Lynx Cat Mountain Quarry - CA Mine ID 91-36-0049

2024 Update to Slope Stability Study Report

October 9, 2024 | Terracon Project No. CB245139

Prepared for:

Matcon Corporation, Inc.
1807 Toyon Lane, Suite 200
Newport Beach, CA 92660

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P (909) 824-7311
Terracon.com

October 9, 2024

Matcon Corporation, Inc.
1807 Toyon Lane, Suite 200
Newport Beach, CA 92660

Attn: Joe Mathewson
P: (949) 722-0378
E: joem@lcmquarry.com

Re: 2024 Update to Slope Stability Study Report
Lynx Cat Mountain Quarry
CA Mine ID 91-36-0049
Hinkley Area, San Bernardino County, California
Terracon Project No. CB245139

Dear Mr. Mathewson:

We have completed the 2024 Update to Slope Stability Study services for the above referenced project in general accordance with Terracon Proposal No. PCB245139, dated October 3, 2024. This report presents the results of our slope stability evaluation of proposed slopes depicted on an amended mining plan.

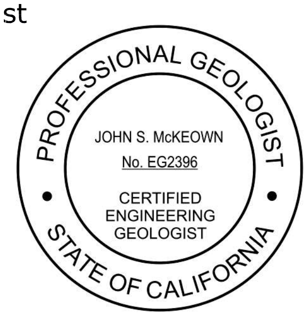
We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

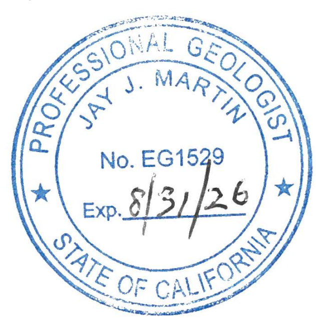
Sincerely,

Terracon

John S. McKeown, E.G.
Senior Geologist

Jay J. Martin, E.G.
Principal





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Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

Refer to each individual Attachment for a listing of contents.

Introduction

As authorized by a signed agreement dated October 3, 2024, this firm evaluated slope configurations depicted on a Mine Plan prepared by Webber & Webber dated September 26, 2024. The Mine Plan depicts an expanded and deepened final pit configuration with slopes facing north, south, east and west. The pit bottom is proposed at elevations between 1670 and 1630 feet. The prior plan proposed a pit bottom at elevation 2030 feet. CHJ Consultants (our predecessor company) performed geologic reconnaissance and structural mapping of existing rock outcrop at the site in 2014. The results of laboratory testing on samples collected in 2014 were utilized in this current analysis. It is anticipated by Matcon that materials similar to those observed and tested from the site in 2014 will be exposed within the proposed expansion area based on the reported results from a well drilled on site to a depth greater than 1,000 feet bgs. The property includes bedrock hillsides formed in granitic rock and alluvium-mantled plains. Field mapping of existing conditions was not included in the scope of this evaluation. The evaluation of environmental or groundwater conditions is not included in the scope of this study.

The site location and proposed mine configuration are shown on the **Site Location** and **Mine Plan**, respectively.

Scope of Services

The scope of services provided during this evaluation included the following:

- Global stability calculation of the tallest plan rock slope—580 feet
- Kinematic analysis of geologic structure using sensitivity analysis for slopes with azimuths of 000, 090, 180 and 270
- Preparation of this letter report summarizing the findings of our evaluation

Global Stability Calculations

Global (rotational) stability of the tallest proposed rock slope was analyzed using Spencer's method under seismic conditions for rotational failures utilizing the SLIDE computer program, version 9.012 (Rocscience, 2020). The seismic stability calculations were performed using a lateral pseudostatic coefficient "Kh" of 0.20. Slip surface search models were used for both circular and non-circular failure modes with an auto refine function. Groundwater was considered in the global stability evaluation based on the potential for seepage and regional groundwater table approximately 150 feet below ground surface as described in a well evaluation report by Geoscience Support Services, Inc. dated January 2024.

According to the Mine Plan and cross sections, final quarry slopes are planned at an overall angle of approximately 50 degrees. This is obtained using 63-degree bench face slopes with a benching scheme of 40-foot-high cuts and 15-foot-wide benches. The bench face angle was selected based on a prevalence of joints in quarry faces with this angle. The geometry of proposed mine slopes was modeled for the highest mine slope proposed (580 feet), determined from existing terrain and planned bottom depth as shown in the slope stability section B on the **Mine Plan**.

The strength parameters for resource rock were modeled with the Generalized Hoek-Brown criteria (Hoek and Karzulovic, 2000; Hoek, Carranza-Torres and Corkum, 2002), using the prior results of laboratory testing, field strength criteria, such as how easily rock is broken with a hammer, and the SLIDE program's integrated calculator application.

The modeled strength parameter values for the mine resource are presented in the following table.

	Value	Description
Unit weight (pcf*)	160	Estimated
Intact UCS[1] (psf)**	2.628×10^6	Lab test
Geological Strength Index	65	Block/undisturbed/interlocked with good surface conditions
Intact Rock Constant (mi*)**	32	Granite
Disturbance Factor	1	Production blasting

[1] uniaxial compressive strength
* pcf = pounds per cubic foot
**psf = pounds per square foot
*** mi = unitless constant

The results of our global slope stability analyses are attached and include material type boundaries, strength parameters, the minimum factor of safety and location of critical slip surface.

Sufficient static and seismic factors of safety in excess of 1.5 and 1.1, respectively—in conformance with OMR and County of San Bernardino criteria—were indicated for the modeled rock slope configurations for the maximum proposed slope height and angle.

Kinematic Evaluation

Kinematic analysis uses geologic structural data to evaluate the potential for rock mass discontinuities to form planar, wedge, or topple type failures. It considers geometry and friction along potential slip planes. It does not consider block size or mass as in global stability models. The data set compiled from the previously measured discontinuities was applied to the entire Mine Plan area. The data are presented as poles-to-planes and dip vectors in the kinematic attachments. Two main joint sets are indicated in the data set and include northwest- and west-dipping joints.

For the kinematic evaluation of the proposed pit geometry, we considered four slope azimuths (facing directions) with the proposed 63-degree bench face angle. The overall pit wall angle is approximately 50 degrees; therefore, this analysis is focused on bench-scale features and is conservative with regard to the overall pit.

Planar sliding analysis considers dip vectors of measured data points. Wedge sliding analysis generates dip vectors for the intersections of all data points; therefore, wedge analysis generates a larger number of vectors to evaluate. Topple analysis identifies the potential for columns to form along steeply dipping joint systems and to tilt out of the excavated face on low-angle separation surfaces. The stereonet data plots and sensitivity graphs for each failure mode are attached and are summarized in the following table.

Summary of Kinematic Analysis			
	Percentage of Critical Points		
Slope Aspect	**Planar**	**Wedge**	**Topple**
000	8	28	7.5
090	2	11	11.5
180	4.5	12	12
270	1	20	5
310	23.7	--	2
320	--	42	2.5
330	26	--	--

The stereonet evaluation provides results as a percentage of points in a data set with a geometrically feasible orientation to undergo a particular failure mode. In general, the percentage value relates to probability of geometries to exist in the rock mass to create a particular failure mode. Probabilities below 5 percent suggest low mode potential, 5 percent to 20 percent (green highlight) a low to moderate mode potential, and values above 20 percent (orange highlight) a moderate or higher potential.

The results of the kinematic evaluation for the proposed pit slopes indicate a potential for planar and wedge features to form in northwest-facing slopes coincident with the joint sets. The intersection of joints in the northwest direction forms wedge blocks as shown on the example of a wedge calculation in the kinematic attachments. This area of wedge potential corresponds to the southwest corner of the proposed pit. A more moderate wedge potential is indicated for the south and east pit slopes. A potential for topple failure is not indicated in the kinematic data nor was one observed in site outcrops.

Observations of quarry faces in 2014 indicated that scaling of loose blocks during excavation had provided a suitable mitigation of potential rock fall from planar, topple or wedge structures. Inclusion of safety benches and access ramps in future slopes can also help to mitigate rockfall hazard. Scaling and inclusion of safety benches as per the proposed slope configuration can effectively mitigate planar, topple and wedge-related rock fall in the final reclaimed slope face.

Conclusions

Based on this evaluation and the results of global (limit equilibrium) slope stability calculations, it is the opinion of this firm that the proposed final rock slopes are feasible with respect to slope stability from a geotechnical standpoint, provided the recommendations contained in this report are implemented.

Based upon our analyses, an overall 50-degree slope up to approximately 580 feet in height is suitably stable against gross failure for the anticipated long-term conditions, including the effects of seismic shaking. Excavation of the bench faces at the proposed approximate 63-degree angle may aid in overall stability of final slopes. Inclusion of safety benches and access ramps in the overall slope profiles, together with scaling of finished bench faces, is anticipated to mitigate raveling or rockfall.

A potential for planar and wedge failure is indicated by kinematic analysis for slopes in the south and southwestern portions of the future pit. These failure types are mitigatable with proper excavation, scaling and benching techniques.

Recommendations

Moderate to severe seismic shaking of the site can be expected to occur during the lifetime of the proposed mining and reclamation. This potential has been considered in our analyses and evaluation of slope stability.

The configuration of final quarry slopes, including wall height, wall angle and bench width, is controlled primarily by the type of mining equipment used and bench face angles that can be achieved (Ryan and Pryor, 2000). Typical wall heights in hard rock mines range from 40 to 50 feet, which is the expected range for the proposed quarry reclamation.

The overall reclaimed slope angle (50 degrees) and bench face angle proposed (63 degrees) may be suitable for the proposed mining and reclamation plans. Bench face angles were observed to exist at near-vertical to approximately 63-degree angles, indicating that a 63-degree angle can be utilized in bench face design. Reclaimed bench faces may not stand steeper than approximately 65 degrees [1/2(h):1(v)] on the east wall due to a west-dipping joint set at that approximate orientation.

Individual bench face angles and widths should be adjusted locally, if necessary, to accommodate the geologic structure exposed in future excavations and to produce stable working and final slope configurations. The adjustment of slope configuration during mining is the responsibility of the mine operator. A minimum reclaimed bench width of 15 feet may be suitable for the proposed mining and reclamation. The design width should be adjusted by the project mining engineer to be consistent with the conditions encountered during mining. In addition, scaling of loose or dislodged blocks from bench face cuts should be performed as necessary at any working level while access for equipment is available.

The rock mass within the proposed mine area is generally hard, competent and capable of forming stable slopes at the proposed gradients for reclamation. The rock structure includes joint systems that have been characterized by mapping along the eastern outcrop exposures and analysis to yield suitably stable rock slopes. We did not observe geologic structures that exhibit exceptional continuity and adverse geometry with regard to planned slope aspects and that contain significant clay linings, water seepage or other potentially deleterious conditions during the prior site mapping within the mine area. Where highly weathered/shear zones are exposed, scaling should be performed to expose a stable rock surface to mitigate potential instability.

If geologic conditions that are inconsistent with conditions described in this report, or that warrant further analysis, are exposed during future mining, we should be notified to evaluate such conditions.

The proposed mine slope configurations are considered suitably stable under static and seismic conditions based on global limit equilibrium analysis as reclaimed slopes.

Inclusion of safety benches in final slope design is an effective protection from rockfall and can reduce tensional forces in surface rock and surface erosion rates (Highland and Brabowsky, 2008). Slopes may be protected with berms along the pit margins and benches as necessary to prevent slope erosion in areas where overland flow is directed toward slopes.

Based on anticipated reclamation slope conditions, use of steel netting or other structural installations to mitigate toppling or rockfall is not considered necessary at this time; however, these measures, as well as a berm at the toe of the final quarry slopes, can be considered if warranted by future observation or conditions.

Periodic geologic mapping of the reclamation slopes should be performed during slope construction (annual inspections during mining) to identify conditions that may preclude reclamation of the site in accordance with the approved reclamation plan.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

References

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Rocscience, Inc., 2020, Dips computer software program, ver. 8.009: Graphical and statistical analysis of Orientation data.

Ryan, T. M., and Pryor, P. R., 2000, Designing Catch Benches and Interramp Slopes in Slope Stability in Surface Mining, ed. Hustrulid, W. A., McCarter, M. K., and Van Zyl, D. J. A., Society for Mining, Metallurgy & Exploration, Englewood, Colorado, pp. 27-35.

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Site Plans

Contents:

Note: All attachments are one page unless noted above.

Site Location

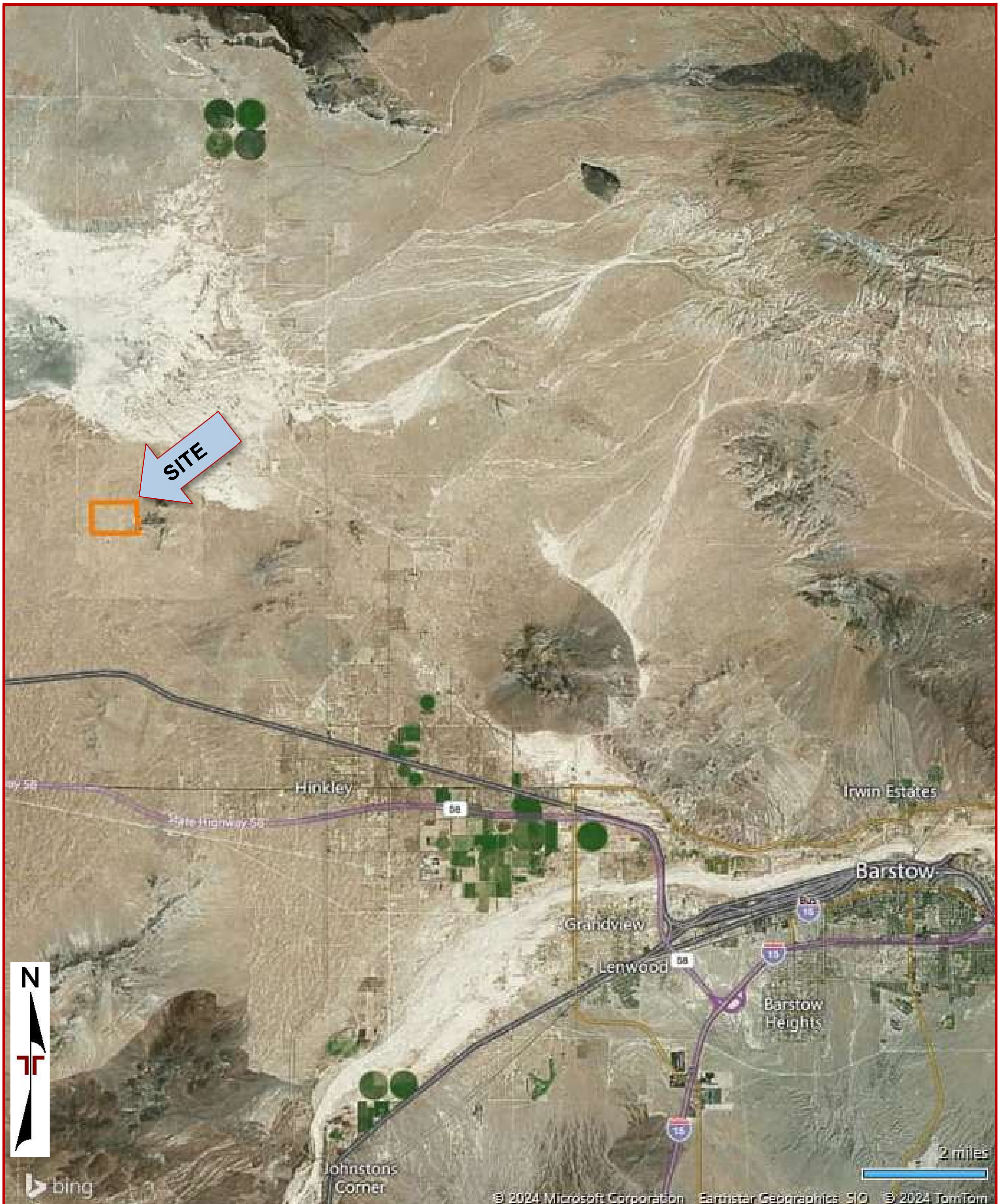


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

Mine Plan

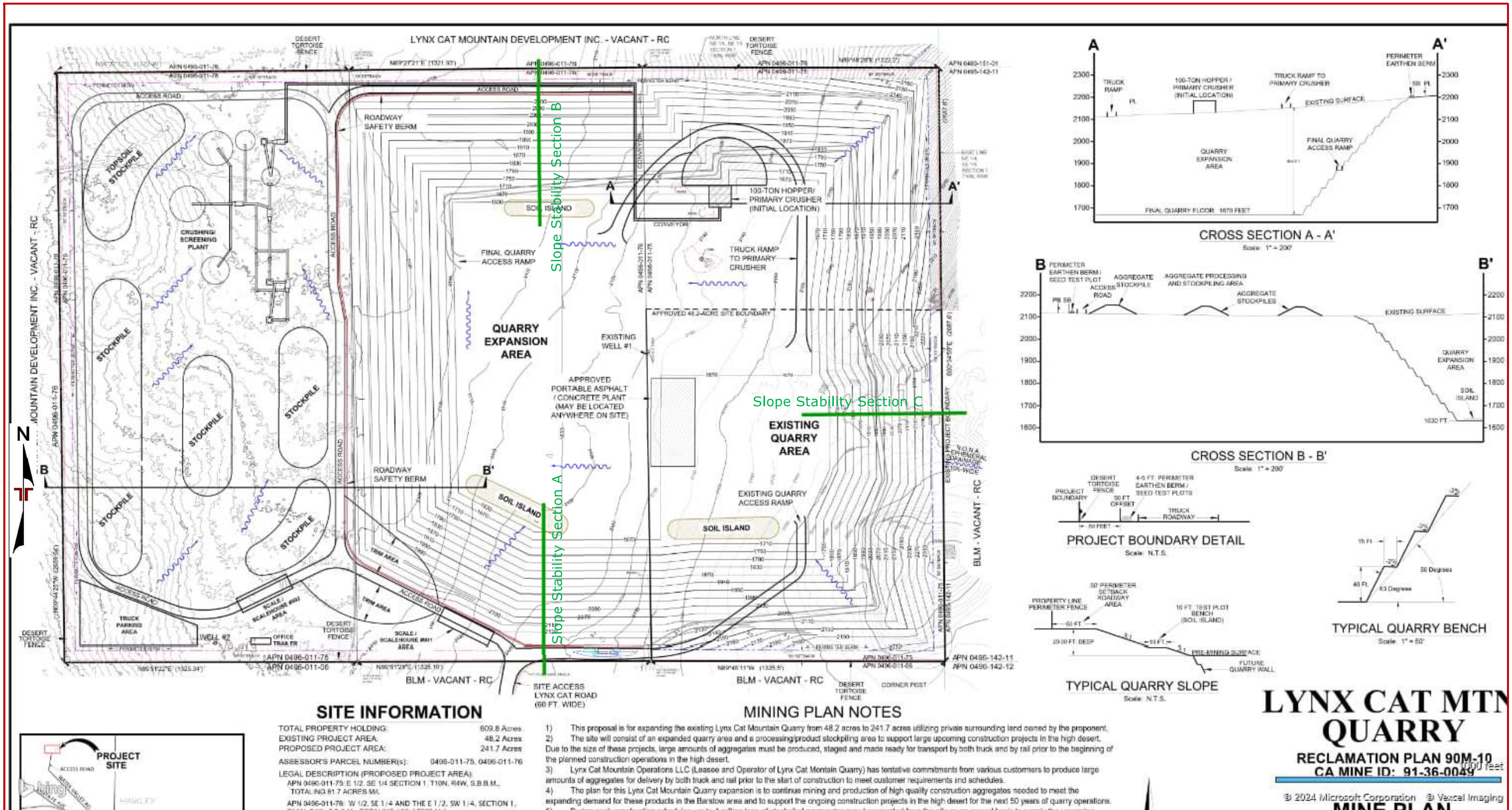


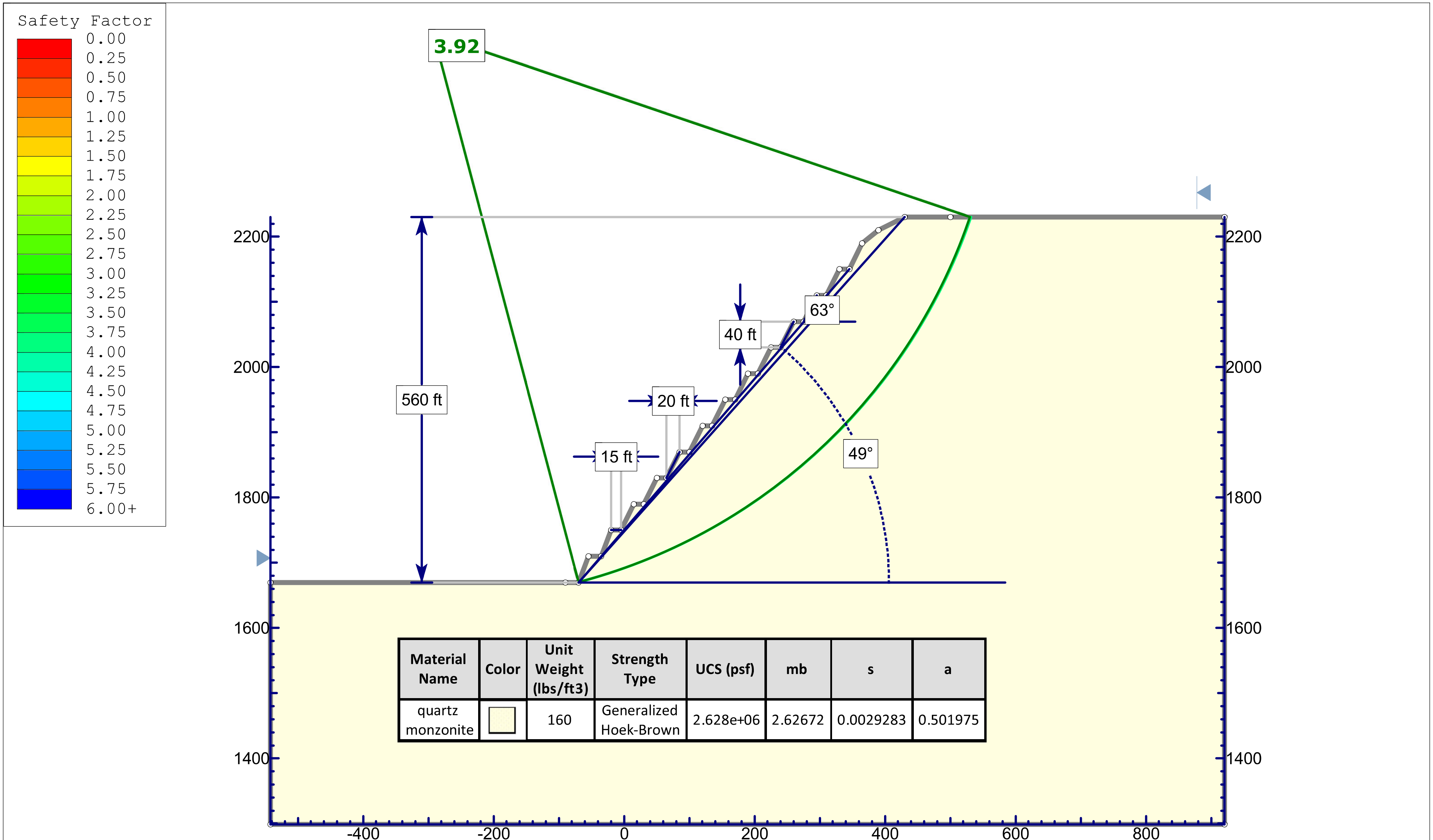
DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Attachments

Contents:

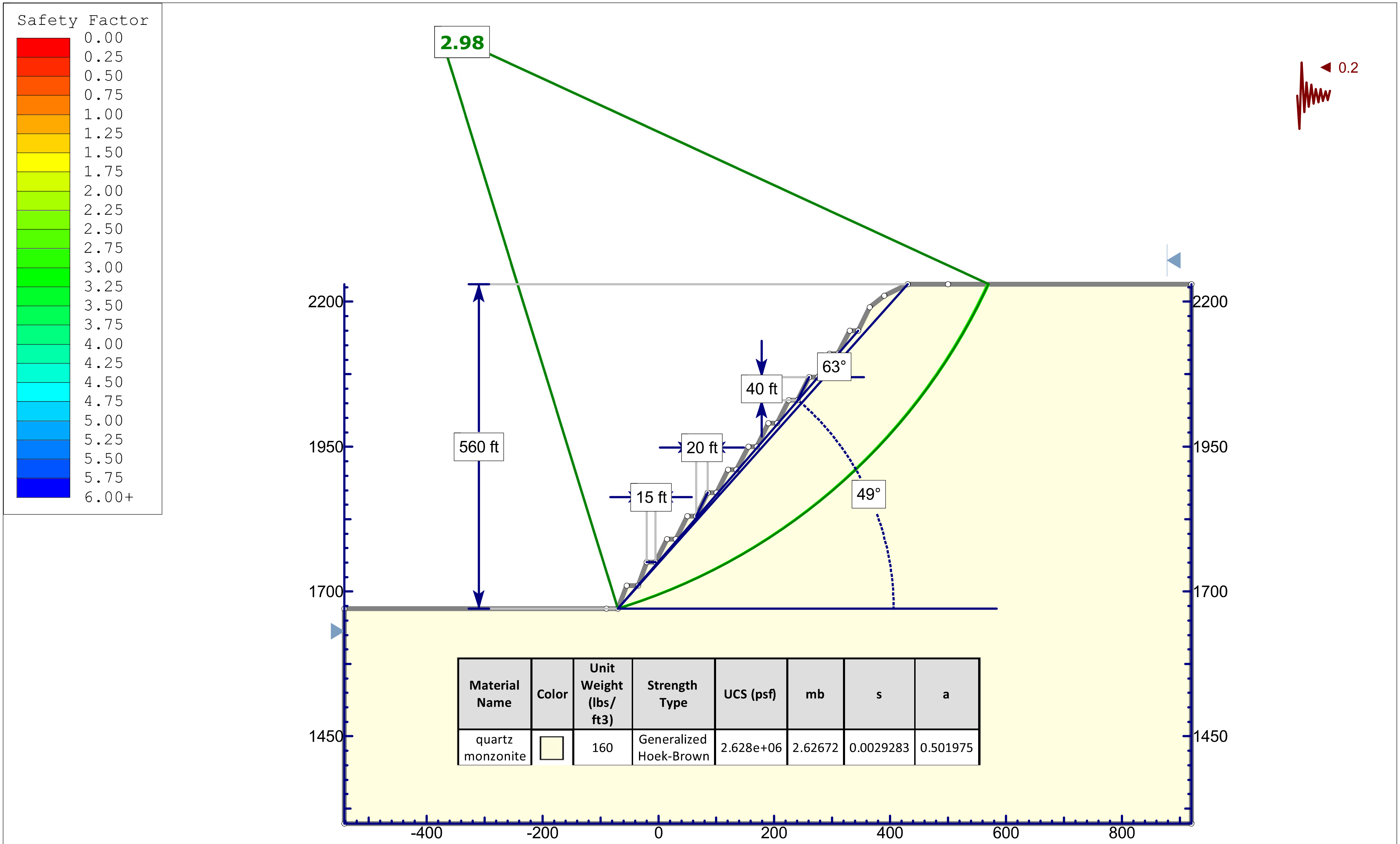
Global Stability Calculations



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	UCS (psf)	mb	s	a
quartz monzonite		160	Generalized Hoek-Brown	2.628e+06	2.62672	0.0029283	0.501975

Project	Lynx Cat
Analysis Description	east wall
Drawn By	JMc
Scale	1:2500
File Name	2024 update Sect C east wall stat.slmd
Date	10/7/2024
Enclosure	

SLIDEINTERPRET 9.012



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	UCS (psf)	mb	s	a
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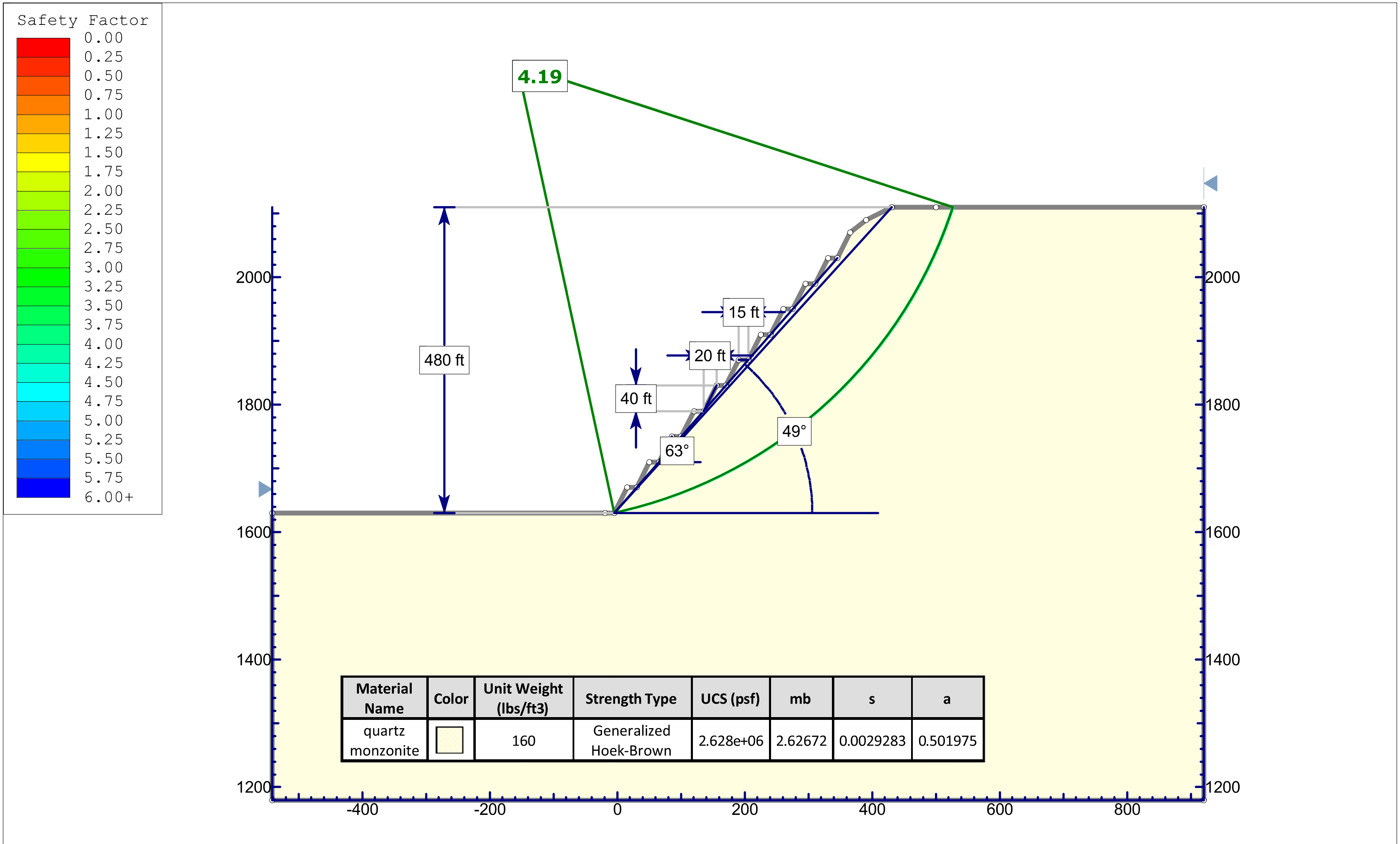
Project	Lynx Cat		
Analysis Description	east wall		
Drawn By	JMc	Scale	1:2750
File Name	2024 update Sect C east wall stat.slmd	Date	10/7/2024
		Enclosure	

Terracon

SLIDEINTERPRET 9.012

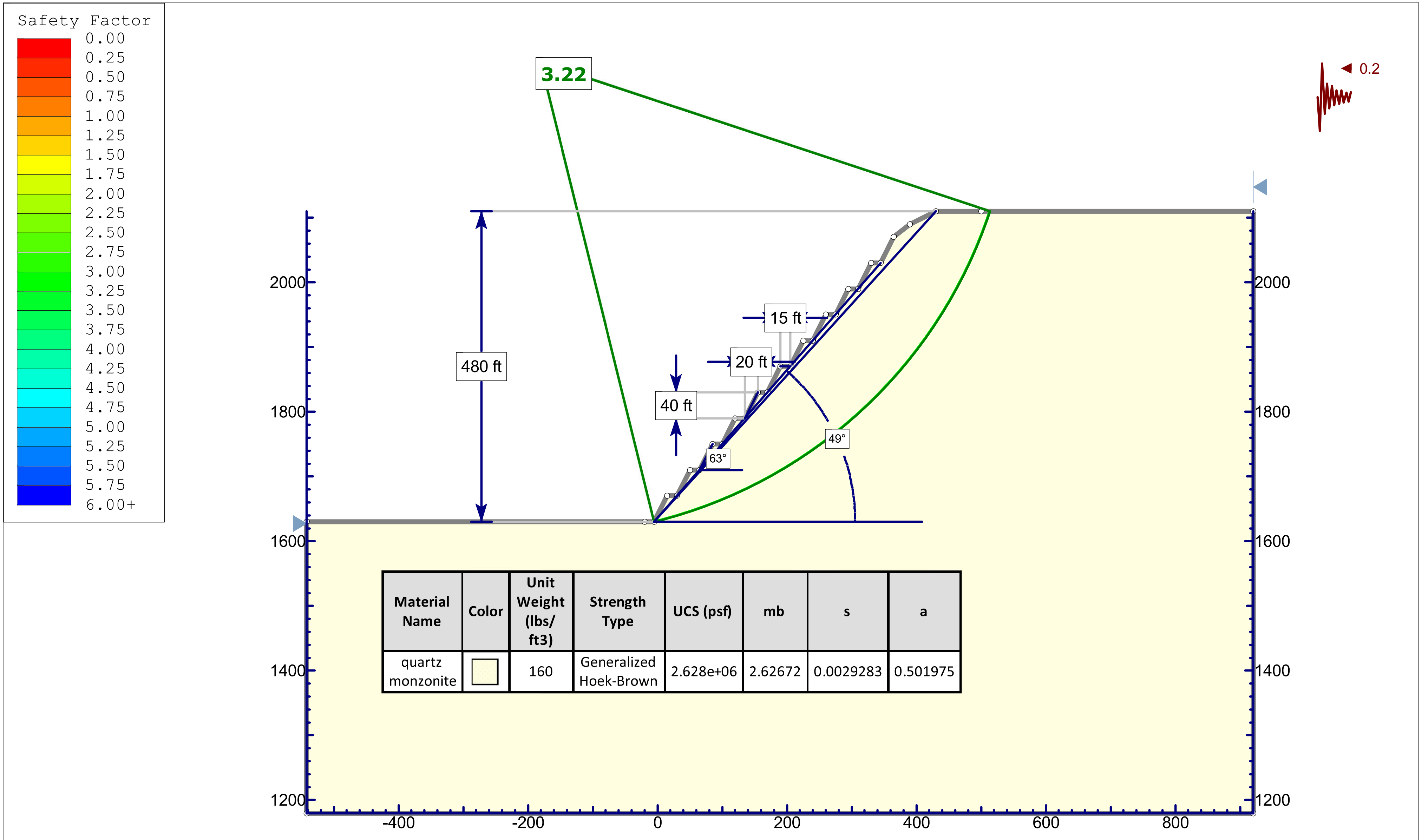


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	UCS (psf)	mb	s	a
quartz monzonite		160	Generalized Hoek-Brown	2.628e+06	2.62672	0.0029283	0.501975

Terracon

SLIDEINTERPRET 9.012

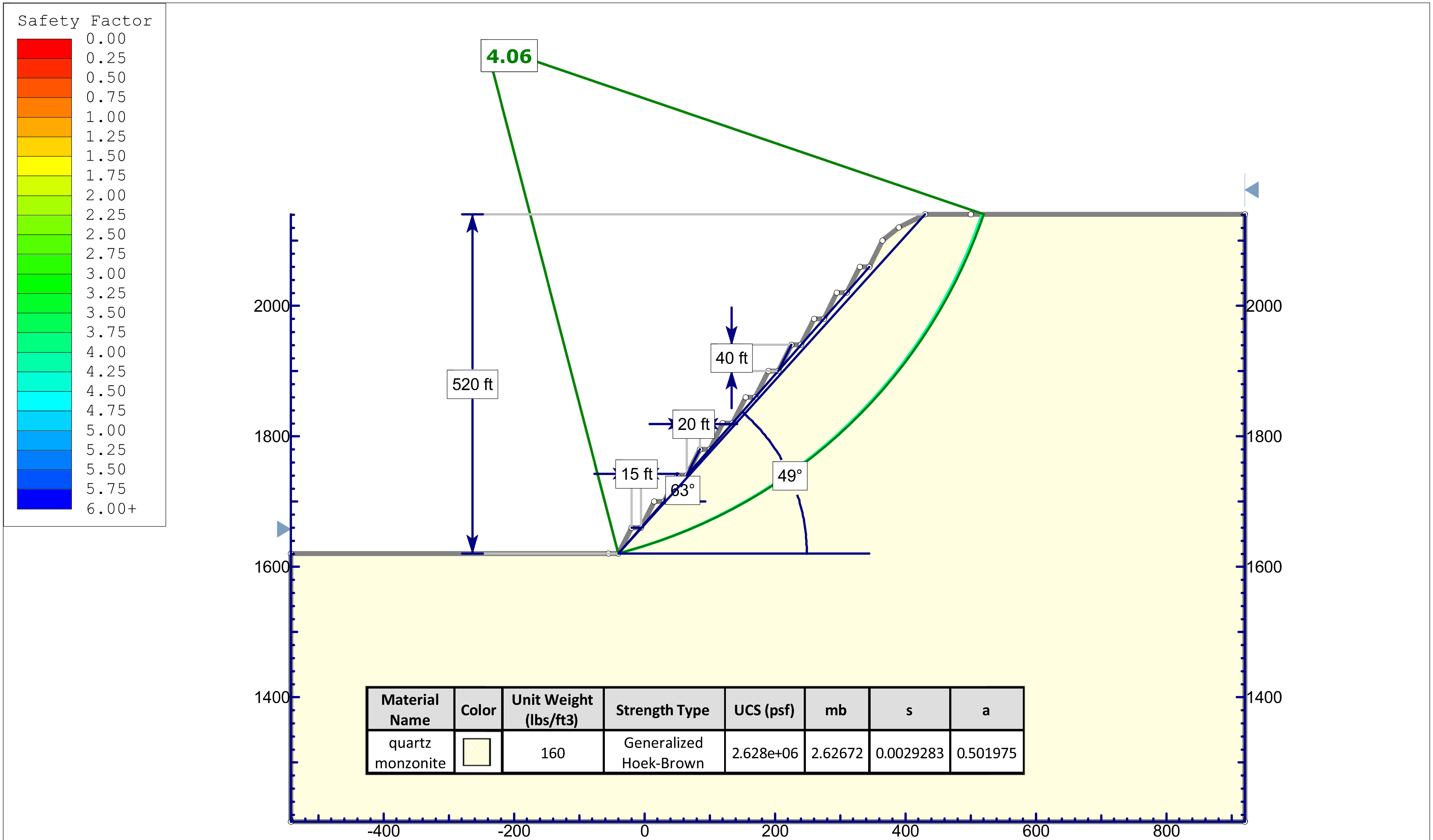
Project	Lynx Cat
Analysis Description	north wall
Drawn By	JMc
Scale	1:2500
File Name	2024 update Sect B stat.slmd
Date	10/7/2024
Enclosure	



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	UCS (psf)	mb	s	a
quartz monzonite		160	Generalized Hoek-Brown	2.628e+06	2.62672	0.0029283	0.501975

SLIDEINTERPRET 9.012

Project	Lynx Cat		
Analysis Description	north wall		
Drawn By	JMc	Scale	1:2500
File Name	2024 update Sect B stat.slmd	Date	10/7/2024
		Enclosure	



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	UCS (psf)	mb	s	a
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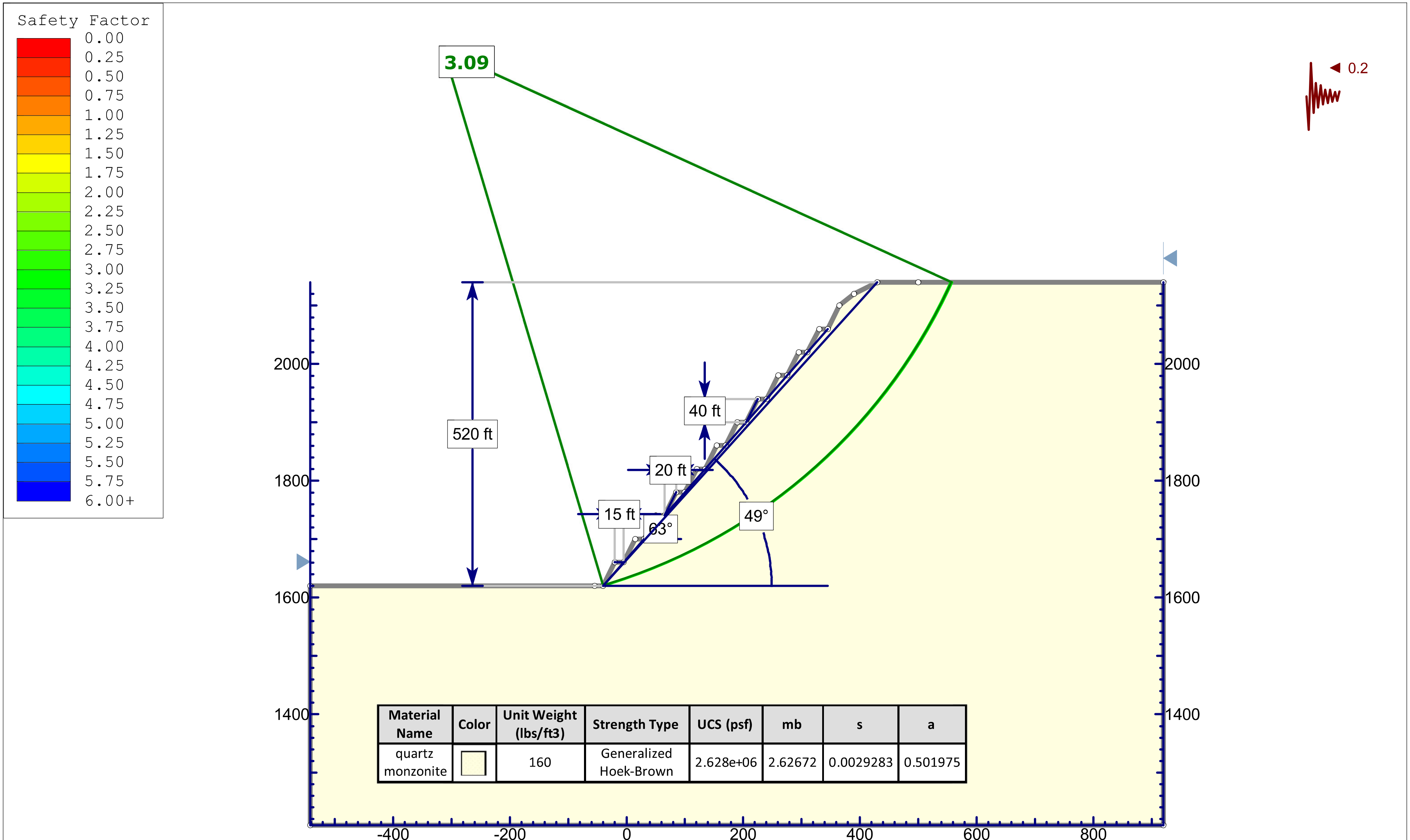
Project	Lynx Cat
Analysis Description	south wall
Drawn By	JMc
Scale	1:2500
File Name	2024 update Sect A stat.slmd
Date	10/7/2024
Enclosure	

SLIDEINTERPRET 9.012



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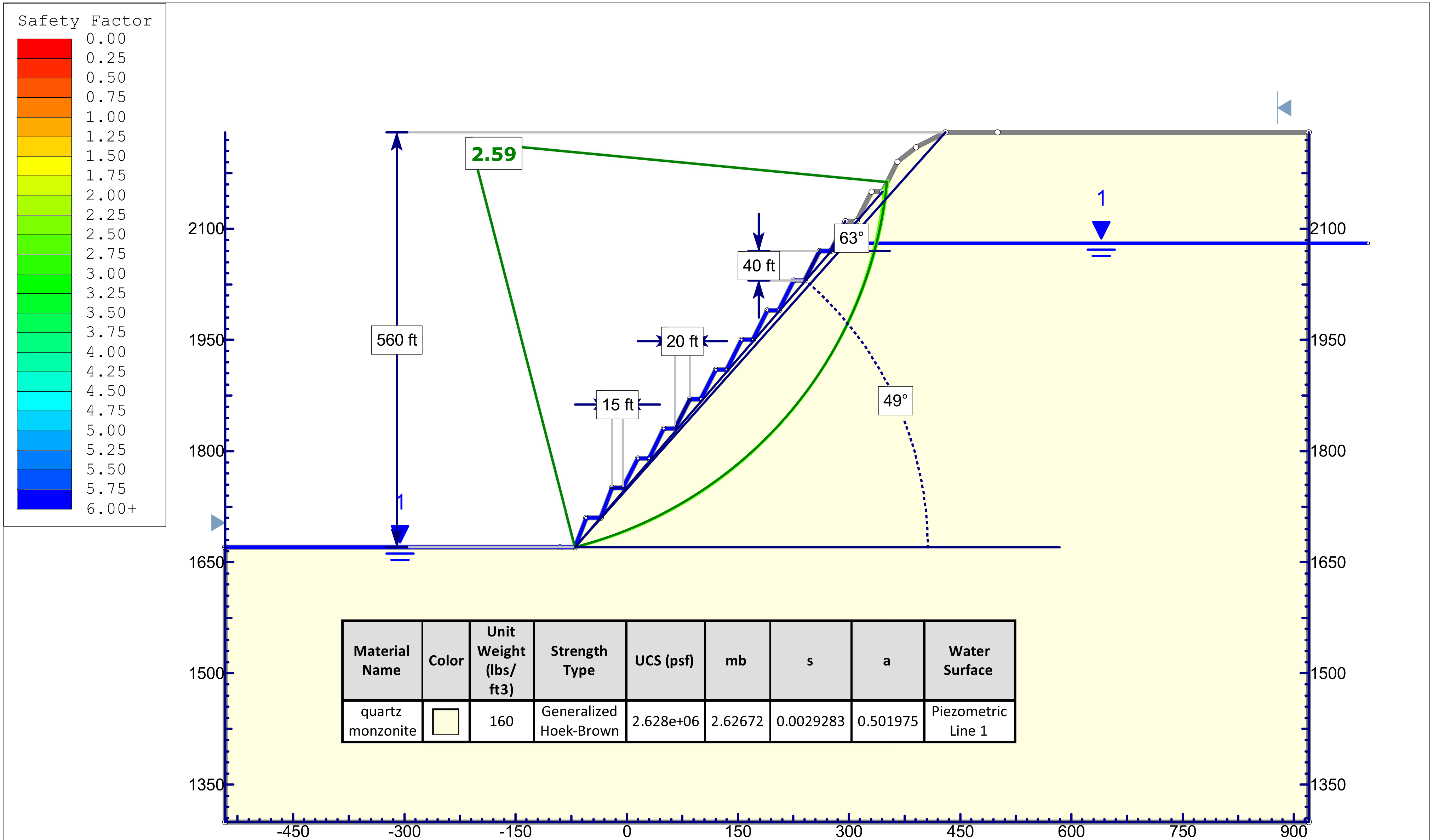
Terracon

Project	Lynx Cat
Analysis Description	south wall
Drawn By	JMc
Scale	1:2750
File Name	2024 update Sect A stat.slmd
Date	10/7/2024
Enclosure	

SLIDEINTERPRET 9.012



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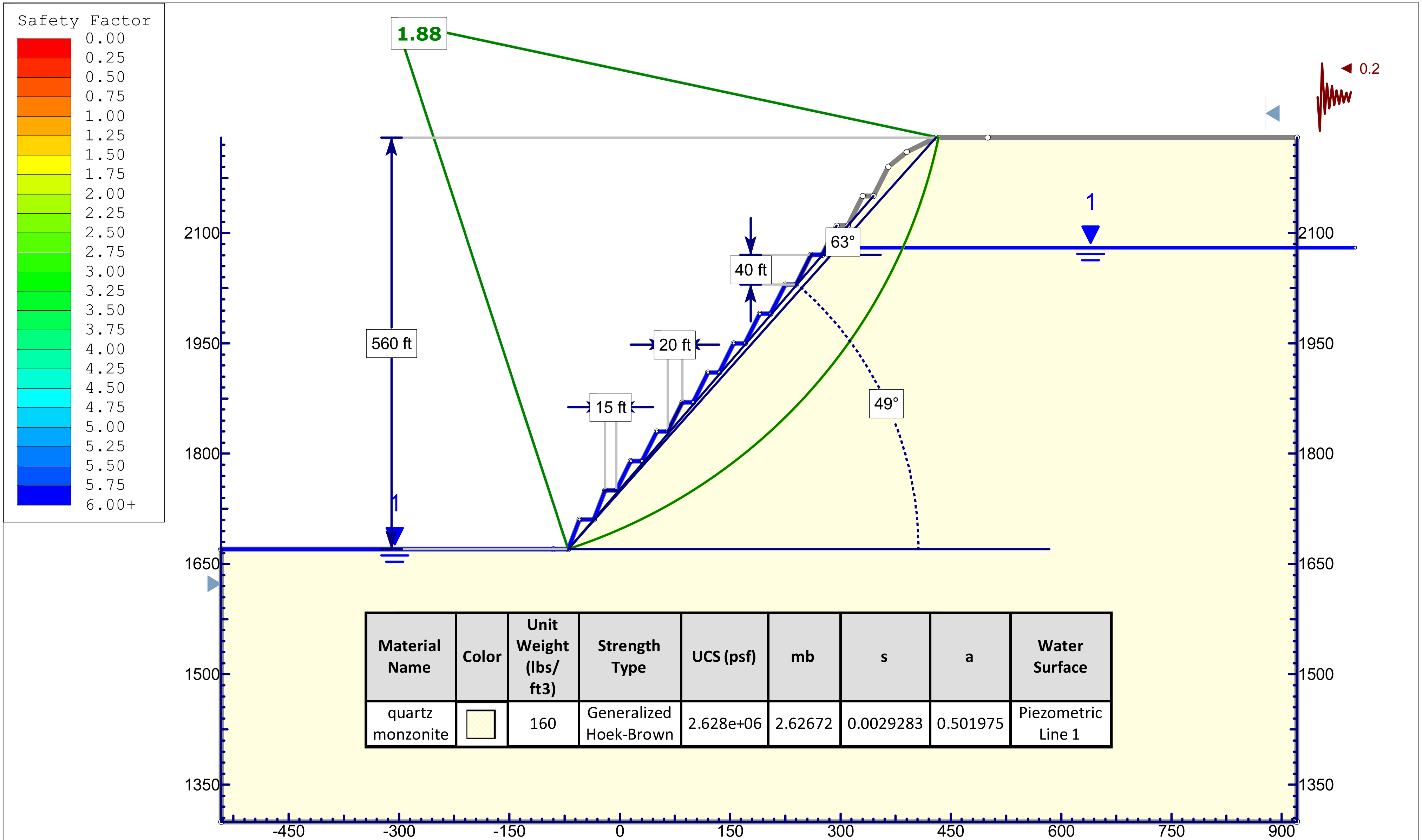
Terracon

SLIDEINTERPRET 9.012

Project	Lynx Cat
Analysis Description	east wall
Drawn By	JMc
Scale	1:2200
File Name	2024 update Sect C east wall gw.slmd
Date	10/7/2024
Enclosure	



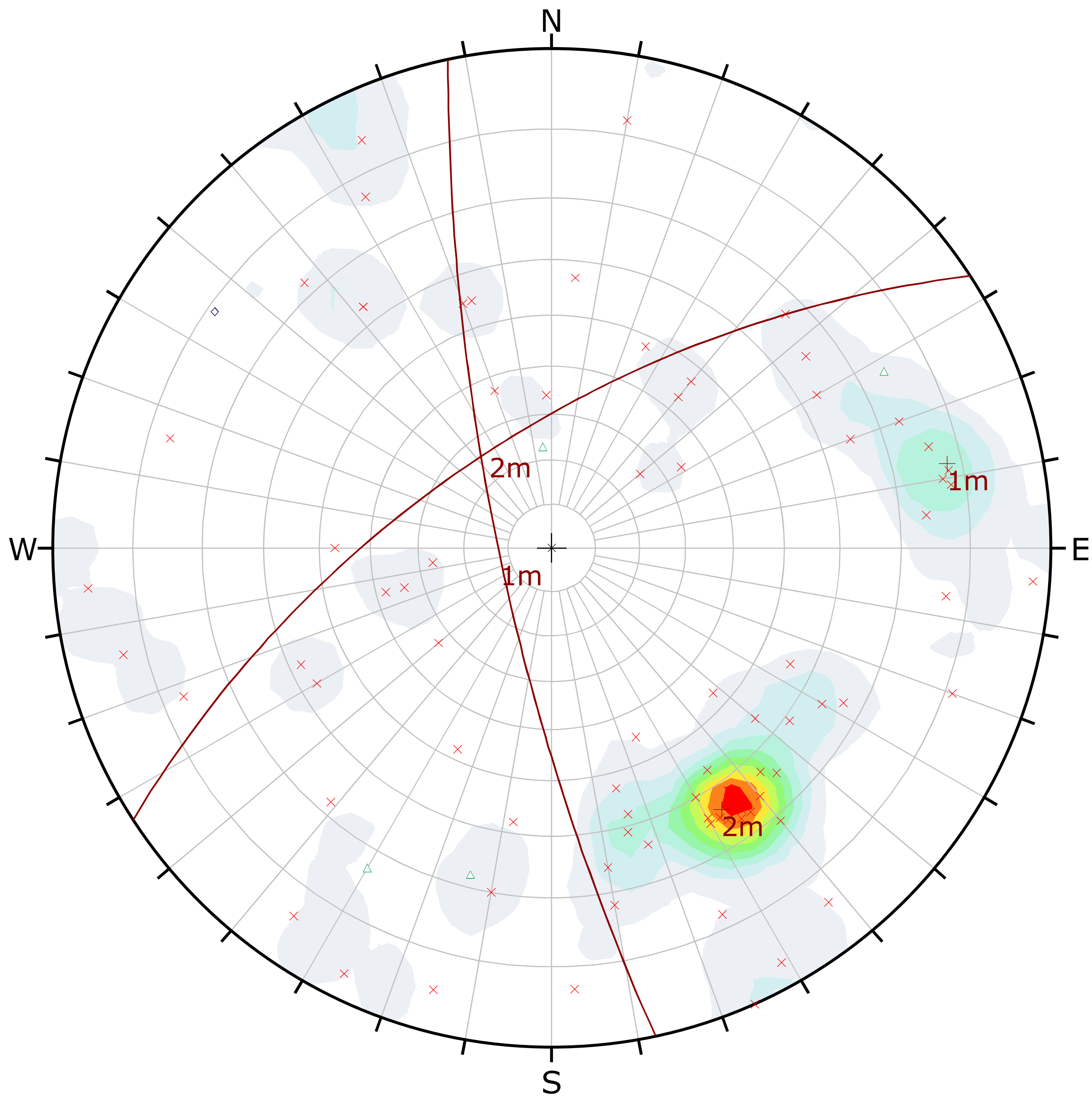
Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	UCS (psf)	mb	s	a	Water Surface
quartz monzonite		160	Generalized Hoek-Brown	2.628e+06	2.62672	0.0029283	0.501975	Piezometric Line 1

Terracon

SLIDEINTERPRET 9.012

Project	Lynx Cat
Analysis Description	east wall
Drawn By	JMc
Scale	1:2200
File Name	2024 update Sect C east wall gw.slmd
Date	10/7/2024
Enclosure	

Kinematic Evaluation



Symbol	TYPE	Quantity
◇	fol	1
×	joint	80
△	shear	4

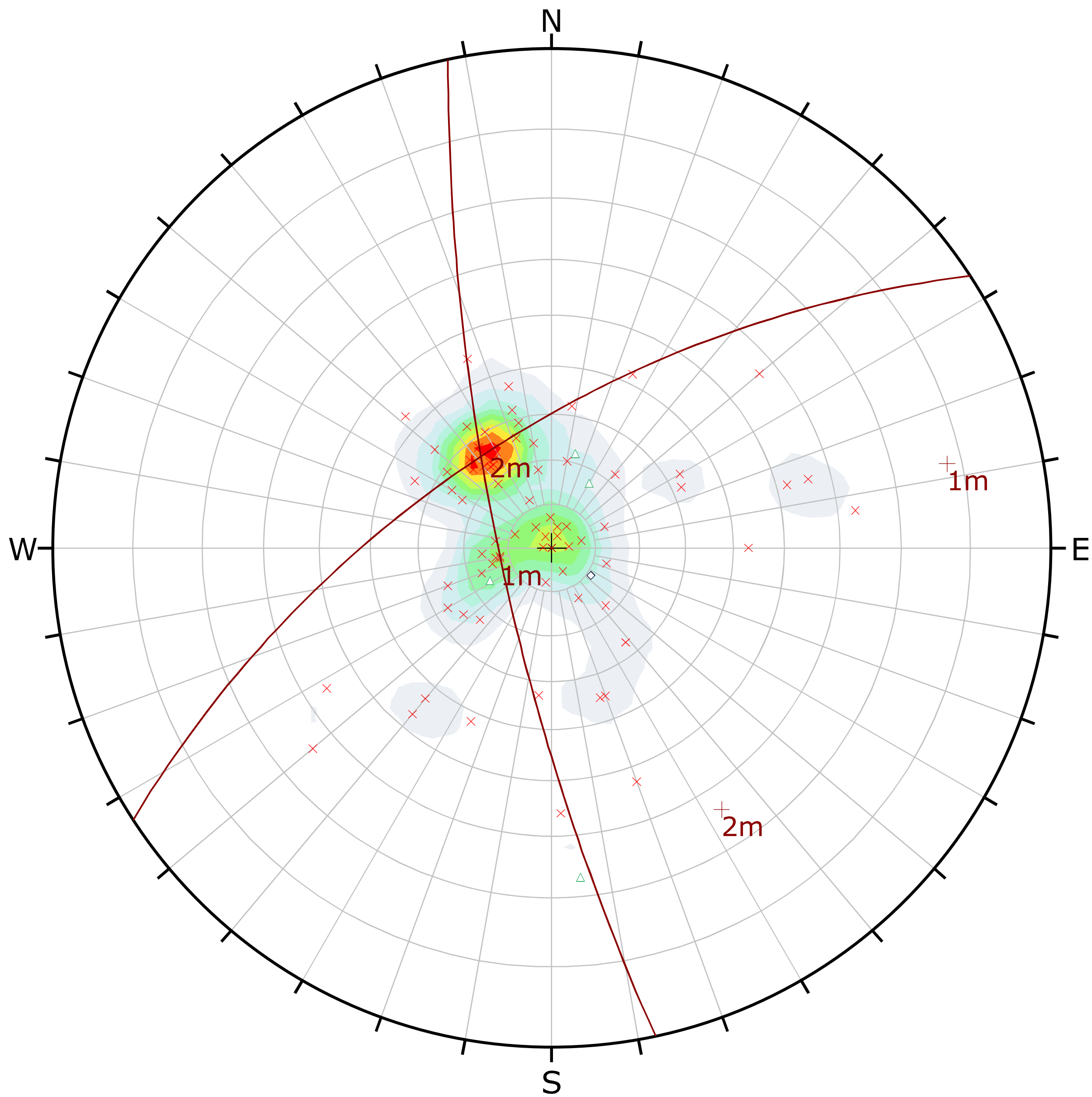
Color	Density Concentrations
	0.00 - 1.50
	1.50 - 3.00
	3.00 - 4.50
	4.50 - 6.00
	6.00 - 7.50
	7.50 - 9.00
	9.00 - 10.50
	10.50 - 12.00
	12.00 - 13.50
	13.50 - 15.00
Contour Data	Pole Vectors
Maximum Density	14.34%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Plot Mode	Pole Vectors
Vector Count	85 (85 Entries)
Hemisphere	Lower
Projection	Equal Angle

Terracon

Project	Lynx Cat Mountain		
Analysis Description	2014 data		
Drawn By	JMc	Company	CHJ
Date	10/7/2024	File Name	Data.dips6

DIPS 8.009



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◇	fol	1
×	joint	80
△	shear	4

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	1.90 - 3.80
	3.80 - 5.70
	5.70 - 7.60
	7.60 - 9.50
	9.50 - 11.40
	11.40 - 13.30
	13.30 - 15.20
	15.20 - 17.10
	17.10 - 19.00
Contour Data	Dip Vectors
Maximum Density	18.16%
Contour Distribution	Fisher
Counting Circle Size	1.0%

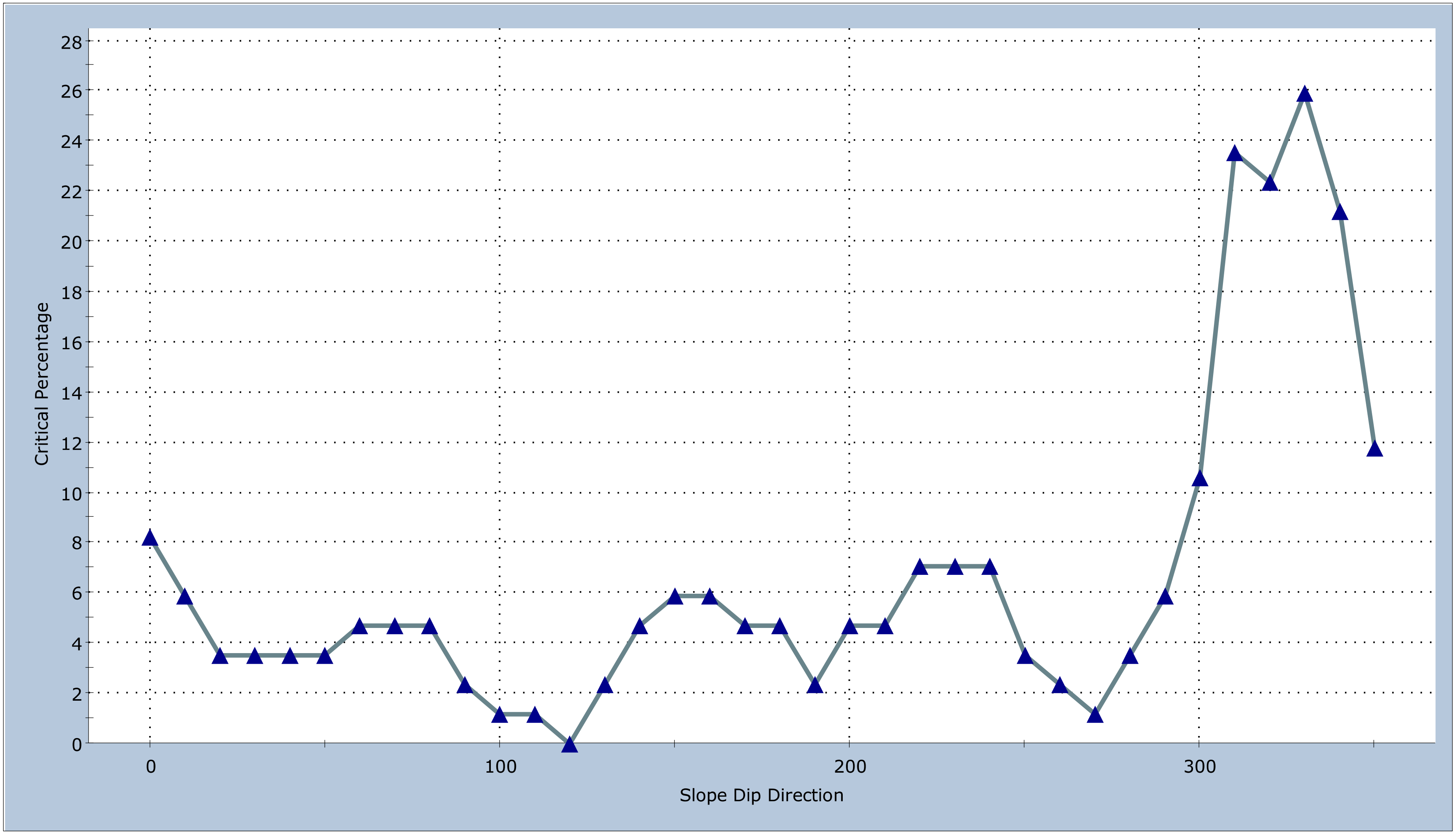
Plot Mode	Dip Vectors
Vector Count	85 (85 Entries)
Hemisphere	Lower
Projection	Equal Angle

Terracon

Project	Lynx Cat Mountain		
Analysis Description	2014 data		
Drawn By	JMc	*Company*	CHJ
Date	10/7/2024	*File Name*	Data.dips6

DIPS 8.009

Planar Sliding: Critical Percentage vs. Slope Dip Direction

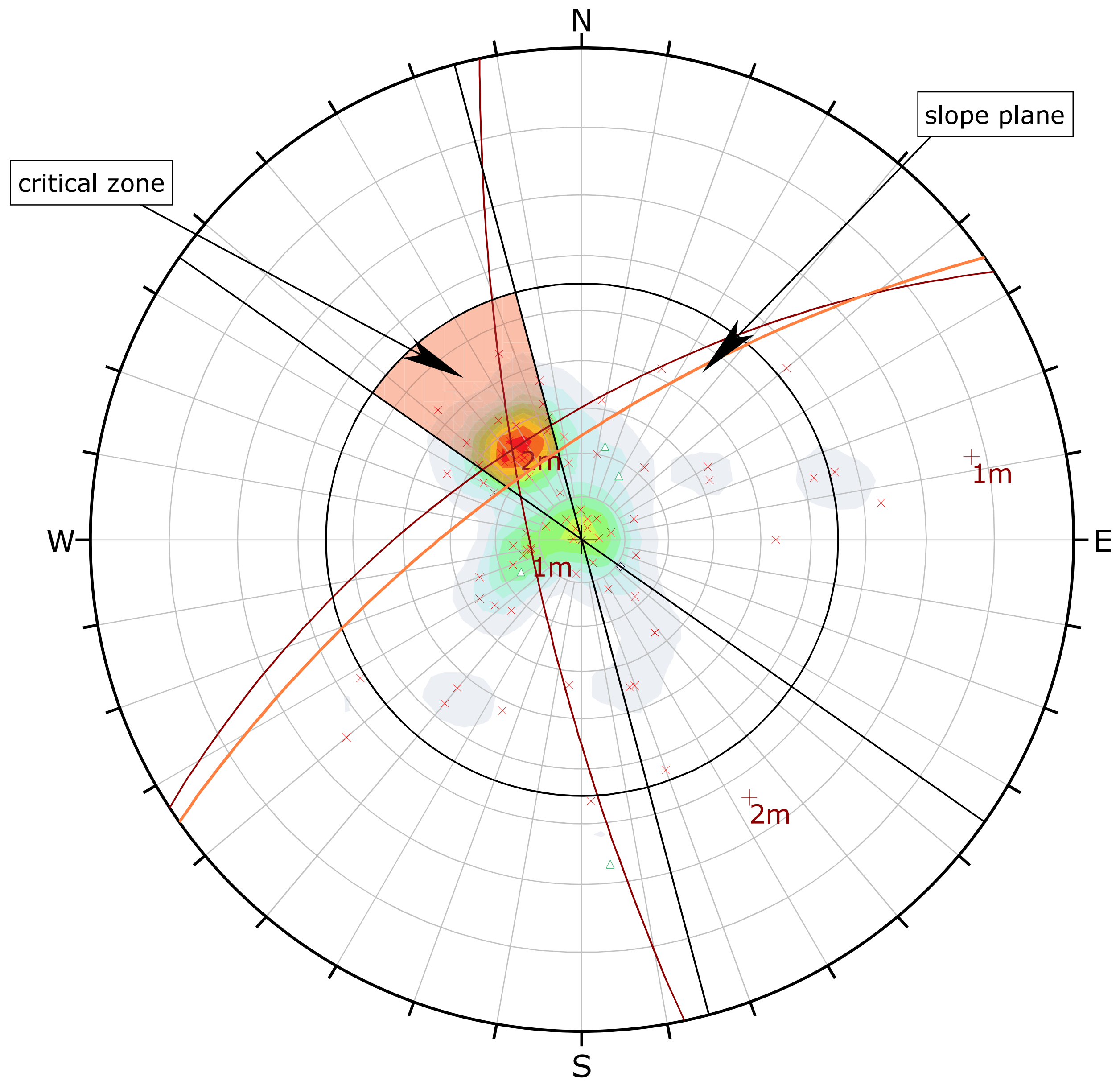


Mean Values

Slope Dip = 70 **Slope Dip Direction = 325** **Friction Angle = 35** **Lateral Limit = 20**

Project	Lynx Cat Mountain		
Analysis Description	2014 data		
Drawn By	JMc	Company	CHJ
Date	10/8/2024	File Name	Data.dips8

DIPS 8.009



Symbol	TYPE	Quantity
◇	fol	1
×	joint	80
△	shear	4

Color	Density Concentrations
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	1.90 - 3.80
	3.80 - 5.70
	5.70 - 7.60
	7.60 - 9.50
	9.50 - 11.40
	11.40 - 13.30
	13.30 - 15.20
	15.20 - 17.10
	17.10 - 19.00

Contour Data	Dip Vectors
Maximum Density	18.16%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Planar Sliding
Slope Dip	70
Slope Dip Direction	325
Friction Angle	35°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	22	85	25.88%
Planar Sliding (Set 2)	22	29	75.86%

Plot Mode	Dip Vectors
Vector Count	85 (85 Entries)
Hemisphere	Lower
Projection	Equal Angle

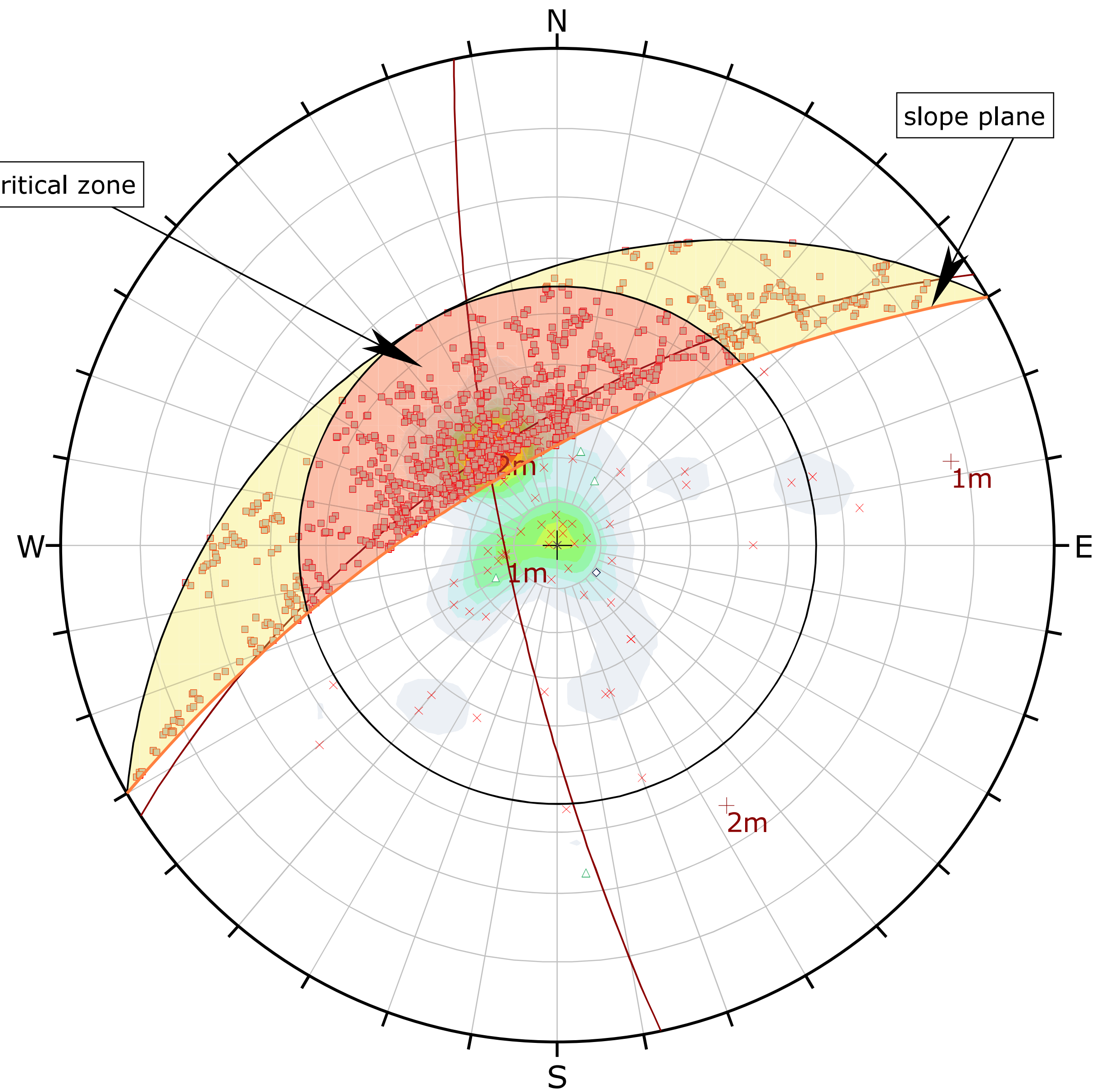
Terracon	*Project* Lynx Cat Mountain		
	Analysis Description 2014 data		
	Drawn By JMc	*Company* CHJ	
DIPS 8.009	*Date* 10/8/2024	*File Name* Data.dips8	

Wedge Sliding: Critical Percentage vs. Slope Dip Direction

Mean Values

Slope Dip = 70 **Slope Dip Direction = 325** **Friction Angle = 35** **Lateral Limit = 20**

Terracon	*Project*	Lynx Cat Mountain		
	Analysis Description	2014 data		
	Drawn By	JMc	*Company*	CHJ
DIPS 8.009	*Date*	10/8/2024	*File Name*	Data.dips8



Symbol	TYPE	Quantity
◇	fol	1
×	joint	80
△	shear	4
Symbol	**Feature**	
■	Critical Intersection	

Color	Density Concentrations
	0.00 - 1.90
	1.90 - 3.80
	3.80 - 5.70
	5.70 - 7.60
	7.60 - 9.50
	9.50 - 11.40
	11.40 - 13.30
	13.30 - 15.20
	15.20 - 17.10
	17.10 - 19.00

Contour Data	Dip Vectors
Maximum Density	18.16%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding
Slope Dip	70
Slope Dip Direction	330
Friction Angle	35°

	Critical	Total	%
Wedge Sliding	1474	3568	41.31%

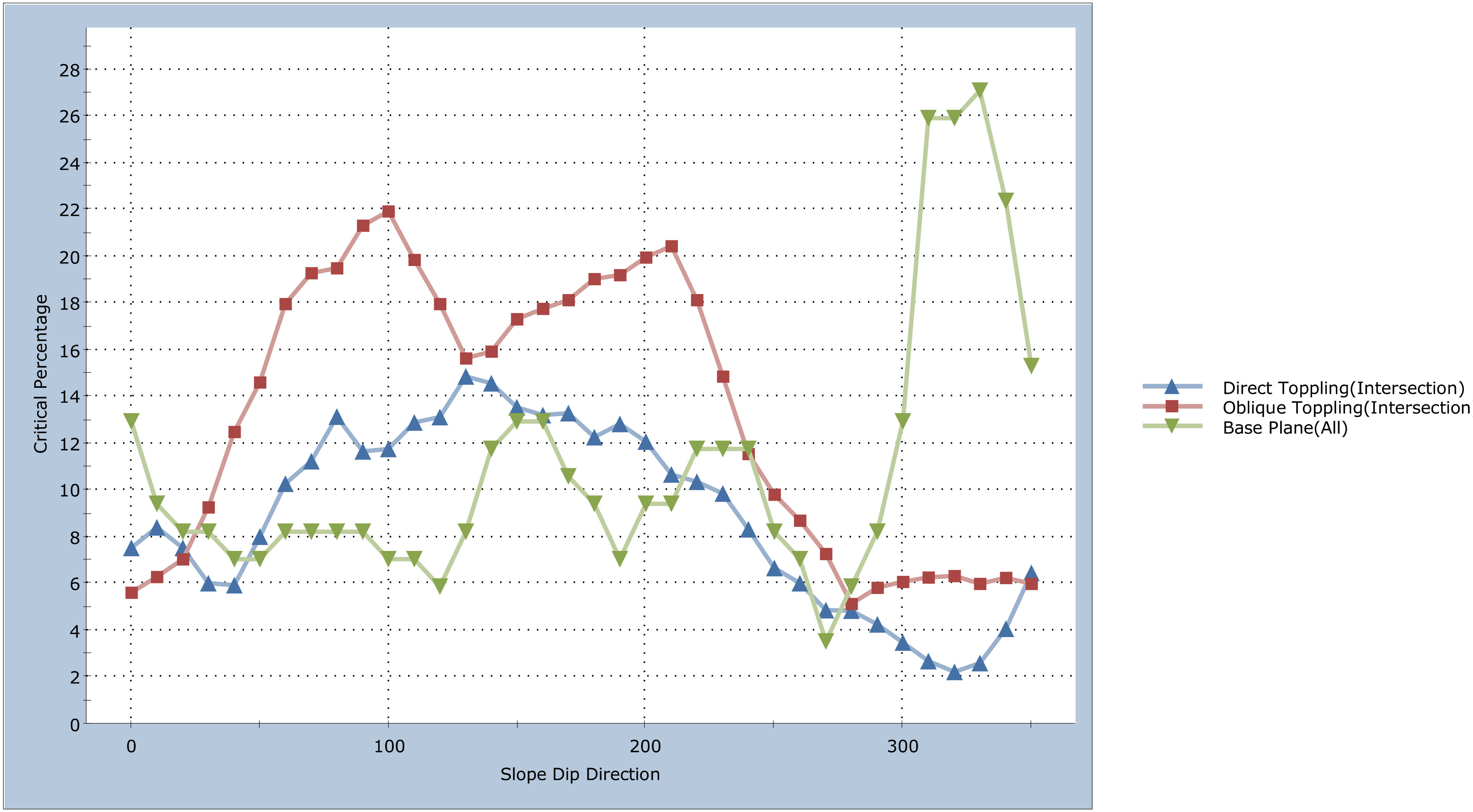
Plot Mode	Dip Vectors
Vector Count	85 (85 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	3568
Hemisphere	Lower
Projection	Equal Angle

Terracon

Project	Lynx Cat Mountain		
Analysis Description	2014 data		
Drawn By	JMc	*Company*	CHJ
Date	10/8/2024	*File Name*	Data.dips8

DIPS 8.009

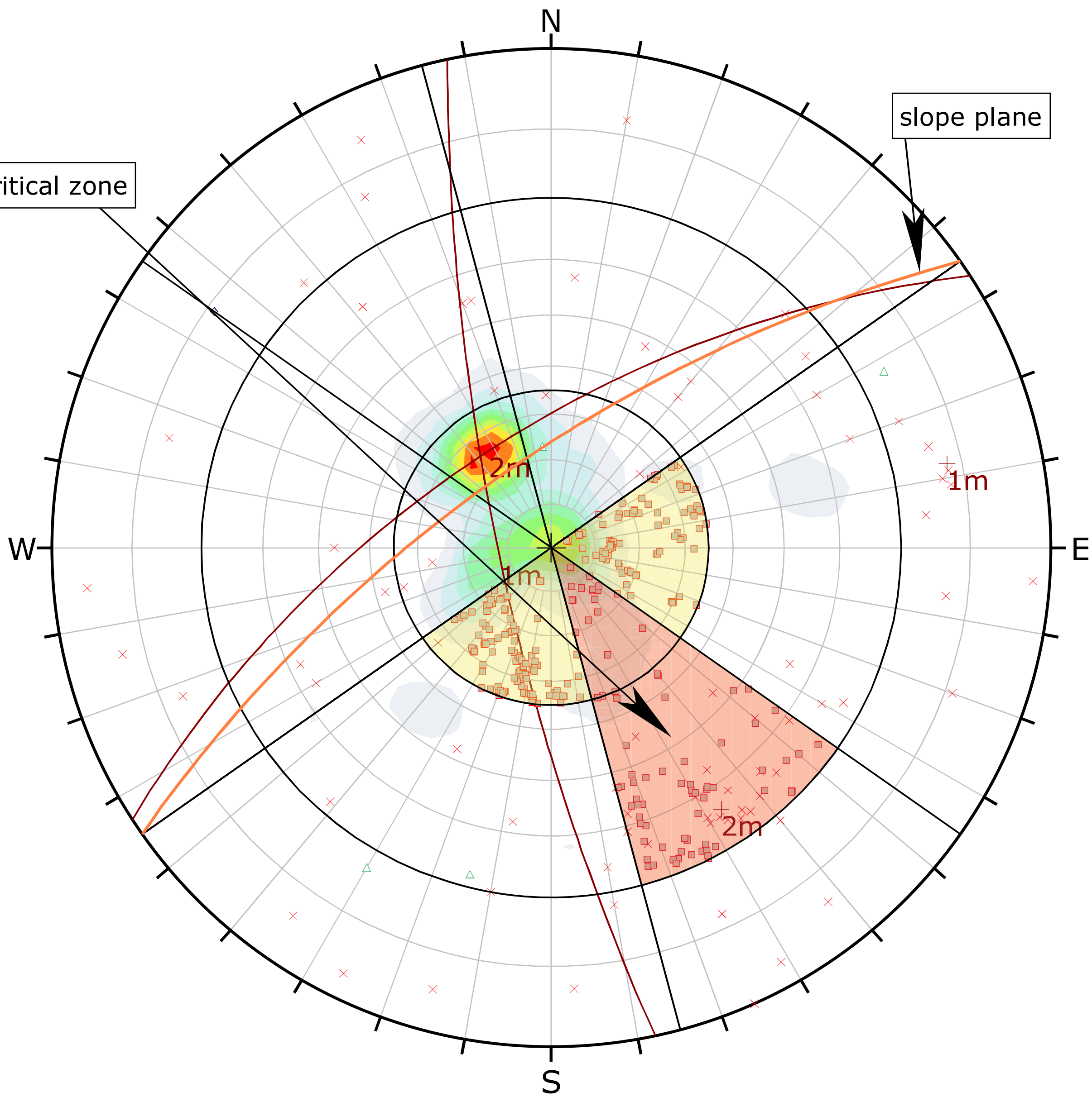
Direct Toppling: Critical Percentage vs. Slope Dip Direction



Mean Values

Slope Dip = 70 Slope Dip Direction = 325 Friction Angle = 35 Lateral Limit = 20

Terracon	Project	Lynx Cat Mountain		
	Analysis Description	2014 data		
	Drawn By	JMc	Company	CHJ
DIPS 8.009	Date	10/8/2024	File Name	Data.dips8



Symbol	TYPE	Quantity
◇	fol	1
×	joint	80
△	shear	4
Symbol	**Feature**	
■	Critical Intersection	

Color	Density Concentrations
	0.00 - 1.90
	1.90 - 3.80
	3.80 - 5.70
	5.70 - 7.60
	7.60 - 9.50
	9.50 - 11.40
	11.40 - 13.30
	13.30 - 15.20
	15.20 - 17.10
	17.10 - 19.00

Contour Data	Pole Vectors
Maximum Density	18.16%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Direct Toppling
Slope Dip	70
Slope Dip Direction	325
Friction Angle	35°
Lateral Limits	20°

	Critical	Total	%
Direct Toppling (Intersection)	87	3568	2.44%
Oblique Toppling (Intersection)	223	3568	6.25%
Base Plane (All)	24	85	28.24%
Base Plane (Set 2)	22	29	75.86%

Plot Mode	Pole Vectors
Vector Count	85 (85 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	3568
Hemisphere	Lower
Projection	Equal Angle

Terracon

Project	Lynx Cat Mountain		
Analysis Description	2014 data		
Drawn By	JMc	*Company*	CHJ
Date	10/8/2024	*File Name*	Data.dips8

DIPS 8.009