

## RULE 6.5 – GEOTECHNICAL STABILITY EXHIBIT

## **RULE 6.5: GEOTECHNICAL STABILITY EXHIBIT**

There are no known geologic hazards on the proposed site. Based on a slope stability analysis, buildings or other structures within 200' of the Peak Ranch Resource affected area will not be affected by mining excavation. Sufficient buffers will be maintained to neighboring property lines. Maps C-2A and C-2B shows these buffers. Map C-3 shows the mining and reclamation slopes of the mine. Various cross sections of the proposed mining and reclaimed slopes were modelled and analyzed for slope stability (see Figure GS-1 and Table GS-1).

The material properties are derived from Table 2.5 in the SME Mining Reference Handbook<sup>1</sup>, as there is no site-specific sample data of the material available. Therefore, all materials are matched to a classification from this table that best matches the materials in terms of description. The native alluvial material is best classified as sand and gravel with a mixed grain size. From the SME table, sand and gravel with a mixed grain size has an internal angle of friction of 45 degrees and no cohesion. A thin layer (18 inches thick) of overburden lies atop of the sand and gravel. It is described in the soil survey for the property as gravelly sandy loam. This best matches the description for loose sand, mixed grain size from the SME table, which has an internal angle of friction of 34 degrees and no cohesion.

The final slope will be created during mining, thus no backfill will be needed. The sand and gravel will be mined to a 3H:1V slope with a loader and dozer. Therefore, one slope model was developed and analyzed: full mining at the end of Phase 2 with a 3H:1V slope extending down into the groundwater lake.

### **1. Mining and Reclamation Slopes**

Slope stability is analyzed by comparing the resistive capacity of earth materials (soil, sands, rock, etc.) to the forces applied to them when they are in place as a built slope. In simpler terms, slope stability is a simple comparison of the *strength* of a slope to the *stress* on a slope. The *strength* of a slope is determined from the physical characteristics of the material within the slope (density, angle of friction, cohesion, etc.), the slope configuration (the slope one material

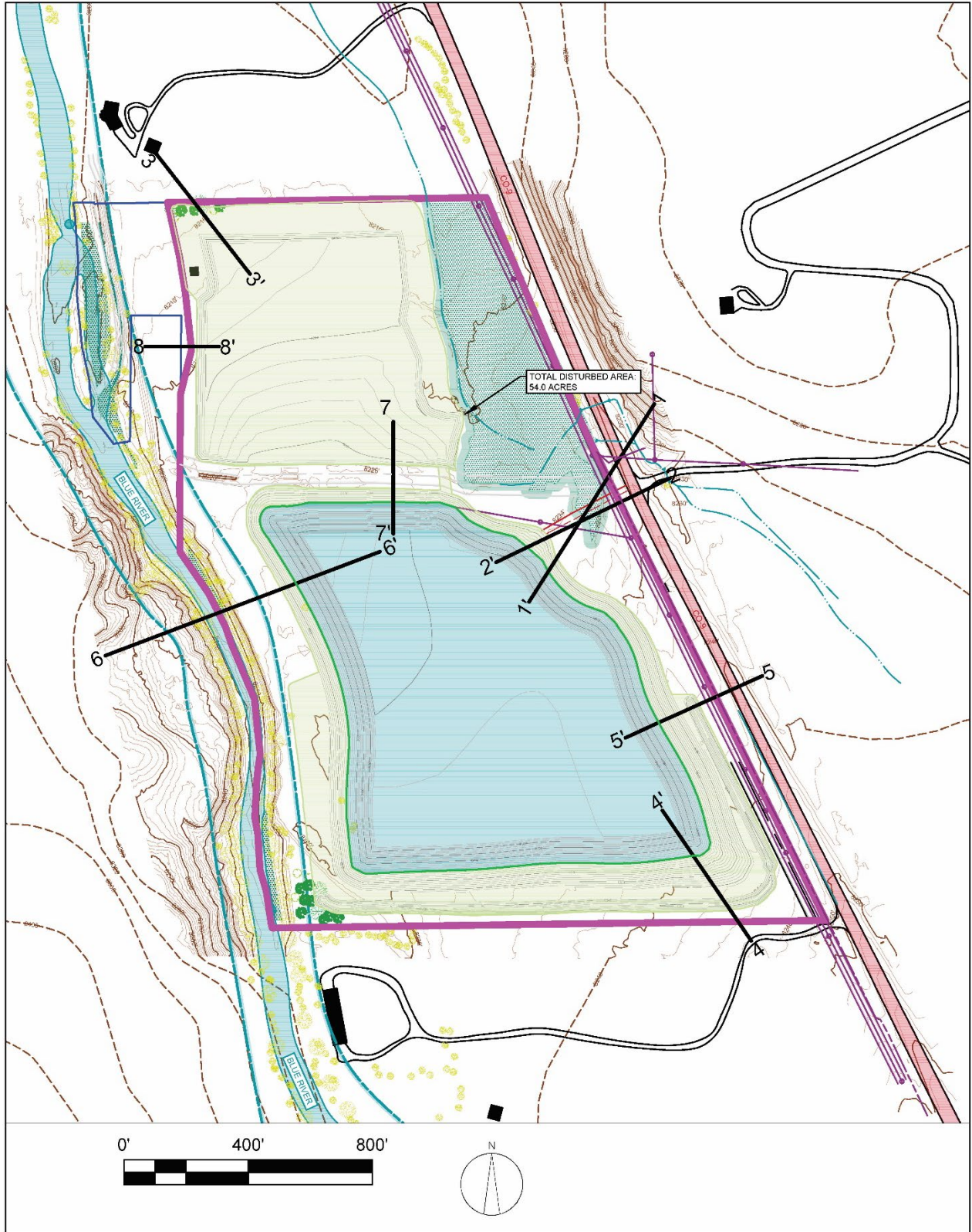
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<sup>1</sup> Original source: Houk and Bray 1977

or multiple materials in several in layers), and the presence of external forces (water pressure, cracks, presence or lack of retaining structures, etc.). The *stress* on a slope is determined from physical characteristics, the slope configuration, and external forces (sudden removal of water, weight applied to locations on the slope, etc.). Using a computer model, the strengths and stresses related to a given slope are compared using a standard engineering methodology to determine how many time stronger the slope is than the stress applied to it. This ratio is known as the Factor of Safety.

Factor of Safety is expressed in terms of strength divided by stress, and is a simple number. It is arrived at by an iterative computer process where a slope failure is assumed, the strength and stress of that slope failure are calculated, and those values are compared to determine a lowest factor of safety. In the case of the Peak Ranch slope stability analysis, the Bishop's Method of Slices was the iterative calculation used, and the software GALENA was used to model slopes and calculate the factor of safety. Seven different slopes (see Figure GS-1) were analyzed to look at the factor of safety for the slope in areas that have neighboring structures within 200' or slopes running parallel to the banks of the Blue River. Table GS-1 lists the slopes and their respective factors of safety. The lowest factor of safety for slope stability in operations of this type is 1.5. As shown in Table GS-1, the model demonstrated that the slopes proposed at Peak Ranch will have a lowest factor of safety of at least 2.0.

GALENA data tables and analysis result figures are attached as Appendix GS-1.



**Figure GS-1. Locations of Slope Stability Analysis**

**Table GS-1. Factors of Safety for Slope Stability**

<b>Slope Location</b>	<b>Lowest Factor of Safety</b>	<b>Notes</b>
<b>1</b>	2.8	East side of affected area.
<b>2</b>	2.9	East side of affected area.
<b>3</b>	3.0	Northwest corner of affected area.
<b>4</b>	2.0	Southwest corner of affected area.
<b>5</b>	2.0	East side of affected area.
<b>6</b>	2.1	West side of affected area, nearest the Blue River.
<b>7</b>	2.2	Drainage easement bisecting property.
<b>8</b>	2.6	Closest area of USFS land

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

Ben Langenfeld, P.E.  
P.E.# 0047151

**APPENDIX GS-1**

**GALENA INFORMATION**

# Section 1

GALENA 7.1 Analysis Results

Version: 7.10.1.02

Licensee: Greg Lewicki and Associates

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Project: Peak Ranch Resource  
File: E:\Work\Dropbox (GLA)\Elam\Hillyard\DRMS\Geotechnical Stability Exhibit\Peak Ranch 1.gmf  
Processed: 16 Jan 2020 12:13:03

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DATA: Analysis 1 - Geotechnical Stability Analysis

Material Properties (2 materials)

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Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto  
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (2 profiles)

-----  
Profile: 1 (11 points) Material beneath: 2 - Loose sand, mixed grain size  
0.00 8234.00 5.21 8234.00 90.56 8234.00 106.53 8236.00 158.60 8236.00  
174.09 8234.00 263.55 8232.00 306.41 8230.00 352.53 8228.00 712.73 8228.00  
800.00 8228.00  
Profile: 2 (11 points) Material beneath: 1 - Sand and gravel, mixed grain size  
0.00 8232.50 5.21 8232.50 90.65 8232.50 106.63 8234.50 158.51 8234.50  
173.98 8232.50 263.50 8230.50 306.34 8228.50 352.47 8226.50 712.66 8226.50  
800.00 8226.50

Slope Surface (7 points)

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174.09 8234.00 263.55 8232.00 306.41 8230.00 336.00 8228.70 352.53 8228.00  
550.53 8162.00 794.70 8162.00

Phreatic Surface (2 points)

-----  
-200.00 8218.00 700.00 8218.00

Failure Surface

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Initial circular surface for critical search defined by: XL, XR, R  
Intersects: XL: 334.00 YL: 8228.79 XR: 533.00 YR: 8167.84  
Centre: XC: 500.06 YC: 8415.66 Radius: R: 250.00

Variable Restraints

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 Parameter descriptor:           XL           XR           R  
 Range of variation:           200.00    180.00    31.00  
 Trial positions within range:   100       50       50

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 RESULTS: Analysis 1 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

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 Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 3.084

There were: 245330 successful analyses from a total of 250001 trial surfaces  
 4671 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.80

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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	349.15	8228.14	443.00	8197.84	466.51	8431.16	234.50	2.802	<-- Critical Surface
2	349.15	8228.14	443.00	8197.84	466.71	8431.78	235.13	2.802	
3	351.17	8228.06	443.00	8197.84	468.80	8430.92	234.50	2.802	
4	349.15	8228.14	443.00	8197.84	466.91	8432.39	235.77	2.802	
5	351.17	8228.06	443.00	8197.84	469.01	8431.53	235.13	2.802	
6	351.17	8228.06	443.00	8197.84	469.21	8432.15	235.77	2.802	
7	349.15	8228.14	443.00	8197.84	467.11	8433.01	236.40	2.803	
8	351.17	8228.06	443.00	8197.84	469.41	8432.76	236.40	2.803	
9	349.15	8228.14	443.00	8197.84	467.31	8433.62	237.03	2.803	
10	351.17	8228.06	443.00	8197.84	469.61	8433.38	237.03	2.803	
11	349.15	8228.14	443.00	8197.84	467.51	8434.24	237.66	2.803	
12	351.17	8228.06	443.00	8197.84	469.81	8433.99	237.66	2.803	
13	349.15	8228.14	443.00	8197.84	467.71	8434.86	238.30	2.803	
14	351.17	8228.06	443.00	8197.84	470.02	8434.60	238.30	2.803	
15	349.15	8228.14	443.00	8197.84	467.90	8435.47	238.93	2.803	
16	351.17	8228.06	443.00	8197.84	470.22	8435.22	238.93	2.803	
17	349.15	8228.14	443.00	8197.84	468.10	8436.09	239.56	2.804	
18	351.17	8228.06	443.00	8197.84	470.42	8435.83	239.56	2.804	
19	351.17	8228.06	443.00	8197.84	470.62	8436.44	240.19	2.804	
20	349.15	8228.14	443.00	8197.84	468.30	8436.70	240.19	2.804	
21	349.15	8228.14	443.00	8197.84	468.50	8437.32	240.83	2.804	
22	351.17	8228.06	443.00	8197.84	470.82	8437.06	240.83	2.804	
23	351.17	8228.06	443.00	8197.84	471.02	8437.67	241.46	2.804	
24	349.15	8228.14	443.00	8197.84	468.70	8437.93	241.46	2.804	
25	351.17	8228.06	443.00	8197.84	471.23	8438.28	242.09	2.804	



26	349.15	8228.14	443.00	8197.84	468.90	8438.55	242.09	2.805
27	351.17	8228.06	443.00	8197.84	471.43	8438.90	242.72	2.805
28	349.15	8228.14	443.00	8197.84	469.10	8439.16	242.72	2.805
29	351.17	8228.06	443.00	8197.84	471.63	8439.51	243.36	2.805
30	349.15	8228.14	443.00	8197.84	469.29	8439.78	243.36	2.805
31	351.17	8228.06	443.00	8197.84	471.83	8440.12	243.99	2.805
32	349.15	8228.14	443.00	8197.84	469.49	8440.39	243.99	2.805
33	351.17	8228.06	443.00	8197.84	472.03	8440.74	244.62	2.805
34	349.15	8228.14	443.00	8197.84	469.69	8441.01	244.62	2.805
35	351.17	8228.06	443.00	8197.84	472.24	8441.35	245.26	2.805
36	349.15	8228.14	443.00	8197.84	469.89	8441.62	245.26	2.806
37	351.17	8228.06	443.00	8197.84	472.44	8441.96	245.89	2.806
38	351.17	8228.06	443.00	8197.84	472.64	8442.58	246.52	2.806
39	349.15	8228.14	443.00	8197.84	470.09	8442.23	245.89	2.806
40	351.17	8228.06	443.00	8197.84	472.84	8443.19	247.15	2.806
41	349.15	8228.14	443.00	8197.84	470.29	8442.85	246.52	2.806
42	349.15	8228.14	446.67	8196.62	468.30	8430.12	234.50	2.806
43	351.17	8228.06	443.00	8197.84	473.04	8443.80	247.79	2.806
44	349.15	8228.14	443.00	8197.84	470.49	8443.46	247.15	2.806
45	349.15	8228.14	446.67	8196.62	468.50	8430.74	235.13	2.806
46	349.15	8228.14	446.67	8196.62	468.70	8431.35	235.77	2.806
47	351.17	8228.06	443.00	8197.84	473.24	8444.41	248.42	2.806
48	349.15	8228.14	443.00	8197.84	470.68	8444.08	247.79	2.807
49	351.17	8228.06	443.00	8197.84	473.44	8445.03	249.05	2.807
50	349.15	8228.14	446.67	8196.62	468.90	8431.97	236.40	2.807
51	349.15	8228.14	443.00	8197.84	470.88	8444.69	248.42	2.807
52	351.17	8228.06	443.00	8197.84	473.65	8445.64	249.68	2.807
53	349.15	8228.14	446.67	8196.62	469.09	8432.59	237.03	2.807
54	349.15	8228.14	443.00	8197.84	471.08	8445.31	249.05	2.807
55	349.15	8228.14	446.67	8196.62	469.29	8433.20	237.66	2.807
56	351.17	8228.06	443.00	8197.84	473.85	8446.25	250.32	2.807
57	349.15	8228.14	446.67	8196.62	469.49	8433.82	238.30	2.807
58	349.15	8228.14	443.00	8197.84	471.28	8445.92	249.68	2.807
59	351.17	8228.06	443.00	8197.84	474.05	8446.86	250.95	2.807
60	349.15	8228.14	446.67	8196.62	469.69	8434.44	238.93	2.807
61	349.15	8228.14	443.00	8197.84	471.48	8446.54	250.32	2.807
62	351.17	8228.06	443.00	8197.84	474.25	8447.48	251.58	2.807
63	349.15	8228.14	446.67	8196.62	469.89	8435.05	239.56	2.808
64	349.15	8228.14	443.00	8197.84	471.67	8447.15	250.95	2.808
65	351.17	8228.06	443.00	8197.84	474.45	8448.09	252.21	2.808
66	349.15	8228.14	446.67	8196.62	470.09	8435.67	240.19	2.808
67	351.17	8228.06	443.00	8197.84	474.65	8448.70	252.85	2.808
68	349.15	8228.14	443.00	8197.84	471.87	8447.76	251.58	2.808
69	349.15	8228.14	446.67	8196.62	470.29	8436.29	240.83	2.808
70	351.17	8228.06	443.00	8197.84	474.86	8449.31	253.48	2.808
71	349.15	8228.14	443.00	8197.84	472.07	8448.38	252.21	2.808
72	349.15	8228.14	446.67	8196.62	470.49	8436.90	241.46	2.808
73	351.17	8228.06	446.67	8196.62	470.54	8429.90	234.50	2.808
74	351.17	8228.06	443.00	8197.84	475.06	8449.93	254.11	2.808
75	351.17	8228.06	446.67	8196.62	470.75	8430.52	235.13	2.808
76	349.15	8228.14	443.00	8197.84	472.27	8448.99	252.85	2.808

77	351.17	8228.06	443.00	8197.84	475.26	8450.54	254.74	2.808
78	349.15	8228.14	446.67	8196.62	470.69	8437.52	242.09	2.808
79	349.15	8228.14	443.00	8197.84	472.47	8449.60	253.48	2.808
80	351.17	8228.06	446.67	8196.62	470.95	8431.13	235.77	2.808
81	349.15	8228.14	446.67	8196.62	470.89	8438.13	242.72	2.808
82	349.15	8228.14	443.00	8197.84	472.67	8450.22	254.11	2.809
83	351.17	8228.06	443.00	8197.84	475.46	8451.15	255.38	2.809
84	351.17	8228.06	446.67	8196.62	471.15	8431.75	236.40	2.809
85	349.15	8228.14	446.67	8196.62	471.09	8438.75	243.36	2.809
86	351.17	8228.06	443.00	8197.84	475.66	8451.76	256.01	2.809
87	349.15	8228.14	443.00	8197.84	472.86	8450.83	254.74	2.809
88	351.17	8228.06	446.67	8196.62	471.35	8432.36	237.03	2.809
89	349.15	8228.14	446.67	8196.62	471.29	8439.36	243.99	2.809
90	351.17	8228.06	443.00	8197.84	475.86	8452.37	256.64	2.809
91	351.17	8228.06	446.67	8196.62	471.55	8432.98	237.66	2.809
92	349.15	8228.14	443.00	8197.84	473.06	8451.45	255.38	2.809
93	349.15	8228.14	446.67	8196.62	471.48	8439.98	244.62	2.809
94	351.17	8228.06	446.67	8196.62	471.76	8433.59	238.30	2.809
95	351.17	8228.06	443.00	8197.84	476.06	8452.99	257.28	2.809
96	349.15	8228.14	443.00	8197.84	473.26	8452.06	256.01	2.809
97	351.17	8228.06	446.67	8196.62	471.96	8434.21	238.93	2.809
98	349.15	8228.14	446.67	8196.62	471.68	8440.60	245.26	2.809
99	351.17	8228.06	443.00	8197.84	476.26	8453.60	257.91	2.809

Critical Failure Surface (circle 1)

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Intersects: XL: 349.15 YL: 8228.14 XR: 443.00 YR: 8197.84  
Centre: XC: 466.51 YC: 8431.16 Radius: R: 234.50

Generated failure surface: (20 points)

349.15	8228.14	353.71	8225.58	358.32	8223.11	362.99	8220.75	367.70	8218.50
372.47	8216.35	377.28	8214.30	382.14	8212.37	387.04	8210.54	391.98	8208.82
396.96	8207.21	401.97	8205.72	407.01	8204.34	412.08	8203.07	417.18	8201.91
422.31	8200.87	427.46	8199.94	432.62	8199.12	437.80	8198.43	443.00	8197.84

Slice Geometry and Properties - Critical Failure Surface (circle 1, 42 slices)

Slice	X-S		Base						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	349.15	2.17	29.4	2.88	3.31	2	0.00	34.0	214.46	0.00	65.47	1.01	
2	352.04	0.70	29.4	0.43	0.50	1	0.00	45.0	69.92	0.00	134.20	0.96	
3	352.47	2.34	29.4	1.24	1.42	1	0.00	45.0	239.17	0.00	160.86	0.96	
4	353.71	3.65	28.1	1.66	1.88	1	0.00	45.0	386.12	0.00	195.22	0.95	
5	355.37	4.20	28.1	1.66	1.88	1	0.00	45.0	457.27	0.00	231.23	0.95	
6	357.03	3.65	28.1	1.29	1.46	1	0.00	45.0	401.24	0.00	261.18	0.95	
7	358.32	7.37	26.8	2.33	2.61	1	0.00	45.0	810.27	0.00	294.17	0.95	
8	360.65	8.31	26.8	2.33	2.61	1	0.00	45.0	914.02	0.00	331.83	0.95	
9	362.99	9.28	25.6	2.36	2.61	1	0.00	45.0	1020.65	0.00	369.62	0.95	
10	365.35	10.08	25.6	2.36	2.61	1	0.00	45.0	1109.09	0.00	401.64	0.95	
11	367.70	4.96	24.3	1.10	1.21	1	0.00	45.0	545.64	0.00	427.37	0.94	
12	368.80	8.59	24.3	1.83	2.01	1	0.00	45.0	944.61	51.97	447.33	0.94	
13	370.64	8.98	24.3	1.83	2.01	1	0.00	45.0	988.14	155.79	474.94	0.94	

14	372.47	12.32	23.0	2.41	2.61	1	0.00	45.0	1354.76	353.28	506.57	0.94
15	374.88	12.84	23.0	2.41	2.61	1	0.00	45.0	1412.92	520.04	536.00	0.94
16	377.28	13.42	21.7	2.43	2.61	1	0.00	45.0	1476.28	682.25	564.61	0.94
17	379.71	13.81	21.7	2.43	2.61	1	0.00	45.0	1518.79	840.29	587.46	0.94
18	382.14	2.24	20.4	0.39	0.41	1	0.00	45.0	246.23	147.39	602.05	0.94
19	382.53	13.14	20.5	2.26	2.41	1	0.00	45.0	1445.10	931.47	631.44	0.94
20	384.79	13.34	20.4	2.26	2.41	1	0.00	45.0	1467.14	1057.65	687.68	0.94
21	387.04	14.76	19.2	2.47	2.61	1	0.00	45.0	1623.10	1287.53	745.35	0.94
22	389.51	14.84	19.2	2.47	2.61	1	0.00	45.0	1632.65	1427.42	800.43	0.94
23	391.98	14.97	17.9	2.49	2.61	1	0.00	45.0	1646.21	1563.10	854.50	0.94
24	394.47	14.90	17.9	2.49	2.61	1	0.00	45.0	1639.27	1694.04	903.60	0.94
25	396.96	14.86	16.6	2.51	2.61	1	0.00	45.0	1635.07	1820.78	951.53	0.94
26	399.46	14.64	16.6	2.51	2.61	1	0.00	45.0	1610.58	1942.46	994.36	0.94
27	401.97	14.44	15.3	2.52	2.61	1	0.00	45.0	1588.42	2060.00	1036.15	0.94
28	404.49	14.06	15.3	2.52	2.61	1	0.00	45.0	1546.95	2172.79	1072.81	0.94
29	407.01	13.69	14.1	2.54	2.61	1	0.00	45.0	1505.86	2281.08	1108.20	0.95
30	409.55	13.16	14.1	2.54	2.61	1	0.00	45.0	1447.29	2384.60	1138.73	0.95
31	412.08	12.61	12.8	2.55	2.61	1	0.00	45.0	1387.38	2483.60	1167.71	0.95
32	414.63	11.92	12.8	2.55	2.61	1	0.00	45.0	1311.24	2578.33	1191.87	0.95
33	417.18	11.20	11.5	2.56	2.61	1	0.00	45.0	1232.49	2667.87	1214.40	0.95
34	419.75	10.35	11.5	2.56	2.61	1	0.00	45.0	1138.64	2752.96	1232.16	0.95
35	422.31	9.46	10.2	2.57	2.61	1	0.00	45.0	1040.96	2833.31	1248.13	0.95
36	424.88	8.45	10.2	2.57	2.61	1	0.00	45.0	929.56	2909.19	1259.45	0.95
37	427.46	7.39	9.0	2.58	2.61	1	0.00	45.0	812.68	2980.27	1268.67	0.96
38	430.04	6.21	8.9	2.58	2.61	1	0.00	45.0	683.65	3046.51	1273.64	0.96
39	432.62	4.98	7.7	2.59	2.61	1	0.00	45.0	547.81	3108.15	1276.06	0.96
40	435.21	3.65	7.7	2.59	2.61	1	0.00	45.0	401.11	3165.19	1274.43	0.96
41	437.80	2.24	6.4	2.60	2.61	1	0.00	45.0	246.46	3217.30	1269.98	0.97
42	440.40	0.75	6.4	2.60	2.61	1	0.00	45.0	82.06	3264.82	1261.81	0.97

-----  
X-S Area: 388.91 Path Length: 99.36 X-S Weight: 42711.28  
-----

DATA: Analysis 2 - Geotechnical Stability Analysis

Material Properties (2 materials)  
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Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties  
-----

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

Material Profiles (2 profiles)  
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Profile: 1 (11 points)      Material beneath: 2 - Loose sand, mixed grain size

0.00	8234.00	5.21	8234.00	90.56	8234.00	106.53	8236.00	158.60	8236.00
174.09	8234.00	263.55	8232.00	306.41	8230.00	352.53	8228.00	712.73	8228.00
800.00	8228.00								

Profile: 2 (11 points)      Material beneath: 1 - Sand and gravel, mixed grain size

0.00	8232.50	5.21	8232.50	90.65	8232.50	106.63	8234.50	158.51	8234.50
173.98	8232.50	263.50	8230.50	306.34	8228.50	352.47	8226.50	712.66	8226.50
800.00	8226.50								

Slope Surface (7 points)

-----

174.09	8234.00	263.55	8232.00	306.41	8230.00	336.00	8228.70	352.53	8228.00
550.53	8162.00	794.70	8162.00						

Phreatic Surface (2 points)

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-200.00	8218.00	700.00	8218.00
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Failure Surface

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

Intersects:	XL: 334.00	YL: 8228.79	XR: 533.00	YR: 8167.84
Centre:	XC: 500.06	YC: 8415.66	Radius: R: 250.00	

Variable Restraints

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Parameter descriptor:	XL	XR	R
Range of variation:	200.00	180.00	31.00
Trial positions within range:	100	50	50

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RESULTS: Analysis 2 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 3.084

There were: 245330 successful analyses from a total of 250001 trial surfaces  
4671 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.80

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Results Summary - Lowest 99 Factor of Safety circles

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Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	349.15	8228.14	443.00	8197.84	466.51	8431.16	234.50	2.802	<-- Critical Surface
2	349.15	8228.14	443.00	8197.84	466.71	8431.78	235.13	2.802	

3	351.17	8228.06	443.00	8197.84	468.80	8430.92	234.50	2.802
4	349.15	8228.14	443.00	8197.84	466.91	8432.39	235.77	2.802
5	351.17	8228.06	443.00	8197.84	469.01	8431.53	235.13	2.802
6	351.17	8228.06	443.00	8197.84	469.21	8432.15	235.77	2.802
7	349.15	8228.14	443.00	8197.84	467.11	8433.01	236.40	2.803
8	351.17	8228.06	443.00	8197.84	469.41	8432.76	236.40	2.803
9	349.15	8228.14	443.00	8197.84	467.31	8433.62	237.03	2.803
10	351.17	8228.06	443.00	8197.84	469.61	8433.38	237.03	2.803
11	349.15	8228.14	443.00	8197.84	467.51	8434.24	237.66	2.803
12	351.17	8228.06	443.00	8197.84	469.81	8433.99	237.66	2.803
13	349.15	8228.14	443.00	8197.84	467.71	8434.86	238.30	2.803
14	351.17	8228.06	443.00	8197.84	470.02	8434.60	238.30	2.803
15	349.15	8228.14	443.00	8197.84	467.90	8435.47	238.93	2.803
16	351.17	8228.06	443.00	8197.84	470.22	8435.22	238.93	2.803
17	349.15	8228.14	443.00	8197.84	468.10	8436.09	239.56	2.804
18	351.17	8228.06	443.00	8197.84	470.42	8435.83	239.56	2.804
19	351.17	8228.06	443.00	8197.84	470.62	8436.44	240.19	2.804
20	349.15	8228.14	443.00	8197.84	468.30	8436.70	240.19	2.804
21	349.15	8228.14	443.00	8197.84	468.50	8437.32	240.83	2.804
22	351.17	8228.06	443.00	8197.84	470.82	8437.06	240.83	2.804
23	351.17	8228.06	443.00	8197.84	471.02	8437.67	241.46	2.804
24	349.15	8228.14	443.00	8197.84	468.70	8437.93	241.46	2.804
25	351.17	8228.06	443.00	8197.84	471.23	8438.28	242.09	2.804
26	349.15	8228.14	443.00	8197.84	468.90	8438.55	242.09	2.805
27	351.17	8228.06	443.00	8197.84	471.43	8438.90	242.72	2.805
28	349.15	8228.14	443.00	8197.84	469.10	8439.16	242.72	2.805
29	351.17	8228.06	443.00	8197.84	471.63	8439.51	243.36	2.805
30	349.15	8228.14	443.00	8197.84	469.29	8439.78	243.36	2.805
31	351.17	8228.06	443.00	8197.84	471.83	8440.12	243.99	2.805
32	349.15	8228.14	443.00	8197.84	469.49	8440.39	243.99	2.805
33	351.17	8228.06	443.00	8197.84	472.03	8440.74	244.62	2.805
34	349.15	8228.14	443.00	8197.84	469.69	8441.01	244.62	2.805
35	351.17	8228.06	443.00	8197.84	472.24	8441.35	245.26	2.805
36	349.15	8228.14	443.00	8197.84	469.89	8441.62	245.26	2.806
37	351.17	8228.06	443.00	8197.84	472.44	8441.96	245.89	2.806
38	351.17	8228.06	443.00	8197.84	472.64	8442.58	246.52	2.806
39	349.15	8228.14	443.00	8197.84	470.09	8442.23	245.89	2.806
40	351.17	8228.06	443.00	8197.84	472.84	8443.19	247.15	2.806
41	349.15	8228.14	443.00	8197.84	470.29	8442.85	246.52	2.806
42	349.15	8228.14	446.67	8196.62	468.30	8430.12	234.50	2.806
43	351.17	8228.06	443.00	8197.84	473.04	8443.80	247.79	2.806
44	349.15	8228.14	443.00	8197.84	470.49	8443.46	247.15	2.806
45	349.15	8228.14	446.67	8196.62	468.50	8430.74	235.13	2.806
46	349.15	8228.14	446.67	8196.62	468.70	8431.35	235.77	2.806
47	351.17	8228.06	443.00	8197.84	473.24	8444.41	248.42	2.806
48	349.15	8228.14	443.00	8197.84	470.68	8444.08	247.79	2.807
49	351.17	8228.06	443.00	8197.84	473.44	8445.03	249.05	2.807
50	349.15	8228.14	446.67	8196.62	468.90	8431.97	236.40	2.807
51	349.15	8228.14	443.00	8197.84	470.88	8444.69	248.42	2.807
52	351.17	8228.06	443.00	8197.84	473.65	8445.64	249.68	2.807
53	349.15	8228.14	446.67	8196.62	469.09	8432.59	237.03	2.807

54	349.15	8228.14	443.00	8197.84	471.08	8445.31	249.05	2.807
55	349.15	8228.14	446.67	8196.62	469.29	8433.20	237.66	2.807
56	351.17	8228.06	443.00	8197.84	473.85	8446.25	250.32	2.807
57	349.15	8228.14	446.67	8196.62	469.49	8433.82	238.30	2.807
58	349.15	8228.14	443.00	8197.84	471.28	8445.92	249.68	2.807
59	351.17	8228.06	443.00	8197.84	474.05	8446.86	250.95	2.807
60	349.15	8228.14	446.67	8196.62	469.69	8434.44	238.93	2.807
61	349.15	8228.14	443.00	8197.84	471.48	8446.54	250.32	2.807
62	351.17	8228.06	443.00	8197.84	474.25	8447.48	251.58	2.807
63	349.15	8228.14	446.67	8196.62	469.89	8435.05	239.56	2.808
64	349.15	8228.14	443.00	8197.84	471.67	8447.15	250.95	2.808
65	351.17	8228.06	443.00	8197.84	474.45	8448.09	252.21	2.808
66	349.15	8228.14	446.67	8196.62	470.09	8435.67	240.19	2.808
67	351.17	8228.06	443.00	8197.84	474.65	8448.70	252.85	2.808
68	349.15	8228.14	443.00	8197.84	471.87	8447.76	251.58	2.808
69	349.15	8228.14	446.67	8196.62	470.29	8436.29	240.83	2.808
70	351.17	8228.06	443.00	8197.84	474.86	8449.31	253.48	2.808
71	349.15	8228.14	443.00	8197.84	472.07	8448.38	252.21	2.808
72	349.15	8228.14	446.67	8196.62	470.49	8436.90	241.46	2.808
73	351.17	8228.06	446.67	8196.62	470.54	8429.90	234.50	2.808
74	351.17	8228.06	443.00	8197.84	475.06	8449.93	254.11	2.808
75	351.17	8228.06	446.67	8196.62	470.75	8430.52	235.13	2.808
76	349.15	8228.14	443.00	8197.84	472.27	8448.99	252.85	2.808
77	351.17	8228.06	443.00	8197.84	475.26	8450.54	254.74	2.808
78	349.15	8228.14	446.67	8196.62	470.69	8437.52	242.09	2.808
79	349.15	8228.14	443.00	8197.84	472.47	8449.60	253.48	2.808
80	351.17	8228.06	446.67	8196.62	470.95	8431.13	235.77	2.808
81	349.15	8228.14	446.67	8196.62	470.89	8438.13	242.72	2.808
82	349.15	8228.14	443.00	8197.84	472.67	8450.22	254.11	2.809
83	351.17	8228.06	443.00	8197.84	475.46	8451.15	255.38	2.809
84	351.17	8228.06	446.67	8196.62	471.15	8431.75	236.40	2.809
85	349.15	8228.14	446.67	8196.62	471.09	8438.75	243.36	2.809
86	351.17	8228.06	443.00	8197.84	475.66	8451.76	256.01	2.809
87	349.15	8228.14	443.00	8197.84	472.86	8450.83	254.74	2.809
88	351.17	8228.06	446.67	8196.62	471.35	8432.36	237.03	2.809
89	349.15	8228.14	446.67	8196.62	471.29	8439.36	243.99	2.809
90	351.17	8228.06	443.00	8197.84	475.86	8452.37	256.64	2.809
91	351.17	8228.06	446.67	8196.62	471.55	8432.98	237.66	2.809
92	349.15	8228.14	443.00	8197.84	473.06	8451.45	255.38	2.809
93	349.15	8228.14	446.67	8196.62	471.48	8439.98	244.62	2.809
94	351.17	8228.06	446.67	8196.62	471.76	8433.59	238.30	2.809
95	351.17	8228.06	443.00	8197.84	476.06	8452.99	257.28	2.809
96	349.15	8228.14	443.00	8197.84	473.26	8452.06	256.01	2.809
97	351.17	8228.06	446.67	8196.62	471.96	8434.21	238.93	2.809
98	349.15	8228.14	446.67	8196.62	471.68	8440.60	245.26	2.809
99	351.17	8228.06	443.00	8197.84	476.26	8453.60	257.91	2.809

Critical Failure Surface (circle 1)

-----  
Intersects: XL: 349.15 YL: 8228.14 XR: 443.00 YR: 8197.84  
Centre: XC: 466.51 YC: 8431.16 Radius: R: 234.50

Generated failure surface: (20 points)

349.15	8228.14	353.71	8225.58	358.32	8223.11	362.99	8220.75	367.70	8218.50
372.47	8216.35	377.28	8214.30	382.14	8212.37	387.04	8210.54	391.98	8208.82
396.96	8207.21	401.97	8205.72	407.01	8204.34	412.08	8203.07	417.18	8201.91
422.31	8200.87	427.46	8199.94	432.62	8199.12	437.80	8198.43	443.00	8197.84

Slice Geometry and Properties - Critical Failure Surface (circle 1, 42 slices)

Slice	X-S		----- Base -----						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	349.15	2.17	29.4	2.88	3.31	2	0.00	34.0	214.46	0.00	65.47	1.01	
2	352.04	0.70	29.4	0.43	0.50	1	0.00	45.0	69.92	0.00	134.20	0.96	
3	352.47	2.34	29.4	1.24	1.42	1	0.00	45.0	239.17	0.00	160.86	0.96	
4	353.71	3.65	28.1	1.66	1.88	1	0.00	45.0	386.12	0.00	195.22	0.95	
5	355.37	4.20	28.1	1.66	1.88	1	0.00	45.0	457.27	0.00	231.23	0.95	
6	357.03	3.65	28.1	1.29	1.46	1	0.00	45.0	401.24	0.00	261.18	0.95	
7	358.32	7.37	26.8	2.33	2.61	1	0.00	45.0	810.27	0.00	294.17	0.95	
8	360.65	8.31	26.8	2.33	2.61	1	0.00	45.0	914.02	0.00	331.83	0.95	
9	362.99	9.28	25.6	2.36	2.61	1	0.00	45.0	1020.65	0.00	369.62	0.95	
10	365.35	10.08	25.6	2.36	2.61	1	0.00	45.0	1109.09	0.00	401.64	0.95	
11	367.70	4.96	24.3	1.10	1.21	1	0.00	45.0	545.64	0.00	427.37	0.94	
12	368.80	8.59	24.3	1.83	2.01	1	0.00	45.0	944.61	51.97	447.33	0.94	
13	370.64	8.98	24.3	1.83	2.01	1	0.00	45.0	988.14	155.79	474.94	0.94	
14	372.47	12.32	23.0	2.41	2.61	1	0.00	45.0	1354.76	353.28	506.57	0.94	
15	374.88	12.84	23.0	2.41	2.61	1	0.00	45.0	1412.92	520.04	536.00	0.94	
16	377.28	13.42	21.7	2.43	2.61	1	0.00	45.0	1476.28	682.25	564.61	0.94	
17	379.71	13.81	21.7	2.43	2.61	1	0.00	45.0	1518.79	840.29	587.46	0.94	
18	382.14	2.24	20.4	0.39	0.41	1	0.00	45.0	246.23	147.39	602.05	0.94	
19	382.53	13.14	20.5	2.26	2.41	1	0.00	45.0	1445.10	931.47	631.44	0.94	
20	384.79	13.34	20.4	2.26	2.41	1	0.00	45.0	1467.14	1057.65	687.68	0.94	
21	387.04	14.76	19.2	2.47	2.61	1	0.00	45.0	1623.10	1287.53	745.35	0.94	
22	389.51	14.84	19.2	2.47	2.61	1	0.00	45.0	1632.65	1427.42	800.43	0.94	
23	391.98	14.97	17.9	2.49	2.61	1	0.00	45.0	1646.21	1563.10	854.50	0.94	
24	394.47	14.90	17.9	2.49	2.61	1	0.00	45.0	1639.27	1694.04	903.60	0.94	
25	396.96	14.86	16.6	2.51	2.61	1	0.00	45.0	1635.07	1820.78	951.53	0.94	
26	399.46	14.64	16.6	2.51	2.61	1	0.00	45.0	1610.58	1942.46	994.36	0.94	
27	401.97	14.44	15.3	2.52	2.61	1	0.00	45.0	1588.42	2060.00	1036.15	0.94	
28	404.49	14.06	15.3	2.52	2.61	1	0.00	45.0	1546.95	2172.79	1072.81	0.94	
29	407.01	13.69	14.1	2.54	2.61	1	0.00	45.0	1505.86	2281.08	1108.20	0.95	
30	409.55	13.16	14.1	2.54	2.61	1	0.00	45.0	1447.29	2384.60	1138.73	0.95	
31	412.08	12.61	12.8	2.55	2.61	1	0.00	45.0	1387.38	2483.60	1167.71	0.95	
32	414.63	11.92	12.8	2.55	2.61	1	0.00	45.0	1311.24	2578.33	1191.87	0.95	
33	417.18	11.20	11.5	2.56	2.61	1	0.00	45.0	1232.49	2667.87	1214.40	0.95	
34	419.75	10.35	11.5	2.56	2.61	1	0.00	45.0	1138.64	2752.96	1232.16	0.95	
35	422.31	9.46	10.2	2.57	2.61	1	0.00	45.0	1040.96	2833.31	1248.13	0.95	
36	424.88	8.45	10.2	2.57	2.61	1	0.00	45.0	929.56	2909.19	1259.45	0.95	
37	427.46	7.39	9.0	2.58	2.61	1	0.00	45.0	812.68	2980.27	1268.67	0.96	
38	430.04	6.21	8.9	2.58	2.61	1	0.00	45.0	683.65	3046.51	1273.64	0.96	
39	432.62	4.98	7.7	2.59	2.61	1	0.00	45.0	547.81	3108.15	1276.06	0.96	
40	435.21	3.65	7.7	2.59	2.61	1	0.00	45.0	401.11	3165.19	1274.43	0.96	
41	437.80	2.24	6.4	2.60	2.61	1	0.00	45.0	246.46	3217.30	1269.98	0.97	

42	440.40	0.75	6.4	2.60	2.61	1	0.00	45.0	82.06	3264.82	1261.81	0.97
X-S Area:	388.91	Path Length:	99.36	X-S Weight:	42711.28							

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# Section 2

GALENA 7.1 Analysis Results

Version: 7.10.1.02

Licensee: Greg Lewicki and Associates

Project: Peak Ranch Resource - Section 2  
File: E:\Work\Dropbox (GLA)\Elam\Hillyard\DRMS\Geotechnical Stability Exhibit\Peak Ranch 2.gmf  
Processed: 15 Jul 2020 14:54:16

DATA: Analysis 1 - Geotechnical Stability Analysis

Material Properties (2 materials)

-----  
Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto  
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (2 profiles)

-----  
Profile: 1 (80 points) Material beneath: 2 - Loose sand, mixed grain size  
0.00 8231.32 5.88 8230.00 9.98 8229.08 14.53 8228.00 39.62 8228.00  
40.31 8228.11 41.61 8228.24 57.22 8230.00 65.43 8230.27 69.21 8230.41  
77.81 8230.82 81.32 8230.94 82.85 8230.98 83.83 8230.97 85.13 8230.99  
99.29 8232.00 106.22 8232.16 116.70 8232.39 117.24 8232.36 119.64 8232.00  
128.39 8230.84 133.76 8230.00 142.70 8228.77 143.69 8228.71 148.58 8228.48  
156.63 8228.00 170.03 8227.29 178.59 8226.80 193.32 8226.00 199.41 8225.73  
218.10 8224.86 232.49 8224.22 235.64 8224.00 249.56 8224.00 254.07 8224.45  
256.14 8224.69 260.52 8225.22 270.95 8225.63 271.88 8225.62 279.06 8225.48  
283.96 8225.37 290.14 8225.23 302.51 8224.98 316.57 8224.81 327.32 8224.75  
335.81 8224.70 341.16 8224.67 353.76 8224.58 374.79 8224.41 378.91 8224.34  
382.78 8224.26 384.51 8224.25 387.29 8224.22 388.44 8224.19 391.55 8224.24  
433.78 8224.00 434.39 8224.00 434.44 8223.98 434.66 8223.98 439.83 8223.98  
457.58 8223.98 458.08 8224.00 461.34 8224.00 530.79 8224.65 531.41 8224.65  
532.68 8224.66 551.60 8224.74 551.96 8224.74 552.60 8224.75 554.39 8224.77  
556.14 8224.79 561.28 8225.09 564.03 8225.10 565.26 8225.10 569.01 8224.98  
569.68 8224.96 612.03 8224.52 614.72 8224.49 617.08 8224.47 621.00 8224.45  
Profile: 2 (80 points) Material beneath: 1 - Sand and gravel, mixed grain size  
-0.33 8229.86 5.55 8228.54 9.65 8227.62 14.36 8226.50 39.74 8226.50  
40.50 8226.63 41.77 8226.75 57.33 8228.50 65.48 8228.77 69.27 8228.91  
77.87 8229.32 81.36 8229.44 82.86 8229.48 83.84 8229.47 85.20 8229.49  
99.36 8230.50 106.25 8230.66 116.66 8230.89 117.08 8230.87 119.43 8230.51  
128.17 8229.35 133.54 8228.52 148.50 8226.98 156.54 8226.50 169.95 8225.79

178.51	8225.30	193.25	8224.50	218.03	8223.36	232.40	8222.72	254.23	8222.96
256.32	8223.20	260.64	8223.72	270.98	8224.13	279.03	8223.98	336.77	8223.19
341.15	8223.17	353.75	8223.08	374.77	8222.91	378.88	8222.84	382.76	8222.76
384.49	8222.75	385.92	8222.74	387.26	8222.72	388.42	8222.69	389.79	8222.68
389.81	8222.74	391.55	8222.74	411.99	8222.78	414.38	8222.80	415.03	8222.80
417.70	8222.78	433.76	8222.50	434.10	8222.50	434.13	8222.49	434.64	8222.48
439.83	8222.48	457.60	8222.48	458.11	8222.50	461.35	8222.50	530.80	8223.15
531.42	8223.15	532.69	8223.16	551.60	8223.24	551.97	8223.24	552.61	8223.25
554.41	8223.27	556.16	8223.29	556.67	8223.30	561.33	8223.59	564.03	8223.60
565.23	8223.60	566.58	8223.55	568.97	8223.48	569.66	8223.46	576.62	8223.38
607.06	8223.09	612.01	8223.02	614.71	8222.99	617.07	8222.97	620.99	8222.95

Slope Surface (104 points)

0.00	8231.32	5.88	8230.00	9.98	8229.08	14.53	8228.00	39.62	8228.00
40.31	8228.11	41.61	8228.24	57.22	8230.00	65.43	8230.27	69.21	8230.41
77.81	8230.82	81.32	8230.94	82.85	8230.98	83.83	8230.97	85.13	8230.99
99.29	8232.00	106.22	8232.16	116.70	8232.39	117.24	8232.36	119.64	8232.00
128.39	8230.84	133.76	8230.00	142.70	8228.77	143.69	8228.71	148.58	8228.48
156.63	8228.00	170.03	8227.29	178.59	8226.80	193.32	8226.00	199.41	8225.73
218.10	8224.86	232.49	8224.22	235.64	8224.00	249.56	8224.00	254.07	8224.45
256.14	8224.69	260.52	8225.22	270.95	8225.63	271.88	8225.62	279.06	8225.48
283.96	8225.37	290.14	8225.23	302.51	8224.98	316.57	8224.81	327.32	8224.75
335.81	8224.70	336.78	8224.69	341.16	8224.67	353.76	8224.58	374.79	8224.41
378.91	8224.34	382.78	8224.26	384.51	8224.25	385.94	8224.24	387.29	8224.22
388.44	8224.19	388.80	8224.19	388.82	8224.24	432.14	8223.96	432.54	8223.95
443.32	8222.00	449.84	8220.80	454.38	8220.00	476.25	8216.00	483.29	8214.71
487.22	8214.00	490.89	8213.41	498.38	8212.00	499.98	8212.00	501.04	8211.71
509.96	8210.00	516.56	8208.00	523.18	8206.00	524.36	8205.63	529.89	8204.00
531.82	8203.38	538.64	8201.30	542.94	8200.00	544.85	8199.13	547.42	8198.00
549.07	8197.26	552.08	8196.00	556.45	8194.00	558.56	8192.97	560.73	8192.00
562.85	8191.04	565.12	8190.00	567.70	8188.83	569.64	8188.00	571.77	8186.98
573.98	8186.00	576.41	8184.83	578.26	8184.00	579.42	8183.47	582.84	8182.00
586.30	8180.33	587.02	8180.00	591.40	8178.00	595.25	8176.16	599.05	8174.75
601.55	8174.00	606.59	8172.32	607.56	8172.00	621.00	8172.00		

Phreatic Surface (3 points)

-200.00	8210.00	875.00	8210.00	950.00	8210.00
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Failure Surface

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

Intersects:	XL:	442.00	YL:	8222.24	XR:	570.00	YR:	8187.83
Centre:	XC:	699.96	YC:	8926.48	Radius:	R:	750.00	

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	85.00	92.00	26.00
Trial positions within range:	10	10	50

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RESULTS: Analysis 1 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 3.637

There were: 4501 successful analyses from a total of 5001 trial surfaces  
500 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.80

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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	484.50	8214.49	605.78	8172.59	784.89	8887.49	737.00	2.801	<-- Critical Surface
2	484.50	8214.49	605.78	8172.59	785.07	8888.00	737.53	2.801	
3	484.50	8214.49	605.78	8172.59	785.42	8889.00	738.59	2.801	
4	484.50	8214.49	605.78	8172.59	785.59	8889.51	739.12	2.801	
5	484.50	8214.49	605.78	8172.59	785.76	8890.01	739.65	2.801	
6	484.50	8214.49	605.78	8172.59	785.24	8888.50	738.06	2.801	
7	484.50	8214.49	605.78	8172.59	785.94	8890.51	740.18	2.801	
8	484.50	8214.49	605.78	8172.59	786.11	8891.02	740.71	2.801	
9	484.50	8214.49	605.78	8172.59	786.46	8892.02	741.78	2.801	
10	484.50	8214.49	605.78	8172.59	786.63	8892.53	742.31	2.801	
11	484.50	8214.49	605.78	8172.59	786.28	8891.52	741.24	2.801	
12	484.50	8214.49	605.78	8172.59	786.81	8893.03	742.84	2.801	
13	484.50	8214.49	605.78	8172.59	786.98	8893.54	743.37	2.801	
14	484.50	8214.49	605.78	8172.59	787.50	8895.04	744.96	2.801	
15	484.50	8214.49	605.78	8172.59	787.33	8894.54	744.43	2.801	
16	484.50	8214.49	605.78	8172.59	787.15	8894.04	743.90	2.801	
17	484.50	8214.49	605.78	8172.59	787.68	8895.55	745.49	2.801	
18	484.50	8214.49	605.78	8172.59	787.85	8896.05	746.02	2.801	
19	484.50	8214.49	605.78	8172.59	788.20	8897.06	747.08	2.802	
20	484.50	8214.49	605.78	8172.59	788.37	8897.56	747.61	2.802	
21	484.50	8214.49	605.78	8172.59	788.02	8896.56	746.55	2.802	
22	484.50	8214.49	605.78	8172.59	788.55	8898.07	748.14	2.802	
23	484.50	8214.49	605.78	8172.59	789.07	8899.58	749.73	2.802	
24	484.50	8214.49	605.78	8172.59	788.72	8898.57	748.67	2.802	
25	484.50	8214.49	605.78	8172.59	788.89	8899.07	749.20	2.802	
26	484.50	8214.49	605.78	8172.59	789.24	8900.08	750.27	2.802	
27	484.50	8214.49	605.78	8172.59	789.42	8900.58	750.80	2.802	
28	484.50	8214.49	605.78	8172.59	789.59	8901.09	751.33	2.802	
29	484.50	8214.49	605.78	8172.59	789.76	8901.59	751.86	2.802	
30	484.50	8214.49	605.78	8172.59	789.94	8902.09	752.39	2.802	
31	484.50	8214.49	605.78	8172.59	790.11	8902.60	752.92	2.802	

32	484.50	8214.49	605.78	8172.59	790.46	8903.60	753.98	2.802
33	484.50	8214.49	605.78	8172.59	790.28	8903.10	753.45	2.802
34	484.50	8214.49	605.78	8172.59	790.63	8904.11	754.51	2.802
35	484.50	8214.49	605.78	8172.59	790.98	8905.11	755.57	2.802
36	484.50	8214.49	605.78	8172.59	790.81	8904.61	755.04	2.802
37	484.50	8214.49	605.78	8172.59	791.15	8905.62	756.10	2.802
38	484.50	8214.49	605.78	8172.59	791.33	8906.12	756.63	2.802
39	484.50	8214.49	605.78	8172.59	791.68	8907.13	757.69	2.802
40	484.50	8214.49	605.78	8172.59	791.50	8906.62	757.16	2.802
41	484.50	8214.49	605.78	8172.59	791.85	8907.63	758.22	2.802
42	484.50	8214.49	605.78	8172.59	792.20	8908.64	759.29	2.802
43	484.50	8214.49	605.78	8172.59	792.02	8908.13	758.76	2.802
44	484.50	8214.49	605.78	8172.59	792.37	8909.14	759.82	2.802
45	484.50	8214.49	605.78	8172.59	792.72	8910.15	760.88	2.802
46	484.50	8214.49	605.78	8172.59	792.89	8910.65	761.41	2.802
47	484.50	8214.49	605.78	8172.59	792.55	8909.64	760.35	2.802
48	484.50	8214.49	605.78	8172.59	793.07	8911.15	761.94	2.802
49	484.50	8214.49	605.78	8172.59	793.42	8912.16	763.00	2.803
50	484.50	8214.49	605.78	8172.59	793.24	8911.66	762.47	2.803
51	484.50	8214.49	595.56	8176.05	780.53	8890.01	737.53	2.834
52	484.50	8214.49	595.56	8176.05	780.70	8890.51	738.06	2.834
53	484.50	8214.49	595.56	8176.05	780.87	8891.01	738.59	2.834
54	484.50	8214.49	595.56	8176.05	781.40	8892.52	740.18	2.834
55	484.50	8214.49	595.56	8176.05	780.35	8889.50	737.00	2.834
56	484.50	8214.49	595.56	8176.05	781.22	8892.02	739.65	2.834
57	484.50	8214.49	595.56	8176.05	781.05	8891.51	739.12	2.834
58	484.50	8214.49	595.56	8176.05	781.57	8893.02	740.71	2.834
59	484.50	8214.49	595.56	8176.05	781.75	8893.53	741.24	2.834
60	484.50	8214.49	595.56	8176.05	781.92	8894.03	741.78	2.834
61	484.50	8214.49	595.56	8176.05	782.09	8894.53	742.31	2.834
62	484.50	8214.49	595.56	8176.05	782.27	8895.04	742.84	2.834
63	484.50	8214.49	595.56	8176.05	782.96	8897.05	744.96	2.834
64	484.50	8214.49	595.56	8176.05	782.62	8896.04	743.90	2.834
65	484.50	8214.49	595.56	8176.05	782.44	8895.54	743.37	2.834
66	484.50	8214.49	595.56	8176.05	782.79	8896.54	744.43	2.834
67	484.50	8214.49	595.56	8176.05	783.14	8897.55	745.49	2.834
68	484.50	8214.49	595.56	8176.05	783.31	8898.05	746.02	2.834
69	484.50	8214.49	595.56	8176.05	783.66	8899.06	747.08	2.834
70	484.50	8214.49	595.56	8176.05	783.49	8898.56	746.55	2.834
71	484.50	8214.49	595.56	8176.05	783.83	8899.56	747.61	2.834
72	484.50	8214.49	595.56	8176.05	784.01	8900.07	748.14	2.834
73	484.50	8214.49	595.56	8176.05	784.71	8902.08	750.27	2.834
74	484.50	8214.49	595.56	8176.05	784.18	8900.57	748.67	2.834
75	484.50	8214.49	595.56	8176.05	784.36	8901.07	749.20	2.834
76	484.50	8214.49	595.56	8176.05	784.53	8901.57	749.73	2.834
77	484.50	8214.49	595.56	8176.05	784.88	8902.58	750.80	2.834
78	484.50	8214.49	595.56	8176.05	785.05	8903.08	751.33	2.834
79	484.50	8214.49	595.56	8176.05	785.23	8903.59	751.86	2.834
80	484.50	8214.49	595.56	8176.05	785.92	8905.60	753.98	2.834
81	484.50	8214.49	595.56	8176.05	785.40	8904.09	752.39	2.834
82	484.50	8214.49	595.56	8176.05	785.58	8904.59	752.92	2.834

83	484.50	8214.49	595.56	8176.05	786.27	8906.60	755.04	2.834
84	484.50	8214.49	595.56	8176.05	785.75	8905.10	753.45	2.834
85	484.50	8214.49	595.56	8176.05	786.10	8906.10	754.51	2.834
86	484.50	8214.49	595.56	8176.05	786.62	8907.61	756.10	2.834
87	484.50	8214.49	595.56	8176.05	786.97	8908.62	757.16	2.834
88	484.50	8214.49	595.56	8176.05	786.79	8908.11	756.63	2.834
89	484.50	8214.49	595.56	8176.05	787.14	8909.12	757.69	2.834
90	484.50	8214.49	595.56	8176.05	786.45	8907.11	755.57	2.834
91	484.50	8214.49	595.56	8176.05	787.32	8909.62	758.22	2.835
92	484.50	8214.49	595.56	8176.05	787.49	8910.12	758.76	2.835
93	484.50	8214.49	595.56	8176.05	787.66	8910.63	759.29	2.835
94	484.50	8214.49	595.56	8176.05	787.84	8911.13	759.82	2.835
95	484.50	8214.49	595.56	8176.05	788.19	8912.14	760.88	2.835
96	484.50	8214.49	595.56	8176.05	788.01	8911.63	760.35	2.835
97	484.50	8214.49	595.56	8176.05	788.36	8912.64	761.41	2.835
98	484.50	8214.49	595.56	8176.05	788.71	8913.64	762.47	2.835
99	484.50	8214.49	595.56	8176.05	788.88	8914.15	763.00	2.835

Critical Failure Surface (circle 1)

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Intersects: XL: 484.50 YL: 8214.49 XR: 605.78 YR: 8172.59  
Centre: XC: 784.89 YC: 8887.49 Radius: R: 737.00

Generated failure surface: (20 points)

484.50	8214.49	490.69	8211.76	496.90	8209.09	503.14	8206.48	509.40	8203.92
515.68	8201.42	521.98	8198.98	528.31	8196.60	534.66	8194.27	541.03	8192.01
547.42	8189.80	553.83	8187.65	560.27	8185.56	566.71	8183.53	573.18	8181.56
579.67	8179.64	586.17	8177.79	592.69	8176.00	599.23	8174.26	605.78	8172.59

Slice Geometry and Properties - Critical Failure Surface (circle 1, 56 slices)

Slice	X-S		----- Base -----						Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi				
1	484.50	0.96	23.8	2.72	2.97	1	0.00	45.0	106.06	0.00	33.69	0.94
2	487.22	4.14	23.8	3.47	3.79	1	0.00	45.0	455.19	0.00	113.42	0.94
3	490.69	3.96	23.3	2.05	2.23	1	0.00	45.0	435.80	0.00	184.20	0.94
4	492.74	4.98	23.3	2.05	2.23	1	0.00	45.0	547.93	0.00	231.60	0.94
5	494.79	6.18	23.3	2.11	2.30	1	0.00	45.0	680.22	64.94	283.23	0.94
6	496.90	4.97	22.7	1.48	1.61	1	0.00	45.0	546.74	121.97	331.16	0.94
7	498.38	6.18	22.7	1.60	1.73	1	0.00	45.0	679.94	201.72	384.77	0.94
8	499.98	4.53	22.7	1.06	1.15	1	0.00	45.0	498.62	173.63	428.83	0.94
9	501.04	9.62	22.8	2.10	2.27	1	0.00	45.0	1058.39	437.08	464.27	0.94
10	503.14	16.18	22.2	3.13	3.38	1	0.00	45.0	1779.32	877.58	529.19	0.94
11	506.27	18.30	22.2	3.13	3.38	1	0.00	45.0	2013.00	1147.36	604.48	0.94
12	509.40	3.52	21.7	0.56	0.61	1	0.00	45.0	387.45	234.53	649.35	0.94
13	509.96	18.40	21.7	2.86	3.08	1	0.00	45.0	2024.47	1319.10	696.99	0.94
14	512.82	19.18	21.7	2.86	3.08	1	0.00	45.0	2109.83	1537.71	779.27	0.94
15	515.68	6.06	21.1	0.88	0.94	1	0.00	45.0	667.09	515.77	833.61	0.94
16	516.56	19.07	21.2	2.71	2.91	1	0.00	45.0	2098.02	1713.79	883.26	0.94
17	519.27	19.70	21.2	2.71	2.91	1	0.00	45.0	2166.83	1904.14	958.44	0.94
18	521.98	8.88	20.6	1.20	1.28	1	0.00	45.0	976.27	896.23	1013.07	0.94
19	523.18	8.85	20.6	1.18	1.26	1	0.00	45.0	974.00	919.71	1044.28	0.94

20	524.36	30.45	20.6	3.95	4.22	1	0.00	45.0	3349.46	3335.36	1113.01	0.94
21	528.31	12.50	20.1	1.58	1.68	1	0.00	45.0	1374.76	1435.29	1187.68	0.94
22	529.89	15.48	20.1	1.93	2.06	1	0.00	45.0	1702.95	1837.78	1231.97	0.94
23	531.82	23.17	20.1	2.84	3.03	1	0.00	45.0	2548.26	2871.67	1291.93	0.94
24	534.66	33.18	19.6	3.98	4.22	1	0.00	45.0	3649.37	4329.69	1377.70	0.94
25	538.64	20.35	19.6	2.39	2.54	1	0.00	45.0	2238.29	2783.71	1455.33	0.94
26	541.03	16.42	19.1	1.91	2.02	1	0.00	45.0	1806.54	2307.32	1508.10	0.94
27	542.94	16.32	19.1	1.91	2.02	1	0.00	45.0	1795.37	2393.32	1546.52	0.94
28	544.85	21.38	19.1	2.57	2.72	1	0.00	45.0	2351.88	3351.72	1585.23	0.94
29	547.42	13.37	18.5	1.65	1.74	1	0.00	45.0	1471.16	2223.54	1622.25	0.94
30	549.07	23.74	18.5	3.01	3.17	1	0.00	45.0	2611.30	4211.02	1661.70	0.94
31	552.08	13.43	18.5	1.75	1.85	1	0.00	45.0	1477.51	2547.25	1701.67	0.94
32	553.83	19.28	18.0	2.62	2.75	1	0.00	45.0	2121.14	3907.99	1735.64	0.94
33	556.45	14.83	18.0	2.11	2.22	1	0.00	45.0	1630.92	3259.40	1768.74	0.94
34	558.56	11.51	18.0	1.71	1.79	1	0.00	45.0	1266.52	2703.65	1795.71	0.94
35	560.27	16.73	17.5	2.58	2.71	1	0.00	45.0	1840.07	4201.35	1827.40	0.94
36	562.85	13.92	17.5	2.27	2.38	1	0.00	45.0	1531.01	3803.45	1860.50	0.94
37	565.12	9.34	17.5	1.59	1.67	1	0.00	45.0	1027.80	2735.92	1886.81	0.94
38	566.71	5.59	17.0	0.99	1.03	1	0.00	45.0	614.93	1710.79	1904.79	0.94
39	567.70	10.64	17.0	1.94	2.03	1	0.00	45.0	1169.95	3425.74	1924.34	0.94
40	569.64	11.03	17.0	2.13	2.23	1	0.00	45.0	1213.26	3847.32	1950.02	0.94
41	571.77	6.92	17.0	1.41	1.48	1	0.00	45.0	760.68	2601.46	1971.56	0.94
42	573.18	3.78	16.4	0.80	0.83	1	0.00	45.0	415.49	1481.47	1986.22	0.94
43	573.98	10.82	16.4	2.43	2.53	1	0.00	45.0	1189.93	4590.18	2003.61	0.94
44	576.41	7.55	16.4	1.85	1.93	1	0.00	45.0	830.91	3570.93	2027.11	0.94
45	578.26	4.46	16.4	1.16	1.21	1	0.00	45.0	490.89	2272.21	2044.67	0.94
46	579.42	12.00	15.9	3.42	3.56	1	0.00	45.0	1319.66	6829.91	2071.72	0.94
47	582.84	9.76	15.9	3.33	3.46	1	0.00	45.0	1073.82	6858.71	2106.84	0.94
48	586.17	2.14	15.4	0.85	0.88	1	0.00	45.0	235.39	1776.07	2126.38	0.94
49	587.02	4.91	15.4	2.19	2.27	1	0.00	45.0	540.50	4640.89	2140.45	0.94
50	589.21	4.04	15.4	2.19	2.27	1	0.00	45.0	444.63	4725.95	2160.77	0.94
51	591.40	1.96	15.4	1.29	1.34	1	0.00	45.0	215.24	2825.28	2176.38	0.94
52	592.69	2.85	14.9	2.56	2.65	1	0.00	45.0	313.28	5674.21	2191.28	0.95
53	595.25	2.43	14.9	3.80	3.93	1	0.00	45.0	267.58	8631.49	2223.38	0.95
54	599.05	0.96	14.4	2.50	2.58	1	0.00	45.0	105.94	5798.83	2263.84	0.95
55	601.55	0.52	14.3	2.11	2.18	1	0.00	45.0	57.34	4982.73	2294.54	0.95
56	603.66	0.17	14.3	2.11	2.18	1	0.00	45.0	19.07	5056.25	2321.06	0.95

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X-S Area: 611.62 Path Length: 128.47 X-S Weight: 67277.99  
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DATA: Analysis 2 - Geotechnical Stability Analysis

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion Phi UnitWeight Ru

0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (2 profiles)

Profile: 1 (80 points)		Material beneath: 2 - Loose sand, mixed grain size							
0.00	8231.32	5.88	8230.00	9.98	8229.08	14.53	8228.00	39.62	8228.00
40.31	8228.11	41.61	8228.24	57.22	8230.00	65.43	8230.27	69.21	8230.41
77.81	8230.82	81.32	8230.94	82.85	8230.98	83.83	8230.97	85.13	8230.99
99.29	8232.00	106.22	8232.16	116.70	8232.39	117.24	8232.36	119.64	8232.00
128.39	8230.84	133.76	8230.00	142.70	8228.77	143.69	8228.71	148.58	8228.48
156.63	8228.00	170.03	8227.29	178.59	8226.80	193.32	8226.00	199.41	8225.73
218.10	8224.86	232.49	8224.22	235.64	8224.00	249.56	8224.00	254.07	8224.45
256.14	8224.69	260.52	8225.22	270.95	8225.63	271.88	8225.62	279.06	8225.48
283.96	8225.37	290.14	8225.23	302.51	8224.98	316.57	8224.81	327.32	8224.75
335.81	8224.70	341.16	8224.67	353.76	8224.58	374.79	8224.41	378.91	8224.34
382.78	8224.26	384.51	8224.25	387.29	8224.22	388.44	8224.19	391.55	8224.24
433.78	8224.00	434.39	8224.00	434.44	8223.98	434.66	8223.98	439.83	8223.98
457.58	8223.98	458.08	8224.00	461.34	8224.00	530.79	8224.65	531.41	8224.65
532.68	8224.66	551.60	8224.74	551.96	8224.74	552.60	8224.75	554.39	8224.77
556.14	8224.79	561.28	8225.09	564.03	8225.10	565.26	8225.10	569.01	8224.98
569.68	8224.96	612.03	8224.52	614.72	8224.49	617.08	8224.47	621.00	8224.45
Profile: 2 (80 points)		Material beneath: 1 - Sand and gravel, mixed grain size							
-0.33	8229.86	5.55	8228.54	9.65	8227.62	14.36	8226.50	39.74	8226.50
40.50	8226.63	41.77	8226.75	57.33	8228.50	65.48	8228.77	69.27	8228.91
77.87	8229.32	81.36	8229.44	82.86	8229.48	83.84	8229.47	85.20	8229.49
99.36	8230.50	106.25	8230.66	116.66	8230.89	117.08	8230.87	119.43	8230.51
128.17	8229.35	133.54	8228.52	148.50	8226.98	156.54	8226.50	169.95	8225.79
178.51	8225.30	193.25	8224.50	218.03	8223.36	232.40	8222.72	254.23	8222.96
256.32	8223.20	260.64	8223.72	270.98	8224.13	279.03	8223.98	336.77	8223.19
341.15	8223.17	353.75	8223.08	374.77	8222.91	378.88	8222.84	382.76	8222.76
384.49	8222.75	385.92	8222.74	387.26	8222.72	388.42	8222.69	389.79	8222.68
389.81	8222.74	391.55	8222.74	411.99	8222.78	414.38	8222.80	415.03	8222.80
417.70	8222.78	433.76	8222.50	434.10	8222.50	434.13	8222.49	434.64	8222.48
439.83	8222.48	457.60	8222.48	458.11	8222.50	461.35	8222.50	530.80	8223.15
531.42	8223.15	532.69	8223.16	551.60	8223.24	551.97	8223.24	552.61	8223.25
554.41	8223.27	556.16	8223.29	556.67	8223.30	561.33	8223.59	564.03	8223.60
565.23	8223.60	566.58	8223.55	568.97	8223.48	569.66	8223.46	576.62	8223.38
607.06	8223.09	612.01	8223.02	614.71	8222.99	617.07	8222.97	620.99	8222.95

Slope Surface (104 points)

0.00	8231.32	5.88	8230.00	9.98	8229.08	14.53	8228.00	39.62	8228.00
40.31	8228.11	41.61	8228.24	57.22	8230.00	65.43	8230.27	69.21	8230.41
77.81	8230.82	81.32	8230.94	82.85	8230.98	83.83	8230.97	85.13	8230.99
99.29	8232.00	106.22	8232.16	116.70	8232.39	117.24	8232.36	119.64	8232.00
128.39	8230.84	133.76	8230.00	142.70	8228.77	143.69	8228.71	148.58	8228.48
156.63	8228.00	170.03	8227.29	178.59	8226.80	193.32	8226.00	199.41	8225.73

218.10	8224.86	232.49	8224.22	235.64	8224.00	249.56	8224.00	254.07	8224.45
256.14	8224.69	260.52	8225.22	270.95	8225.63	271.88	8225.62	279.06	8225.48
283.96	8225.37	290.14	8225.23	302.51	8224.98	316.57	8224.81	327.32	8224.75
335.81	8224.70	336.78	8224.69	341.16	8224.67	353.76	8224.58	374.79	8224.41
378.91	8224.34	382.78	8224.26	384.51	8224.25	385.94	8224.24	387.29	8224.22
388.44	8224.19	388.80	8224.19	388.82	8224.24	432.14	8223.96	432.54	8223.95
443.32	8222.00	449.84	8220.80	454.38	8220.00	476.25	8216.00	483.29	8214.71
487.22	8214.00	490.89	8213.41	498.38	8212.00	499.98	8212.00	501.04	8211.71
509.96	8210.00	516.56	8208.00	523.18	8206.00	524.36	8205.63	529.89	8204.00
531.82	8203.38	538.64	8201.30	542.94	8200.00	544.85	8199.13	547.42	8198.00
549.07	8197.26	552.08	8196.00	556.45	8194.00	558.56	8192.97	560.73	8192.00
562.85	8191.04	565.12	8190.00	567.70	8188.83	569.64	8188.00	571.77	8186.98
573.98	8186.00	576.41	8184.83	578.26	8184.00	579.42	8183.47	582.84	8182.00
586.30	8180.33	587.02	8180.00	591.40	8178.00	595.25	8176.16	599.05	8174.75
601.55	8174.00	606.59	8172.32	607.56	8172.00	621.00	8172.00		

Phreatic Surface (3 points)

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-200.00    8210.00            875.00    8210.00            950.00    8210.00

Failure Surface (Critical, from previous analysis)

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

Intersects: XL:    484.50        YL:    8214.49        XR:    605.78        YR:    8172.59  
Centre:    XC:    784.89        YC:    8887.49        Radius: R:    737.00

Variable Restraints

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Parameter descriptor:            XL            XR            R  
Range of variation:            135.00        106.00        26.00  
Trial positions within range:    100            50            50

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RESULTS: Analysis 2 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.801

There were: 119538 successful analyses from a total of 250001 trial surfaces  
130463 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.17

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Results Summary - Lowest 99 Factor of Safety circles

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



1	550.64	8196.60	563.59	8190.70	857.56	8852.91	724.53	2.171	<-- Critical Surface
2	550.64	8196.60	565.76	8189.71	866.87	8870.23	744.16	2.174	
3	550.64	8196.60	563.59	8190.70	865.04	8869.33	742.57	2.174	
4	550.64	8196.60	565.76	8189.71	861.15	8857.68	730.37	2.175	
5	550.64	8196.60	563.59	8190.70	860.64	8859.67	731.96	2.175	
6	550.64	8196.60	563.59	8190.70	865.48	8870.30	743.63	2.175	
7	550.64	8196.60	563.59	8190.70	867.02	8873.68	747.35	2.176	
8	550.64	8196.60	563.59	8190.70	860.42	8859.19	731.43	2.177	
9	550.64	8196.60	563.59	8190.70	858.66	8855.33	727.18	2.177	
10	550.64	8196.60	565.76	8189.71	865.77	8867.82	741.51	2.177	
11	550.64	8196.60	563.59	8190.70	867.46	8874.64	748.41	2.178	
12	550.64	8196.60	565.76	8189.71	859.61	8854.30	726.65	2.178	
13	550.64	8196.60	563.59	8190.70	861.08	8860.64	733.02	2.178	
14	550.64	8196.60	565.76	8189.71	860.05	8855.26	727.71	2.178	
15	550.64	8196.60	563.59	8190.70	859.54	8857.26	729.31	2.179	
16	550.64	8196.60	563.59	8190.70	862.84	8864.50	737.27	2.179	
17	550.64	8196.60	563.59	8190.70	863.06	8864.98	737.80	2.179	
18	550.64	8196.60	563.59	8190.70	859.98	8858.22	730.37	2.179	
19	550.64	8196.60	563.59	8190.70	862.40	8863.54	736.20	2.180	
20	550.64	8196.60	563.59	8190.70	863.50	8865.95	738.86	2.180	
21	550.64	8196.60	563.59	8190.70	864.60	8868.36	741.51	2.180	
22	550.64	8196.60	563.59	8190.70	859.10	8856.29	728.24	2.180	
23	550.64	8196.60	565.76	8189.71	858.95	8852.85	725.06	2.180	
24	550.64	8196.60	565.76	8189.71	859.39	8853.82	726.12	2.180	
25	550.64	8196.60	563.59	8190.70	858.44	8854.84	726.65	2.180	
26	550.64	8196.60	563.59	8190.70	861.96	8862.57	735.14	2.180	
27	550.64	8196.60	563.59	8190.70	858.00	8853.88	725.59	2.181	
28	550.64	8196.60	565.76	8189.71	864.23	8864.44	737.80	2.181	
29	550.64	8196.60	565.76	8189.71	861.59	8858.64	731.43	2.181	
30	550.64	8196.60	563.59	8190.70	862.62	8864.02	736.73	2.181	
31	552.00	8196.03	557.10	8193.68	864.48	8867.31	740.45	2.182	
32	550.64	8196.60	563.59	8190.70	863.94	8866.92	739.92	2.182	
33	550.64	8196.60	565.76	8189.71	860.49	8856.23	728.78	2.182	
34	550.64	8196.60	565.76	8189.71	864.01	8863.96	737.27	2.182	
35	550.64	8196.60	565.76	8189.71	867.31	8871.20	745.22	2.182	
36	550.64	8196.60	565.76	8189.71	868.85	8874.58	748.94	2.182	
37	550.64	8196.60	563.59	8190.70	864.38	8867.88	740.98	2.182	
38	550.64	8196.60	565.76	8189.71	863.35	8862.51	735.67	2.182	
39	550.64	8196.60	565.76	8189.71	862.03	8859.61	732.49	2.183	
40	550.64	8196.60	563.59	8190.70	860.86	8860.16	732.49	2.183	
41	550.64	8196.60	563.59	8190.70	857.78	8853.40	725.06	2.183	
42	550.64	8196.60	565.76	8189.71	865.11	8866.37	739.92	2.183	
43	550.64	8196.60	563.59	8190.70	857.34	8852.43	724.00	2.184	
44	550.64	8196.60	565.76	8189.71	869.29	8875.54	750.00	2.184	
45	550.64	8196.60	565.76	8189.71	866.21	8868.78	742.57	2.184	
46	550.64	8196.60	565.76	8189.71	858.51	8851.88	724.00	2.184	
47	550.64	8196.60	565.76	8189.71	862.69	8861.06	734.08	2.184	
48	550.64	8196.60	563.59	8190.70	861.52	8861.60	734.08	2.184	
49	550.64	8196.60	565.76	8189.71	863.13	8862.02	735.14	2.184	
50	550.64	8196.60	563.59	8190.70	867.68	8875.12	748.94	2.184	
51	550.64	8196.60	565.76	8189.71	863.57	8862.99	736.20	2.184	

52	550.64	8196.60	565.76	8189.71	863.79	8863.47	736.73	2.184
53	550.64	8196.60	563.59	8190.70	867.90	8875.61	749.47	2.184
54	550.64	8196.60	563.59	8190.70	858.22	8854.36	726.12	2.184
55	550.64	8196.60	563.59	8190.70	863.72	8866.43	739.39	2.185
56	550.64	8196.60	565.76	8189.71	864.89	8865.89	739.39	2.185
57	550.64	8196.60	565.76	8189.71	864.67	8865.40	738.86	2.185
58	550.64	8196.60	563.59	8190.70	865.92	8871.26	744.69	2.185
59	552.00	8196.03	557.10	8193.68	866.04	8870.69	744.16	2.185
60	550.64	8196.60	565.76	8189.71	868.19	8873.13	747.35	2.185
61	550.64	8196.60	563.59	8190.70	859.32	8856.78	728.78	2.185
62	550.64	8196.60	565.76	8189.71	862.91	8861.54	734.61	2.185
63	550.64	8196.60	565.76	8189.71	864.45	8864.92	738.33	2.185
64	550.64	8196.60	565.76	8189.71	867.75	8872.16	746.29	2.185
65	550.64	8196.60	565.76	8189.71	866.65	8869.75	743.63	2.185
66	552.00	8196.03	557.10	8193.68	866.93	8872.62	746.29	2.185
67	550.64	8196.60	565.76	8189.71	867.53	8871.68	745.76	2.186
68	550.64	8196.60	563.59	8190.70	858.88	8855.81	727.71	2.186
69	550.64	8196.60	563.59	8190.70	861.30	8861.12	733.55	2.186
70	552.00	8196.03	574.41	8185.79	865.83	8853.19	728.24	2.186
71	550.64	8196.60	563.59	8190.70	859.76	8857.74	729.84	2.186
72	550.64	8196.60	563.59	8190.70	862.18	8863.05	735.67	2.186
73	552.00	8196.03	557.10	8193.68	860.71	8859.12	731.43	2.186
74	552.00	8196.03	578.74	8183.78	867.56	8849.41	725.59	2.186
75	550.64	8196.60	563.59	8190.70	868.12	8876.09	750.00	2.186
76	552.00	8196.03	578.74	8183.78	875.29	8866.30	744.16	2.187
77	552.00	8196.03	578.74	8183.78	867.34	8848.93	725.06	2.187
78	550.64	8196.60	565.76	8189.71	868.41	8873.61	747.88	2.187
79	550.64	8196.60	578.74	8183.78	866.27	8851.13	726.65	2.187
80	552.00	8196.03	578.74	8183.78	867.12	8848.45	724.53	2.187
81	550.64	8196.60	565.76	8189.71	865.55	8867.34	740.98	2.187
82	550.64	8196.60	565.76	8189.71	861.37	8858.16	730.90	2.187
83	550.64	8196.60	565.76	8189.71	868.63	8874.10	748.41	2.187
84	550.64	8196.60	563.59	8190.70	866.80	8873.19	746.82	2.187
85	550.64	8196.60	563.59	8190.70	860.20	8858.71	730.90	2.187
86	550.64	8196.60	578.74	8183.78	874.64	8869.47	746.82	2.187
87	552.00	8196.03	578.74	8183.78	867.78	8849.90	726.12	2.187
88	550.64	8196.60	563.59	8190.70	864.16	8867.40	740.45	2.187
89	550.64	8196.60	565.76	8189.71	861.81	8859.13	731.96	2.187
90	550.64	8196.60	565.76	8189.71	867.97	8872.65	746.82	2.187
91	550.64	8196.60	563.59	8190.70	864.82	8868.85	742.04	2.187
92	552.00	8196.03	578.74	8183.78	874.41	8864.37	742.04	2.187
93	550.64	8196.60	578.74	8183.78	868.91	8856.92	733.02	2.187
94	550.64	8196.60	565.76	8189.71	866.43	8869.27	743.10	2.188
95	550.64	8196.60	578.74	8183.78	865.83	8850.16	725.59	2.188
96	550.64	8196.60	563.59	8190.70	866.36	8872.23	745.76	2.188
97	550.64	8196.60	565.76	8189.71	860.27	8855.75	728.24	2.188
98	550.64	8196.60	578.74	8183.78	874.86	8869.96	747.35	2.188
99	550.64	8196.60	565.76	8189.71	862.25	8860.09	733.02	2.188

Critical Failure Surface (circle 1)

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Intersects: XL: 550.64 YL: 8196.60 XR: 563.59 YR: 8190.70  
 Centre: XC: 857.56 YC: 8852.91 Radius: R: 724.53

Generated failure surface: (20 points)

550.64	8196.60	551.32	8196.29	551.99	8195.97	552.67	8195.66	553.35	8195.34
554.04	8195.03	554.72	8194.71	555.40	8194.40	556.08	8194.09	556.76	8193.78
557.44	8193.46	558.12	8193.15	558.81	8192.84	559.49	8192.54	560.17	8192.23
560.86	8191.92	561.54	8191.61	562.22	8191.31	562.91	8191.00	563.59	8190.70

Slice Geometry and Properties - Critical Failure Surface (circle 1, 42 slices)

Slice	X-S		Base						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	550.64	0.00	25.0	0.34	0.37	1	0.00	45.0	0.29	314.91	841.12	0.91	
2	550.98	0.01	25.1	0.34	0.37	1	0.00	45.0	0.91	319.03	851.70	0.91	
3	551.32	0.01	25.0	0.34	0.37	1	0.00	45.0	1.53	322.57	862.23	0.91	
4	551.66	0.02	25.0	0.34	0.37	1	0.00	45.0	2.12	326.31	872.71	0.91	
5	551.99	0.01	24.7	0.09	0.09	1	0.00	45.0	0.62	82.02	879.26	0.91	
6	552.08	0.02	25.0	0.30	0.33	1	0.00	45.0	2.27	289.41	884.91	0.91	
7	552.38	0.02	24.9	0.30	0.33	1	0.00	45.0	2.33	291.81	893.58	0.91	
8	552.67	0.03	24.8	0.34	0.37	1	0.00	45.0	2.78	337.12	902.96	0.91	
9	553.01	0.03	25.0	0.34	0.37	1	0.00	45.0	2.81	341.17	912.81	0.91	
10	553.35	0.03	24.8	0.34	0.37	1	0.00	45.0	2.92	344.80	922.80	0.91	
11	553.69	0.03	24.8	0.34	0.37	1	0.00	45.0	2.96	348.43	932.65	0.91	
12	554.04	0.03	24.7	0.34	0.37	1	0.00	45.0	3.00	351.70	942.44	0.91	
13	554.38	0.03	24.8	0.34	0.37	1	0.00	45.0	3.07	355.81	952.32	0.91	
14	554.72	0.03	24.6	0.34	0.37	1	0.00	45.0	3.07	359.29	962.08	0.91	
15	555.06	0.03	24.6	0.34	0.37	1	0.00	45.0	3.07	363.00	971.83	0.91	
16	555.40	0.03	24.6	0.34	0.37	1	0.00	45.0	3.11	366.65	981.61	0.91	
17	555.74	0.03	24.6	0.34	0.37	1	0.00	45.0	3.11	370.25	991.36	0.91	
18	556.08	0.03	24.6	0.37	0.41	1	0.00	45.0	3.40	408.16	1001.54	0.91	
19	556.45	0.02	24.6	0.31	0.34	1	0.00	45.0	2.69	343.26	1011.14	0.91	
20	556.76	0.02	24.5	0.34	0.37	1	0.00	45.0	2.57	381.28	1019.98	0.91	
21	557.10	0.02	24.5	0.34	0.37	1	0.00	45.0	2.12	384.86	1029.21	0.91	
22	557.44	0.02	24.5	0.34	0.37	1	0.00	45.0	1.69	388.52	1038.38	0.91	
23	557.78	0.01	24.5	0.34	0.37	1	0.00	45.0	1.28	392.18	1047.70	0.91	
24	558.12	0.01	24.4	0.22	0.24	1	0.00	45.0	0.59	252.16	1055.24	0.91	
25	558.34	0.00	24.3	0.22	0.24	1	0.00	45.0	0.40	253.69	1061.09	0.91	
26	558.56	0.00	24.5	0.25	0.27	1	0.00	45.0	0.40	289.17	1067.59	0.91	
27	558.81	0.01	24.3	0.34	0.37	1	0.00	45.0	0.59	403.01	1075.92	0.91	
28	559.15	0.01	24.3	0.34	0.37	1	0.00	45.0	0.66	406.62	1085.62	0.91	
29	559.49	0.01	24.2	0.34	0.37	1	0.00	45.0	0.70	409.85	1095.29	0.91	
30	559.83	0.01	24.3	0.34	0.37	1	0.00	45.0	0.73	413.87	1104.90	0.91	
31	560.17	0.01	24.2	0.28	0.31	1	0.00	45.0	0.63	339.72	1113.65	0.91	
32	560.45	0.01	24.3	0.28	0.31	1	0.00	45.0	0.66	342.32	1121.49	0.91	
33	560.73	0.00	24.3	0.13	0.14	1	0.00	45.0	0.31	156.56	1127.23	0.91	
34	560.86	0.01	24.2	0.34	0.37	1	0.00	45.0	0.79	424.53	1133.75	0.91	
35	561.20	0.01	24.1	0.34	0.37	1	0.00	45.0	0.72	427.87	1143.21	0.91	
36	561.54	0.01	24.1	0.34	0.37	1	0.00	45.0	0.66	431.59	1152.72	0.91	
37	561.88	0.01	24.1	0.34	0.37	1	0.00	45.0	0.59	435.39	1162.18	0.91	
38	562.22	0.00	24.0	0.31	0.34	1	0.00	45.0	0.47	400.67	1171.24	0.91	
39	562.54	0.00	24.1	0.31	0.34	1	0.00	45.0	0.39	403.88	1179.83	0.91	

40	562.85	0.00	23.9	0.06	0.07	1	0.00	45.0	0.06	77.04	1184.95	0.91
41	562.91	0.00	23.9	0.34	0.37	1	0.00	45.0	0.28	445.72	1190.43	0.91
42	563.25	0.00	24.0	0.34	0.37	1	0.00	45.0	0.07	449.51	1199.69	0.91

X-S Area: 0.58

Path Length: 14.24

X-S Weight: 63.41

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# Section 3

GALENA 7.1 Analysis Results

Version: 7.10.1.02

Licensee: Greg Lewicki and Associates

Project: Peak Ranch Resource - Section 3

File: E:\Work\Dropbox (GLA)\Elam\Hillyard\DRMS\Geotechnical Stability Exhibit\Peak Ranch 3.gmf

Processed: 15 Jun 2020 16:09:05

DATA: Analysis 1 - Geotechnical Stability Analysis

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	34.0	99.00	Auto

Water Properties

Unit weight of water: 62.400

Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (6 points)	Material beneath: 2 - Loose sand, mixed grain size								
0.75	8212.78	255.29	8216.00	304.93	8216.63	325.75	8216.89	413.28	8218.00
500.00	8218.98								
Profile: 2 (4 points)	Material beneath: 1 - Sand and gravel, mixed grain size								
0.77	8211.28	255.31	8214.50	413.30	8216.50	500.00	8217.48		
Profile: 3 (19 points)	Material beneath: 2 - Loose sand, mixed grain size								
223.51	8215.60	225.12	8216.00	229.12	8217.00	233.12	8218.00	237.13	8219.00
241.06	8220.00	245.21	8221.00	249.26	8222.00	253.34	8223.00	257.13	8224.00
270.75	8224.00	275.70	8223.00	280.43	8222.00	285.17	8221.00	289.91	8220.00
294.34	8219.00	298.73	8218.00	303.32	8217.00	304.93	8216.63		

Slope Surface (23 points)

0.00	8212.78	223.51	8215.60	225.12	8216.00	229.12	8217.00	233.12	8218.00
237.13	8219.00	241.06	8220.00	245.21	8221.00	249.26	8222.00	253.34	8223.00
257.13	8224.00	270.75	8224.00	275.70	8223.00	280.43	8222.00	285.17	8221.00
289.91	8220.00	294.34	8219.00	298.73	8218.00	303.32	8217.00	304.93	8216.63
324.16	8216.80	365.36	8206.00	500.00	8207.50				

Phreatic Surface (2 points)

0.00	8202.00	500.00	8204.50
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Failure Surface

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

Intersects: XL: 288.00 YL: 8220.40 XR: 392.00 YR: 8206.30  
Centre: XC: 372.85 YC: 8455.56 Radius: R: 250.00

Variable Restraints

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Parameter descriptor: XL XR R  
Range of variation: 93.00 77.00 5.00  
Trial positions within range: 100 100 50

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RESULTS: Analysis 1 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 5.953

There were: 337787 successful analyses from a total of 500001 trial surfaces  
162214 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.75

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	323.23	8216.79	353.50	8209.11	400.16	8456.43	251.68	3.745	<-- Critical Surface
2	323.23	8216.79	353.50	8209.11	400.34	8457.12	252.40	3.745	
3	323.23	8216.79	353.50	8209.11	400.29	8456.92	252.19	3.745	
4	323.23	8216.79	353.50	8209.11	400.21	8456.63	251.89	3.745	
5	323.23	8216.79	353.50	8209.11	400.36	8457.22	252.50	3.745	
6	323.23	8216.79	353.50	8209.11	400.11	8456.23	251.48	3.745	
7	323.23	8216.79	353.50	8209.11	400.26	8456.83	252.09	3.745	
8	323.23	8216.79	353.50	8209.11	399.99	8455.74	250.97	3.745	
9	323.23	8216.79	353.50	8209.11	400.06	8456.03	251.28	3.745	
10	323.23	8216.79	353.50	8209.11	399.94	8455.54	250.77	3.745	
11	323.23	8216.79	353.50	8209.11	400.04	8455.93	251.17	3.745	
12	323.23	8216.79	353.50	8209.11	400.24	8456.73	251.99	3.745	
13	323.23	8216.79	353.50	8209.11	400.19	8456.53	251.79	3.746	
14	323.23	8216.79	353.50	8209.11	400.09	8456.13	251.38	3.746	
15	323.23	8216.79	353.50	8209.11	400.14	8456.33	251.58	3.746	
16	323.23	8216.79	353.50	8209.11	400.31	8457.02	252.30	3.746	
17	323.23	8216.79	353.50	8209.11	400.01	8455.83	251.07	3.746	
18	323.23	8216.79	353.50	8209.11	399.88	8455.34	250.56	3.746	
19	323.23	8216.79	353.50	8209.11	399.96	8455.64	250.87	3.746	

20	323.23	8216.79	353.50	8209.11	399.91	8455.44	250.66	3.746
21	323.23	8216.79	353.50	8209.11	399.71	8454.65	249.85	3.746
22	323.23	8216.79	353.50	8209.11	399.83	8455.14	250.36	3.746
23	323.23	8216.79	353.50	8209.11	399.86	8455.24	250.46	3.746
24	323.23	8216.79	353.50	8209.11	399.81	8455.04	250.26	3.746
25	323.23	8216.79	353.50	8209.11	399.73	8454.74	249.95	3.746
26	323.23	8216.79	353.50	8209.11	399.66	8454.45	249.64	3.746
27	323.23	8216.79	353.50	8209.11	399.78	8454.94	250.15	3.746
28	323.23	8216.79	353.50	8209.11	399.46	8453.65	248.83	3.746
29	323.23	8216.79	353.50	8209.11	399.76	8454.84	250.05	3.746
30	323.23	8216.79	353.50	8209.11	399.63	8454.35	249.54	3.746
31	323.23	8216.79	353.50	8209.11	399.68	8454.55	249.74	3.746
32	323.23	8216.79	353.50	8209.11	399.58	8454.15	249.34	3.746
33	323.23	8216.79	353.50	8209.11	399.53	8453.95	249.13	3.746
34	323.23	8216.79	353.50	8209.11	399.56	8454.05	249.23	3.746
35	323.23	8216.79	353.50	8209.11	399.61	8454.25	249.44	3.746
36	323.23	8216.79	353.50	8209.11	399.51	8453.85	249.03	3.746
37	323.23	8216.79	353.50	8209.11	399.48	8453.75	248.93	3.746
38	323.23	8216.79	353.50	8209.11	399.41	8453.46	248.62	3.746
39	323.23	8216.79	353.50	8209.11	399.28	8452.96	248.11	3.746
40	323.23	8216.79	353.50	8209.11	399.43	8453.55	248.72	3.746
41	323.23	8216.79	353.50	8209.11	399.36	8453.26	248.42	3.746
42	323.23	8216.79	353.50	8209.11	399.26	8452.86	248.01	3.746
43	323.23	8216.79	353.50	8209.11	399.38	8453.36	248.52	3.747
44	323.23	8216.79	353.50	8209.11	399.33	8453.16	248.32	3.747
45	323.23	8216.79	353.50	8209.11	399.21	8452.66	247.81	3.747
46	323.23	8216.79	353.50	8209.11	399.31	8453.06	248.21	3.747
47	323.23	8216.79	353.50	8209.11	399.13	8452.37	247.50	3.747
48	323.23	8216.79	353.50	8209.11	399.23	8452.76	247.91	3.747
49	323.23	8216.79	353.50	8209.11	399.16	8452.46	247.60	3.747
50	323.23	8216.79	353.50	8209.11	399.18	8452.56	247.70	3.747
51	323.23	8216.79	354.28	8208.91	400.76	8456.99	252.40	3.750
52	323.23	8216.79	354.28	8208.91	400.74	8456.89	252.30	3.750
53	323.23	8216.79	354.28	8208.91	400.71	8456.79	252.19	3.750
54	323.23	8216.79	354.28	8208.91	400.79	8457.08	252.50	3.750
55	323.23	8216.79	354.28	8208.91	400.69	8456.69	252.09	3.751
56	323.23	8216.79	354.28	8208.91	400.59	8456.29	251.68	3.751
57	323.23	8216.79	354.28	8208.91	400.61	8456.39	251.79	3.751
58	323.23	8216.79	354.28	8208.91	400.44	8455.70	251.07	3.751
59	323.23	8216.79	354.28	8208.91	400.64	8456.49	251.89	3.751
60	323.23	8216.79	354.28	8208.91	400.66	8456.59	251.99	3.751
61	323.23	8216.79	354.28	8208.91	400.56	8456.19	251.58	3.751
62	323.23	8216.79	354.28	8208.91	400.31	8455.20	250.56	3.751
63	323.23	8216.79	354.28	8208.91	400.54	8456.09	251.48	3.751
64	323.23	8216.79	354.28	8208.91	400.36	8455.40	250.77	3.751
65	323.23	8216.79	354.28	8208.91	400.51	8456.00	251.38	3.751
66	323.23	8216.79	354.28	8208.91	400.26	8455.00	250.36	3.751
67	323.23	8216.79	354.28	8208.91	400.46	8455.80	251.17	3.751
68	323.23	8216.79	354.28	8208.91	400.38	8455.50	250.87	3.751
69	323.23	8216.79	354.28	8208.91	400.49	8455.90	251.28	3.751
70	323.23	8216.79	354.28	8208.91	400.23	8454.90	250.26	3.751

71	323.23	8216.79	354.28	8208.91	400.33	8455.30	250.66	3.751
72	323.23	8216.79	354.28	8208.91	400.28	8455.10	250.46	3.751
73	323.23	8216.79	354.28	8208.91	400.18	8454.71	250.05	3.751
74	323.23	8216.79	354.28	8208.91	400.11	8454.41	249.74	3.751
75	323.23	8216.79	354.28	8208.91	400.41	8455.60	250.97	3.751
76	323.23	8216.79	354.28	8208.91	400.21	8454.81	250.15	3.751
77	323.23	8216.79	354.28	8208.91	400.06	8454.21	249.54	3.751
78	323.23	8216.79	354.28	8208.91	400.16	8454.61	249.95	3.751
79	323.23	8216.79	354.28	8208.91	400.01	8454.01	249.34	3.751
80	323.23	8216.79	354.28	8208.91	400.08	8454.31	249.64	3.751
81	323.23	8216.79	354.28	8208.91	400.13	8454.51	249.85	3.751
82	323.23	8216.79	354.28	8208.91	399.83	8453.32	248.62	3.751
83	323.23	8216.79	354.28	8208.91	400.03	8454.11	249.44	3.751
84	323.23	8216.79	354.28	8208.91	399.96	8453.81	249.13	3.751
85	323.23	8216.79	354.28	8208.91	399.88	8453.52	248.83	3.751
86	323.23	8216.79	354.28	8208.91	399.91	8453.62	248.93	3.751
87	323.23	8216.79	354.28	8208.91	399.93	8453.71	249.03	3.751
88	323.23	8216.79	354.28	8208.91	399.81	8453.22	248.52	3.752
89	323.23	8216.79	354.28	8208.91	399.98	8453.91	249.23	3.752
90	323.23	8216.79	354.28	8208.91	399.76	8453.02	248.32	3.752
91	323.23	8216.79	354.28	8208.91	399.86	8453.42	248.72	3.752
92	323.23	8216.79	354.28	8208.91	399.68	8452.72	248.01	3.752
93	323.23	8216.79	354.28	8208.91	399.73	8452.92	248.21	3.752
94	323.23	8216.79	354.28	8208.91	399.71	8452.82	248.11	3.752
95	323.23	8216.79	354.28	8208.91	399.78	8453.12	248.42	3.752
96	323.23	8216.79	354.28	8208.91	399.63	8452.53	247.81	3.752
97	323.23	8216.79	354.28	8208.91	399.58	8452.33	247.60	3.752
98	323.23	8216.79	354.28	8208.91	399.55	8452.23	247.50	3.752
99	323.23	8216.79	354.28	8208.91	399.65	8452.62	247.91	3.752

Critical Failure Surface (circle 1)

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Intersects: XL: 323.23 YL: 8216.79 XR: 353.50 YR: 8209.11  
Centre: XC: 400.16 YC: 8456.43 Radius: R: 251.68

Generated failure surface: (20 points)

323.23	8216.79	324.80	8216.29	326.37	8215.81	327.94	8215.33	329.52	8214.86
331.10	8214.41	332.68	8213.96	334.27	8213.52	335.86	8213.10	337.45	8212.68
339.04	8212.28	340.64	8211.88	342.24	8211.50	343.84	8211.13	345.44	8210.76
347.05	8210.41	348.66	8210.07	350.27	8209.74	351.88	8209.42	353.50	8209.11

Slice Geometry and Properties - Critical Failure Surface (circle 1, 40 slices)

Slice	X-S		Base						Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi				
1	323.23	0.14	17.6	0.93	0.98	2	0.00	34.0	14.07	0.00	14.27	0.99
2	324.16	0.20	17.7	0.64	0.67	2	0.00	34.0	20.26	0.00	30.17	0.99
3	324.80	0.28	17.2	0.79	0.82	2	0.00	34.0	27.87	0.00	33.61	0.99
4	325.58	0.31	17.3	0.79	0.82	2	0.00	34.0	30.76	0.00	37.08	0.99
5	326.37	0.28	16.8	0.65	0.67	2	0.00	34.0	27.33	0.00	40.16	0.99
6	327.01	0.29	16.8	0.65	0.67	2	0.00	34.0	29.02	0.00	42.63	0.99
7	327.66	0.13	16.9	0.28	0.30	1	0.00	45.0	13.40	0.00	43.74	0.97



8	327.94	0.35	16.5	0.71	0.74	1	0.00	45.0	36.01	0.00	47.10	0.97
9	328.65	0.37	16.5	0.71	0.74	1	0.00	45.0	39.43	0.00	51.56	0.97
10	329.36	0.08	16.7	0.16	0.17	1	0.00	45.0	9.33	0.00	54.02	0.97
11	329.52	0.43	16.1	0.79	0.82	1	0.00	45.0	47.28	0.00	55.56	0.97
12	330.31	0.45	16.1	0.79	0.82	1	0.00	45.0	49.06	0.00	57.64	0.97
13	331.10	0.46	15.7	0.79	0.82	1	0.00	45.0	50.77	0.00	59.65	0.97
14	331.89	0.47	15.8	0.79	0.82	1	0.00	45.0	52.13	0.00	61.23	0.97
15	332.68	0.48	15.4	0.79	0.82	1	0.00	45.0	53.25	0.00	62.55	0.97
16	333.47	0.49	15.4	0.79	0.82	1	0.00	45.0	54.18	0.00	63.65	0.97
17	334.27	0.50	15.0	0.79	0.82	1	0.00	45.0	54.88	0.00	64.46	0.97
18	335.06	0.50	15.0	0.79	0.82	1	0.00	45.0	55.30	0.00	64.96	0.97
19	335.86	0.51	14.6	0.80	0.82	1	0.00	45.0	55.57	0.00	65.27	0.97
20	336.65	0.50	14.6	0.80	0.82	1	0.00	45.0	55.48	0.00	65.19	0.97
21	337.45	0.50	14.2	0.80	0.82	1	0.00	45.0	55.14	0.00	64.79	0.97
22	338.24	0.50	14.2	0.80	0.82	1	0.00	45.0	54.55	0.00	64.09	0.97
23	339.04	0.49	13.9	0.80	0.82	1	0.00	45.0	53.86	0.00	63.29	0.97
24	339.84	0.48	13.9	0.80	0.82	1	0.00	45.0	52.84	0.00	62.08	0.97
25	340.64	0.47	13.5	0.80	0.82	1	0.00	45.0	51.55	0.00	60.58	0.97
26	341.44	0.46	13.5	0.80	0.82	1	0.00	45.0	50.09	0.00	58.85	0.97
27	342.24	0.44	13.1	0.80	0.82	1	0.00	45.0	48.27	0.00	56.74	0.97
28	343.04	0.42	13.1	0.80	0.82	1	0.00	45.0	46.29	0.00	54.41	0.97
29	343.84	0.40	12.8	0.80	0.82	1	0.00	45.0	44.03	0.00	51.76	0.97
30	344.64	0.38	12.8	0.80	0.82	1	0.00	45.0	41.45	0.00	48.72	0.97
31	345.44	0.35	12.4	0.80	0.82	1	0.00	45.0	38.75	0.00	45.56	0.97
32	346.25	0.32	12.3	0.80	0.82	1	0.00	45.0	35.73	0.00	42.02	0.97
33	347.05	0.29	12.0	0.80	0.82	1	0.00	45.0	32.41	0.00	38.12	0.97
34	347.86	0.26	12.0	0.80	0.82	1	0.00	45.0	29.04	0.00	34.16	0.97
35	348.66	0.23	11.6	0.81	0.82	1	0.00	45.0	25.18	0.00	29.63	0.97
36	349.47	0.19	11.6	0.81	0.82	1	0.00	45.0	21.11	0.00	24.85	0.97
37	350.27	0.15	11.2	0.81	0.82	1	0.00	45.0	16.90	0.00	19.89	0.97
38	351.08	0.11	11.2	0.81	0.82	1	0.00	45.0	12.30	0.00	14.49	0.97
39	351.88	0.07	10.9	0.81	0.82	1	0.00	45.0	7.55	0.00	8.89	0.97
40	352.69	0.02	10.9	0.81	0.82	1	0.00	45.0	2.60	0.00	3.07	0.97

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X-S Area: 13.78 Path Length: 31.25 X-S Weight: 1494.99  
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DATA: Analysis 2 - Geotechnical Stability Analysis

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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Unit weight of water: 62.400

Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (6 points)		Material beneath: 2 - Loose sand, mixed grain size							
0.75	8212.78	255.29	8216.00	304.93	8216.63	325.75	8216.89	413.28	8218.00
500.00	8218.98								
Profile: 2 (4 points)		Material beneath: 1 - Sand and gravel, mixed grain size							
0.77	8211.28	255.31	8214.50	413.30	8216.50	500.00	8217.48		
Profile: 3 (19 points)		Material beneath: 2 - Loose sand, mixed grain size							
223.51	8215.60	225.12	8216.00	229.12	8217.00	233.12	8218.00	237.13	8219.00
241.06	8220.00	245.21	8221.00	249.26	8222.00	253.34	8223.00	257.13	8224.00
270.75	8224.00	275.70	8223.00	280.43	8222.00	285.17	8221.00	289.91	8220.00
294.34	8219.00	298.73	8218.00	303.32	8217.00	304.93	8216.63		

Slope Surface (23 points)

0.00	8212.78	223.51	8215.60	225.12	8216.00	229.12	8217.00	233.12	8218.00
237.13	8219.00	241.06	8220.00	245.21	8221.00	249.26	8222.00	253.34	8223.00
257.13	8224.00	270.75	8224.00	275.70	8223.00	280.43	8222.00	285.17	8221.00
289.91	8220.00	294.34	8219.00	298.73	8218.00	303.32	8217.00	304.93	8216.63
324.16	8216.80	365.36	8206.00	500.00	8207.50				

Phreatic Surface (2 points)

0.00	8202.00	500.00	8204.50
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Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XL, XR, R  
 Intersects: XL: 323.23 YL: 8216.79 XR: 353.50 YR: 8209.11  
 Centre: XC: 400.16 YC: 8456.43 Radius: R: 251.68

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	50.00	50.00	31.00
Trial positions within range:	25	25	25

RESULTS: Analysis 2 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 3.745

There were: 7858 successful analyses from a total of 15625 trial surfaces  
7767 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	323.23	8216.79	330.58	8215.12	380.51	8451.25	241.35	2.999	<-- Critical Surface
2	323.23	8216.79	330.58	8215.12	381.37	8455.03	245.23	2.999	
3	323.23	8216.79	330.58	8215.12	380.22	8449.99	240.06	3.000	
4	323.23	8216.79	330.58	8215.12	379.65	8447.47	237.48	3.000	
5	323.23	8216.79	330.58	8215.12	381.66	8456.29	246.52	3.000	
6	323.23	8216.79	330.58	8215.12	383.09	8462.58	252.98	3.000	
7	323.23	8216.79	330.58	8215.12	379.93	8448.73	238.77	3.000	
8	323.23	8216.79	330.58	8215.12	379.36	8446.21	236.18	3.001	
9	323.23	8216.79	330.58	8215.12	382.23	8458.80	249.10	3.001	
10	323.23	8216.79	330.58	8215.12	384.24	8467.62	258.14	3.001	
11	323.23	8216.79	330.58	8215.12	382.52	8460.06	250.39	3.001	
12	323.23	8216.79	330.58	8215.12	382.80	8461.32	251.68	3.001	
13	323.23	8216.79	330.58	8215.12	381.08	8453.77	243.93	3.001	
14	323.23	8216.79	330.58	8215.12	383.66	8465.10	255.56	3.001	
15	323.23	8216.79	330.58	8215.12	383.38	8463.84	254.27	3.001	
16	323.23	8216.79	330.58	8215.12	380.79	8452.51	242.64	3.002	
17	323.23	8216.79	330.58	8215.12	385.39	8472.66	263.31	3.002	
18	323.23	8216.79	330.58	8215.12	384.52	8468.88	259.43	3.002	
19	323.23	8216.79	330.58	8215.12	385.67	8473.92	264.60	3.002	
20	323.23	8216.79	330.58	8215.12	383.95	8466.36	256.85	3.002	
21	323.23	8216.79	330.58	8215.12	385.10	8471.40	262.02	3.002	
22	323.23	8216.79	330.58	8215.12	385.96	8475.18	265.89	3.002	
23	323.23	8216.79	330.58	8215.12	384.81	8470.14	260.73	3.002	
24	323.23	8216.79	330.58	8215.12	386.25	8476.44	267.18	3.003	
25	323.23	8216.79	330.58	8215.12	381.94	8457.54	247.81	3.003	
26	323.23	8216.79	328.50	8215.66	376.70	8453.47	242.64	3.113	
27	323.23	8216.79	328.50	8215.66	375.89	8449.68	238.77	3.113	
28	323.23	8216.79	328.50	8215.66	375.35	8447.15	236.18	3.114	
29	323.23	8216.79	328.50	8215.66	376.16	8450.94	240.06	3.115	
30	323.23	8216.79	328.50	8215.66	377.51	8457.26	246.52	3.115	
31	323.23	8216.79	328.50	8215.66	375.62	8448.42	237.48	3.115	
32	323.23	8216.79	328.50	8215.66	378.33	8461.05	250.39	3.115	
33	323.23	8216.79	328.50	8215.66	376.97	8454.73	243.93	3.115	
34	323.23	8216.79	328.50	8215.66	376.43	8452.21	241.35	3.115	
35	323.23	8216.79	328.50	8215.66	377.24	8455.99	245.23	3.116	
36	323.23	8216.79	328.50	8215.66	377.78	8458.52	247.81	3.116	
37	323.23	8216.79	328.50	8215.66	378.05	8459.78	249.10	3.116	
38	323.23	8216.79	328.50	8215.66	379.14	8464.84	254.27	3.116	
39	323.23	8216.79	328.50	8215.66	378.87	8463.57	252.98	3.116	
40	323.23	8216.79	328.50	8215.66	378.60	8462.31	251.68	3.116	
41	323.23	8216.79	328.50	8215.66	380.49	8471.15	260.73	3.116	
42	323.23	8216.79	328.50	8215.66	379.41	8466.10	255.56	3.116	
43	323.23	8216.79	328.50	8215.66	380.76	8472.41	262.02	3.116	
44	323.23	8216.79	328.50	8215.66	379.68	8467.36	256.85	3.116	

45	323.23	8216.79	328.50	8215.66	379.95	8468.62	258.14	3.117
46	323.23	8216.79	328.50	8215.66	381.57	8476.20	265.89	3.117
47	323.23	8216.79	328.50	8215.66	381.30	8474.94	264.60	3.117
48	323.23	8216.79	328.50	8215.66	380.22	8469.89	259.43	3.118
49	323.23	8216.79	328.50	8215.66	381.03	8473.68	263.31	3.118
50	323.23	8216.79	328.50	8215.66	381.84	8477.47	267.18	3.120
51	323.23	8216.79	332.67	8214.57	388.26	8471.94	263.31	3.138
52	323.23	8216.79	332.67	8214.57	389.15	8475.72	267.18	3.138
53	323.23	8216.79	332.67	8214.57	387.97	8470.69	262.02	3.139
54	323.23	8216.79	332.67	8214.57	387.08	8466.91	258.14	3.139
55	323.23	8216.79	332.67	8214.57	388.85	8474.46	265.89	3.139
56	323.23	8216.79	332.67	8214.57	388.56	8473.20	264.60	3.139
57	323.23	8216.79	332.67	8214.57	384.12	8454.34	245.23	3.139
58	323.23	8216.79	332.67	8214.57	386.78	8465.66	256.85	3.140
59	323.23	8216.79	332.67	8214.57	386.19	8463.14	254.27	3.140
60	323.23	8216.79	332.67	8214.57	382.93	8449.31	240.06	3.140
61	323.23	8216.79	332.67	8214.57	385.01	8458.11	249.10	3.140
62	323.23	8216.79	332.67	8214.57	387.67	8469.43	260.73	3.141
63	323.23	8216.79	332.67	8214.57	384.71	8456.85	247.81	3.141
64	323.23	8216.79	332.67	8214.57	385.89	8461.88	252.98	3.141
65	323.23	8216.79	332.67	8214.57	387.37	8468.17	259.43	3.141
66	323.23	8216.79	332.67	8214.57	385.60	8460.62	251.68	3.141
67	323.23	8216.79	332.67	8214.57	383.82	8453.08	243.93	3.141
68	323.23	8216.79	332.67	8214.57	386.49	8464.40	255.56	3.141
69	323.23	8216.79	332.67	8214.57	384.41	8455.59	246.52	3.141
70	323.23	8216.79	332.67	8214.57	385.30	8459.37	250.39	3.141
71	323.23	8216.79	332.67	8214.57	383.53	8451.82	242.64	3.141
72	323.23	8216.79	332.67	8214.57	382.64	8448.05	238.77	3.142
73	323.23	8216.79	332.67	8214.57	382.34	8446.79	237.48	3.143
74	323.23	8216.79	332.67	8214.57	382.05	8445.53	236.18	3.143
75	323.23	8216.79	332.67	8214.57	383.23	8450.56	241.35	3.143
76	325.31	8216.50	332.67	8214.57	396.71	8473.96	267.18	3.151
77	325.31	8216.50	332.67	8214.57	392.78	8458.97	251.68	3.151
78	325.31	8216.50	332.67	8214.57	395.08	8467.72	260.73	3.151
79	325.31	8216.50	332.67	8214.57	389.84	8447.72	240.06	3.151
80	325.31	8216.50	332.67	8214.57	388.85	8443.97	236.18	3.153
81	325.31	8216.50	332.67	8214.57	389.51	8446.47	238.77	3.154
82	323.23	8216.79	334.75	8214.02	391.09	8473.88	265.89	3.282
83	323.23	8216.79	334.75	8214.02	391.39	8475.13	267.18	3.282
84	323.23	8216.79	334.75	8214.02	390.49	8471.37	263.31	3.283
85	323.23	8216.79	334.75	8214.02	390.19	8470.11	262.02	3.283
86	323.23	8216.79	334.75	8214.02	390.79	8472.62	264.60	3.283
87	323.23	8216.79	334.75	8214.02	389.88	8468.85	260.73	3.284
88	323.23	8216.79	334.75	8214.02	389.58	8467.60	259.43	3.285
89	323.23	8216.79	334.75	8214.02	388.98	8465.08	256.85	3.285
90	323.23	8216.79	334.75	8214.02	388.68	8463.83	255.56	3.285
91	323.23	8216.79	334.75	8214.02	388.07	8461.32	252.98	3.286
92	323.23	8216.79	334.75	8214.02	388.37	8462.57	254.27	3.286
93	323.23	8216.79	334.75	8214.02	389.28	8466.34	258.14	3.286
94	323.23	8216.79	334.75	8214.02	387.17	8457.55	249.10	3.286
95	323.23	8216.79	334.75	8214.02	387.47	8458.80	250.39	3.287

96	323.23	8216.79	334.75	8214.02	386.56	8455.03	246.52	3.287
97	323.23	8216.79	334.75	8214.02	386.87	8456.29	247.81	3.287
98	323.23	8216.79	334.75	8214.02	387.77	8460.06	251.68	3.288
99	323.23	8216.79	334.75	8214.02	385.96	8452.52	243.93	3.288

Critical Failure Surface (circle 1)

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Intersects: XL: 323.23 YL: 8216.79 XR: 330.58 YR: 8215.12  
Centre: XC: 380.51 YC: 8451.25 Radius: R: 241.35

Generated failure surface: (20 points)

323.23	8216.79	323.61	8216.70	324.00	8216.61	324.39	8216.51	324.77	8216.42
325.16	8216.33	325.54	8216.24	325.93	8216.15	326.32	8216.06	326.71	8215.97
327.09	8215.88	327.48	8215.79	327.87	8215.71	328.25	8215.62	328.64	8215.54
329.03	8215.45	329.42	8215.37	329.81	8215.28	330.20	8215.20	330.58	8215.12

Slice Geometry and Properties - Critical Failure Surface (circle 1, 40 slices)

Slice	X-S		Base						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	323.23	0.00	13.7	0.19	0.20	2	0.00	34.0	0.45	0.00	2.20	0.98	
2	323.42	0.01	13.7	0.19	0.20	2	0.00	34.0	1.38	0.00	6.78	0.98	
3	323.61	0.02	13.4	0.19	0.20	2	0.00	34.0	2.31	0.00	11.38	0.98	
4	323.81	0.03	13.6	0.19	0.20	2	0.00	34.0	3.23	0.00	15.86	0.98	
5	324.00	0.03	13.7	0.16	0.17	2	0.00	34.0	3.39	0.00	19.98	0.98	
6	324.16	0.05	13.4	0.23	0.23	2	0.00	34.0	5.14	0.00	21.66	0.98	
7	324.39	0.04	13.4	0.19	0.20	2	0.00	34.0	4.31	0.00	21.20	0.98	
8	324.58	0.04	13.4	0.19	0.20	2	0.00	34.0	4.24	0.00	20.83	0.98	
9	324.77	0.04	13.4	0.19	0.20	2	0.00	34.0	4.13	0.00	20.28	0.98	
10	324.96	0.04	13.4	0.19	0.20	2	0.00	34.0	4.05	0.00	19.92	0.98	
11	325.16	0.04	13.4	0.19	0.20	2	0.00	34.0	3.94	0.00	19.37	0.98	
12	325.35	0.04	13.1	0.19	0.20	2	0.00	34.0	3.85	0.00	18.93	0.98	
13	325.54	0.04	13.1	0.19	0.20	2	0.00	34.0	3.74	0.00	18.38	0.98	
14	325.74	0.04	13.1	0.19	0.20	2	0.00	34.0	3.63	0.00	17.82	0.98	
15	325.93	0.04	13.1	0.19	0.20	2	0.00	34.0	3.53	0.00	17.37	0.98	
16	326.12	0.03	13.1	0.19	0.20	2	0.00	34.0	3.42	0.00	16.81	0.98	
17	326.32	0.03	12.8	0.19	0.20	2	0.00	34.0	3.31	0.00	16.28	0.98	
18	326.51	0.03	13.1	0.19	0.20	2	0.00	34.0	3.18	0.00	15.62	0.98	
19	326.71	0.03	12.8	0.19	0.20	2	0.00	34.0	3.07	0.00	15.09	0.98	
20	326.90	0.03	12.8	0.19	0.20	2	0.00	34.0	2.94	0.00	14.44	0.98	
21	327.09	0.03	12.8	0.19	0.20	2	0.00	34.0	2.79	0.00	13.71	0.98	
22	327.29	0.03	12.8	0.19	0.20	2	0.00	34.0	2.68	0.00	13.15	0.98	
23	327.48	0.03	12.8	0.19	0.20	2	0.00	34.0	2.53	0.00	12.42	0.98	
24	327.67	0.02	12.5	0.19	0.20	2	0.00	34.0	2.40	0.00	11.79	0.98	
25	327.87	0.02	12.5	0.19	0.20	2	0.00	34.0	2.25	0.00	11.05	0.98	
26	328.06	0.02	12.5	0.19	0.20	2	0.00	34.0	2.10	0.00	10.31	0.98	
27	328.25	0.02	12.5	0.19	0.20	2	0.00	34.0	1.95	0.00	9.58	0.98	
28	328.45	0.02	12.5	0.19	0.20	2	0.00	34.0	1.80	0.00	8.84	0.98	
29	328.64	0.02	12.5	0.19	0.20	2	0.00	34.0	1.65	0.00	8.10	0.98	
30	328.84	0.01	12.2	0.19	0.20	2	0.00	34.0	1.48	0.00	7.28	0.98	
31	329.03	0.01	11.9	0.07	0.08	2	0.00	34.0	0.52	0.00	6.74	0.98	
32	329.10	0.01	12.2	0.13	0.13	1	0.00	45.0	0.85	0.00	6.27	0.95	

33	329.23	0.01	12.2	0.13	0.13	1	0.00	45.0	0.82	0.00	6.03	0.95
34	329.36	0.00	12.6	0.06	0.06	1	0.00	45.0	0.38	0.00	5.80	0.95
35	329.42	0.01	12.2	0.19	0.20	1	0.00	45.0	1.06	0.00	5.11	0.95
36	329.61	0.01	12.2	0.19	0.20	1	0.00	45.0	0.90	0.00	4.31	0.95
37	329.81	0.01	12.2	0.19	0.20	1	0.00	45.0	0.69	0.00	3.31	0.95
38	330.00	0.00	11.9	0.19	0.20	1	0.00	45.0	0.50	0.00	2.41	0.95
39	330.20	0.00	11.9	0.19	0.20	1	0.00	45.0	0.29	0.00	1.40	0.95
40	330.39	0.00	12.2	0.19	0.20	1	0.00	45.0	0.10	0.00	0.50	0.95

X-S Area: 0.95

Path Length: 7.54

X-S Weight: 94.99

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# Section 4

GALENA 7.1 Analysis Results

Version: 7.10.1.02

Licensee: Greg Lewicki and Associates

Project: Peak Ranch Resource - Section 4

File: E:\Work\Dropbox (GLA)\Elam\Hillyard\DRMS\Geotechnical Stability Exhibit\Peak Ranch 4.gmf

Processed: 15 Jun 2020 17:02:06

DATA: Analysis 1 - Geotechnical Stability Analysis

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	34.0	99.00	Auto

Water Properties

Unit weight of water: 62.400

Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (4 points)	Material beneath: 2 - Loose sand, mixed grain size								
208.00	8232.11	225.90	8242.22	232.02	8242.25	250.00	8232.36		
Profile: 2 (6 points)	Material beneath: 2 - Loose sand, mixed grain size								
0.00	8229.68	95.25	8231.15	107.40	8230.33	158.71	8231.80	335.02	8232.88
508.50	8232.72								
Profile: 3 (6 points)	Material beneath: 1 - Sand and gravel, mixed grain size								
0.03	8228.19	95.20	8229.65	107.40	8228.83	158.77	8230.31	335.03	8231.38
508.50	8231.22								

Slope Surface (12 points)

0.00	8229.68	95.25	8231.15	107.40	8230.33	158.71	8231.80	208.00	8232.11
225.90	8242.22	232.02	8242.25	250.00	8232.36	274.80	8232.38	372.86	8199.96
424.70	8174.00	508.50	8173.18						

Phreatic Surface (2 points)

-200.00	8212.00	700.00	8210.00
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Failure Surface

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

Intersects: XL:	283.18	YL:	8229.61	XR:	390.00	YR:	8191.38
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Centre: XC: 392.38 YC: 8366.36 Radius: R: 175.00

Variable Restraints

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Parameter descriptor:      XL      XR      R
Range of variation:      75.94   96.00   30.00
Trial positions within range: 30      30      30
-----
```

RESULTS: Analysis 1 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.606

There were: 26461 successful analyses from a total of 27001 trial surfaces  
540 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.39

Results Summary - Lowest 99 Factor of Safety circles

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Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	321.15	8217.06	424.76	8174.00	442.62	8363.16	190.00	2.394	<-- Critical Surface
2	321.15	8217.06	424.76	8174.00	442.20	8362.16	188.97	2.395	
3	321.15	8217.06	424.76	8174.00	441.78	8361.16	187.93	2.396	
4	321.15	8217.06	424.76	8174.00	441.37	8360.16	186.90	2.397	
5	321.15	8217.06	424.76	8174.00	440.95	8359.16	185.86	2.398	
6	321.15	8217.06	424.76	8174.00	440.54	8358.15	184.83	2.399	
7	321.15	8217.06	424.76	8174.00	440.12	8357.15	183.79	2.401	
8	318.53	8217.92	424.76	8174.00	440.84	8363.32	190.00	2.402	
9	321.15	8217.06	424.76	8174.00	439.70	8356.15	182.76	2.402	
10	318.53	8217.92	424.76	8174.00	440.43	8362.31	188.97	2.403	
11	321.15	8217.06	424.76	8174.00	439.28	8355.14	181.72	2.403	
12	318.53	8217.92	424.76	8174.00	440.01	8361.31	187.93	2.404	
13	321.15	8217.06	424.76	8174.00	438.87	8354.14	180.69	2.404	
14	318.53	8217.92	424.76	8174.00	439.60	8360.31	186.90	2.405	
15	321.15	8217.06	421.45	8175.63	440.81	8364.64	190.00	2.405	
16	321.15	8217.06	424.76	8174.00	438.45	8353.13	179.66	2.406	
17	318.53	8217.92	424.76	8174.00	439.18	8359.30	185.86	2.406	
18	321.15	8217.06	421.45	8175.63	440.40	8363.64	188.97	2.406	
19	321.15	8217.06	424.76	8174.00	438.03	8352.13	178.62	2.407	
20	318.53	8217.92	424.76	8174.00	438.77	8358.30	184.83	2.407	
21	321.15	8217.06	421.45	8175.63	439.99	8362.64	187.93	2.407	
22	321.15	8217.06	424.76	8174.00	437.61	8351.12	177.59	2.408	
23	321.15	8217.06	421.45	8175.63	439.58	8361.64	186.90	2.408	
24	315.91	8218.79	424.76	8174.00	439.08	8363.46	190.00	2.408	



25	318.53	8217.92	424.76	8174.00	438.35	8357.29	183.79	2.409
26	321.15	8217.06	421.45	8175.63	439.16	8360.64	185.86	2.409
27	315.91	8218.79	424.76	8174.00	438.67	8362.45	188.97	2.410
28	321.15	8217.06	424.76	8174.00	437.19	8350.11	176.55	2.410
29	318.53	8217.92	424.76	8174.00	437.93	8356.28	182.76	2.410
30	321.15	8217.06	421.45	8175.63	438.75	8359.64	184.83	2.410
31	315.91	8218.79	424.76	8174.00	438.25	8361.45	187.93	2.411
32	318.53	8217.92	424.76	8174.00	437.52	8355.28	181.72	2.411
33	321.15	8217.06	424.76	8174.00	436.78	8349.10	175.52	2.411
34	321.15	8217.06	421.45	8175.63	438.34	8358.64	183.79	2.412
35	315.91	8218.79	424.76	8174.00	437.84	8360.44	186.90	2.412
36	318.53	8217.92	424.76	8174.00	437.10	8354.27	180.69	2.412
37	318.53	8217.92	421.45	8175.63	439.04	8364.81	190.00	2.413
38	321.15	8217.06	424.76	8174.00	436.36	8348.10	174.48	2.413
39	321.15	8217.06	421.45	8175.63	437.92	8357.64	182.76	2.413
40	315.91	8218.79	424.76	8174.00	437.42	8359.43	185.86	2.413
41	318.53	8217.92	424.76	8174.00	436.68	8353.26	179.66	2.413
42	318.53	8217.92	421.45	8175.63	438.63	8363.81	188.97	2.414
43	321.15	8217.06	421.45	8175.63	437.51	8356.64	181.72	2.414
44	321.15	8217.06	424.76	8174.00	435.94	8347.09	173.45	2.414
45	315.91	8218.79	424.76	8174.00	437.01	8358.42	184.83	2.414
46	313.29	8219.65	424.76	8174.00	437.33	8363.58	190.00	2.414
47	318.53	8217.92	421.45	8175.63	438.22	8362.81	187.93	2.415
48	318.53	8217.92	424.76	8174.00	436.27	8352.25	178.62	2.415
49	321.15	8217.06	421.45	8175.63	437.10	8355.64	180.69	2.415
50	315.91	8218.79	424.76	8174.00	436.59	8357.41	183.79	2.415
51	313.29	8219.65	424.76	8174.00	436.91	8362.57	188.97	2.415
52	321.15	8217.06	424.76	8174.00	435.52	8346.08	172.41	2.415
53	318.53	8217.92	421.45	8175.63	437.81	8361.81	186.90	2.415
54	318.53	8217.92	424.76	8174.00	435.85	8351.24	177.59	2.416
55	321.15	8217.06	421.45	8175.63	436.68	8354.64	179.66	2.416
56	313.29	8219.65	424.76	8174.00	436.50	8361.56	187.93	2.416
57	315.91	8218.79	424.76	8174.00	436.18	8356.40	182.76	2.416
58	318.53	8217.92	421.45	8175.63	437.40	8360.80	185.86	2.417
59	321.15	8217.06	424.76	8174.00	435.10	8345.07	171.38	2.417
60	321.15	8217.06	421.45	8175.63	436.27	8353.63	178.62	2.417
61	313.29	8219.65	424.76	8174.00	436.09	8360.55	186.90	2.418
62	318.53	8217.92	424.76	8174.00	435.43	8350.23	176.55	2.418
63	318.53	8217.92	421.45	8175.63	436.99	8359.80	184.83	2.418
64	315.91	8218.79	424.76	8174.00	435.76	8355.39	181.72	2.418
65	321.15	8217.06	418.14	8177.29	438.93	8366.14	190.00	2.418
66	321.15	8217.06	424.76	8174.00	434.68	8344.06	170.34	2.419
67	321.15	8217.06	421.45	8175.63	435.85	8352.63	177.59	2.419
68	321.15	8217.06	438.00	8173.87	432.99	8340.00	166.21	2.419
69	318.53	8217.92	421.45	8175.63	436.57	8358.80	183.79	2.419
70	313.29	8219.65	424.76	8174.00	435.67	8359.54	185.86	2.419
71	318.53	8217.92	424.76	8174.00	435.01	8349.22	175.52	2.419
72	315.91	8218.79	421.45	8175.63	437.29	8364.97	190.00	2.419
73	315.91	8218.79	424.76	8174.00	435.34	8354.38	180.69	2.419
74	321.15	8217.06	418.14	8177.29	438.52	8365.15	188.97	2.419
75	310.68	8220.52	424.76	8174.00	435.58	8363.69	190.00	2.419

76	318.53	8217.92	421.45	8175.63	436.16	8357.79	182.76	2.420
77	321.15	8217.06	421.45	8175.63	435.44	8351.62	176.55	2.420
78	315.91	8218.79	421.45	8175.63	436.88	8363.96	188.97	2.420
79	313.29	8219.65	424.76	8174.00	435.26	8358.53	184.83	2.420
80	321.15	8217.06	418.14	8177.29	438.11	8364.15	187.93	2.420
81	321.15	8217.06	424.76	8174.00	434.26	8343.04	169.31	2.420
82	318.53	8217.92	438.00	8173.87	432.93	8344.14	170.34	2.420
83	315.91	8218.79	424.76	8174.00	434.93	8353.37	179.66	2.420
84	318.53	8217.92	424.76	8174.00	434.59	8348.21	174.48	2.420
85	310.68	8220.52	424.76	8174.00	435.17	8362.68	188.97	2.421
86	321.15	8217.06	438.00	8173.87	432.61	8338.95	165.17	2.421
87	318.53	8217.92	421.45	8175.63	435.75	8356.79	181.72	2.421
88	315.91	8218.79	421.45	8175.63	436.46	8362.96	187.93	2.421
89	321.15	8217.06	418.14	8177.29	437.71	8363.16	186.90	2.421
90	313.29	8219.65	424.76	8174.00	434.84	8357.52	183.79	2.421
91	321.15	8217.06	421.45	8175.63	435.02	8350.62	175.52	2.421
92	315.91	8218.79	438.00	8173.87	432.86	8348.28	174.48	2.421
93	315.91	8218.79	424.76	8174.00	434.51	8352.35	178.62	2.422
94	321.15	8217.06	424.76	8174.00	433.84	8342.03	168.28	2.422
95	310.68	8220.52	424.76	8174.00	434.76	8361.66	187.93	2.422
96	318.53	8217.92	424.76	8174.00	434.18	8347.19	173.45	2.422
97	313.29	8219.65	438.00	8173.87	432.79	8352.42	178.62	2.422
98	321.15	8217.06	418.14	8177.29	437.30	8362.16	185.86	2.422
99	315.91	8218.79	421.45	8175.63	436.05	8361.95	186.90	2.422

Critical Failure Surface (circle 1)

-----  
Intersects: XL: 321.15 YL: 8217.06 XR: 424.76 YR: 8174.00  
Centre: XC: 442.62 YC: 8363.16 Radius: R: 190.00

Generated failure surface: (20 points)

321.15	8217.06	325.82	8213.30	330.60	8209.69	335.50	8206.23	340.51	8202.93
345.61	8199.79	350.81	8196.81	356.11	8194.00	361.48	8191.35	366.95	8188.88
372.48	8186.58	378.09	8184.45	383.75	8182.51	389.48	8180.74	395.26	8179.15
401.09	8177.75	406.96	8176.53	412.87	8175.50	418.80	8174.66	424.76	8174.00

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

Slice	X-S		----- Base -----						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	321.15	1.29	38.8	2.33	3.00	1	0.00	45.0	142.20	0.00	45.58	0.96	
2	323.48	3.88	38.8	2.33	3.00	1	0.00	45.0	426.84	0.00	136.83	0.96	
3	325.82	9.54	37.0	3.28	4.11	1	0.00	45.0	1049.19	0.00	243.41	0.95	
4	329.10	5.92	37.0	1.51	1.89	1	0.00	45.0	650.90	66.77	336.67	0.95	
5	330.60	11.52	35.2	2.45	3.00	1	0.00	45.0	1266.71	373.31	427.90	0.95	
6	333.05	13.77	35.2	2.45	3.00	1	0.00	45.0	1514.23	695.49	530.44	0.95	
7	335.50	14.76	33.4	2.29	2.74	1	0.00	45.0	1623.59	911.01	628.79	0.94	
8	337.79	16.48	33.4	2.29	2.74	1	0.00	45.0	1812.64	1167.80	713.90	0.94	
9	340.07	3.31	33.4	0.43	0.52	1	0.00	45.0	364.31	249.84	768.04	0.94	
10	340.51	20.66	31.6	2.55	3.00	1	0.00	45.0	2272.10	1618.09	846.34	0.93	
11	343.06	22.51	31.6	2.55	3.00	1	0.00	45.0	2476.11	1911.17	971.49	0.93	
12	345.61	24.70	29.8	2.60	3.00	1	0.00	45.0	2717.12	2196.02	1097.52	0.93	

13	348.21	26.33	29.8	2.60	3.00	1	0.00	45.0	2896.78	2473.45	1214.21	0.93
14	350.81	28.33	28.0	2.65	3.00	1	0.00	45.0	3116.82	2743.11	1332.33	0.93
15	353.46	29.74	28.0	2.65	3.00	1	0.00	45.0	3271.48	3005.00	1440.41	0.93
16	356.11	31.52	26.2	2.69	3.00	1	0.00	45.0	3467.40	3258.94	1550.19	0.92
17	358.80	32.69	26.2	2.69	3.00	1	0.00	45.0	3595.72	3505.85	1649.46	0.92
18	361.48	34.23	24.4	2.73	3.00	1	0.00	45.0	3765.06	3743.59	1750.89	0.92
19	364.21	35.14	24.4	2.73	3.00	1	0.00	45.0	3865.39	3973.75	1841.04	0.92
20	366.95	36.41	22.6	2.77	3.00	1	0.00	45.0	4005.34	4196.06	1933.57	0.92
21	369.71	37.06	22.6	2.77	3.00	1	0.00	45.0	4076.84	4409.57	2014.46	0.92
22	372.48	37.56	20.8	2.80	3.00	1	0.00	45.0	4131.88	4615.41	2090.78	0.92
23	375.28	36.61	20.8	2.80	3.00	1	0.00	45.0	4026.66	4813.21	2142.62	0.92
24	378.09	35.91	19.0	2.83	3.00	1	0.00	45.0	3950.26	5002.39	2196.35	0.92
25	380.92	34.65	18.9	2.83	3.00	1	0.00	45.0	3810.95	5183.03	2238.14	0.92
26	383.75	33.58	17.1	2.86	3.00	1	0.00	45.0	3693.43	5355.48	2281.23	0.93
27	386.62	32.00	17.1	2.86	3.00	1	0.00	45.0	3519.60	5519.49	2312.69	0.93
28	389.48	30.55	15.3	2.89	3.00	1	0.00	45.0	3360.66	5674.97	2344.91	0.93
29	392.37	28.66	15.3	2.89	3.00	1	0.00	45.0	3152.32	5822.34	2365.98	0.93
30	395.26	26.83	13.5	2.91	3.00	1	0.00	45.0	2951.72	5960.71	2387.05	0.93
31	398.18	24.62	13.5	2.91	3.00	1	0.00	45.0	2708.66	6090.56	2397.58	0.93
32	401.09	22.42	11.7	2.93	3.00	1	0.00	45.0	2466.52	6211.91	2407.26	0.94
33	404.03	19.90	11.7	2.93	3.00	1	0.00	45.0	2188.60	6324.23	2407.14	0.94
34	406.96	17.32	9.9	2.95	3.00	1	0.00	45.0	1905.74	6428.03	2405.12	0.95
35	409.91	14.48	9.9	2.95	3.00	1	0.00	45.0	1593.21	6523.71	2394.25	0.95
36	412.87	11.55	8.1	2.97	3.00	1	0.00	45.0	1270.52	6610.27	2380.36	0.95
37	415.83	8.39	8.1	2.97	3.00	1	0.00	45.0	923.40	6687.83	2358.52	0.95
38	418.80	5.08	6.3	2.95	2.97	1	0.00	45.0	558.64	6690.20	2332.73	0.96
39	421.75	1.68	6.3	3.01	3.03	1	0.00	45.0	184.85	6884.02	2299.88	0.96
-----												
X-S Area:	861.59	Path Length:	113.89	X-S Weight:	94774.41							

DATA: Analysis 2 - Geotechnical Stability Analysis

Material Properties (2 materials)

-----  
Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto  
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (3 profiles)

-----  
Profile: 1 (4 points) Material beneath: 2 - Loose sand, mixed grain size  
208.00 8232.11 225.90 8242.22 232.02 8242.25 250.00 8232.36

Profile: 2 (6 points) Material beneath: 2 - Loose sand, mixed grain size  
 0.00 8229.68 95.25 8231.15 107.40 8230.33 158.71 8231.80 335.02 8232.88  
 508.50 8232.72  
 Profile: 3 (6 points) Material beneath: 1 - Sand and gravel, mixed grain size  
 0.03 8228.19 95.20 8229.65 107.40 8228.83 158.77 8230.31 335.03 8231.38  
 508.50 8231.22

Slope Surface (12 points)  
 -----  
 0.00 8229.68 95.25 8231.15 107.40 8230.33 158.71 8231.80 208.00 8232.11  
 225.90 8242.22 232.02 8242.25 250.00 8232.36 274.80 8232.38 372.86 8199.96  
 424.70 8174.00 508.50 8173.18

Phreatic Surface (2 points)  
 -----  
 -200.00 8212.00 700.00 8210.00

Failure Surface (Critical, from previous analysis)  
 -----  
 Initial circular surface for critical search defined by: XL, XR, R  
 Intersects: XL: 321.15 YL: 8217.06 XR: 424.76 YR: 8174.00  
 Centre: XC: 442.62 YC: 8363.16 Radius: R: 190.00

Variable Restraints  
 -----  
 Parameter descriptor: XL XR R  
 Range of variation: 75.94 96.00 30.00  
 Trial positions within range: 30 30 30

-----  
 RESULTS: Analysis 2 - Geotechnical Stability Analysis

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

Factor of Safety for initial failure surface approximation: 2.394  
 There were: 19180 successful analyses from a total of 27001 trial surfaces  
 7821 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.03

Results Summary - Lowest 99 Factor of Safety circles  
 -----

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	359.12	8204.50	423.10	8174.80	476.15	8372.82	205.00	2.028	<-- Critical Surface
2	359.12	8204.50	423.10	8174.80	475.70	8371.87	203.97	2.029	
3	359.12	8204.50	423.10	8174.80	475.26	8370.91	202.93	2.029	

4	359.12	8204.50	423.10	8174.80	474.82	8369.96	201.90	2.030
5	359.12	8204.50	423.10	8174.80	474.38	8369.01	200.86	2.030
6	359.12	8204.50	419.79	8176.46	474.32	8374.07	205.00	2.031
7	359.12	8204.50	423.10	8174.80	473.93	8368.05	199.83	2.031
8	359.12	8204.50	419.79	8176.46	473.88	8373.12	203.97	2.032
9	359.12	8204.50	423.10	8174.80	473.49	8367.10	198.79	2.032
10	359.12	8204.50	419.79	8176.46	473.44	8372.17	202.93	2.032
11	359.12	8204.50	423.10	8174.80	473.05	8366.15	197.76	2.032
12	359.12	8204.50	419.79	8176.46	473.00	8371.22	201.90	2.033
13	359.12	8204.50	423.10	8174.80	472.61	8365.19	196.72	2.033
14	359.12	8204.50	419.79	8176.46	472.56	8370.26	200.86	2.033
15	359.12	8204.50	423.10	8174.80	472.16	8364.24	195.69	2.034
16	359.12	8204.50	419.79	8176.46	472.12	8369.31	199.83	2.034
17	359.12	8204.50	416.48	8178.11	472.45	8375.33	205.00	2.034
18	359.12	8204.50	423.10	8174.80	471.72	8363.29	194.66	2.034
19	359.12	8204.50	419.79	8176.46	471.68	8368.36	198.79	2.035
20	359.12	8204.50	416.48	8178.11	472.02	8374.38	203.97	2.035
21	359.12	8204.50	423.10	8174.80	471.28	8362.33	193.62	2.035
22	359.12	8204.50	416.48	8178.11	471.58	8373.42	202.93	2.035
23	359.12	8204.50	419.79	8176.46	471.24	8367.41	197.76	2.035
24	359.12	8204.50	416.48	8178.11	471.14	8372.47	201.90	2.036
25	359.12	8204.50	423.10	8174.80	470.83	8361.38	192.59	2.036
26	359.12	8204.50	419.79	8176.46	470.80	8366.45	196.72	2.036
27	359.12	8204.50	416.48	8178.11	470.70	8371.52	200.86	2.036
28	359.12	8204.50	423.10	8174.80	470.39	8360.42	191.55	2.036
29	359.12	8204.50	419.79	8176.46	470.36	8365.50	195.69	2.037
30	359.12	8204.50	416.48	8178.11	470.27	8370.57	199.83	2.037
31	359.12	8204.50	419.79	8176.46	469.92	8364.55	194.66	2.037
32	359.12	8204.50	423.10	8174.80	469.95	8359.47	190.52	2.037
33	359.12	8204.50	416.48	8178.11	469.83	8369.62	198.79	2.038
34	359.12	8204.50	419.79	8176.46	469.48	8363.59	193.62	2.038
35	359.12	8204.50	423.10	8174.80	469.50	8358.51	189.48	2.038
36	359.12	8204.50	416.48	8178.11	469.39	8368.67	197.76	2.038
37	359.12	8204.50	419.79	8176.46	469.04	8362.64	192.59	2.038
38	359.12	8204.50	423.10	8174.80	469.06	8357.56	188.45	2.039
39	359.12	8204.50	416.48	8178.11	468.95	8367.71	196.72	2.039
40	359.12	8204.50	419.79	8176.46	468.60	8361.69	191.55	2.039
41	359.12	8204.50	416.48	8178.11	468.51	8366.76	195.69	2.039
42	359.12	8204.50	423.10	8174.80	468.62	8356.60	187.41	2.039
43	359.12	8204.50	419.79	8176.46	468.16	8360.73	190.52	2.040
44	359.12	8204.50	413.17	8179.77	470.54	8376.58	205.00	2.040
45	359.12	8204.50	416.48	8178.11	468.08	8365.81	194.66	2.040
46	359.12	8204.50	423.10	8174.80	468.17	8355.65	186.38	2.040
47	359.12	8204.50	419.79	8176.46	467.71	8359.78	189.48	2.040
48	359.12	8204.50	416.48	8178.11	467.64	8364.86	193.62	2.041
49	359.12	8204.50	413.17	8179.77	470.10	8375.63	203.97	2.041
50	359.12	8204.50	423.10	8174.80	467.73	8354.69	185.34	2.041
51	359.12	8204.50	419.79	8176.46	467.27	8358.83	188.45	2.041
52	359.12	8204.50	413.17	8179.77	469.67	8374.68	202.93	2.041
53	359.12	8204.50	416.48	8178.11	467.20	8363.90	192.59	2.041
54	359.12	8204.50	413.17	8179.77	469.23	8373.73	201.90	2.042

55	359.12	8204.50	423.10	8174.80	467.29	8353.74	184.31	2.042
56	359.12	8204.50	419.79	8176.46	466.83	8357.87	187.41	2.042
57	359.12	8204.50	416.48	8178.11	466.76	8362.95	191.55	2.042
58	359.12	8204.50	413.17	8179.77	468.79	8372.78	200.86	2.042
59	359.12	8204.50	423.10	8174.80	466.84	8352.78	183.28	2.042
60	359.12	8204.50	416.48	8178.11	466.32	8362.00	190.52	2.042
61	359.12	8204.50	419.79	8176.46	466.39	8356.92	186.38	2.043
62	359.12	8204.50	413.17	8179.77	468.36	8371.83	199.83	2.043
63	359.12	8204.50	416.48	8178.11	465.88	8361.04	189.48	2.043
64	359.12	8204.50	423.10	8174.80	466.40	8351.82	182.24	2.043
65	359.12	8204.50	419.79	8176.46	465.95	8355.96	185.34	2.043
66	359.12	8204.50	413.17	8179.77	467.92	8370.88	198.79	2.043
67	359.12	8204.50	416.48	8178.11	465.45	8360.09	188.45	2.044
68	359.12	8204.50	423.10	8174.80	465.95	8350.87	181.21	2.044
69	359.12	8204.50	413.17	8179.77	467.49	8369.93	197.76	2.044
70	359.12	8204.50	419.79	8176.46	465.51	8355.01	184.31	2.044
71	359.12	8204.50	416.48	8178.11	465.01	8359.14	187.41	2.044
72	359.12	8204.50	413.17	8179.77	467.05	8368.97	196.72	2.045
73	359.12	8204.50	419.79	8176.46	465.07	8354.05	183.28	2.045
74	359.12	8204.50	423.10	8174.80	465.51	8349.91	180.17	2.045
75	359.12	8204.50	413.17	8179.77	466.62	8368.02	195.69	2.045
76	359.12	8204.50	416.48	8178.11	464.57	8358.18	186.38	2.045
77	359.12	8204.50	419.79	8176.46	464.63	8353.10	182.24	2.045
78	359.12	8204.50	423.10	8174.80	465.07	8348.95	179.14	2.045
79	359.12	8204.50	413.17	8179.77	466.18	8367.07	194.66	2.046
80	359.12	8204.50	416.48	8178.11	464.13	8357.23	185.34	2.046
81	359.12	8204.50	419.79	8176.46	464.18	8352.14	181.21	2.046
82	359.12	8204.50	413.17	8179.77	465.75	8366.12	193.62	2.046
83	359.12	8204.50	423.10	8174.80	464.62	8348.00	178.10	2.046
84	359.12	8204.50	409.86	8181.43	468.56	8377.85	205.00	2.046
85	359.12	8204.50	416.48	8178.11	463.69	8356.28	184.31	2.046
86	359.12	8204.50	409.86	8181.43	468.13	8376.90	203.97	2.047
87	359.12	8204.50	413.17	8179.77	465.31	8365.17	192.59	2.047
88	359.12	8204.50	419.79	8176.46	463.74	8351.19	180.17	2.047
89	359.12	8204.50	423.10	8174.80	464.18	8347.04	177.07	2.047
90	359.12	8204.50	416.48	8178.11	463.25	8355.32	183.28	2.047
91	359.12	8204.50	409.86	8181.43	467.69	8375.95	202.93	2.047
92	359.12	8204.50	413.17	8179.77	464.88	8364.21	191.55	2.047
93	359.12	8204.50	419.79	8176.46	463.30	8350.23	179.14	2.048
94	359.12	8204.50	416.48	8178.11	462.81	8354.37	182.24	2.048
95	359.12	8204.50	423.10	8174.80	463.73	8346.08	176.03	2.048
96	359.12	8204.50	409.86	8181.43	467.26	8375.00	201.90	2.048
97	359.12	8204.50	413.17	8179.77	464.44	8363.26	190.52	2.048
98	359.12	8204.50	419.79	8176.46	462.86	8349.28	178.10	2.048
99	359.12	8204.50	409.86	8181.43	466.83	8374.04	200.86	2.049

Critical Failure Surface (circle 1)

-----  
Intersects: XL: 359.12 YL: 8204.50 XR: 423.10 YR: 8174.80  
Centre: XC: 476.15 YC: 8372.82 Radius: R: 205.00  
Generated failure surface: (20 points)

359.12	8204.50	362.20	8202.40	365.32	8200.36	368.48	8198.37	371.67	8196.44
374.90	8194.56	378.16	8192.75	381.46	8191.00	384.78	8189.30	388.14	8187.67
391.52	8186.10	394.93	8184.59	398.37	8183.14	401.84	8181.76	405.33	8180.44
408.84	8179.18	412.38	8177.99	415.93	8176.86	419.51	8175.80	423.10	8174.80

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

Slice	X-S		Base						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	359.12	0.42	34.3	1.54	1.87	1	0.00	45.0	45.87	789.03	432.60	0.91	
2	360.66	1.25	34.3	1.54	1.87	1	0.00	45.0	137.76	911.29	517.29	0.91	
3	362.20	2.09	33.2	1.56	1.87	1	0.00	45.0	229.46	1031.39	600.98	0.90	
4	363.76	2.88	33.2	1.56	1.87	1	0.00	45.0	316.45	1149.96	682.77	0.90	
5	365.32	3.68	32.2	1.58	1.87	1	0.00	45.0	404.96	1267.01	763.85	0.90	
6	366.90	4.43	32.2	1.58	1.87	1	0.00	45.0	487.03	1382.27	842.81	0.90	
7	368.48	5.20	31.1	1.60	1.87	1	0.00	45.0	572.27	1495.78	921.38	0.90	
8	370.08	5.90	31.2	1.60	1.87	1	0.00	45.0	649.28	1608.20	997.45	0.90	
9	371.67	4.82	30.1	1.19	1.37	1	0.00	45.0	530.44	1252.84	1063.75	0.90	
10	372.86	8.76	30.1	2.04	2.36	1	0.00	45.0	964.11	2292.80	1130.44	0.90	
11	374.90	7.21	29.1	1.63	1.87	1	0.00	45.0	792.57	1933.51	1201.58	0.90	
12	376.53	7.35	29.1	1.63	1.87	1	0.00	45.0	808.70	2038.58	1261.24	0.90	
13	378.16	7.54	28.0	1.65	1.87	1	0.00	45.0	829.67	2142.21	1320.85	0.90	
14	379.81	7.63	28.0	1.65	1.87	1	0.00	45.0	839.06	2243.99	1377.34	0.90	
15	381.46	7.76	27.0	1.66	1.87	1	0.00	45.0	853.18	2343.72	1433.76	0.90	
16	383.12	7.78	27.0	1.66	1.87	1	0.00	45.0	855.68	2441.83	1486.87	0.90	
17	384.78	7.84	26.0	1.68	1.87	1	0.00	45.0	862.66	2538.25	1539.95	0.90	
18	386.46	7.80	25.9	1.68	1.87	1	0.00	45.0	858.25	2632.60	1589.78	0.90	
19	388.14	7.80	24.9	1.69	1.87	1	0.00	45.0	857.82	2725.72	1639.47	0.90	
20	389.83	7.69	24.9	1.69	1.87	1	0.00	45.0	846.18	2816.67	1685.80	0.90	
21	391.52	7.62	23.9	1.71	1.87	1	0.00	45.0	838.05	2905.66	1732.06	0.90	
22	393.23	7.45	23.9	1.71	1.87	1	0.00	45.0	819.36	2993.34	1774.98	0.90	
23	394.93	7.30	22.8	1.72	1.87	1	0.00	45.0	803.38	3078.90	1817.70	0.90	
24	396.65	7.07	22.8	1.72	1.87	1	0.00	45.0	777.22	3162.27	1857.15	0.90	
25	398.37	6.85	21.8	1.73	1.87	1	0.00	45.0	753.29	3244.44	1896.29	0.90	
26	400.10	6.54	21.8	1.73	1.87	1	0.00	45.0	719.81	3324.90	1932.21	0.90	
27	401.84	6.25	20.7	1.74	1.87	1	0.00	45.0	687.60	3403.16	1967.74	0.90	
28	403.58	5.88	20.7	1.74	1.87	1	0.00	45.0	646.73	3479.24	2000.20	0.90	
29	405.33	5.51	19.7	1.76	1.87	1	0.00	45.0	606.07	3553.83	2031.88	0.90	
30	407.08	5.07	19.7	1.76	1.87	1	0.00	45.0	557.68	3626.64	2060.75	0.90	
31	408.84	4.62	18.6	1.77	1.87	1	0.00	45.0	508.63	3697.41	2088.69	0.90	
32	410.61	4.11	18.7	1.77	1.87	1	0.00	45.0	452.43	3766.74	2113.84	0.90	
33	412.38	3.59	17.6	1.78	1.87	1	0.00	45.0	395.04	3833.65	2137.93	0.91	
34	414.15	3.01	17.6	1.78	1.87	1	0.00	45.0	331.14	3898.54	2159.44	0.91	
35	415.93	2.41	16.6	1.79	1.87	1	0.00	45.0	265.19	3962.09	2179.67	0.91	
36	417.72	1.76	16.6	1.79	1.87	1	0.00	45.0	193.64	4023.65	2197.53	0.91	
37	419.51	1.08	15.5	1.80	1.87	1	0.00	45.0	119.05	4082.91	2213.78	0.91	
38	421.31	0.36	15.5	1.80	1.87	1	0.00	45.0	39.68	4140.54	2227.87	0.91	

X-S Area: 202.32 Path Length: 70.89 X-S Weight: 22255.37

# Section 5

GALENA 7.1 Analysis Results

Version: 7.10.1.02

Licensee: Greg Lewicki and Associates

Project: Peak Ranch Resource - Section 5

File: E:\Work\Dropbox (GLA)\Elam\Hillyard\DRMS\Geotechnical Stability Exhibit\Peak Ranch 5.gmf

Processed: 15 Jun 2020 17:28:56

DATA: Analysis 1 - Geotechnical Stability Analysis

Material Properties (2 materials)

-----

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	34.0	99.00	Auto

Water Properties

-----

Unit weight of water: 62.400

Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

-----

Profile: 1 (13 points)

Material beneath: 2 - Loose sand, mixed grain size

0.00	8237.87	28.05	8236.00	43.88	8236.05	61.02	8240.03	90.41	8241.12
106.53	8240.00	118.09	8238.00	142.81	8235.98	237.43	8236.07	277.47	8237.17
344.58	8236.07	405.96	8233.94	483.67	8232.79				

Profile: 2 (13 points)

Material beneath: 1 - Sand and gravel, mixed grain size

-0.10	8236.38	28.01	8234.50	44.20	8234.58	61.13	8238.53	90.38	8239.62
106.37	8238.51	117.92	8236.51	142.75	8234.48	237.46	8234.57	277.47	8235.67
344.54	8234.57	405.93	8232.44	483.65	8231.29				

Profile: 3 (4 points)

Material beneath: 2 - Loose sand, mixed grain size

202.06	8236.04	228.30	8244.64	233.57	8245.64	260.46	8236.52		
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Slope Surface (16 points)

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0.00	8237.87	28.05	8236.00	43.88	8236.05	69.07	8241.16	96.61	8241.16
118.09	8238.00	142.81	8235.98	202.06	8236.04	228.30	8244.64	233.57	8245.64
239.23	8243.64	260.46	8236.52	284.96	8237.01	396.49	8200.00	452.54	8172.00
483.67	8172.00								

Phreatic Surface (2 points)

-----

-200.00	8206.00	700.00	8206.00
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Failure Surface



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Initial circular surface for critical search defined by: XL, XR, R  
Intersects: XL: 313.00 YL: 8227.71 XR: 425.00 YR: 8185.76  
Centre: XC: 454.14 YC: 8434.05 Radius: R: 250.00

Variable Restraints

-----  
Parameter descriptor: XL XR R  
Range of variation: 76.94 83.00 20.00  
Trial positions within range: 30 30 20

-----  
RESULTS: Analysis 1 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

-----  
Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.543

There were: 15571 successful analyses from a total of 18001 trial surfaces  
2430 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.29

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	351.47	8214.94	452.19	8172.17	501.17	8427.52	260.00	2.291	<-- Critical Surface
2	351.47	8214.94	452.19	8172.17	500.75	8426.53	258.95	2.291	
3	351.47	8214.94	452.19	8172.17	500.33	8425.54	257.89	2.291	
4	351.47	8214.94	452.19	8172.17	499.91	8424.55	256.84	2.291	
5	351.47	8214.94	452.19	8172.17	499.48	8423.55	255.79	2.291	
6	351.47	8214.94	452.19	8172.17	499.06	8422.56	254.74	2.291	
7	351.47	8214.94	452.19	8172.17	498.64	8421.57	253.68	2.291	
8	351.47	8214.94	452.19	8172.17	498.22	8420.58	252.63	2.292	
9	351.47	8214.94	452.19	8172.17	497.80	8419.58	251.58	2.292	
10	351.47	8214.94	452.19	8172.17	497.38	8418.59	250.53	2.292	
11	351.47	8214.94	452.19	8172.17	496.96	8417.60	249.47	2.292	
12	351.47	8214.94	452.19	8172.17	496.53	8416.61	248.42	2.292	
13	351.47	8214.94	452.19	8172.17	496.11	8415.61	247.37	2.292	
14	351.47	8214.94	452.19	8172.17	495.69	8414.62	246.32	2.292	
15	351.47	8214.94	452.19	8172.17	495.27	8413.62	245.26	2.292	
16	351.47	8214.94	452.19	8172.17	494.85	8412.63	244.21	2.293	
17	351.47	8214.94	452.19	8172.17	494.42	8411.64	243.16	2.293	
18	351.47	8214.94	452.19	8172.17	494.00	8410.64	242.11	2.293	
19	351.47	8214.94	452.19	8172.17	493.58	8409.65	241.05	2.293	
20	351.47	8214.94	452.19	8172.17	493.16	8408.65	240.00	2.293	
21	348.82	8215.82	452.19	8172.17	499.25	8427.88	260.00	2.298	

22	348.82	8215.82	452.19	8172.17	498.83	8426.89	258.95	2.298
23	348.82	8215.82	452.19	8172.17	498.41	8425.89	257.89	2.298
24	348.82	8215.82	452.19	8172.17	497.99	8424.90	256.84	2.298
25	348.82	8215.82	452.19	8172.17	497.57	8423.91	255.79	2.298
26	348.82	8215.82	452.19	8172.17	497.15	8422.91	254.74	2.298
27	348.82	8215.82	452.19	8172.17	496.73	8421.92	253.68	2.298
28	348.82	8215.82	452.19	8172.17	496.31	8420.92	252.63	2.299
29	348.82	8215.82	452.19	8172.17	495.89	8419.93	251.58	2.299
30	348.82	8215.82	452.19	8172.17	495.47	8418.93	250.53	2.299
31	348.82	8215.82	452.19	8172.17	495.05	8417.94	249.47	2.299
32	348.82	8215.82	452.19	8172.17	494.63	8416.94	248.42	2.299
33	348.82	8215.82	452.19	8172.17	494.21	8415.95	247.37	2.299
34	348.82	8215.82	452.19	8172.17	493.79	8414.95	246.32	2.299
35	348.82	8215.82	452.19	8172.17	493.37	8413.96	245.26	2.299
36	348.82	8215.82	452.19	8172.17	492.95	8412.96	244.21	2.299
37	348.82	8215.82	452.19	8172.17	492.53	8411.96	243.16	2.300
38	348.82	8215.82	452.19	8172.17	492.11	8410.97	242.11	2.300
39	348.82	8215.82	452.19	8172.17	491.69	8409.97	241.05	2.300
40	348.82	8215.82	452.19	8172.17	491.27	8408.97	240.00	2.300
41	351.47	8214.94	449.33	8173.60	499.43	8428.73	260.00	2.301
42	351.47	8214.94	449.33	8173.60	499.01	8427.74	258.95	2.302
43	351.47	8214.94	449.33	8173.60	498.60	8426.75	257.89	2.302
44	351.47	8214.94	449.33	8173.60	498.18	8425.76	256.84	2.302
45	351.47	8214.94	449.33	8173.60	497.76	8424.77	255.79	2.302
46	351.47	8214.94	449.33	8173.60	497.34	8423.78	254.74	2.302
47	351.47	8214.94	449.33	8173.60	496.92	8422.79	253.68	2.302
48	351.47	8214.94	449.33	8173.60	496.50	8421.79	252.63	2.302
49	351.47	8214.94	449.33	8173.60	496.08	8420.80	251.58	2.302
50	351.47	8214.94	449.33	8173.60	495.66	8419.81	250.53	2.302
51	351.47	8214.94	449.33	8173.60	495.24	8418.82	249.47	2.302
52	351.47	8214.94	449.33	8173.60	494.83	8417.82	248.42	2.302
53	351.47	8214.94	449.33	8173.60	494.41	8416.83	247.37	2.302
54	351.47	8214.94	449.33	8173.60	493.99	8415.84	246.32	2.303
55	351.47	8214.94	449.33	8173.60	493.57	8414.85	245.26	2.303
56	351.47	8214.94	449.33	8173.60	493.15	8413.85	244.21	2.303
57	351.47	8214.94	449.33	8173.60	492.73	8412.86	243.16	2.303
58	351.47	8214.94	449.33	8173.60	492.31	8411.86	242.11	2.303
59	351.47	8214.94	449.33	8173.60	491.89	8410.87	241.05	2.303
60	351.47	8214.94	449.33	8173.60	491.47	8409.88	240.00	2.303
61	346.16	8216.70	452.19	8172.17	497.35	8428.22	260.00	2.305
62	346.16	8216.70	452.19	8172.17	496.94	8427.23	258.95	2.305
63	346.16	8216.70	452.19	8172.17	496.10	8425.24	256.84	2.305
64	346.16	8216.70	452.19	8172.17	496.52	8426.23	257.89	2.305
65	346.16	8216.70	452.19	8172.17	495.68	8424.24	255.79	2.305
66	346.16	8216.70	452.19	8172.17	495.26	8423.24	254.74	2.305
67	346.16	8216.70	452.19	8172.17	494.85	8422.25	253.68	2.305
68	346.16	8216.70	452.19	8172.17	494.43	8421.25	252.63	2.305
69	346.16	8216.70	452.19	8172.17	494.01	8420.25	251.58	2.305
70	346.16	8216.70	452.19	8172.17	493.59	8419.26	250.53	2.305
71	346.16	8216.70	452.19	8172.17	493.17	8418.26	249.47	2.305
72	346.16	8216.70	452.19	8172.17	492.75	8417.26	248.42	2.306

73	346.16	8216.70	452.19	8172.17	492.33	8416.26	247.37	2.306
74	346.16	8216.70	452.19	8172.17	491.91	8415.27	246.32	2.306
75	346.16	8216.70	452.19	8172.17	491.49	8414.27	245.26	2.306
76	346.16	8216.70	452.19	8172.17	491.07	8413.27	244.21	2.306
77	346.16	8216.70	452.19	8172.17	490.66	8412.27	243.16	2.306
78	346.16	8216.70	452.19	8172.17	490.24	8411.27	242.11	2.306
79	346.16	8216.70	452.19	8172.17	489.82	8410.27	241.05	2.306
80	346.16	8216.70	452.19	8172.17	489.40	8409.27	240.00	2.306
81	348.82	8215.82	449.33	8173.60	497.52	8429.10	260.00	2.309
82	348.82	8215.82	449.33	8173.60	497.10	8428.11	258.95	2.309
83	348.82	8215.82	449.33	8173.60	496.68	8427.12	257.89	2.309
84	348.82	8215.82	449.33	8173.60	496.26	8426.12	256.84	2.309
85	348.82	8215.82	449.33	8173.60	495.85	8425.13	255.79	2.309
86	348.82	8215.82	449.33	8173.60	495.43	8424.14	254.74	2.309
87	348.82	8215.82	449.33	8173.60	495.01	8423.14	253.68	2.309
88	348.82	8215.82	449.33	8173.60	494.59	8422.15	252.63	2.309
89	348.82	8215.82	449.33	8173.60	494.18	8421.15	251.58	2.309
90	348.82	8215.82	449.33	8173.60	493.76	8420.16	250.53	2.309
91	348.82	8215.82	449.33	8173.60	493.34	8419.17	249.47	2.309
92	348.82	8215.82	449.33	8173.60	492.92	8418.17	248.42	2.309
93	348.82	8215.82	449.33	8173.60	492.51	8417.18	247.37	2.309
94	348.82	8215.82	449.33	8173.60	492.09	8416.18	246.32	2.310
95	348.82	8215.82	449.33	8173.60	491.67	8415.19	245.26	2.310
96	348.82	8215.82	449.33	8173.60	491.25	8414.19	244.21	2.310
97	348.82	8215.82	449.33	8173.60	490.83	8413.19	243.16	2.310
98	348.82	8215.82	449.33	8173.60	490.42	8412.20	242.11	2.310
99	348.82	8215.82	449.33	8173.60	490.00	8411.20	241.05	2.310

Critical Failure Surface (circle 1)

-----  
 Intersects: XL: 351.47 YL: 8214.94 XR: 452.19 YR: 8172.17  
 Centre: XC: 501.17 YC: 8427.52 Radius: R: 260.00

Generated failure surface: (20 points)

351.47	8214.94	356.25	8211.65	361.10	8208.47	366.03	8205.40	371.02	8202.44
376.07	8199.59	381.19	8196.86	386.37	8194.24	391.60	8191.73	396.89	8189.35
402.23	8187.08	407.62	8184.93	413.06	8182.90	418.54	8181.00	424.06	8179.22
429.62	8177.56	435.22	8176.02	440.85	8174.61	446.50	8173.33	452.19	8172.17

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

Slice	X-S		----- Base -----						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	351.47	1.02	34.5	2.39	2.90	1	0.00	45.0	111.96	0.00	36.02	0.93	
2	353.86	3.05	34.5	2.39	2.90	1	0.00	45.0	335.37	0.00	107.89	0.93	
3	356.25	5.08	33.2	2.43	2.90	1	0.00	45.0	558.88	0.00	179.09	0.93	
4	358.68	6.98	33.2	2.43	2.90	1	0.00	45.0	768.21	0.00	246.17	0.93	
5	361.10	7.05	31.9	1.98	2.33	1	0.00	45.0	775.85	0.00	307.85	0.93	
6	363.09	8.20	32.0	1.98	2.34	1	0.00	45.0	901.61	0.00	357.70	0.93	
7	365.07	4.39	32.0	0.96	1.13	1	0.00	45.0	482.98	21.19	398.96	0.93	
8	366.03	12.56	30.7	2.50	2.90	1	0.00	45.0	1381.73	242.57	457.04	0.92	
9	368.52	14.19	30.7	2.50	2.90	1	0.00	45.0	1560.51	510.33	532.99	0.92	

10	371.02	15.94	29.4	2.53	2.90	1	0.00	45.0	1752.88	773.23	609.24	0.92
11	373.55	17.42	29.4	2.53	2.90	1	0.00	45.0	1915.81	1031.33	678.48	0.92
12	376.07	17.33	28.1	2.34	2.65	1	0.00	45.0	1906.75	1162.45	744.78	0.92
13	378.41	22.08	28.1	2.78	3.15	1	0.00	45.0	2428.76	1653.05	830.58	0.92
14	381.19	21.86	26.8	2.59	2.90	1	0.00	45.0	2405.01	1773.79	940.76	0.92
15	383.78	23.03	26.8	2.59	2.90	1	0.00	45.0	2533.20	2010.67	1039.97	0.92
16	386.37	24.37	25.6	2.62	2.90	1	0.00	45.0	2681.23	2242.77	1139.79	0.92
17	388.98	25.38	25.6	2.62	2.90	1	0.00	45.0	2791.72	2469.42	1233.03	0.92
18	391.60	24.53	24.3	2.44	2.68	1	0.00	45.0	2697.92	2479.27	1323.70	0.92
19	394.05	25.24	24.3	2.44	2.68	1	0.00	45.0	2776.33	2664.05	1404.10	0.92
20	396.49	29.78	23.2	2.87	3.12	1	0.00	45.0	3276.34	3330.76	1482.64	0.92
21	399.36	29.17	23.0	2.87	3.12	1	0.00	45.0	3208.34	3563.76	1550.62	0.92
22	402.23	26.73	21.7	2.70	2.90	1	0.00	45.0	2940.00	3522.69	1616.27	0.92
23	404.93	25.99	21.7	2.70	2.90	1	0.00	45.0	2859.08	3716.85	1672.23	0.92
24	407.62	25.38	20.4	2.72	2.90	1	0.00	45.0	2791.44	3905.69	1728.51	0.92
25	410.34	24.44	20.5	2.72	2.90	1	0.00	45.0	2688.51	4089.34	1777.61	0.92
26	413.06	23.60	19.2	2.74	2.90	1	0.00	45.0	2595.64	4267.43	1826.78	0.92
27	415.80	22.46	19.2	2.74	2.90	1	0.00	45.0	2470.21	4439.85	1869.03	0.92
28	418.54	21.38	17.9	2.76	2.90	1	0.00	45.0	2351.39	4606.57	1910.92	0.92
29	421.30	20.03	17.9	2.76	2.90	1	0.00	45.0	2203.12	4768.18	1946.13	0.92
30	424.06	18.71	16.6	2.78	2.90	1	0.00	45.0	2058.37	4923.83	1980.64	0.92
31	426.84	17.16	16.6	2.78	2.90	1	0.00	45.0	1887.40	5073.77	2008.88	0.92
32	429.62	15.60	15.3	2.80	2.90	1	0.00	45.0	1716.18	5218.39	2035.78	0.93
33	432.42	13.84	15.3	2.80	2.90	1	0.00	45.0	1522.17	5357.25	2056.85	0.93
34	435.22	12.05	14.1	2.81	2.90	1	0.00	45.0	1325.06	5490.55	2076.20	0.93
35	438.03	10.07	14.1	2.81	2.90	1	0.00	45.0	1107.69	5618.02	2090.01	0.93
36	440.85	8.04	12.8	2.83	2.90	1	0.00	45.0	884.61	5740.01	2101.60	0.93
37	443.67	5.86	12.8	2.83	2.90	1	0.00	45.0	644.35	5856.16	2108.19	0.93
38	446.50	3.59	11.5	2.84	2.90	1	0.00	45.0	395.02	5966.31	2111.80	0.94
39	449.35	1.20	11.5	2.84	2.90	1	0.00	45.0	131.77	6070.90	2111.08	0.94

X-S Area: 634.76 Path Length: 110.24 X-S Weight: 69823.41

DATA: Analysis 2 - Geotechnical Stability Analysis

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto  
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (3 profiles)

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-----
Profile: 1 (13 points)  Material beneath: 2 - Loose sand, mixed grain size
  0.00  8237.87      28.05  8236.00      43.88  8236.05      61.02  8240.03      90.41  8241.12
 106.53  8240.00      118.09  8238.00      142.81  8235.98      237.43  8236.07      277.47  8237.17
 344.58  8236.07      405.96  8233.94      483.67  8232.79
Profile: 2 (13 points)  Material beneath: 1 - Sand and gravel, mixed grain size
 -0.10  8236.38      28.01  8234.50      44.20  8234.58      61.13  8238.53      90.38  8239.62
 106.37  8238.51      117.92  8236.51      142.75  8234.48      237.46  8234.57      277.47  8235.67
 344.54  8234.57      405.93  8232.44      483.65  8231.29
Profile: 3 (4 points)  Material beneath: 2 - Loose sand, mixed grain size
 202.06  8236.04      228.30  8244.64      233.57  8245.64      260.46  8236.52

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```

Slope Surface (16 points)
-----
  0.00  8237.87      28.05  8236.00      43.88  8236.05      69.07  8241.16      96.61  8241.16
 118.09  8238.00      142.81  8235.98      202.06  8236.04      228.30  8244.64      233.57  8245.64
 239.23  8243.64      260.46  8236.52      284.96  8237.01      396.49  8200.00      452.54  8172.00
 483.67  8172.00

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Phreatic Surface (2 points)
-----
 -200.00  8206.00      700.00  8206.00

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Failure Surface (Critical, from previous analysis)
-----
Initial circular surface for critical search defined by: XL, XR, R
Intersects: XL: 351.47  YL: 8214.94  XR: 452.19  YR: 8172.17
Centre: XC: 501.17  YC: 8427.52  Radius: R: 260.00

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Variable Restraints
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Parameter descriptor:      XL      XR      R
Range of variation:      76.94  83.00  20.00
Trial positions within range: 30      30      20

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RESULTS: Analysis 2 - Geotechnical Stability Analysis

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

Factor of Safety for initial failure surface approximation: 2.291

There were: 9001 successful analyses from a total of 18001 trial surfaces
           9000 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.05

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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	389.94	8202.17	450.76	8172.89	536.56	8428.89	270.00	2.054	<-- Critical Surface
2	389.94	8202.17	450.76	8172.89	535.64	8426.98	267.89	2.054	
3	389.94	8202.17	450.76	8172.89	536.10	8427.94	268.95	2.054	
4	389.94	8202.17	450.76	8172.89	535.18	8426.02	266.84	2.054	
5	389.94	8202.17	450.76	8172.89	534.72	8425.07	265.79	2.055	
6	389.94	8202.17	450.76	8172.89	533.80	8423.16	263.68	2.055	
7	389.94	8202.17	450.76	8172.89	534.26	8424.11	264.74	2.055	
8	389.94	8202.17	450.76	8172.89	533.34	8422.20	262.63	2.055	
9	389.94	8202.17	450.76	8172.89	532.88	8421.24	261.58	2.055	
10	389.94	8202.17	450.76	8172.89	532.42	8420.29	260.53	2.055	
11	389.94	8202.17	450.76	8172.89	531.96	8419.33	259.47	2.055	
12	389.94	8202.17	450.76	8172.89	531.50	8418.37	258.42	2.055	
13	389.94	8202.17	450.76	8172.89	530.58	8416.46	256.32	2.055	
14	389.94	8202.17	450.76	8172.89	531.04	8417.42	257.37	2.055	
15	389.94	8202.17	450.76	8172.89	530.12	8415.50	255.26	2.056	
16	389.94	8202.17	450.76	8172.89	529.66	8414.55	254.21	2.056	
17	389.94	8202.17	447.90	8174.32	535.04	8429.87	270.00	2.056	
18	389.94	8202.17	450.76	8172.89	529.20	8413.59	253.16	2.056	
19	389.94	8202.17	447.90	8174.32	534.58	8428.91	268.95	2.056	
20	389.94	8202.17	450.76	8172.89	528.74	8412.63	252.11	2.056	
21	389.94	8202.17	447.90	8174.32	534.12	8427.96	267.89	2.056	
22	389.94	8202.17	450.76	8172.89	528.27	8411.68	251.05	2.056	
23	389.94	8202.17	450.76	8172.89	527.81	8410.72	250.00	2.056	
24	389.94	8202.17	447.90	8174.32	533.66	8427.00	266.84	2.056	
25	389.94	8202.17	447.90	8174.32	532.29	8424.13	263.68	2.056	
26	389.94	8202.17	447.90	8174.32	533.21	8426.05	265.79	2.056	
27	389.94	8202.17	447.90	8174.32	532.75	8425.09	264.74	2.056	
28	389.94	8202.17	447.90	8174.32	531.83	8423.18	262.63	2.057	
29	389.94	8202.17	447.90	8174.32	531.37	8422.22	261.58	2.057	
30	389.94	8202.17	447.90	8174.32	530.91	8421.27	260.53	2.057	
31	389.94	8202.17	447.90	8174.32	530.45	8420.31	259.47	2.057	
32	389.94	8202.17	447.90	8174.32	529.53	8418.40	257.37	2.057	
33	389.94	8202.17	447.90	8174.32	529.99	8419.36	258.42	2.057	
34	389.94	8202.17	447.90	8174.32	529.07	8417.44	256.32	2.057	
35	389.94	8202.17	447.90	8174.32	528.61	8416.49	255.26	2.057	
36	389.94	8202.17	447.90	8174.32	528.15	8415.53	254.21	2.057	
37	389.94	8202.17	447.90	8174.32	527.69	8414.57	253.16	2.058	
38	389.94	8202.17	447.90	8174.32	527.23	8413.62	252.11	2.058	
39	389.94	8202.17	447.90	8174.32	526.77	8412.66	251.05	2.058	
40	389.94	8202.17	447.90	8174.32	526.31	8411.70	250.00	2.058	
41	389.94	8202.17	445.03	8175.75	532.58	8428.93	267.89	2.058	
42	389.94	8202.17	445.03	8175.75	533.50	8430.85	270.00	2.059	
43	389.94	8202.17	445.03	8175.75	533.04	8429.89	268.95	2.059	
44	389.94	8202.17	445.03	8175.75	532.12	8427.98	266.84	2.059	
45	389.94	8202.17	445.03	8175.75	531.21	8426.07	264.74	2.059	
46	389.94	8202.17	445.03	8175.75	531.67	8427.02	265.79	2.059	
47	389.94	8202.17	445.03	8175.75	530.75	8425.11	263.68	2.059	
48	389.94	8202.17	445.03	8175.75	530.29	8424.16	262.63	2.059	

49	389.94	8202.17	445.03	8175.75	529.37	8422.25	260.53	2.059
50	389.94	8202.17	445.03	8175.75	529.83	8423.20	261.58	2.059
51	389.94	8202.17	445.03	8175.75	528.46	8420.33	258.42	2.059
52	389.94	8202.17	445.03	8175.75	528.92	8421.29	259.47	2.059
53	389.94	8202.17	445.03	8175.75	528.00	8419.38	257.37	2.059
54	389.94	8202.17	445.03	8175.75	527.08	8417.47	255.26	2.059
55	389.94	8202.17	445.03	8175.75	527.54	8418.42	256.32	2.059
56	389.94	8202.17	445.03	8175.75	526.62	8416.51	254.21	2.060
57	389.94	8202.17	445.03	8175.75	526.17	8415.55	253.16	2.060
58	389.94	8202.17	445.03	8175.75	525.71	8414.60	252.11	2.060
59	389.94	8202.17	445.03	8175.75	525.25	8413.64	251.05	2.060
60	389.94	8202.17	445.03	8175.75	524.79	8412.69	250.00	2.060
61	389.94	8202.17	442.17	8177.18	531.47	8430.87	268.95	2.062
62	389.94	8202.17	442.17	8177.18	531.02	8429.91	267.89	2.062
63	389.94	8202.17	442.17	8177.18	531.93	8431.82	270.00	2.062
64	389.94	8202.17	442.17	8177.18	529.19	8426.09	263.68	2.062
65	389.94	8202.17	442.17	8177.18	529.64	8427.05	264.74	2.062
66	389.94	8202.17	442.17	8177.18	530.56	8428.96	266.84	2.062
67	389.94	8202.17	442.17	8177.18	530.10	8428.00	265.79	2.062
68	389.94	8202.17	442.17	8177.18	528.73	8425.14	262.63	2.062
69	389.94	8202.17	442.17	8177.18	527.36	8422.27	259.47	2.062
70	389.94	8202.17	442.17	8177.18	527.82	8423.23	260.53	2.062
71	389.94	8202.17	442.17	8177.18	528.27	8424.18	261.58	2.062
72	389.94	8202.17	442.17	8177.18	526.44	8420.36	257.37	2.062
73	389.94	8202.17	442.17	8177.18	526.90	8421.32	258.42	2.062
74	389.94	8202.17	442.17	8177.18	525.53	8418.45	255.26	2.062
75	389.94	8202.17	442.17	8177.18	525.99	8419.40	256.32	2.062
76	389.94	8202.17	442.17	8177.18	525.07	8417.49	254.21	2.063
77	389.94	8202.17	442.17	8177.18	524.62	8416.54	253.16	2.063
78	389.94	8202.17	442.17	8177.18	523.70	8414.62	251.05	2.063
79	389.94	8202.17	442.17	8177.18	524.16	8415.58	252.11	2.063
80	389.94	8202.17	442.17	8177.18	523.24	8413.67	250.00	2.063
81	389.94	8202.17	439.31	8178.61	529.42	8430.89	267.89	2.066
82	389.94	8202.17	439.31	8178.61	528.96	8429.94	266.84	2.066
83	389.94	8202.17	439.31	8178.61	530.33	8432.80	270.00	2.066
84	389.94	8202.17	439.31	8178.61	528.51	8428.98	265.79	2.066
85	389.94	8202.17	439.31	8178.61	528.05	8428.03	264.74	2.066
86	389.94	8202.17	439.31	8178.61	529.88	8431.85	268.95	2.066
87	389.94	8202.17	439.31	8178.61	525.77	8423.25	259.47	2.066
88	389.94	8202.17	439.31	8178.61	527.14	8426.12	262.63	2.066
89	389.94	8202.17	439.31	8178.61	527.60	8427.07	263.68	2.066
90	389.94	8202.17	439.31	8178.61	526.23	8424.21	260.53	2.066
91	389.94	8202.17	439.31	8178.61	525.32	8422.30	258.42	2.066
92	389.94	8202.17	439.31	8178.61	526.68	8425.16	261.58	2.066
93	389.94	8202.17	439.31	8178.61	523.95	8419.43	255.26	2.066
94	389.94	8202.17	439.31	8178.61	524.40	8420.39	256.32	2.066
95	389.94	8202.17	439.31	8178.61	524.86	8421.34	257.37	2.066
96	389.94	8202.17	439.31	8178.61	523.49	8418.48	254.21	2.066
97	389.94	8202.17	439.31	8178.61	523.04	8417.52	253.16	2.066
98	389.94	8202.17	439.31	8178.61	522.12	8415.61	251.05	2.066
99	389.94	8202.17	439.31	8178.61	522.58	8416.57	252.11	2.067

Critical Failure Surface (circle 1)

-----  
 Intersects: XL: 389.94 YL: 8202.17 XR: 450.76 YR: 8172.89  
 Centre: XC: 536.56 YC: 8428.89 Radius: R: 270.00

Generated failure surface: (20 points)

389.94	8202.17	392.94	8200.26	395.97	8198.38	399.03	8196.55	402.10	8194.76
405.20	8193.00	408.33	8191.29	411.47	8189.62	414.64	8187.99	417.83	8186.40
421.04	8184.86	424.27	8183.35	427.52	8181.89	430.78	8180.48	434.07	8179.10
437.38	8177.77	440.70	8176.49	444.03	8175.24	447.39	8174.04	450.76	8172.89

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

Slice	X-S		Base						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	389.94	0.34	32.5	1.50	1.78	1	0.00	45.0	37.91	478.38	276.95	0.91	
2	391.44	1.03	32.5	1.50	1.78	1	0.00	45.0	113.58	584.73	353.31	0.91	
3	392.94	1.72	31.8	1.51	1.78	1	0.00	45.0	189.03	690.05	428.95	0.90	
4	394.46	2.38	31.8	1.51	1.78	1	0.00	45.0	261.42	794.25	503.34	0.90	
5	395.97	0.96	31.0	0.52	0.60	1	0.00	45.0	105.66	292.61	553.27	0.90	
6	396.49	2.52	31.0	1.27	1.48	1	0.00	45.0	277.70	767.01	591.71	0.90	
7	397.76	2.69	31.0	1.27	1.48	1	0.00	45.0	295.54	837.05	643.97	0.90	
8	399.03	3.46	30.3	1.54	1.78	1	0.00	45.0	380.29	1100.16	700.97	0.90	
9	400.56	3.66	30.2	1.54	1.78	1	0.00	45.0	402.11	1199.58	761.77	0.90	
10	402.10	3.86	29.5	1.55	1.78	1	0.00	45.0	424.84	1298.46	821.97	0.90	
11	403.65	4.02	29.5	1.55	1.78	1	0.00	45.0	442.33	1395.93	880.52	0.90	
12	405.20	4.19	28.7	1.56	1.78	1	0.00	45.0	460.83	1492.15	938.55	0.90	
13	406.77	4.31	28.7	1.56	1.78	1	0.00	45.0	473.92	1587.13	994.87	0.90	
14	408.33	4.44	28.0	1.57	1.78	1	0.00	45.0	488.37	1681.25	1050.77	0.90	
15	409.90	4.52	28.0	1.57	1.78	1	0.00	45.0	496.82	1774.04	1104.72	0.90	
16	411.47	4.61	27.2	1.58	1.78	1	0.00	45.0	506.73	1865.91	1158.33	0.90	
17	413.06	4.64	27.2	1.58	1.78	1	0.00	45.0	510.80	1956.20	1210.08	0.90	
18	414.64	4.69	26.5	1.59	1.78	1	0.00	45.0	516.11	2045.82	1261.39	0.90	
19	416.23	4.69	26.5	1.59	1.78	1	0.00	45.0	515.51	2133.74	1310.78	0.90	
20	417.83	4.69	25.7	1.60	1.78	1	0.00	45.0	516.09	2220.82	1359.78	0.90	
21	419.43	4.65	25.7	1.60	1.78	1	0.00	45.0	511.01	2307.02	1406.89	0.90	
22	421.04	4.61	25.0	1.61	1.78	1	0.00	45.0	506.76	2391.61	1453.54	0.90	
23	422.65	4.52	25.0	1.61	1.78	1	0.00	45.0	496.95	2475.09	1498.29	0.90	
24	424.27	4.43	24.2	1.62	1.78	1	0.00	45.0	487.65	2557.28	1542.49	0.90	
25	425.89	4.30	24.2	1.62	1.78	1	0.00	45.0	473.09	2638.44	1584.85	0.90	
26	427.52	4.17	23.4	1.63	1.78	1	0.00	45.0	458.91	2718.34	1626.68	0.90	
27	429.15	4.00	23.4	1.63	1.78	1	0.00	45.0	439.61	2797.18	1666.70	0.90	
28	430.78	3.82	22.7	1.64	1.78	1	0.00	45.0	420.19	2874.78	1706.06	0.90	
29	432.43	3.60	22.7	1.64	1.78	1	0.00	45.0	395.92	2951.07	1743.58	0.90	
30	434.07	3.38	21.9	1.65	1.78	1	0.00	45.0	371.46	3026.16	1780.50	0.90	
31	435.72	3.11	21.9	1.65	1.78	1	0.00	45.0	342.36	3100.44	1815.65	0.90	
32	437.38	2.84	21.2	1.66	1.78	1	0.00	45.0	312.56	3172.67	1850.03	0.90	
33	439.04	2.53	21.2	1.66	1.78	1	0.00	45.0	278.39	3244.46	1882.66	0.90	
34	440.70	2.21	20.4	1.67	1.78	1	0.00	45.0	243.22	3314.76	1914.47	0.90	
35	442.37	1.86	20.4	1.67	1.78	1	0.00	45.0	204.22	3383.46	1944.70	0.90	
36	444.03	1.49	19.7	1.68	1.78	1	0.00	45.0	163.68	3451.37	1973.94	0.90	



37	445.71	1.09	19.7	1.68	1.78	1	0.00	45.0	119.63	3518.33	2001.64	0.90
38	447.39	0.67	18.9	1.68	1.78	1	0.00	45.0	73.57	3583.40	2028.26	0.91
39	449.07	0.22	18.9	1.68	1.78	1	0.00	45.0	24.52	3647.54	2053.48	0.91
		-----			-----				-----			
X-S Area:	124.90		Path Length:	67.68			X-S Weight:	13739.30				

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# Section 6

GALENA 7.1 Analysis Results

Version: 7.10.1.02

Licensee: Greg Lewicki and Associates

Project: Peak Ranch Pit - Section 6  
 File: E:\Work\Dropbox (GLA)\Elam\Hillyard\DRMS\Geotechnical Stability Exhibit\Peak Ranch 6.gmf  
 Processed: 16 Jun 2020 08:54:56

DATA: Analysis 1 - Geotechnical Slope Stability Exhibit

Material Properties (2 materials)

```

-----
Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size
  Cohesion  Phi  UnitWeight  Ru
    0.00  45.0   110.00   Auto
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size
  Cohesion  Phi  UnitWeight  Ru
    0.00  34.0    99.00   Auto
  
```

Water Properties

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

Material Profiles (2 profiles)

```

-----
Profile: 1 (20 points)  Material beneath: 2 - Loose sand, mixed grain size
  0.00  8256.23  21.28  8254.09  81.39  8251.40  82.90  8252.00  120.20  8248.00
 154.65  8242.95  230.65  8238.00  270.29  8230.00  334.88  8210.00  347.20  8208.00
 350.06  8206.00  361.41  8204.00  392.84  8204.04  421.35  8211.08  439.96  8222.00
 443.16  8222.51  445.32  8224.00  677.75  8227.87  800.74  8228.00  945.03  8226.83
Profile: 2 (20 points)  Material beneath: 1 - Sand and gravel, mixed grain size
 -0.15  8254.73  21.17  8252.59  81.64  8249.89  83.11  8250.47  120.01  8246.51
 154.50  8241.46  230.45  8236.51  269.92  8228.54  334.53  8208.54  346.62  8206.57
 349.47  8204.58  361.28  8202.50  393.02  8202.54  421.92  8209.68  440.47  8220.56
 443.73  8221.08  445.80  8222.51  677.76  8226.37  800.74  8226.50  945.02  8225.33
  
```

Slope Surface (13 points)

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-----
 334.88  8210.00  347.20  8208.00  350.06  8206.00  361.41  8204.00  392.84  8204.04
 421.35  8211.08  439.96  8222.00  443.16  8222.51  445.32  8224.00  605.52  8226.00
 686.61  8200.00  755.51  8166.00  945.03  8168.29
  
```

Phreatic Surface (5 points)

```

-----
 0.00  8204.00  361.00  8204.00  392.00  8204.00  655.00  8210.00  950.00  8210.00
  
```

Failure Surface

```

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```

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

Intersects: XL: 600.00 YL: 8225.93 XR: 750.00 YR: 8168.72  
Centre: XC: 763.13 YC: 8428.39 Radius: R: 260.00

Variable Restraints

-----  
Parameter descriptor: XL XR R  
Range of variation: 75.00 75.00 31.00  
Trial positions within range: 100 100 50

-----  
RESULTS: Analysis 1 - Geotechnical Slope Stability Exhibit

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.497

There were: 377009 successful analyses from a total of 500001 trial surfaces  
122992 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.37

Results Summary - Lowest 99 Factor of Safety circles

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Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	637.50	8215.75	755.68	8166.00	800.54	8437.83	275.50	2.373	<-- Critical Surface
2	637.50	8215.75	755.68	8166.00	800.28	8437.23	274.87	2.373	
3	637.50	8215.75	755.68	8166.00	800.03	8436.63	274.23	2.373	
4	637.50	8215.75	755.68	8166.00	799.78	8436.03	273.60	2.374	
5	637.50	8215.75	755.68	8166.00	799.53	8435.43	272.97	2.374	
6	637.50	8215.75	755.68	8166.00	799.27	8434.83	272.34	2.374	
7	637.50	8215.75	755.68	8166.00	799.02	8434.23	271.70	2.374	
8	637.50	8215.75	754.92	8166.29	800.25	8438.04	275.50	2.374	
9	637.50	8215.75	755.68	8166.00	798.77	8433.63	271.07	2.375	
10	637.50	8215.75	754.92	8166.29	800.00	8437.44	274.87	2.375	
11	637.50	8215.75	755.68	8166.00	798.52	8433.03	270.44	2.375	
12	637.50	8215.75	754.92	8166.29	799.75	8436.84	274.23	2.375	
13	637.50	8215.75	755.68	8166.00	798.26	8432.43	269.81	2.375	
14	637.50	8215.75	754.92	8166.29	799.49	8436.24	273.60	2.375	
15	637.50	8215.75	755.68	8166.00	798.01	8431.83	269.17	2.375	
16	637.50	8215.75	754.92	8166.29	799.24	8435.64	272.97	2.375	
17	637.50	8215.75	755.68	8166.00	797.76	8431.23	268.54	2.376	
18	636.74	8215.99	755.68	8166.00	799.99	8437.92	275.50	2.376	
19	637.50	8215.75	754.92	8166.29	798.99	8435.04	272.34	2.376	
20	637.50	8215.75	755.68	8166.00	797.51	8430.62	267.91	2.376	
21	637.50	8215.75	754.92	8166.29	798.74	8434.44	271.70	2.376	
22	636.74	8215.99	755.68	8166.00	799.73	8437.32	274.87	2.376	

23	637.50	8215.75	755.68	8166.00	797.25	8430.02	267.28	2.376
24	636.74	8215.99	755.68	8166.00	799.48	8436.72	274.23	2.376
25	637.50	8215.75	754.92	8166.29	798.48	8433.84	271.07	2.376
26	636.74	8215.99	755.68	8166.00	799.23	8436.12	273.60	2.376
27	637.50	8215.75	755.68	8166.00	797.00	8429.42	266.64	2.376
28	637.50	8215.75	754.92	8166.29	798.23	8433.24	270.44	2.376
29	637.50	8215.75	754.92	8166.29	797.98	8432.64	269.81	2.376
30	636.74	8215.99	755.68	8166.00	798.98	8435.52	272.97	2.376
31	637.50	8215.75	755.68	8166.00	796.75	8428.82	266.01	2.377
32	636.74	8215.99	755.68	8166.00	798.73	8434.92	272.34	2.377
33	637.50	8215.75	754.92	8166.29	797.73	8432.04	269.17	2.377
34	637.50	8215.75	755.68	8166.00	796.49	8428.22	265.38	2.377
35	637.50	8215.75	754.17	8166.66	799.81	8438.36	275.50	2.377
36	637.50	8215.75	754.17	8166.66	799.56	8437.76	274.87	2.377
37	636.74	8215.99	755.68	8166.00	798.47	8434.32	271.70	2.377
38	637.50	8215.75	754.92	8166.29	797.47	8431.44	268.54	2.377
39	637.50	8215.75	755.68	8166.00	796.24	8427.62	264.74	2.377
40	636.74	8215.99	754.92	8166.29	799.70	8438.13	275.50	2.377
41	636.74	8215.99	755.68	8166.00	798.22	8433.71	271.07	2.377
42	637.50	8215.75	754.17	8166.66	799.31	8437.16	274.23	2.377
43	637.50	8215.75	754.92	8166.29	797.22	8430.84	267.91	2.377
44	636.74	8215.99	754.92	8166.29	799.45	8437.53	274.87	2.377
45	637.50	8215.75	755.68	8166.00	795.99	8427.02	264.11	2.377
46	636.74	8215.99	755.68	8166.00	797.97	8433.11	270.44	2.377
47	637.50	8215.75	754.17	8166.66	799.06	8436.56	273.60	2.377
48	636.74	8215.99	754.92	8166.29	799.20	8436.93	274.23	2.377
49	637.50	8215.75	754.92	8166.29	796.97	8430.24	267.28	2.377
50	637.50	8215.75	755.68	8166.00	795.73	8426.42	263.48	2.378
51	637.50	8215.75	754.17	8166.66	798.80	8435.96	272.97	2.378
52	636.74	8215.99	755.68	8166.00	797.72	8432.51	269.81	2.378
53	636.74	8215.99	754.92	8166.29	798.94	8436.33	273.60	2.378
54	637.50	8215.75	754.92	8166.29	796.71	8429.64	266.64	2.378
55	637.50	8215.75	755.68	8166.00	795.48	8425.82	262.85	2.378
56	636.74	8215.99	755.68	8166.00	797.46	8431.91	269.17	2.378
57	637.50	8215.75	754.17	8166.66	798.55	8435.36	272.34	2.378
58	636.74	8215.99	754.92	8166.29	798.69	8435.73	272.97	2.378
59	637.50	8215.75	754.92	8166.29	796.46	8429.04	266.01	2.378
60	637.50	8215.75	755.68	8166.00	795.23	8425.22	262.21	2.378
61	637.50	8215.75	754.17	8166.66	798.30	8434.76	271.70	2.378
62	635.98	8216.23	755.68	8166.00	799.44	8438.00	275.50	2.378
63	636.74	8215.99	755.68	8166.00	797.21	8431.31	268.54	2.378
64	636.74	8215.99	754.92	8166.29	798.44	8435.13	272.34	2.378
65	637.50	8215.75	754.92	8166.29	796.21	8428.44	265.38	2.378
66	635.98	8216.23	755.68	8166.00	799.19	8437.40	274.87	2.378
67	636.74	8215.99	755.68	8166.00	796.96	8430.71	267.91	2.378
68	637.50	8215.75	754.17	8166.66	798.05	8434.16	271.07	2.378
69	637.50	8215.75	755.68	8166.00	794.98	8424.62	261.58	2.378
70	636.74	8215.99	754.92	8166.29	798.19	8434.53	271.70	2.378
71	637.50	8215.75	754.92	8166.29	795.96	8427.83	264.74	2.378
72	635.98	8216.23	755.68	8166.00	798.94	8436.80	274.23	2.378
73	637.50	8215.75	754.17	8166.66	797.79	8433.56	270.44	2.379

74	637.50	8215.75	755.68	8166.00	794.72	8424.01	260.95	2.379
75	636.74	8215.99	755.68	8166.00	796.71	8430.11	267.28	2.379
76	636.74	8215.99	754.92	8166.29	797.94	8433.93	271.07	2.379
77	637.50	8215.75	754.92	8166.29	795.70	8427.23	264.11	2.379
78	637.50	8215.75	754.17	8166.66	797.54	8432.96	269.81	2.379
79	635.98	8216.23	755.68	8166.00	798.68	8436.20	273.60	2.379
80	636.74	8215.99	755.68	8166.00	796.45	8429.51	266.64	2.379
81	637.50	8215.75	755.68	8166.00	794.47	8423.41	260.32	2.379
82	636.74	8215.99	754.92	8166.29	797.68	8433.33	270.44	2.379
83	637.50	8215.75	754.92	8166.29	795.45	8426.63	263.48	2.379
84	637.50	8215.75	754.17	8166.66	797.29	8432.36	269.17	2.379
85	635.98	8216.23	755.68	8166.00	798.43	8435.60	272.97	2.379
86	636.74	8215.99	755.68	8166.00	796.20	8428.91	266.01	2.379
87	637.50	8215.75	753.41	8167.04	799.37	8438.68	275.50	2.379
88	636.74	8215.99	754.92	8166.29	797.43	8432.73	269.81	2.379
89	637.50	8215.75	755.68	8166.00	794.22	8422.81	259.68	2.379
90	637.50	8215.75	754.92	8166.29	795.20	8426.03	262.85	2.379
91	635.98	8216.23	755.68	8166.00	798.18	8435.00	272.34	2.379
92	637.50	8215.75	754.17	8166.66	797.04	8431.76	268.54	2.379
93	637.50	8215.75	753.41	8167.04	799.12	8438.08	274.87	2.379
94	636.74	8215.99	754.92	8166.29	797.18	8432.12	269.17	2.379
95	636.74	8215.99	754.17	8166.66	799.26	8438.45	275.50	2.379
96	636.74	8215.99	755.68	8166.00	795.95	8428.31	265.38	2.379
97	637.50	8215.75	755.68	8166.00	793.96	8422.21	259.05	2.379
98	637.50	8215.75	754.17	8166.66	796.79	8431.16	267.91	2.379
99	635.98	8216.23	755.68	8166.00	797.93	8434.40	271.70	2.379

Critical Failure Surface (circle 1)

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Intersects: XL: 637.50 YL: 8215.75 XR: 755.68 YR: 8166.00  
Centre: XC: 800.54 YC: 8437.83 Radius: R: 275.50

Generated failure surface: (20 points)

637.50	8215.75	643.04	8211.78	648.68	8207.96	654.40	8204.28	660.22	8200.73
666.13	8197.34	672.11	8194.09	678.18	8190.99	684.32	8188.04	690.53	8185.24
696.80	8182.60	703.14	8180.11	709.54	8177.79	716.00	8175.62	722.51	8173.61
729.06	8171.76	735.66	8170.07	742.30	8168.55	748.98	8167.19	755.68	8166.00

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

Slice	X-S		----- Base -----						PoreWater Force	Normal Stress	Test Factor	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi				Weight
1	637.50	1.51	35.6	2.77	3.41	1	0.00	45.0	166.33	0.00	46.14	0.94
2	640.27	4.54	35.6	2.77	3.41	1	0.00	45.0	499.57	0.00	138.60	0.94
3	643.04	7.95	34.2	2.93	3.54	1	0.00	45.0	874.61	0.00	231.89	0.94
4	645.97	10.05	34.2	2.70	3.27	1	0.00	45.0	1105.99	193.28	331.35	0.94
5	648.68	13.36	32.8	2.86	3.41	1	0.00	45.0	1469.87	605.63	441.63	0.94
6	651.54	16.01	32.7	2.86	3.41	1	0.00	45.0	1760.91	1011.01	547.00	0.94
7	654.40	3.66	31.3	0.60	0.70	1	0.00	45.0	402.08	256.65	612.42	0.93
8	655.00	17.23	31.3	2.61	3.06	1	0.00	45.0	1895.34	1312.81	679.39	0.93
9	657.61	19.19	31.3	2.61	3.06	1	0.00	45.0	2111.05	1615.64	807.01	0.93
10	660.22	23.92	29.9	2.95	3.41	1	0.00	45.0	2630.71	2149.07	941.55	0.93

11	663.17	26.14	29.9	2.95	3.41	1	0.00	45.0	2874.88	2510.27	1076.29	0.93
12	666.13	28.62	28.5	2.99	3.41	1	0.00	45.0	3147.86	2862.89	1211.18	0.93
13	669.12	30.60	28.5	2.99	3.41	1	0.00	45.0	3366.55	3208.46	1338.20	0.93
14	672.11	32.89	27.1	3.03	3.41	1	0.00	45.0	3618.18	3546.02	1465.97	0.92
15	675.14	34.65	27.1	3.03	3.41	1	0.00	45.0	3811.01	3874.88	1585.37	0.92
16	678.18	36.71	25.7	3.07	3.41	1	0.00	45.0	4038.41	4196.48	1705.73	0.92
17	681.25	38.22	25.7	3.07	3.41	1	0.00	45.0	4203.86	4509.76	1817.15	0.92
18	684.32	29.47	24.2	2.29	2.52	1	0.00	45.0	3241.33	3528.78	1916.41	0.92
19	686.61	50.55	24.2	3.92	4.29	1	0.00	45.0	5560.95	6398.63	2006.26	0.92
20	690.53	39.89	22.8	3.14	3.41	1	0.00	45.0	4388.42	5401.30	2099.91	0.92
21	693.66	39.18	22.8	3.14	3.41	1	0.00	45.0	4309.69	5681.66	2173.14	0.92
22	696.80	38.71	21.4	3.17	3.41	1	0.00	45.0	4257.56	5954.43	2247.18	0.92
23	699.97	37.69	21.4	3.17	3.41	1	0.00	45.0	4145.52	6218.60	2311.62	0.92
24	703.14	36.86	20.0	3.20	3.41	1	0.00	45.0	4054.78	6474.40	2376.54	0.92
25	706.34	35.53	20.0	3.20	3.41	1	0.00	45.0	3908.85	6721.54	2432.12	0.92
26	709.54	34.35	18.6	3.23	3.41	1	0.00	45.0	3778.83	6960.79	2487.71	0.92
27	712.77	32.71	18.6	3.23	3.41	1	0.00	45.0	3598.44	7191.22	2534.24	0.92
28	716.00	31.17	17.2	3.25	3.41	1	0.00	45.0	3428.99	7413.52	2580.40	0.93
29	719.25	29.22	17.2	3.25	3.41	1	0.00	45.0	3213.85	7627.06	2617.79	0.93
30	722.51	27.31	15.7	3.28	3.41	1	0.00	45.0	3004.04	7831.57	2654.28	0.93
31	725.79	25.04	15.7	3.28	3.41	1	0.00	45.0	2754.11	8028.43	2682.44	0.93
32	729.06	22.77	14.3	3.30	3.41	1	0.00	45.0	2504.15	8216.01	2709.07	0.93
33	732.36	20.17	14.3	3.30	3.41	1	0.00	45.0	2218.78	8394.55	2727.86	0.93
34	735.66	17.53	12.9	3.32	3.41	1	0.00	45.0	1928.51	8565.13	2744.43	0.94
35	738.98	14.62	12.9	3.32	3.41	1	0.00	45.0	1608.48	8727.17	2753.88	0.94
36	742.30	11.62	11.5	3.34	3.41	1	0.00	45.0	1278.35	8880.04	2760.25	0.94
37	745.64	8.39	11.5	3.34	3.41	1	0.00	45.0	923.10	9024.27	2760.18	0.94
38	748.98	4.95	10.1	3.27	3.32	1	0.00	45.0	544.30	8923.12	2756.31	0.94
39	752.24	1.57	10.1	3.44	3.49	1	0.00	45.0	172.51	9522.51	2746.60	0.94

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X-S Area: 934.55 Path Length: 129.41 X-S Weight: 102800.75  
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DATA: Analysis 2 - Geotechnical Slope Stability Exhibit

Material Properties (2 materials)  
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Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

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

Material Profiles (2 profiles)  
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Profile: 1 (20 points)	Material beneath: 2 - Loose sand, mixed grain size								
0.00	8256.23	21.28	8254.09	81.39	8251.40	82.90	8252.00	120.20	8248.00
154.65	8242.95	230.65	8238.00	270.29	8230.00	334.88	8210.00	347.20	8208.00
350.06	8206.00	361.41	8204.00	392.84	8204.04	421.35	8211.08	439.96	8222.00
443.16	8222.51	445.32	8224.00	677.75	8227.87	800.74	8228.00	945.03	8226.83
Profile: 2 (20 points)	Material beneath: 1 - Sand and gravel, mixed grain size								
-0.15	8254.73	21.17	8252.59	81.64	8249.89	83.11	8250.47	120.01	8246.51
154.50	8241.46	230.45	8236.51	269.92	8228.54	334.53	8208.54	346.62	8206.57
349.47	8204.58	361.28	8202.50	393.02	8202.54	421.92	8209.68	440.47	8220.56
443.73	8221.08	445.80	8222.51	677.76	8226.37	800.74	8226.50	945.02	8225.33

Slope Surface (13 points)

334.88	8210.00	347.20	8208.00	350.06	8206.00	361.41	8204.00	392.84	8204.04
421.35	8211.08	439.96	8222.00	443.16	8222.51	445.32	8224.00	605.52	8226.00
686.61	8200.00	755.51	8166.00	945.03	8168.29				

Phreatic Surface (5 points)

0.00	8204.00	361.00	8204.00	392.00	8204.00	655.00	8210.00	950.00	8210.00
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Failure Surface (Critical, from previous analysis)

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

Intersects:	XL: 637.50	YL: 8215.75	XR: 755.68	YR: 8166.00
Centre:	XC: 800.54	YC: 8437.83	Radius: R: 275.50	

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	75.00	75.00	31.00
Trial positions within range:	100	100	50

RESULTS: Analysis 2 - Geotechnical Slope Stability Exhibit

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.373

There were: 251576 successful analyses from a total of 500001 trial surfaces  
 248425 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.11

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	675.00	8203.72	755.30	8166.10	837.16	8445.35	291.00	2.111	<-- Critical Surface
2	675.00	8203.72	755.30	8166.10	836.89	8444.77	290.37	2.111	
3	675.00	8203.72	755.30	8166.10	836.62	8444.19	289.73	2.111	
4	675.00	8203.72	755.30	8166.10	836.35	8443.61	289.10	2.112	
5	675.00	8203.72	755.30	8166.10	836.08	8443.03	288.47	2.112	
6	675.00	8203.72	755.30	8166.10	835.80	8442.45	287.84	2.112	
7	675.00	8203.72	755.30	8166.10	835.53	8441.87	287.20	2.112	
8	675.00	8203.72	754.55	8166.48	836.76	8445.62	291.00	2.112	
9	675.00	8203.72	754.55	8166.48	836.49	8445.04	290.37	2.112	
10	675.00	8203.72	755.30	8166.10	835.26	8441.29	286.57	2.112	
11	675.00	8203.72	755.30	8166.10	834.99	8440.71	285.94	2.112	
12	675.00	8203.72	755.30	8166.10	834.72	8440.13	285.31	2.112	
13	675.00	8203.72	754.55	8166.48	836.22	8444.46	289.73	2.112	
14	675.00	8203.72	755.30	8166.10	834.45	8439.55	284.67	2.112	
15	675.00	8203.72	754.55	8166.48	835.95	8443.88	289.10	2.112	
16	675.00	8203.72	755.30	8166.10	834.17	8438.97	284.04	2.112	
17	675.00	8203.72	754.55	8166.48	835.67	8443.30	288.47	2.112	
18	675.00	8203.72	754.55	8166.48	835.40	8442.72	287.84	2.112	
19	675.00	8203.72	755.30	8166.10	833.90	8438.39	283.41	2.112	
20	675.00	8203.72	754.55	8166.48	834.86	8441.56	286.57	2.112	
21	675.00	8203.72	754.55	8166.48	835.13	8442.14	287.20	2.112	
22	675.00	8203.72	755.30	8166.10	833.63	8437.81	282.78	2.112	
23	675.00	8203.72	753.79	8166.85	836.36	8445.89	291.00	2.113	
24	675.00	8203.72	755.30	8166.10	833.36	8437.23	282.14	2.113	
25	675.00	8203.72	755.30	8166.10	833.09	8436.65	281.51	2.113	
26	675.00	8203.72	753.79	8166.85	836.09	8445.31	290.37	2.113	
27	675.00	8203.72	754.55	8166.48	834.59	8440.98	285.94	2.113	
28	675.00	8203.72	754.55	8166.48	834.32	8440.40	285.31	2.113	
29	675.00	8203.72	753.79	8166.85	835.81	8444.73	289.73	2.113	
30	675.00	8203.72	754.55	8166.48	834.05	8439.82	284.67	2.113	
31	675.00	8203.72	753.79	8166.85	835.54	8444.15	289.10	2.113	
32	675.00	8203.72	755.30	8166.10	832.82	8436.07	280.88	2.113	
33	675.00	8203.72	755.30	8166.10	832.54	8435.49	280.24	2.113	
34	675.00	8203.72	754.55	8166.48	833.77	8439.24	284.04	2.113	
35	675.00	8203.72	753.79	8166.85	835.27	8443.57	288.47	2.113	
36	675.00	8203.72	755.30	8166.10	832.27	8434.91	279.61	2.113	
37	675.00	8203.72	754.55	8166.48	833.50	8438.66	283.41	2.113	
38	675.00	8203.72	753.79	8166.85	835.00	8442.99	287.84	2.113	
39	675.00	8203.72	753.79	8166.85	834.73	8442.41	287.20	2.113	
40	675.00	8203.72	755.30	8166.10	832.00	8434.33	278.98	2.113	
41	675.00	8203.72	753.79	8166.85	834.46	8441.83	286.57	2.113	
42	675.00	8203.72	754.55	8166.48	833.23	8438.08	282.78	2.113	
43	675.00	8203.72	755.30	8166.10	831.73	8433.75	278.35	2.113	
44	675.00	8203.72	754.55	8166.48	832.96	8437.50	282.14	2.113	
45	675.00	8203.72	753.03	8167.22	835.95	8446.16	291.00	2.113	
46	675.00	8203.72	754.55	8166.48	832.69	8436.92	281.51	2.113	
47	675.00	8203.72	755.30	8166.10	831.46	8433.17	277.71	2.113	
48	675.00	8203.72	753.79	8166.85	834.19	8441.25	285.94	2.113	
49	675.00	8203.72	753.79	8166.85	833.92	8440.67	285.31	2.113	
50	675.00	8203.72	753.03	8167.22	835.68	8445.58	290.37	2.113	



51	675.00	8203.72	755.30	8166.10	831.18	8432.59	277.08	2.113
52	675.00	8203.72	753.03	8167.22	835.41	8445.00	289.73	2.113
53	675.00	8203.72	754.55	8166.48	832.42	8436.34	280.88	2.113
54	675.00	8203.72	754.55	8166.48	832.14	8435.76	280.24	2.113
55	675.00	8203.72	753.03	8167.22	835.14	8444.42	289.10	2.113
56	675.00	8203.72	755.30	8166.10	830.91	8432.01	276.45	2.113
57	675.00	8203.72	753.79	8166.85	833.64	8440.09	284.67	2.113
58	675.00	8203.72	755.30	8166.10	830.64	8431.43	275.82	2.114
59	675.00	8203.72	753.79	8166.85	833.37	8439.51	284.04	2.114
60	675.00	8203.72	754.55	8166.48	831.87	8435.18	279.61	2.114
61	675.00	8203.72	754.55	8166.48	831.60	8434.60	278.98	2.114
62	675.00	8203.72	753.03	8167.22	834.87	8443.84	288.47	2.114
63	675.00	8203.72	755.30	8166.10	830.37	8430.85	275.18	2.114
64	675.00	8203.72	753.03	8167.22	834.60	8443.26	287.84	2.114
65	675.00	8203.72	753.03	8167.22	834.33	8442.68	287.20	2.114
66	675.00	8203.72	753.79	8166.85	833.10	8438.93	283.41	2.114
67	675.00	8203.72	753.79	8166.85	832.83	8438.35	282.78	2.114
68	675.00	8203.72	754.55	8166.48	831.33	8434.02	278.35	2.114
69	675.00	8203.72	753.03	8167.22	834.05	8442.10	286.57	2.114
70	675.00	8203.72	755.30	8166.10	830.10	8430.27	274.55	2.114
71	675.00	8203.72	752.27	8167.60	835.55	8446.43	291.00	2.114
72	675.00	8203.72	753.79	8166.85	832.56	8437.77	282.14	2.114
73	675.00	8203.72	754.55	8166.48	831.06	8433.44	277.71	2.114
74	675.00	8203.72	753.79	8166.85	832.29	8437.19	281.51	2.114
75	675.00	8203.72	753.03	8167.22	833.78	8441.52	285.94	2.114
76	675.00	8203.72	755.30	8166.10	829.82	8429.69	273.92	2.114
77	675.00	8203.72	753.03	8167.22	833.51	8440.94	285.31	2.114
78	675.00	8203.72	752.27	8167.60	835.27	8445.85	290.37	2.114
79	675.00	8203.72	754.55	8166.48	830.79	8432.86	277.08	2.114
80	675.00	8203.72	752.27	8167.60	835.00	8445.27	289.73	2.114
81	675.00	8203.72	755.30	8166.10	829.55	8429.11	273.29	2.114
82	675.00	8203.72	753.79	8166.85	832.02	8436.61	280.88	2.114
83	675.00	8203.72	753.79	8166.85	831.74	8436.03	280.24	2.114
84	675.00	8203.72	753.03	8167.22	833.24	8440.36	284.67	2.114
85	675.00	8203.72	752.27	8167.60	834.73	8444.69	289.10	2.114
86	675.00	8203.72	754.55	8166.48	830.51	8432.28	276.45	2.114
87	675.00	8203.72	753.79	8166.85	831.47	8435.45	279.61	2.114
88	675.00	8203.72	753.03	8167.22	832.97	8439.78	284.04	2.114
89	675.00	8203.72	755.30	8166.10	829.28	8428.53	272.65	2.114
90	675.00	8203.72	752.27	8167.60	834.46	8444.11	288.47	2.114
91	675.00	8203.72	754.55	8166.48	830.24	8431.70	275.82	2.114
92	675.00	8203.72	752.27	8167.60	834.19	8443.53	287.84	2.114
93	675.00	8203.72	753.03	8167.22	832.70	8439.20	283.41	2.114
94	675.00	8203.72	755.30	8166.10	829.01	8427.95	272.02	2.114
95	675.00	8203.72	753.79	8166.85	831.20	8434.87	278.98	2.114
96	675.00	8203.72	753.03	8167.22	832.43	8438.62	282.78	2.114
97	675.00	8203.72	754.55	8166.48	829.97	8431.12	275.18	2.114
98	675.00	8203.72	754.55	8166.48	829.70	8430.54	274.55	2.114
99	675.00	8203.72	752.27	8167.60	833.65	8442.37	286.57	2.114

Critical Failure Surface (circle 1)

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 Intersects: XL: 675.00 YL: 8203.72 XR: 755.30 YR: 8166.10  
 Centre: XC: 837.16 YC: 8445.35 Radius: R: 291.00

Generated failure surface: (20 points)

675.00	8203.72	678.91	8201.14	682.86	8198.63	686.86	8196.17	690.89	8193.79
694.96	8191.46	699.06	8189.21	703.21	8187.02	707.38	8184.89	711.59	8182.84
715.84	8180.85	720.11	8178.93	724.41	8177.08	728.75	8175.30	733.11	8173.59
737.50	8171.95	741.91	8170.38	746.35	8168.88	750.82	8167.46	755.30	8166.10

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

Slice	X-S		Base						Phi	Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion						
1	675.00	0.65	33.4	1.96	2.34	1	0.00	45.0	71.23	1011.77	443.93	0.91	
2	676.96	1.94	33.4	1.96	2.34	1	0.00	45.0	213.89	1200.61	548.48	0.91	
3	678.91	3.23	32.5	1.98	2.34	1	0.00	45.0	355.80	1386.85	651.74	0.91	
4	680.89	4.47	32.5	1.98	2.34	1	0.00	45.0	491.67	1570.55	753.16	0.91	
5	682.86	5.34	31.6	1.87	2.20	1	0.00	45.0	586.86	1638.73	850.61	0.91	
6	684.74	6.36	31.6	1.87	2.20	1	0.00	45.0	700.13	1796.51	942.66	0.91	
7	686.61	8.10	30.7	2.14	2.49	1	0.00	45.0	890.63	2222.84	1033.67	0.91	
8	688.75	8.55	30.6	2.14	2.49	1	0.00	45.0	940.26	2416.65	1120.69	0.91	
9	690.89	8.51	29.7	2.03	2.34	1	0.00	45.0	935.69	2454.98	1204.60	0.91	
10	692.92	8.83	29.7	2.03	2.34	1	0.00	45.0	970.88	2624.99	1282.93	0.91	
11	694.96	9.19	28.8	2.05	2.34	1	0.00	45.0	1010.47	2792.28	1360.83	0.91	
12	697.01	9.42	28.8	2.05	2.34	1	0.00	45.0	1036.50	2957.17	1435.56	0.91	
13	699.06	9.70	27.9	2.07	2.34	1	0.00	45.0	1066.96	3119.62	1509.89	0.90	
14	701.13	9.85	27.9	2.07	2.34	1	0.00	45.0	1083.54	3279.41	1581.02	0.90	
15	703.21	10.04	26.9	2.09	2.34	1	0.00	45.0	1104.64	3437.24	1651.70	0.90	
16	705.29	10.11	27.0	2.09	2.34	1	0.00	45.0	1111.82	3592.82	1719.15	0.90	
17	707.38	10.21	26.0	2.11	2.34	1	0.00	45.0	1123.13	3745.23	1786.20	0.90	
18	709.49	10.19	26.0	2.11	2.34	1	0.00	45.0	1120.53	3895.41	1849.87	0.90	
19	711.59	10.20	25.1	2.12	2.34	1	0.00	45.0	1121.83	4043.25	1913.18	0.90	
20	713.71	10.09	25.1	2.12	2.34	1	0.00	45.0	1109.41	4188.88	1973.09	0.90	
21	715.84	10.00	24.2	2.14	2.34	1	0.00	45.0	1100.28	4331.73	2032.57	0.90	
22	717.97	9.80	24.2	2.14	2.34	1	0.00	45.0	1077.89	4471.62	2088.72	0.90	
23	720.11	9.62	23.3	2.15	2.34	1	0.00	45.0	1058.01	4609.59	2144.28	0.90	
24	722.26	9.32	23.3	2.15	2.34	1	0.00	45.0	1025.64	4744.47	2196.62	0.90	
25	724.41	9.04	22.3	2.17	2.34	1	0.00	45.0	994.91	4877.32	2248.24	0.91	
26	726.58	8.66	22.3	2.17	2.34	1	0.00	45.0	952.17	5007.32	2296.65	0.90	
27	728.75	8.28	21.4	2.18	2.34	1	0.00	45.0	910.36	5135.36	2344.24	0.91	
28	730.93	7.79	21.4	2.18	2.34	1	0.00	45.0	857.29	5259.96	2388.72	0.91	
29	733.11	7.31	20.5	2.19	2.34	1	0.00	45.0	804.22	5382.38	2432.30	0.91	
30	735.31	6.73	20.5	2.19	2.34	1	0.00	45.0	740.69	5502.62	2472.80	0.91	
31	737.50	6.15	19.6	2.21	2.34	1	0.00	45.0	676.17	5619.78	2512.22	0.91	
32	739.71	5.48	19.6	2.21	2.34	1	0.00	45.0	602.29	5734.42	2548.82	0.91	
33	741.91	4.78	18.6	2.22	2.34	1	0.00	45.0	526.15	5846.58	2584.04	0.91	
34	744.13	4.01	18.6	2.22	2.34	1	0.00	45.0	441.50	5956.08	2616.55	0.91	
35	746.35	3.22	17.7	2.23	2.34	1	0.00	45.0	353.72	6062.88	2647.53	0.91	
36	748.59	2.35	17.7	2.23	2.34	1	0.00	45.0	258.54	6167.55	2676.01	0.91	
37	750.82	1.45	16.8	2.24	2.34	1	0.00	45.0	159.00	6268.74	2702.70	0.91	
38	753.06	0.48	16.8	2.24	2.34	1	0.00	45.0	53.00	6367.58	2727.06	0.91	

X-S Area: 269.43 Path Length: 89.02 X-S Weight: 29637.68

DATA: Analysis 3 - Geotechnical Slope Stability Exhibit

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (2 profiles)

Profile: 1 (20 points)	Material beneath: 2 - Loose sand, mixed grain size									
0.00	8256.23	21.28	8254.09	81.39	8251.40	82.90	8252.00	120.20	8248.00	
154.65	8242.95	230.65	8238.00	270.29	8230.00	334.88	8210.00	347.20	8208.00	
350.06	8206.00	361.41	8204.00	392.84	8204.04	421.35	8211.08	439.96	8222.00	
443.16	8222.51	445.32	8224.00	677.75	8227.87	800.74	8228.00	945.03	8226.83	
Profile: 2 (20 points)	Material beneath: 1 - Sand and gravel, mixed grain size									
-0.15	8254.73	21.17	8252.59	81.64	8249.89	83.11	8250.47	120.01	8246.51	
154.50	8241.46	230.45	8236.51	269.92	8228.54	334.53	8208.54	346.62	8206.57	
349.47	8204.58	361.28	8202.50	393.02	8202.54	421.92	8209.68	440.47	8220.56	
443.73	8221.08	445.80	8222.51	677.76	8226.37	800.74	8226.50	945.02	8225.33	

Slope Surface (13 points)

334.88	8210.00	347.20	8208.00	350.06	8206.00	361.41	8204.00	392.84	8204.04	
421.35	8211.08	439.96	8222.00	443.16	8222.51	445.32	8224.00	605.52	8226.00	
686.61	8200.00	755.51	8166.00	945.03	8168.29					

Phreatic Surface (5 points)

0.00	8204.00	361.00	8204.00	392.00	8204.00	655.00	8210.00	950.00	8210.00	
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Failure Surface (Critical, from previous analysis)

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

Intersects: XL: 675.00 YL: 8203.72 XR: 755.30 YR: 8166.10  
Centre: XC: 837.16 YC: 8445.35 Radius: R: 291.00

Variable Restraints

Parameter descriptor:           XL           XR           R  
 Range of variation:       75.00       75.00       31.00  
 Trial positions within range: 100       100       50

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 RESULTS: Analysis 3 - Geotechnical Slope Stability Exhibit

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

Factor of Safety for initial failure surface approximation: 2.111

There were: 254151 successful analyses from a total of 500001 trial surfaces  
 245850 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.00  
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Results Summary - Lowest 99 Factor of Safety circles  
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Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	710.98	8187.97	719.32	8183.86	844.05	8447.12	291.32	1.996	<-- Critical Surface
2	710.98	8187.97	719.32	8183.86	844.61	8448.26	292.58	1.998	
3	710.98	8187.97	719.32	8183.86	842.09	8443.15	286.89	1.999	
4	710.98	8187.97	719.32	8183.86	840.97	8440.88	284.36	1.999	
5	710.98	8187.97	718.56	8184.23	844.51	8449.02	293.21	2.000	
6	710.98	8187.97	718.56	8184.23	842.83	8445.61	289.42	2.000	
7	710.98	8187.97	719.32	8183.86	843.21	8445.42	289.42	2.000	
8	710.98	8187.97	719.32	8183.86	842.37	8443.72	287.52	2.001	
9	710.98	8187.97	719.32	8183.86	837.05	8432.94	275.50	2.001	
10	710.98	8187.97	719.32	8183.86	837.33	8433.50	276.13	2.001	
11	710.98	8187.97	719.32	8183.86	839.57	8438.04	281.19	2.001	
12	710.98	8187.97	718.56	8184.23	843.95	8447.88	291.95	2.002	
13	710.98	8187.97	719.32	8183.86	850.77	8460.74	306.50	2.002	
14	710.98	8187.97	719.32	8183.86	845.73	8450.53	295.11	2.002	
15	710.98	8187.97	718.56	8184.23	838.07	8435.97	278.66	2.002	
16	710.98	8187.97	719.32	8183.86	839.85	8438.61	281.83	2.002	
17	710.98	8187.97	718.56	8184.23	838.91	8437.67	280.56	2.002	
18	710.98	8187.97	718.56	8184.23	841.99	8443.91	287.52	2.002	
19	710.98	8187.97	719.32	8183.86	850.21	8459.60	305.23	2.002	
20	710.23	8188.35	718.56	8184.23	843.29	8447.50	291.32	2.002	
21	710.98	8187.97	719.32	8183.86	843.77	8446.55	290.68	2.003	
22	710.98	8187.97	718.56	8184.23	840.31	8440.51	283.72	2.003	
23	710.98	8187.97	719.32	8183.86	847.13	8453.36	298.28	2.003	
24	710.98	8187.97	719.32	8183.86	841.53	8442.01	285.62	2.003	
25	710.98	8187.97	719.32	8183.86	837.89	8434.64	277.40	2.003	
26	710.98	8187.97	718.56	8184.23	840.87	8441.64	284.99	2.003	
27	710.98	8187.97	718.56	8184.23	839.47	8438.81	281.83	2.003	
28	710.98	8187.97	718.56	8184.23	845.91	8451.86	296.38	2.003	

29	710.98	8187.97	718.56	8184.23	843.67	8447.32	291.32	2.003
30	710.98	8187.97	718.56	8184.23	843.39	8446.75	290.68	2.004
31	710.98	8187.97	719.32	8183.86	838.73	8436.34	279.30	2.004
32	710.98	8187.97	718.56	8184.23	838.35	8436.54	279.30	2.004
33	710.98	8187.97	719.32	8183.86	838.17	8435.21	278.03	2.004
34	710.98	8187.97	719.32	8183.86	842.65	8444.28	288.15	2.004
35	710.98	8187.97	718.56	8184.23	843.11	8446.18	290.05	2.004
36	710.98	8187.97	719.32	8183.86	846.29	8451.66	296.38	2.004
37	710.98	8187.97	719.32	8183.86	837.61	8434.07	276.77	2.004
38	710.98	8187.97	718.56	8184.23	844.23	8448.45	292.58	2.004
39	710.98	8187.97	719.32	8183.86	844.33	8447.69	291.95	2.004
40	710.98	8187.97	718.56	8184.23	849.55	8459.23	304.60	2.004
41	710.98	8187.97	718.56	8184.23	837.51	8434.83	277.40	2.004
42	710.98	8187.97	719.32	8183.86	847.69	8454.50	299.54	2.005
43	710.98	8187.97	719.32	8183.86	841.25	8441.45	284.99	2.005
44	710.98	8187.97	718.56	8184.23	845.07	8450.15	294.48	2.005
45	710.98	8187.97	719.32	8183.86	843.49	8445.99	290.05	2.005
46	710.23	8188.35	718.56	8184.23	844.13	8449.20	293.21	2.005
47	710.23	8188.35	719.32	8183.86	837.23	8434.25	276.77	2.005
48	710.23	8188.35	718.56	8184.23	841.33	8443.52	286.89	2.005
49	710.23	8188.35	718.56	8184.23	840.21	8441.25	284.36	2.005
50	710.98	8187.97	719.32	8183.86	840.41	8439.75	283.09	2.005
51	710.98	8187.97	718.56	8184.23	841.43	8442.78	286.26	2.005
52	710.98	8187.97	719.32	8183.86	848.53	8456.20	301.44	2.005
53	710.98	8187.97	719.32	8183.86	842.93	8444.85	288.79	2.005
54	710.98	8187.97	719.32	8183.86	850.49	8460.17	305.87	2.005
55	710.98	8187.97	718.56	8184.23	845.35	8450.72	295.11	2.005
56	710.98	8187.97	718.56	8184.23	844.79	8449.59	293.85	2.006
57	710.98	8187.97	719.32	8183.86	840.13	8439.18	282.46	2.006
58	711.74	8187.60	719.32	8183.86	846.12	8450.34	295.11	2.006
59	710.98	8187.97	718.56	8184.23	842.55	8445.05	288.79	2.006
60	710.98	8187.97	719.32	8183.86	849.09	8457.33	302.70	2.006
61	710.98	8187.97	718.56	8184.23	839.75	8439.37	282.46	2.006
62	710.23	8188.35	718.56	8184.23	842.45	8445.79	289.42	2.006
63	710.98	8187.97	719.32	8183.86	840.69	8440.31	283.72	2.006
64	710.98	8187.97	718.56	8184.23	841.71	8443.34	286.89	2.006
65	710.98	8187.97	718.56	8184.23	848.99	8458.10	303.34	2.006
66	710.23	8188.35	719.32	8183.86	844.23	8448.43	292.58	2.006
67	710.98	8187.97	719.32	8183.86	846.57	8452.23	297.01	2.006
68	710.98	8187.97	719.32	8183.86	846.85	8452.80	297.64	2.006
69	710.98	8187.97	719.32	8183.86	844.89	8448.82	293.21	2.006
70	710.98	8187.97	719.32	8183.86	838.45	8435.77	278.66	2.006
71	710.98	8187.97	719.32	8183.86	849.65	8458.47	303.97	2.006
72	710.98	8187.97	718.56	8184.23	850.39	8460.93	306.50	2.006
73	710.98	8187.97	719.32	8183.86	839.01	8436.91	279.93	2.006
74	710.98	8187.97	718.56	8184.23	839.19	8438.24	281.19	2.006
75	710.23	8188.35	719.32	8183.86	836.67	8433.11	275.50	2.006
76	710.98	8187.97	718.56	8184.23	841.15	8442.21	285.62	2.007
77	710.23	8188.35	719.32	8183.86	844.51	8449.00	293.21	2.007
78	710.98	8187.97	719.32	8183.86	846.01	8451.09	295.74	2.007
79	710.23	8188.35	718.56	8184.23	841.61	8444.09	287.52	2.007

80	710.23	8188.35	719.32	8183.86	837.51	8434.82	277.40	2.007
81	710.23	8188.35	719.32	8183.86	843.67	8447.30	291.32	2.007
82	710.23	8188.35	719.32	8183.86	843.11	8446.17	290.05	2.007
83	710.98	8187.97	718.56	8184.23	837.23	8434.27	276.77	2.007
84	710.23	8188.35	718.56	8184.23	838.81	8438.42	281.19	2.007
85	710.98	8187.97	719.32	8183.86	839.29	8437.48	280.56	2.007
86	710.98	8187.97	718.56	8184.23	850.11	8460.37	305.87	2.007
87	710.23	8188.35	719.32	8183.86	836.95	8433.68	276.13	2.007
88	710.98	8187.97	718.56	8184.23	836.95	8433.70	276.13	2.007
89	710.23	8188.35	718.56	8184.23	836.57	8433.88	276.13	2.008
90	710.98	8187.97	719.32	8183.86	849.93	8459.04	304.60	2.008
91	710.98	8187.97	719.32	8183.86	847.97	8455.07	300.17	2.008
92	710.98	8187.97	718.56	8184.23	836.67	8433.13	275.50	2.008
93	710.98	8187.97	718.56	8184.23	842.27	8444.48	288.15	2.008
94	710.98	8187.97	719.32	8183.86	847.41	8453.93	298.91	2.008
95	710.98	8187.97	718.56	8184.23	846.19	8452.42	297.01	2.008
96	710.23	8188.35	719.32	8183.86	842.55	8445.03	288.79	2.008
97	710.23	8188.35	718.56	8184.23	836.29	8433.31	275.50	2.008
98	710.98	8187.97	719.32	8183.86	848.81	8456.77	302.07	2.008
99	711.74	8187.60	719.32	8183.86	837.44	8432.75	275.50	2.008

Critical Failure Surface (circle 1)

-----  
Intersects: XL: 710.98 YL: 8187.97 XR: 719.32 YR: 8183.86  
Centre: XC: 844.05 YC: 8447.12 Radius: R: 291.32

Generated failure surface: (20 points)

710.98	8187.97	711.42	8187.75	711.86	8187.53	712.29	8187.30	712.73	8187.08
713.17	8186.86	713.60	8186.64	714.04	8186.43	714.48	8186.21	714.92	8185.99
715.35	8185.77	715.79	8185.56	716.23	8185.34	716.67	8185.13	717.11	8184.92
717.55	8184.70	717.99	8184.49	718.43	8184.28	718.88	8184.07	719.32	8183.86

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

Slice	X-Left	X-S Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	PoreWater Force	Normal Stress	Test Factor
1	710.98	0.00	27.1	0.22	0.24	1	0.00	45.0	0.05	336.82	1378.11	0.89
2	711.20	0.00	27.2	0.22	0.24	1	0.00	45.0	0.15	338.83	1385.26	0.89
3	711.42	0.00	27.1	0.22	0.24	1	0.00	45.0	0.25	340.52	1392.35	0.89
4	711.64	0.00	27.1	0.22	0.24	1	0.00	45.0	0.34	342.22	1399.45	0.89
5	711.86	0.00	26.9	0.22	0.24	1	0.00	45.0	0.43	343.84	1406.54	0.89
6	712.07	0.00	27.0	0.22	0.24	1	0.00	45.0	0.52	345.45	1413.59	0.89
7	712.29	0.01	26.8	0.22	0.24	1	0.00	45.0	0.57	347.13	1420.57	0.89
8	712.51	0.01	26.8	0.22	0.24	1	0.00	45.0	0.64	348.89	1427.57	0.89
9	712.73	0.01	26.7	0.22	0.24	1	0.00	45.0	0.70	350.50	1434.55	0.89
10	712.95	0.01	26.8	0.22	0.24	1	0.00	45.0	0.75	352.49	1441.48	0.89
11	713.17	0.01	26.6	0.22	0.24	1	0.00	45.0	0.80	353.69	1448.41	0.89
12	713.38	0.01	26.7	0.22	0.24	1	0.00	45.0	0.85	355.68	1455.34	0.89
13	713.60	0.01	26.6	0.22	0.24	1	0.00	45.0	0.89	357.27	1462.24	0.89
14	713.82	0.01	26.6	0.22	0.24	1	0.00	45.0	0.92	358.94	1469.10	0.89
15	714.04	0.01	26.4	0.22	0.24	1	0.00	45.0	0.95	360.53	1475.98	0.89
16	714.26	0.01	26.4	0.22	0.24	1	0.00	45.0	0.96	362.19	1482.76	0.89

17	714.48	0.01	26.4	0.22	0.24	1	0.00	45.0	0.99	364.09	1489.60	0.89
18	714.70	0.01	26.3	0.22	0.24	1	0.00	45.0	1.00	365.43	1496.41	0.89
19	714.92	0.01	26.3	0.22	0.24	1	0.00	45.0	1.01	367.33	1503.19	0.89
20	715.14	0.01	26.2	0.22	0.24	1	0.00	45.0	1.00	368.65	1509.91	0.89
21	715.35	0.01	26.2	0.22	0.24	1	0.00	45.0	1.00	370.55	1516.67	0.89
22	715.57	0.01	26.2	0.22	0.24	1	0.00	45.0	0.99	372.19	1523.36	0.89
23	715.79	0.01	26.1	0.22	0.24	1	0.00	45.0	0.98	373.76	1530.08	0.89
24	716.01	0.01	26.1	0.22	0.24	1	0.00	45.0	0.96	375.40	1536.74	0.89
25	716.23	0.01	25.9	0.22	0.24	1	0.00	45.0	0.93	376.96	1543.41	0.89
26	716.45	0.01	26.0	0.22	0.24	1	0.00	45.0	0.89	378.93	1550.01	0.89
27	716.67	0.01	25.8	0.22	0.24	1	0.00	45.0	0.85	380.15	1556.62	0.89
28	716.89	0.01	25.9	0.22	0.24	1	0.00	45.0	0.82	382.12	1563.24	0.89
29	717.11	0.01	25.8	0.22	0.24	1	0.00	45.0	0.76	383.75	1569.79	0.89
30	717.33	0.01	25.8	0.22	0.24	1	0.00	45.0	0.71	385.38	1576.36	0.89
31	717.55	0.01	25.7	0.22	0.24	1	0.00	45.0	0.64	386.75	1582.86	0.89
32	717.77	0.01	25.7	0.22	0.24	1	0.00	45.0	0.58	388.46	1589.41	0.89
33	717.99	0.00	25.6	0.22	0.24	1	0.00	45.0	0.50	389.90	1595.86	0.89
34	718.21	0.00	25.7	0.22	0.24	1	0.00	45.0	0.44	391.95	1602.37	0.89
35	718.43	0.00	25.4	0.22	0.24	1	0.00	45.0	0.36	393.06	1608.83	0.89
36	718.66	0.00	25.5	0.22	0.24	1	0.00	45.0	0.25	395.09	1615.21	0.89
37	718.88	0.00	25.4	0.22	0.24	1	0.00	45.0	0.15	396.62	1621.61	0.89
38	719.10	0.00	25.3	0.22	0.24	1	0.00	45.0	0.06	397.88	1628.01	0.89

X-S Area: 0.23

Path Length: 9.29

X-S Weight: 25.63

# Section 7

GALENA 7.1 Analysis Results

Version: 7.10.1.02

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File: E:\Work\Dropbox (GLA)\Elam\Hillyard\DRMS\Geotechnical Stability Exhibit\Peak Ranch 7.gmf  
Processed: 23 Jun 2020 14:56:45

DATA: Analysis 1

Material Properties (2 materials)

-----  
Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto  
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (2 profiles)

-----  
Profile: 1 (2 points) Material beneath: 2 - Loose sand, mixed grain size  
0.00 8222.88 500.00 8227.21  
Profile: 2 (2 points) Material beneath: 1 - Sand and gravel, mixed grain size  
0.01 8221.38 500.01 8225.71

Slope Surface (8 points)

-----  
0.00 8214.14 60.56 8216.39 126.58 8220.00 138.88 8224.00 217.02 8224.00  
288.94 8200.00 351.06 8168.99 500.00 8168.80

Phreatic Surface (3 points)

-----  
0.00 8212.00 250.00 8210.00 500.00 8210.00

Failure Surface

-----  
Initial circular surface for critical search defined by: XL, XR, R  
Intersects: XL: 212.00 YL: 8224.00 XR: 310.00 YR: 8189.49  
Centre: XC: 342.23 YC: 8437.40 Radius: R: 250.00

Variable Restraints

-----  
Parameter descriptor: XL XR R  
Range of variation: 100.00 75.00 50.00



Trial positions within range:       25           25           25

-----  
RESULTS: Analysis 1

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation:   2.631

There were: 15613 successful analyses from a total of 15625 trial surfaces  
          12 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.23

Results Summary - Lowest 99 Factor of Safety circles

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Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	262.00	8208.99	347.50	8170.77	415.34	8437.27	275.00	2.230	<-- Critical Surface
2	262.00	8208.99	347.50	8170.77	414.48	8435.34	272.92	2.231	
3	262.00	8208.99	347.50	8170.77	413.62	8433.41	270.83	2.231	
4	262.00	8208.99	347.50	8170.77	412.76	8431.47	268.75	2.232	
5	262.00	8208.99	347.50	8170.77	411.89	8429.54	266.67	2.232	
6	262.00	8208.99	347.50	8170.77	411.03	8427.61	264.58	2.233	
7	262.00	8208.99	347.50	8170.77	410.16	8425.68	262.50	2.233	
8	262.00	8208.99	347.50	8170.77	409.30	8423.75	260.42	2.234	
9	262.00	8208.99	347.50	8170.77	408.44	8421.81	258.33	2.234	
10	262.00	8208.99	347.50	8170.77	407.57	8419.88	256.25	2.235	
11	262.00	8208.99	347.50	8170.77	406.71	8417.94	254.17	2.235	
12	262.00	8208.99	347.50	8170.77	405.84	8416.01	252.08	2.236	
13	262.00	8208.99	347.50	8170.77	404.97	8414.07	250.00	2.237	
14	262.00	8208.99	347.50	8170.77	404.11	8412.13	247.92	2.237	
15	262.00	8208.99	347.50	8170.77	403.24	8410.20	245.83	2.238	
16	262.00	8208.99	347.50	8170.77	402.38	8408.26	243.75	2.238	
17	262.00	8208.99	347.50	8170.77	401.51	8406.32	241.67	2.239	
18	262.00	8208.99	347.50	8170.77	400.64	8404.38	239.58	2.240	
19	262.00	8208.99	347.50	8170.77	399.78	8402.44	237.50	2.240	
20	262.00	8208.99	344.38	8172.33	413.50	8438.50	275.00	2.240	
21	262.00	8208.99	344.38	8172.33	412.64	8436.57	272.92	2.241	
22	262.00	8208.99	347.50	8170.77	398.91	8400.50	235.42	2.241	
23	262.00	8208.99	344.38	8172.33	411.78	8434.64	270.83	2.241	
24	262.00	8208.99	344.38	8172.33	410.92	8432.71	268.75	2.242	
25	262.00	8208.99	347.50	8170.77	398.04	8398.56	233.33	2.242	
26	262.00	8208.99	344.38	8172.33	410.06	8430.78	266.67	2.242	
27	262.00	8208.99	344.38	8172.33	409.20	8428.85	264.58	2.243	
28	262.00	8208.99	347.50	8170.77	397.17	8396.62	231.25	2.243	
29	262.00	8208.99	344.38	8172.33	408.34	8426.92	262.50	2.243	
30	262.00	8208.99	347.50	8170.77	396.30	8394.68	229.17	2.243	

31	262.00	8208.99	344.38	8172.33	407.48	8424.98	260.42	2.244
32	262.00	8208.99	344.38	8172.33	406.62	8423.05	258.33	2.244
33	262.00	8208.99	347.50	8170.77	395.44	8392.73	227.08	2.244
34	262.00	8208.99	344.38	8172.33	405.76	8421.12	256.25	2.244
35	262.00	8208.99	344.38	8172.33	404.90	8419.18	254.17	2.245
36	262.00	8208.99	347.50	8170.77	394.57	8390.79	225.00	2.245
37	262.00	8208.99	344.38	8172.33	404.04	8417.25	252.08	2.246
38	262.00	8208.99	344.38	8172.33	403.18	8415.31	250.00	2.246
39	262.00	8208.99	344.38	8172.33	402.31	8413.38	247.92	2.247
40	262.00	8208.99	344.38	8172.33	401.45	8411.44	245.83	2.247
41	262.00	8208.99	344.38	8172.33	400.59	8409.51	243.75	2.248
42	262.00	8208.99	344.38	8172.33	399.73	8407.57	241.67	2.248
43	262.00	8208.99	344.38	8172.33	398.87	8405.63	239.58	2.249
44	262.00	8208.99	344.38	8172.33	398.00	8403.69	237.50	2.250
45	262.00	8208.99	344.38	8172.33	397.14	8401.75	235.42	2.250
46	262.00	8208.99	344.38	8172.33	396.28	8399.81	233.33	2.251
47	262.00	8208.99	344.38	8172.33	395.41	8397.87	231.25	2.252
48	262.00	8208.99	341.25	8173.89	411.61	8439.74	275.00	2.252
49	262.00	8208.99	341.25	8173.89	410.75	8437.81	272.92	2.252
50	262.00	8208.99	344.38	8172.33	394.55	8395.93	229.17	2.252
51	262.00	8208.99	341.25	8173.89	409.90	8435.88	270.83	2.252
52	262.00	8208.99	341.25	8173.89	409.04	8433.95	268.75	2.253
53	262.00	8208.99	344.38	8172.33	393.69	8393.99	227.08	2.253
54	262.00	8208.99	341.25	8173.89	408.19	8432.02	266.67	2.253
55	262.00	8208.99	341.25	8173.89	407.33	8430.09	264.58	2.254
56	262.00	8208.99	344.38	8172.33	392.82	8392.05	225.00	2.254
57	262.00	8208.99	341.25	8173.89	406.48	8428.15	262.50	2.254
58	262.00	8208.99	341.25	8173.89	405.62	8426.22	260.42	2.254
59	262.00	8208.99	341.25	8173.89	404.76	8424.29	258.33	2.255
60	262.00	8208.99	341.25	8173.89	403.91	8422.36	256.25	2.255
61	262.00	8208.99	341.25	8173.89	403.05	8420.43	254.17	2.256
62	262.00	8208.99	341.25	8173.89	402.20	8418.49	252.08	2.256
63	262.00	8208.99	341.25	8173.89	401.34	8416.56	250.00	2.257
64	262.00	8208.99	341.25	8173.89	400.48	8414.62	247.92	2.257
65	262.00	8208.99	341.25	8173.89	399.63	8412.69	245.83	2.258
66	262.00	8208.99	341.25	8173.89	398.77	8410.75	243.75	2.258
67	262.00	8208.99	341.25	8173.89	397.91	8408.82	241.67	2.259
68	262.00	8208.99	341.25	8173.89	397.05	8406.88	239.58	2.259
69	262.00	8208.99	341.25	8173.89	396.20	8404.94	237.50	2.260
70	262.00	8208.99	341.25	8173.89	395.34	8403.01	235.42	2.261
71	262.00	8208.99	341.25	8173.89	394.48	8401.07	233.33	2.261
72	262.00	8208.99	341.25	8173.89	393.62	8399.13	231.25	2.262
73	262.00	8208.99	341.25	8173.89	392.76	8397.19	229.17	2.263
74	262.00	8208.99	341.25	8173.89	391.90	8395.25	227.08	2.263
75	262.00	8208.99	341.25	8173.89	391.04	8393.31	225.00	2.264
76	262.00	8208.99	338.12	8175.45	409.67	8440.98	275.00	2.264
77	262.00	8208.99	338.12	8175.45	408.82	8439.05	272.92	2.265
78	262.00	8208.99	338.12	8175.45	407.97	8437.12	270.83	2.265
79	262.00	8208.99	338.12	8175.45	407.12	8435.19	268.75	2.265
80	257.83	8210.38	347.50	8170.77	412.02	8438.09	275.00	2.265
81	262.00	8208.99	338.12	8175.45	406.27	8433.26	266.67	2.266

82	257.83	8210.38	347.50	8170.77	411.16	8436.16	272.92	2.266
83	262.00	8208.99	338.12	8175.45	405.42	8431.33	264.58	2.266
84	262.00	8208.99	338.12	8175.45	404.57	8429.40	262.50	2.266
85	257.83	8210.38	347.50	8170.77	410.30	8434.22	270.83	2.267
86	262.00	8208.99	338.12	8175.45	403.72	8427.47	260.42	2.267
87	257.83	8210.38	347.50	8170.77	409.45	8432.28	268.75	2.267
88	262.00	8208.99	338.12	8175.45	402.87	8425.54	258.33	2.267
89	257.83	8210.38	347.50	8170.77	408.59	8430.34	266.67	2.267
90	262.00	8208.99	338.12	8175.45	402.02	8423.60	256.25	2.268
91	262.00	8208.99	338.12	8175.45	401.17	8421.67	254.17	2.268
92	257.83	8210.38	347.50	8170.77	407.74	8428.40	264.58	2.268
93	262.00	8208.99	338.12	8175.45	400.31	8419.74	252.08	2.269
94	257.83	8210.38	347.50	8170.77	406.88	8426.46	262.50	2.269
95	262.00	8208.99	338.12	8175.45	399.46	8417.81	250.00	2.269
96	257.83	8210.38	347.50	8170.77	406.02	8424.52	260.42	2.269
97	262.00	8208.99	338.12	8175.45	398.61	8415.87	247.92	2.269
98	257.83	8210.38	347.50	8170.77	405.16	8422.58	258.33	2.270
99	262.00	8208.99	338.12	8175.45	397.76	8413.94	245.83	2.270

Critical Failure Surface (circle 1)

-----  
Intersects: XL: 262.00 YL: 8208.99 XR: 347.50 YR: 8170.77  
Centre: XC: 415.34 YC: 8437.27 Radius: R: 275.00

Generated failure surface: (20 points)

262.00	8208.99	266.14	8206.27	270.32	8203.62	274.55	8201.04	278.83	8198.54
283.15	8196.12	287.52	8193.78	291.92	8191.52	296.37	8189.34	300.85	8187.23
305.38	8185.21	309.93	8183.27	314.53	8181.42	319.15	8179.64	323.81	8177.95
328.49	8176.34	333.21	8174.82	337.95	8173.38	342.71	8172.03	347.50	8170.77

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

Slice	X-S		----- Base -----						Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi				
1	262.00	0.69	33.4	2.07	2.48	1	0.00	45.0	76.43	261.39	117.89	0.92
2	264.07	2.08	33.4	2.07	2.48	1	0.00	45.0	229.29	471.78	227.53	0.92
3	266.14	3.47	32.3	2.09	2.48	1	0.00	45.0	381.66	679.63	335.88	0.92
4	268.23	4.78	32.3	2.09	2.48	1	0.00	45.0	525.95	884.42	441.81	0.92
5	270.32	6.11	31.3	2.12	2.48	1	0.00	45.0	672.35	1086.18	546.60	0.92
6	272.44	7.34	31.3	2.12	2.48	1	0.00	45.0	807.58	1285.08	648.65	0.92
7	274.55	8.61	30.3	2.14	2.48	1	0.00	45.0	947.52	1480.79	749.93	0.92
8	276.69	9.76	30.3	2.14	2.48	1	0.00	45.0	1073.42	1674.13	848.03	0.92
9	278.83	10.96	29.2	2.16	2.48	1	0.00	45.0	1205.92	1863.84	945.61	0.92
10	280.99	12.02	29.2	2.16	2.48	1	0.00	45.0	1322.44	2050.98	1039.82	0.92
11	283.15	13.16	28.2	2.18	2.48	1	0.00	45.0	1447.38	2234.96	1133.77	0.91
12	285.34	14.12	28.2	2.18	2.48	1	0.00	45.0	1553.34	2415.76	1223.71	0.91
13	287.52	9.70	27.2	1.42	1.60	1	0.00	45.0	1067.29	1654.81	1298.68	0.91
14	288.94	10.38	27.2	1.49	1.68	1	0.00	45.0	1142.09	1813.93	1350.78	0.91
15	290.43	10.41	27.2	1.49	1.68	1	0.00	45.0	1145.47	1893.84	1399.38	0.91
16	291.92	15.52	26.2	2.22	2.48	1	0.00	45.0	1707.62	2940.58	1459.68	0.91
17	294.15	15.48	26.1	2.22	2.48	1	0.00	45.0	1702.94	3108.93	1527.06	0.91
18	296.37	15.52	25.1	2.24	2.48	1	0.00	45.0	1707.28	3274.72	1594.49	0.91

19	298.61	15.37	25.1	2.24	2.48	1	0.00	45.0	1690.52	3437.15	1657.42	0.91
20	300.85	15.29	24.1	2.26	2.48	1	0.00	45.0	1681.36	3596.52	1720.23	0.91
21	303.12	15.02	24.1	2.26	2.48	1	0.00	45.0	1651.99	3752.77	1778.62	0.91
22	305.38	14.81	23.1	2.28	2.48	1	0.00	45.0	1629.10	3905.91	1836.80	0.91
23	307.66	14.43	23.1	2.28	2.48	1	0.00	45.0	1587.24	4055.55	1890.69	0.91
24	309.93	14.10	22.0	2.30	2.48	1	0.00	45.0	1550.46	4202.08	1944.19	0.91
25	312.23	13.60	22.0	2.30	2.48	1	0.00	45.0	1495.46	4345.84	1993.31	0.91
26	314.53	13.13	21.0	2.31	2.48	1	0.00	45.0	1444.49	4486.15	2042.05	0.91
27	316.84	12.51	21.0	2.31	2.48	1	0.00	45.0	1376.56	4623.26	2086.56	0.91
28	319.15	11.92	20.0	2.33	2.48	1	0.00	45.0	1311.09	4757.35	2130.39	0.91
29	321.48	11.18	20.0	2.33	2.48	1	0.00	45.0	1229.95	4887.65	2170.18	0.91
30	323.81	10.45	18.9	2.34	2.48	1	0.00	45.0	1149.95	5015.12	2209.12	0.92
31	326.15	9.60	18.9	2.34	2.48	1	0.00	45.0	1055.46	5139.17	2244.08	0.92
32	328.49	8.73	17.9	2.36	2.48	1	0.00	45.0	960.56	5260.42	2277.97	0.92
33	330.85	7.75	17.9	2.36	2.48	1	0.00	45.0	852.84	5377.74	2308.20	0.92
34	333.21	6.75	16.9	2.37	2.48	1	0.00	45.0	742.94	5492.34	2336.98	0.92
35	335.58	5.65	16.9	2.37	2.48	1	0.00	45.0	621.75	5603.03	2362.33	0.92
36	337.95	4.52	15.8	2.38	2.48	1	0.00	45.0	496.80	5710.97	2385.95	0.92
37	340.33	3.29	15.8	2.38	2.48	1	0.00	45.0	362.04	5814.95	2406.38	0.92
38	342.71	2.02	14.8	2.39	2.48	1	0.00	45.0	222.10	5916.26	2424.76	0.92
39	345.11	0.67	14.8	2.39	2.48	1	0.00	45.0	73.95	6014.12	2440.31	0.92

-----  
X-S Area: 380.93 Path Length: 94.11 X-S Weight: 41902.57  
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DATA: Analysis 2

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 2 - Loose sand, mixed grain size  
0.00 8222.88 500.00 8227.21

Profile: 2 (2 points) Material beneath: 1 - Sand and gravel, mixed grain size  
0.01 8221.38 500.01 8225.71

Slope Surface (8 points)

-----  
0.00 8214.14 60.56 8216.39 126.58 8220.00 138.88 8224.00 217.02 8224.00

288.94 8200.00 351.06 8168.99 500.00 8168.80

Phreatic Surface (3 points)

0.00 8212.00 250.00 8210.00 500.00 8210.00

Failure Surface (Critical, from previous analysis)

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

Intersects: XL: 262.00 YL: 8208.99 XR: 347.50 YR: 8170.77
Centre: XC: 415.34 YC: 8437.27 Radius: R: 275.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 100.00 75.00 50.00
Trial positions within range: 25 25 25

RESULTS: Analysis 2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.230

There were: 8608 successful analyses from a total of 15625 trial surfaces
7017 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.99

Results Summary - Lowest 99 Factor of Safety circles

Table with 9 columns: Circle, X-Left, Y-Left, X-Right, Y-Right, X-Centre, Y-Centre, Radius, FoS, and a note for the critical surface. It lists 14 circles with their respective coordinates and safety factors.

15	307.83	8190.57	316.25	8186.37	441.37	8447.53	289.58	1.999
16	307.83	8190.57	316.25	8186.37	432.99	8430.75	270.83	1.999
17	307.83	8190.57	316.25	8186.37	426.48	8417.70	256.25	1.999
18	307.83	8190.57	316.25	8186.37	427.41	8419.56	258.33	2.000
19	307.83	8190.57	316.25	8186.37	423.68	8412.11	250.00	2.000
20	307.83	8190.57	316.25	8186.37	433.92	8432.61	272.92	2.000
21	307.83	8190.57	316.25	8186.37	432.06	8428.88	268.75	2.000
22	303.67	8192.65	316.25	8186.37	442.05	8454.12	295.83	2.001
23	303.67	8192.65	313.12	8187.93	431.19	8436.29	275.00	2.001
24	303.67	8192.65	313.12	8187.93	421.88	8417.65	254.17	2.001
25	303.67	8192.65	316.25	8186.37	425.29	8420.56	258.33	2.001
26	295.33	8196.81	313.12	8187.93	434.42	8453.18	291.67	2.001
27	303.67	8192.65	313.12	8187.93	420.02	8413.92	250.00	2.001
28	299.50	8194.73	313.12	8187.93	436.53	8452.20	291.67	2.001
29	303.67	8192.65	316.25	8186.37	427.15	8424.29	262.50	2.001
30	303.67	8192.65	313.12	8187.93	435.84	8445.61	285.42	2.001
31	303.67	8192.65	313.12	8187.93	436.77	8447.48	287.50	2.002
32	295.33	8196.81	313.12	8187.93	436.28	8456.91	295.83	2.002
33	303.67	8192.65	316.25	8186.37	431.81	8433.61	272.92	2.002
34	303.67	8192.65	313.12	8187.93	424.68	8423.24	260.42	2.002
35	303.67	8192.65	313.12	8187.93	433.05	8440.02	279.17	2.002
36	299.50	8194.73	313.12	8187.93	430.02	8439.15	277.08	2.002
37	307.83	8190.57	316.25	8186.37	444.16	8453.12	295.83	2.002
38	295.33	8196.81	313.12	8187.93	438.14	8460.64	300.00	2.002
39	307.83	8190.57	322.50	8183.25	437.01	8430.98	272.92	2.002
40	299.50	8194.73	313.12	8187.93	439.33	8457.79	297.92	2.002
41	303.67	8192.65	316.25	8186.37	436.46	8442.93	283.33	2.002
42	303.67	8192.65	313.12	8187.93	432.12	8438.16	277.08	2.002
43	303.67	8192.65	313.12	8187.93	420.95	8415.78	252.08	2.002
44	299.50	8194.73	313.12	8187.93	424.43	8427.96	264.58	2.002
45	303.67	8192.65	313.12	8187.93	426.54	8426.97	264.58	2.002
46	307.83	8190.57	316.25	8186.37	425.54	8415.83	254.17	2.002
47	295.33	8196.81	313.12	8187.93	418.59	8421.47	256.25	2.002
48	312.00	8188.49	322.50	8183.25	443.77	8439.31	283.33	2.002
49	295.33	8196.81	313.12	8187.93	422.32	8428.93	264.58	2.003
50	299.50	8194.73	313.12	8187.93	426.29	8431.69	268.75	2.003
51	295.33	8196.81	313.12	8187.93	433.49	8451.31	289.58	2.003
52	303.67	8192.65	316.25	8186.37	434.60	8439.21	279.17	2.003
53	295.33	8196.81	313.12	8187.93	417.66	8419.60	254.17	2.003
54	303.67	8192.65	316.25	8186.37	429.02	8428.02	266.67	2.003
55	303.67	8192.65	316.25	8186.37	437.39	8444.80	285.42	2.003
56	303.67	8192.65	316.25	8186.37	440.18	8450.39	291.67	2.003
57	303.67	8192.65	313.12	8187.93	428.40	8430.70	268.75	2.003
58	307.83	8190.57	322.50	8183.25	447.25	8451.49	295.83	2.003
59	307.83	8190.57	322.50	8183.25	430.49	8417.92	258.33	2.003
60	312.00	8188.49	322.50	8183.25	445.63	8443.04	287.50	2.003
61	307.83	8190.57	322.50	8183.25	448.18	8453.36	297.92	2.003
62	295.33	8196.81	313.12	8187.93	432.56	8449.45	287.50	2.003
63	307.83	8190.57	322.50	8183.25	429.56	8416.06	256.25	2.003
64	307.83	8190.57	319.38	8184.81	431.74	8424.34	264.58	2.003
65	295.33	8196.81	313.12	8187.93	431.63	8447.58	285.42	2.003

66	303.67	8192.65	313.12	8187.93	439.57	8453.07	293.75	2.003
67	307.83	8190.57	322.50	8183.25	431.42	8419.79	260.42	2.003
68	303.67	8192.65	313.12	8187.93	423.75	8421.38	258.33	2.003
69	299.50	8194.73	316.25	8186.37	426.90	8428.99	266.67	2.003
70	295.33	8196.81	310.00	8189.49	425.44	8439.08	275.00	2.003
71	303.67	8192.65	316.25	8186.37	422.50	8414.96	252.08	2.003
72	307.83	8190.57	316.25	8186.37	434.85	8434.48	275.00	2.003
73	295.33	8196.81	313.12	8187.93	435.35	8455.04	293.75	2.003
74	299.50	8194.73	313.12	8187.93	433.74	8446.61	285.42	2.003
75	303.67	8192.65	316.25	8186.37	442.98	8455.99	297.92	2.003
76	299.50	8194.73	316.25	8186.37	434.35	8443.91	283.33	2.003
77	303.67	8192.65	319.38	8184.81	436.14	8438.38	279.17	2.003
78	307.83	8190.57	319.38	8184.81	443.84	8448.58	291.67	2.003
79	307.83	8190.57	322.50	8183.25	443.53	8444.03	287.50	2.003
80	303.67	8192.65	319.38	8184.81	430.56	8427.19	266.67	2.003
81	307.83	8190.57	322.50	8183.25	432.35	8421.65	262.50	2.003
82	299.50	8194.73	316.25	8186.37	423.18	8421.53	258.33	2.004
83	307.83	8190.57	322.50	8183.25	439.80	8436.57	279.17	2.004
84	299.50	8194.73	313.12	8187.93	435.60	8450.33	289.58	2.004
85	307.83	8190.57	322.50	8183.25	426.77	8410.46	250.00	2.004
86	295.33	8196.81	313.12	8187.93	419.52	8423.33	258.33	2.004
87	295.33	8196.81	313.12	8187.93	424.18	8432.66	268.75	2.004
88	303.67	8192.65	316.25	8186.37	438.32	8446.66	287.50	2.004
89	307.83	8190.57	319.38	8184.81	442.91	8446.72	289.58	2.004
90	295.33	8196.81	316.25	8186.37	439.68	8459.80	300.00	2.004
91	299.50	8194.73	313.12	8187.93	428.16	8435.42	272.92	2.004
92	299.50	8194.73	313.12	8187.93	427.23	8433.55	270.83	2.004
93	303.67	8192.65	316.25	8186.37	424.36	8418.69	256.25	2.004
94	295.33	8196.81	316.25	8186.37	430.37	8441.14	279.17	2.004
95	312.00	8188.49	322.50	8183.25	438.19	8428.13	270.83	2.004
96	307.83	8190.57	322.50	8183.25	437.94	8432.84	275.00	2.004
97	299.50	8194.73	316.25	8186.37	440.87	8456.97	297.92	2.004
98	303.67	8192.65	319.38	8184.81	433.35	8432.79	272.92	2.004
99	299.50	8194.73	316.25	8186.37	428.76	8432.72	270.83	2.004

Critical Failure Surface (circle 1)

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 Intersects: XL: 307.83 YL: 8190.57 XR: 316.25 YR: 8186.37  
 Centre: XC: 437.64 YC: 8440.07 Radius: R: 281.25

Generated failure surface: (20 points)

307.83	8190.57	308.27	8190.34	308.71	8190.11	309.15	8189.89	309.59	8189.66
310.03	8189.44	310.48	8189.21	310.92	8188.99	311.36	8188.77	311.80	8188.54
312.25	8188.32	312.69	8188.10	313.13	8187.88	313.58	8187.66	314.02	8187.45
314.47	8187.23	314.91	8187.01	315.36	8186.80	315.80	8186.58	316.25	8186.37

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

Slice	X-S		----- Base -----						Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi				
1	307.83	0.00	27.4	0.22	0.25	1	0.00	45.0	0.05	300.96	1216.14	0.89
2	308.05	0.00	27.5	0.22	0.25	1	0.00	45.0	0.14	302.99	1223.39	0.89

3	308.27	0.00	27.4	0.22	0.25	1	0.00	45.0	0.25	304.61	1230.65	0.89
4	308.49	0.00	27.4	0.22	0.25	1	0.00	45.0	0.35	306.41	1237.95	0.89
5	308.71	0.00	27.2	0.22	0.25	1	0.00	45.0	0.44	308.08	1245.15	0.89
6	308.93	0.00	27.2	0.22	0.25	1	0.00	45.0	0.52	309.83	1252.35	0.89
7	309.15	0.01	27.1	0.22	0.25	1	0.00	45.0	0.60	311.51	1259.55	0.89
8	309.37	0.01	27.2	0.22	0.25	1	0.00	45.0	0.67	313.57	1266.69	0.89
9	309.59	0.01	27.0	0.22	0.25	1	0.00	45.0	0.73	314.95	1273.83	0.89
10	309.81	0.01	27.0	0.22	0.25	1	0.00	45.0	0.79	316.68	1280.93	0.89
11	310.03	0.01	27.0	0.22	0.25	1	0.00	45.0	0.84	318.63	1288.01	0.89
12	310.26	0.01	27.0	0.22	0.25	1	0.00	45.0	0.90	320.40	1295.11	0.89
13	310.48	0.01	26.8	0.22	0.25	1	0.00	45.0	0.94	322.05	1302.14	0.89
14	310.70	0.01	26.7	0.22	0.25	1	0.00	45.0	0.97	323.49	1309.18	0.89
15	310.92	0.01	26.7	0.22	0.25	1	0.00	45.0	1.00	325.43	1316.16	0.89
16	311.14	0.01	26.8	0.22	0.25	1	0.00	45.0	1.03	327.48	1323.20	0.89
17	311.36	0.01	26.6	0.22	0.25	1	0.00	45.0	1.06	328.83	1330.18	0.89
18	311.58	0.01	26.6	0.22	0.25	1	0.00	45.0	1.06	330.51	1337.10	0.89
19	311.80	0.01	26.6	0.22	0.25	1	0.00	45.0	1.06	332.51	1343.98	0.89
20	312.02	0.01	26.5	0.22	0.25	1	0.00	45.0	1.07	333.89	1350.92	0.89
21	312.25	0.01	26.5	0.22	0.25	1	0.00	45.0	1.06	335.82	1357.79	0.89
22	312.47	0.01	26.4	0.22	0.25	1	0.00	45.0	1.05	337.22	1364.63	0.89
23	312.69	0.01	26.3	0.22	0.25	1	0.00	45.0	1.04	339.18	1371.49	0.89
24	312.91	0.01	26.3	0.22	0.25	1	0.00	45.0	1.00	340.87	1378.26	0.89
25	313.13	0.01	26.2	0.22	0.25	1	0.00	45.0	0.98	342.54	1385.08	0.89
26	313.36	0.01	26.2	0.22	0.25	1	0.00	45.0	0.94	344.19	1391.85	0.89
27	313.58	0.01	26.1	0.22	0.25	1	0.00	45.0	0.91	345.81	1398.62	0.89
28	313.80	0.01	26.2	0.22	0.25	1	0.00	45.0	0.86	347.83	1405.34	0.89
29	314.02	0.01	26.0	0.22	0.25	1	0.00	45.0	0.80	349.14	1412.05	0.89
30	314.24	0.01	26.1	0.22	0.25	1	0.00	45.0	0.75	351.12	1418.76	0.89
31	314.47	0.01	25.9	0.22	0.25	1	0.00	45.0	0.68	352.42	1425.42	0.89
32	314.69	0.01	26.0	0.22	0.25	1	0.00	45.0	0.61	354.40	1432.04	0.89
33	314.91	0.00	25.8	0.22	0.25	1	0.00	45.0	0.53	355.99	1438.64	0.89
34	315.13	0.00	25.8	0.22	0.25	1	0.00	45.0	0.45	357.67	1445.30	0.89
35	315.36	0.00	25.7	0.22	0.25	1	0.00	45.0	0.36	359.26	1451.85	0.89
36	315.58	0.00	25.7	0.22	0.25	1	0.00	45.0	0.26	360.96	1458.40	0.89
37	315.80	0.00	25.6	0.22	0.25	1	0.00	45.0	0.17	362.47	1464.96	0.89
38	316.03	0.00	25.6	0.22	0.25	1	0.00	45.0	0.06	364.08	1471.46	0.89

X-S Area: 0.25

Path Length: 9.41

X-S Weight: 26.99



# Section 8

GALENA 7.1 Analysis Results

Version: 7.10.1.02

Licensee: Greg Lewicki and Associates

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Project: Peak Ranch Resource - Section 3  
File: E:\Work\Dropbox (GLA)\Elam\Hillyard\DRMS\Geotechnical Stability Exhibit\Peak Ranch 8.gmf  
Processed: 14 Jul 2020 14:10:10

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DATA: Analysis 1 - Geotechnical Stability Analysis

Material Properties (2 materials)

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Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto  
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size  
Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (2 profiles)

-----  
Profile: 1 (23 points) Material beneath: 2 - Loose sand, mixed grain size  
0.00 8220.09 7.85 8220.00 14.76 8219.91 23.87 8219.80 33.20 8219.71  
90.94 8219.22 100.48 8219.16 101.96 8219.15 104.22 8219.25 104.93 8219.25  
109.69 8219.24 119.84 8219.19 142.71 8219.02 146.82 8218.97 148.69 8218.96  
155.66 8218.93 159.10 8218.93 161.95 8218.93 163.41 8218.92 169.01 8218.87  
182.03 8218.73 206.73 8218.44 237.74 8218.05  
Profile: 2 (23 points) Material beneath: 1 - Sand and gravel, mixed grain size  
-0.02 8218.59 7.83 8218.50 14.74 8218.41 23.85 8218.30 33.19 8218.21  
90.93 8217.72 100.48 8217.66 101.99 8217.65 104.25 8217.75 104.93 8217.75  
109.69 8217.74 119.83 8217.69 142.69 8217.52 146.81 8217.47 148.68 8217.46  
155.66 8217.43 159.10 8217.43 161.95 8217.43 163.40 8217.42 168.99 8217.37  
182.02 8217.23 206.72 8216.94 237.72 8216.55

Slope Surface (18 points)

-----  
0.00 8220.09 7.85 8220.00 14.76 8219.91 23.87 8219.80 33.20 8219.71  
90.94 8219.22 100.48 8219.16 101.96 8219.15 104.22 8219.25 104.93 8219.25  
109.69 8219.24 119.84 8219.19 142.71 8219.02 146.82 8218.97 148.69 8218.96  
155.05 8218.93 182.03 8211.20 237.74 8211.00

Phreatic Surface (2 points)

-----  
0.00 8208.00 500.00 8208.00

Failure Surface

-----

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

Intersects: XL: 148.00 YL: 8218.96 XR: 180.00 YR: 8211.78  
Centre: XC: 240.12 YC: 8554.55 Radius: R: 348.00

Variable Restraints

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Parameter descriptor: XL XR R  
Range of variation: 25.00 25.00 4.00  
Trial positions within range: 25 25 50

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RESULTS: Analysis 1 - Geotechnical Stability Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 4.168

There were: 18220 successful analyses from a total of 31251 trial surfaces  
13031 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.04

Results Summary - Lowest 99 Factor of Safety circles

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Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	154.25	8218.93	167.50	8215.36	251.83	8554.71	349.67	3.037	<-- Critical Surface
2	154.25	8218.93	167.50	8215.36	251.75	8554.40	349.35	3.037	
3	154.25	8218.93	167.50	8215.36	251.37	8552.98	347.88	3.037	
4	154.25	8218.93	167.50	8215.36	251.60	8553.85	348.78	3.037	
5	154.25	8218.93	167.50	8215.36	251.52	8553.53	348.45	3.037	
6	154.25	8218.93	167.50	8215.36	251.66	8554.08	349.02	3.037	
7	154.25	8218.93	167.50	8215.36	251.05	8551.80	346.65	3.037	
8	154.25	8218.93	167.50	8215.36	251.20	8552.35	347.22	3.037	
9	154.25	8218.93	167.50	8215.36	251.28	8552.67	347.55	3.038	
10	154.25	8218.93	167.50	8215.36	250.90	8551.25	346.08	3.038	
11	154.25	8218.93	167.50	8215.36	251.13	8552.11	346.98	3.038	
12	154.25	8218.93	167.50	8215.36	251.81	8554.64	349.59	3.038	
13	154.25	8218.93	167.50	8215.36	251.90	8554.95	349.92	3.038	
14	154.25	8218.93	167.50	8215.36	251.88	8554.87	349.84	3.038	
15	154.25	8218.93	167.50	8215.36	251.35	8552.90	347.80	3.038	
16	154.25	8218.93	167.50	8215.36	251.73	8554.32	349.27	3.038	
17	154.25	8218.93	167.50	8215.36	251.64	8554.00	348.94	3.038	
18	154.25	8218.93	167.50	8215.36	251.58	8553.77	348.69	3.038	
19	154.25	8218.93	167.50	8215.36	251.79	8554.56	349.51	3.038	

20	154.25	8218.93	167.50	8215.36	251.49	8553.45	348.37	3.038
21	154.25	8218.93	167.50	8215.36	251.43	8553.22	348.12	3.038
22	154.25	8218.93	167.50	8215.36	251.86	8554.79	349.76	3.038
23	154.25	8218.93	167.50	8215.36	251.07	8551.88	346.73	3.038
24	154.25	8218.93	167.50	8215.36	250.98	8551.56	346.41	3.038
25	154.25	8218.93	167.50	8215.36	250.94	8551.40	346.24	3.039
26	154.25	8218.93	167.50	8215.36	251.26	8552.59	347.47	3.039
27	154.25	8218.93	167.50	8215.36	251.41	8553.14	348.04	3.039
28	154.25	8218.93	167.50	8215.36	251.18	8552.27	347.14	3.039
29	154.25	8218.93	167.50	8215.36	250.92	8551.32	346.16	3.039
30	154.25	8218.93	167.50	8215.36	251.22	8552.43	347.31	3.039
31	154.25	8218.93	167.50	8215.36	251.71	8554.24	349.18	3.039
32	154.25	8218.93	167.50	8215.36	251.32	8552.82	347.71	3.039
33	154.25	8218.93	167.50	8215.36	251.56	8553.69	348.61	3.039
34	154.25	8218.93	167.50	8215.36	250.96	8551.48	346.33	3.039
35	154.25	8218.93	167.50	8215.36	251.77	8554.48	349.43	3.039
36	154.25	8218.93	167.50	8215.36	251.92	8555.03	350.00	3.039
37	154.25	8218.93	167.50	8215.36	251.11	8552.03	346.90	3.039
38	154.25	8218.93	167.50	8215.36	251.45	8553.29	348.20	3.039
39	154.25	8218.93	167.50	8215.36	250.88	8551.17	346.00	3.039
40	154.25	8218.93	167.50	8215.36	251.01	8551.64	346.49	3.039
41	154.25	8218.93	167.50	8215.36	251.39	8553.06	347.96	3.039
42	154.25	8218.93	167.50	8215.36	251.30	8552.74	347.63	3.039
43	154.25	8218.93	167.50	8215.36	251.09	8551.96	346.82	3.039
44	154.25	8218.93	167.50	8215.36	251.15	8552.19	347.06	3.039
45	154.25	8218.93	167.50	8215.36	251.03	8551.72	346.57	3.039
46	154.25	8218.93	167.50	8215.36	251.62	8553.93	348.86	3.039
47	154.25	8218.93	167.50	8215.36	251.69	8554.16	349.10	3.039
48	154.25	8218.93	167.50	8215.36	251.54	8553.61	348.53	3.039
49	154.25	8218.93	167.50	8215.36	251.47	8553.37	348.29	3.039
50	154.25	8218.93	167.50	8215.36	251.24	8552.51	347.39	3.039
51	154.25	8218.93	168.54	8215.06	252.79	8554.60	349.84	3.088
52	154.25	8218.93	168.54	8215.06	252.84	8554.76	350.00	3.088
53	154.25	8218.93	168.54	8215.06	252.58	8553.82	349.02	3.088
54	154.25	8218.93	168.54	8215.06	252.71	8554.29	349.51	3.088
55	154.25	8218.93	168.54	8215.06	252.50	8553.50	348.69	3.088
56	154.25	8218.93	168.54	8215.06	252.28	8552.71	347.88	3.088
57	154.25	8218.93	168.54	8215.06	252.77	8554.53	349.76	3.088
58	154.25	8218.93	168.54	8215.06	252.43	8553.26	348.45	3.088
59	154.25	8218.93	168.54	8215.06	252.22	8552.48	347.63	3.088
60	154.25	8218.93	168.54	8215.06	252.56	8553.74	348.94	3.088
61	154.25	8218.93	168.54	8215.06	252.65	8554.05	349.27	3.088
62	154.25	8218.93	168.54	8215.06	252.69	8554.21	349.43	3.088
63	154.25	8218.93	168.54	8215.06	252.05	8551.85	346.98	3.088
64	154.25	8218.93	168.54	8215.06	252.45	8553.34	348.53	3.088
65	154.25	8218.93	168.54	8215.06	252.07	8551.92	347.06	3.088
66	154.25	8218.93	168.54	8215.06	252.62	8553.97	349.18	3.088
67	154.25	8218.93	168.54	8215.06	252.73	8554.37	349.59	3.088
68	154.25	8218.93	168.54	8215.06	252.39	8553.11	348.29	3.088
69	154.25	8218.93	168.54	8215.06	252.26	8552.63	347.80	3.088
70	154.25	8218.93	168.54	8215.06	252.47	8553.42	348.61	3.088

71	154.25	8218.93	168.54	8215.06	251.96	8551.53	346.65	3.088
72	154.25	8218.93	168.54	8215.06	252.35	8552.95	348.12	3.088
73	154.25	8218.93	168.54	8215.06	252.20	8552.40	347.55	3.088
74	154.25	8218.93	168.54	8215.06	252.03	8551.77	346.90	3.088
75	154.25	8218.93	168.54	8215.06	251.90	8551.29	346.41	3.088
76	154.25	8218.93	168.54	8215.06	251.83	8551.06	346.16	3.088
77	154.25	8218.93	168.54	8215.06	252.11	8552.08	347.22	3.088
78	154.25	8218.93	168.54	8215.06	252.18	8552.32	347.47	3.088
79	154.25	8218.93	168.54	8215.06	252.13	8552.16	347.31	3.088
80	154.25	8218.93	168.54	8215.06	251.86	8551.14	346.24	3.089
81	154.25	8218.93	168.54	8215.06	252.30	8552.79	347.96	3.089
82	154.25	8218.93	168.54	8215.06	252.67	8554.13	349.35	3.089
83	154.25	8218.93	168.54	8215.06	252.33	8552.87	348.04	3.089
84	154.25	8218.93	168.54	8215.06	252.60	8553.89	349.10	3.089
85	154.25	8218.93	168.54	8215.06	252.41	8553.19	348.37	3.089
86	154.25	8218.93	168.54	8215.06	252.82	8554.68	349.92	3.089
87	154.25	8218.93	168.54	8215.06	252.24	8552.55	347.71	3.089
88	154.25	8218.93	168.54	8215.06	252.52	8553.58	348.78	3.089
89	154.25	8218.93	168.54	8215.06	251.88	8551.21	346.33	3.089
90	154.25	8218.93	168.54	8215.06	251.98	8551.61	346.73	3.089
91	154.25	8218.93	168.54	8215.06	251.81	8550.98	346.08	3.089
92	154.25	8218.93	168.54	8215.06	252.15	8552.24	347.39	3.089
93	154.25	8218.93	168.54	8215.06	251.92	8551.37	346.49	3.089
94	154.25	8218.93	168.54	8215.06	252.37	8553.03	348.20	3.089
95	154.25	8218.93	168.54	8215.06	252.75	8554.45	349.67	3.089
96	154.25	8218.93	168.54	8215.06	251.94	8551.45	346.57	3.089
97	154.25	8218.93	168.54	8215.06	252.54	8553.66	348.86	3.089
98	154.25	8218.93	168.54	8215.06	252.09	8552.00	347.14	3.089
99	154.25	8218.93	168.54	8215.06	252.01	8551.69	346.82	3.089

Critical Failure Surface (circle 1)

-----  
Intersects: XL: 154.25 YL: 8218.93 XR: 167.50 YR: 8215.36  
Centre: XC: 251.83 YC: 8554.71 Radius: R: 349.67

Generated failure surface: (20 points)

154.25	8218.93	154.94	8218.73	155.64	8218.53	156.33	8218.34	157.03	8218.14
157.72	8217.94	158.42	8217.75	159.12	8217.56	159.81	8217.37	160.51	8217.18
161.21	8216.99	161.90	8216.80	162.60	8216.62	163.30	8216.43	164.00	8216.25
164.70	8216.07	165.40	8215.89	166.10	8215.71	166.80	8215.54	167.50	8215.36

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

Slice	X-S		Base						Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi				
1	154.25	0.02	16.0	0.35	0.36	2	0.00	34.0	1.68	0.00	4.54	0.98
2	154.60	0.05	16.2	0.35	0.36	2	0.00	34.0	5.07	0.00	13.72	0.98
3	154.94	0.02	15.9	0.11	0.11	2	0.00	34.0	2.22	0.00	19.73	0.98
4	155.05	0.07	16.1	0.29	0.31	2	0.00	34.0	6.63	0.00	21.17	0.98
5	155.34	0.07	16.1	0.29	0.31	2	0.00	34.0	6.65	0.00	21.26	0.98
6	155.64	0.08	15.9	0.35	0.36	2	0.00	34.0	7.79	0.00	21.10	0.98
7	155.99	0.08	15.9	0.35	0.36	2	0.00	34.0	7.82	0.00	21.19	0.98

8	156.33	0.08	15.8	0.35	0.36	2	0.00	34.0	7.76	0.00	21.01	0.98
9	156.68	0.08	15.8	0.35	0.36	2	0.00	34.0	7.73	0.00	20.92	0.98
10	157.03	0.08	15.7	0.35	0.36	2	0.00	34.0	7.70	0.00	20.84	0.98
11	157.38	0.08	15.5	0.35	0.36	2	0.00	34.0	7.60	0.00	20.58	0.98
12	157.72	0.08	15.5	0.35	0.36	2	0.00	34.0	7.53	0.00	20.40	0.98
13	158.07	0.08	15.7	0.35	0.36	2	0.00	34.0	7.43	0.00	20.11	0.98
14	158.42	0.07	15.4	0.35	0.36	2	0.00	34.0	7.34	0.00	19.86	0.98
15	158.77	0.07	15.4	0.35	0.36	2	0.00	34.0	7.17	0.00	19.41	0.98
16	159.12	0.05	15.4	0.23	0.24	2	0.00	34.0	4.76	0.00	19.14	0.98
17	159.35	0.05	15.4	0.23	0.24	2	0.00	34.0	4.69	0.00	18.86	0.98
18	159.58	0.05	15.4	0.23	0.24	1	0.00	45.0	4.56	0.00	18.40	0.95
19	159.81	0.05	15.2	0.24	0.25	1	0.00	45.0	4.85	0.00	18.79	0.95
20	160.05	0.05	15.2	0.24	0.25	1	0.00	45.0	4.95	0.00	19.18	0.95
21	160.29	0.04	15.2	0.22	0.23	1	0.00	45.0	4.65	0.00	19.13	0.95
22	160.51	0.06	15.0	0.35	0.36	1	0.00	45.0	7.08	0.00	18.65	0.95
23	160.86	0.06	15.0	0.35	0.36	1	0.00	45.0	6.85	0.00	18.06	0.95
24	161.21	0.06	15.0	0.35	0.36	1	0.00	45.0	6.63	0.00	17.47	0.95
25	161.56	0.06	14.9	0.35	0.36	1	0.00	45.0	6.33	0.00	16.69	0.95
26	161.90	0.06	14.9	0.35	0.36	1	0.00	45.0	6.08	0.00	16.00	0.95
27	162.25	0.05	14.9	0.35	0.36	1	0.00	45.0	5.85	0.00	15.41	0.95
28	162.60	0.05	14.7	0.35	0.36	1	0.00	45.0	5.52	0.00	14.53	0.95
29	162.95	0.05	14.7	0.35	0.36	1	0.00	45.0	5.22	0.00	13.74	0.95
30	163.30	0.04	14.6	0.35	0.36	1	0.00	45.0	4.88	0.00	12.86	0.95
31	163.65	0.04	14.6	0.35	0.36	1	0.00	45.0	4.51	0.00	11.87	0.95
32	164.00	0.04	14.4	0.35	0.36	1	0.00	45.0	4.13	0.00	10.89	0.95
33	164.35	0.03	14.6	0.35	0.36	1	0.00	45.0	3.79	0.00	9.99	0.95
34	164.70	0.03	14.4	0.35	0.36	1	0.00	45.0	3.38	0.00	8.91	0.95
35	165.05	0.03	14.4	0.35	0.36	1	0.00	45.0	2.97	0.00	7.82	0.95
36	165.40	0.02	14.2	0.35	0.36	1	0.00	45.0	2.59	0.00	6.84	0.95
37	165.75	0.02	14.2	0.35	0.36	1	0.00	45.0	2.11	0.00	5.55	0.95
38	166.10	0.02	14.1	0.35	0.36	1	0.00	45.0	1.66	0.00	4.37	0.95
39	166.45	0.01	14.1	0.35	0.36	1	0.00	45.0	1.20	0.00	3.18	0.95
40	166.80	0.01	14.1	0.35	0.36	1	0.00	45.0	0.71	0.00	1.89	0.95
41	167.15	0.00	14.1	0.35	0.36	1	0.00	45.0	0.23	0.00	0.60	0.95

X-S Area: 2.01 Path Length: 13.72 X-S Weight: 208.31

DATA: Analysis 2 - Geotechnical Stability Analysis

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 45.0 110.00 Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion Phi UnitWeight Ru  
0.00 34.0 99.00 Auto

Water Properties

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

Material Profiles (2 profiles)  
 -----

Profile: 1 (23 points)	Material beneath: 2 - Loose sand, mixed grain size									
0.00	8220.09	7.85	8220.00	14.76	8219.91	23.87	8219.80	33.20	8219.71	
90.94	8219.22	100.48	8219.16	101.96	8219.15	104.22	8219.25	104.93	8219.25	
109.69	8219.24	119.84	8219.19	142.71	8219.02	146.82	8218.97	148.69	8218.96	
155.66	8218.93	159.10	8218.93	161.95	8218.93	163.41	8218.92	169.01	8218.87	
182.03	8218.73	206.73	8218.44	237.74	8218.05					
Profile: 2 (23 points)	Material beneath: 1 - Sand and gravel, mixed grain size									
-0.02	8218.59	7.83	8218.50	14.74	8218.41	23.85	8218.30	33.19	8218.21	
90.93	8217.72	100.48	8217.66	101.99	8217.65	104.25	8217.75	104.93	8217.75	
109.69	8217.74	119.83	8217.69	142.69	8217.52	146.81	8217.47	148.68	8217.46	
155.66	8217.43	159.10	8217.43	161.95	8217.43	163.40	8217.42	168.99	8217.37	
182.02	8217.23	206.72	8216.94	237.72	8216.55					

Slope Surface (18 points)  
 -----

0.00	8220.09	7.85	8220.00	14.76	8219.91	23.87	8219.80	33.20	8219.71	
90.94	8219.22	100.48	8219.16	101.96	8219.15	104.22	8219.25	104.93	8219.25	
109.69	8219.24	119.84	8219.19	142.71	8219.02	146.82	8218.97	148.69	8218.96	
155.05	8218.93	182.03	8211.20	237.74	8211.00					

Phreatic Surface (2 points)  
 -----

0.00	8208.00	500.00	8208.00							
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Failure Surface (Critical, from previous analysis)  
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Initial circular surface for critical search defined by: XL, XR, R  
 Intersects: XL: 154.25    YL: 8218.93    XR: 167.50    YR: 8215.36  
 Centre: XC: 251.83    YC: 8554.71    Radius: R: 349.67

Variable Restraints  
 -----

Parameter descriptor:	XL	XR	R
Range of variation:	50.00	50.00	31.00
Trial positions within range:	25	25	25

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RESULTS: Analysis 2 - Geotechnical Stability Analysis  
 Bishop Simplified Method of Analysis - Circular Failure Surface  
 -----  
 Critical Failure Surface Search using Multiple Circle Generation Techniques  
 Factor of Safety for initial failure surface approximation: 3.037

There were: 5826 successful analyses from a total of 15625 trial surfaces  
 9799 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.67

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	154.25	8218.93	161.25	8217.15	244.57	8559.42	352.26	2.671	<-- Critical Surface
2	154.25	8218.93	161.25	8217.15	240.11	8541.89	334.17	2.672	
3	154.25	8218.93	161.25	8217.15	242.02	8549.40	341.92	2.672	
4	154.25	8218.93	161.25	8217.15	244.25	8558.16	350.97	2.672	
5	154.25	8218.93	161.25	8217.15	241.39	8546.90	339.34	2.672	
6	154.25	8218.93	161.25	8217.15	240.75	8544.39	336.76	2.673	
7	154.25	8218.93	161.25	8217.15	247.75	8571.93	365.17	2.673	
8	154.25	8218.93	161.25	8217.15	244.89	8560.67	353.55	2.673	
9	154.25	8218.93	161.25	8217.15	241.70	8548.15	340.63	2.673	
10	154.25	8218.93	161.25	8217.15	240.43	8543.14	335.47	2.673	
11	154.25	8218.93	161.25	8217.15	243.61	8555.66	348.38	2.673	
12	154.25	8218.93	161.25	8217.15	243.93	8556.91	349.67	2.673	
13	154.25	8218.93	161.25	8217.15	241.07	8545.64	338.05	2.673	
14	154.25	8218.93	161.25	8217.15	243.30	8554.41	347.09	2.673	
15	154.25	8218.93	161.25	8217.15	245.52	8563.17	356.13	2.673	
16	154.25	8218.93	161.25	8217.15	247.43	8570.68	363.88	2.673	
17	154.25	8218.93	161.25	8217.15	242.34	8550.65	343.22	2.673	
18	154.25	8218.93	161.25	8217.15	242.66	8551.90	344.51	2.673	
19	154.25	8218.93	161.25	8217.15	242.98	8553.16	345.80	2.674	
20	154.25	8218.93	161.25	8217.15	245.21	8561.92	354.84	2.674	
21	154.25	8218.93	161.25	8217.15	245.84	8564.42	357.42	2.674	
22	154.25	8218.93	161.25	8217.15	246.16	8565.67	358.72	2.675	
23	154.25	8218.93	161.25	8217.15	247.12	8569.43	362.59	2.675	
24	154.25	8218.93	161.25	8217.15	246.48	8566.93	360.01	2.675	
25	154.25	8218.93	161.25	8217.15	246.80	8568.18	361.30	2.675	
26	154.25	8218.93	159.17	8217.75	236.73	8550.76	341.92	2.782	
27	154.25	8218.93	159.17	8217.75	237.03	8552.02	343.22	2.783	
28	154.25	8218.93	159.17	8217.75	240.36	8565.83	357.42	2.783	
29	154.25	8218.93	159.17	8217.75	234.92	8543.22	334.17	2.783	
30	154.25	8218.93	159.17	8217.75	238.24	8557.04	348.38	2.783	
31	154.25	8218.93	159.17	8217.75	237.34	8553.27	344.51	2.783	
32	154.25	8218.93	159.17	8217.75	237.94	8555.78	347.09	2.783	
33	154.25	8218.93	159.17	8217.75	235.22	8544.48	335.47	2.783	
34	154.25	8218.93	159.17	8217.75	238.55	8558.29	349.67	2.783	
35	154.25	8218.93	159.17	8217.75	236.13	8548.25	339.34	2.783	
36	154.25	8218.93	159.17	8217.75	240.96	8568.34	360.01	2.783	
37	154.25	8218.93	159.17	8217.75	241.27	8569.60	361.30	2.783	
38	154.25	8218.93	159.17	8217.75	239.45	8562.06	353.55	2.784	
39	154.25	8218.93	159.17	8217.75	238.85	8559.55	350.97	2.784	
40	154.25	8218.93	159.17	8217.75	240.66	8567.08	358.72	2.784	
41	154.25	8218.93	159.17	8217.75	237.64	8554.53	345.80	2.784	
42	154.25	8218.93	159.17	8217.75	235.82	8546.99	338.05	2.784	

43	154.25	8218.93	159.17	8217.75	235.52	8545.74	336.76	2.784
44	154.25	8218.93	159.17	8217.75	236.43	8549.50	340.63	2.784
45	154.25	8218.93	159.17	8217.75	239.15	8560.81	352.26	2.784
46	154.25	8218.93	159.17	8217.75	240.06	8564.57	356.13	2.784
47	154.25	8218.93	159.17	8217.75	239.75	8563.32	354.84	2.784
48	154.25	8218.93	159.17	8217.75	241.87	8572.11	363.88	2.784
49	154.25	8218.93	159.17	8217.75	242.17	8573.36	365.17	2.784
50	154.25	8218.93	159.17	8217.75	241.57	8570.85	362.59	2.785
51	154.25	8218.93	163.33	8216.56	250.25	8567.25	361.30	2.790
52	154.25	8218.93	163.33	8216.56	249.27	8563.50	357.42	2.790
53	154.25	8218.93	163.33	8216.56	251.23	8570.99	365.17	2.790
54	154.25	8218.93	163.33	8216.56	246.00	8551.00	344.51	2.790
55	154.25	8218.93	163.33	8216.56	247.63	8557.25	350.97	2.790
56	154.25	8218.93	163.33	8216.56	246.98	8554.75	348.38	2.790
57	154.25	8218.93	163.33	8216.56	247.96	8558.50	352.26	2.790
58	154.25	8218.93	163.33	8216.56	248.61	8561.00	354.84	2.790
59	154.25	8218.93	163.33	8216.56	249.60	8564.75	358.72	2.790
60	154.25	8218.93	163.33	8216.56	250.90	8569.74	363.88	2.790
61	154.25	8218.93	163.33	8216.56	248.94	8562.25	356.13	2.790
62	154.25	8218.93	163.33	8216.56	249.92	8566.00	360.01	2.791
63	154.25	8218.93	163.33	8216.56	243.71	8542.25	335.47	2.791
64	154.25	8218.93	163.33	8216.56	250.58	8568.49	362.59	2.791
65	154.25	8218.93	163.33	8216.56	244.69	8546.00	339.34	2.791
66	154.25	8218.93	163.33	8216.56	246.65	8553.50	347.09	2.791
67	154.25	8218.93	163.33	8216.56	245.67	8549.75	343.22	2.791
68	154.25	8218.93	163.33	8216.56	244.36	8544.75	338.05	2.791
69	154.25	8218.93	163.33	8216.56	246.33	8552.25	345.80	2.792
70	154.25	8218.93	163.33	8216.56	245.34	8548.50	341.92	2.792
71	154.25	8218.93	163.33	8216.56	243.38	8541.00	334.17	2.792
72	154.25	8218.93	163.33	8216.56	247.31	8556.00	349.67	2.792
73	154.25	8218.93	163.33	8216.56	248.29	8559.75	353.55	2.793
74	154.25	8218.93	163.33	8216.56	245.02	8547.25	340.63	2.793
75	154.25	8218.93	163.33	8216.56	244.04	8543.50	336.76	2.793
76	154.25	8218.93	165.42	8215.96	251.80	8562.79	357.42	2.924
77	154.25	8218.93	165.42	8215.96	253.13	8567.78	362.59	2.924
78	154.25	8218.93	165.42	8215.96	253.46	8569.03	363.88	2.924
79	154.25	8218.93	165.42	8215.96	252.13	8564.04	358.72	2.924
80	154.25	8218.93	165.42	8215.96	250.80	8559.04	353.55	2.925
81	154.25	8218.93	165.42	8215.96	249.80	8555.30	349.67	2.925
82	154.25	8218.93	165.42	8215.96	248.47	8550.31	344.51	2.925
83	154.25	8218.93	165.42	8215.96	251.46	8561.54	356.13	2.925
84	154.25	8218.93	165.42	8215.96	253.79	8570.28	365.17	2.925
85	154.25	8218.93	165.42	8215.96	252.46	8565.29	360.01	2.926
86	154.25	8218.93	165.42	8215.96	252.79	8566.53	361.30	2.926
87	154.25	8218.93	165.42	8215.96	250.13	8556.55	350.97	2.926
88	154.25	8218.93	165.42	8215.96	251.13	8560.29	354.84	2.926
89	154.25	8218.93	165.42	8215.96	250.47	8557.79	352.26	2.927
90	154.25	8218.93	165.42	8215.96	249.14	8552.80	347.09	2.927
91	154.25	8218.93	165.42	8215.96	248.80	8551.55	345.80	2.927
92	154.25	8218.93	165.42	8215.96	247.47	8546.56	340.63	2.928
93	154.25	8218.93	165.42	8215.96	247.81	8547.81	341.92	2.928



94	154.25	8218.93	165.42	8215.96	246.48	8542.82	336.76	2.928
95	154.25	8218.93	165.42	8215.96	249.47	8554.05	348.38	2.928
96	154.25	8218.93	165.42	8215.96	246.81	8544.06	338.05	2.928
97	154.25	8218.93	165.42	8215.96	248.14	8549.06	343.22	2.928
98	154.25	8218.93	165.42	8215.96	246.14	8541.57	335.47	2.928
99	154.25	8218.93	165.42	8215.96	247.14	8545.31	339.34	2.928

Critical Failure Surface (circle 1)

Intersects: XL: 154.25 YL: 8218.93 XR: 161.25 YR: 8217.15  
 Centre: XC: 244.57 YC: 8559.42 Radius: R: 352.26

Generated failure surface: (20 points)

154.25	8218.93	154.62	8218.84	154.99	8218.74	155.35	8218.64	155.72	8218.55
156.09	8218.45	156.46	8218.36	156.82	8218.26	157.19	8218.17	157.56	8218.07
157.93	8217.98	158.30	8217.89	158.67	8217.79	159.04	8217.70	159.40	8217.61
159.77	8217.52	160.14	8217.43	160.51	8217.33	160.88	8217.24	161.25	8217.15

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

Slice	X-S		Base						Weight	PoreWater Force	Normal Stress	Test Factor
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi				
1	154.25	0.00	14.9	0.18	0.19	2	0.00	34.0	0.43	0.00	2.17	0.97
2	154.43	0.01	14.6	0.18	0.19	2	0.00	34.0	1.30	0.00	6.62	0.97
3	154.62	0.02	14.6	0.18	0.19	2	0.00	34.0	2.17	0.00	11.07	0.97
4	154.80	0.03	14.9	0.18	0.19	2	0.00	34.0	3.02	0.00	15.40	0.97
5	154.99	0.01	14.4	0.06	0.07	2	0.00	34.0	1.27	0.00	18.43	0.97
6	155.05	0.03	14.8	0.15	0.16	2	0.00	34.0	3.08	0.00	19.03	0.97
7	155.20	0.03	14.8	0.15	0.16	2	0.00	34.0	3.02	0.00	18.67	0.97
8	155.35	0.04	14.6	0.18	0.19	2	0.00	34.0	3.59	0.00	18.33	0.97
9	155.54	0.04	14.9	0.18	0.19	2	0.00	34.0	3.50	0.00	17.85	0.97
10	155.72	0.03	14.6	0.18	0.19	2	0.00	34.0	3.41	0.00	17.42	0.97
11	155.90	0.03	14.6	0.18	0.19	2	0.00	34.0	3.34	0.00	17.06	0.97
12	156.09	0.03	14.3	0.18	0.19	2	0.00	34.0	3.24	0.00	16.53	0.97
13	156.27	0.03	14.6	0.18	0.19	2	0.00	34.0	3.15	0.00	16.06	0.97
14	156.46	0.03	14.6	0.18	0.19	2	0.00	34.0	3.04	0.00	15.51	0.97
15	156.64	0.03	14.3	0.18	0.19	2	0.00	34.0	2.95	0.00	15.08	0.97
16	156.82	0.03	14.3	0.18	0.19	2	0.00	34.0	2.85	0.00	14.53	0.97
17	157.01	0.03	14.6	0.18	0.19	2	0.00	34.0	2.76	0.00	14.06	0.97
18	157.19	0.03	14.3	0.18	0.19	2	0.00	34.0	2.65	0.00	13.54	0.97
19	157.38	0.03	14.3	0.18	0.19	2	0.00	34.0	2.55	0.00	12.99	0.97
20	157.56	0.02	14.3	0.18	0.19	2	0.00	34.0	2.44	0.00	12.45	0.97
21	157.75	0.02	14.3	0.18	0.19	2	0.00	34.0	2.33	0.00	11.90	0.97
22	157.93	0.02	14.3	0.18	0.19	2	0.00	34.0	2.23	0.00	11.36	0.97
23	158.11	0.02	14.3	0.18	0.19	2	0.00	34.0	2.12	0.00	10.81	0.97
24	158.30	0.02	14.0	0.18	0.19	2	0.00	34.0	2.01	0.00	10.28	0.97
25	158.48	0.02	14.3	0.18	0.19	2	0.00	34.0	1.89	0.00	9.63	0.97
26	158.67	0.02	14.3	0.18	0.19	2	0.00	34.0	1.78	0.00	9.08	0.97
27	158.85	0.02	14.0	0.18	0.19	2	0.00	34.0	1.66	0.00	8.46	0.97
28	159.04	0.02	14.0	0.18	0.19	2	0.00	34.0	1.53	0.00	7.82	0.97
29	159.22	0.01	14.0	0.18	0.19	2	0.00	34.0	1.41	0.00	7.19	0.97
30	159.40	0.01	14.0	0.18	0.19	2	0.00	34.0	1.27	0.00	6.46	0.97

31	159.59	0.01	14.0	0.18	0.19	2	0.00	34.0	1.14	0.00	5.82	0.97
32	159.77	0.01	14.0	0.18	0.18	2	0.00	34.0	0.97	0.00	5.18	0.97
33	159.95	0.01	13.7	0.18	0.18	2	0.00	34.0	0.87	0.00	4.65	0.97
34	160.13	0.01	13.8	0.16	0.16	1	0.00	45.0	0.70	0.00	4.00	0.94
35	160.29	0.01	14.1	0.23	0.23	1	0.00	45.0	0.87	0.00	3.54	0.94
36	160.51	0.01	13.7	0.18	0.19	1	0.00	45.0	0.56	0.00	2.76	0.94
37	160.70	0.00	13.7	0.18	0.19	1	0.00	45.0	0.38	0.00	1.87	0.94
38	160.88	0.00	13.7	0.18	0.19	1	0.00	45.0	0.22	0.00	1.08	0.94
39	161.07	0.00	14.0	0.18	0.19	1	0.00	45.0	0.08	0.00	0.39	0.94

X-S Area: 0.78

Path Length: 7.22

X-S Weight: 77.77