



Geotechnical Addendum

2022 Annual Report

Aggregate Industries Deer Creek Quarry

Permit M1977-014
Jefferson County, Colorado

December 2022

Prepared By:

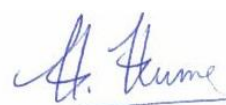
David S. Crotsley, P.G.
Senior Geologist



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Geotechnical Designer



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Senior Engineering Geotechnical Advisor



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1 Introduction

This 2022 Annual Report provides information required by permit M-1977-014, that allows the Colorado Division of Reclamation, Mining and Safety (DRMS) to review existing and evolving quarry conditions at the Deer Creek Quarry, which is operated by LafargeHolcim | Aggregate Industries (AI). This report summarizes geotechnical observations made by HDR field staff on September 12 and November 6, 2022, and is a supplement to the Minerals Reclamation Permit Annual Report.

HDR staff noted and documented exposed rock conditions such as joint and foliation orientation, shear zones, intrusions, rock type, and critical highwalls still exposed from previous mining activities.

1.1 Mine Location and Description

The Deer Creek Quarry is a hard rock aggregate mine located north of State Route 124, west of Ken Caryl, Colorado. The mine location is shown in Figure 1, Project Location Map. The mine site is located southwest of the South Hogback along the Colorado Front Range west of Denver.

The Deer Creek Quarry currently consists of reclaimed slopes and highwall benches. Highwall benches have two primary slope directions, facing approximately east and north. Per the permit conditions of a limited production quarry, the site need only be minimally mined in order to keep the permit active. However, the highwalls have historically not been significantly mined since full production ceased in 2003.

1.2 Mine Configuration

The quarry consists of two dominant highwalls, to the west and to the south. East facing highwall extends from approximately elevation (El.) 6820 above mean sea level (msl) to El. 6380. The north facing highwall begins at approximately El. 6650. Both highwalls have been unmined since approximately 2003, with limited mining activities including moving stockpiled materials and material storage occurring along the floor of the pit and the lower bench at approximately El. 6420. An access/haul road is present to the north of the pit and provides access to the benches of the east facing highwall. Refer to Figures 2 and 3, Quarry Extents and Bench Type and Quarry Aerial Map and Bench View, respectively, for additional information.

2 Site Geology

The Deer Creek Quarry is situated in the Colorado Front Range, within the Colorado Province of the Southern Rocky Mountains. The Front Range forms the easter margin of the Southern Rocky Mountains, situated above the Denver Basin and High Plains to the east. Bedrock geology in the area is mapped as Biotite Gneiss, Schist, and Migmatite of early Proterozoic. Locally, the Deer Creek Quarry typically consists of a fine- to medium-grained granitic gneiss or biotite gneiss, with occasional pegmatitic intrusions.

3 2022 Observations

The following section includes observations of mine conditions made by HDR staff on September 12 and November 6, 2022. Joint and foliation orientations, highwall trends, and rock mass rating (RMR) classification estimates were not included in this task order, as this effort was limited to evaluating conditions resulting from the work done in the current year. Therefore, historical aerial imagery through Google Earth and imagery provided through the Propellor online portal were reviewed for changes relevant to the mine conditions and any reclamation activities. The historical background information was then considered while evaluating the conditions at the site. The following sections detail the findings for the 2022 mining year. Refer to Figure 3 for additional information regarding the quarry feature locations.

3.1 Mining Conditions

Based on aerial imagery, no appreciable mining occurred in 2022. Historical imagery from 2021 indicated the site was previously being used as a storage facility for timber in the laydown area to the east of the highwalls. Existing benches did not appear to be mined, with no recent impacts noted. The access road leading to the upper benches to the north of the highwalls was viewed during the site visit. In general, the access road was overgrown with vegetation, and had experienced numerous slope failures that has currently left the road inaccessible to typical vehicular traffic.

3.2 Reclamation Slope Conditions

Site reclamation has been performed at the quarry prior to HDR's involvement. The upper benches have developed vegetation on the slopes, and historical rockfall has continued to fill the benches. East facing benches have continued to perform well, with little to no significant rockfall. The north facing bench, specifically at approximately elevation El. 6625 experienced a significant rockfall event within approximately the last two (2) years, based on historical imagery. The volume of the slide appeared to be approximately 100 cubic yards and was contained within the lower bench. Similarly, continued development of rockfall at the corner of the east and north facing highwalls has continued. Various benches appear to be at near capacity, resulting in some rockfall likely to fall beyond the next lower bench. Particularly, Benches 6695, 6640, and 6490. During the site evaluation performed by HDR, noted recent rockfall was identified along the lower access road leading to the laydown area.

No groundwater or surface water mitigation efforts were noted during our review of historical aerial imagery, nor were noted during the site visit.

3.2.1 Structural Features

During the site visit, structural features such as joint sets and general foliation trends were noted in relation to the bench configurations. Detailed scanlines were not performed since the existing benches did not exhibit features of recent mining; however, general measurements were

collected in order to ascertain potential failure mechanisms associated with the recent rockfall events.

In general, three (3) joint sets were noted. Set 1 (J1) was identified as being oriented at 20°, 120° using the dip/dip direction notation. Set 2 (J2) was approximately 85°, 45° and Set 3 (J3) was approximately 30°, 320°. Foliation throughout the site varied locally; however, a prominent foliation feature (F1) noted throughout was identified at approximately 70°, 310°.

3.2.2 Kinematic Analyses

Global stability analyses were conducted to assess the general stability of the rock slopes in relation to the known failure events. Kinematic analyses were performed to assess the natural discontinuity patterns on the slopes relative to the slope geometry, and to evaluate the potential and type(s) of failures that may occur (i.e., planar, wedge, or toppling failure). HDR utilized Rocscience's Dips program to perform the kinematic analyses.

4 Results and Recommendations

4.1 Summary of Results

The site evaluation and background research of the Deer Creek Quarry indicates that minimal mining has occurred in recent years. As such, the condition of the quarry appears to be generally stable, with localized failures occurring most often on the east facing highwalls. The kinematic analyses performed based on preliminary joint and foliation data suggests that there is a potential for wedge failures for the northward oriented faces and toppling failure for the eastward oriented faces. Based on field observations and the kinematic analysis results, the primary failure mechanism that would be anticipated are wedge failures for north and west facing slopes, and toppling for south facing slopes, which mimics the conditions observed at the site. Refer to the table below for a summary of the results, and Appendix A for the Stereonet Projections.

Table 1 – Summary of Kinematic Analyses

Failure Mode	North-Facing Slopes Risk	East-Facing Slopes Risk	South-Facing Slopes Risk	West-Facing Slopes Risk
Planar Sliding	0.0%	0.0%	0.0%	0.0%
Wedge Sliding	16.7%	0.0%	0.0%	16.7%
Flexural Toppling	0.0%	0.0%	0.0%	0.0%
Direct Toppling	0.0%	0.0%	16.7%	0.0%

4.2 Recommendations

Due to the presence of recent rockfall conditions, and the potential kinematic failure risk identified through the kinematic analyses, HDR recommends that continued monitoring as part of the annual inspections continue moving forward. Additionally, any on site work performed at the quarry should be performed with the utmost concern for potential localized failure, and all safety measures shall be maintained. If rockfall persists beyond an adjacent lower bench, as noted during our research, benches should be cleaned and/or stabilized to mitigate excessive rockfall energies.

5 References

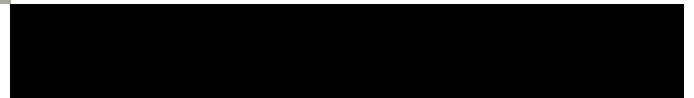
Aggregate Industries, Inc (2020). "Aggregate Industries – WCR, Inc. Deer Creek Quarry (M1997-014) Interim Stability Evaluation," prepared for Aggregate Industries, September.

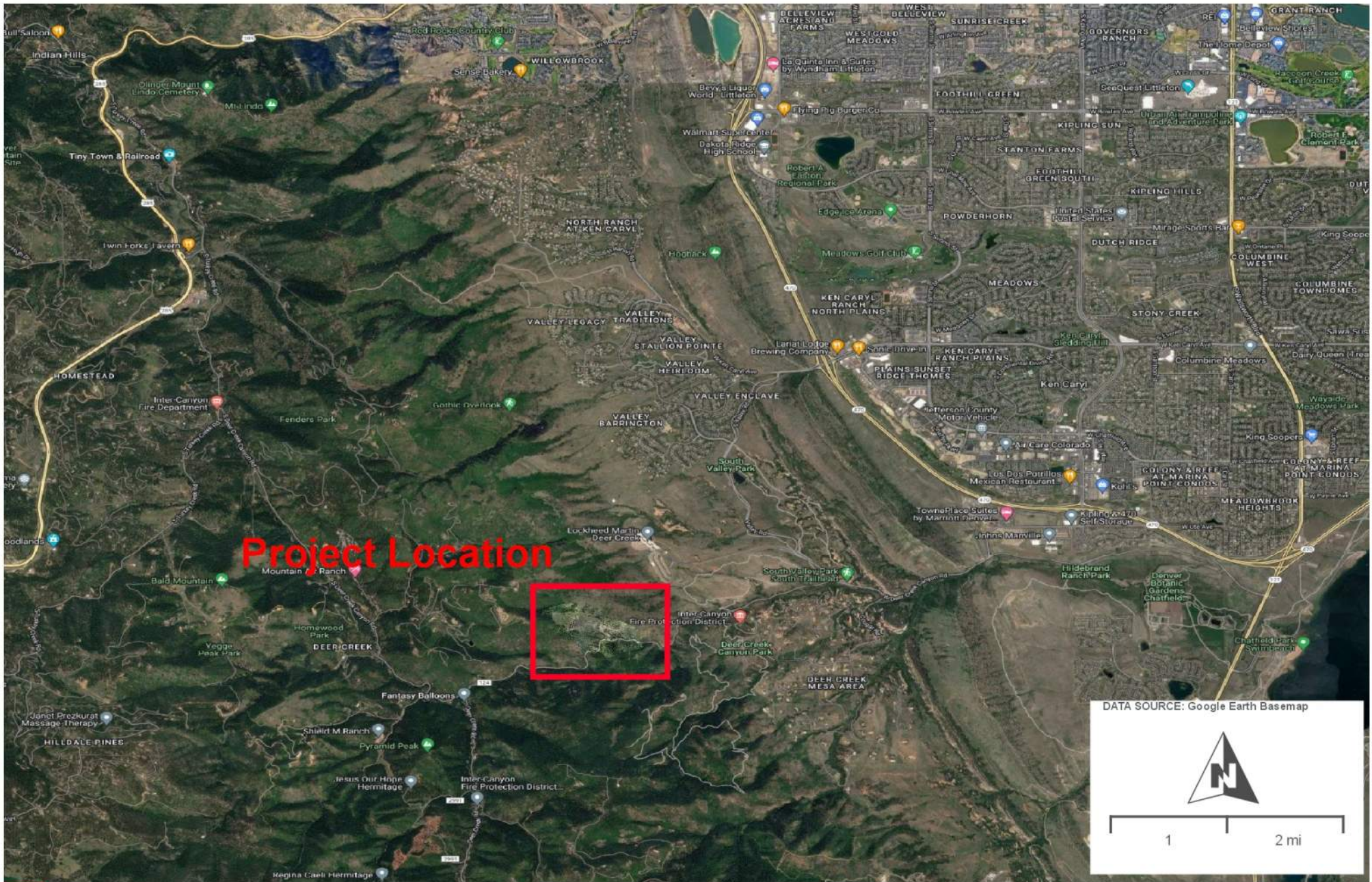
Rocscience, DIPS Stereographic Projection Program, Version 7.0.

Scott, Glenn R., Geologic Map of Morrison Quadrangle, Jefferson County, Colorado 1972.

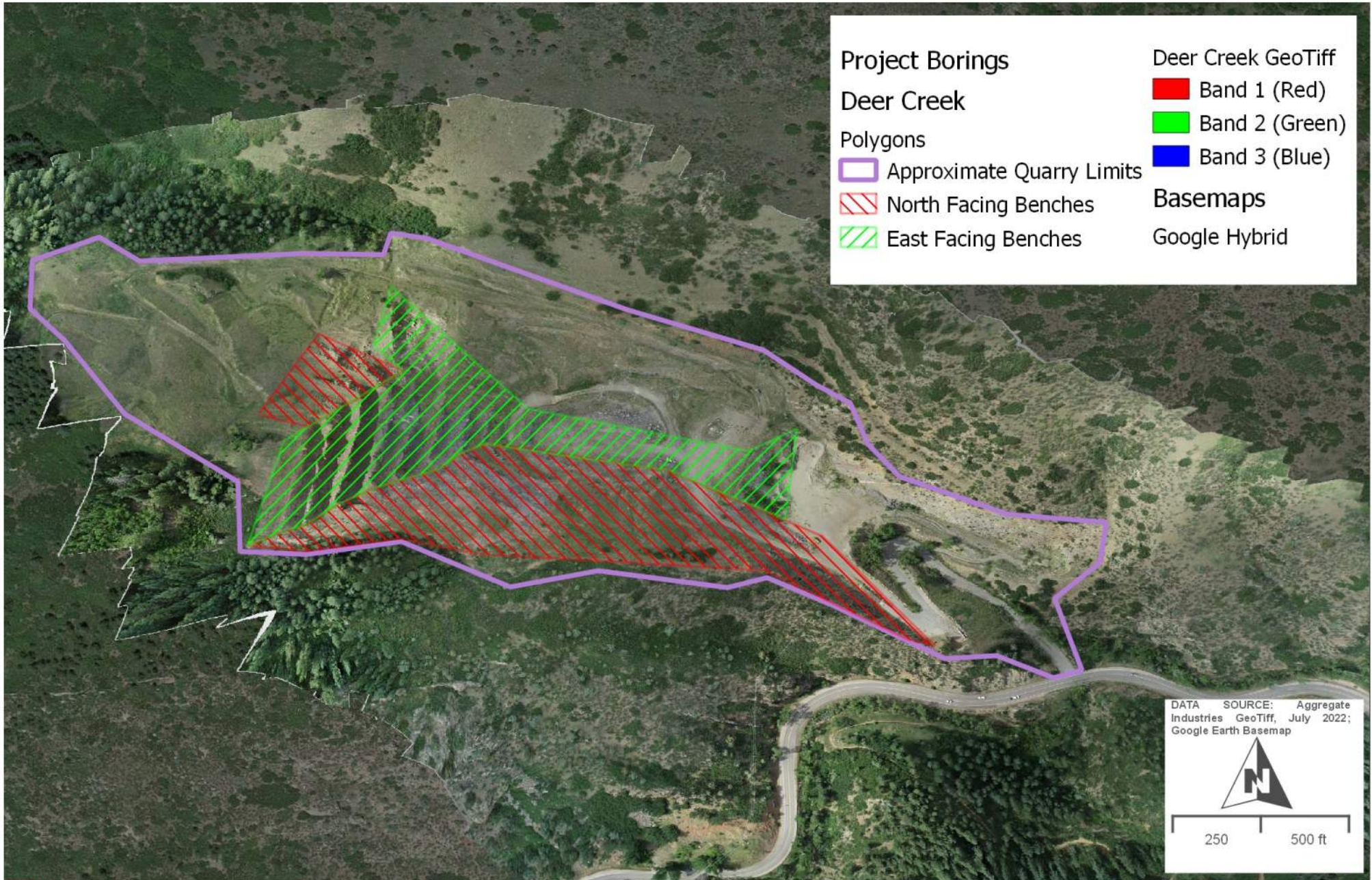


Figures



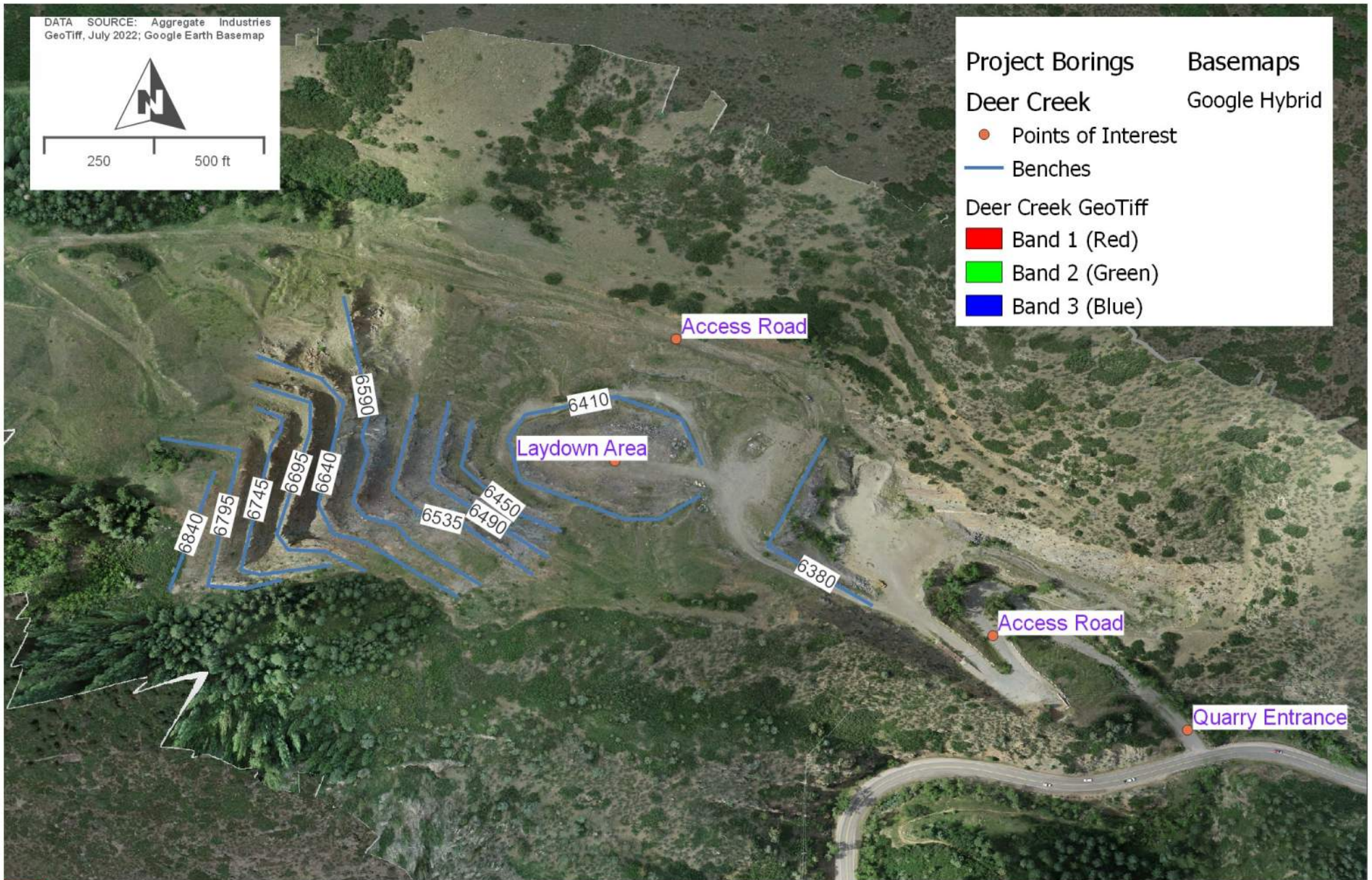


PROJECT LOCATION MAP
DEER CREEK QUARRY
JEFFERSON COUNTY, COLORADO
FIGURE 1



QUARRY EXTENTS AND BENCH TYPE
DEER CREEK QUARRY
JEFFERSON COUNTY, COLORADO
FIGURE 2

GEOTECHNICAL ADDENDUM

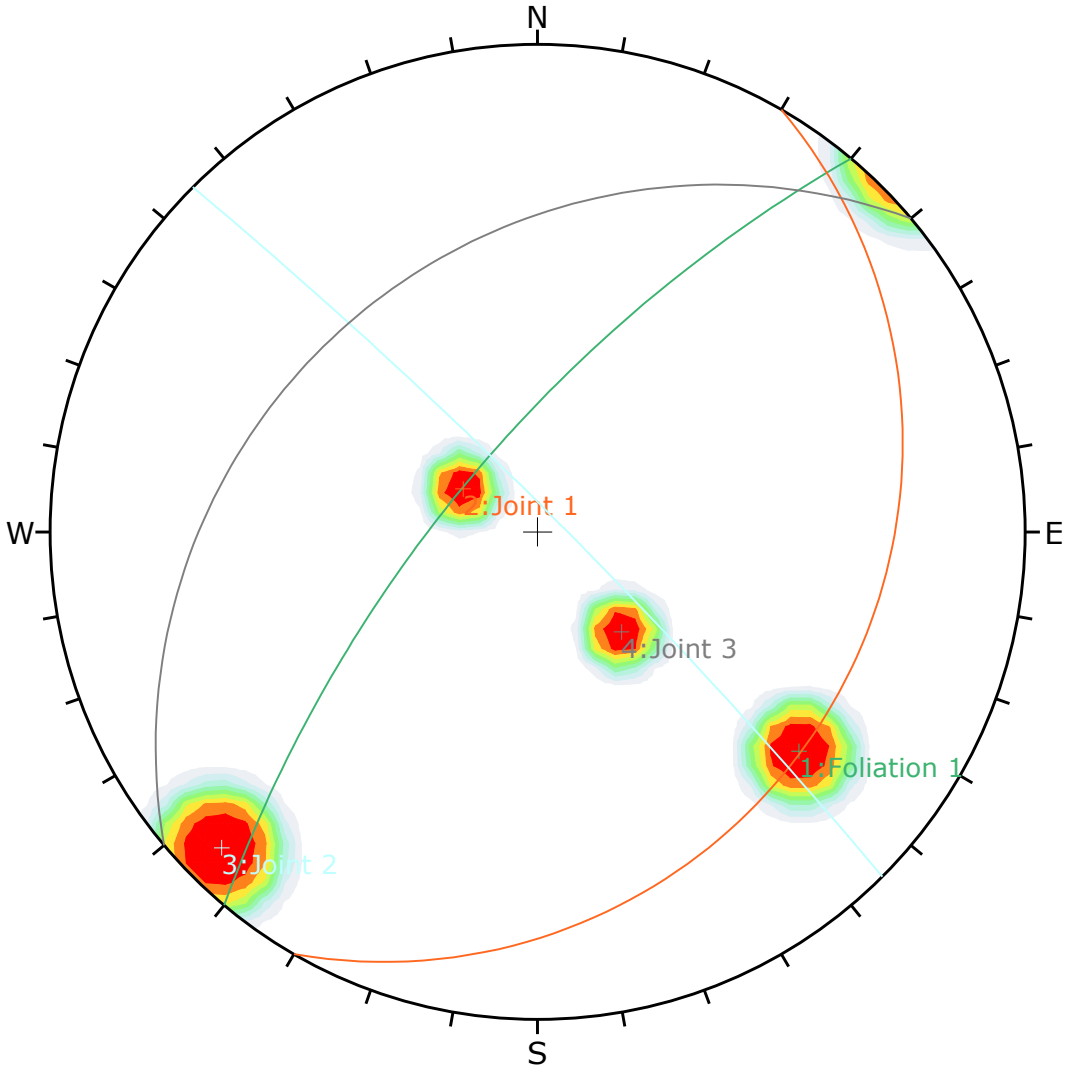


QUARRY AERIAL MAP AND BENCH VIEW
DEER CREEK QUARRY
JEFFERSON COUNTY, COLORADO
FIGURE 3

The page features a large red rectangle on the left side, a grey rectangle at the top right, and a black rectangle at the bottom right. The title text is positioned to the right of the red rectangle.

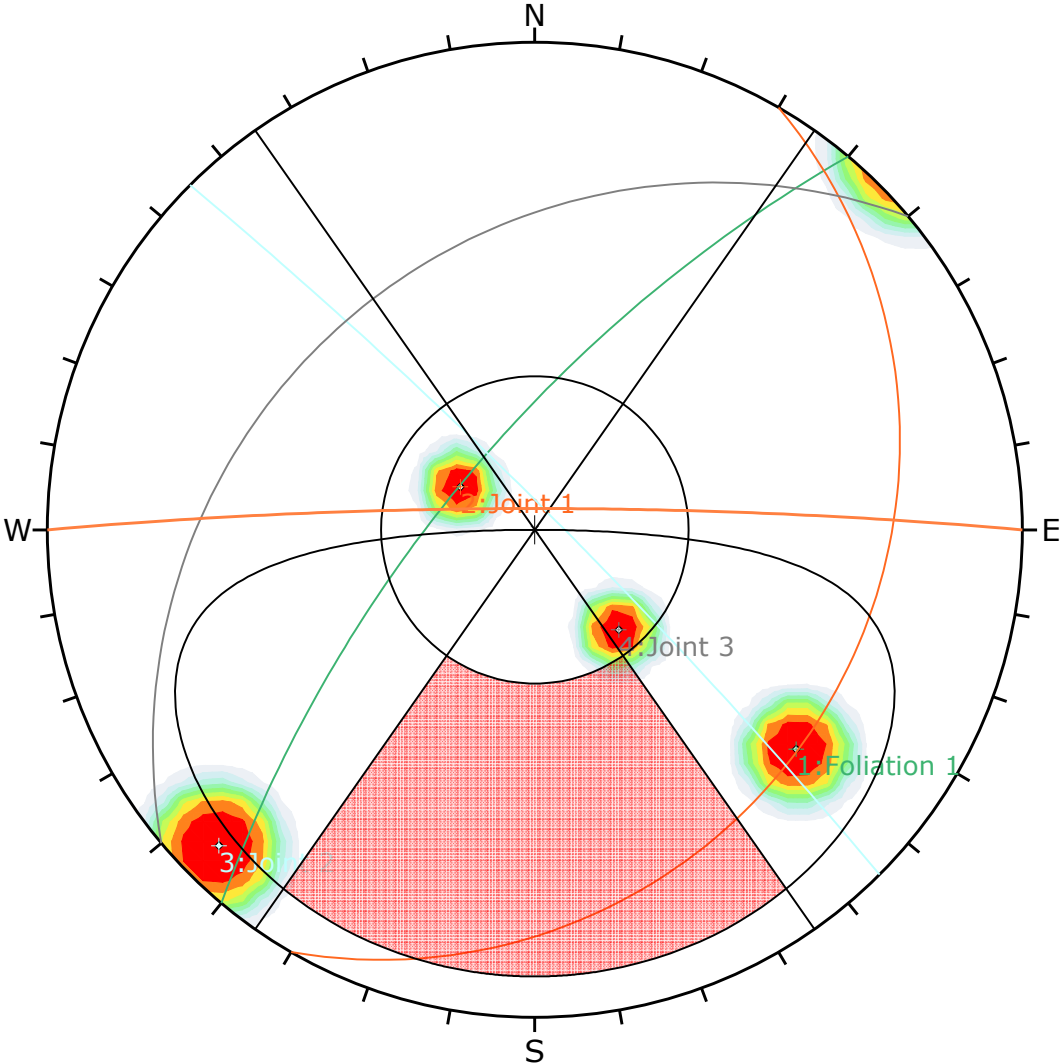
Appendix A

Stereonet Projections



Color	Density Concentrations	
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	2.50	- 5.00
	5.00	- 7.50
	7.50	- 10.00
	10.00	- 12.50
	12.50	- 15.00
	15.00	- 17.50
	17.50	- 20.00
	20.00	- 22.50
	22.50	- 25.00
Contour Data		Pole Vectors
Maximum Density		24.91%
Contour Distribution		Fisher
Counting Circle Size		1.0%
Plot Mode		Pole Vectors
Vector Count		4 (4 Entries)
Hemisphere		Lower
Projection		Equal Angle

Project	Deer Creek Quarry		
Analysis Description	Joint and Foliations		
Drawn By	DSC	Company	HDR Engineering, Inc.
Date	12/13/2022, 2:01:43 PM	File Name	20221213_Stereonets.dips8







Symbol	Feature
◇	Pole Vectors


Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

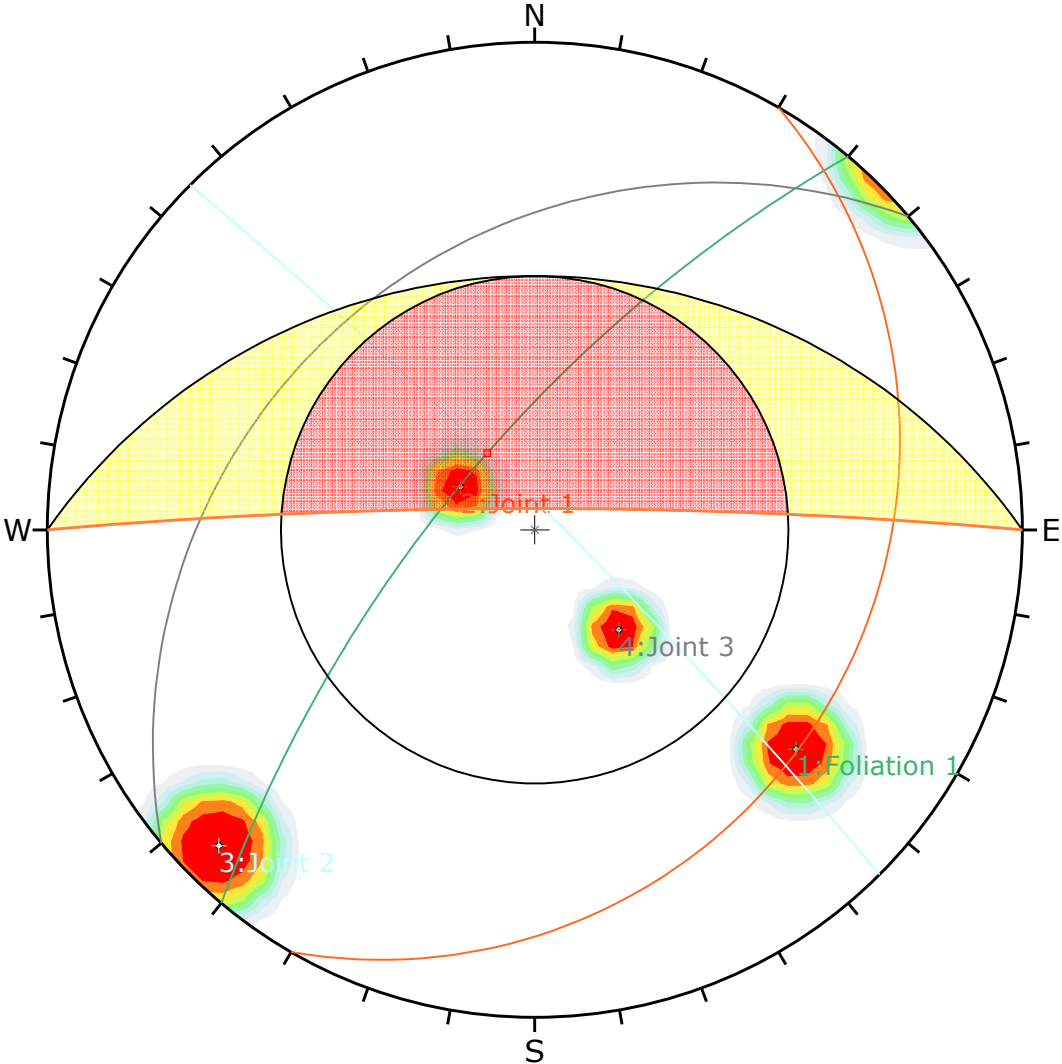
Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Planar Sliding		
Slope Dip	85		
Slope Dip Direction	0		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Planar Sliding (All)	0	4	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Hemisphere	Lower
Projection	Equal Angle

 DIPS 8.018	Project	Deer Creek Quarry	
	Analysis Description	Joint and Foliations	
	Drawn By	DSC	Company HDR Engineering, Inc.
	Date	12/13/2022, 2:01:43 PM	File Name 20221213_Stereonets.dips8



Symbol	Feature
◇	Pole Vectors
■	Critical Intersection

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00


Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

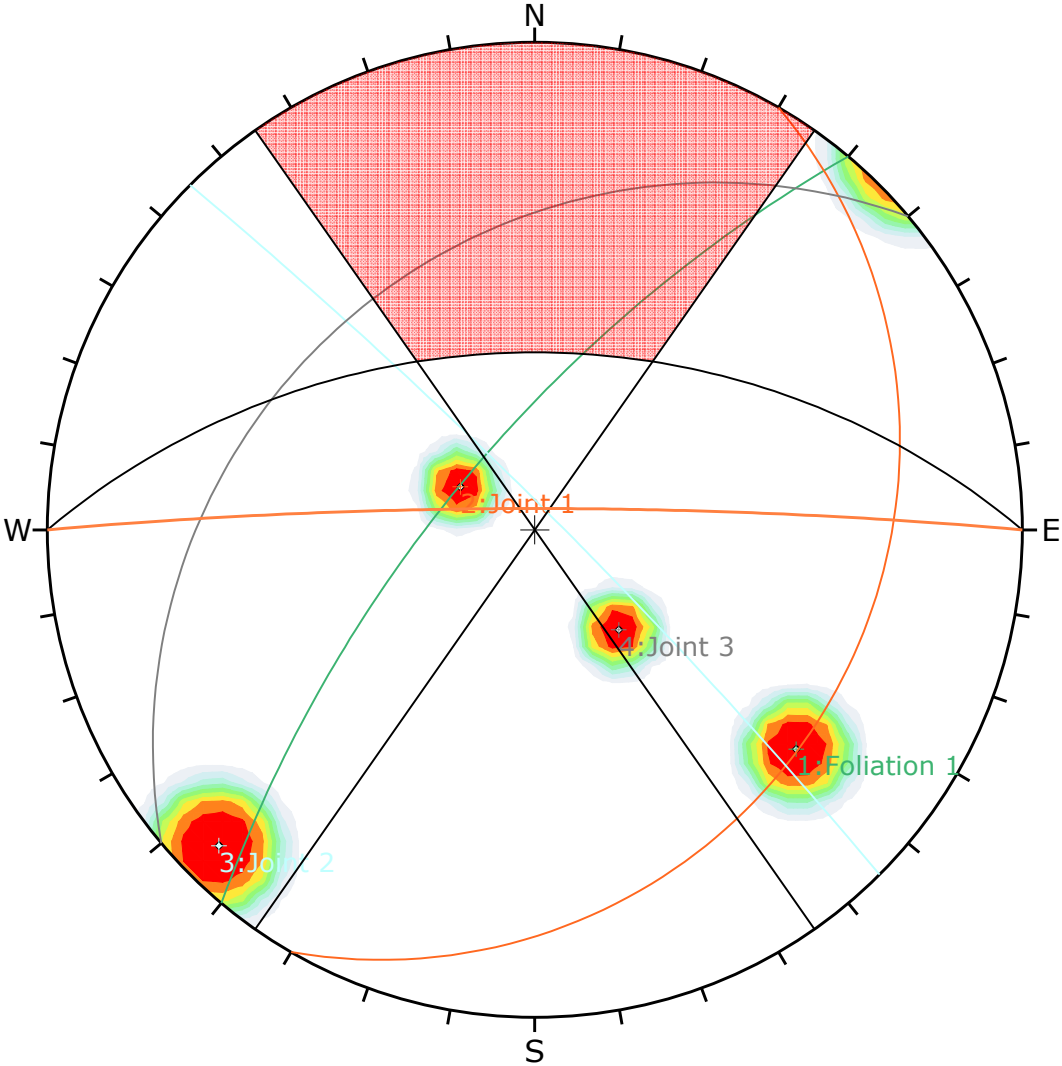
Kinematic Analysis	Wedge Sliding
Slope Dip	85
Slope Dip Direction	0
Friction Angle	35°

	Critical	Total	%
Wedge Sliding	1	6	16.67%

	Color	Dip	Dip Direction	Label
User Planes				
1	■	70	310	Foliation 1
2	■	20	120	Joint 1
3	■	85	45	Joint 2
4	■	30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	6
Hemisphere	Lower
Projection	Equal Angle

	Project	Deer Creek Quarry	
	Analysis Description	Joint and Foliations	
	Drawn By	DSC	Company HDR Engineering, Inc.
	Date	12/13/2022, 2:01:43 PM	File Name 20221213_Stereonets.dips8







Symbol	Feature
◇	Pole Vectors


Color	Density Concentrations
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	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
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	20.00 - 22.50
	22.50 - 25.00

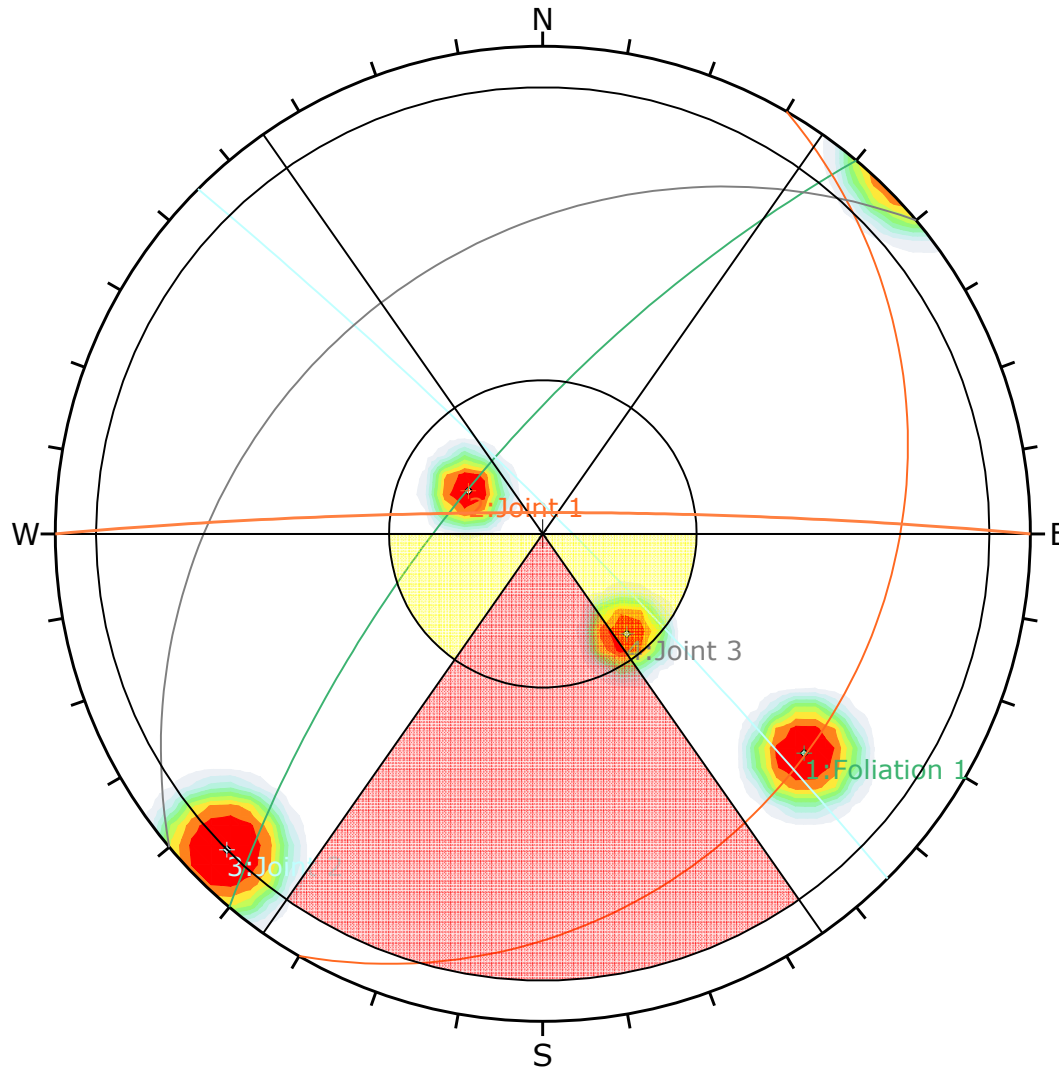
Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Flexural Toppling		
Slope Dip	85		
Slope Dip Direction	0		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Flexural Toppling (All)	0	4	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Hemisphere	Lower
Projection	Equal Angle

	Project	Deer Creek Quarry	
	Analysis Description	Joint and Foliations	
	Drawn By	DSC	Company HDR Engineering, Inc.
	Date	12/13/2022, 2:01:43 PM	File Name 20221213_Stereonets.dips8



Symbol	Feature
◇	Pole Vectors
■	Critical Intersection

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

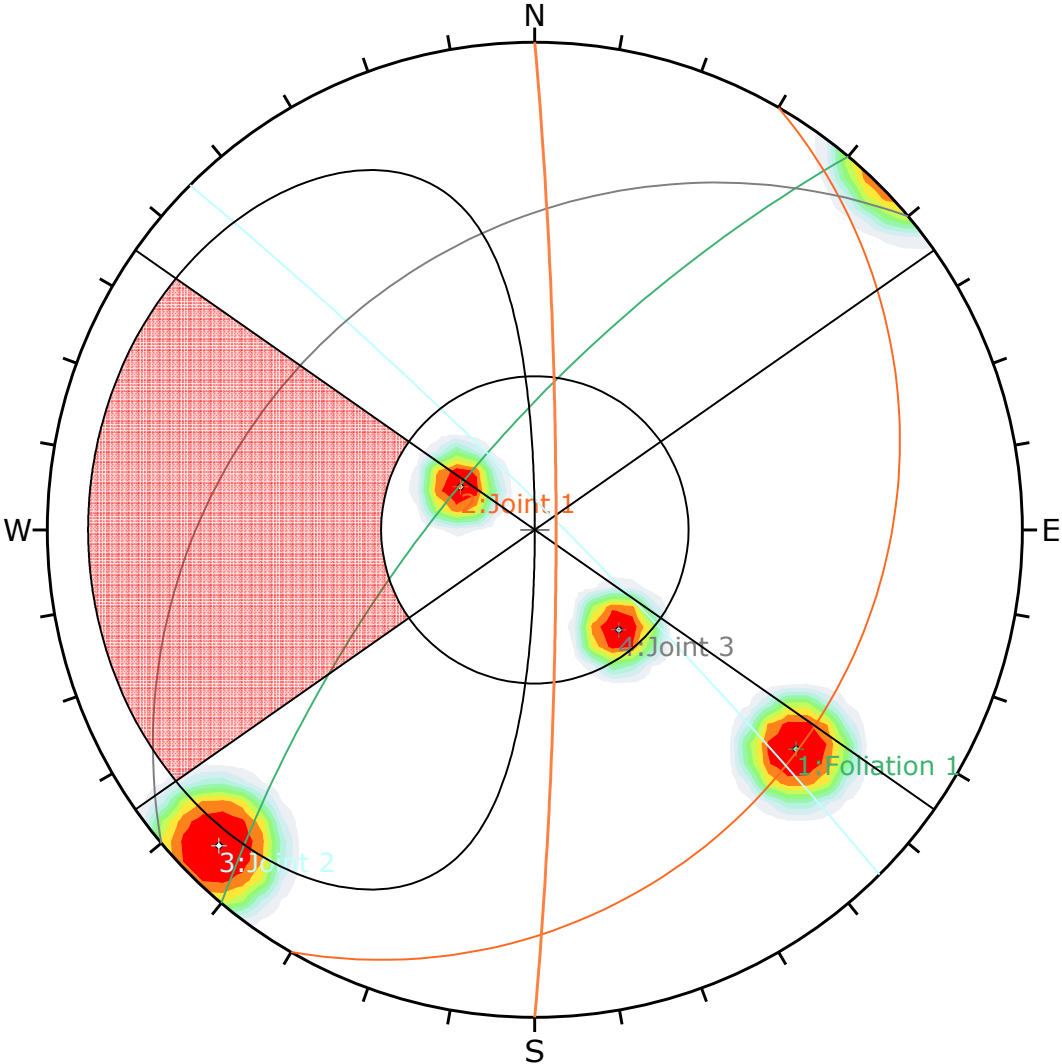
Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Direct Toppling
Slope Dip	85
Slope Dip Direction	0
Friction Angle	35°
Lateral Limits	35°

	Critical	Total	%
Direct Toppling (Intersection)	0	6	0.00%
Oblique Toppling (Intersection)	0	6	0.00%
Base Plane (All)	1	4	25.00%

	Color	Dip	Dip Direction	Label
User Planes				
1	■	70	310	Foliation 1
2	■	20	120	Joint 1
3	■	85	45	Joint 2
4	■	30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	6
Hemisphere	Lower
Projection	Equal Angle







Symbol	Feature
◇	Pole Vectors

Color	Density Concentrations
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	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

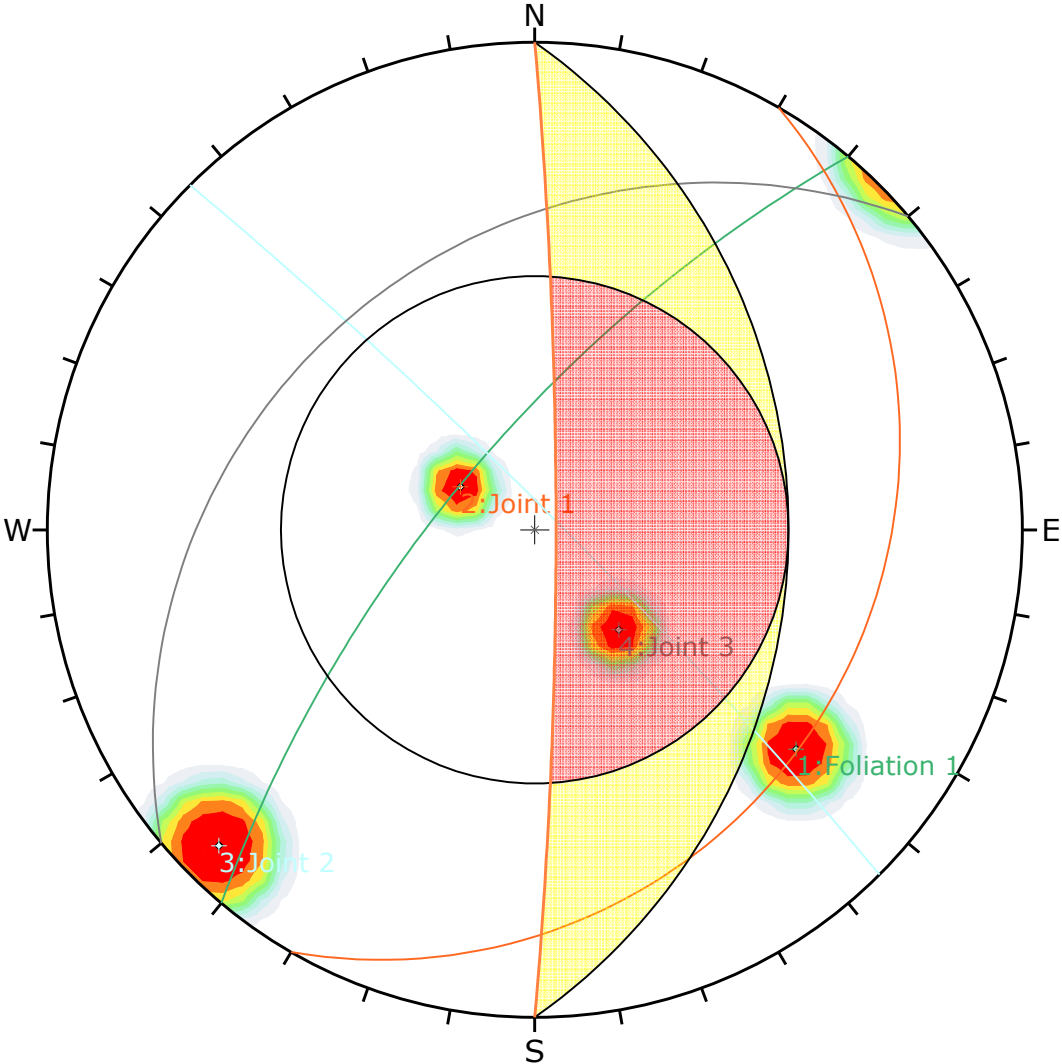
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Slope Dip	85		
Slope Dip Direction	90		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Planar Sliding (All)	0	4	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Hemisphere	Lower
Projection	Equal Angle



Project	Deer Creek Quarry		
Analysis Description	Joint and Foliations		
Drawn By	DSC	Company	HDR Engineering, Inc.
Date	12/13/2022, 2:01:43 PM	File Name	20221213_Stereonets.dips8







Symbol	Feature
◇	Pole Vectors
■	Critical Intersection

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

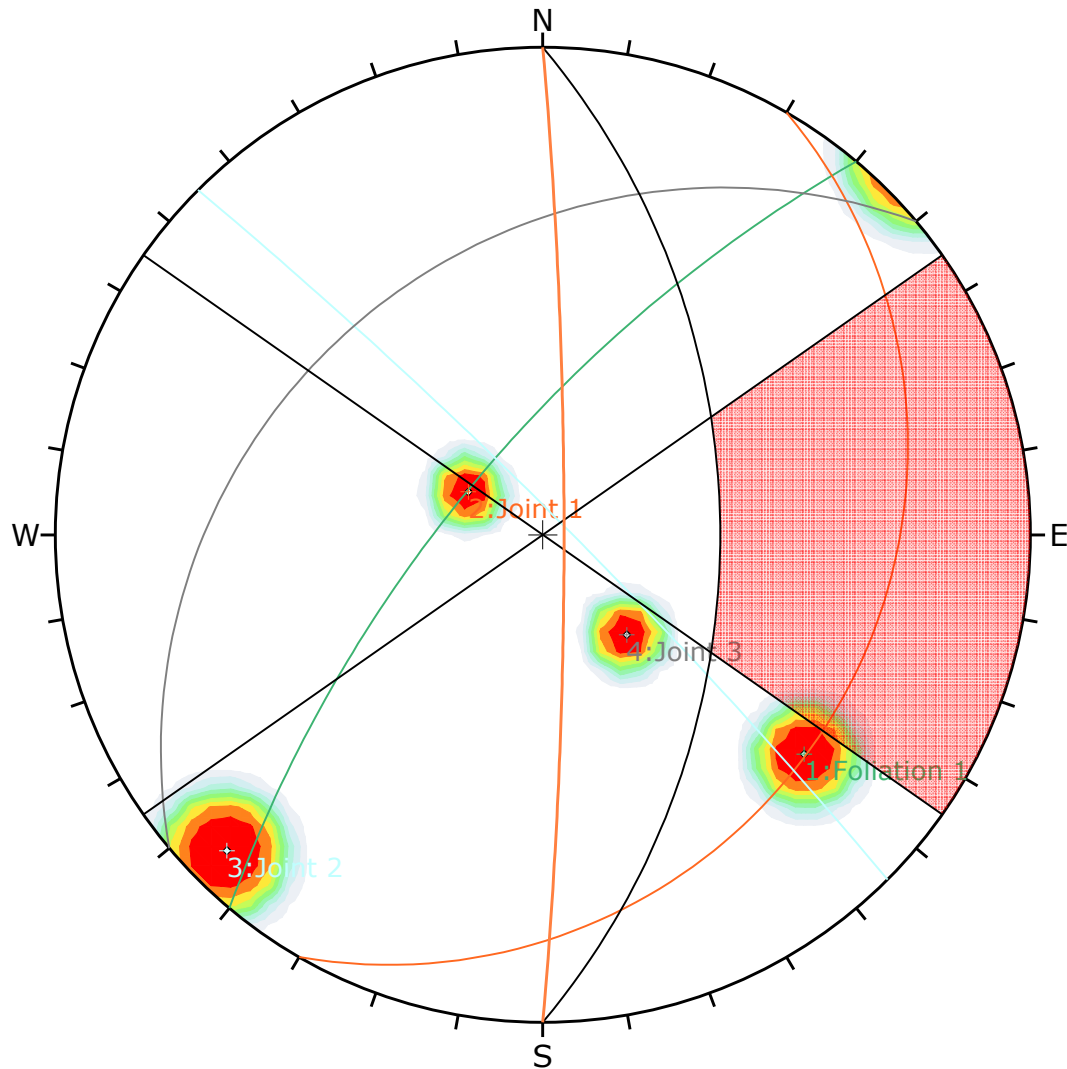
Kinematic Analysis	Wedge Sliding		
Slope Dip	85		
Slope Dip Direction	90		
Friction Angle	35°		
	Critical	Total	%
Wedge Sliding	0	6	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	6
Hemisphere	Lower
Projection	Equal Angle



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Symbol	Feature
◇	Pole Vectors

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

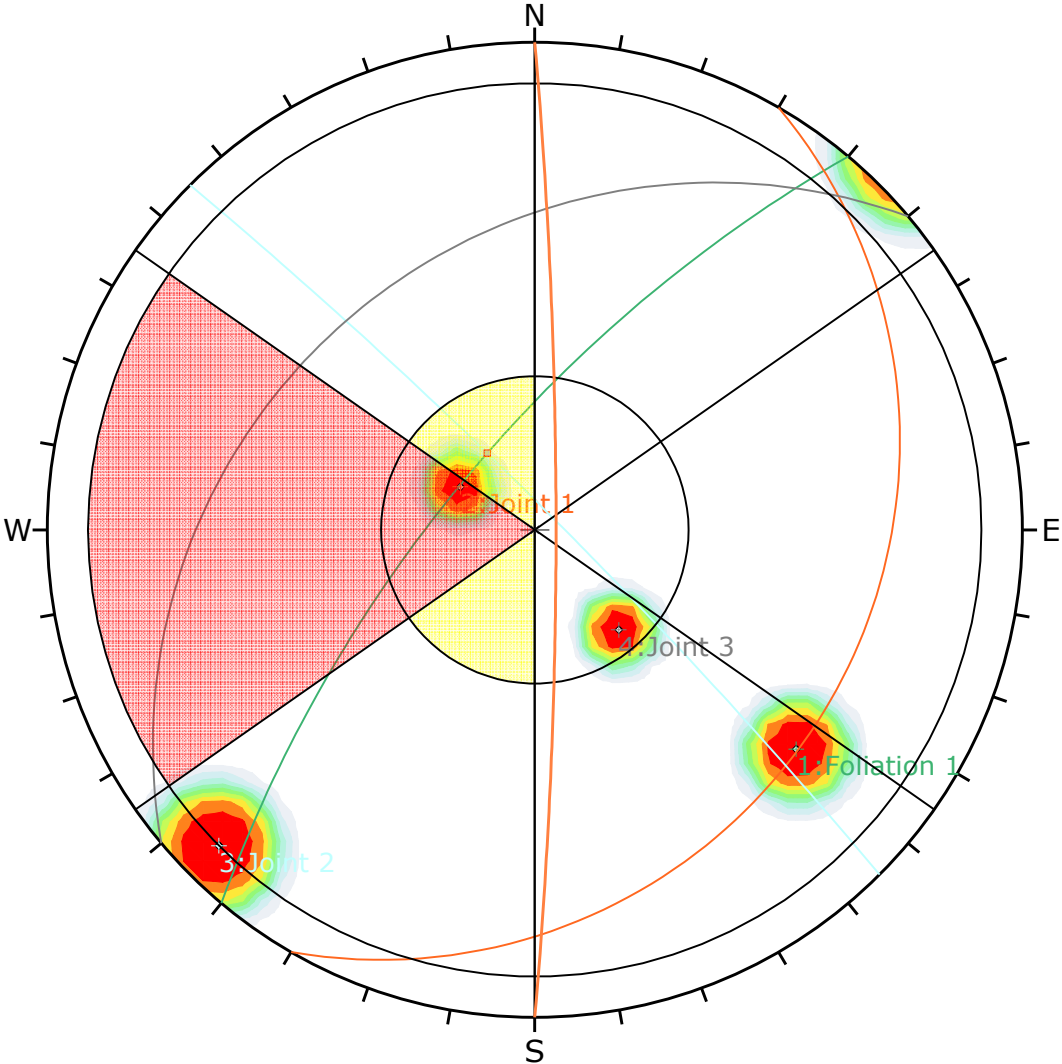
Kinematic Analysis	Flexural Toppling		
Slope Dip	85		
Slope Dip Direction	90		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Flexural Toppling (All)	0	4	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

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Vector Count	4 (4 Entries)
Hemisphere	Lower
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Date	12/13/2022, 2:01:43 PM	File Name	20221213_Stereonets.dips8




Symbol	Feature
◇	Pole Vectors
■	Critical Intersection

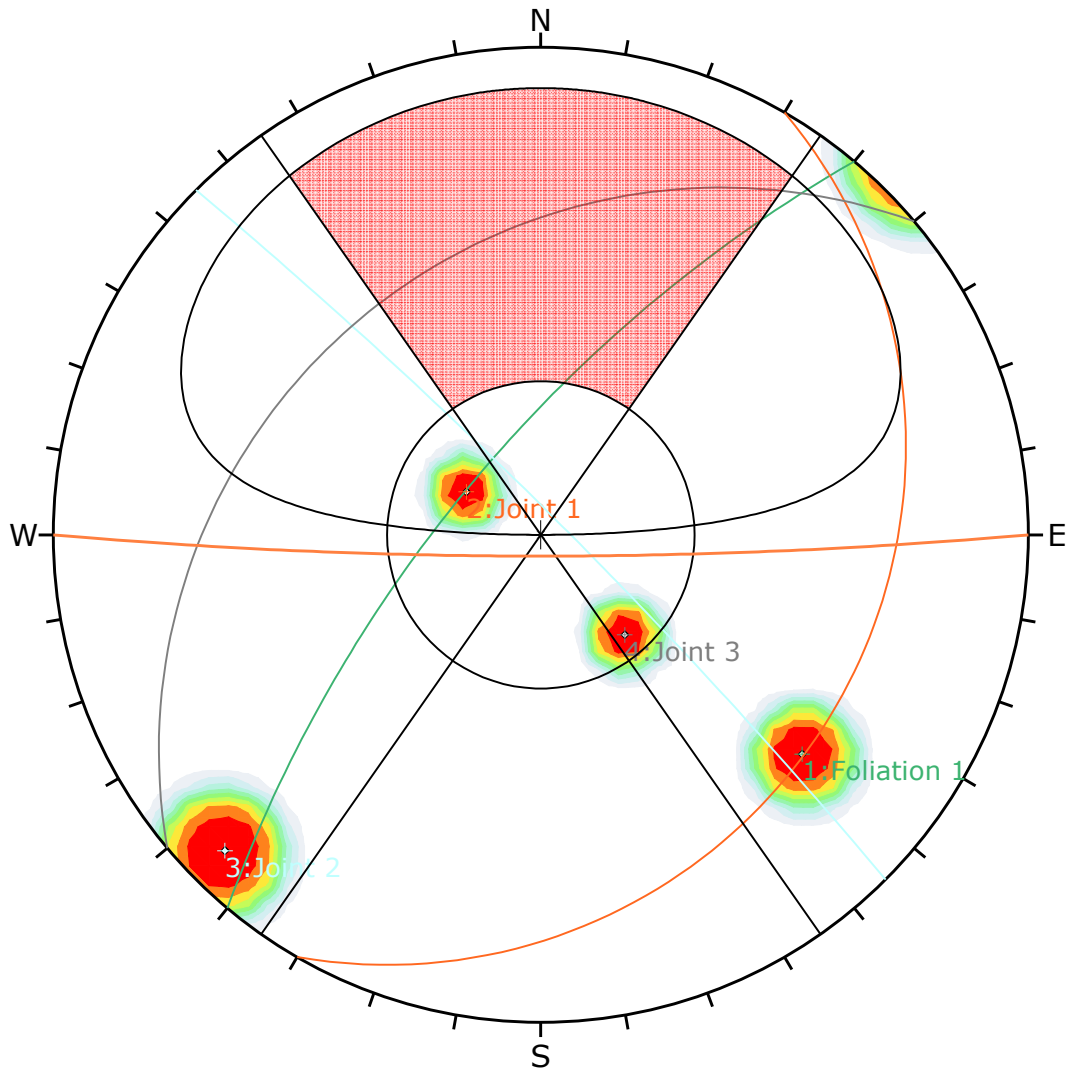
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	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00
Contour Data	
Maximum Density	Pole Vectors
Contour Distribution	24.91%
Counting Circle Size	Fisher
	1.0%

Kinematic Analysis	Direct Toppling		
Slope Dip	85		
Slope Dip Direction	90		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Direct Toppling (Intersection)	0	6	0.00%
Oblique Toppling (Intersection)	1	6	16.67%
Base Plane (All)	1	4	25.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
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Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	6
Hemisphere	Lower
Projection	Equal Angle

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	Analysis Description	Joint and Foliations	
	Drawn By	DSC	Company HDR Engineering, Inc.
	Date	12/13/2022, 2:01:43 PM	File Name 20221213_Stereonets.dips8







Symbol	Feature
◇	Pole Vectors

Color	Density Concentrations
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	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

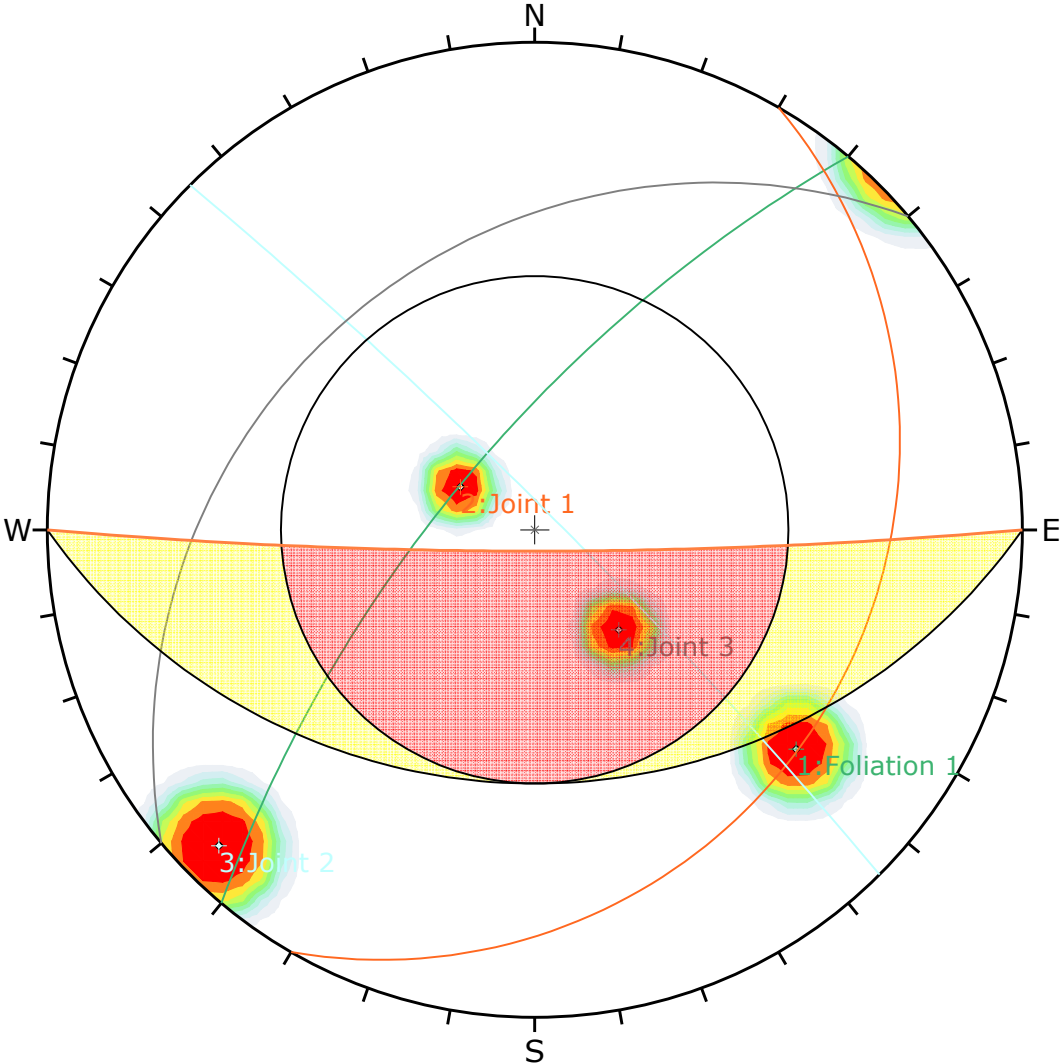
Kinematic Analysis	Planar Sliding		
Slope Dip	85		
Slope Dip Direction	180		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Planar Sliding (All)	0	4	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
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Projection	Equal Angle



Project	Deer Creek Quarry		
Analysis Description	Joint and Foliations		
Drawn By	DSC	Company	HDR Engineering, Inc.
Date	12/13/2022, 2:01:43 PM	File Name	20221213_Stereonets.dips8







Symbol	Feature
◇	Pole Vectors
■	Critical Intersection

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

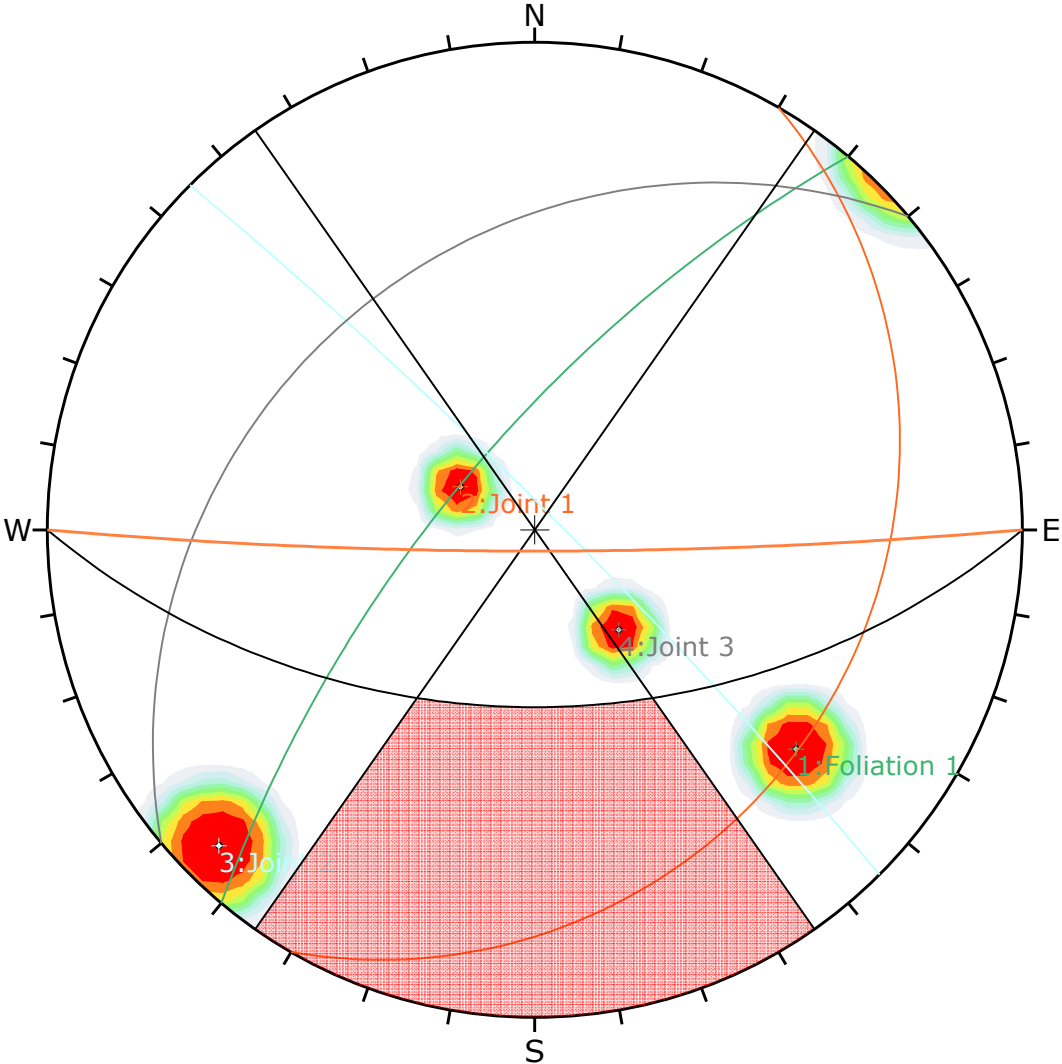
Kinematic Analysis	Wedge Sliding		
Slope Dip	85		
Slope Dip Direction	180		
Friction Angle	35°		
	Critical	Total	%
Wedge Sliding	0	6	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	6
Hemisphere	Lower
Projection	Equal Angle



Project	Deer Creek Quarry		
Analysis Description	Joint and Foliations		
Drawn By	DSC	Company	HDR Engineering, Inc.
Date	12/13/2022, 2:01:43 PM	File Name	20221213_Stereonets.dips8







Symbol	Feature
◇	Pole Vectors

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

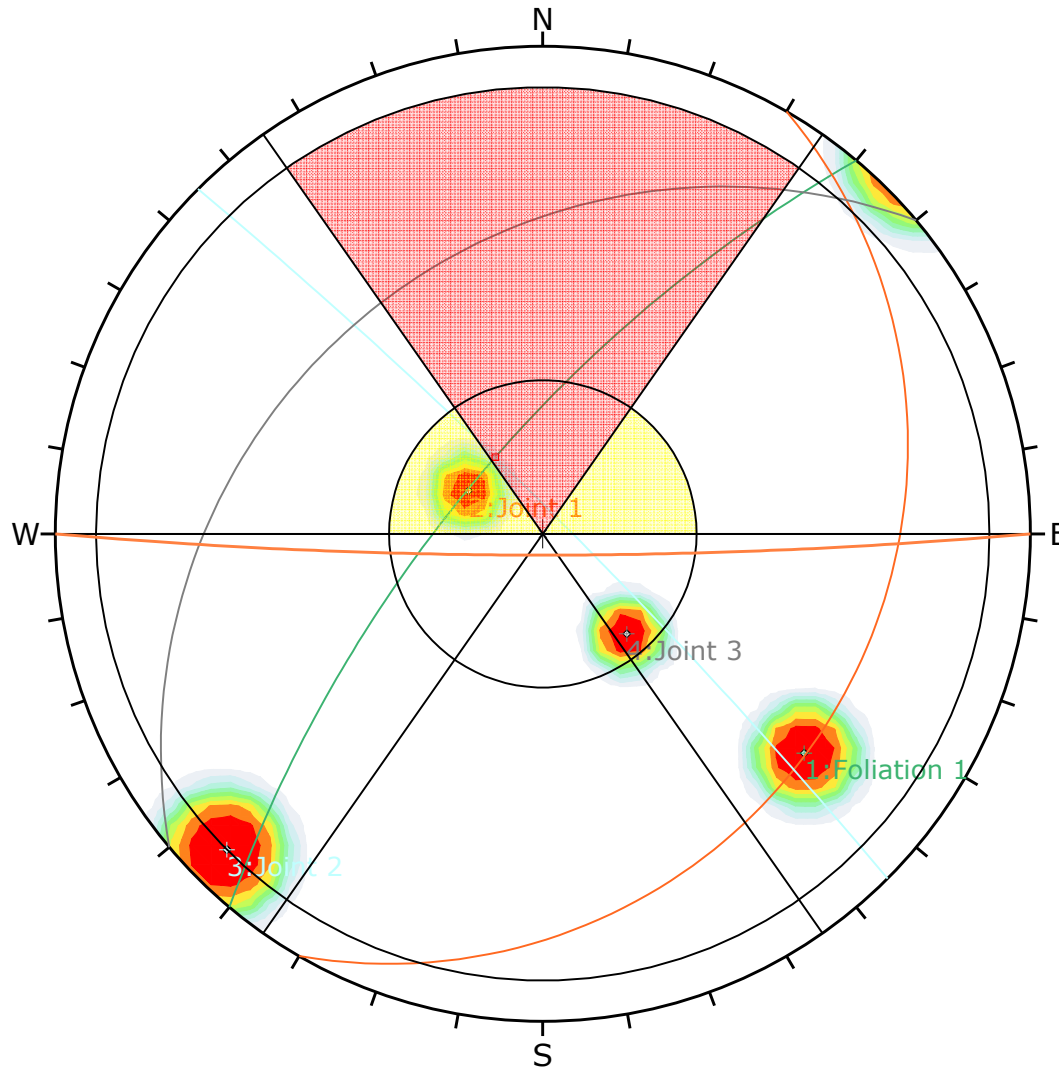
Kinematic Analysis	Flexural Toppling		
Slope Dip	85		
Slope Dip Direction	180		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Flexural Toppling (All)	0	4	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Hemisphere	Lower
Projection	Equal Angle



Project	Deer Creek Quarry		
Analysis Description	Joint and Foliations		
Drawn By	DSC	Company	HDR Engineering, Inc.
Date	12/13/2022, 2:01:43 PM	File Name	20221213_Stereonets.dips8



Symbol	Feature
◇	Pole Vectors
■	Critical Intersection

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

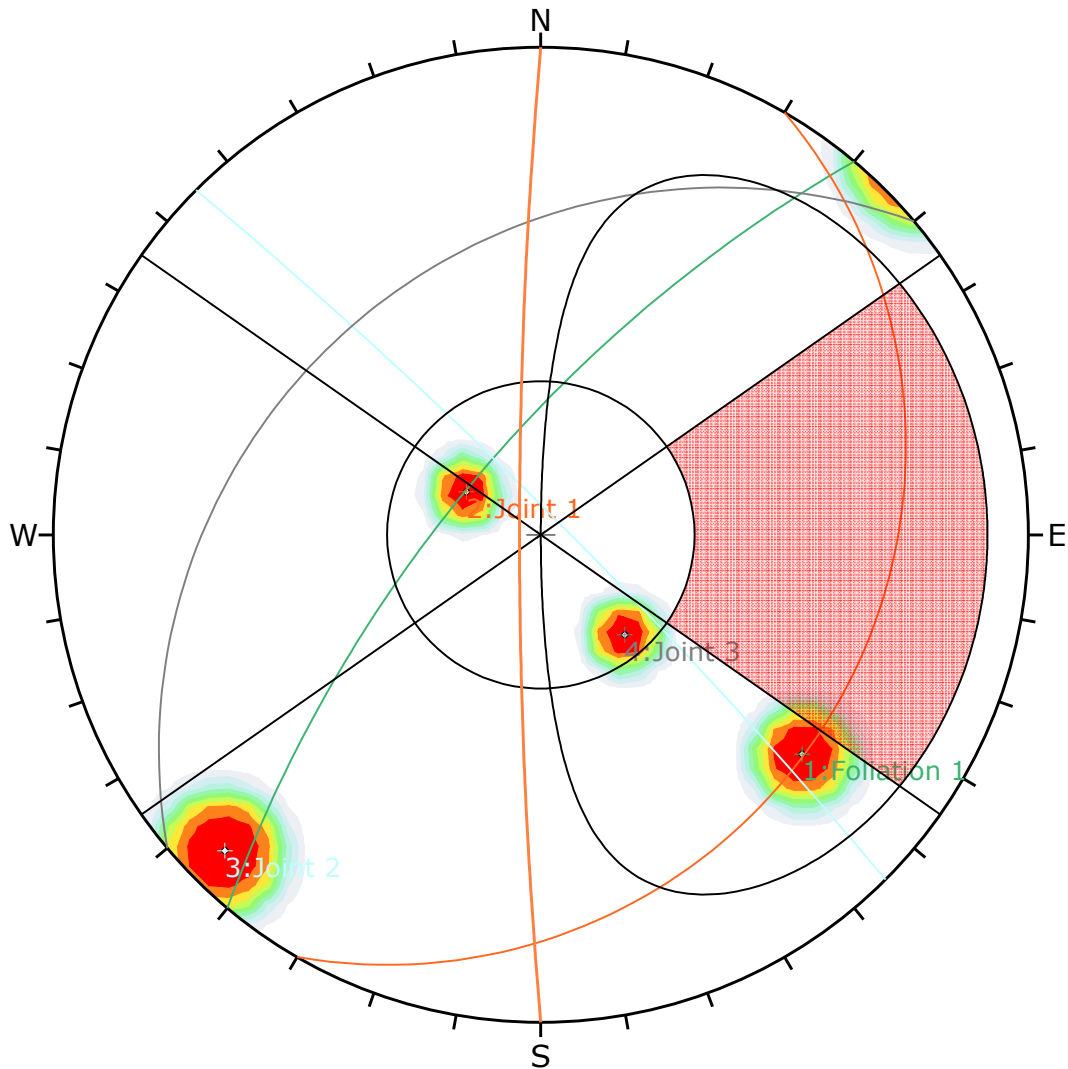
Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Direct Toppling
Slope Dip	85
Slope Dip Direction	180
Friction Angle	35°
Lateral Limits	35°

	Critical	Total	%
Direct Toppling (Intersection)	1	6	16.67%
Oblique Toppling (Intersection)	0	6	0.00%
Base Plane (All)	1	4	25.00%

	Color	Dip	Dip Direction	Label
User Planes				
1	■	70	310	Foliation 1
2	■	20	120	Joint 1
3	■	85	45	Joint 2
4	■	30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	6
Hemisphere	Lower
Projection	Equal Angle







Symbol	Feature
◇	Pole Vectors

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

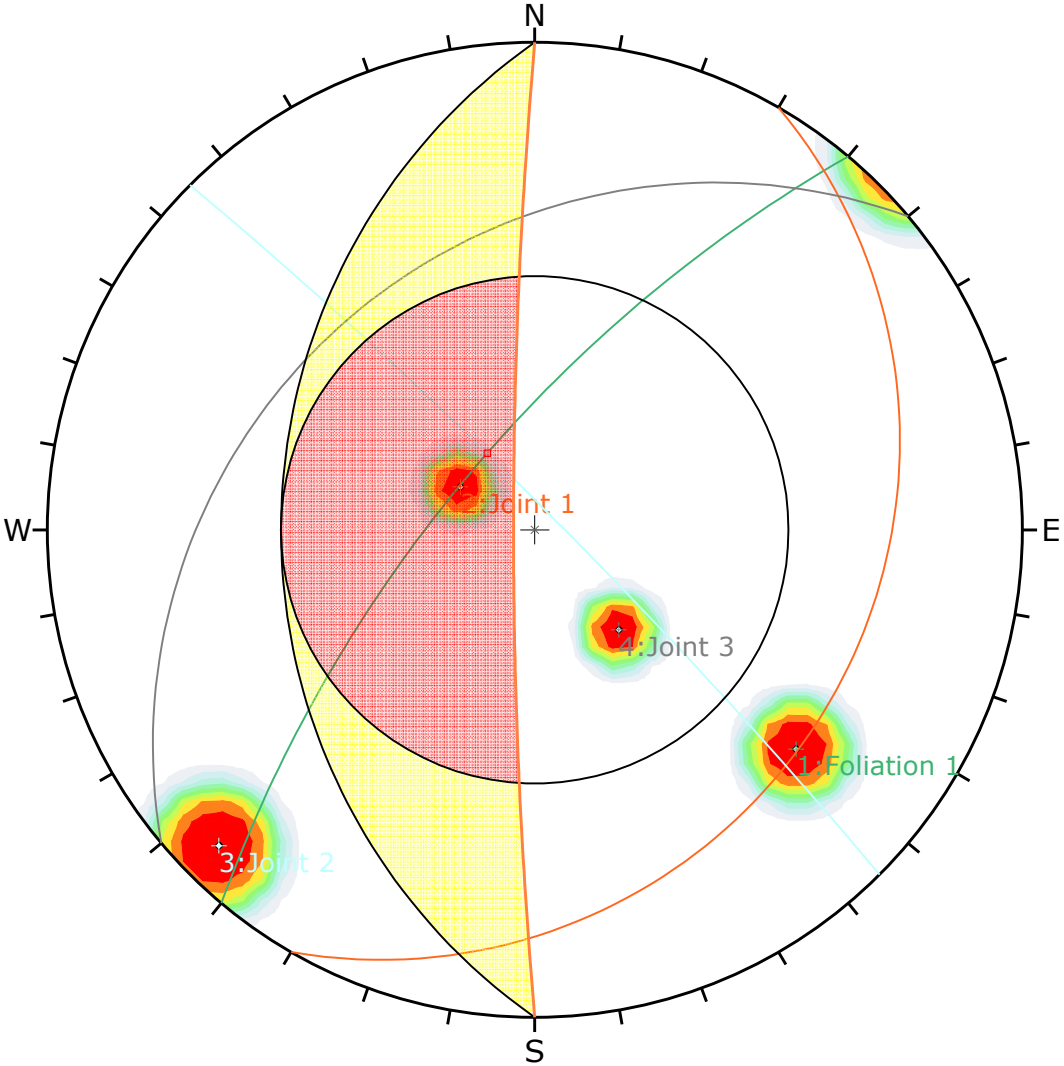
Kinematic Analysis	Planar Sliding		
Slope Dip	85		
Slope Dip Direction	270		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Planar Sliding (All)	0	4	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Hemisphere	Lower
Projection	Equal Angle



Project	Deer Creek Quarry		
Analysis Description	Joint and Foliations		
Drawn By	DSC	Company	HDR Engineering, Inc.
Date	12/13/2022, 2:01:43 PM	File Name	20221213_Stereonets.dips8







Symbol	Feature
◇	Pole Vectors
■	Critical Intersection


Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

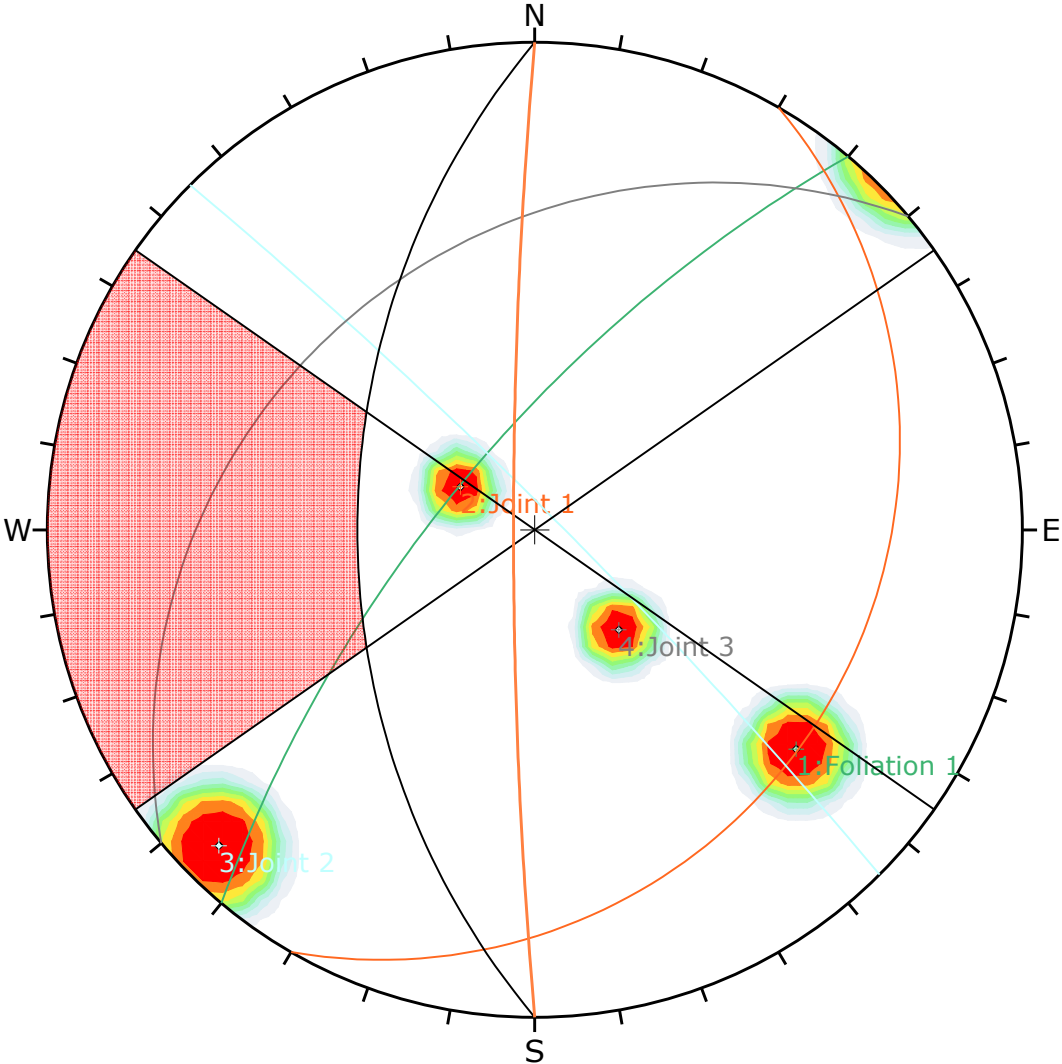
Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding		
Slope Dip	85		
Slope Dip Direction	270		
Friction Angle	35°		
	Critical	Total	%
Wedge Sliding	1	6	16.67%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	6
Hemisphere	Lower
Projection	Equal Angle

	Project	Deer Creek Quarry	
	Analysis Description	Joint and Foliations	
	Drawn By	DSC	Company HDR Engineering, Inc.
	Date	12/13/2022, 2:01:43 PM	File Name 20221213_Stereonets.dips8







Symbol	Feature
◇	Pole Vectors


Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00

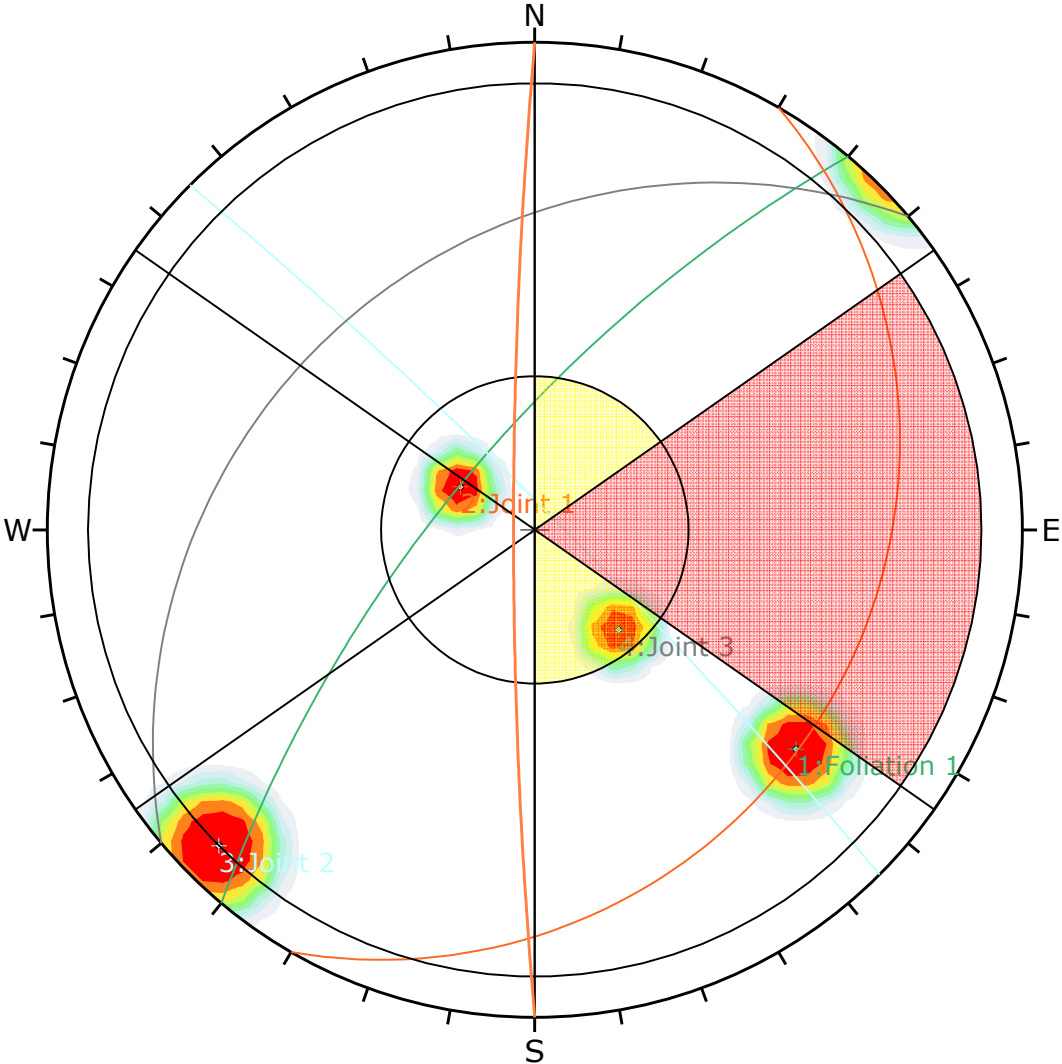
Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Flexural Toppling		
Slope Dip	85		
Slope Dip Direction	270		
Friction Angle	35°		
Lateral Limits	35°		
	Critical	Total	%
Flexural Toppling (All)	0	4	0.00%

	Color	Dip	Dip Direction	Label
User Planes				
1		70	310	Foliation 1
2		20	120	Joint 1
3		85	45	Joint 2
4		30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Hemisphere	Lower
Projection	Equal Angle

	Project	Deer Creek Quarry	
	Analysis Description	Joint and Foliations	
	Drawn By	DSC	Company HDR Engineering, Inc.
	Date	12/13/2022, 2:01:43 PM	File Name 20221213_Stereonets.dips8



Symbol	Feature
◇	Pole Vectors
■	Critical Intersection

Color	Density Concentrations
	0.00 - 2.50
	2.50 - 5.00
	5.00 - 7.50
	7.50 - 10.00
	10.00 - 12.50
	12.50 - 15.00
	15.00 - 17.50
	17.50 - 20.00
	20.00 - 22.50
	22.50 - 25.00


Contour Data	Pole Vectors
Maximum Density	24.91%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Direct Toppling
Slope Dip	85
Slope Dip Direction	270
Friction Angle	35°
Lateral Limits	35°

	Critical	Total	%
Direct Toppling (Intersection)	0	6	0.00%
Oblique Toppling (Intersection)	0	6	0.00%
Base Plane (All)	1	4	25.00%

	Color	Dip	Dip Direction	Label
User Planes				
1	■	70	310	Foliation 1
2	■	20	120	Joint 1
3	■	85	45	Joint 2
4	■	30	320	Joint 3

Plot Mode	Pole Vectors
Vector Count	4 (4 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	6
Hemisphere	Lower
Projection	Equal Angle

	Project	Deer Creek Quarry	
	Analysis Description	Joint and Foliations	
	Drawn By	DSC	Company HDR Engineering, Inc.
	Date	12/13/2022, 2:01:43 PM	File Name 20221213_Stereonets.dips8