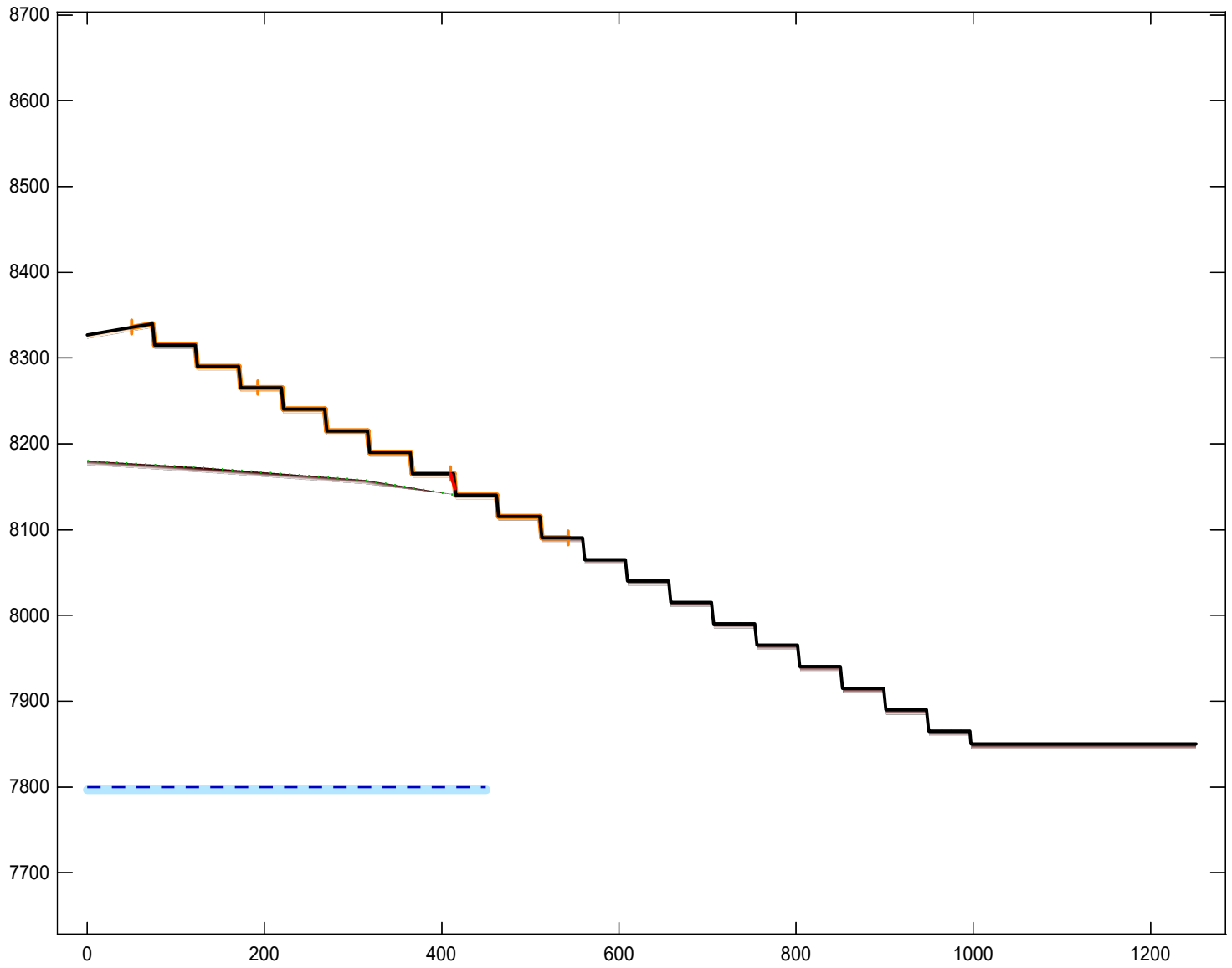

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

2: Gniess

3: Quartenary colluvium

Analysis 4

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 0.32

Project RidgeTop Quarry - Mining Highwall at Bedrock
Active Mined Bench Slope

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

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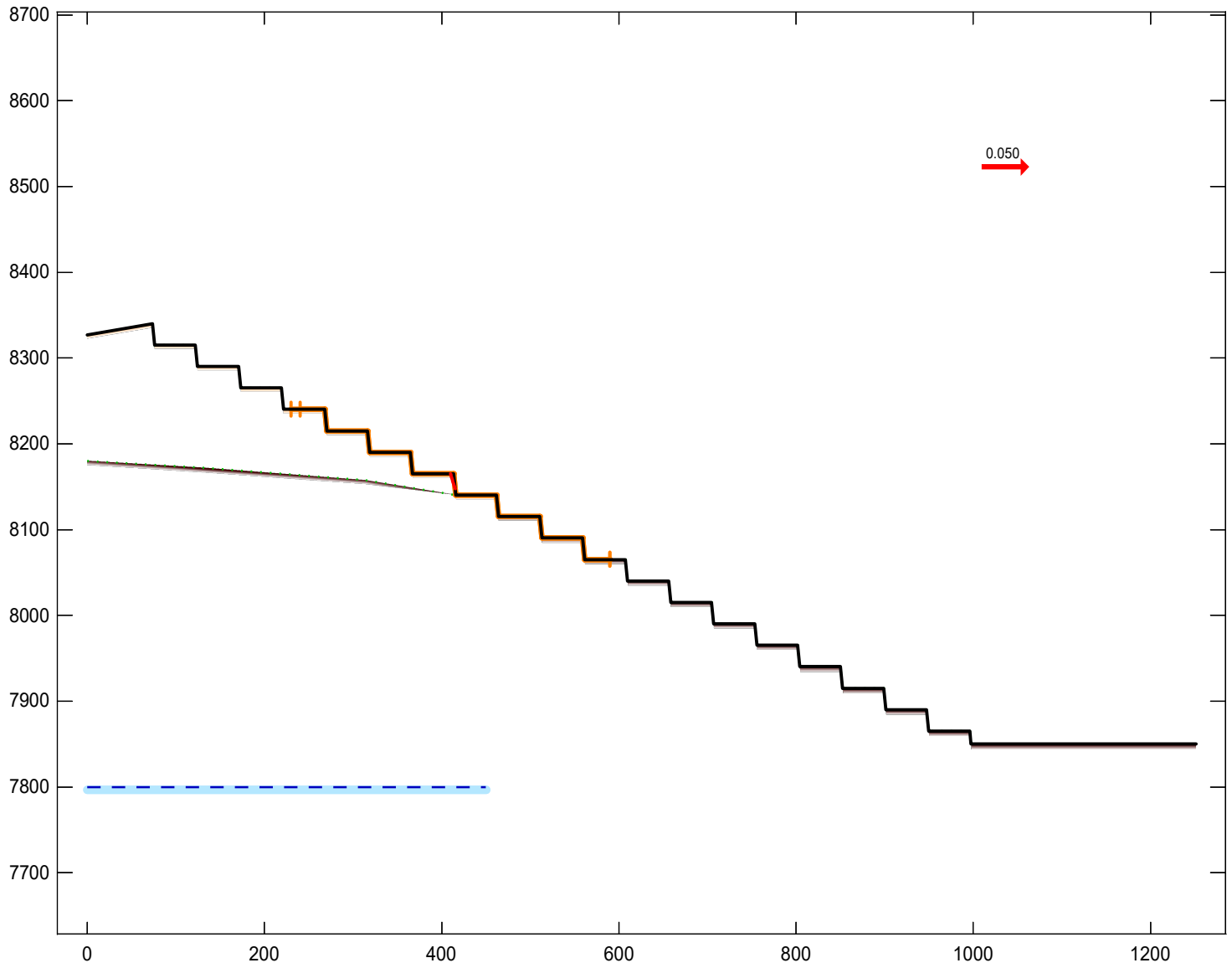

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

2: Gniess

3: Quartenary colluvium

Analysis 5

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 0.27

Project RidgeTop Quarry - Mining Highwall at Bedrock
Active Mined Bench Slope

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

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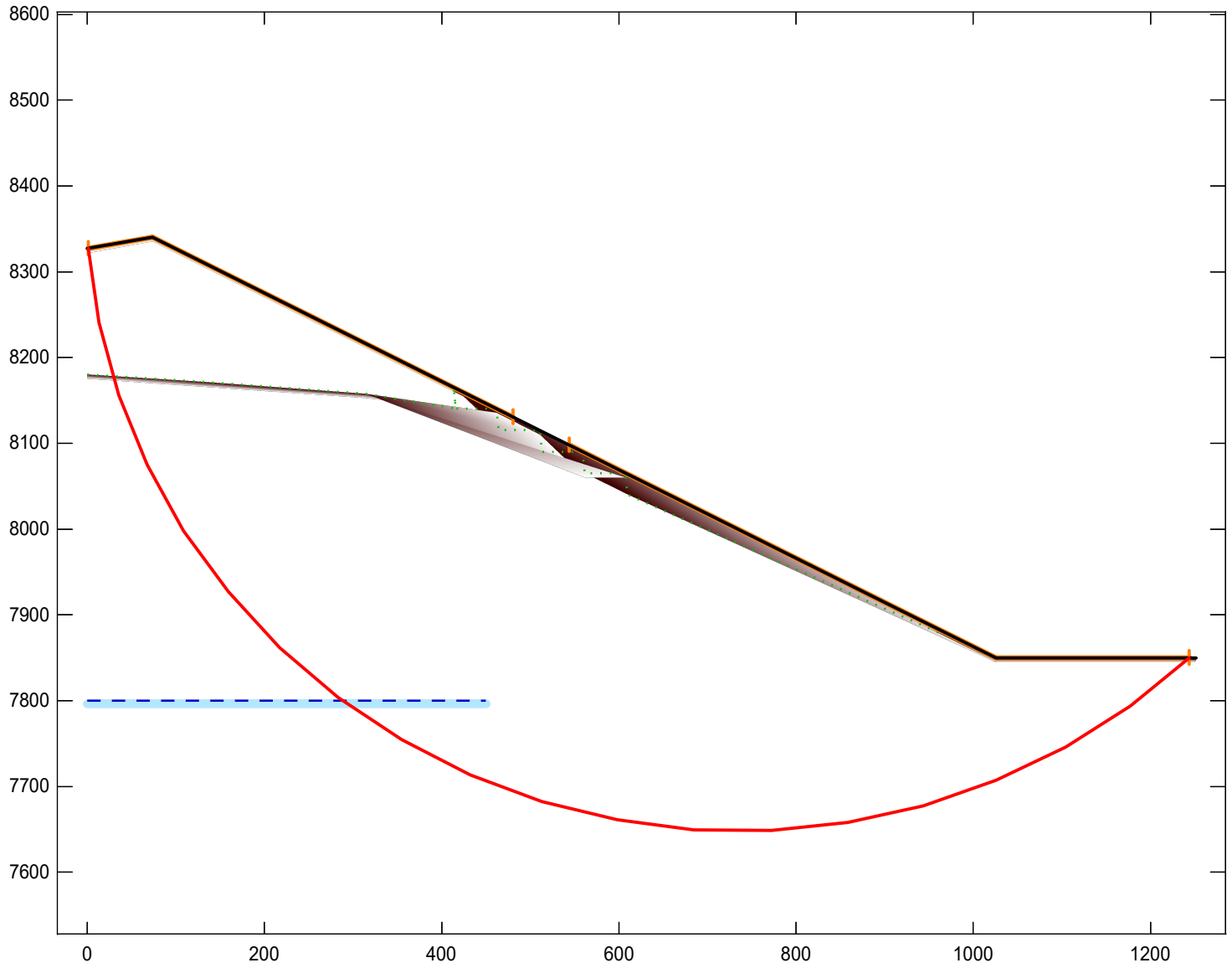

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

2: Gniess

3: Quartenary colluvium

Analysis 6

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 40.51

Project RidgeTop Quarry - Mining Highwall at Bedrock
Reclaimed Mined Bench Slope

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

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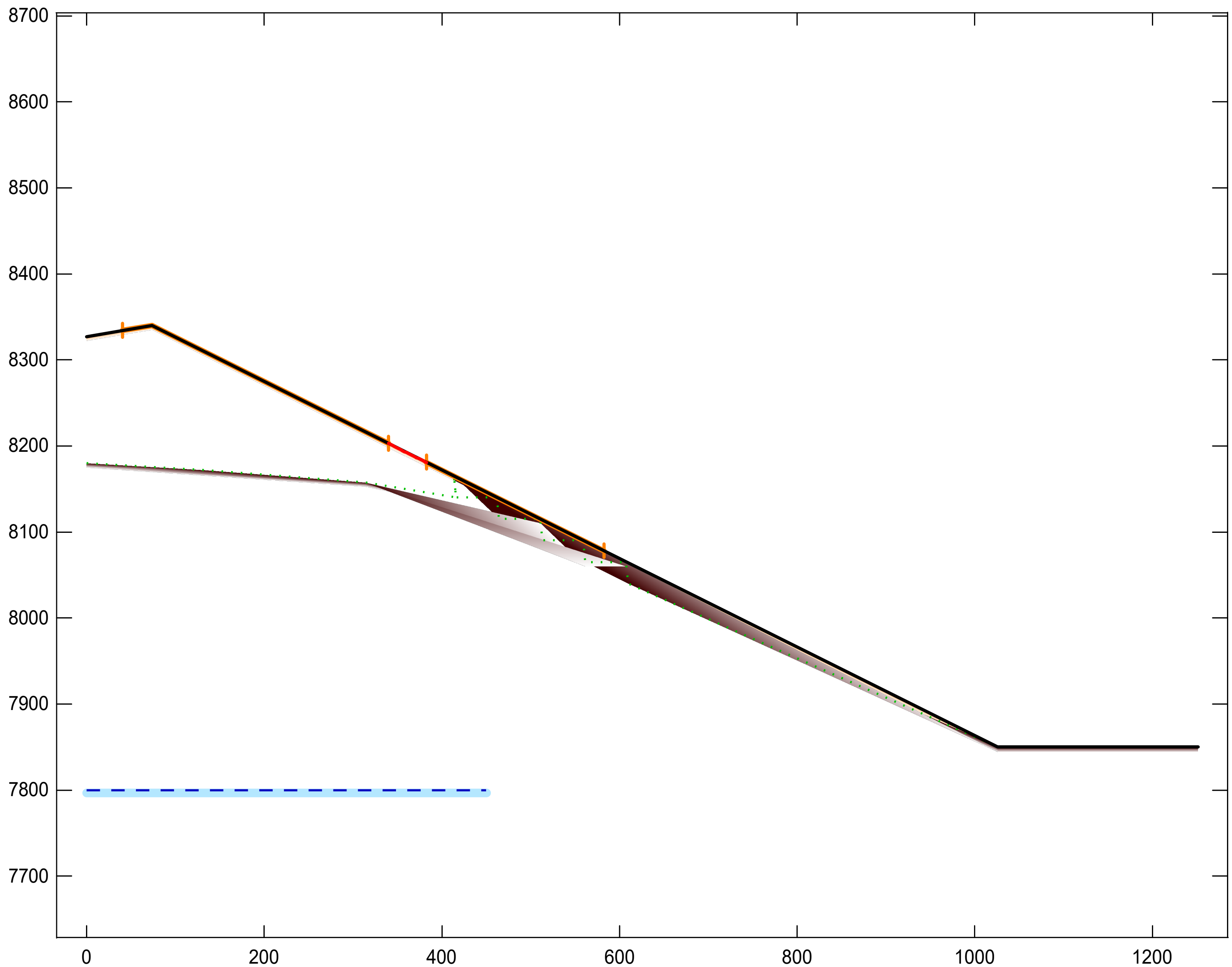

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

2: Gniess

3: Quartenary colluvium

Analysis 7

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 1.94

Project RidgeTop Quarry - Mining Highwall at Bedrock
Reclaimed Mined Bench Slope

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

Edited: 20 Oct 2021
Processed: 20 Oct 2021

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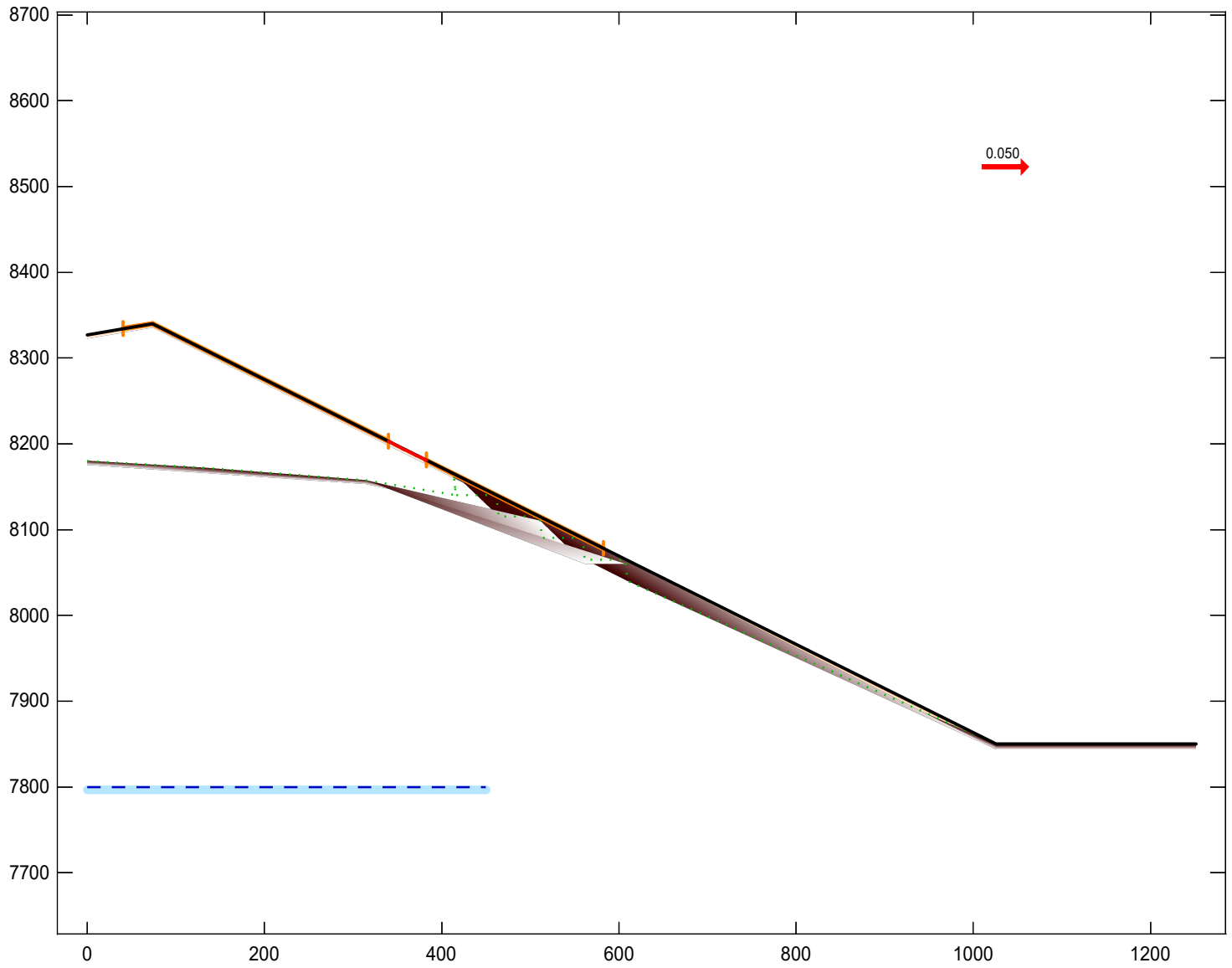

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

2: Gniess

3: Quartenary colluvium

Analysis 8

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 1.72

Project RidgeTop Quarry - Mining Highwall at Bedrock
Reclaimed Mined Bench Slope

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

Edited: 20 Oct 2021
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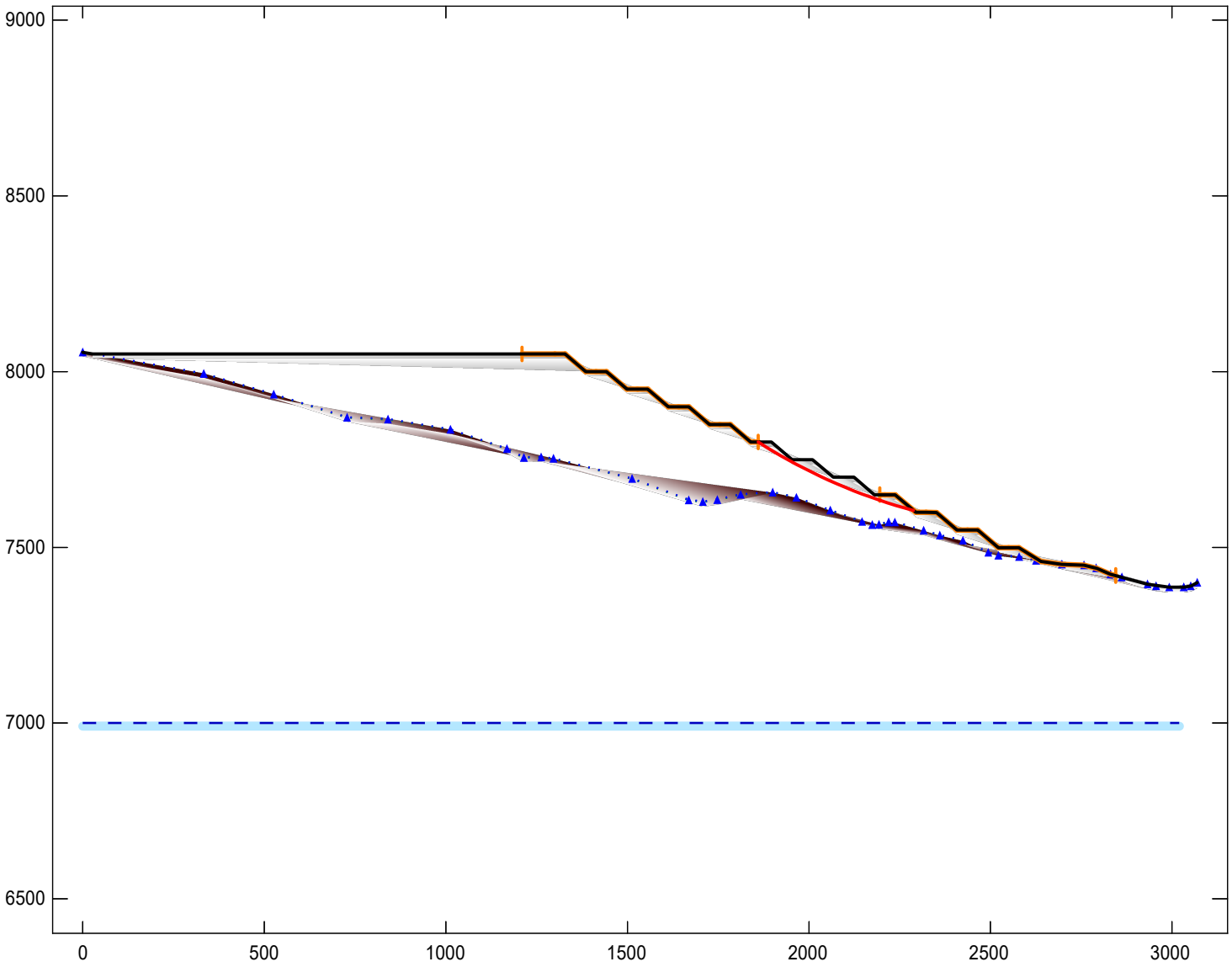

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

1: Crusher Waste Fines

2: Gniess

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 1.53

Project RidgeTop Quarry - Waste Rock Land Form
WRL in active conditions.

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Waste Dump Slopes 211020.gmf

Edited: 20 Oct 2021
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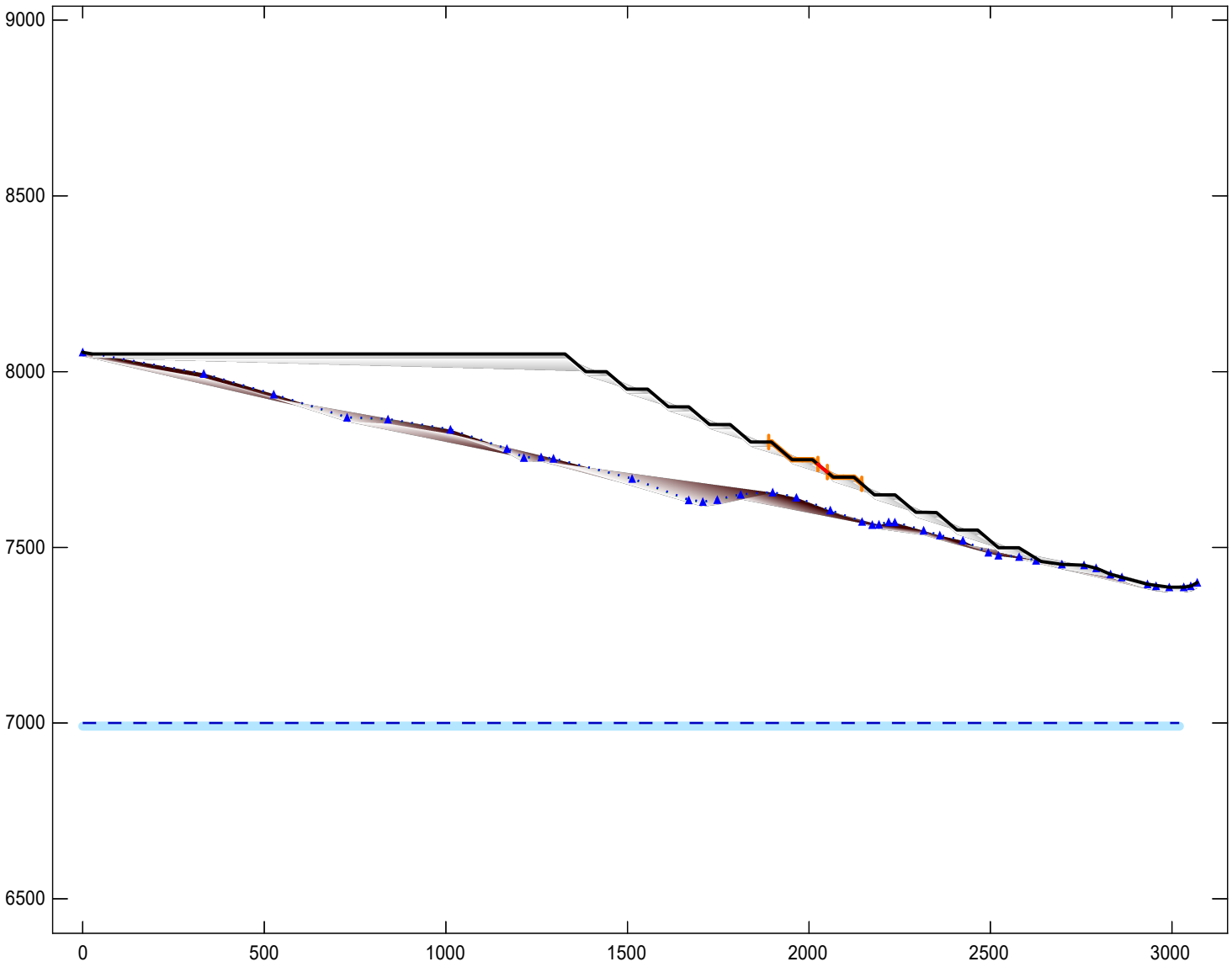

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

1: Crusher Waste Fines

2: Gniess

Analysis 2

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 0.77

Project RidgeTop Quarry - Waste Rock Landform
WRL in active conditions.

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Waste Dump Slopes 211020.gmf

Edited: 20 Oct 2021
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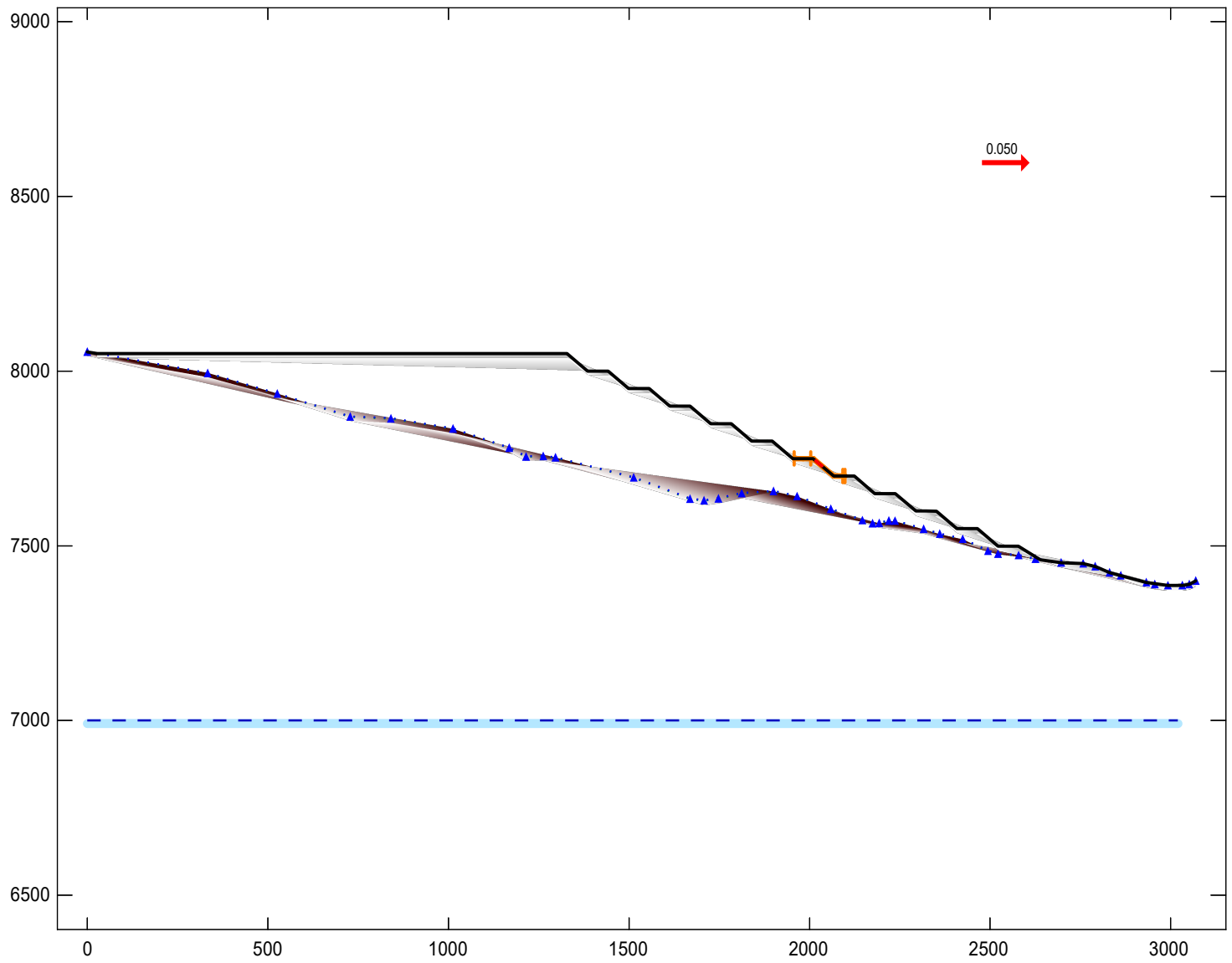

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

1: Crusher Waste Fines

2: Gniess

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 0.70

Project RidgeTop Quarry - Waste Rock Landform
WRL dump in active conditions.

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Waste Dump Slopes 211020.gmf

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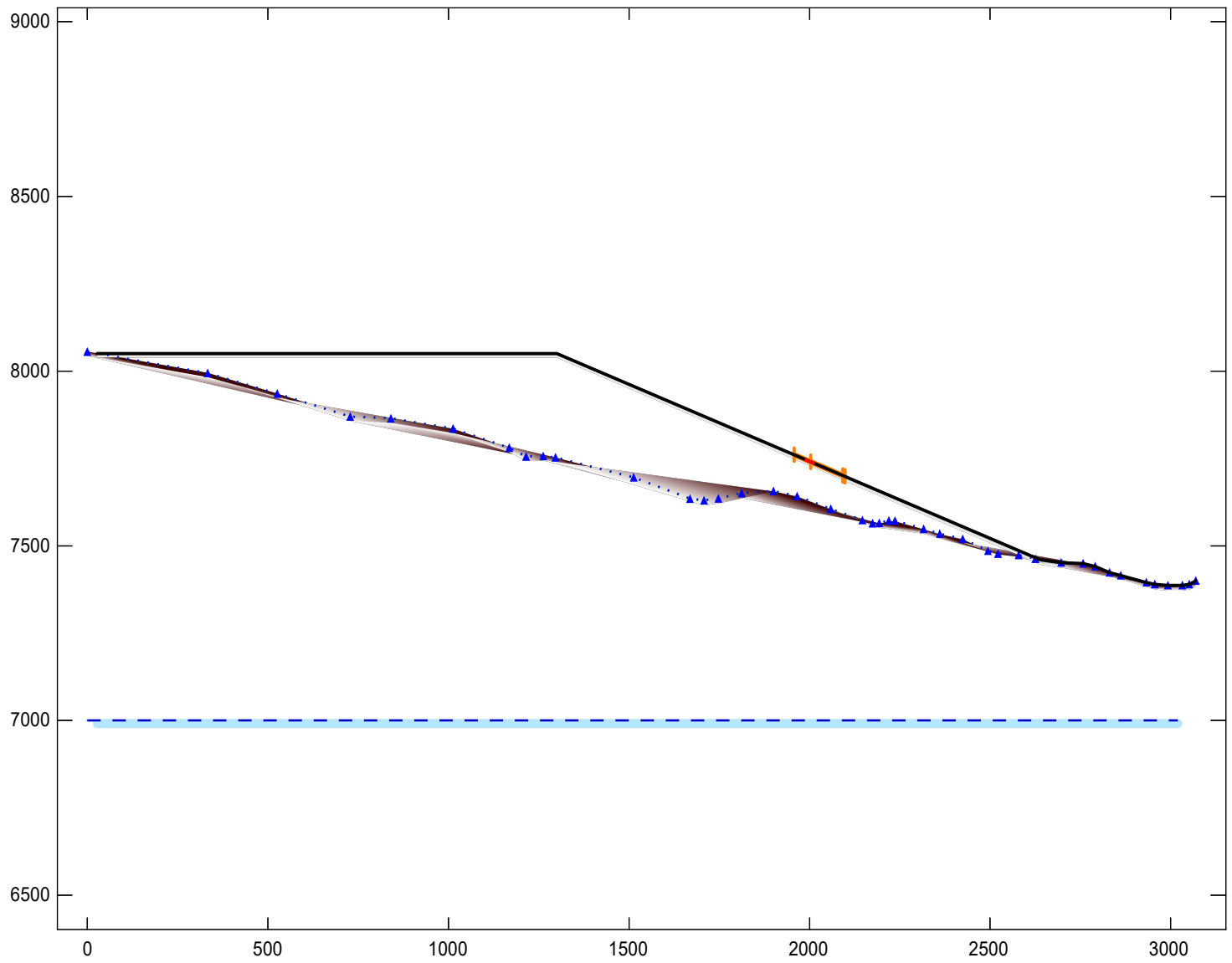

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

1: Crusher Waste Fines

2: Gniess

Analysis 4

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 1.54

Project RidgeTop Quarry - Waste Rock Landform
WRL in reclaimed conditions (>2H:1V).

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Waste Dump Slopes 211020.gmf

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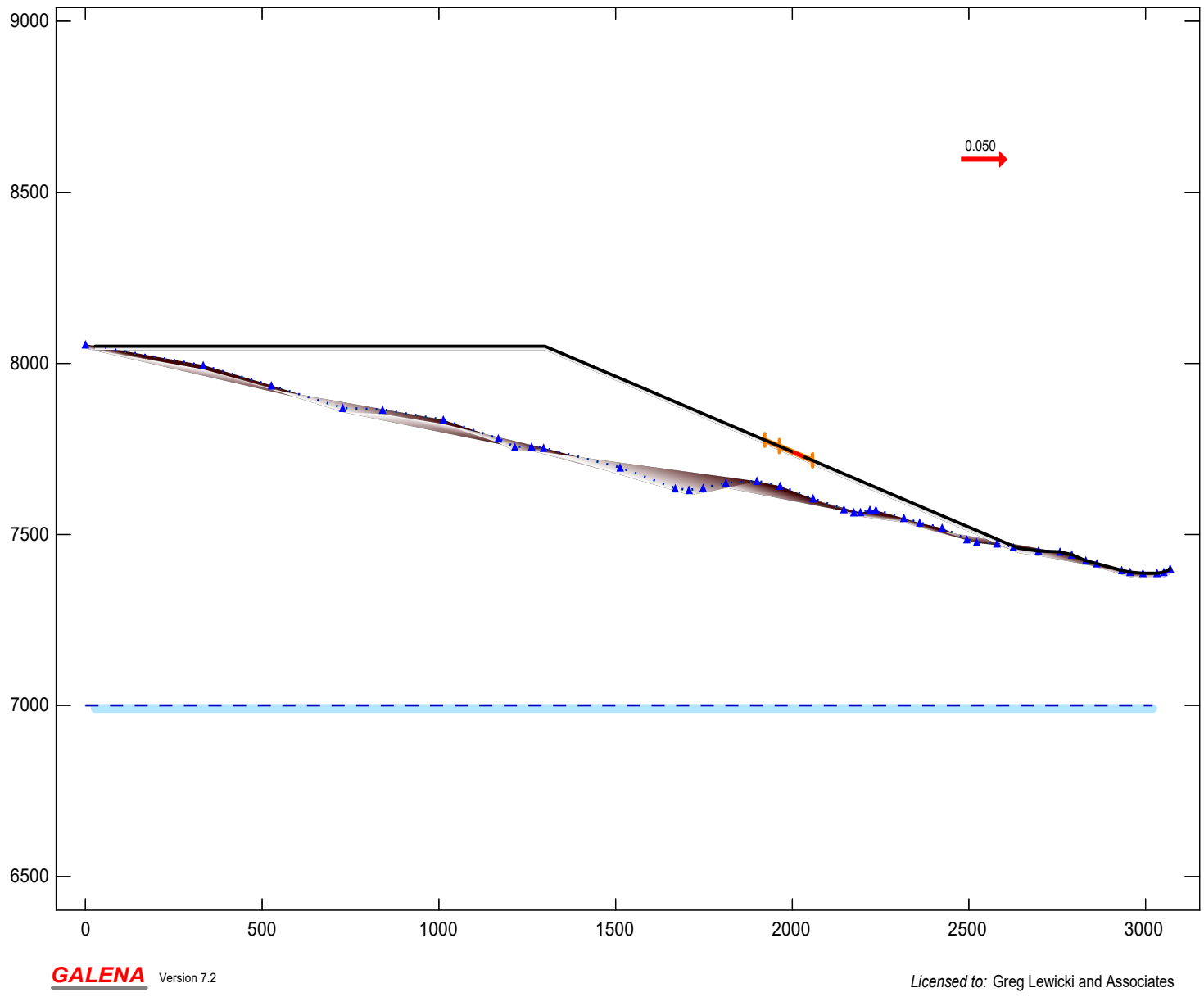

GALENA Version 7.2

Licensed to: Greg Lewicki and Associates

Material Keys

1: Crusher Waste Fines

2: Gniess

Analysis 5

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 1.35

Project RidgeTop Quarry - Waste Rock Landform
WRL dump in reclaimed conditions (>2H:1V). Seismic conditions

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Waste Dump Slopes 211020.gmf

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Mining Highwall

GALENA 7.2 Analysis Results Version: 7.20.1.01 Licensee: Greg Lewicki and Associates

Project: RidgeTop Quarry - Mining Highwall at Bedrock

File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Active Highwall Slopes 211019.gmf

Processed: 21 Oct 2021 12:55:09

1. Analysis 1

1.1. DATA: Analysis 1 - Active Mined Bench Slope

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines

Cohesion	Phi	UnitWeight	Ru
0.03	34.0	116.90	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Gniess

Cohesion	Phi	UnitWeight	Ru
400000.00	30.0	160.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (8 points) Material beneath: 3 - Quartenary colluvium

0.00	8326.88	442.98	8407.51	676.81	8465.00	814.05	8481.92	873.40	8480.00		
1017.50	8462.41	1205.67	8433.60	1250.86	8430.00						

Profile: 2 (31 points) Material beneath: 2 - Gniess

0.00	8180.43	133.26	8171.84	314.05	8158.01	415.86	8140.27	413.36	8165.27		
415.86	8140.27	461.90	8140.27	464.40	8115.27	510.44	8115.27	512.94	8090.27		
558.98	8090.27	561.48	8065.27	607.53	8065.27	610.03	8040.27	656.07	8040.27		
658.57	8015.27	704.61	8015.27	707.11	7990.27	753.15	7990.27	755.65	7965.27		
801.69	7965.27	804.19	7940.27	850.24	7940.27	852.74	7915.27	898.78	7915.27		
901.28	7890.27	947.32	7890.27	949.82	7865.27	995.86	7865.27	997.39	7850.00		
1250.86	7850.00										

Slope Surface (42 points)

0.00	8326.88	73.56	8340.27	76.06	8315.27	122.10	8315.27	124.60	8290.27
170.65	8290.27	173.15	8265.27	219.19	8265.27	221.69	8240.27	267.73	8240.27
270.23	8215.27	316.27	8215.27	318.77	8190.27	364.82	8190.27	367.32	8165.27
413.36	8165.27	415.86	8140.27	461.90	8140.27	464.40	8115.27	510.44	8115.27
512.94	8090.27	558.98	8090.27	561.48	8065.27	607.53	8065.27	610.03	8040.27
656.07	8040.27	658.57	8015.27	704.61	8015.27	707.11	7990.27	753.15	7990.27
755.65	7965.27	801.69	7965.27	804.19	7940.27	850.24	7940.27	852.74	7915.27
898.78	7915.27	901.28	7890.27	947.32	7890.27	949.82	7865.27	995.86	7865.27
997.39	7850.00	1250.86	7850.00						

Phreatic Surface (2 points)

0.00	7800.00	450.00	7800.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects: XL: 200.00 YL: 8265.27 XR: 800.00 YR: 7965.27

Centre: XC: 749.00 YC: 8613.27 Radius: R: 650.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	360.00	605.00	25.00
Trial positions within range:	25	75	50

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1.2. RESULTS: Analysis 1 - Active Mined Bench Slope

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 98.954

Analysis Summary

There were: 49674 successful analyses from a total of 93751 trial failure surfaces
44077 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 41.61

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Negative normal stresses exist on the base of one or more slices; examine slice data and consult the GALENA Help utility

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	20.00	8330.52	1102.50	7850.00	666.16	8326.60	646.17	41.608	<-- Critical Surface
2	20.00	8330.52	1102.50	7850.00	668.72	8332.37	648.72	41.612	
3	20.00	8330.52	1102.50	7850.00	669.23	8333.51	649.23	41.612	
4	20.00	8330.52	1102.50	7850.00	669.73	8334.64	649.74	41.612	
5	20.00	8330.52	1102.50	7850.00	670.23	8335.78	650.26	41.613	
6	20.00	8330.52	1102.50	7850.00	665.64	8325.43	645.66	41.613	
7	20.00	8330.52	1102.50	7850.00	667.19	8328.92	647.19	41.618	
8	20.00	8330.52	1102.50	7850.00	665.12	8324.26	645.15	41.618	
9	20.00	8330.52	1102.50	7850.00	666.68	8327.76	646.68	41.621	
10	20.00	8330.52	1102.50	7850.00	664.60	8323.08	644.64	41.622	
11	20.00	8330.52	1102.50	7850.00	668.21	8331.22	648.21	41.623	
12	20.00	8330.52	1102.50	7850.00	667.70	8330.08	647.70	41.624	
13	20.00	8330.52	1102.50	7850.00	664.08	8321.90	644.13	41.625	
14	20.00	8330.52	1102.50	7850.00	663.55	8320.71	643.62	41.626	
15	20.00	8330.52	1102.50	7850.00	674.67	8345.77	654.85	41.627	
16	20.00	8330.52	1102.50	7850.00	670.73	8336.90	650.77	41.628	
17	20.00	8330.52	1102.50	7850.00	675.15	8346.86	655.36	41.630	
18	20.00	8330.52	1102.50	7850.00	671.23	8338.02	651.28	41.630	
19	20.00	8330.52	1102.50	7850.00	663.02	8319.52	643.11	41.631	
20	20.00	8330.52	1102.50	7850.00	671.73	8339.14	651.79	41.631	
21	20.00	8330.52	1094.32	7850.00	668.17	8338.44	648.21	41.631	
22	20.00	8330.52	1102.50	7850.00	672.22	8340.26	652.30	41.632	
23	20.00	8330.52	1102.50	7850.00	675.64	8347.94	655.87	41.632	
24	20.00	8330.52	1102.50	7850.00	672.72	8341.37	652.81	41.632	
25	20.00	8330.52	1094.32	7850.00	667.67	8337.32	647.70	41.633	
26	20.00	8330.52	1102.50	7850.00	673.21	8342.47	653.32	41.633	
27	20.00	8330.52	1102.50	7850.00	674.18	8344.67	654.34	41.634	
28	20.00	8330.52	1102.50	7850.00	676.12	8349.03	656.38	41.634	
29	20.00	8330.52	1094.32	7850.00	667.17	8336.21	647.19	41.635	
30	20.00	8330.52	1094.32	7850.00	662.59	8325.96	642.60	41.635	
31	20.00	8330.52	1102.50	7850.00	662.49	8318.32	642.60	41.636	
32	20.00	8330.52	1102.50	7850.00	676.60	8350.11	656.89	41.637	
33	20.00	8330.52	1094.32	7850.00	666.67	8335.09	646.68	41.637	
34	20.00	8330.52	1094.32	7850.00	666.16	8333.96	646.17	41.639	
35	20.00	8330.52	1102.50	7850.00	677.07	8351.18	657.40	41.639	
36	20.00	8330.52	1102.50	7850.00	661.95	8317.12	642.09	41.641	
37	20.00	8330.52	1102.50	7850.00	677.55	8352.25	657.91	41.641	
38	20.00	8330.52	1094.32	7850.00	665.66	8332.83	645.66	41.641	
39	20.00	8330.52	1094.32	7850.00	668.66	8339.55	648.72	41.643	
40	20.00	8330.52	1102.50	7850.00	673.70	8343.58	653.83	41.644	
41	20.00	8330.52	1094.32	7850.00	665.15	8331.70	645.15	41.644	
42	20.00	8330.52	1102.50	7850.00	678.02	8353.32	658.42	41.644	
43	20.00	8330.52	1094.32	7850.00	664.64	8330.56	644.64	41.645	
44	20.00	8330.52	1094.32	7850.00	664.13	8329.42	644.13	41.646	
45	20.00	8330.52	1102.50	7850.00	661.42	8315.91	641.58	41.647	
46	20.00	8330.52	1094.32	7850.00	663.62	8328.27	643.62	41.647	
47	20.00	8330.52	1086.15	7850.00	659.53	8326.45	639.54	41.648	

48	20.00	8330.52	1094.32	7850.00	663.10	8327.12	643.11	41.649
49	20.00	8330.52	1094.32	7850.00	662.07	8324.80	642.09	41.650
50	20.00	8330.52	1102.50	7850.00	678.50	8354.39	658.93	41.651
51	20.00	8330.52	1086.15	7850.00	659.01	8325.30	639.03	41.651
52	20.00	8330.52	1086.15	7850.00	664.10	8336.61	644.13	41.653
53	20.00	8330.52	1094.32	7850.00	670.14	8342.85	650.26	41.653
54	20.00	8330.52	1102.50	7850.00	660.88	8314.69	641.07	41.653
55	20.00	8330.52	1086.15	7850.00	658.49	8324.15	638.52	41.653
56	20.00	8330.52	1094.32	7850.00	670.63	8343.94	650.77	41.655
57	20.00	8330.52	1094.32	7850.00	661.54	8323.63	641.58	41.655
58	20.00	8330.52	1086.15	7850.00	663.60	8335.50	643.62	41.655
59	20.00	8330.52	1102.50	7850.00	679.44	8356.51	659.95	41.656
60	20.00	8330.52	1094.32	7850.00	671.11	8345.03	651.28	41.656
61	20.00	8330.52	1086.15	7850.00	663.10	8334.38	643.11	41.658
62	20.00	8330.52	1086.15	7850.00	661.07	8329.88	641.07	41.659
63	20.00	8330.52	1102.50	7850.00	660.33	8313.47	640.56	41.659
64	20.00	8330.52	1086.15	7850.00	657.97	8322.99	638.01	41.659
65	20.00	8330.52	1094.32	7850.00	669.16	8340.65	649.23	41.660
66	20.00	8330.52	1086.15	7850.00	660.56	8328.74	640.56	41.660
67	20.00	8330.52	1094.32	7850.00	661.02	8322.46	641.07	41.660
68	20.00	8330.52	1086.15	7850.00	662.60	8333.26	642.60	41.661
69	20.00	8330.52	1086.15	7850.00	660.04	8327.60	640.05	41.661
70	20.00	8330.52	1094.32	7850.00	669.65	8341.75	649.74	41.661
71	20.00	8330.52	1102.50	7850.00	679.91	8357.56	660.46	41.663
72	20.00	8330.52	1086.15	7850.00	662.09	8332.14	642.09	41.665
73	20.00	8330.52	1086.15	7850.00	665.59	8339.91	645.66	41.665
74	20.00	8330.52	1094.32	7850.00	671.60	8346.11	651.79	41.665
75	20.00	8330.52	1094.32	7850.00	659.44	8318.92	639.54	41.665
76	20.00	8330.52	1094.32	7850.00	660.49	8321.29	640.56	41.666
77	20.00	8330.52	1102.50	7850.00	659.79	8312.25	640.05	41.666
78	20.00	8330.52	1102.50	7850.00	678.97	8355.45	659.44	41.668
79	20.00	8330.52	1086.15	7850.00	661.58	8331.01	641.58	41.669
80	20.00	8330.52	1086.15	7850.00	666.09	8341.01	646.17	41.669
81	20.00	8330.52	1094.32	7850.00	658.90	8317.73	639.03	41.670
82	20.00	8330.52	1086.15	7850.00	657.44	8321.82	637.50	41.670
83	20.00	8330.52	1102.50	7850.00	680.37	8358.61	660.97	41.670
84	20.00	8330.52	1086.15	7850.00	666.58	8342.10	646.68	41.671
85	20.00	8330.52	1086.15	7850.00	664.60	8337.71	644.64	41.672
86	20.00	8330.52	1094.32	7850.00	659.97	8320.10	640.05	41.672
87	20.00	8330.52	1094.32	7850.00	672.08	8347.19	652.30	41.672
88	20.00	8330.52	1102.50	7850.00	659.24	8311.02	639.54	41.674
89	20.00	8330.52	1086.15	7850.00	665.10	8338.82	645.15	41.674
90	20.00	8330.52	1094.32	7850.00	658.37	8316.53	638.52	41.675
91	20.00	8330.52	1102.50	7850.00	680.84	8359.66	661.48	41.678
92	20.00	8330.52	1094.32	7850.00	672.56	8348.27	652.81	41.678
93	20.00	8330.52	1094.32	7850.00	657.83	8315.33	638.01	41.681
94	20.00	8330.52	1102.50	7850.00	658.69	8309.78	639.03	41.681
95	20.00	8330.52	1102.50	7850.00	657.59	8307.29	638.01	41.683
96	20.00	8330.52	1094.32	7850.00	673.05	8349.35	653.32	41.685
97	20.00	8330.52	1102.50	7850.00	681.30	8360.71	661.99	41.685

98	20.00	8330.52	1102.50	7850.00	657.03	8306.03	637.50	41.686
99	20.00	8330.52	1094.32	7850.00	657.29	8314.12	637.50	41.687

Critical Failure Surface (circle 1)

Intersects: XL: 20.00 YL: 8330.52 XR: 1102.50 YR: 7850.00

Centre: XC: 666.16 YC: 8326.60 Radius: R: 646.17

Generated failure surface: (20 points)

20.00	8330.52	24.33	8251.85	38.20	8174.29	61.40	8098.99	93.60	8027.08
134.31	7959.62	182.93	7897.62	238.73	7842.00	300.89	7793.58	368.48	7753.08
440.49	7721.12	515.86	7698.15	593.46	7684.53	672.15	7680.46	750.74	7685.99
828.08	7701.04	903.01	7725.40	974.42	7758.70	1041.25	7800.44	1102.50	7850.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 52 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	20.00	1842.23	83.4	17.53	153.51	3	0.00	45.0	202645.16	0.00	9560.66	7.24
2	37.53	4730.45	73.2	23.87	82.55	2	400000.00	30.0	567520.06	0.00	-7694.56	3.31
3	61.40	3085.09	65.9	12.16	29.75	2	400000.00	30.0	394475.19	0.00	10644.14	2.37
4	73.56	5326.65	65.9	20.04	49.04	2	400000.00	30.0	711761.75	0.00	13624.82	2.37
5	93.60	8886.57	58.9	28.50	55.16	2	400000.00	30.0	1219792.88	0.00	26264.81	1.89
6	122.10	3567.42	58.9	11.16	21.60	2	400000.00	30.0	504904.94	0.00	28653.99	1.89
7	133.26	6379.28	52.4	18.69	30.61	2	400000.00	30.0	909314.94	0.00	35533.88	1.61
8	151.95	6825.00	51.9	18.70	30.30	2	400000.00	30.0	979292.94	0.00	39425.11	1.59
9	170.65	4417.60	51.9	12.28	19.90	2	400000.00	30.0	647419.56	0.00	39769.41	1.59
10	182.93	6829.83	44.9	18.13	25.60	2	400000.00	30.0	1003999.12	0.00	45166.22	1.39
11	201.06	7157.52	44.9	18.13	25.60	2	400000.00	30.0	1055172.38	0.00	47949.79	1.39
12	219.19	7591.84	44.9	19.54	27.59	2	400000.00	30.0	1140687.75	0.00	48129.61	1.39
13	238.73	11877.61	37.9	29.00	36.76	2	400000.00	30.0	1787886.62	0.00	53582.68	1.25
14	267.73	10103.45	37.9	24.91	31.58	2	400000.00	30.0	1548456.38	0.00	54083.93	1.25
15	292.64	3450.46	37.9	8.25	10.45	2	400000.00	30.0	529013.25	2094.43	56067.52	1.25
16	300.89	5602.56	30.9	13.16	15.34	2	400000.00	30.0	859055.44	9925.12	59018.84	1.16
17	314.05	2027.68	30.9	4.72	5.50	2	400000.00	30.0	311148.59	5398.15	59674.21	1.16
18	318.77	9539.35	30.9	23.02	26.84	2	400000.00	30.0	1485900.12	40254.63	58302.30	1.16
19	341.79	9856.99	30.9	23.03	26.84	2	400000.00	30.0	1532104.75	63359.69	60299.49	1.16
20	364.82	10095.12	25.0	24.27	26.79	2	400000.00	30.0	1593107.62	84719.28	60775.34	1.10
21	389.09	10356.59	23.9	24.27	26.55	2	400000.00	30.0	1629812.25	101826.45	62524.50	1.09
22	413.36	11208.23	23.9	27.13	29.68	2	400000.00	30.0	1793317.00	134955.67	61483.04	1.09
23	440.49	3999.99	16.9	9.51	9.94	2	400000.00	30.0	639997.69	49835.37	64117.59	1.04
24	450.00	5043.98	16.9	11.90	12.44	2	400000.00	30.0	807037.12	0.00	64615.82	1.04
25	461.90	9814.18	16.9	24.27	25.37	2	400000.00	30.0	1570268.25	0.00	61510.73	1.04
26	486.17	9993.67	16.9	24.27	25.37	2	400000.00	30.0	1598986.62	0.00	62688.95	1.04
27	510.44	2120.59	16.9	5.42	5.67	2	400000.00	30.0	339293.81	0.00	59426.27	1.04
28	515.86	8494.97	10.0	21.56	21.89	2	400000.00	30.0	1359194.75	0.00	61205.34	1.01
29	537.42	8576.58	10.0	21.56	21.89	2	400000.00	30.0	1372252.62	0.00	61809.34	1.01
30	558.98	13024.96	10.0	34.48	35.01	2	400000.00	30.0	2083994.00	0.00	58604.08	1.01
31	593.46	5360.71	3.0	14.07	14.09	2	400000.00	30.0	857713.69	0.00	60435.24	1.00
32	607.53	8666.73	3.0	24.27	24.30	2	400000.00	30.0	1386677.00	0.00	56596.88	1.00
33	631.80	8697.21	3.0	24.27	24.30	2	400000.00	30.0	1391554.12	0.00	56797.83	1.00

34	656.07	5376.73	3.0	16.08	16.10	2	400000.00	30.0	860276.62	0.00	52967.78	1.00
35	672.15	10831.35	-4.0	32.46	32.54	2	400000.00	30.0	1733015.50	0.00	54116.89	1.00
36	704.61	7075.20	-4.0	23.07	23.12	2	400000.00	30.0	1132032.38	0.00	49800.02	1.00
37	727.68	7037.75	-4.0	23.07	23.12	2	400000.00	30.0	1126040.25	0.00	49540.00	1.00
38	750.74	1487.84	-11.0	4.91	5.00	2	400000.00	30.0	238054.48	0.00	50541.16	1.02
39	755.65	6355.52	-11.0	23.02	23.45	2	400000.00	30.0	1016882.38	0.00	46170.06	1.02
40	778.67	6252.32	-11.0	23.02	23.45	2	400000.00	30.0	1000371.88	0.00	45451.23	1.02
41	801.69	6381.80	-11.0	26.39	26.89	2	400000.00	30.0	1021088.00	0.00	40668.68	1.02
42	828.08	5220.60	-18.0	22.16	23.30	2	400000.00	30.0	835296.38	0.00	41009.75	1.06
43	850.24	4928.71	-18.0	24.27	25.52	2	400000.00	30.0	788593.62	0.00	35779.02	1.06
44	874.51	4737.24	-18.0	24.27	25.52	2	400000.00	30.0	757958.38	0.00	34510.82	1.06
45	898.78	3911.94	-23.8	24.27	26.53	2	400000.00	30.0	625910.50	0.00	30220.19	1.10
46	923.05	3637.28	-25.0	24.27	26.78	2	400000.00	30.0	581965.19	0.00	28646.66	1.11
47	947.32	3059.81	-25.0	27.10	29.91	2	400000.00	30.0	489569.38	0.00	22691.72	1.11
48	974.42	2140.95	-32.0	21.44	25.27	2	400000.00	30.0	342552.31	0.00	22177.11	1.19
49	995.86	1607.40	-32.0	22.70	26.76	2	400000.00	30.0	257183.30	0.00	17488.10	1.19
50	1018.56	1285.69	-32.0	22.70	26.76	2	400000.00	30.0	205711.17	0.00	15200.30	1.19
51	1041.25	1138.38	-39.0	30.62	39.40	2	400000.00	30.0	182140.73	0.00	13882.50	1.30
52	1071.88	379.46	-39.0	30.62	39.40	2	400000.00	30.0	60713.58	0.00	9872.47	1.30

X-S Area: 317397.06 Path Length: 1496.64 X-S Weight: 49069116.00

2. Analysis 2

2.1. DATA: Analysis 2 - Active Mined Bench Slope

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (8 points) Material beneath: 3 - Quartenary colluvium
0.00 8326.88 442.98 8407.51 676.81 8465.00 814.05 8481.92 873.40 8480.00
1017.50 8462.41 1205.67 8433.60 1250.86 8430.00
Profile: 2 (31 points) Material beneath: 2 - Gniess
0.00 8180.43 133.26 8171.84 314.05 8158.01 415.86 8140.27 413.36 8165.27
415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27 512.94 8090.27
558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27 656.07 8040.27
658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27 755.65 7965.27
801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27 898.78 7915.27
901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27 997.39 7850.00
1250.86 7850.00

Slope Surface (42 points)

0.00 8326.88 73.56 8340.27 76.06 8315.27 122.10 8315.27 124.60 8290.27
170.65 8290.27 173.15 8265.27 219.19 8265.27 221.69 8240.27 267.73 8240.27
270.23 8215.27 316.27 8215.27 318.77 8190.27 364.82 8190.27 367.32 8165.27
413.36 8165.27 415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27
512.94 8090.27 558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27
656.07 8040.27 658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27
755.65 7965.27 801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27
898.78 7915.27 901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27
997.39 7850.00 1250.86 7850.00

Phreatic Surface (2 points)

0.00 7800.00 450.00 7800.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 200.00 YL: 8265.27 XR: 609.00 YR: 8050.57
Centre: XC: 610.62 YC: 8550.57 Radius: R: 500.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	360.00	350.00	25.00
Trial positions within range:	25	75	50

- -

2.2. RESULTS: Analysis 2 - Active Mined Bench Slope

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 134.925

Analysis Summary

There were: 37173 successful analyses from a total of 93751 trial failure surfaces
56578 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 54.22

Negative normal stresses exist on the base of one or more slices; examine slice data and consult the GALENA Help utility

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	125.00	8290.27	462.38	8135.49	491.52	8644.09	509.44	54.220	<-- Critical Surface
2	20.00	8330.52	784.00	7965.27	506.22	8365.88	487.50	54.371	
3	20.00	8330.52	784.00	7965.27	506.66	8366.81	488.01	54.372	
4	20.00	8330.52	784.00	7965.27	507.10	8367.74	488.52	54.373	
5	20.00	8330.52	784.00	7965.27	507.54	8368.66	489.03	54.375	
6	20.00	8330.52	784.00	7965.27	508.42	8370.49	490.05	54.376	
7	20.00	8330.52	784.00	7965.27	507.98	8369.58	489.54	54.376	
8	20.00	8330.52	784.00	7965.27	508.85	8371.40	490.56	54.384	
9	20.00	8330.52	784.00	7965.27	509.29	8372.31	491.07	54.385	
10	20.00	8330.52	784.00	7965.27	509.72	8373.22	491.58	54.386	
11	20.00	8330.52	784.00	7965.27	510.16	8374.13	492.09	54.388	
12	20.00	8330.52	784.00	7965.27	510.59	8375.03	492.60	54.389	
13	20.00	8330.52	784.00	7965.27	511.02	8375.93	493.11	54.391	

14	20.00	8330.52	784.00	7965.27	511.45	8376.83	493.62	54.393
15	20.00	8330.52	784.00	7965.27	511.87	8377.72	494.13	54.395
16	20.00	8330.52	784.00	7965.27	512.30	8378.61	494.64	54.397
17	20.00	8330.52	784.00	7965.27	512.72	8379.50	495.15	54.399
18	20.00	8330.52	779.27	7965.27	505.98	8368.96	487.50	54.402
19	20.00	8330.52	784.00	7965.27	513.15	8380.39	495.66	54.402
20	20.00	8330.52	779.27	7965.27	506.42	8369.88	488.01	54.403
21	20.00	8330.52	779.27	7965.27	506.86	8370.79	488.52	54.404
22	20.00	8330.52	779.27	7965.27	507.29	8371.69	489.03	54.405
23	20.00	8330.52	779.27	7965.27	507.73	8372.60	489.54	54.406
24	20.00	8330.52	779.27	7965.27	508.16	8373.50	490.05	54.408
25	20.00	8330.52	779.27	7965.27	508.60	8374.40	490.56	54.410
26	20.00	8330.52	784.00	7965.27	513.57	8381.27	496.17	54.410
27	20.00	8330.52	779.27	7965.27	509.03	8375.29	491.07	54.413
28	20.00	8330.52	760.35	7965.27	517.99	8406.97	503.83	54.417
29	20.00	8330.52	779.27	7965.27	509.46	8376.19	491.58	54.419
30	20.00	8330.52	760.35	7965.27	518.39	8407.77	504.34	54.422
31	20.00	8330.52	784.00	7965.27	513.99	8382.15	496.68	54.424
32	20.00	8330.52	760.35	7965.27	518.78	8408.57	504.85	54.431
33	20.00	8330.52	779.27	7965.27	509.88	8377.08	492.09	54.431
34	20.00	8330.52	784.00	7965.27	514.41	8383.03	497.19	54.438
35	20.00	8330.52	779.27	7965.27	510.31	8377.97	492.60	54.443
36	20.00	8330.52	760.35	7965.27	519.17	8409.36	505.36	54.444
37	20.00	8330.52	765.08	7965.27	519.93	8407.77	505.87	54.448
38	20.00	8330.52	760.35	7965.27	509.53	8389.83	493.11	54.449
39	20.00	8330.52	760.35	7965.27	509.12	8388.99	492.60	54.449
40	20.00	8330.52	760.35	7965.27	508.71	8388.15	492.09	54.449
41	20.00	8330.52	760.35	7965.27	508.29	8387.31	491.58	54.450
42	20.00	8330.52	760.35	7965.27	507.87	8386.47	491.07	54.450
43	20.00	8330.52	784.00	7965.27	514.83	8383.91	497.70	54.451
44	20.00	8330.52	774.54	7965.27	505.74	8371.96	487.50	54.452
45	20.00	8330.52	779.27	7965.27	510.74	8378.85	493.11	54.455
46	20.00	8330.52	760.35	7965.27	510.36	8391.50	494.13	54.455
47	20.00	8330.52	760.35	7965.27	509.94	8390.66	493.62	54.455
48	20.00	8330.52	760.35	7965.27	510.77	8392.33	494.64	54.455
49	20.00	8330.52	760.35	7965.27	511.18	8393.16	495.15	54.455
50	20.00	8330.52	760.35	7965.27	519.56	8410.15	505.87	54.456
51	20.00	8330.52	760.35	7965.27	511.58	8393.99	495.66	54.456
52	20.00	8330.52	760.35	7965.27	511.99	8394.81	496.17	54.457
53	20.00	8330.52	765.08	7965.27	520.33	8408.57	506.38	54.457
54	20.00	8330.52	760.35	7965.27	512.40	8395.63	496.68	54.458
55	20.00	8330.52	774.54	7965.27	506.17	8372.86	488.01	54.459
56	20.00	8330.52	760.35	7965.27	512.80	8396.46	497.19	54.460
57	20.00	8330.52	760.35	7965.27	513.21	8397.28	497.70	54.461
58	20.00	8330.52	765.08	7965.27	511.91	8391.40	495.66	54.463
59	20.00	8330.52	765.08	7965.27	512.32	8392.24	496.17	54.464
60	20.00	8330.52	774.54	7965.27	506.60	8373.76	488.52	54.465
61	20.00	8330.52	784.00	7965.27	515.25	8384.78	498.21	54.465
62	20.00	8330.52	765.08	7965.27	512.73	8393.07	496.68	54.466
63	20.00	8330.52	760.35	7965.27	519.95	8410.94	506.38	54.467

64	20.00	8330.52	779.27	7965.27	511.16	8379.74	493.62	54.467
65	20.00	8330.52	765.08	7965.27	513.54	8394.73	497.70	54.467
66	20.00	8330.52	765.08	7965.27	513.14	8393.90	497.19	54.467
67	20.00	8330.52	760.35	7965.27	514.01	8398.91	498.72	54.469
68	20.00	8330.52	769.81	7965.27	518.32	8401.25	503.32	54.469
69	20.00	8330.52	765.08	7965.27	518.36	8404.55	503.83	54.469
70	20.00	8330.52	765.08	7965.27	513.95	8395.56	498.21	54.470
71	20.00	8330.52	765.08	7965.27	520.72	8409.37	506.89	54.471
72	20.00	8330.52	760.35	7965.27	514.41	8399.72	499.23	54.471
73	20.00	8330.52	774.54	7965.27	519.48	8400.35	504.34	54.472
74	20.00	8330.52	760.35	7965.27	513.61	8398.09	498.21	54.473
75	20.00	8330.52	765.08	7965.27	514.36	8396.39	498.72	54.473
76	20.00	8330.52	774.54	7965.27	507.04	8374.65	489.03	54.473
77	20.00	8330.52	769.81	7965.27	518.72	8402.07	503.83	54.473
78	20.00	8330.52	760.35	7965.27	514.82	8400.54	499.74	54.474
79	20.00	8330.52	765.08	7965.27	518.75	8405.36	504.34	54.474
80	20.00	8330.52	765.08	7965.27	514.76	8397.21	499.23	54.476
81	20.00	8330.52	760.35	7965.27	520.34	8411.73	506.89	54.477
82	20.00	8330.52	769.81	7965.27	519.12	8402.89	504.34	54.478
83	20.00	8330.52	779.27	7965.27	511.59	8380.62	494.13	54.479
84	20.00	8330.52	784.00	7965.27	515.67	8385.66	498.72	54.480
85	20.00	8330.52	765.08	7965.27	515.16	8398.04	499.74	54.481
86	20.00	8330.52	774.54	7965.27	519.88	8401.18	504.85	54.481
87	20.00	8330.52	774.54	7965.27	507.47	8375.54	489.54	54.482
88	20.00	8330.52	765.08	7965.27	519.15	8406.16	504.85	54.482
89	20.00	8330.52	765.08	7965.27	521.11	8410.16	507.40	54.484
90	20.00	8330.52	769.81	7965.27	521.49	8407.75	507.40	54.484
91	20.00	8330.52	769.81	7965.27	515.91	8396.30	500.26	54.486
92	20.00	8330.52	765.08	7965.27	515.57	8398.86	500.26	54.487
93	20.00	8330.52	760.35	7965.27	520.73	8412.52	507.40	54.487
94	20.00	8330.52	760.35	7965.27	515.22	8401.35	500.26	54.489
95	20.00	8330.52	774.54	7965.27	507.90	8376.43	490.05	54.489
96	20.00	8330.52	774.54	7965.27	520.28	8402.00	505.36	54.490
97	20.00	8330.52	769.81	7965.27	516.32	8397.13	500.77	54.490
98	20.00	8330.52	760.35	7965.27	515.61	8402.16	500.77	54.491
99	20.00	8330.52	765.08	7965.27	519.54	8406.97	505.36	54.491

Critical Failure Surface (circle 1)

Intersects: XL: 125.00 YL: 8290.27 XR: 462.38 YR: 8135.49

Centre: XC: 491.52 YC: 8644.09 Radius: R: 509.44

Generated failure surface: (20 points)

125.00	8290.27	139.17	8276.16	153.88	8262.62	169.11	8249.66	184.83	8237.31
201.03	8225.59	217.68	8214.51	234.75	8204.10	252.21	8194.36	270.04	8185.31
288.22	8176.98	306.71	8169.36	325.48	8162.47	344.50	8156.33	363.76	8150.93
383.21	8146.30	402.83	8142.43	422.58	8139.34	442.44	8137.02	462.38	8135.49

Slice Geometry and Properties - Critical Failure Surface (circle 1, 48 slices)

Slice X-S ---------- Base ---------- PoreWater Normal Test

	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	125.00	24.99	44.9	7.08	10.00	3	0.00	45.0	2748.48	0.00	381.01	1.39
2	132.08	74.97	44.9	7.08	10.00	3	0.00	45.0	8246.19	0.00	1143.13	1.39
3	139.17	128.68	42.6	7.35	10.00	3	0.00	45.0	14154.97	0.00	1892.43	1.34
4	146.52	178.49	42.6	7.35	10.00	3	0.00	45.0	19634.14	0.00	2624.97	1.34
5	153.88	235.25	40.4	7.61	10.00	3	0.00	45.0	25877.85	0.00	3345.79	1.29
6	161.49	284.58	40.4	7.61	10.00	3	0.00	45.0	31303.73	0.00	4047.32	1.29
7	169.11	63.60	38.1	1.54	1.96	3	0.00	45.0	6996.53	0.00	4469.01	1.25
8	170.65	75.76	38.1	2.50	3.18	3	0.00	45.0	8333.52	0.00	3285.83	1.25
9	173.15	123.13	38.1	5.84	7.43	3	0.00	45.0	13544.65	0.00	2285.50	1.25
10	178.99	149.93	38.1	5.84	7.43	3	0.00	45.0	16492.17	0.00	2782.85	1.25
11	184.83	250.19	35.9	8.10	10.00	3	0.00	45.0	27520.99	0.00	3353.11	1.22
12	192.93	297.66	35.9	8.10	10.00	3	0.00	45.0	32742.24	0.00	3989.27	1.22
13	201.03	353.33	33.6	8.32	10.00	3	0.00	45.0	38865.98	0.00	4612.91	1.19
14	209.36	399.42	33.6	8.32	10.00	3	0.00	45.0	43936.47	0.00	5214.71	1.19
15	217.68	77.38	31.4	1.51	1.77	3	0.00	45.0	8512.13	0.00	5571.36	1.16
16	219.19	99.86	31.4	2.50	2.93	3	0.00	45.0	10984.16	0.00	4344.77	1.16
17	221.69	197.15	31.4	6.53	7.65	3	0.00	45.0	21686.59	0.00	3284.73	1.16
18	228.22	223.16	31.4	6.53	7.65	3	0.00	45.0	24547.32	0.00	3718.03	1.16
19	234.75	337.12	29.1	8.73	10.00	3	0.00	45.0	37083.44	0.00	4203.59	1.13
20	243.48	379.63	29.1	8.73	10.00	3	0.00	45.0	41759.44	0.00	4733.63	1.13
21	252.21	371.49	26.9	7.76	8.70	3	0.00	45.0	40864.31	0.00	5217.76	1.11
22	259.97	402.03	26.9	7.76	8.70	3	0.00	45.0	44223.34	0.00	5646.66	1.11
23	267.73	99.05	26.9	2.31	2.60	3	0.00	45.0	10895.26	0.00	4663.92	1.11
24	270.04	291.14	24.6	9.09	10.00	3	0.00	45.0	32025.36	0.00	3494.78	1.09
25	279.13	329.02	24.6	9.09	10.00	3	0.00	45.0	36191.97	0.00	3949.47	1.09
26	288.22	371.57	22.4	9.24	10.00	3	0.00	45.0	40872.38	0.00	4388.35	1.07
27	297.46	406.78	22.4	9.24	10.00	3	0.00	45.0	44745.44	0.00	4804.18	1.07
28	306.71	455.90	20.1	9.56	10.19	3	0.00	45.0	50149.22	0.00	5207.97	1.06
29	316.27	93.45	20.2	2.50	2.66	3	0.00	45.0	10279.20	0.00	4084.04	1.06
30	318.77	178.19	20.1	6.71	7.14	3	0.00	45.0	19601.16	0.00	2902.83	1.06
31	325.48	279.08	17.9	9.51	10.00	3	0.00	45.0	30699.23	0.00	3207.69	1.04
32	334.99	308.32	17.9	9.51	10.00	3	0.00	45.0	33914.94	0.00	3543.69	1.04
33	344.50	339.75	15.6	9.63	10.00	3	0.00	45.0	37372.46	0.00	3862.11	1.03
34	354.13	365.72	15.6	9.63	10.00	3	0.00	45.0	40228.77	0.00	4157.29	1.03
35	363.76	115.99	13.4	3.56	3.66	3	0.00	45.0	12758.38	0.00	3566.79	1.02
36	367.32	128.16	13.4	7.94	8.17	3	0.00	45.0	14098.11	0.00	1766.74	1.02
37	375.26	143.20	13.4	7.94	8.17	3	0.00	45.0	15752.15	0.00	1974.01	1.02
38	383.21	146.62	11.2	7.44	7.58	3	0.00	45.0	16127.76	0.00	2159.60	1.02
39	390.65	157.53	11.1	7.44	7.58	3	0.00	45.0	17327.93	0.00	2320.31	1.02
40	398.09	105.94	11.2	4.74	4.83	2	400000.00	30.0	11666.82	0.00	1007.08	1.02
41	402.83	143.36	8.9	6.15	6.22	2	400000.00	30.0	15786.83	0.00	1410.03	1.01
42	408.98	105.86	8.9	4.38	4.44	3	0.00	45.0	11644.78	0.00	2648.14	1.01
43	413.36	30.46	8.9	2.49	2.52	3	0.00	45.0	3350.40	0.00	1342.92	1.01
44	415.85	2.72	8.9	6.73	6.82	2	400000.00	30.0	435.62	0.00	-1088.91	1.01
45	422.58	15.00	6.7	9.93	10.00	2	400000.00	30.0	2400.35	0.00	-617.95	1.01
46	432.51	26.51	6.7	9.93	10.00	2	400000.00	30.0	4241.35	0.00	-433.15	1.01
47	442.44	35.25	4.4	9.73	9.76	2	400000.00	30.0	5639.64	0.00	11.69	1.00
48	452.17	44.82	4.4	10.21	10.24	2	400000.00	30.0	7170.48	0.00	134.20	1.00
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X-S Area: 9447.18 Path Length: 379.91 X-S Weight: 1045434.56

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3. Analysis 3

3.1. DATA: Analysis 3 - Active Mined Bench Slope

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (8 points) Material beneath: 3 - Quartenary colluvium
0.00 8326.88 442.98 8407.51 676.81 8465.00 814.05 8481.92 873.40 8480.00
1017.50 8462.41 1205.67 8433.60 1250.86 8430.00
Profile: 2 (31 points) Material beneath: 2 - Gniess
0.00 8180.43 133.26 8171.84 314.05 8158.01 415.86 8140.27 413.36 8165.27
415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27 512.94 8090.27
558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27 656.07 8040.27
658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27 755.65 7965.27
801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27 898.78 7915.27
901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27 997.39 7850.00
1250.86 7850.00

Slope Surface (42 points)

0.00 8326.88 73.56 8340.27 76.06 8315.27 122.10 8315.27 124.60 8290.27
170.65 8290.27 173.15 8265.27 219.19 8265.27 221.69 8240.27 267.73 8240.27
270.23 8215.27 316.27 8215.27 318.77 8190.27 364.82 8190.27 367.32 8165.27
413.36 8165.27 415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27
512.94 8090.27 558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27
656.07 8040.27 658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27
755.65 7965.27 801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27
898.78 7915.27 901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27
997.39 7850.00 1250.86 7850.00

Phreatic Surface (2 points)

0.00 7800.00 450.00 7800.00

Failure Surface (Critical seed, from a previous multiple analysis)

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 125.00 YL: 8290.27 XR: 462.38 YR: 8135.49
Centre: XC: 491.52 YC: 8644.09 Radius: R: 509.44

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	360.00	350.00	25.00
Trial positions within range:	25	75	50

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3.2. RESULTS: Analysis 3 - Active Mined Bench Slope

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 54.220

Analysis Summary

There were: 15984 successful analyses from a total of 93751 trial failure surfaces
77506 analyses terminated due to unacceptable geometry
261 analyses that failed to produce a valid result

Critical (minimum) Factor of Safety: 1.93
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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	230.00	8240.27	367.78	8165.27	545.59	8655.99	521.94	1.931	<-- Critical Surface
2	230.00	8240.27	367.78	8165.27	545.34	8655.54	521.43	1.931	
3	230.00	8240.27	367.78	8165.27	545.10	8655.08	520.92	1.932	
4	230.00	8240.27	367.78	8165.27	544.85	8654.63	520.41	1.932	
5	230.00	8240.27	367.78	8165.27	544.60	8654.18	519.90	1.932	
6	230.00	8240.27	367.78	8165.27	544.36	8653.72	519.39	1.932	
7	230.00	8240.27	367.78	8165.27	544.11	8653.27	518.88	1.932	
8	230.00	8240.27	367.78	8165.27	543.86	8652.82	518.37	1.932	
9	230.00	8240.27	367.78	8165.27	543.62	8652.36	517.86	1.932	
10	230.00	8240.27	367.78	8165.27	543.37	8651.91	517.35	1.932	
11	230.00	8240.27	367.78	8165.27	543.12	8651.46	516.84	1.932	
12	230.00	8240.27	367.78	8165.27	542.88	8651.00	516.33	1.932	
13	230.00	8240.27	367.78	8165.27	542.63	8650.55	515.82	1.933	
14	230.00	8240.27	367.78	8165.27	542.38	8650.09	515.31	1.933	

15	230.00	8240.27	367.78	8165.27	542.14	8649.64	514.80	1.933
16	230.00	8240.27	367.78	8165.27	541.89	8649.19	514.29	1.933
17	230.00	8240.27	367.78	8165.27	541.64	8648.74	513.78	1.933
18	230.00	8240.27	367.78	8165.27	541.40	8648.28	513.27	1.933
19	230.00	8240.27	367.78	8165.27	541.15	8647.83	512.76	1.933
20	230.00	8240.27	367.78	8165.27	540.90	8647.38	512.24	1.933
21	230.00	8240.27	367.78	8165.27	540.66	8646.92	511.73	1.933
22	230.00	8240.27	367.78	8165.27	540.41	8646.47	511.22	1.934
23	230.00	8240.27	367.78	8165.27	540.16	8646.01	510.71	1.934
24	230.00	8240.27	367.78	8165.27	539.92	8645.56	510.20	1.934
25	230.00	8240.27	367.78	8165.27	539.67	8645.11	509.69	1.934
26	230.00	8240.27	367.78	8165.27	539.42	8644.65	509.18	1.934
27	230.00	8240.27	367.78	8165.27	539.17	8644.20	508.67	1.934
28	230.00	8240.27	367.78	8165.27	538.93	8643.75	508.16	1.934
29	230.00	8240.27	367.78	8165.27	538.68	8643.29	507.65	1.934
30	230.00	8240.27	367.78	8165.27	538.43	8642.84	507.14	1.935
31	230.00	8240.27	367.78	8165.27	538.19	8642.39	506.63	1.935
32	230.00	8240.27	367.78	8165.27	537.94	8641.93	506.12	1.935
33	230.00	8240.27	367.78	8165.27	537.69	8641.48	505.61	1.935
34	230.00	8240.27	367.78	8165.27	537.45	8641.03	505.10	1.935
35	230.00	8240.27	367.78	8165.27	537.20	8640.57	504.59	1.935
36	230.00	8240.27	367.78	8165.27	536.95	8640.12	504.08	1.935
37	230.00	8240.27	367.78	8165.27	536.71	8639.66	503.57	1.935
38	230.00	8240.27	367.78	8165.27	536.46	8639.21	503.06	1.935
39	230.00	8240.27	367.78	8165.27	536.21	8638.76	502.55	1.936
40	230.00	8240.27	367.78	8165.27	535.96	8638.30	502.04	1.936
41	230.00	8240.27	367.78	8165.27	535.72	8637.85	501.53	1.936
42	230.00	8240.27	367.78	8165.27	535.47	8637.40	501.02	1.936
43	230.00	8240.27	367.78	8165.27	535.22	8636.94	500.51	1.936
44	230.00	8240.27	367.78	8165.27	534.98	8636.49	500.00	1.936
45	230.00	8240.27	367.78	8165.27	534.73	8636.03	499.49	1.936
46	230.00	8240.27	367.78	8165.27	534.48	8635.58	498.98	1.936
47	230.00	8240.27	367.78	8165.27	534.24	8635.13	498.47	1.936
48	230.00	8240.27	367.78	8165.27	533.99	8634.67	497.96	1.937
49	230.00	8240.27	367.78	8165.27	533.74	8634.22	497.45	1.937
50	230.00	8240.27	367.78	8165.27	533.49	8633.77	496.94	1.937
51	185.00	8265.27	367.78	8165.27	521.86	8663.95	521.94	1.951
52	185.00	8265.27	367.78	8165.27	521.61	8663.49	521.43	1.952
53	185.00	8265.27	367.78	8165.27	521.36	8663.04	520.92	1.952
54	185.00	8265.27	367.78	8165.27	521.11	8662.58	520.41	1.952
55	185.00	8265.27	367.78	8165.27	520.86	8662.12	519.90	1.952
56	185.00	8265.27	367.78	8165.27	520.61	8661.66	519.39	1.952
57	185.00	8265.27	367.78	8165.27	520.36	8661.21	518.88	1.952
58	185.00	8265.27	367.78	8165.27	520.11	8660.75	518.37	1.952
59	185.00	8265.27	367.78	8165.27	519.86	8660.29	517.86	1.953
60	185.00	8265.27	367.78	8165.27	519.61	8659.84	517.35	1.953
61	185.00	8265.27	367.78	8165.27	519.36	8659.38	516.84	1.953
62	185.00	8265.27	367.78	8165.27	519.11	8658.92	516.33	1.953
63	185.00	8265.27	367.78	8165.27	518.86	8658.47	515.82	1.953
64	185.00	8265.27	367.78	8165.27	518.61	8658.01	515.31	1.953

65	185.00	8265.27	367.78	8165.27	518.36	8657.55	514.80	1.954
66	185.00	8265.27	367.78	8165.27	518.11	8657.09	514.29	1.954
67	185.00	8265.27	367.78	8165.27	517.86	8656.64	513.78	1.954
68	185.00	8265.27	367.78	8165.27	517.61	8656.18	513.27	1.954
69	185.00	8265.27	367.78	8165.27	517.36	8655.72	512.76	1.954
70	185.00	8265.27	367.78	8165.27	517.11	8655.27	512.24	1.954
71	185.00	8265.27	367.78	8165.27	516.86	8654.81	511.73	1.954
72	185.00	8265.27	367.78	8165.27	516.61	8654.35	511.22	1.955
73	185.00	8265.27	367.78	8165.27	516.36	8653.89	510.71	1.955
74	185.00	8265.27	367.78	8165.27	516.11	8653.44	510.20	1.955
75	185.00	8265.27	367.78	8165.27	515.86	8652.98	509.69	1.955
76	185.00	8265.27	367.78	8165.27	515.61	8652.52	509.18	1.955
77	185.00	8265.27	367.78	8165.27	515.36	8652.07	508.67	1.955
78	185.00	8265.27	367.78	8165.27	515.11	8651.61	508.16	1.956
79	185.00	8265.27	367.78	8165.27	514.86	8651.15	507.65	1.956
80	185.00	8265.27	367.78	8165.27	514.61	8650.69	507.14	1.956
81	185.00	8265.27	367.78	8165.27	514.36	8650.24	506.63	1.956
82	185.00	8265.27	367.78	8165.27	514.11	8649.78	506.12	1.956
83	185.00	8265.27	367.78	8165.27	513.86	8649.32	505.61	1.956
84	185.00	8265.27	367.78	8165.27	513.61	8648.86	505.10	1.956
85	185.00	8265.27	367.78	8165.27	513.36	8648.41	504.59	1.957
86	185.00	8265.27	367.78	8165.27	513.11	8647.95	504.08	1.957
87	185.00	8265.27	367.78	8165.27	512.86	8647.49	503.57	1.957
88	185.00	8265.27	367.78	8165.27	512.61	8647.03	503.06	1.957
89	185.00	8265.27	367.78	8165.27	512.36	8646.58	502.55	1.957
90	185.00	8265.27	367.78	8165.27	512.11	8646.12	502.04	1.957
91	185.00	8265.27	367.78	8165.27	511.86	8645.66	501.53	1.958
92	185.00	8265.27	367.78	8165.27	511.61	8645.20	501.02	1.958
93	185.00	8265.27	367.78	8165.27	511.36	8644.75	500.51	1.958
94	185.00	8265.27	367.78	8165.27	511.10	8644.29	500.00	1.958
95	185.00	8265.27	367.78	8165.27	510.85	8643.83	499.49	1.958
96	185.00	8265.27	367.78	8165.27	510.60	8643.37	498.98	1.958
97	185.00	8265.27	367.78	8165.27	510.35	8642.92	498.47	1.959
98	185.00	8265.27	367.78	8165.27	510.10	8642.46	497.96	1.959
99	185.00	8265.27	367.78	8165.27	509.85	8642.00	497.45	1.959

Critical Failure Surface (circle 1)

Intersects: XL: 230.00 YL: 8240.27 XR: 367.78 YR: 8165.27

Centre: XC: 545.59 YC: 8655.99 Radius: R: 521.94

Generated failure surface: (20 points)

230.00	8240.27	236.64	8235.31	243.36	8230.46	250.15	8225.71	257.02	8221.08
263.97	8216.55	270.98	8212.13	278.06	8207.83	285.21	8203.64	292.43	8199.56
299.71	8195.60	307.05	8191.75	314.45	8188.02	321.91	8184.41	329.42	8180.92
336.99	8177.55	344.62	8174.29	352.29	8171.16	360.01	8168.16	367.78	8165.27

Slice Geometry and Properties - Critical Failure Surface (circle 1, 41 slices)

Slice	X-S	---------- Base ----------						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor

1	230.00	4.12	36.8	3.32	4.14	3	0.00	45.0	452.99	0.00	98.39	0.90
2	233.32	12.35	36.8	3.32	4.14	3	0.00	45.0	1358.25	0.00	295.00	0.90
3	236.64	20.73	35.8	3.36	4.14	3	0.00	45.0	2280.69	0.00	494.15	0.90
4	240.00	28.89	35.8	3.36	4.14	3	0.00	45.0	3177.45	0.00	688.37	0.90
5	243.36	37.36	34.9	3.40	4.14	3	0.00	45.0	4110.03	0.00	888.55	0.90
6	246.76	45.42	34.9	3.40	4.14	3	0.00	45.0	4996.49	0.00	1080.08	0.90
7	250.15	53.98	34.0	3.43	4.14	3	0.00	45.0	5937.66	0.00	1281.03	0.89
8	253.59	61.94	34.0	3.43	4.14	3	0.00	45.0	6813.57	0.00	1470.01	0.89
9	257.02	70.55	33.1	3.47	4.14	3	0.00	45.0	7760.52	0.00	1671.39	0.89
10	260.49	78.41	33.1	3.47	4.14	3	0.00	45.0	8624.83	0.00	1857.54	0.89
11	263.97	93.76	32.2	3.76	4.45	3	0.00	45.0	10313.12	0.00	2066.12	0.89
12	267.73	35.94	32.2	2.50	2.95	3	0.00	45.0	3953.93	0.00	1192.71	0.89
13	270.23	2.17	32.2	0.75	0.88	3	0.00	45.0	238.98	0.00	240.66	0.89
14	270.98	14.92	31.3	3.54	4.14	3	0.00	45.0	1641.06	0.00	352.49	0.89
15	274.52	22.54	31.3	3.54	4.14	3	0.00	45.0	2479.44	0.00	532.57	0.89
16	278.06	30.35	30.4	3.57	4.14	3	0.00	45.0	3338.21	0.00	716.37	0.89
17	281.64	37.84	30.4	3.57	4.14	3	0.00	45.0	4162.34	0.00	893.22	0.89
18	285.21	45.65	29.5	3.61	4.14	3	0.00	45.0	5021.08	0.00	1076.79	0.89
19	288.82	53.00	29.5	3.61	4.14	3	0.00	45.0	5829.95	0.00	1250.11	0.89
20	292.43	60.79	28.6	3.64	4.14	3	0.00	45.0	6686.56	0.00	1433.15	0.89
21	296.07	68.00	28.6	3.64	4.14	3	0.00	45.0	7479.80	0.00	1603.18	0.89
22	299.71	75.74	27.6	3.67	4.14	3	0.00	45.0	8331.74	0.00	1785.53	0.89
23	303.38	82.80	27.7	3.67	4.14	3	0.00	45.0	9108.13	0.00	1951.81	0.89
24	307.05	90.48	26.7	3.70	4.14	3	0.00	45.0	9953.30	0.00	2133.09	0.89
25	310.75	97.39	26.7	3.70	4.14	3	0.00	45.0	10712.38	0.00	2295.89	0.89
26	314.45	50.44	25.8	1.82	2.02	3	0.00	45.0	5548.84	0.00	2435.41	0.89
27	316.27	40.59	25.8	2.50	2.78	3	0.00	45.0	4464.72	0.00	1427.91	0.89
28	318.77	16.00	25.8	3.14	3.49	3	0.00	45.0	1760.43	0.00	448.58	0.89
29	321.91	25.30	24.9	3.76	4.14	3	0.00	45.0	2783.29	0.00	597.00	0.89
30	325.67	31.86	24.9	3.76	4.14	3	0.00	45.0	3505.10	0.00	751.82	0.89
31	329.42	38.59	24.0	3.79	4.14	3	0.00	45.0	4245.20	0.00	911.26	0.89
32	333.21	44.97	24.0	3.79	4.14	3	0.00	45.0	4947.20	0.00	1062.02	0.89
33	336.99	51.60	23.1	3.81	4.14	3	0.00	45.0	5676.01	0.00	1219.73	0.89
34	340.81	57.80	23.1	3.81	4.14	3	0.00	45.0	6357.80	0.00	1366.23	0.89
35	344.62	64.30	22.2	3.84	4.14	3	0.00	45.0	7073.32	0.00	1522.08	0.89
36	348.45	70.31	22.2	3.84	4.14	3	0.00	45.0	7733.81	0.00	1664.12	0.89
37	352.29	76.68	21.3	3.86	4.14	3	0.00	45.0	8434.98	0.00	1817.88	0.89
38	356.15	82.49	21.3	3.86	4.14	3	0.00	45.0	9073.69	0.00	1955.54	0.89
39	360.01	54.21	20.4	2.40	2.56	3	0.00	45.0	5963.22	0.00	2081.57	0.89
40	362.42	56.35	20.4	2.40	2.56	3	0.00	45.0	6198.93	0.00	2163.68	0.89
41	364.82	28.54	20.4	2.96	3.16	3	0.00	45.0	3139.78	0.00	888.55	0.89

X-S Area: 2015.17 Path Length: 157.47 X-S Weight: 221668.88

4. Analysis 4

4.1. DATA: Analysis 4 - Active Mined Bench Slope

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (8 points) Material beneath: 3 - Quartenary colluvium
0.00 8326.88 442.98 8407.51 676.81 8465.00 814.05 8481.92 873.40 8480.00
1017.50 8462.41 1205.67 8433.60 1250.86 8430.00
Profile: 2 (31 points) Material beneath: 2 - Gniess
0.00 8180.43 133.26 8171.84 314.05 8158.01 415.86 8140.27 413.36 8165.27
415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27 512.94 8090.27
558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27 656.07 8040.27
658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27 755.65 7965.27
801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27 898.78 7915.27
901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27 997.39 7850.00
1250.86 7850.00

Slope Surface (42 points)

0.00 8326.88 73.56 8340.27 76.06 8315.27 122.10 8315.27 124.60 8290.27
170.65 8290.27 173.15 8265.27 219.19 8265.27 221.69 8240.27 267.73 8240.27
270.23 8215.27 316.27 8215.27 318.77 8190.27 364.82 8190.27 367.32 8165.27
413.36 8165.27 415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27
512.94 8090.27 558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27
656.07 8040.27 658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27
755.65 7965.27 801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27
898.78 7915.27 901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27
997.39 7850.00 1250.86 7850.00

Phreatic Surface (2 points)

0.00 7800.00 450.00 7800.00

Failure Surface (Critical seed, from a previous multiple analysis)

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL: 230.00	YL:	8240.27	XR:	367.78	YR:	8165.27
Centre:	XC: 545.59	YC:	8655.99		Radius:	R:	521.94

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	360.00	350.00	25.00
Trial positions within range:	25	75	50

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4.2. RESULTS: Analysis 4 - Active Mined Bench Slope

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 1.931

Analysis Summary

There were: 3575 successful analyses from a total of 93751 trial failure surfaces
89099 analyses terminated due to unacceptable geometry
1077 analyses that failed to produce a valid result

Critical (minimum) Factor of Safety: 0.32
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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	410.00	8165.27	415.08	8148.06	925.04	8307.97	534.44	0.323	<-- Critical Surface
2	410.00	8165.27	415.08	8148.06	924.55	8307.82	533.93	0.323	
3	410.00	8165.27	415.08	8148.06	924.06	8307.68	533.42	0.323	
4	410.00	8165.27	415.08	8148.06	923.57	8307.54	532.91	0.323	
5	410.00	8165.27	415.08	8148.06	923.08	8307.39	532.40	0.323	
6	410.00	8165.27	415.08	8148.06	922.59	8307.25	531.89	0.323	
7	410.00	8165.27	415.08	8148.06	921.12	8306.81	530.36	0.323	
8	410.00	8165.27	415.08	8148.06	922.10	8307.10	531.38	0.323	
9	410.00	8165.27	415.08	8148.06	921.61	8306.96	530.87	0.323	
10	410.00	8165.27	415.08	8148.06	920.63	8306.67	529.85	0.323	
11	410.00	8165.27	415.08	8148.06	920.14	8306.52	529.34	0.323	
12	410.00	8165.27	415.08	8148.06	919.65	8306.38	528.83	0.323	
13	410.00	8165.27	415.08	8148.06	919.16	8306.24	528.32	0.323	
14	410.00	8165.27	415.08	8148.06	918.67	8306.09	527.81	0.323	

15	410.00	8165.27	415.08	8148.06	917.69	8305.80	526.79	0.323
16	410.00	8165.27	415.08	8148.06	918.18	8305.95	527.30	0.323
17	410.00	8165.27	415.08	8148.06	917.21	8305.66	526.28	0.323
18	410.00	8165.27	415.08	8148.06	916.72	8305.51	525.77	0.323
19	410.00	8165.27	415.08	8148.06	916.23	8305.37	525.26	0.323
20	410.00	8165.27	415.08	8148.06	915.74	8305.22	524.74	0.323
21	410.00	8165.27	415.08	8148.06	915.25	8305.08	524.23	0.323
22	410.00	8165.27	415.08	8148.06	914.76	8304.93	523.72	0.323
23	410.00	8165.27	415.08	8148.06	914.27	8304.79	523.21	0.323
24	410.00	8165.27	415.08	8148.06	913.29	8304.50	522.19	0.323
25	410.00	8165.27	415.08	8148.06	913.78	8304.65	522.70	0.323
26	410.00	8165.27	415.08	8148.06	912.80	8304.36	521.68	0.323
27	410.00	8165.27	415.08	8148.06	911.82	8304.07	520.66	0.323
28	410.00	8165.27	415.08	8148.06	912.31	8304.21	521.17	0.323
29	410.00	8165.27	415.08	8148.06	911.33	8303.92	520.15	0.323
30	410.00	8165.27	415.08	8148.06	910.84	8303.78	519.64	0.323
31	410.00	8165.27	415.08	8148.06	910.35	8303.63	519.13	0.323
32	410.00	8165.27	415.08	8148.06	909.86	8303.49	518.62	0.323
33	410.00	8165.27	415.08	8148.06	909.38	8303.35	518.11	0.323
34	410.00	8165.27	415.08	8148.06	908.89	8303.20	517.60	0.323
35	410.00	8165.27	415.08	8148.06	908.40	8303.06	517.09	0.323
36	410.00	8165.27	415.08	8148.06	907.91	8302.91	516.58	0.323
37	410.00	8165.27	415.08	8148.06	907.42	8302.77	516.07	0.323
38	410.00	8165.27	415.08	8148.06	906.93	8302.62	515.56	0.323
39	410.00	8165.27	415.08	8148.06	906.44	8302.48	515.05	0.323
40	410.00	8165.27	415.08	8148.06	905.46	8302.19	514.03	0.323
41	410.00	8165.27	415.08	8148.06	904.48	8301.90	513.01	0.323
42	410.00	8165.27	415.08	8148.06	905.95	8302.33	514.54	0.323
43	410.00	8165.27	415.08	8148.06	904.97	8302.04	513.52	0.323
44	410.00	8165.27	415.08	8148.06	903.99	8301.76	512.50	0.323
45	410.00	8165.27	415.08	8148.06	903.50	8301.61	511.99	0.323
46	410.00	8165.27	415.08	8148.06	902.52	8301.32	510.97	0.323
47	410.00	8165.27	415.08	8148.06	903.01	8301.47	511.48	0.323
48	410.00	8165.27	415.08	8148.06	902.03	8301.18	510.46	0.323
49	410.00	8165.27	415.08	8148.06	901.54	8301.03	509.95	0.323
50	410.00	8165.27	415.08	8148.06	901.06	8300.89	509.44	0.323
51	215.00	8265.27	221.16	8245.55	728.10	8414.77	534.44	0.337
52	215.00	8265.27	221.16	8245.55	727.62	8414.62	533.93	0.337
53	215.00	8265.27	221.16	8245.55	727.13	8414.46	533.42	0.337
54	215.00	8265.27	221.16	8245.55	726.16	8414.16	532.40	0.337
55	215.00	8265.27	221.16	8245.55	726.64	8414.31	532.91	0.337
56	215.00	8265.27	221.16	8245.55	725.67	8414.01	531.89	0.337
57	215.00	8265.27	221.16	8245.55	725.18	8413.85	531.38	0.337
58	215.00	8265.27	221.16	8245.55	724.69	8413.70	530.87	0.337
59	215.00	8265.27	221.16	8245.55	724.21	8413.55	530.36	0.337
60	215.00	8265.27	221.16	8245.55	723.72	8413.40	529.85	0.337
61	215.00	8265.27	221.16	8245.55	723.23	8413.25	529.34	0.337
62	215.00	8265.27	221.16	8245.55	722.75	8413.09	528.83	0.337
63	215.00	8265.27	221.16	8245.55	722.26	8412.94	528.32	0.337
64	215.00	8265.27	221.16	8245.55	721.77	8412.79	527.81	0.337

65	215.00	8265.27	221.16	8245.55	721.28	8412.64	527.30	0.337
66	215.00	8265.27	221.16	8245.55	720.80	8412.48	526.79	0.337
67	215.00	8265.27	221.16	8245.55	720.31	8412.33	526.28	0.337
68	215.00	8265.27	221.16	8245.55	719.82	8412.18	525.77	0.337
69	215.00	8265.27	221.16	8245.55	719.34	8412.03	525.26	0.337
70	215.00	8265.27	221.16	8245.55	718.36	8411.72	524.23	0.337
71	215.00	8265.27	221.16	8245.55	718.85	8411.88	524.74	0.337
72	215.00	8265.27	221.16	8245.55	717.87	8411.57	523.72	0.337
73	215.00	8265.27	221.16	8245.55	717.39	8411.42	523.21	0.337
74	215.00	8265.27	221.16	8245.55	716.41	8411.12	522.19	0.337
75	215.00	8265.27	221.16	8245.55	716.90	8411.27	522.70	0.337
76	215.00	8265.27	221.16	8245.55	715.44	8410.81	521.17	0.337
77	215.00	8265.27	221.16	8245.55	715.93	8410.96	521.68	0.337
78	215.00	8265.27	221.16	8245.55	714.95	8410.66	520.66	0.337
79	215.00	8265.27	221.16	8245.55	714.47	8410.51	520.15	0.337
80	215.00	8265.27	221.16	8245.55	713.49	8410.20	519.13	0.337
81	215.00	8265.27	221.16	8245.55	713.98	8410.35	519.64	0.337
82	215.00	8265.27	221.16	8245.55	713.00	8410.05	518.62	0.337
83	215.00	8265.27	221.16	8245.55	712.52	8409.90	518.11	0.337
84	215.00	8265.27	221.16	8245.55	712.03	8409.75	517.60	0.337
85	215.00	8265.27	221.16	8245.55	711.54	8409.59	517.09	0.337
86	215.00	8265.27	221.16	8245.55	711.06	8409.44	516.58	0.337
87	215.00	8265.27	221.16	8245.55	710.57	8409.29	516.07	0.337
88	215.00	8265.27	221.16	8245.55	710.08	8409.14	515.56	0.337
89	215.00	8265.27	221.16	8245.55	709.59	8408.98	515.05	0.337
90	215.00	8265.27	221.16	8245.55	709.11	8408.83	514.54	0.337
91	215.00	8265.27	221.16	8245.55	708.13	8408.53	513.52	0.337
92	215.00	8265.27	221.16	8245.55	708.62	8408.68	514.03	0.337
93	215.00	8265.27	221.16	8245.55	707.65	8408.38	513.01	0.337
94	215.00	8265.27	221.16	8245.55	707.16	8408.22	512.50	0.337
95	215.00	8265.27	221.16	8245.55	706.67	8408.07	511.99	0.337
96	215.00	8265.27	221.16	8245.55	706.18	8407.92	511.48	0.337
97	215.00	8265.27	221.16	8245.55	705.70	8407.77	510.97	0.337
98	215.00	8265.27	221.16	8245.55	705.21	8407.61	510.46	0.337
99	215.00	8265.27	221.16	8245.55	704.72	8407.46	509.95	0.337

Critical Failure Surface (circle 1)

Intersects: XL: 410.00 YL: 8165.27 XR: 415.08 YR: 8148.06

Centre: XC: 925.04 YC: 8307.97 Radius: R: 534.44

Generated failure surface: (20 points)

410.00	8165.27	410.25	8164.36	410.51	8163.45	410.76	8162.54	411.02	8161.63
411.28	8160.72	411.54	8159.82	411.80	8158.91	412.07	8158.00	412.33	8157.10
412.60	8156.19	412.87	8155.29	413.14	8154.38	413.41	8153.48	413.69	8152.57
413.96	8151.67	414.24	8150.77	414.52	8149.86	414.80	8148.96	415.08	8148.06

Slice Geometry and Properties - Critical Failure Surface (circle 1, 39 slices)

Slice	X-S	---------- Base ----------						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor

1	410.00	0.03	74.5	0.13	0.47	3	0.00	45.0	3.17	0.00	2.06	0.31
2	410.13	0.09	74.5	0.13	0.47	3	0.00	45.0	9.50	0.00	6.18	0.31
3	410.25	0.14	74.4	0.13	0.47	3	0.00	45.0	15.93	0.00	10.37	0.31
4	410.38	0.20	74.4	0.13	0.47	3	0.00	45.0	22.29	0.00	14.50	0.31
5	410.51	0.26	74.3	0.13	0.47	3	0.00	45.0	28.86	0.00	18.78	0.31
6	410.64	0.32	74.3	0.13	0.47	3	0.00	45.0	35.26	0.00	22.94	0.31
7	410.76	0.38	74.2	0.13	0.47	3	0.00	45.0	41.91	0.00	27.28	0.31
8	410.89	0.44	74.2	0.13	0.47	3	0.00	45.0	48.34	0.00	31.47	0.31
9	411.02	0.50	74.1	0.13	0.47	3	0.00	45.0	55.14	0.00	35.88	0.31
10	411.15	0.56	74.1	0.13	0.47	3	0.00	45.0	61.62	0.00	40.09	0.31
11	411.28	0.62	74.0	0.13	0.47	3	0.00	45.0	68.51	0.00	44.55	0.31
12	411.41	0.68	74.0	0.13	0.47	3	0.00	45.0	75.02	0.00	48.83	0.31
13	411.54	0.75	73.9	0.13	0.47	3	0.00	45.0	82.05	0.00	53.38	0.31
14	411.67	0.81	73.9	0.13	0.47	3	0.00	45.0	88.60	0.00	57.58	0.31
15	411.80	0.87	73.7	0.13	0.47	3	0.00	45.0	95.75	0.00	62.32	0.31
16	411.94	0.93	73.8	0.13	0.47	3	0.00	45.0	102.34	0.00	66.55	0.31
17	412.07	1.00	73.7	0.13	0.47	3	0.00	45.0	109.56	0.00	71.27	0.31
18	412.20	1.06	73.7	0.13	0.47	3	0.00	45.0	116.18	0.00	75.58	0.31
19	412.33	1.12	73.5	0.13	0.47	3	0.00	45.0	123.57	0.00	80.42	0.31
20	412.47	1.18	73.6	0.13	0.47	3	0.00	45.0	130.23	0.00	84.67	0.31
21	412.60	1.25	73.5	0.13	0.47	3	0.00	45.0	137.68	0.00	89.56	0.31
22	412.74	1.31	73.5	0.13	0.47	3	0.00	45.0	144.36	0.00	93.91	0.31
23	412.87	1.38	73.4	0.14	0.47	3	0.00	45.0	152.03	0.00	98.84	0.31
24	413.01	1.44	73.4	0.14	0.47	3	0.00	45.0	158.76	0.00	103.21	0.31
25	413.14	1.21	73.2	0.11	0.38	3	0.00	45.0	132.83	0.00	107.82	0.31
26	413.25	1.25	73.2	0.11	0.38	3	0.00	45.0	137.18	0.00	111.35	0.31
27	413.36	0.62	73.2	0.05	0.19	3	0.00	45.0	68.05	0.00	111.38	0.31
28	413.41	1.48	73.2	0.14	0.47	3	0.00	45.0	162.56	0.00	105.68	0.31
29	413.55	1.35	73.1	0.14	0.47	3	0.00	45.0	148.75	0.00	96.80	0.31
30	413.69	1.23	73.0	0.14	0.47	3	0.00	45.0	135.69	0.00	88.25	0.31
31	413.83	1.11	73.0	0.14	0.47	3	0.00	45.0	121.66	0.00	79.13	0.31
32	413.96	0.98	72.9	0.14	0.47	3	0.00	45.0	108.20	0.00	70.34	0.31
33	414.10	0.85	73.0	0.14	0.47	3	0.00	45.0	93.96	0.00	61.08	0.31
34	414.24	0.73	72.8	0.14	0.47	3	0.00	45.0	80.16	0.00	52.14	0.31
35	414.38	0.60	72.8	0.14	0.47	3	0.00	45.0	65.71	0.00	42.74	0.31
36	414.52	0.47	72.7	0.14	0.47	3	0.00	45.0	51.50	0.00	33.51	0.31
37	414.66	0.34	72.8	0.14	0.47	3	0.00	45.0	36.86	0.00	23.96	0.31
38	414.80	0.20	72.6	0.14	0.47	3	0.00	45.0	22.29	0.00	14.50	0.31
39	414.94	0.07	72.6	0.14	0.47	3	0.00	45.0	7.43	0.00	4.83	0.31

X-S Area: 29.81 Path Length: 17.95 X-S Weight: 3279.50

5. Analysis 5

5.1. DATA: Analysis 5 - Active Mined Bench Slope

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (8 points) Material beneath: 3 - Quartenary colluvium
0.00 8326.88 442.98 8407.51 676.81 8465.00 814.05 8481.92 873.40 8480.00
1017.50 8462.41 1205.67 8433.60 1250.86 8430.00
Profile: 2 (31 points) Material beneath: 2 - Gniess
0.00 8180.43 133.26 8171.84 314.05 8158.01 415.86 8140.27 413.36 8165.27
415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27 512.94 8090.27
558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27 656.07 8040.27
658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27 755.65 7965.27
801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27 898.78 7915.27
901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27 997.39 7850.00
1250.86 7850.00

Slope Surface (42 points)

0.00 8326.88 73.56 8340.27 76.06 8315.27 122.10 8315.27 124.60 8290.27
170.65 8290.27 173.15 8265.27 219.19 8265.27 221.69 8240.27 267.73 8240.27
270.23 8215.27 316.27 8215.27 318.77 8190.27 364.82 8190.27 367.32 8165.27
413.36 8165.27 415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27
512.94 8090.27 558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27
656.07 8040.27 658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27
755.65 7965.27 801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27
898.78 7915.27 901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27
997.39 7850.00 1250.86 7850.00

Phreatic Surface (2 points)

0.00 7800.00 450.00 7800.00

Failure Surface (Critical seed, from a previous multiple analysis)

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 410.00 YL: 8165.27 XR: 415.08 YR: 8148.06
Centre: XC: 925.04 YC: 8307.97 Radius: R: 534.44

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.050

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	360.00	350.00	25.00
Trial positions within range:	25	75	50

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5.2. RESULTS: Analysis 5 - Active Mined Bench Slope

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 0.274

Analysis Summary

There were: 4401 successful analyses from a total of 93751 trial failure surfaces
89350 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 0.27
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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	410.00	8165.27	415.08	8148.06	937.03	8311.51	546.94	0.274	<-- Critical Surface
2	410.00	8165.27	415.08	8148.06	936.54	8311.36	546.43	0.274	
3	410.00	8165.27	415.08	8148.06	936.05	8311.22	545.92	0.274	
4	410.00	8165.27	415.08	8148.06	935.56	8311.08	545.41	0.274	
5	410.00	8165.27	415.08	8148.06	935.07	8310.93	544.90	0.274	
6	410.00	8165.27	415.08	8148.06	934.09	8310.64	543.88	0.274	
7	410.00	8165.27	415.08	8148.06	934.58	8310.79	544.39	0.274	
8	410.00	8165.27	415.08	8148.06	933.60	8310.50	543.37	0.274	
9	410.00	8165.27	415.08	8148.06	933.11	8310.35	542.86	0.274	
10	410.00	8165.27	415.08	8148.06	932.62	8310.21	542.35	0.274	
11	410.00	8165.27	415.08	8148.06	932.13	8310.06	541.84	0.274	

12	410.00	8165.27	415.08	8148.06	931.64	8309.92	541.33	0.274
13	410.00	8165.27	415.08	8148.06	931.15	8309.78	540.82	0.274
14	410.00	8165.27	415.08	8148.06	930.66	8309.63	540.31	0.274
15	410.00	8165.27	415.08	8148.06	930.17	8309.49	539.80	0.274
16	410.00	8165.27	415.08	8148.06	929.68	8309.34	539.29	0.274
17	410.00	8165.27	415.08	8148.06	929.20	8309.20	538.78	0.274
18	410.00	8165.27	415.08	8148.06	928.71	8309.05	538.27	0.274
19	410.00	8165.27	415.08	8148.06	928.22	8308.91	537.76	0.274
20	410.00	8165.27	415.08	8148.06	927.73	8308.76	537.24	0.274
21	410.00	8165.27	415.08	8148.06	927.24	8308.62	536.73	0.274
22	410.00	8165.27	415.08	8148.06	926.75	8308.47	536.22	0.274
23	410.00	8165.27	415.08	8148.06	926.26	8308.33	535.71	0.274
24	410.00	8165.27	415.08	8148.06	925.77	8308.19	535.20	0.274
25	410.00	8165.27	415.08	8148.06	925.28	8308.04	534.69	0.274
26	410.00	8165.27	415.08	8148.06	925.04	8307.97	534.44	0.274
27	410.00	8165.27	415.08	8148.06	924.79	8307.90	534.18	0.274
28	410.00	8165.27	415.08	8148.06	924.30	8307.75	533.67	0.274
29	410.00	8165.27	415.08	8148.06	923.81	8307.61	533.16	0.274
30	410.00	8165.27	415.08	8148.06	923.32	8307.46	532.65	0.274
31	410.00	8165.27	415.08	8148.06	922.83	8307.32	532.14	0.274
32	410.00	8165.27	415.08	8148.06	921.85	8307.03	531.12	0.274
33	410.00	8165.27	415.08	8148.06	922.34	8307.17	531.63	0.274
34	410.00	8165.27	415.08	8148.06	921.37	8306.89	530.61	0.274
35	410.00	8165.27	415.08	8148.06	920.88	8306.74	530.10	0.274
36	410.00	8165.27	415.08	8148.06	920.39	8306.60	529.59	0.274
37	410.00	8165.27	415.08	8148.06	919.90	8306.45	529.08	0.274
38	410.00	8165.27	415.08	8148.06	919.41	8306.31	528.57	0.274
39	410.00	8165.27	415.08	8148.06	918.92	8306.16	528.06	0.274
40	410.00	8165.27	415.08	8148.06	918.43	8306.02	527.55	0.274
41	410.00	8165.27	415.08	8148.06	917.94	8305.87	527.04	0.274
42	410.00	8165.27	415.08	8148.06	917.45	8305.73	526.53	0.274
43	410.00	8165.27	415.08	8148.06	916.96	8305.58	526.02	0.274
44	410.00	8165.27	415.08	8148.06	916.47	8305.44	525.51	0.274
45	410.00	8165.27	415.08	8148.06	915.98	8305.30	525.00	0.274
46	410.00	8165.27	415.08	8148.06	915.49	8305.15	524.49	0.274
47	410.00	8165.27	415.08	8148.06	914.51	8304.86	523.47	0.274
48	410.00	8165.27	415.08	8148.06	915.00	8305.01	523.98	0.274
49	410.00	8165.27	415.08	8148.06	914.02	8304.72	522.96	0.274
50	410.00	8165.27	415.08	8148.06	913.53	8304.57	522.45	0.274
51	410.00	8165.27	415.08	8148.06	913.05	8304.43	521.94	0.274
52	260.00	8240.27	268.46	8232.98	620.03	8649.28	544.90	1.054
53	260.00	8240.27	268.46	8232.98	621.03	8650.44	546.43	1.054
54	260.00	8240.27	268.46	8232.98	618.70	8647.73	542.86	1.054
55	260.00	8240.27	268.46	8232.98	619.70	8648.89	544.39	1.054
56	260.00	8240.27	268.46	8232.98	620.70	8650.05	545.92	1.054
57	260.00	8240.27	268.46	8232.98	617.70	8646.57	541.33	1.054
58	260.00	8240.27	268.46	8232.98	614.70	8643.10	536.73	1.054
59	260.00	8240.27	268.46	8232.98	616.70	8645.42	539.80	1.054
60	260.00	8240.27	268.46	8232.98	616.37	8645.03	539.29	1.055
61	260.00	8240.27	268.46	8232.98	615.70	8644.26	538.27	1.055

62	260.00	8240.27	268.46	8232.98	611.37	8639.23	531.63	1.055
63	260.00	8240.27	268.46	8232.98	615.37	8643.87	537.76	1.055
64	260.00	8240.27	268.46	8232.98	614.37	8642.71	536.22	1.055
65	260.00	8240.27	268.46	8232.98	618.04	8646.96	541.84	1.055
66	260.00	8240.27	268.46	8232.98	619.37	8648.51	543.88	1.055
67	260.00	8240.27	268.46	8232.98	617.04	8645.80	540.31	1.055
68	260.00	8240.27	268.46	8232.98	613.37	8641.55	534.69	1.055
69	260.00	8240.27	268.46	8232.98	621.37	8650.83	546.94	1.055
70	260.00	8240.27	268.46	8232.98	617.37	8646.19	540.82	1.055
71	260.00	8240.27	268.46	8232.98	620.37	8649.67	545.41	1.055
72	260.00	8240.27	268.46	8232.98	612.37	8640.39	533.16	1.055
73	260.00	8240.27	268.46	8232.98	611.04	8638.85	531.12	1.055
74	260.00	8240.27	268.46	8232.98	618.37	8647.35	542.35	1.055
75	260.00	8240.27	268.46	8232.98	609.37	8636.91	528.57	1.055
76	260.00	8240.27	268.46	8232.98	612.04	8640.00	532.65	1.055
77	260.00	8240.27	268.46	8232.98	608.37	8635.75	527.04	1.055
78	260.00	8240.27	268.46	8232.98	610.04	8637.69	529.59	1.055
79	260.00	8240.27	268.46	8232.98	619.03	8648.12	543.37	1.055
80	260.00	8240.27	268.46	8232.98	606.04	8633.05	523.47	1.055
81	260.00	8240.27	268.46	8232.98	611.70	8639.62	532.14	1.055
82	260.00	8240.27	268.46	8232.98	609.04	8636.53	528.06	1.055
83	260.00	8240.27	268.46	8232.98	608.04	8635.37	526.53	1.055
84	260.00	8240.27	268.46	8232.98	616.04	8644.64	538.78	1.055
85	260.00	8240.27	268.46	8232.98	614.04	8642.32	535.71	1.055
86	260.00	8240.27	268.46	8232.98	615.04	8643.48	537.24	1.055
87	260.00	8240.27	268.46	8232.98	607.71	8634.98	526.02	1.055
88	260.00	8240.27	268.46	8232.98	613.04	8641.17	534.18	1.055
89	260.00	8240.27	268.46	8232.98	608.71	8636.14	527.55	1.055
90	260.00	8240.27	268.46	8232.98	610.71	8638.46	530.61	1.055
91	260.00	8240.27	268.46	8232.98	613.70	8641.94	535.20	1.055
92	260.00	8240.27	268.46	8232.98	612.70	8640.78	533.67	1.055
93	260.00	8240.27	268.46	8232.98	606.71	8633.82	524.49	1.055
94	260.00	8240.27	268.46	8232.98	605.71	8632.66	522.96	1.055
95	260.00	8240.27	268.46	8232.98	605.37	8632.28	522.45	1.055
96	260.00	8240.27	268.46	8232.98	609.71	8637.30	529.08	1.055
97	260.00	8240.27	268.46	8232.98	610.37	8638.07	530.10	1.055
98	260.00	8240.27	268.46	8232.98	606.37	8633.44	523.98	1.055
99	260.00	8240.27	268.46	8232.98	607.37	8634.60	525.51	1.055

Critical Failure Surface (circle 1)

Intersects: XL: 410.00 YL: 8165.27 XR: 415.08 YR: 8148.06

Centre: XC: 937.03 YC: 8311.51 Radius: R: 546.94

Generated failure surface: (20 points)

410.00	8165.27	410.25	8164.36	410.51	8163.45	410.76	8162.54	411.02	8161.63
411.28	8160.72	411.54	8159.82	411.81	8158.91	412.07	8158.00	412.34	8157.10
412.60	8156.19	412.87	8155.29	413.14	8154.38	413.42	8153.48	413.69	8152.57
413.96	8151.67	414.24	8150.77	414.52	8149.86	414.80	8148.96	415.08	8148.06

Slice Geometry and Properties - Critical Failure Surface (circle 1, 39 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	410.00	0.03	74.4	0.13	0.47	3	0.00	45.0	3.17	0.00	1.77	0.26
2	410.13	0.09	74.4	0.13	0.47	3	0.00	45.0	9.51	0.00	5.32	0.26
3	410.25	0.14	74.3	0.13	0.47	3	0.00	45.0	15.94	0.00	8.93	0.26
4	410.38	0.20	74.3	0.13	0.47	3	0.00	45.0	22.32	0.00	12.50	0.26
5	410.51	0.26	74.2	0.13	0.47	3	0.00	45.0	28.87	0.00	16.16	0.26
6	410.64	0.32	74.2	0.13	0.47	3	0.00	45.0	35.29	0.00	19.75	0.26
7	410.76	0.38	74.2	0.13	0.47	3	0.00	45.0	41.95	0.00	23.47	0.26
8	410.89	0.44	74.1	0.13	0.47	3	0.00	45.0	48.40	0.00	27.11	0.26
9	411.02	0.50	74.0	0.13	0.47	3	0.00	45.0	55.17	0.00	30.88	0.26
10	411.15	0.56	74.0	0.13	0.47	3	0.00	45.0	61.65	0.00	34.51	0.26
11	411.28	0.62	74.0	0.13	0.47	3	0.00	45.0	68.55	0.00	38.36	0.26
12	411.41	0.68	73.9	0.13	0.47	3	0.00	45.0	75.07	0.00	42.05	0.26
13	411.54	0.75	73.8	0.13	0.47	3	0.00	45.0	82.08	0.00	45.95	0.26
14	411.67	0.81	73.8	0.13	0.47	3	0.00	45.0	88.64	0.00	49.63	0.26
15	411.81	0.87	73.8	0.13	0.47	3	0.00	45.0	95.74	0.00	53.58	0.26
16	411.94	0.93	73.7	0.13	0.47	3	0.00	45.0	102.34	0.00	57.33	0.26
17	412.07	1.00	73.6	0.13	0.47	3	0.00	45.0	109.58	0.00	61.36	0.26
18	412.20	1.06	73.6	0.13	0.47	3	0.00	45.0	116.20	0.00	65.07	0.26
19	412.34	1.12	73.6	0.13	0.47	3	0.00	45.0	123.56	0.00	69.16	0.26
20	412.47	1.18	73.5	0.13	0.47	3	0.00	45.0	130.22	0.00	72.96	0.26
21	412.60	1.25	73.5	0.13	0.47	3	0.00	45.0	137.67	0.00	77.10	0.26
22	412.74	1.31	73.5	0.13	0.47	3	0.00	45.0	144.36	0.00	80.84	0.26
23	412.87	1.38	73.4	0.14	0.47	3	0.00	45.0	151.94	0.00	85.05	0.26
24	413.01	1.44	73.4	0.14	0.47	3	0.00	45.0	158.69	0.00	88.83	0.26
25	413.14	1.20	73.3	0.11	0.38	3	0.00	45.0	131.84	0.00	92.78	0.26
26	413.25	1.24	73.3	0.11	0.38	3	0.00	45.0	136.13	0.00	95.79	0.26
27	413.36	0.64	73.2	0.06	0.19	3	0.00	45.0	69.87	0.00	95.86	0.26
28	413.42	1.48	73.1	0.14	0.47	3	0.00	45.0	162.26	0.00	90.93	0.26
29	413.55	1.35	73.2	0.14	0.47	3	0.00	45.0	148.46	0.00	83.11	0.26
30	413.69	1.23	73.1	0.14	0.47	3	0.00	45.0	135.36	0.00	75.75	0.26
31	413.83	1.10	73.1	0.14	0.47	3	0.00	45.0	121.37	0.00	67.99	0.26
32	413.96	0.98	73.0	0.14	0.47	3	0.00	45.0	107.96	0.00	60.45	0.26
33	414.10	0.85	72.9	0.14	0.47	3	0.00	45.0	93.76	0.00	52.55	0.26
34	414.24	0.73	72.9	0.14	0.47	3	0.00	45.0	79.93	0.00	44.78	0.26
35	414.38	0.60	72.9	0.14	0.47	3	0.00	45.0	65.54	0.00	36.68	0.26
36	414.52	0.47	72.7	0.14	0.47	3	0.00	45.0	51.36	0.00	28.79	0.26
37	414.66	0.33	72.8	0.14	0.47	3	0.00	45.0	36.74	0.00	20.58	0.26
38	414.80	0.20	72.7	0.14	0.47	3	0.00	45.0	22.20	0.00	12.44	0.26
39	414.94	0.07	72.7	0.14	0.47	3	0.00	45.0	7.40	0.00	4.15	0.26

X-S Area: 29.79 Path Length: 17.95 X-S Weight: 3277.11

6. Analysis 6

6.1. DATA: Analysis 6 - Reclaimed Mined Bench Slope

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (8 points) Material beneath: 3 - Quartenary colluvium
0.00 8326.88 442.98 8407.51 676.81 8465.00 814.05 8481.92 873.40 8480.00
1017.50 8462.41 1205.67 8433.60 1250.86 8430.00
Profile: 2 (31 points) Material beneath: 2 - Gniess
0.00 8180.43 133.26 8171.84 314.05 8158.01 415.86 8140.27 413.36 8165.27
415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27 512.94 8090.27
558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27 656.07 8040.27
658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27 755.65 7965.27
801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27 898.78 7915.27
901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27 997.39 7850.00
1250.86 7850.00

Slope Surface (4 points)

0.00 8326.88 73.56 8340.27 1025.52 7850.00 1250.86 7850.00

Phreatic Surface (2 points)

0.00 7800.00 450.00 7800.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 240.90 YL: 8254.09 XR: 893.90 YR: 7917.79
Centre: XC: 866.81 YC: 8667.30 Radius: R: 750.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 479.00 700.00 25.00
Trial positions within range: 100 100 50

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6.2. RESULTS: Analysis 6 - Reclaimed Mined Bench Slope

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 84.890

Analysis Summary

There were: 495014 successful analyses from a total of 500001 trial failure surfaces
4987 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 40.51
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Negative normal stresses exist on the base of one or more slices; examine slice data and consult the GALENA Help utility

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	1.40	8327.13	1243.90	7850.00	736.60	8385.31	737.50	40.508	<-- Critical Surface
2	1.40	8327.13	1236.83	7850.00	736.09	8391.45	737.50	40.513	
3	1.40	8327.13	1243.90	7850.00	737.03	8386.41	738.01	40.513	
4	1.40	8327.13	1243.90	7850.00	737.45	8387.51	738.52	40.518	
5	1.40	8327.13	1236.83	7850.00	736.51	8392.53	738.01	40.519	
6	1.40	8327.13	1243.90	7850.00	737.87	8388.61	739.03	40.523	
7	1.40	8327.13	1229.76	7850.00	735.54	8397.41	737.50	40.524	
8	1.40	8327.13	1236.83	7850.00	736.92	8393.60	738.52	40.525	
9	1.40	8327.13	1222.69	7850.00	734.97	8403.20	737.50	40.525	
10	1.40	8327.13	1243.90	7850.00	738.29	8389.70	739.54	40.527	
11	1.40	8327.13	1229.76	7850.00	735.95	8398.47	738.01	40.530	
12	1.40	8327.13	1236.83	7850.00	737.34	8394.68	739.03	40.530	
13	1.40	8327.13	1222.69	7850.00	735.37	8404.24	738.01	40.532	
14	1.40	8327.13	1243.90	7850.00	738.71	8390.79	740.05	40.532	
15	1.40	8327.13	1229.76	7850.00	736.36	8399.52	738.52	40.536	
16	1.40	8327.13	1236.83	7850.00	737.75	8395.75	739.54	40.536	
17	1.40	8327.13	1243.90	7850.00	739.13	8391.88	740.56	40.538	
18	1.40	8327.13	1222.69	7850.00	735.78	8405.27	738.52	40.539	
19	1.40	8327.13	1229.76	7850.00	736.77	8400.57	739.03	40.542	
20	1.40	8327.13	1236.83	7850.00	738.16	8396.82	740.05	40.542	
21	1.40	8327.13	1243.90	7850.00	739.54	8392.96	741.07	40.543	

22	1.40	8327.13	1222.69	7850.00	736.18	8406.30	739.03	40.546
23	1.40	8327.13	1236.83	7850.00	738.57	8397.88	740.56	40.549
24	1.40	8327.13	1215.62	7850.00	734.36	8408.84	737.50	40.549
25	1.40	8327.13	1229.76	7850.00	737.18	8401.62	739.54	40.549
26	1.40	8327.13	1243.90	7850.00	739.96	8394.04	741.58	40.549
27	1.40	8327.13	1222.69	7850.00	736.58	8407.33	739.54	40.552
28	1.40	8327.13	1236.83	7850.00	738.98	8398.94	741.07	40.555
29	1.40	8327.13	1229.76	7850.00	737.59	8402.67	740.05	40.555
30	1.40	8327.13	1243.90	7850.00	740.37	8395.12	742.09	40.555
31	1.40	8327.13	1215.62	7850.00	734.76	8409.85	738.01	40.556
32	1.40	8327.13	1222.69	7850.00	736.98	8408.36	740.05	40.559
33	1.40	8327.13	1236.83	7850.00	739.39	8400.00	741.58	40.561
34	1.40	8327.13	1229.76	7850.00	737.99	8403.71	740.56	40.562
35	1.40	8327.13	1215.62	7850.00	735.16	8410.87	738.52	40.563
36	1.40	8327.13	1222.69	7850.00	737.38	8409.38	740.56	40.566
37	1.40	8327.13	1243.90	7850.00	740.78	8396.20	742.60	40.567
38	1.40	8327.13	1236.83	7850.00	739.80	8401.06	742.09	40.568
39	1.40	8327.13	1229.76	7850.00	738.40	8404.75	741.07	40.569
40	1.40	8327.13	1208.55	7850.00	733.73	8414.32	737.50	40.569
41	1.40	8327.13	1215.62	7850.00	735.56	8411.88	739.03	40.570
42	1.40	8327.13	1243.90	7850.00	741.20	8397.27	743.11	40.573
43	1.40	8327.13	1222.69	7850.00	737.78	8410.40	741.07	40.574
44	1.40	8327.13	1236.83	7850.00	740.21	8402.11	742.60	40.574
45	1.40	8327.13	1229.76	7850.00	738.80	8405.79	741.58	40.575
46	1.40	8327.13	1208.55	7850.00	734.12	8415.32	738.01	40.576
47	1.40	8327.13	1215.62	7850.00	735.95	8412.89	739.54	40.578
48	1.40	8327.13	1243.90	7850.00	741.61	8398.34	743.62	40.579
49	1.40	8327.13	1236.83	7850.00	740.61	8403.16	743.11	40.581
50	1.40	8327.13	1229.76	7850.00	739.20	8406.82	742.09	40.582
51	1.40	8327.13	1208.55	7850.00	734.52	8416.31	738.52	40.584
52	1.40	8327.13	1222.69	7850.00	738.18	8411.42	741.58	40.585
53	1.40	8327.13	1215.62	7850.00	736.35	8413.89	740.05	40.585
54	1.40	8327.13	1243.90	7850.00	742.02	8399.40	744.13	40.586
55	1.40	8327.13	1236.83	7850.00	741.02	8404.21	743.62	40.587
56	1.40	8327.13	1229.76	7850.00	740.40	8409.91	743.62	40.589
57	1.40	8327.13	1229.76	7850.00	739.60	8407.86	742.60	40.589
58	1.40	8327.13	1208.55	7850.00	734.91	8417.30	739.03	40.591
59	1.40	8327.13	1222.69	7850.00	738.57	8412.44	742.09	40.592
60	1.40	8327.13	1243.90	7850.00	742.42	8400.47	744.64	40.592
61	1.40	8327.13	1215.62	7850.00	736.74	8414.90	740.56	40.593
62	1.40	8327.13	1236.83	7850.00	741.42	8405.25	744.13	40.594
63	1.40	8327.13	1229.76	7850.00	740.00	8408.89	743.11	40.596
64	1.40	8327.13	1229.76	7850.00	740.80	8410.94	744.13	40.596
65	1.40	8327.13	1201.48	7850.00	733.07	8419.65	737.50	40.597
66	1.40	8327.13	1215.62	7850.00	737.14	8415.90	741.07	40.599
67	1.40	8327.13	1243.90	7850.00	742.83	8401.53	745.15	40.599
68	1.40	8327.13	1208.55	7850.00	735.30	8418.29	739.54	40.599
69	1.40	8327.13	1222.69	7850.00	738.97	8413.45	742.60	40.600
70	1.40	8327.13	1236.83	7850.00	741.82	8406.29	744.64	40.601
71	1.40	8327.13	1229.76	7850.00	741.20	8411.96	744.64	40.604

72	1.40	8327.13	1201.48	7850.00	733.46	8420.63	738.01	40.605
73	1.40	8327.13	1243.90	7850.00	743.24	8402.58	745.66	40.606
74	1.40	8327.13	1215.62	7850.00	737.53	8416.90	741.58	40.606
75	1.40	8327.13	1208.55	7850.00	735.69	8419.28	740.05	40.607
76	1.40	8327.13	1222.69	7850.00	739.36	8414.46	743.11	40.607
77	1.40	8327.13	1236.83	7850.00	742.22	8407.33	745.15	40.608
78	1.40	8327.13	1229.76	7850.00	741.59	8412.98	745.15	40.611
79	1.40	8327.13	1201.48	7850.00	733.85	8421.61	738.52	40.613
80	1.40	8327.13	1243.90	7850.00	743.64	8403.64	746.17	40.613
81	1.40	8327.13	1215.62	7850.00	737.92	8417.90	742.09	40.614
82	1.40	8327.13	1222.69	7850.00	739.76	8415.47	743.62	40.615
83	1.40	8327.13	1208.55	7850.00	736.08	8420.27	740.56	40.615
84	1.40	8327.13	1236.83	7850.00	742.63	8408.37	745.66	40.615
85	1.40	8327.13	1229.76	7850.00	741.99	8414.00	745.66	40.619
86	1.40	8327.13	1243.90	7850.00	744.05	8404.69	746.68	40.620
87	1.40	8327.13	1201.48	7850.00	734.24	8422.59	739.03	40.620
88	1.40	8327.13	1215.62	7850.00	738.31	8418.89	742.60	40.622
89	1.40	8327.13	1222.69	7850.00	740.15	8416.47	744.13	40.622
90	1.40	8327.13	1208.55	7850.00	736.47	8421.25	741.07	40.622
91	1.40	8327.13	1236.83	7850.00	743.02	8409.40	746.17	40.623
92	1.40	8327.13	1194.41	7850.00	732.40	8424.85	737.50	40.625
93	1.40	8327.13	1229.76	7850.00	742.38	8415.01	746.17	40.626
94	1.40	8327.13	1243.90	7850.00	744.45	8405.74	747.19	40.627
95	1.40	8327.13	1201.48	7850.00	734.63	8423.56	739.54	40.628
96	1.40	8327.13	1215.62	7850.00	738.70	8419.88	743.11	40.629
97	1.40	8327.13	1222.69	7850.00	740.54	8417.48	744.64	40.630
98	1.40	8327.13	1236.83	7850.00	743.42	8410.43	746.68	40.630
99	1.40	8327.13	1208.55	7850.00	736.86	8422.24	741.58	40.630

Critical Failure Surface (circle 1)

Intersects: XL: 1.40 YL: 8327.13 XR: 1243.90 YR: 7850.00

Centre: XC: 736.60 YC: 8385.31 Radius: R: 737.50

Generated failure surface: (20 points)

1.40	8327.13	13.42	8240.67	35.58	8156.23	67.56	8075.00	108.92	7998.11
159.07	7926.66	217.31	7861.63	282.83	7803.93	354.70	7754.39	431.93	7713.68
513.43	7682.39	598.05	7660.94	684.62	7649.64	771.91	7648.65	858.71	7657.99
943.80	7677.51	1025.98	7706.95	1104.11	7745.90	1177.09	7793.81	1243.90	7850.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 50 slices)

Slice	X-S	---------- Base ----------						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	1.40	533.04	82.1	12.02	87.30	3	0.00	45.0	58634.40	0.00	4141.02	6.17
2	13.42	1977.03	75.3	16.31	64.26	3	0.00	45.0	217473.72	0.00	12187.32	3.60
3	29.73	967.57	75.3	5.85	23.04	2	400000.00	30.0	109636.07	0.00	-17909.49	3.74
4	35.58	7056.60	68.5	31.98	87.30	2	400000.00	30.0	874555.50	0.00	2186.20	2.63
5	67.56	1620.96	61.7	6.00	12.66	2	400000.00	30.0	210227.09	0.00	16267.16	2.06
6	73.56	10613.88	61.7	35.36	74.64	2	400000.00	30.0	1421339.75	0.00	21277.30	2.06
7	108.92	8155.05	54.9	24.34	42.37	2	400000.00	30.0	1130559.88	0.00	31730.58	1.71

8	133.26	9234.94	54.9	25.81	44.93	2	400000.00	30.0	1307225.50	0.00	35854.17	1.71
9	159.07	11017.45	48.2	29.12	43.65	2	400000.00	30.0	1588092.50	0.00	42827.30	1.48
10	188.19	11527.58	48.2	29.12	43.65	2	400000.00	30.0	1688307.00	0.00	46214.70	1.48
11	217.31	13450.81	41.4	32.76	43.65	2	400000.00	30.0	1998744.75	0.00	51669.82	1.32
12	250.07	13843.10	41.4	32.76	43.65	2	400000.00	30.0	2085042.38	0.00	54271.31	1.32
13	282.83	2449.00	34.6	5.71	6.93	2	400000.00	30.0	371620.94	0.00	57732.99	1.20
14	288.54	11016.32	34.6	25.51	30.99	2	400000.00	30.0	1680968.25	17003.63	58508.33	1.20
15	314.05	17788.35	34.6	40.65	49.38	2	400000.00	30.0	2741493.25	97364.21	60056.02	1.20
16	354.70	12941.28	27.8	29.33	33.15	2	400000.00	30.0	2012603.88	110347.29	62972.01	1.12
17	384.03	12951.66	27.8	29.33	33.15	2	400000.00	30.0	2028920.38	142326.19	63531.48	1.12
18	413.36	8207.31	27.8	18.57	20.99	2	400000.00	30.0	1294396.88	106669.70	64046.95	1.12
19	431.93	7964.93	21.0	18.07	19.35	2	400000.00	30.0	1264648.50	108435.34	65873.49	1.07
20	450.00	5222.61	21.0	11.90	12.75	2	400000.00	30.0	833793.94	0.00	65914.16	1.07
21	461.90	10594.03	21.0	24.27	26.00	2	400000.00	30.0	1672291.00	0.00	64757.29	1.07
22	486.17	10516.87	21.0	24.27	26.00	2	400000.00	30.0	1675113.00	0.00	64872.93	1.07
23	510.44	10410.69	15.1	24.27	25.14	2	400000.00	30.0	1642954.38	0.00	64784.62	1.03
24	534.71	10256.64	14.2	24.27	25.04	2	400000.00	30.0	1633475.00	0.00	64568.45	1.03
25	558.98	16188.71	14.2	39.07	40.31	2	400000.00	30.0	2561002.75	0.00	62814.85	1.03
26	598.05	3860.32	7.4	9.48	9.56	2	400000.00	30.0	616495.38	0.00	63653.48	1.01
27	607.53	9730.14	7.4	24.27	24.48	2	400000.00	30.0	1534068.75	0.00	61803.00	1.01
28	631.80	9503.63	7.4	24.27	24.48	2	400000.00	30.0	1512996.38	0.00	60936.61	1.01
29	656.07	10888.51	7.4	28.55	28.79	2	400000.00	30.0	1716969.88	0.00	58745.78	1.01
30	684.62	7414.91	0.6	19.99	19.99	2	400000.00	30.0	1181237.00	0.00	58963.50	1.00
31	704.61	8730.97	0.6	24.27	24.27	2	400000.00	30.0	1374199.62	0.00	56500.32	1.00
32	728.88	8434.28	0.6	24.27	24.27	2	400000.00	30.0	1341897.25	0.00	55169.57	1.00
33	753.15	6316.50	0.6	18.76	18.76	2	400000.00	30.0	991717.31	0.00	52740.14	1.00
34	771.91	9609.29	-6.1	29.78	29.95	2	400000.00	30.0	1526061.75	0.00	52388.45	1.01
35	801.69	7424.81	-6.1	24.27	24.41	2	400000.00	30.0	1165206.75	0.00	49137.28	1.01
36	825.96	7057.98	-6.1	24.28	24.41	2	400000.00	30.0	1121687.62	0.00	47341.86	1.01
37	850.24	2376.23	-6.1	8.47	8.52	2	400000.00	30.0	370533.50	0.00	44878.77	1.01
38	858.71	10538.76	-12.9	40.07	41.11	2	400000.00	30.0	1665524.00	0.00	43974.66	1.03
39	898.78	5395.59	-12.9	22.51	23.09	2	400000.00	30.0	841679.12	0.00	39789.45	1.03
40	921.29	5018.41	-12.9	22.51	23.09	2	400000.00	30.0	794375.94	0.00	37681.23	1.03
41	943.80	1276.51	-19.7	6.02	6.40	2	400000.00	30.0	204160.52	0.00	37627.90	1.07
42	949.82	4587.10	-19.7	23.02	24.45	2	400000.00	30.0	713461.00	0.00	34707.76	1.07
43	972.84	4124.35	-19.7	23.02	24.45	2	400000.00	30.0	653066.81	0.00	32070.65	1.07
44	995.86	4631.77	-19.7	29.66	31.51	2	400000.00	30.0	729757.00	0.00	28285.94	1.07
45	1025.52	5245.31	-26.4	39.30	43.88	2	400000.00	30.0	839249.88	0.00	26450.57	1.12
46	1064.82	4475.57	-26.5	39.30	43.91	2	400000.00	30.0	716091.00	0.00	23310.94	1.13
47	1104.11	3361.58	-33.3	36.49	43.65	2	400000.00	30.0	537852.88	0.00	21421.99	1.21
48	1140.60	2487.53	-33.3	36.49	43.65	2	400000.00	30.0	398004.50	0.00	17553.30	1.21
49	1177.09	1407.81	-40.1	33.40	43.65	2	400000.00	30.0	225250.31	0.00	15231.39	1.32
50	1210.50	469.27	-40.1	33.40	43.65	2	400000.00	30.0	75083.16	0.00	10681.40	1.32

X-S Area: 370873.53 Path Length: 1658.66 X-S Weight: 56949740.00

7. Analysis 7

7.1. DATA: Analysis 7 - Reclaimed Mined Bench Slope

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (8 points) Material beneath: 3 - Quartenary colluvium
0.00 8326.88 442.98 8407.51 676.81 8465.00 814.05 8481.92 873.40 8480.00
1017.50 8462.41 1205.67 8433.60 1250.86 8430.00
Profile: 2 (31 points) Material beneath: 2 - Gniess
0.00 8180.43 133.26 8171.84 314.05 8158.01 415.86 8140.27 413.36 8165.27
415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27 512.94 8090.27
558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27 656.07 8040.27
658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27 755.65 7965.27
801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27 898.78 7915.27
901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27 997.39 7850.00
1250.86 7850.00

Slope Surface (4 points)

0.00 8326.88 73.56 8340.27 1025.52 7850.00 1250.86 7850.00

Phreatic Surface (2 points)

0.00 7800.00 450.00 7800.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 190.10 YL: 8280.25 XR: 482.80 YR: 8129.51
Centre: XC: 671.47 YC: 8855.39 Radius: R: 750.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	300.00	200.00	150.00
Trial positions within range:	50	50	50

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7.2. RESULTS: Analysis 7 - Reclaimed Mined Bench Slope

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 36.559

Analysis Summary

There were: 125001 successful analyses from a total of 125001 trial failure surfaces

Critical (minimum) Factor of Safety: 1.94

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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	340.10	8203.00	382.80	8181.01	739.03	8925.14	825.00	1.942	<-- Critical Surface
2	340.10	8203.00	382.80	8181.01	737.62	8922.41	821.94	1.942	
3	340.10	8203.00	382.80	8181.01	732.01	8911.52	809.69	1.942	
4	340.10	8203.00	382.80	8181.01	736.22	8919.69	818.88	1.942	
5	340.10	8203.00	382.80	8181.01	733.42	8914.25	812.76	1.942	
6	340.10	8203.00	382.80	8181.01	734.82	8916.97	815.82	1.942	
7	340.10	8203.00	382.80	8181.01	725.00	8897.91	794.39	1.942	
8	340.10	8203.00	382.80	8181.01	730.61	8908.80	806.63	1.942	
9	340.10	8203.00	382.80	8181.01	729.21	8906.08	803.57	1.942	
10	340.10	8203.00	382.80	8181.01	727.81	8903.36	800.51	1.942	
11	340.10	8203.00	382.80	8181.01	726.41	8900.63	797.45	1.942	
12	340.10	8203.00	382.80	8181.01	723.60	8895.19	791.33	1.942	
13	340.10	8203.00	382.80	8181.01	720.80	8889.74	785.20	1.942	
14	340.10	8203.00	382.80	8181.01	717.99	8884.30	779.08	1.942	
15	340.10	8203.00	382.80	8181.01	722.20	8892.46	788.27	1.942	
16	340.10	8203.00	382.80	8181.01	719.39	8887.02	782.14	1.942	
17	340.10	8203.00	382.80	8181.01	716.59	8881.57	776.02	1.942	
18	340.10	8203.00	382.80	8181.01	713.79	8876.13	769.90	1.943	
19	340.10	8203.00	382.80	8181.01	710.98	8870.68	763.78	1.943	
20	340.10	8203.00	382.80	8181.01	712.38	8873.40	766.84	1.943	
21	340.10	8203.00	382.80	8181.01	715.19	8878.85	772.96	1.943	
22	340.10	8203.00	382.80	8181.01	708.18	8865.24	757.65	1.943	
23	340.10	8203.00	386.88	8178.91	741.03	8924.02	825.00	1.943	
24	340.10	8203.00	386.88	8178.91	738.23	8918.58	818.88	1.943	

25	340.10	8203.00	382.80	8181.01	709.58	8867.96	760.71	1.943
26	340.10	8203.00	382.80	8181.01	706.77	8862.51	754.59	1.943
27	340.10	8203.00	382.80	8181.01	705.37	8859.79	751.53	1.943
28	340.10	8203.00	382.80	8181.01	703.97	8857.07	748.47	1.943
29	340.10	8203.00	382.80	8181.01	701.16	8851.62	742.35	1.943
30	340.10	8203.00	386.88	8178.91	739.63	8921.30	821.94	1.943
31	340.10	8203.00	386.88	8178.91	735.42	8913.13	812.76	1.943
32	340.10	8203.00	382.80	8181.01	702.57	8854.34	745.41	1.943
33	340.10	8203.00	386.88	8178.91	736.83	8915.86	815.82	1.943
34	340.10	8203.00	386.88	8178.91	734.02	8910.41	809.69	1.943
35	340.10	8203.00	382.80	8181.01	698.36	8846.18	736.22	1.943
36	340.10	8203.00	386.88	8178.91	732.62	8907.69	806.63	1.943
37	340.10	8203.00	386.88	8178.91	729.82	8902.24	800.51	1.943
38	340.10	8203.00	382.80	8181.01	699.76	8848.90	739.29	1.943
39	340.10	8203.00	382.80	8181.01	696.96	8843.45	733.16	1.943
40	340.10	8203.00	386.88	8178.91	725.61	8894.07	791.33	1.943
41	340.10	8203.00	386.88	8178.91	724.21	8891.35	788.27	1.943
42	340.10	8203.00	382.80	8181.01	695.56	8840.73	730.10	1.943
43	340.10	8203.00	382.80	8181.01	694.15	8838.01	727.04	1.943
44	340.10	8203.00	386.88	8178.91	728.41	8899.52	797.45	1.943
45	340.10	8203.00	386.88	8178.91	727.01	8896.79	794.39	1.943
46	340.10	8203.00	386.88	8178.91	731.22	8904.96	803.57	1.943
47	340.10	8203.00	382.80	8181.01	692.75	8835.28	723.98	1.943
48	333.98	8206.15	382.80	8181.01	731.70	8918.45	815.82	1.943
49	333.98	8206.15	382.80	8181.01	735.91	8926.62	825.00	1.943
50	333.98	8206.15	382.80	8181.01	734.50	8923.90	821.94	1.943
51	340.10	8203.00	386.88	8178.91	722.80	8888.62	785.20	1.943
52	333.98	8206.15	382.80	8181.01	733.10	8921.18	818.88	1.943
53	340.10	8203.00	382.80	8181.01	689.95	8829.84	717.86	1.943
54	340.10	8203.00	382.80	8181.01	691.35	8832.56	720.92	1.943
55	340.10	8203.00	382.80	8181.01	684.34	8818.95	705.61	1.943
56	340.10	8203.00	386.88	8178.91	720.00	8883.18	779.08	1.943
57	340.10	8203.00	386.88	8178.91	717.19	8877.73	772.96	1.943
58	340.10	8203.00	382.80	8181.01	688.54	8827.12	714.80	1.943
59	333.98	8206.15	382.80	8181.01	727.49	8910.28	806.63	1.943
60	340.10	8203.00	382.80	8181.01	687.14	8824.39	711.73	1.943
61	333.98	8206.15	382.80	8181.01	728.89	8913.01	809.69	1.943
62	340.10	8203.00	386.88	8178.91	715.79	8875.01	769.90	1.943
63	333.98	8206.15	382.80	8181.01	730.30	8915.73	812.76	1.943
64	340.10	8203.00	382.80	8181.01	682.93	8816.22	702.55	1.943
65	340.10	8203.00	382.80	8181.01	681.53	8813.50	699.49	1.943
66	340.10	8203.00	386.88	8178.91	721.40	8885.90	782.14	1.943
67	340.10	8203.00	386.88	8178.91	718.60	8880.46	776.02	1.943
68	340.10	8203.00	382.80	8181.01	685.74	8821.67	708.67	1.943
69	340.10	8203.00	386.88	8178.91	714.39	8872.29	766.84	1.943
70	333.98	8206.15	382.80	8181.01	726.09	8907.56	803.57	1.943
71	333.98	8206.15	382.80	8181.01	724.69	8904.84	800.51	1.943
72	333.98	8206.15	382.80	8181.01	723.28	8902.12	797.45	1.943
73	340.10	8203.00	382.80	8181.01	680.13	8810.78	696.43	1.943
74	340.10	8203.00	390.96	8176.80	741.64	8920.18	821.94	1.943

75	340.10	8203.00	390.96	8176.80	740.23	8917.46	818.88	1.943
76	340.10	8203.00	386.88	8178.91	712.99	8869.56	763.78	1.943
77	340.10	8203.00	386.88	8178.91	707.38	8858.67	751.53	1.943
78	340.10	8203.00	382.80	8181.01	678.73	8808.05	693.37	1.943
79	333.98	8206.15	382.80	8181.01	717.67	8891.22	785.20	1.943
80	333.98	8206.15	382.80	8181.01	720.48	8896.67	791.33	1.943
81	333.98	8206.15	382.80	8181.01	721.88	8899.39	794.39	1.943
82	340.10	8203.00	390.96	8176.80	738.83	8914.74	815.82	1.943
83	340.10	8203.00	386.88	8178.91	708.78	8861.39	754.59	1.943
84	340.10	8203.00	390.96	8176.80	743.04	8922.91	825.00	1.943
85	340.10	8203.00	386.88	8178.91	710.18	8864.12	757.65	1.943
86	340.10	8203.00	386.88	8178.91	711.58	8866.84	760.71	1.943
87	340.10	8203.00	386.88	8178.91	703.17	8850.50	742.35	1.943
88	340.10	8203.00	382.80	8181.01	677.32	8805.33	690.31	1.943
89	340.10	8203.00	382.80	8181.01	675.92	8802.61	687.24	1.943
90	333.98	8206.15	382.80	8181.01	719.08	8893.95	788.27	1.943
91	340.10	8203.00	390.96	8176.80	737.43	8912.01	812.76	1.943
92	340.10	8203.00	382.80	8181.01	674.52	8799.88	684.18	1.943
93	333.98	8206.15	382.80	8181.01	712.06	8880.33	772.96	1.943
94	333.98	8206.15	382.80	8181.01	714.87	8885.78	779.08	1.943
95	340.10	8203.00	386.88	8178.91	704.57	8853.22	745.41	1.943
96	340.10	8203.00	386.88	8178.91	705.97	8855.95	748.47	1.943
97	340.10	8203.00	386.88	8178.91	701.77	8847.78	739.29	1.943
98	333.98	8206.15	382.80	8181.01	710.66	8877.61	769.90	1.943
99	340.10	8203.00	390.96	8176.80	736.03	8909.29	809.69	1.943

Critical Failure Surface (circle 1)

Intersects: XL: 340.10 YL: 8203.00 XR: 382.80 YR: 8181.01

Centre: XC: 739.03 YC: 8925.14 Radius: R: 825.00

Generated failure surface: (20 points)

340.10	8203.00	342.32	8201.78	344.53	8200.57	346.76	8199.36	348.98	8198.16
351.21	8196.97	353.44	8195.79	355.68	8194.61	357.92	8193.44	360.17	8192.27
362.41	8191.11	364.67	8189.96	366.92	8188.82	369.18	8187.68	371.44	8186.55
373.71	8185.43	375.97	8184.31	378.25	8183.21	380.52	8182.10	382.80	8181.01

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	---------- Base ----------						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	340.10	0.02	28.8	1.11	1.26	3	0.00	45.0	2.38	0.00	1.67	0.89
2	341.21	0.06	28.9	1.11	1.26	3	0.00	45.0	7.14	0.00	5.02	0.89
3	342.32	0.11	28.6	1.11	1.26	3	0.00	45.0	11.68	0.00	8.22	0.89
4	343.42	0.15	28.7	1.11	1.26	3	0.00	45.0	15.97	0.00	11.23	0.89
5	344.53	0.18	28.5	1.11	1.26	3	0.00	45.0	19.93	0.00	14.02	0.89
6	345.64	0.21	28.5	1.11	1.26	3	0.00	45.0	23.63	0.00	16.62	0.89
7	346.76	0.25	28.3	1.11	1.26	3	0.00	45.0	27.26	0.00	19.17	0.89
8	347.87	0.28	28.3	1.11	1.26	3	0.00	45.0	30.37	0.00	21.37	0.89
9	348.98	0.30	28.1	1.11	1.26	3	0.00	45.0	33.29	0.00	23.42	0.89
10	350.10	0.33	28.1	1.11	1.26	3	0.00	45.0	36.04	0.00	25.36	0.89

11	351.21	0.35	28.0	1.12	1.26	3	0.00	45.0	38.39	0.00	27.00	0.89
12	352.33	0.37	28.0	1.12	1.26	3	0.00	45.0	40.55	0.00	28.52	0.89
13	353.44	0.39	27.8	1.12	1.26	3	0.00	45.0	42.65	0.00	30.00	0.89
14	354.56	0.40	27.8	1.12	1.26	3	0.00	45.0	44.10	0.00	31.02	0.89
15	355.68	0.41	27.6	1.12	1.26	3	0.00	45.0	45.61	0.00	32.08	0.89
16	356.80	0.42	27.6	1.12	1.26	3	0.00	45.0	46.69	0.00	32.84	0.89
17	357.92	0.43	27.4	1.12	1.26	3	0.00	45.0	47.61	0.00	33.49	0.89
18	359.04	0.44	27.4	1.12	1.26	3	0.00	45.0	48.09	0.00	33.83	0.89
19	360.17	0.44	27.3	1.12	1.26	3	0.00	45.0	48.47	0.00	34.09	0.89
20	361.29	0.44	27.3	1.12	1.26	3	0.00	45.0	48.47	0.00	34.09	0.89
21	362.41	0.44	27.1	1.13	1.26	3	0.00	45.0	48.25	0.00	33.93	0.89
22	363.54	0.43	27.1	1.13	1.26	3	0.00	45.0	47.70	0.00	33.55	0.89
23	364.67	0.43	26.9	1.13	1.26	3	0.00	45.0	46.99	0.00	33.04	0.89
24	365.79	0.42	26.9	1.13	1.26	3	0.00	45.0	45.90	0.00	32.28	0.89
25	366.92	0.41	26.7	1.13	1.26	3	0.00	45.0	44.64	0.00	31.40	0.89
26	368.05	0.39	26.7	1.13	1.26	3	0.00	45.0	43.00	0.00	30.24	0.89
27	369.18	0.37	26.5	1.13	1.26	3	0.00	45.0	41.18	0.00	28.97	0.89
28	370.31	0.35	26.5	1.13	1.26	3	0.00	45.0	38.99	0.00	27.43	0.89
29	371.44	0.33	26.4	1.13	1.26	3	0.00	45.0	36.62	0.00	25.76	0.89
30	372.57	0.31	26.4	1.13	1.26	3	0.00	45.0	33.88	0.00	23.83	0.89
31	373.71	0.28	26.2	1.13	1.26	3	0.00	45.0	30.95	0.00	21.77	0.89
32	374.84	0.25	26.2	1.13	1.26	3	0.00	45.0	27.72	0.00	19.50	0.89
33	375.97	0.22	26.0	1.14	1.26	3	0.00	45.0	24.22	0.00	17.04	0.89
34	377.11	0.19	26.0	1.14	1.26	3	0.00	45.0	20.38	0.00	14.34	0.89
35	378.25	0.15	25.9	1.14	1.26	3	0.00	45.0	16.38	0.00	11.52	0.89
36	379.38	0.11	25.9	1.14	1.26	3	0.00	45.0	11.98	0.00	8.43	0.89
37	380.52	0.07	25.7	1.14	1.26	3	0.00	45.0	7.40	0.00	5.21	0.89
38	381.66	0.02	25.7	1.14	1.26	3	0.00	45.0	2.39	0.00	1.68	0.89

X-S Area: 11.15 Path Length: 48.04 X-S Weight: 1226.89

8. Analysis 8

8.1. DATA: Analysis 8 - Reclaimed Mined Bench Slope

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (8 points) Material beneath: 3 - Quartenary colluvium
0.00 8326.88 442.98 8407.51 676.81 8465.00 814.05 8481.92 873.40 8480.00
1017.50 8462.41 1205.67 8433.60 1250.86 8430.00
Profile: 2 (31 points) Material beneath: 2 - Gniess
0.00 8180.43 133.26 8171.84 314.05 8158.01 415.86 8140.27 413.36 8165.27
415.86 8140.27 461.90 8140.27 464.40 8115.27 510.44 8115.27 512.94 8090.27
558.98 8090.27 561.48 8065.27 607.53 8065.27 610.03 8040.27 656.07 8040.27
658.57 8015.27 704.61 8015.27 707.11 7990.27 753.15 7990.27 755.65 7965.27
801.69 7965.27 804.19 7940.27 850.24 7940.27 852.74 7915.27 898.78 7915.27
901.28 7890.27 947.32 7890.27 949.82 7865.27 995.86 7865.27 997.39 7850.00
1250.86 7850.00

Slope Surface (4 points)

0.00 8326.88 73.56 8340.27 1025.52 7850.00 1250.86 7850.00

Phreatic Surface (2 points)

0.00 7800.00 450.00 7800.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 190.10 YL: 8280.25 XR: 482.80 YR: 8129.51
Centre: XC: 671.47 YC: 8855.39 Radius: R: 750.00

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.050

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 300.00 200.00 150.00
Trial positions within range: 50 50 50

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8.2. RESULTS: Analysis 8 - Reclaimed Mined Bench Slope

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 33.300

Analysis Summary

There were: 125001 successful analyses from a total of 125001 trial failure surfaces

Critical (minimum) Factor of Safety: 1.72
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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	340.10	8203.00	382.80	8181.01	739.03	8925.14	825.00	1.725	<-- Critical Surface
2	340.10	8203.00	382.80	8181.01	737.62	8922.41	821.94	1.725	
3	340.10	8203.00	382.80	8181.01	736.22	8919.69	818.88	1.725	
4	340.10	8203.00	382.80	8181.01	732.01	8911.52	809.69	1.725	
5	340.10	8203.00	382.80	8181.01	733.42	8914.25	812.76	1.725	
6	340.10	8203.00	382.80	8181.01	734.82	8916.97	815.82	1.725	
7	340.10	8203.00	382.80	8181.01	725.00	8897.91	794.39	1.725	
8	340.10	8203.00	382.80	8181.01	730.61	8908.80	806.63	1.725	
9	340.10	8203.00	382.80	8181.01	729.21	8906.08	803.57	1.725	
10	340.10	8203.00	382.80	8181.01	727.81	8903.36	800.51	1.725	
11	340.10	8203.00	382.80	8181.01	726.41	8900.63	797.45	1.725	
12	340.10	8203.00	382.80	8181.01	723.60	8895.19	791.33	1.725	
13	340.10	8203.00	382.80	8181.01	720.80	8889.74	785.20	1.725	
14	340.10	8203.00	382.80	8181.01	722.20	8892.46	788.27	1.725	
15	340.10	8203.00	382.80	8181.01	717.99	8884.30	779.08	1.725	
16	340.10	8203.00	382.80	8181.01	719.39	8887.02	782.14	1.725	
17	340.10	8203.00	382.80	8181.01	716.59	8881.57	776.02	1.725	
18	340.10	8203.00	382.80	8181.01	713.79	8876.13	769.90	1.725	
19	340.10	8203.00	382.80	8181.01	712.38	8873.40	766.84	1.725	
20	340.10	8203.00	382.80	8181.01	710.98	8870.68	763.78	1.725	

21	340.10	8203.00	382.80	8181.01	715.19	8878.85	772.96	1.725
22	340.10	8203.00	382.80	8181.01	708.18	8865.24	757.65	1.725
23	340.10	8203.00	386.88	8178.91	741.03	8924.02	825.00	1.725
24	340.10	8203.00	382.80	8181.01	709.58	8867.96	760.71	1.725
25	340.10	8203.00	386.88	8178.91	738.23	8918.58	818.88	1.725
26	340.10	8203.00	382.80	8181.01	706.77	8862.51	754.59	1.725
27	340.10	8203.00	382.80	8181.01	705.37	8859.79	751.53	1.725
28	340.10	8203.00	382.80	8181.01	703.97	8857.07	748.47	1.725
29	340.10	8203.00	386.88	8178.91	739.63	8921.30	821.94	1.725
30	340.10	8203.00	382.80	8181.01	701.16	8851.62	742.35	1.725
31	340.10	8203.00	386.88	8178.91	735.42	8913.13	812.76	1.725
32	340.10	8203.00	382.80	8181.01	702.57	8854.34	745.41	1.725
33	340.10	8203.00	386.88	8178.91	736.83	8915.86	815.82	1.725
34	340.10	8203.00	386.88	8178.91	734.02	8910.41	809.69	1.725
35	340.10	8203.00	382.80	8181.01	698.36	8846.18	736.22	1.725
36	340.10	8203.00	386.88	8178.91	732.62	8907.69	806.63	1.725
37	340.10	8203.00	386.88	8178.91	729.82	8902.24	800.51	1.725
38	340.10	8203.00	382.80	8181.01	699.76	8848.90	739.29	1.725
39	340.10	8203.00	382.80	8181.01	696.96	8843.45	733.16	1.725
40	340.10	8203.00	382.80	8181.01	695.56	8840.73	730.10	1.725
41	340.10	8203.00	386.88	8178.91	725.61	8894.07	791.33	1.725
42	340.10	8203.00	386.88	8178.91	724.21	8891.35	788.27	1.725
43	340.10	8203.00	382.80	8181.01	694.15	8838.01	727.04	1.725
44	340.10	8203.00	386.88	8178.91	728.41	8899.52	797.45	1.725
45	340.10	8203.00	386.88	8178.91	731.22	8904.96	803.57	1.725
46	340.10	8203.00	386.88	8178.91	727.01	8896.79	794.39	1.725
47	340.10	8203.00	382.80	8181.01	692.75	8835.28	723.98	1.725
48	333.98	8206.15	382.80	8181.01	735.91	8926.62	825.00	1.725
49	333.98	8206.15	382.80	8181.01	731.70	8918.45	815.82	1.725
50	333.98	8206.15	382.80	8181.01	734.50	8923.90	821.94	1.725
51	340.10	8203.00	386.88	8178.91	722.80	8888.62	785.20	1.725
52	333.98	8206.15	382.80	8181.01	733.10	8921.18	818.88	1.725
53	340.10	8203.00	382.80	8181.01	689.95	8829.84	717.86	1.725
54	340.10	8203.00	382.80	8181.01	691.35	8832.56	720.92	1.725
55	340.10	8203.00	386.88	8178.91	720.00	8883.18	779.08	1.725
56	340.10	8203.00	382.80	8181.01	684.34	8818.95	705.61	1.725
57	340.10	8203.00	382.80	8181.01	688.54	8827.12	714.80	1.725
58	340.10	8203.00	386.88	8178.91	717.19	8877.73	772.96	1.725
59	340.10	8203.00	382.80	8181.01	687.14	8824.39	711.73	1.725
60	333.98	8206.15	382.80	8181.01	727.49	8910.28	806.63	1.725
61	333.98	8206.15	382.80	8181.01	728.89	8913.01	809.69	1.725
62	333.98	8206.15	382.80	8181.01	730.30	8915.73	812.76	1.725
63	340.10	8203.00	386.88	8178.91	715.79	8875.01	769.90	1.725
64	340.10	8203.00	386.88	8178.91	721.40	8885.90	782.14	1.725
65	340.10	8203.00	382.80	8181.01	682.93	8816.22	702.55	1.725
66	340.10	8203.00	386.88	8178.91	718.60	8880.46	776.02	1.725
67	340.10	8203.00	382.80	8181.01	681.53	8813.50	699.49	1.725
68	340.10	8203.00	382.80	8181.01	685.74	8821.67	708.67	1.725
69	340.10	8203.00	386.88	8178.91	714.39	8872.29	766.84	1.725
70	333.98	8206.15	382.80	8181.01	726.09	8907.56	803.57	1.725

71	333.98	8206.15	382.80	8181.01	724.69	8904.84	800.51	1.725
72	333.98	8206.15	382.80	8181.01	723.28	8902.12	797.45	1.725
73	340.10	8203.00	382.80	8181.01	680.13	8810.78	696.43	1.725
74	340.10	8203.00	386.88	8178.91	712.99	8869.56	763.78	1.725
75	340.10	8203.00	390.96	8176.80	741.64	8920.18	821.94	1.725
76	340.10	8203.00	390.96	8176.80	740.23	8917.46	818.88	1.725
77	340.10	8203.00	382.80	8181.01	678.73	8808.05	693.37	1.725
78	340.10	8203.00	386.88	8178.91	707.38	8858.67	751.53	1.725
79	333.98	8206.15	382.80	8181.01	720.48	8896.67	791.33	1.725
80	333.98	8206.15	382.80	8181.01	717.67	8891.22	785.20	1.725
81	333.98	8206.15	382.80	8181.01	721.88	8899.39	794.39	1.725
82	340.10	8203.00	386.88	8178.91	708.78	8861.39	754.59	1.725
83	340.10	8203.00	390.96	8176.80	738.83	8914.74	815.82	1.725
84	340.10	8203.00	390.96	8176.80	743.04	8922.91	825.00	1.725
85	340.10	8203.00	386.88	8178.91	710.18	8864.12	757.65	1.725
86	340.10	8203.00	386.88	8178.91	711.58	8866.84	760.71	1.725
87	340.10	8203.00	386.88	8178.91	703.17	8850.50	742.35	1.725
88	340.10	8203.00	382.80	8181.01	677.32	8805.33	690.31	1.725
89	340.10	8203.00	382.80	8181.01	675.92	8802.61	687.24	1.725
90	333.98	8206.15	382.80	8181.01	719.08	8893.95	788.27	1.725
91	340.10	8203.00	382.80	8181.01	674.52	8799.88	684.18	1.725
92	340.10	8203.00	390.96	8176.80	737.43	8912.01	812.76	1.725
93	333.98	8206.15	382.80	8181.01	714.87	8885.78	779.08	1.725
94	340.10	8203.00	386.88	8178.91	705.97	8855.95	748.47	1.725
95	333.98	8206.15	382.80	8181.01	712.06	8880.33	772.96	1.725
96	340.10	8203.00	386.88	8178.91	704.57	8853.22	745.41	1.725
97	340.10	8203.00	386.88	8178.91	701.77	8847.78	739.29	1.725
98	340.10	8203.00	390.96	8176.80	736.03	8909.29	809.69	1.725
99	333.98	8206.15	382.80	8181.01	710.66	8877.61	769.90	1.725

Critical Failure Surface (circle 1)

Intersects: XL: 340.10 YL: 8203.00 XR: 382.80 YR: 8181.01

Centre: XC: 739.03 YC: 8925.14 Radius: R: 825.00

Generated failure surface: (20 points)

340.10	8203.00	342.32	8201.78	344.53	8200.57	346.76	8199.36	348.98	8198.16
351.21	8196.97	353.44	8195.79	355.68	8194.61	357.92	8193.44	360.17	8192.27
362.41	8191.11	364.67	8189.96	366.92	8188.82	369.18	8187.68	371.44	8186.55
373.71	8185.43	375.97	8184.31	378.25	8183.21	380.52	8182.10	382.80	8181.01

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	340.10	0.02	28.8	1.11	1.26	3	0.00	45.0	2.38	0.00	1.63	0.87
2	341.21	0.06	28.9	1.11	1.26	3	0.00	45.0	7.14	0.00	4.88	0.87
3	342.32	0.11	28.6	1.11	1.26	3	0.00	45.0	11.68	0.00	8.00	0.87
4	343.42	0.15	28.7	1.11	1.26	3	0.00	45.0	15.97	0.00	10.93	0.87
5	344.53	0.18	28.5	1.11	1.26	3	0.00	45.0	19.93	0.00	13.65	0.87
6	345.64	0.21	28.5	1.11	1.26	3	0.00	45.0	23.63	0.00	16.18	0.87

7	346.76	0.25	28.3	1.11	1.26	3	0.00	45.0	27.26	0.00	18.66	0.87
8	347.87	0.28	28.3	1.11	1.26	3	0.00	45.0	30.37	0.00	20.80	0.87
9	348.98	0.30	28.1	1.11	1.26	3	0.00	45.0	33.29	0.00	22.80	0.87
10	350.10	0.33	28.1	1.11	1.26	3	0.00	45.0	36.04	0.00	24.69	0.87
11	351.21	0.35	28.0	1.12	1.26	3	0.00	45.0	38.39	0.00	26.29	0.87
12	352.33	0.37	28.0	1.12	1.26	3	0.00	45.0	40.55	0.00	27.76	0.87
13	353.44	0.39	27.8	1.12	1.26	3	0.00	45.0	42.65	0.00	29.22	0.87
14	354.56	0.40	27.8	1.12	1.26	3	0.00	45.0	44.10	0.00	30.20	0.87
15	355.68	0.41	27.6	1.12	1.26	3	0.00	45.0	45.61	0.00	31.24	0.87
16	356.80	0.42	27.6	1.12	1.26	3	0.00	45.0	46.69	0.00	31.98	0.87
17	357.92	0.43	27.4	1.12	1.26	3	0.00	45.0	47.61	0.00	32.62	0.87
18	359.04	0.44	27.4	1.12	1.26	3	0.00	45.0	48.09	0.00	32.95	0.87
19	360.17	0.44	27.3	1.12	1.26	3	0.00	45.0	48.47	0.00	33.21	0.87
20	361.29	0.44	27.3	1.12	1.26	3	0.00	45.0	48.47	0.00	33.21	0.87
21	362.41	0.44	27.1	1.13	1.26	3	0.00	45.0	48.25	0.00	33.07	0.87
22	363.54	0.43	27.1	1.13	1.26	3	0.00	45.0	47.70	0.00	32.69	0.87
23	364.67	0.43	26.9	1.13	1.26	3	0.00	45.0	46.99	0.00	32.20	0.87
24	365.79	0.42	26.9	1.13	1.26	3	0.00	45.0	45.90	0.00	31.46	0.87
25	366.92	0.41	26.7	1.13	1.26	3	0.00	45.0	44.64	0.00	30.60	0.87
26	368.05	0.39	26.7	1.13	1.26	3	0.00	45.0	43.00	0.00	29.48	0.87
27	369.18	0.37	26.5	1.13	1.26	3	0.00	45.0	41.18	0.00	28.24	0.87
28	370.31	0.35	26.5	1.13	1.26	3	0.00	45.0	38.99	0.00	26.74	0.87
29	371.44	0.33	26.4	1.13	1.26	3	0.00	45.0	36.62	0.00	25.11	0.87
30	372.57	0.31	26.4	1.13	1.26	3	0.00	45.0	33.88	0.00	23.24	0.87
31	373.71	0.28	26.2	1.13	1.26	3	0.00	45.0	30.95	0.00	21.23	0.87
32	374.84	0.25	26.2	1.13	1.26	3	0.00	45.0	27.72	0.00	19.01	0.87
33	375.97	0.22	26.0	1.14	1.26	3	0.00	45.0	24.22	0.00	16.62	0.87
34	377.11	0.19	26.0	1.14	1.26	3	0.00	45.0	20.38	0.00	13.98	0.87
35	378.25	0.15	25.9	1.14	1.26	3	0.00	45.0	16.38	0.00	11.24	0.87
36	379.38	0.11	25.9	1.14	1.26	3	0.00	45.0	11.98	0.00	8.22	0.87
37	380.52	0.07	25.7	1.14	1.26	3	0.00	45.0	7.40	0.00	5.08	0.87
38	381.66	0.02	25.7	1.14	1.26	3	0.00	45.0	2.39	0.00	1.64	0.87

X-S Area: 11.15 Path Length: 48.04 X-S Weight: 1226.89

Waste Dump

GALENA 7.2 Analysis Results Version: 7.20.1.01 Licensee: Greg Lewicki and Associates

Project: RidgeTop Quarry - Waste Dump
File: E:\Work\Dropbox (GLA)\RidgeTop Quarry Dataroom\Slope Stability\Waste Dump Slopes 211020.gmf
Processed: 21 Oct 2021 17:11:01

9. Analysis 1

9.1. DATA: Analysis 1 - Waste dump in active conditions.

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (41 points) Material beneath: 2 - Gniess
0.00 8055.00 333.41 7993.84 526.18 7935.00 727.94 7869.29 840.63 7864.19
1012.55 7834.88 1168.37 7780.00 1214.81 7755.00 1262.74 7756.41 1296.49 7752.45
1513.10 7695.10 1668.85 7634.24 1707.92 7629.41 1747.56 7635.23 1812.08 7650.00
1900.00 7656.37 1965.57 7641.58 2058.82 7605.00 2146.10 7572.77 2174.38 7563.85
2192.84 7565.00 2219.74 7571.55 2236.48 7571.31 2316.06 7547.86 2360.72 7533.98
2424.03 7519.40 2493.99 7485.00 2521.86 7476.45 2578.74 7472.75 2625.75 7461.92
2696.56 7451.58 2757.83 7449.33 2791.15 7440.81 2830.50 7423.50 2861.71 7415.00
2932.63 7395.00 2956.08 7389.94 2992.34 7386.49 3032.29 7386.71 3051.33 7390.00
3069.40 7400.00
Profile: 2 (2 points) Material beneath: 1 - Crusher Waste Fines
27.25 8050.00 2700.00 8050.00

Slope Surface (47 points)

0.00 8055.00 27.26 8050.00 1300.00 8050.00 1328.41 8050.00 1385.23 8000.00
1413.64 8000.00 1442.05 7999.98 1498.87 7949.92 1527.28 7949.92 1555.68 7949.90

1612.50	7899.84	1640.91	7899.84	1669.32	7899.82	1726.14	7849.76	1754.55	7849.76
1782.96	7849.74	1839.78	7799.68	1868.19	7799.68	1896.60	7799.66	1953.42	7749.60
1981.83	7749.60	2010.24	7749.58	2067.05	7699.52	2095.46	7699.52	2123.87	7699.50
2180.69	7649.44	2209.10	7649.44	2237.51	7649.42	2294.33	7599.36	2322.74	7599.36
2351.15	7599.34	2407.97	7549.28	2436.38	7549.28	2464.79	7549.26	2521.60	7499.20
2550.01	7499.20	2578.42	7499.18	2639.00	7459.98	2696.56	7451.58	2757.83	7449.33
2792.78	7440.00	2830.50	7423.50	2932.63	7395.00	2992.34	7386.49	3032.29	7386.71
3051.33	7390.00	3069.40	7400.00						

Phreatic Surface (2 points)

0.00 7000.00 3020.00 7000.00

Piezometric Surfaces (1 surface)

Surface within profile: 2 (41 points) - Crusher Waste Fines

0.00	8057.00	333.41	7995.84	526.18	7937.00	727.94	7871.29	840.63	7866.19
1012.55	7836.88	1168.37	7782.00	1214.81	7757.00	1262.74	7758.41	1296.49	7754.45
1513.10	7697.10	1668.85	7636.24	1707.92	7631.41	1747.56	7637.23	1812.08	7652.00
1900.00	7658.37	1965.57	7643.58	2058.82	7607.00	2146.10	7574.77	2174.38	7565.85
2192.84	7567.00	2219.74	7573.55	2236.48	7573.31	2316.06	7549.86	2360.72	7535.98
2424.03	7521.40	2493.99	7487.00	2521.86	7478.45	2578.74	7474.75	2625.75	7463.92
2696.56	7453.58	2757.83	7451.33	2791.15	7442.81	2830.50	7425.50	2861.71	7417.00
2932.63	7397.00	2956.08	7391.94	2992.34	7388.49	3032.29	7388.71	3051.33	7392.00
3069.40	7402.00								

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects: XL: 1535.00 YL: 7949.91 XR: 2520.00 YR: 7500.61

Centre: XC: 2608.07 YC: 8998.02 Radius: R: 1500.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	650.00	650.00	25.00
Trial positions within range:	50	50	50

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9.2. RESULTS: Analysis 1 - Waste dump in active conditions.

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 56.419

Analysis Summary

There were: 69885 successful analyses from a total of 125001 trial failure surfaces
55116 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.53

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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	1860.00	7799.68	2287.86	7605.06	2692.56	9062.41	1512.50	1.528	<-- Critical Surface
2	1860.00	7799.68	2287.86	7605.06	2692.35	9061.94	1511.99	1.528	
3	1860.00	7799.68	2287.86	7605.06	2692.14	9061.47	1511.48	1.528	
4	1860.00	7799.68	2287.86	7605.06	2691.92	9061.00	1510.97	1.529	
5	1860.00	7799.68	2287.86	7605.06	2691.71	9060.53	1510.46	1.529	
6	1860.00	7799.68	2287.86	7605.06	2691.50	9060.06	1509.95	1.529	
7	1860.00	7799.68	2287.86	7605.06	2691.28	9059.59	1509.44	1.529	
8	1860.00	7799.68	2287.86	7605.06	2691.07	9059.12	1508.93	1.529	
9	1860.00	7799.68	2287.86	7605.06	2690.85	9058.65	1508.42	1.529	
10	1860.00	7799.68	2287.86	7605.06	2690.64	9058.18	1507.91	1.529	
11	1860.00	7799.68	2287.86	7605.06	2690.43	9057.71	1507.40	1.529	
12	1860.00	7799.68	2287.86	7605.06	2690.21	9057.24	1506.89	1.529	
13	1860.00	7799.68	2287.86	7605.06	2690.00	9056.77	1506.38	1.529	
14	1860.00	7799.68	2287.86	7605.06	2689.78	9056.30	1505.87	1.529	
15	1860.00	7799.68	2287.86	7605.06	2689.57	9055.83	1505.36	1.529	
16	1860.00	7799.68	2287.86	7605.06	2689.36	9055.36	1504.85	1.529	
17	1860.00	7799.68	2287.86	7605.06	2689.14	9054.89	1504.34	1.529	
18	1860.00	7799.68	2287.86	7605.06	2688.93	9054.42	1503.83	1.529	
19	1860.00	7799.68	2287.86	7605.06	2688.72	9053.95	1503.32	1.529	
20	1860.00	7799.68	2287.86	7605.06	2688.50	9053.48	1502.81	1.529	
21	1860.00	7799.68	2287.86	7605.06	2688.29	9053.01	1502.30	1.529	
22	1860.00	7799.68	2287.86	7605.06	2688.07	9052.54	1501.79	1.529	
23	1860.00	7799.68	2287.86	7605.06	2687.86	9052.07	1501.28	1.529	
24	1860.00	7799.68	2287.86	7605.06	2687.65	9051.60	1500.77	1.529	
25	1860.00	7799.68	2287.86	7605.06	2687.43	9051.13	1500.26	1.529	
26	1860.00	7799.68	2287.86	7605.06	2687.22	9050.66	1499.74	1.529	
27	1860.00	7799.68	2287.86	7605.06	2687.00	9050.19	1499.23	1.529	
28	1860.00	7799.68	2287.86	7605.06	2686.79	9049.72	1498.72	1.529	
29	1860.00	7799.68	2287.86	7605.06	2686.58	9049.25	1498.21	1.529	
30	1860.00	7799.68	2287.86	7605.06	2686.36	9048.78	1497.70	1.529	
31	1860.00	7799.68	2287.86	7605.06	2686.15	9048.31	1497.19	1.529	
32	1860.00	7799.68	2287.86	7605.06	2685.93	9047.84	1496.68	1.529	
33	1860.00	7799.68	2287.86	7605.06	2685.72	9047.37	1496.17	1.529	
34	1860.00	7799.68	2287.86	7605.06	2685.51	9046.90	1495.66	1.529	
35	1860.00	7799.68	2287.86	7605.06	2685.29	9046.43	1495.15	1.529	
36	1860.00	7799.68	2287.86	7605.06	2685.08	9045.96	1494.64	1.529	
37	1860.00	7799.68	2287.86	7605.06	2684.87	9045.48	1494.13	1.529	
38	1860.00	7799.68	2287.86	7605.06	2684.65	9045.01	1493.62	1.529	
39	1860.00	7799.68	2287.86	7605.06	2684.44	9044.54	1493.11	1.529	
40	1860.00	7799.68	2287.86	7605.06	2684.22	9044.07	1492.60	1.529	

41	1860.00	7799.68	2287.86	7605.06	2684.01	9043.60	1492.09	1.529
42	1860.00	7799.68	2287.86	7605.06	2683.80	9043.13	1491.58	1.529
43	1860.00	7799.68	2287.86	7605.06	2683.58	9042.66	1491.07	1.529
44	1860.00	7799.68	2287.86	7605.06	2683.37	9042.19	1490.56	1.529
45	1860.00	7799.68	2287.86	7605.06	2683.15	9041.72	1490.05	1.529
46	1860.00	7799.68	2287.86	7605.06	2682.94	9041.25	1489.54	1.529
47	1860.00	7799.68	2287.86	7605.06	2682.73	9040.78	1489.03	1.529
48	1860.00	7799.68	2287.86	7605.06	2682.51	9040.31	1488.52	1.529
49	1860.00	7799.68	2287.86	7605.06	2682.30	9039.84	1488.01	1.529
50	1860.00	7799.68	2287.86	7605.06	2682.08	9039.37	1487.50	1.529
51	1767.14	7849.75	2287.86	7605.06	2649.51	9051.08	1490.56	1.542
52	1767.14	7849.75	2287.86	7605.06	2649.29	9050.61	1490.05	1.542
53	1767.14	7849.75	2287.86	7605.06	2649.07	9050.14	1489.54	1.542
54	1767.14	7849.75	2287.86	7605.06	2648.85	9049.67	1489.03	1.543
55	1767.14	7849.75	2287.86	7605.06	2648.62	9049.20	1488.52	1.543
56	1767.14	7849.75	2287.86	7605.06	2648.40	9048.73	1488.01	1.543
57	1767.14	7849.75	2287.86	7605.06	2648.18	9048.26	1487.50	1.543
58	1860.00	7799.68	2407.24	7549.92	2749.07	9023.29	1512.50	1.543
59	1860.00	7799.68	2407.24	7549.92	2748.85	9022.81	1511.99	1.543
60	1860.00	7799.68	2407.24	7549.92	2748.64	9022.34	1511.48	1.543
61	1860.00	7799.68	2407.24	7549.92	2748.42	9021.87	1510.97	1.543
62	1860.00	7799.68	2407.24	7549.92	2748.21	9021.39	1510.46	1.543
63	1860.00	7799.68	2407.24	7549.92	2747.99	9020.92	1509.95	1.543
64	1860.00	7799.68	2407.24	7549.92	2747.77	9020.44	1509.44	1.543
65	1860.00	7799.68	2407.24	7549.92	2747.56	9019.97	1508.93	1.543
66	1860.00	7799.68	2407.24	7549.92	2747.34	9019.50	1508.42	1.543
67	1860.00	7799.68	2407.24	7549.92	2747.12	9019.02	1507.91	1.543
68	1860.00	7799.68	2407.24	7549.92	2746.91	9018.55	1507.40	1.543
69	1860.00	7799.68	2407.24	7549.92	2746.69	9018.08	1506.89	1.543
70	1860.00	7799.68	2407.24	7549.92	2746.48	9017.60	1506.38	1.543
71	1860.00	7799.68	2407.24	7549.92	2746.26	9017.13	1505.87	1.543
72	1860.00	7799.68	2407.24	7549.92	2746.04	9016.66	1505.36	1.543
73	1860.00	7799.68	2407.24	7549.92	2745.83	9016.18	1504.85	1.543
74	1860.00	7799.68	2407.24	7549.92	2745.61	9015.71	1504.34	1.543
75	1860.00	7799.68	2407.24	7549.92	2745.39	9015.23	1503.83	1.543
76	1860.00	7799.68	2407.24	7549.92	2745.18	9014.76	1503.32	1.543
77	1860.00	7799.68	2407.24	7549.92	2744.96	9014.29	1502.81	1.543
78	1860.00	7799.68	2407.24	7549.92	2744.75	9013.81	1502.30	1.543
79	1860.00	7799.68	2407.24	7549.92	2744.53	9013.34	1501.79	1.543
80	1860.00	7799.68	2407.24	7549.92	2744.31	9012.87	1501.28	1.543
81	1860.00	7799.68	2407.24	7549.92	2744.10	9012.39	1500.77	1.543
82	1860.00	7799.68	2407.24	7549.92	2743.88	9011.92	1500.26	1.543
83	1860.00	7799.68	2407.24	7549.92	2743.66	9011.44	1499.74	1.543
84	1860.00	7799.68	2407.24	7549.92	2743.45	9010.97	1499.23	1.543
85	1860.00	7799.68	2407.24	7549.92	2743.23	9010.50	1498.72	1.543
86	1860.00	7799.68	2407.24	7549.92	2743.02	9010.02	1498.21	1.543
87	1753.88	7849.76	2287.86	7605.06	2638.97	9076.24	1512.50	1.543
88	1860.00	7799.68	2407.24	7549.92	2742.80	9009.55	1497.70	1.543
89	1753.88	7849.76	2287.86	7605.06	2638.76	9075.77	1511.99	1.543
90	1860.00	7799.68	2407.24	7549.92	2742.58	9009.08	1497.19	1.543

91	1753.88	7849.76	2287.86	7605.06	2638.54	9075.30	1511.48	1.543
92	1753.88	7849.76	2287.86	7605.06	2638.32	9074.83	1510.97	1.544
93	1860.00	7799.68	2407.24	7549.92	2742.37	9008.60	1496.68	1.544
94	1860.00	7799.68	2407.24	7549.92	2742.15	9008.13	1496.17	1.544
95	1753.88	7849.76	2287.86	7605.06	2638.11	9074.35	1510.46	1.544
96	1860.00	7799.68	2407.24	7549.92	2741.94	9007.65	1495.66	1.544
97	1753.88	7849.76	2287.86	7605.06	2637.89	9073.88	1509.95	1.544
98	1860.00	7799.68	2407.24	7549.92	2741.72	9007.18	1495.15	1.544
99	1753.88	7849.76	2287.86	7605.06	2637.67	9073.41	1509.44	1.544

Critical Failure Surface (circle 1)

Intersects: XL: 1860.00 YL: 7799.68 XR: 2287.86 YR: 7605.06

Centre: XC: 2692.56 YC: 9062.41 Radius: R: 1512.50

Generated failure surface: (20 points)

1860.00	7799.68	1880.85	7786.18	1901.92	7773.02	1923.20	7760.21	1944.69	7747.75
1966.38	7735.65	1988.26	7723.90	2010.34	7712.51	2032.60	7701.49	2055.04	7690.84
2077.65	7680.55	2100.43	7670.64	2123.36	7661.10	2146.45	7651.95	2169.69	7643.17
2193.06	7634.77	2216.58	7626.76	2240.22	7619.14	2263.98	7611.91	2287.86	7605.06

Slice Geometry and Properties - Critical Failure Surface (circle 1, 43 slices)

Slice	X-S	---------- Base ----------						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	1860.00	21.72	32.9	8.19	9.76	1	0.03	34.0	2538.90	0.00	241.09	0.93
2	1868.19	118.98	32.9	12.66	15.08	1	0.03	34.0	13909.35	0.00	854.51	0.93
3	1880.85	125.61	32.0	7.88	9.28	1	0.03	34.0	14683.56	0.00	1461.66	0.92
4	1888.72	164.31	32.0	7.88	9.29	1	0.03	34.0	19207.37	0.00	1911.95	0.92
5	1896.60	120.38	32.0	5.32	6.27	1	0.03	34.0	14072.95	0.00	2074.52	0.92
6	1901.92	217.82	31.0	10.64	12.42	1	0.03	34.0	25462.99	0.00	1890.74	0.92
7	1912.56	186.22	31.0	10.64	12.42	1	0.03	34.0	21769.63	0.00	1616.49	0.92
8	1923.20	154.70	30.1	10.74	12.42	1	0.03	34.0	18084.50	0.00	1340.24	0.92
9	1933.94	119.92	30.1	10.74	12.42	1	0.03	34.0	14019.04	0.00	1038.97	0.92
10	1944.69	71.02	29.2	8.73	10.00	1	0.03	34.0	8302.25	0.00	762.84	0.92
11	1953.42	133.96	29.2	12.96	14.84	1	0.03	34.0	15660.04	0.00	969.73	0.92
12	1966.38	123.83	28.2	7.73	8.77	1	0.03	34.0	14475.55	0.00	1514.82	0.92
13	1974.10	155.87	28.2	7.73	8.77	1	0.03	34.0	18220.85	0.00	1906.68	0.92
14	1981.83	154.24	28.2	6.43	7.30	1	0.03	34.0	18031.19	0.00	2265.70	0.92
15	1988.26	313.44	27.3	10.99	12.36	1	0.03	34.0	36640.72	0.00	2716.41	0.92
16	1999.25	375.62	27.3	10.99	12.36	1	0.03	34.0	43909.79	0.00	3255.31	0.92
17	2010.24	389.73	26.3	11.18	12.48	1	0.03	34.0	45559.76	0.00	3344.06	0.92
18	2021.42	341.47	26.3	11.18	12.48	1	0.03	34.0	39918.31	0.00	2930.17	0.92
19	2032.60	292.87	25.4	11.22	12.42	1	0.03	34.0	34236.05	0.00	2522.94	0.92
20	2043.82	241.72	25.4	11.22	12.42	1	0.03	34.0	28257.46	0.00	2082.36	0.92
21	2055.04	200.66	24.5	12.01	13.20	1	0.03	34.0	23457.66	0.00	1626.43	0.91
22	2067.05	175.49	24.5	10.60	11.64	1	0.03	34.0	20514.29	0.00	1611.89	0.91
23	2077.65	186.17	23.5	8.91	9.71	1	0.03	34.0	21763.54	0.00	2050.11	0.91
24	2086.55	220.68	23.5	8.91	9.71	1	0.03	34.0	25796.92	0.00	2430.10	0.91
25	2095.46	138.01	23.5	4.97	5.41	1	0.03	34.0	16133.54	0.00	2725.91	0.91
26	2100.43	358.44	22.6	11.47	12.42	1	0.03	34.0	41901.07	0.00	3087.33	0.92

27	2111.89	413.02	22.6	11.47	12.42	1	0.03	34.0	48281.93	0.00	3557.42	0.92
28	2123.36	416.17	21.6	11.54	12.42	1	0.03	34.0	48649.86	0.00	3586.30	0.92
29	2134.91	351.60	21.6	11.54	12.42	1	0.03	34.0	41102.45	0.00	3029.99	0.92
30	2146.45	287.40	20.7	11.62	12.42	1	0.03	34.0	33597.34	0.00	2478.52	0.92
31	2158.07	219.47	20.7	11.62	12.42	1	0.03	34.0	25656.43	0.00	1892.71	0.92
32	2169.69	144.09	19.8	11.00	11.69	1	0.03	34.0	16843.74	0.00	1321.35	0.92
33	2180.69	154.00	19.8	12.37	13.15	1	0.03	34.0	18002.44	0.00	1255.82	0.92
34	2193.06	128.56	18.8	8.02	8.47	1	0.03	34.0	15028.11	0.00	1629.33	0.92
35	2201.08	150.46	18.8	8.02	8.47	1	0.03	34.0	17588.79	0.00	1906.91	0.92
36	2209.10	160.00	18.8	7.48	7.90	1	0.03	34.0	18704.22	0.00	2174.90	0.92
37	2216.58	254.93	17.9	10.47	11.00	1	0.03	34.0	29801.78	0.00	2492.58	0.92
38	2227.04	290.19	17.9	10.47	11.00	1	0.03	34.0	33923.16	0.00	2837.17	0.92
39	2237.51	77.55	17.9	2.71	2.84	1	0.03	34.0	9065.30	0.00	2932.23	0.92
40	2240.22	290.75	16.9	11.88	12.42	1	0.03	34.0	33988.78	0.00	2521.82	0.92
41	2252.10	209.34	16.9	11.88	12.42	1	0.03	34.0	24472.42	0.00	1815.81	0.92
42	2263.98	127.10	16.0	11.94	12.42	1	0.03	34.0	14858.24	0.00	1104.79	0.92
43	2275.92	42.36	16.0	11.94	12.42	1	0.03	34.0	4952.19	0.00	368.23	0.92

X-S Area: 8819.88 Path Length: 471.95 X-S Weight: 1031044.50

10. Analysis 2

10.1. DATA: Analysis 2 - Waste dump in active conditions.

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (41 points) Material beneath: 2 - Gniess
0.00 8055.00 333.41 7993.84 526.18 7935.00 727.94 7869.29 840.63 7864.19
1012.55 7834.88 1168.37 7780.00 1214.81 7755.00 1262.74 7756.41 1296.49 7752.45
1513.10 7695.10 1668.85 7634.24 1707.92 7629.41 1747.56 7635.23 1812.08 7650.00
1900.00 7656.37 1965.57 7641.58 2058.82 7605.00 2146.10 7572.77 2174.38 7563.85
2192.84 7565.00 2219.74 7571.55 2236.48 7571.31 2316.06 7547.86 2360.72 7533.98
2424.03 7519.40 2493.99 7485.00 2521.86 7476.45 2578.74 7472.75 2625.75 7461.92
2696.56 7451.58 2757.83 7449.33 2791.15 7440.81 2830.50 7423.50 2861.71 7415.00
2932.63 7395.00 2956.08 7389.94 2992.34 7386.49 3032.29 7386.71 3051.33 7390.00
3069.40 7400.00
Profile: 2 (2 points) Material beneath: 1 - Crusher Waste Fines
27.25 8050.00 2700.00 8050.00

Slope Surface (47 points)

0.00 8055.00 27.26 8050.00 1300.00 8050.00 1328.41 8050.00 1385.23 8000.00
1413.64 8000.00 1442.05 7999.98 1498.87 7949.92 1527.28 7949.92 1555.68 7949.90
1612.50 7899.84 1640.91 7899.84 1669.32 7899.82 1726.14 7849.76 1754.55 7849.76
1782.96 7849.74 1839.78 7799.68 1868.19 7799.68 1896.60 7799.66 1953.42 7749.60
1981.83 7749.60 2010.24 7749.58 2067.05 7699.52 2095.46 7699.52 2123.87 7699.50
2180.69 7649.44 2209.10 7649.44 2237.51 7649.42 2294.33 7599.36 2322.74 7599.36
2351.15 7599.34 2407.97 7549.28 2436.38 7549.28 2464.79 7549.26 2521.60 7499.20
2550.01 7499.20 2578.42 7499.18 2639.00 7459.98 2696.56 7451.58 2757.83 7449.33
2792.78 7440.00 2830.50 7423.50 2932.63 7395.00 2992.34 7386.49 3032.29 7386.71
3051.33 7390.00 3069.40 7400.00

Phreatic Surface (2 points)

0.00 7000.00 3020.00 7000.00

Piezometric Surfaces (1 surface)

Surface within profile: 2 (41 points) - Crusher Waste Fines

0.00	8057.00	333.41	7995.84	526.18	7937.00	727.94	7871.29	840.63	7866.19
1012.55	7836.88	1168.37	7782.00	1214.81	7757.00	1262.74	7758.41	1296.49	7754.45
1513.10	7697.10	1668.85	7636.24	1707.92	7631.41	1747.56	7637.23	1812.08	7652.00
1900.00	7658.37	1965.57	7643.58	2058.82	7607.00	2146.10	7574.77	2174.38	7565.85
2192.84	7567.00	2219.74	7573.55	2236.48	7573.31	2316.06	7549.86	2360.72	7535.98
2424.03	7521.40	2493.99	7487.00	2521.86	7478.45	2578.74	7474.75	2625.75	7463.92
2696.56	7453.58	2757.83	7451.33	2791.15	7442.81	2830.50	7425.50	2861.71	7417.00
2932.63	7397.00	2956.08	7391.94	2992.34	7388.49	3032.29	7388.71	3051.33	7392.00
3069.40	7402.00								

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 1957.00 YL: 7749.60 XR: 2098.00 YR: 7699.52
Centre: XC: 2076.35 YC: 7862.08 Radius: R: 164.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	135.00	95.00	25.00
Trial positions within range:	50	50	50

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10.2. RESULTS: Analysis 2 - Waste dump in active conditions.

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 1.618

Analysis Summary

There were: 82720 successful analyses from a total of 125001 trial failure surfaces
42281 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 0.77
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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS

1	2024.50	7737.01	2050.50	7714.10	2153.62	7857.34	176.50	0.773	<-- Critical Surface
2	2024.50	7737.01	2050.50	7714.10	2153.29	7856.96	175.99	0.773	
3	2024.50	7737.01	2050.50	7714.10	2152.95	7856.57	175.48	0.773	
4	2024.50	7737.01	2050.50	7714.10	2152.61	7856.19	174.97	0.773	
5	2024.50	7737.01	2050.50	7714.10	2152.27	7855.80	174.46	0.773	
6	2024.50	7737.01	2050.50	7714.10	2151.93	7855.42	173.95	0.773	
7	2024.50	7737.01	2050.50	7714.10	2151.59	7855.03	173.44	0.773	
8	2024.50	7737.01	2050.50	7714.10	2151.25	7854.65	172.93	0.773	
9	2024.50	7737.01	2050.50	7714.10	2150.91	7854.27	172.42	0.773	
10	2024.50	7737.01	2050.50	7714.10	2150.57	7853.88	171.91	0.773	
11	2024.50	7737.01	2050.50	7714.10	2150.24	7853.50	171.40	0.773	
12	2024.50	7737.01	2050.50	7714.10	2149.90	7853.11	170.89	0.773	
13	2024.50	7737.01	2050.50	7714.10	2149.56	7852.73	170.38	0.773	
14	2024.50	7737.01	2050.50	7714.10	2149.22	7852.34	169.87	0.773	
15	2024.50	7737.01	2050.50	7714.10	2148.88	7851.96	169.36	0.773	
16	2024.50	7737.01	2050.50	7714.10	2148.54	7851.57	168.85	0.773	
17	2024.50	7737.01	2050.50	7714.10	2148.20	7851.19	168.34	0.773	
18	2024.50	7737.01	2050.50	7714.10	2147.86	7850.80	167.83	0.773	
19	2024.50	7737.01	2050.50	7714.10	2147.52	7850.42	167.32	0.773	
20	2024.50	7737.01	2050.50	7714.10	2147.18	7850.03	166.81	0.773	
21	2024.50	7737.01	2050.50	7714.10	2146.84	7849.65	166.30	0.773	
22	2024.50	7737.01	2050.50	7714.10	2146.50	7849.26	165.79	0.773	
23	2024.50	7737.01	2050.50	7714.10	2146.17	7848.88	165.28	0.773	
24	2024.50	7737.01	2052.44	7712.40	2154.51	7856.39	176.50	0.773	
25	2024.50	7737.01	2050.50	7714.10	2145.83	7848.49	164.77	0.773	
26	2024.50	7737.01	2052.44	7712.40	2154.17	7856.01	175.99	0.773	
27	2024.50	7737.01	2050.50	7714.10	2145.49	7848.11	164.26	0.773	
28	2024.50	7737.01	2052.44	7712.40	2153.83	7855.62	175.48	0.773	
29	2024.50	7737.01	2050.50	7714.10	2145.15	7847.72	163.74	0.773	
30	2024.50	7737.01	2052.44	7712.40	2153.49	7855.24	174.97	0.773	
31	2024.50	7737.01	2050.50	7714.10	2144.81	7847.34	163.23	0.773	
32	2024.50	7737.01	2052.44	7712.40	2153.15	7854.85	174.46	0.773	
33	2024.50	7737.01	2050.50	7714.10	2144.47	7846.95	162.72	0.773	
34	2024.50	7737.01	2052.44	7712.40	2152.81	7854.47	173.95	0.773	
35	2024.50	7737.01	2050.50	7714.10	2144.13	7846.57	162.21	0.774	
36	2024.50	7737.01	2052.44	7712.40	2152.47	7854.08	173.44	0.774	
37	2024.50	7737.01	2050.50	7714.10	2143.79	7846.18	161.70	0.774	
38	2024.50	7737.01	2052.44	7712.40	2152.13	7853.70	172.93	0.774	
39	2024.50	7737.01	2050.50	7714.10	2143.45	7845.80	161.19	0.774	
40	2024.50	7737.01	2052.44	7712.40	2151.79	7853.31	172.42	0.774	
41	2024.50	7737.01	2050.50	7714.10	2143.11	7845.41	160.68	0.774	
42	2024.50	7737.01	2052.44	7712.40	2151.45	7852.93	171.91	0.774	
43	2021.74	7739.44	2050.50	7714.10	2152.12	7858.41	176.50	0.774	
44	2024.50	7737.01	2050.50	7714.10	2142.77	7845.03	160.17	0.774	
45	2024.50	7737.01	2052.44	7712.40	2151.11	7852.54	171.40	0.774	
46	2021.74	7739.44	2050.50	7714.10	2151.78	7858.03	175.99	0.774	
47	2024.50	7737.01	2050.50	7714.10	2142.43	7844.64	159.66	0.774	
48	2024.50	7737.01	2052.44	7712.40	2150.77	7852.16	170.89	0.774	
49	2021.74	7739.44	2050.50	7714.10	2151.44	7857.64	175.48	0.774	
50	2024.50	7737.01	2050.50	7714.10	2142.09	7844.26	159.15	0.774	

51	2024.50	7737.01	2052.44	7712.40	2150.43	7851.77	170.38	0.774
52	2021.74	7739.44	2050.50	7714.10	2151.10	7857.26	174.97	0.774
53	2024.50	7737.01	2052.44	7712.40	2150.10	7851.38	169.87	0.774
54	2024.50	7737.01	2050.50	7714.10	2141.76	7843.87	158.64	0.774
55	2021.74	7739.44	2050.50	7714.10	2150.77	7856.87	174.46	0.774
56	2024.50	7737.01	2052.44	7712.40	2149.76	7851.00	169.36	0.774
57	2024.50	7737.01	2050.50	7714.10	2141.42	7843.49	158.13	0.774
58	2021.74	7739.44	2050.50	7714.10	2150.43	7856.49	173.95	0.774
59	2024.50	7737.01	2050.50	7714.10	2141.08	7843.10	157.62	0.774
60	2024.50	7737.01	2052.44	7712.40	2149.42	7850.61	168.85	0.774
61	2021.74	7739.44	2050.50	7714.10	2150.09	7856.10	173.44	0.774
62	2024.50	7737.01	2050.50	7714.10	2140.74	7842.72	157.11	0.774
63	2021.74	7739.44	2050.50	7714.10	2149.75	7855.72	172.93	0.774
64	2024.50	7737.01	2052.44	7712.40	2149.08	7850.23	168.34	0.774
65	2024.50	7737.01	2052.44	7712.40	2148.74	7849.84	167.83	0.774
66	2021.74	7739.44	2050.50	7714.10	2149.41	7855.33	172.42	0.774
67	2024.50	7737.01	2050.50	7714.10	2140.40	7842.33	156.60	0.774
68	2024.50	7737.01	2052.44	7712.40	2148.40	7849.46	167.32	0.774
69	2021.74	7739.44	2050.50	7714.10	2149.07	7854.95	171.91	0.774
70	2024.50	7737.01	2050.50	7714.10	2140.06	7841.95	156.09	0.774
71	2024.50	7737.01	2052.44	7712.40	2148.06	7849.07	166.81	0.774
72	2021.74	7739.44	2050.50	7714.10	2148.73	7854.56	171.40	0.774
73	2024.50	7737.01	2050.50	7714.10	2139.72	7841.56	155.58	0.774
74	2024.50	7737.01	2052.44	7712.40	2147.72	7848.69	166.30	0.774
75	2021.74	7739.44	2050.50	7714.10	2148.39	7854.18	170.89	0.774
76	2024.50	7737.01	2050.50	7714.10	2139.38	7841.18	155.07	0.774
77	2024.50	7737.01	2052.44	7712.40	2147.38	7848.30	165.79	0.774
78	2021.74	7739.44	2050.50	7714.10	2148.05	7853.79	170.38	0.774
79	2024.50	7737.01	2050.50	7714.10	2139.04	7840.79	154.56	0.774
80	2024.50	7737.01	2054.38	7710.69	2155.38	7855.43	176.50	0.774
81	2024.50	7737.01	2052.44	7712.40	2147.04	7847.92	165.28	0.774
82	2021.74	7739.44	2050.50	7714.10	2147.71	7853.41	169.87	0.774
83	2024.50	7737.01	2050.50	7714.10	2138.70	7840.41	154.05	0.774
84	2024.50	7737.01	2054.38	7710.69	2155.04	7855.04	175.99	0.774
85	2024.50	7737.01	2052.44	7712.40	2146.70	7847.53	164.77	0.774
86	2021.74	7739.44	2050.50	7714.10	2147.37	7853.02	169.36	0.774
87	2024.50	7737.01	2054.38	7710.69	2154.70	7854.66	175.48	0.774
88	2024.50	7737.01	2050.50	7714.10	2138.36	7840.02	153.54	0.774
89	2024.50	7737.01	2052.44	7712.40	2146.36	7847.15	164.26	0.774
90	2021.74	7739.44	2050.50	7714.10	2147.03	7852.63	168.85	0.774
91	2024.50	7737.01	2054.38	7710.69	2154.36	7854.27	174.97	0.774
92	2024.50	7737.01	2050.50	7714.10	2138.02	7839.64	153.03	0.774
93	2024.50	7737.01	2052.44	7712.40	2146.02	7846.76	163.74	0.774
94	2021.74	7739.44	2050.50	7714.10	2146.69	7852.25	168.34	0.774
95	2024.50	7737.01	2054.38	7710.69	2154.02	7853.89	174.46	0.774
96	2024.50	7737.01	2050.50	7714.10	2137.68	7839.25	152.52	0.774
97	2021.74	7739.44	2050.50	7714.10	2146.35	7851.86	167.83	0.774
98	2024.50	7737.01	2052.44	7712.40	2145.68	7846.38	163.23	0.774
99	2024.50	7737.01	2054.38	7710.69	2153.69	7853.50	173.95	0.774

Critical Failure Surface (circle 1)

Intersects: XL: 2024.50 YL: 7737.01 XR: 2050.50 YR: 7714.10

Centre: XC: 2153.62 YC: 7857.34 Radius: R: 176.50

Generated failure surface: (20 points)

2024.50	7737.01	2025.75	7735.68	2027.02	7734.37	2028.30	7733.06	2029.59	7731.77
2030.90	7730.50	2032.22	7729.23	2033.55	7727.98	2034.89	7726.75	2036.25	7725.52
2037.62	7724.32	2039.01	7723.12	2040.40	7721.94	2041.81	7720.78	2043.23	7719.63
2044.66	7718.49	2046.10	7717.37	2047.56	7716.27	2049.02	7715.18	2050.50	7714.10

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	2024.50	0.04	46.7	0.63	0.91	1	0.03	34.0	4.15	0.00	3.41	0.76
2	2025.13	0.11	46.7	0.63	0.91	1	0.03	34.0	12.44	0.00	10.29	0.76
3	2025.75	0.18	46.1	0.63	0.91	1	0.03	34.0	20.49	0.00	16.94	0.76
4	2026.39	0.24	46.1	0.63	0.91	1	0.03	34.0	27.96	0.00	23.14	0.76
5	2027.02	0.30	45.5	0.64	0.91	1	0.03	34.0	35.31	0.00	29.19	0.76
6	2027.66	0.36	45.5	0.64	0.91	1	0.03	34.0	41.89	0.00	34.63	0.76
7	2028.30	0.42	45.0	0.65	0.91	1	0.03	34.0	48.53	0.00	40.09	0.76
8	2028.94	0.46	44.9	0.65	0.91	1	0.03	34.0	54.21	0.00	44.79	0.75
9	2029.59	0.51	44.4	0.65	0.91	1	0.03	34.0	60.09	0.00	49.62	0.75
10	2030.24	0.56	44.4	0.65	0.91	1	0.03	34.0	64.91	0.00	53.59	0.75
11	2030.90	0.60	43.8	0.66	0.91	1	0.03	34.0	69.94	0.00	57.71	0.75
12	2031.56	0.63	43.7	0.66	0.91	1	0.03	34.0	73.80	0.00	60.93	0.75
13	2032.22	0.67	43.2	0.67	0.91	1	0.03	34.0	77.96	0.00	64.31	0.75
14	2032.88	0.69	43.2	0.67	0.91	1	0.03	34.0	80.93	0.00	66.76	0.75
15	2033.55	0.72	42.6	0.67	0.91	1	0.03	34.0	84.19	0.00	69.46	0.75
16	2034.22	0.74	42.6	0.67	0.91	1	0.03	34.0	86.17	0.00	71.05	0.75
17	2034.89	0.76	42.0	0.68	0.91	1	0.03	34.0	88.45	0.00	72.94	0.75
18	2035.57	0.77	42.0	0.68	0.91	1	0.03	34.0	89.45	0.00	73.77	0.75
19	2036.25	0.78	41.4	0.69	0.91	1	0.03	34.0	90.79	0.00	74.85	0.75
20	2036.94	0.78	41.4	0.69	0.91	1	0.03	34.0	90.79	0.00	74.85	0.75
21	2037.62	0.78	40.8	0.69	0.91	1	0.03	34.0	91.10	0.00	75.12	0.75
22	2038.31	0.77	40.8	0.69	0.91	1	0.03	34.0	90.08	0.00	74.27	0.75
23	2039.01	0.76	40.2	0.70	0.91	1	0.03	34.0	89.36	0.00	73.70	0.75
24	2039.70	0.75	40.2	0.70	0.91	1	0.03	34.0	87.29	0.00	71.97	0.75
25	2040.40	0.73	39.6	0.70	0.91	1	0.03	34.0	85.48	0.00	70.52	0.75
26	2041.11	0.70	39.6	0.70	0.91	1	0.03	34.0	82.35	0.00	67.91	0.75
27	2041.81	0.68	39.0	0.71	0.91	1	0.03	34.0	79.40	0.00	65.52	0.75
28	2042.52	0.64	39.0	0.71	0.91	1	0.03	34.0	75.20	0.00	62.03	0.75
29	2043.23	0.61	38.4	0.72	0.91	1	0.03	34.0	71.07	0.00	58.67	0.75
30	2043.94	0.56	38.4	0.72	0.91	1	0.03	34.0	65.84	0.00	54.34	0.75
31	2044.66	0.52	37.8	0.72	0.91	1	0.03	34.0	60.54	0.00	49.98	0.75
32	2045.38	0.46	37.8	0.72	0.91	1	0.03	34.0	54.15	0.00	44.72	0.75
33	2046.10	0.41	37.2	0.73	0.91	1	0.03	34.0	47.62	0.00	39.34	0.76
34	2046.83	0.34	37.2	0.73	0.91	1	0.03	34.0	40.14	0.00	33.16	0.76
35	2047.56	0.28	36.6	0.73	0.91	1	0.03	34.0	32.34	0.00	26.74	0.76
36	2048.29	0.20	36.6	0.73	0.91	1	0.03	34.0	23.72	0.00	19.61	0.76

37	2049.02	0.13	36.1	0.74	0.91	1	0.03	34.0	14.67	0.00	12.13	0.76
38	2049.76	0.04	36.1	0.74	0.91	1	0.03	34.0	4.89	0.00	4.03	0.76

X-S Area: 19.66 Path Length: 34.71 X-S Weight: 2297.69

11. Analysis 3

11.1. DATA: Analysis 3 - Waste dump in active conditions.

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (41 points) Material beneath: 2 - Gniess
0.00 8055.00 333.41 7993.84 526.18 7935.00 727.94 7869.29 840.63 7864.19
1012.55 7834.88 1168.37 7780.00 1214.81 7755.00 1262.74 7756.41 1296.49 7752.45
1513.10 7695.10 1668.85 7634.24 1707.92 7629.41 1747.56 7635.23 1812.08 7650.00
1900.00 7656.37 1965.57 7641.58 2058.82 7605.00 2146.10 7572.77 2174.38 7563.85
2192.84 7565.00 2219.74 7571.55 2236.48 7571.31 2316.06 7547.86 2360.72 7533.98
2424.03 7519.40 2493.99 7485.00 2521.86 7476.45 2578.74 7472.75 2625.75 7461.92
2696.56 7451.58 2757.83 7449.33 2791.15 7440.81 2830.50 7423.50 2861.71 7415.00
2932.63 7395.00 2956.08 7389.94 2992.34 7386.49 3032.29 7386.71 3051.33 7390.00
3069.40 7400.00
Profile: 2 (2 points) Material beneath: 1 - Crusher Waste Fines
27.25 8050.00 2700.00 8050.00

Slope Surface (14 points)

27.26 8050.00 1300.00 8050.00 2639.00 7459.98 2696.56 7451.58 2757.83 7449.33
2791.15 7440.81 2830.50 7423.50 2861.71 7415.00 2932.63 7395.00 2956.08 7389.94
2992.34 7386.49 3032.29 7386.71 3051.33 7390.00 3069.40 7400.00

Phreatic Surface (2 points)

0.00 7000.00 3020.00 7000.00

Piezometric Surfaces (1 surface)

Surface within profile: 2 (41 points) - Crusher Waste Fines
0.00 8057.00 333.41 7995.84 526.18 7937.00 727.94 7871.29 840.63 7866.19

1012.55	7836.88	1168.37	7782.00	1214.81	7757.00	1262.74	7758.41	1296.49	7754.45
1513.10	7697.10	1668.85	7636.24	1707.92	7631.41	1747.56	7637.23	1812.08	7652.00
1900.00	7658.37	1965.57	7643.58	2058.82	7607.00	2146.10	7574.77	2174.38	7565.85
2192.84	7567.00	2219.74	7573.55	2236.48	7573.31	2316.06	7549.86	2360.72	7535.98
2424.03	7521.40	2493.99	7487.00	2521.86	7478.45	2578.74	7474.75	2625.75	7463.92
2696.56	7453.58	2757.83	7451.33	2791.15	7442.81	2830.50	7425.50	2861.71	7417.00
2932.63	7397.00	2956.08	7391.94	2992.34	7388.49	3032.29	7388.71	3051.33	7392.00
3069.40	7402.00								

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 1957.00 YL: 7760.50 XR: 2098.00 YR: 7698.37
Centre: XC: 2085.88 YC: 7861.92 Radius: R: 164.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	135.00	95.00	25.00
Trial positions within range:	50	50	50

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11.2. RESULTS: Analysis 3 - Waste dump in reclaimed conditions (>2H:1V).

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 1.715

Analysis Summary

There were: 125001 successful analyses from a total of 125001 trial failure surfaces

Critical (minimum) Factor of Safety: 1.54
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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	2024.50	7730.75	2050.50	7719.30	2108.44	7886.02	176.50	1.537	<-- Critical Surface
2	2024.50	7730.75	2050.50	7719.30	2108.23	7885.55	175.99	1.537	
3	2024.50	7730.75	2050.50	7719.30	2107.82	7884.61	174.97	1.537	
4	2024.50	7730.75	2050.50	7719.30	2108.03	7885.08	175.48	1.537	
5	2024.50	7730.75	2050.50	7719.30	2107.62	7884.14	174.46	1.537	
6	2024.50	7730.75	2050.50	7719.30	2107.41	7883.67	173.95	1.537	
7	2024.50	7730.75	2050.50	7719.30	2107.20	7883.21	173.44	1.537	
8	2024.50	7730.75	2050.50	7719.30	2107.00	7882.74	172.93	1.537	

9	2024.50	7730.75	2050.50	7719.30	2106.79	7882.27	172.42	1.537
10	2024.50	7730.75	2050.50	7719.30	2106.58	7881.80	171.91	1.537
11	2024.50	7730.75	2050.50	7719.30	2106.17	7880.86	170.89	1.537
12	2024.50	7730.75	2050.50	7719.30	2106.38	7881.33	171.40	1.537
13	2024.50	7730.75	2050.50	7719.30	2105.96	7880.40	170.38	1.537
14	2024.50	7730.75	2050.50	7719.30	2105.76	7879.93	169.87	1.537
15	2024.50	7730.75	2050.50	7719.30	2105.55	7879.46	169.36	1.537
16	2024.50	7730.75	2050.50	7719.30	2105.34	7878.99	168.85	1.537
17	2024.50	7730.75	2050.50	7719.30	2104.93	7878.05	167.83	1.537
18	2024.50	7730.75	2050.50	7719.30	2105.14	7878.52	168.34	1.537
19	2024.50	7730.75	2050.50	7719.30	2104.73	7877.58	167.32	1.538
20	2024.50	7730.75	2050.50	7719.30	2104.52	7877.12	166.81	1.538
21	2024.50	7730.75	2050.50	7719.30	2104.31	7876.65	166.30	1.538
22	2024.50	7730.75	2052.44	7718.44	2109.37	7885.51	176.50	1.538
23	2024.50	7730.75	2052.44	7718.44	2109.17	7885.04	175.99	1.538
24	2024.50	7730.75	2050.50	7719.30	2104.11	7876.18	165.79	1.538
25	2024.50	7730.75	2050.50	7719.30	2103.90	7875.71	165.28	1.538
26	2024.50	7730.75	2052.44	7718.44	2108.75	7884.10	174.97	1.538
27	2024.50	7730.75	2052.44	7718.44	2108.96	7884.57	175.48	1.538
28	2024.50	7730.75	2050.50	7719.30	2103.69	7875.24	164.77	1.538
29	2024.50	7730.75	2050.50	7719.30	2103.49	7874.77	164.26	1.538
30	2024.50	7730.75	2052.44	7718.44	2108.55	7883.63	174.46	1.538
31	2024.50	7730.75	2050.50	7719.30	2103.28	7874.30	163.74	1.538
32	2024.50	7730.75	2052.44	7718.44	2108.34	7883.17	173.95	1.538
33	2024.50	7730.75	2050.50	7719.30	2103.07	7873.83	163.23	1.538
34	2024.50	7730.75	2052.44	7718.44	2108.13	7882.70	173.44	1.538
35	2024.50	7730.75	2050.50	7719.30	2102.87	7873.37	162.72	1.538
36	2024.50	7730.75	2052.44	7718.44	2107.93	7882.23	172.93	1.538
37	2024.50	7730.75	2050.50	7719.30	2102.66	7872.90	162.21	1.538
38	2024.50	7730.75	2052.44	7718.44	2107.72	7881.76	172.42	1.538
39	2024.50	7730.75	2052.44	7718.44	2107.51	7881.29	171.91	1.538
40	2021.74	7731.97	2050.50	7719.30	2107.01	7886.51	176.50	1.538
41	2024.50	7730.75	2050.50	7719.30	2102.25	7871.96	161.19	1.538
42	2024.50	7730.75	2050.50	7719.30	2102.45	7872.43	161.70	1.538
43	2021.74	7731.97	2050.50	7719.30	2106.80	7886.04	175.99	1.538
44	2021.74	7731.97	2050.50	7719.30	2106.60	7885.57	175.48	1.538
45	2024.50	7730.75	2052.44	7718.44	2107.31	7880.82	171.40	1.538
46	2024.50	7730.75	2050.50	7719.30	2102.04	7871.49	160.68	1.538
47	2024.50	7730.75	2052.44	7718.44	2107.10	7880.35	170.89	1.538
48	2024.50	7730.75	2052.44	7718.44	2106.89	7879.88	170.38	1.538
49	2021.74	7731.97	2050.50	7719.30	2106.39	7885.10	174.97	1.538
50	2021.74	7731.97	2050.50	7719.30	2106.18	7884.63	174.46	1.538
51	2024.50	7730.75	2050.50	7719.30	2101.83	7871.02	160.17	1.538
52	2024.50	7730.75	2050.50	7719.30	2101.63	7870.55	159.66	1.538
53	2024.50	7730.75	2052.44	7718.44	2106.69	7879.42	169.87	1.538
54	2021.74	7731.97	2050.50	7719.30	2105.98	7884.16	173.95	1.538
55	2024.50	7730.75	2052.44	7718.44	2106.28	7878.48	168.85	1.538
56	2024.50	7730.75	2050.50	7719.30	2101.42	7870.08	159.15	1.538
57	2021.74	7731.97	2050.50	7719.30	2105.77	7883.69	173.44	1.538
58	2024.50	7730.75	2052.44	7718.44	2106.48	7878.95	169.36	1.538

59	2021.74	7731.97	2050.50	7719.30	2105.56	7883.23	172.93	1.538
60	2024.50	7730.75	2052.44	7718.44	2106.07	7878.01	168.34	1.538
61	2024.50	7730.75	2050.50	7719.30	2101.01	7869.15	158.13	1.538
62	2024.50	7730.75	2050.50	7719.30	2101.21	7869.62	158.64	1.538
63	2021.74	7731.97	2050.50	7719.30	2105.15	7882.29	171.91	1.538
64	2021.74	7731.97	2050.50	7719.30	2105.36	7882.76	172.42	1.538
65	2024.50	7730.75	2052.44	7718.44	2105.86	7877.54	167.83	1.538
66	2024.50	7730.75	2050.50	7719.30	2100.80	7868.68	157.62	1.538
67	2024.50	7730.75	2052.44	7718.44	2105.66	7877.07	167.32	1.538
68	2021.74	7731.97	2050.50	7719.30	2104.95	7881.82	171.40	1.538
69	2024.50	7730.75	2050.50	7719.30	2100.59	7868.21	157.11	1.538
70	2024.50	7730.75	2050.50	7719.30	2100.39	7867.74	156.60	1.538
71	2024.50	7730.75	2052.44	7718.44	2105.45	7876.60	166.81	1.538
72	2024.50	7730.75	2052.44	7718.44	2105.24	7876.13	166.30	1.538
73	2024.50	7730.75	2054.38	7717.59	2110.30	7884.99	176.50	1.538
74	2021.74	7731.97	2050.50	7719.30	2104.74	7881.35	170.89	1.538
75	2024.50	7730.75	2050.50	7719.30	2100.18	7867.27	156.09	1.538
76	2021.74	7731.97	2050.50	7719.30	2104.33	7880.41	169.87	1.538
77	2021.74	7731.97	2050.50	7719.30	2104.53	7880.88	170.38	1.538
78	2024.50	7730.75	2052.44	7718.44	2105.04	7875.67	165.79	1.538
79	2024.50	7730.75	2054.38	7717.59	2110.10	7884.53	175.99	1.538
80	2024.50	7730.75	2050.50	7719.30	2099.97	7866.80	155.58	1.538
81	2024.50	7730.75	2054.38	7717.59	2109.89	7884.06	175.48	1.538
82	2024.50	7730.75	2052.44	7718.44	2104.83	7875.20	165.28	1.538
83	2024.50	7730.75	2054.38	7717.59	2109.68	7883.59	174.97	1.538
84	2021.74	7731.97	2050.50	7719.30	2104.12	7879.94	169.36	1.538
85	2024.50	7730.75	2050.50	7719.30	2099.77	7866.33	155.07	1.538
86	2024.50	7730.75	2052.44	7718.44	2104.62	7874.73	164.77	1.538
87	2021.74	7731.97	2050.50	7719.30	2103.91	7879.47	168.85	1.538
88	2024.50	7730.75	2050.50	7719.30	2099.35	7865.40	154.05	1.538
89	2021.74	7731.97	2050.50	7719.30	2103.71	7879.01	168.34	1.538
90	2024.50	7730.75	2050.50	7719.30	2099.56	7865.87	154.56	1.538
91	2024.50	7730.75	2054.38	7717.59	2109.48	7883.12	174.46	1.538
92	2024.50	7730.75	2052.44	7718.44	2104.42	7874.26	164.26	1.538
93	2024.50	7730.75	2054.38	7717.59	2109.27	7882.65	173.95	1.538
94	2024.50	7730.75	2050.50	7719.30	2099.15	7864.93	153.54	1.538
95	2021.74	7731.97	2050.50	7719.30	2103.50	7878.54	167.83	1.538
96	2024.50	7730.75	2052.44	7718.44	2104.21	7873.79	163.74	1.538
97	2024.50	7730.75	2054.38	7717.59	2109.06	7882.18	173.44	1.538
98	2024.50	7730.75	2054.38	7717.59	2108.86	7881.71	172.93	1.538
99	2024.50	7730.75	2052.44	7718.44	2104.00	7873.32	163.23	1.538

Critical Failure Surface (circle 1)

Intersects: XL: 2024.50 YL: 7730.75 XR: 2050.50 YR: 7719.30

Centre: XC: 2108.44 YC: 7886.02 Radius: R: 176.50

Generated failure surface: (20 points)

2024.50	7730.75	2025.82	7730.05	2027.15	7729.35	2028.48	7728.67	2029.81	7728.00
2031.16	7727.34	2032.51	7726.69	2033.86	7726.05	2035.22	7725.42	2036.58	7724.81
2037.95	7724.20	2039.33	7723.61	2040.71	7723.03	2042.09	7722.46	2043.48	7721.90

2044.88 7721.36 2046.28 7720.83 2047.68 7720.30 2049.09 7719.80 2050.50 7719.30

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	2024.50	0.02	28.1	0.66	0.75	1	0.03	34.0	2.37	0.00	2.90	0.92
2	2025.16	0.06	28.1	0.66	0.75	1	0.03	34.0	7.20	0.00	8.82	0.92
3	2025.82	0.10	27.7	0.66	0.75	1	0.03	34.0	11.77	0.00	14.42	0.92
4	2026.48	0.14	27.7	0.66	0.75	1	0.03	34.0	16.08	0.00	19.71	0.92
5	2027.15	0.17	27.2	0.67	0.75	1	0.03	34.0	20.18	0.00	24.72	0.92
6	2027.81	0.21	27.2	0.67	0.75	1	0.03	34.0	23.98	0.00	29.39	0.92
7	2028.48	0.24	26.7	0.67	0.75	1	0.03	34.0	27.60	0.00	33.80	0.92
8	2029.15	0.26	26.7	0.67	0.75	1	0.03	34.0	30.88	0.00	37.83	0.92
9	2029.81	0.29	26.2	0.67	0.75	1	0.03	34.0	33.96	0.00	41.58	0.92
10	2030.49	0.31	26.2	0.67	0.75	1	0.03	34.0	36.72	0.00	44.96	0.92
11	2031.16	0.34	25.7	0.67	0.75	1	0.03	34.0	39.34	0.00	48.14	0.92
12	2031.83	0.35	25.7	0.67	0.75	1	0.03	34.0	41.49	0.00	50.79	0.92
13	2032.51	0.37	25.2	0.68	0.75	1	0.03	34.0	43.63	0.00	53.40	0.92
14	2033.18	0.39	25.2	0.68	0.75	1	0.03	34.0	45.26	0.00	55.37	0.92
15	2033.86	0.40	24.8	0.68	0.75	1	0.03	34.0	46.80	0.00	57.25	0.92
16	2034.54	0.41	24.8	0.68	0.75	1	0.03	34.0	47.91	0.00	58.62	0.92
17	2035.22	0.42	24.3	0.68	0.75	1	0.03	34.0	48.92	0.00	59.85	0.92
18	2035.90	0.42	24.3	0.68	0.75	1	0.03	34.0	49.50	0.00	60.56	0.92
19	2036.58	0.43	23.8	0.68	0.75	1	0.03	34.0	49.96	0.00	61.12	0.92
20	2037.27	0.43	23.8	0.69	0.75	1	0.03	34.0	49.97	0.00	61.12	0.92
21	2037.95	0.43	23.3	0.69	0.75	1	0.03	34.0	49.84	0.00	60.97	0.92
22	2038.64	0.42	23.3	0.69	0.75	1	0.03	34.0	49.29	0.00	60.30	0.92
23	2039.33	0.42	22.8	0.69	0.75	1	0.03	34.0	48.60	0.00	59.46	0.92
24	2040.02	0.41	22.8	0.69	0.75	1	0.03	34.0	47.53	0.00	58.14	0.92
25	2040.71	0.40	22.3	0.69	0.75	1	0.03	34.0	46.28	0.00	56.63	0.92
26	2041.40	0.38	22.3	0.69	0.75	1	0.03	34.0	44.58	0.00	54.55	0.92
27	2042.09	0.37	21.9	0.69	0.75	1	0.03	34.0	42.75	0.00	52.31	0.92
28	2042.79	0.35	21.8	0.69	0.75	1	0.03	34.0	40.53	0.00	49.61	0.92
29	2043.48	0.33	21.3	0.70	0.75	1	0.03	34.0	38.12	0.00	46.67	0.92
30	2044.18	0.30	21.3	0.70	0.75	1	0.03	34.0	35.30	0.00	43.21	0.92
31	2044.88	0.28	20.9	0.70	0.75	1	0.03	34.0	32.30	0.00	39.55	0.92
32	2045.58	0.25	20.9	0.70	0.75	1	0.03	34.0	28.90	0.00	35.40	0.92
33	2046.28	0.22	20.4	0.70	0.75	1	0.03	34.0	25.27	0.00	30.96	0.92
34	2046.98	0.18	20.4	0.70	0.75	1	0.03	34.0	21.31	0.00	26.10	0.92
35	2047.68	0.15	19.9	0.70	0.75	1	0.03	34.0	17.12	0.00	20.98	0.92
36	2048.38	0.11	19.9	0.70	0.75	1	0.03	34.0	12.53	0.00	15.37	0.92
37	2049.09	0.07	19.4	0.71	0.75	1	0.03	34.0	7.74	0.00	9.49	0.92
38	2049.79	0.02	19.4	0.71	0.75	1	0.03	34.0	2.58	0.00	3.16	0.92

X-S Area: 10.81 Path Length: 28.44 X-S Weight: 1264.09

12. Analysis 4

12.1. DATA: Analysis 4 - Waste dump in reclaimed conditions (>2H:1V).

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Crusher Waste Fines
Cohesion Phi UnitWeight Ru
0.03 34.0 116.90 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Gniess
Cohesion Phi UnitWeight Ru
400000.00 30.0 160.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Quartenary colluvium
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (41 points) Material beneath: 2 - Gniess
0.00 8055.00 333.41 7993.84 526.18 7935.00 727.94 7869.29 840.63 7864.19
1012.55 7834.88 1168.37 7780.00 1214.81 7755.00 1262.74 7756.41 1296.49 7752.45
1513.10 7695.10 1668.85 7634.24 1707.92 7629.41 1747.56 7635.23 1812.08 7650.00
1900.00 7656.37 1965.57 7641.58 2058.82 7605.00 2146.10 7572.77 2174.38 7563.85
2192.84 7565.00 2219.74 7571.55 2236.48 7571.31 2316.06 7547.86 2360.72 7533.98
2424.03 7519.40 2493.99 7485.00 2521.86 7476.45 2578.74 7472.75 2625.75 7461.92
2696.56 7451.58 2757.83 7449.33 2791.15 7440.81 2830.50 7423.50 2861.71 7415.00
2932.63 7395.00 2956.08 7389.94 2992.34 7386.49 3032.29 7386.71 3051.33 7390.00
3069.40 7400.00
Profile: 2 (2 points) Material beneath: 1 - Crusher Waste Fines
27.25 8050.00 2700.00 8050.00

Slope Surface (14 points)

27.26 8050.00 1300.00 8050.00 2639.00 7459.98 2696.56 7451.58 2757.83 7449.33
2791.15 7440.81 2830.50 7423.50 2861.71 7415.00 2932.63 7395.00 2956.08 7389.94
2992.34 7386.49 3032.29 7386.71 3051.33 7390.00 3069.40 7400.00

Phreatic Surface (2 points)

0.00 7000.00 3020.00 7000.00

Piezometric Surfaces (1 surface)

Surface within profile: 2 (41 points) - Crusher Waste Fines
0.00 8057.00 333.41 7995.84 526.18 7937.00 727.94 7871.29 840.63 7866.19

1012.55	7836.88	1168.37	7782.00	1214.81	7757.00	1262.74	7758.41	1296.49	7754.45
1513.10	7697.10	1668.85	7636.24	1707.92	7631.41	1747.56	7637.23	1812.08	7652.00
1900.00	7658.37	1965.57	7643.58	2058.82	7607.00	2146.10	7574.77	2174.38	7565.85
2192.84	7567.00	2219.74	7573.55	2236.48	7573.31	2316.06	7549.86	2360.72	7535.98
2424.03	7521.40	2493.99	7487.00	2521.86	7478.45	2578.74	7474.75	2625.75	7463.92
2696.56	7453.58	2757.83	7451.33	2791.15	7442.81	2830.50	7425.50	2861.71	7417.00
2932.63	7397.00	2956.08	7391.94	2992.34	7388.49	3032.29	7388.71	3051.33	7392.00
3069.40	7402.00								

Failure Surface (Critical seed, from a previous multiple analysis)

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 2024.50 YL: 7730.75 XR: 2050.50 YR: 7719.30
Centre: XC: 2108.44 YC: 7886.02 Radius: R: 176.50

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.050

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	135.00	95.00	25.00
Trial positions within range:	50	50	50

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12.2. RESULTS: Analysis 4 - Waste dump in reclaimed conditions (>2H:1V). Seismic conditions

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 1.350

Analysis Summary

There were: 81224 successful analyses from a total of 125001 trial failure surfaces
43777 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.35
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Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	1990.06	7745.93	2010.76	7736.81	2076.28	7913.55	188.49	1.349	<-- Critical Surface

2	2053.43	7718.01	2074.73	7708.62	2140.15	7885.94	189.00	1.349
3	2075.47	7708.30	2096.06	7699.22	2161.43	7875.47	187.98	1.349
4	2034.14	7726.51	2055.35	7717.16	2120.61	7893.99	188.49	1.349
5	2075.47	7708.30	2096.06	7699.22	2161.64	7875.94	188.49	1.349
6	2064.45	7713.15	2084.43	7704.35	2150.52	7881.42	189.00	1.349
7	2006.59	7738.65	2028.20	7729.12	2093.25	7906.03	188.49	1.349
8	2020.37	7732.58	2041.78	7723.14	2107.13	7900.48	189.00	1.349
9	2047.92	7720.44	2068.92	7711.18	2134.08	7887.51	187.98	1.349
10	2053.43	7718.01	2074.73	7708.62	2139.74	7885.00	187.98	1.349
11	2061.69	7714.37	2082.49	7705.20	2147.54	7881.02	187.47	1.349
12	2053.43	7718.01	2074.73	7708.62	2139.94	7885.47	188.49	1.349
13	2020.37	7732.58	2041.78	7723.14	2106.93	7900.01	188.49	1.349
14	2012.10	7736.22	2032.08	7727.41	2098.17	7904.48	189.00	1.349
15	2028.63	7728.93	2049.53	7719.73	2114.95	7896.50	188.49	1.349
16	2023.12	7731.36	2043.71	7722.29	2109.49	7899.47	189.00	1.349
17	2067.20	7711.94	2088.31	7702.64	2153.62	7879.45	188.49	1.349
18	2014.86	7735.00	2035.96	7725.71	2101.48	7902.98	189.00	1.349
19	1992.82	7744.72	2012.69	7735.96	2078.84	7913.00	189.00	1.349
20	2067.20	7711.94	2088.31	7702.64	2153.82	7879.92	189.00	1.349
21	2058.94	7715.58	2080.55	7706.06	2145.81	7883.43	189.00	1.349
22	2061.69	7714.37	2082.49	7705.20	2148.16	7882.43	189.00	1.349
23	2047.92	7720.44	2068.92	7711.18	2134.49	7888.44	189.00	1.349
24	2001.08	7741.07	2022.39	7731.69	2086.97	7907.13	186.96	1.349
25	2014.86	7735.00	2035.96	7725.71	2101.27	7902.52	188.49	1.349
26	2031.39	7727.72	2051.47	7718.87	2116.89	7894.55	187.47	1.349
27	2072.71	7709.51	2094.12	7700.08	2159.48	7877.42	189.00	1.349
28	2023.12	7731.36	2043.71	7722.29	2108.46	7897.13	186.45	1.349
29	1995.57	7743.50	2016.57	7734.25	2081.73	7910.57	187.98	1.349
30	2003.84	7739.86	2024.33	7730.83	2089.75	7907.06	187.98	1.349
31	2003.84	7739.86	2024.33	7730.83	2089.95	7907.53	188.49	1.349
32	2056.18	7716.79	2076.67	7707.76	2142.30	7884.46	188.49	1.349
33	1995.57	7743.50	2016.57	7734.25	2081.94	7911.04	188.49	1.349
34	2075.47	7708.30	2096.06	7699.22	2161.22	7875.00	187.47	1.349
35	2009.35	7737.43	2030.14	7728.27	2095.82	7905.49	189.00	1.349
36	2017.61	7733.79	2037.90	7724.85	2103.83	7901.98	189.00	1.349
37	2056.18	7716.79	2076.67	7707.76	2142.51	7884.93	189.00	1.349
38	2009.35	7737.43	2030.14	7728.27	2094.99	7903.62	186.96	1.349
39	1984.55	7748.36	2004.94	7739.37	2070.82	7916.52	189.00	1.349
40	2058.94	7715.58	2080.55	7706.06	2145.40	7882.50	187.98	1.349
41	1995.57	7743.50	2016.57	7734.25	2081.32	7909.64	186.96	1.349
42	2061.69	7714.37	2082.49	7705.20	2147.96	7881.96	188.49	1.349
43	1995.57	7743.50	2016.57	7734.25	2082.14	7911.51	189.00	1.349
44	2039.65	7724.08	2061.16	7714.60	2126.47	7891.96	189.00	1.349
45	2003.84	7739.86	2024.33	7730.83	2090.16	7908.00	189.00	1.349
46	2069.96	7710.72	2090.24	7701.78	2155.98	7878.44	188.49	1.349
47	2056.18	7716.79	2076.67	7707.76	2142.09	7883.99	187.98	1.349
48	1987.31	7747.14	2008.82	7737.67	2073.92	7914.56	188.49	1.349
49	2017.61	7733.79	2037.90	7724.85	2102.80	7899.64	186.45	1.349
50	2001.08	7741.07	2022.39	7731.69	2087.80	7909.01	189.00	1.349
51	2001.08	7741.07	2022.39	7731.69	2087.39	7908.07	187.98	1.349

52	2036.90	7725.29	2057.29	7716.31	2123.17	7893.45	189.00	1.349
53	2012.10	7736.22	2032.08	7727.41	2097.76	7903.55	187.98	1.349
54	1981.80	7749.57	2003.00	7740.23	2068.26	7917.06	188.49	1.349
55	2028.63	7728.93	2049.53	7719.73	2115.15	7896.97	189.00	1.349
56	2025.88	7730.15	2047.59	7720.58	2112.79	7897.98	189.00	1.349
57	1987.31	7747.14	2008.82	7737.67	2074.13	7915.02	189.00	1.349
58	1998.33	7742.29	2018.51	7733.39	2084.50	7910.50	189.00	1.349
59	2034.14	7726.51	2055.35	7717.16	2120.20	7893.06	187.47	1.349
60	2061.69	7714.37	2082.49	7705.20	2147.75	7881.49	187.98	1.349
61	2031.39	7727.72	2053.41	7718.02	2118.45	7895.47	189.00	1.349
62	2017.61	7733.79	2037.90	7724.85	2102.60	7899.17	185.94	1.349
63	1981.80	7749.57	2003.00	7740.23	2067.64	7915.66	186.96	1.349
64	2031.39	7727.72	2051.47	7718.87	2117.10	7895.02	187.98	1.349
65	1984.55	7748.36	2004.94	7739.37	2070.41	7915.58	187.98	1.349
66	2056.18	7716.79	2076.67	7707.76	2141.89	7883.53	187.47	1.349
67	1998.33	7742.29	2018.51	7733.39	2083.88	7909.10	187.47	1.349
68	2014.86	7735.00	2035.96	7725.71	2101.07	7902.05	187.98	1.349
69	1992.82	7744.72	2012.69	7735.96	2078.63	7912.54	188.49	1.349
70	2050.67	7719.22	2070.86	7710.33	2136.85	7887.43	189.00	1.349
71	1990.06	7745.93	2010.76	7736.81	2076.07	7913.08	187.98	1.349
72	2014.86	7735.00	2035.96	7725.71	2100.66	7901.11	186.96	1.349
73	1995.57	7743.50	2016.57	7734.25	2081.11	7909.17	186.45	1.349
74	1984.55	7748.36	2004.94	7739.37	2069.59	7913.71	185.94	1.349
75	2034.14	7726.51	2055.35	7717.16	2119.78	7892.12	186.45	1.349
76	2012.10	7736.22	2032.08	7727.41	2097.97	7904.01	188.49	1.349
77	1981.80	7749.57	2003.00	7740.23	2067.43	7915.19	186.45	1.349
78	2009.35	7737.43	2030.14	7728.27	2095.61	7905.02	188.49	1.349
79	2056.18	7716.79	2076.67	7707.76	2141.48	7882.59	186.45	1.349
80	2036.90	7725.29	2057.29	7716.31	2122.96	7892.98	188.49	1.349
81	1990.06	7745.93	2010.76	7736.81	2076.48	7914.01	189.00	1.349
82	2001.08	7741.07	2022.39	7731.69	2087.59	7908.54	188.49	1.349
83	2058.94	7715.58	2080.55	7706.06	2144.98	7881.56	186.96	1.349
84	2009.35	7737.43	2030.14	7728.27	2094.58	7902.68	185.94	1.349
85	2072.71	7709.51	2094.12	7700.08	2159.28	7876.95	188.49	1.349
86	2075.47	7708.30	2096.06	7699.22	2160.19	7872.66	184.92	1.349
87	1998.33	7742.29	2018.51	7733.39	2084.29	7910.03	188.49	1.349
88	2028.63	7728.93	2049.53	7719.73	2114.53	7895.56	187.47	1.349
89	2014.86	7735.00	2035.96	7725.71	2100.86	7901.58	187.47	1.349
90	1984.55	7748.36	2006.88	7738.52	2071.77	7916.03	189.00	1.349
91	2056.18	7716.79	2076.67	7707.76	2141.27	7882.12	185.94	1.349
92	1984.55	7748.36	2004.94	7739.37	2070.62	7916.05	188.49	1.349
93	2039.65	7724.08	2061.16	7714.60	2126.27	7891.49	188.49	1.349
94	1990.06	7745.93	2010.76	7736.81	2075.66	7912.14	186.96	1.349
95	2042.41	7722.86	2063.10	7713.75	2127.59	7888.14	185.94	1.349
96	2072.71	7709.51	2094.12	7700.08	2159.07	7876.48	187.98	1.349
97	2023.12	7731.36	2043.71	7722.29	2109.29	7899.00	188.49	1.349
98	2017.61	7733.79	2037.90	7724.85	2101.98	7897.77	184.41	1.349
99	2036.90	7725.29	2057.29	7716.31	2122.55	7892.05	187.47	1.349

Critical Failure Surface (circle 1)

Intersects: XL: 1990.06 YL: 7745.93 XR: 2010.76 YR: 7736.81

Centre: XC: 2076.28 YC: 7913.55 Radius: R: 188.49

Generated failure surface: (20 points)

1990.06	7745.93	1991.12	7745.39	1992.19	7744.85	1993.25	7744.33	1994.32	7743.80
1995.40	7743.29	1996.48	7742.78	1997.56	7742.28	1998.64	7741.79	1999.73	7741.30
2000.82	7740.82	2001.91	7740.35	2003.01	7739.88	2004.10	7739.42	2005.21	7738.97
2006.31	7738.52	2007.42	7738.08	2008.53	7737.65	2009.64	7737.23	2010.76	7736.81

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	1990.06	0.01	27.0	0.53	0.60	1	0.03	34.0	1.15	0.00	1.72	0.89
2	1990.59	0.03	27.1	0.53	0.60	1	0.03	34.0	3.45	0.00	5.17	0.89
3	1991.12	0.05	26.7	0.53	0.60	1	0.03	34.0	5.65	0.00	8.48	0.89
4	1991.65	0.07	26.7	0.53	0.60	1	0.03	34.0	7.68	0.00	11.53	0.89
5	1992.19	0.08	26.3	0.53	0.60	1	0.03	34.0	9.63	0.00	14.45	0.89
6	1992.72	0.10	26.3	0.53	0.60	1	0.03	34.0	11.42	0.00	17.16	0.89
7	1993.25	0.11	25.9	0.54	0.60	1	0.03	34.0	13.14	0.00	19.74	0.89
8	1993.79	0.13	26.0	0.54	0.60	1	0.03	34.0	14.67	0.00	22.02	0.89
9	1994.32	0.14	25.6	0.54	0.60	1	0.03	34.0	16.16	0.00	24.26	0.89
10	1994.86	0.15	25.6	0.54	0.60	1	0.03	34.0	17.44	0.00	26.19	0.89
11	1995.40	0.16	25.2	0.54	0.60	1	0.03	34.0	18.66	0.00	28.03	0.89
12	1995.94	0.17	25.2	0.54	0.60	1	0.03	34.0	19.68	0.00	29.57	0.89
13	1996.48	0.18	24.9	0.54	0.60	1	0.03	34.0	20.66	0.00	31.04	0.89
14	1997.02	0.18	24.9	0.54	0.60	1	0.03	34.0	21.40	0.00	32.15	0.89
15	1997.56	0.19	24.5	0.54	0.60	1	0.03	34.0	22.14	0.00	33.27	0.89
16	1998.10	0.19	24.5	0.54	0.60	1	0.03	34.0	22.67	0.00	34.06	0.89
17	1998.64	0.20	24.1	0.54	0.60	1	0.03	34.0	23.11	0.00	34.74	0.90
18	1999.18	0.20	24.1	0.54	0.60	1	0.03	34.0	23.39	0.00	35.15	0.90
19	1999.73	0.20	23.8	0.54	0.60	1	0.03	34.0	23.58	0.00	35.44	0.90
20	2000.27	0.20	23.8	0.54	0.60	1	0.03	34.0	23.58	0.00	35.44	0.90
21	2000.82	0.20	23.4	0.55	0.60	1	0.03	34.0	23.52	0.00	35.38	0.90
22	2001.36	0.20	23.4	0.55	0.60	1	0.03	34.0	23.27	0.00	34.99	0.90
23	2001.91	0.20	23.0	0.55	0.60	1	0.03	34.0	22.92	0.00	34.50	0.90
24	2002.46	0.19	23.1	0.55	0.60	1	0.03	34.0	22.36	0.00	33.64	0.90
25	2003.01	0.19	22.7	0.55	0.60	1	0.03	34.0	21.76	0.00	32.76	0.90
26	2003.55	0.18	22.7	0.55	0.60	1	0.03	34.0	21.01	0.00	31.62	0.90
27	2004.10	0.17	22.4	0.55	0.60	1	0.03	34.0	20.13	0.00	30.29	0.90
28	2004.65	0.16	22.3	0.55	0.60	1	0.03	34.0	19.05	0.00	28.69	0.90
29	2005.21	0.15	22.0	0.55	0.60	1	0.03	34.0	17.90	0.00	26.97	0.90
30	2005.76	0.14	22.0	0.55	0.60	1	0.03	34.0	16.58	0.00	24.98	0.90
31	2006.31	0.13	21.6	0.55	0.60	1	0.03	34.0	15.17	0.00	22.85	0.90
32	2006.86	0.12	21.6	0.55	0.60	1	0.03	34.0	13.59	0.00	20.48	0.90
33	2007.42	0.10	21.2	0.56	0.60	1	0.03	34.0	11.88	0.00	17.91	0.90
34	2007.97	0.09	21.2	0.55	0.60	1	0.03	34.0	9.98	0.00	15.05	0.90
35	2008.53	0.07	20.9	0.56	0.60	1	0.03	34.0	8.04	0.00	12.12	0.90
36	2009.08	0.05	20.9	0.56	0.60	1	0.03	34.0	5.88	0.00	8.86	0.90
37	2009.64	0.03	20.5	0.56	0.60	1	0.03	34.0	3.63	0.00	5.47	0.90

38 2010.20 0.01 20.5 0.56 0.60 1 0.03 34.0 1.21 0.00 1.82 0.90

X-S Area: 5.11 Path Length: 22.63 X-S Weight: 597.12