LAC

LAC MINERALS (USA) LLC

August 15, 2023

Carmen Rose
Sr. Reclamation Specialist
Mining and Minerals Division
Mining Act Reclamation Program
1220 S. St. Francis Drive
Santa Fe, NM 87505

RE: Cunningham Hill Pit Slope Stability Analysis, Cunningham Hill Mine, Permit No. SF200RE

Dear Ms. Rose,

As required by the New Mexico Mining and Mineral Division on June 21, 2023, in the Conditional Approval of the Pit Wall Slope Stability Work Plan letter, LAC Minerals (USA) LLC hereby provides the enclosed Memorandum prepared by Call & Nicholas, Inc. (CNI). Also enclosed is a Drilling report prepared by Schafer & Associates Inc. (Schafer) on near-pit drilling activities. Unfortunately, no directly applicable documentation on pit slope performance (other than the original CNI analysis) or discontinuity information is available.

If you have questions or comments, please contact me at (775) 934-1766 or eburch@barrick.com.

Sincerely,

Eric Burch

Eric Burch
Project Manager

Enclosures: Cunningham Hill Pit Slope Stability Analysis Memorandum (CNI, 2023)
Cunningham Hill Mine Residue Pile, Waste Rock Pile, and Pit Perimeter Drilling Activities (Schafer, 1995)

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MEMORANDUM

To: Eric Burch, Project Manager / LAC Minerals (USA) LLC

From: Sean de Bruin, Associate Geologist / Call & Nicholas, Inc.
Scott Cylwik, P.E., Vice President / Call & Nicholas, Inc.
Tom Ryan, P.E., President / Call & Nicholas, Inc.

Date: 9 August 2023

Subject: Cunningham Hill Pit Slope Stability Analysis

1.0 INTRODUCTION

On 15 March 2023, Call & Nicholas, Inc, (CNI) was engaged by Mr. Eric Burch of LAC Minerals (USA) LLC (LAC) to perform a long-term pit stability review for the Cunningham Hill Mine Reclamation Project (CHMRP) as part of the closure requirements per the New Mexico Mining & Minerals Division (MMD). This work updates the 1994 CNI memo *Long-Term Stability of Cunningham Pit Slopes* by David Nicholas, P.E.

The work that comprised this update includes:

1. A one-day site visit to characterize for geotechnical purposes the geology and structure present in the pit wall, including a full-pit drone survey.
2. Drone survey photogrammetric processing to create a 3D point cloud of the pit and an updated topographical contour map.
3. 2D limit equilibrium slope stability analysis of two cross sections.
4. An evaluation of pit wall stability as it relates to wildlife and human health and safety.

2.0 CONCLUSIONS

The following conclusions have been reached based on the site visit, the available data, and the slope stability analysis:

1. No signs of recent, active, or incipient slope movement beyond gravel-size raveling were noted.

2. Small-scale pit slope raveling will continue and presents the primary hazard to human and animal health and safety. This is exacerbated by freeze/thaw and rain events. Access to any area of the site below a highwall should be restricted during and after these events. Prior to entry at any time, areas below a highwall should be examined for any visible or audible raveling or slope deformation.
3. The probability of occurrence of a large-scale slope failure is low. Based on available data, the slope is unlikely to break back past the existing pit limits. The factor of safety for the south and east slopes is greater than 2.0 for each of the limit equilibrium models.
4. A fence circumscribing the entire pit area will be the best mitigation strategy for human entry into the area.

3.0 SUMMARY OF PREVIOUS WORK

The primary conclusions of the CNI 1994 report *Long-Term Stability of Cunningham Pit Slopes* were that 1) The probability of a slope failure greater than 100 feet in height was low, 2) Raveling of the pit walls will continue, and 3) The pit should be fenced in to prevent any unauthorized or untrained persons from entering the pit area. Additionally, it was recommended that monument surveys over time would provide an accurate measure of slope movement if it were suspected that the slopes were displacing. No signs of slope displacement were recorded during the 1994 site visit. This report does not substantially change the findings of the previous report but does reinforce them with new data and more rigorous analysis.

4.0 SITE VISIT AND GEOTECHNICAL CHARACTERIZATION

A one-day site visit to the CHMRP property was conducted on 27 June 2023. The property is located approximately 25 miles south of Santa Fe, on the eastern side of the Ortiz mountains. Pit geology is primarily metamorphosed Paleocene sediments, volcanic vent breccia, and latite porphyry. Brecciation in the sediments, caused by the latite intrusion, is the primary ore host. Major structure consists of a nearly vertical fault striking north-south that crosses the pit, movement along which has caused contact between vent breccia to the west and quartzite to the east. Current topography, with outlines of mapped geology from Stephen R. Maynard's 1995 work, is shown in Figure 1. Large scale figures will follow the full text of the memo.

4.1 Site Visit Inspection

Inspection of the pit walls showed no signs of slope movement or slope instability

beyond small-scale raveling of material. Raveling witnessed during the site visit was discontinuous and of material gravel size or smaller. Site personnel mentioned boulder-sized rocks in the road that could be moved by hand once or twice a year. No heavy equipment has been required to clean roads.

Reoccurring wedge or plane shear combinations of structures with spoils piles below, indicating the failure happened post-mining, were not noted in the pit wall. Additionally, no tension cracks were noted during the site walk or during drone photo inspection. Of special concern were the pit wall intersections with the mountains on the west, east, and south sides of the pit.

4.2 Geotechnical Characterization

Geotechnical characterization was conducted during the site visit and consisted of assigning Q'-system (Q'), Rock-Mass Rating (RMR), and Geological Strength Index (GSI) ratings to each major rock type during a walking inspection of the pit edge, walls, and ramp. This data is shown in Table 1. Diamond Tail Sandstone has been split into two components based on location relative to the north-south major fault.

Stereonet plots of structure sets for the most prominent rock types in the pit wall (the Diamond Tail Sandstone and the Volcanic Breccia) are shown in Figures 2 and 3. Pervasive Diamond Tail Sandstone structure east of the pit-scale fault generally includes a low angle bedding set, of variable dip direction, and long perpendicular high-angle cross joints resulting in blocky pit wall outcrops. West of the fault the Diamond Tail is massive with only sporadic, irregular joints. Volcanic Breccia shows long, high angle jointing in the upper west wall.

Table 1. Geotechnical Characterization of CHMRP Geology

Rock Type	GSI	Q'	RMR	RMR
Mineralized Breccia	78	41.3	77	Good
Diamond Tail Sandstone (East)	59	49.0	59	Fair
Diamond Tail Sandstone (West)	85	56.7	80	Good
Latite Porphyry	65	40.0	73	Good
Volcanic Breccia	62	53.3	61	Fair

5.0 DRONE SURVEY

Prior to the site visit, existing topographical data was used in CNI's proprietary DronePlan3D software to create a drone flight plan. This flight plan uses the site digital elevation model (DEM) to map out a terrain-optimized flight plan providing for full photographic coverage of the pit while keeping the drone camera gimbal at an angle perpendicular to the slope, thus optimizing the photo orientation for photogrammetric processing. A full-pit drone photo scan was completed during the 27 June 2023 site visit and was comprised of eight staged flights resulting in 555 photographs. A DJI Phantom 4 Pro was used for the flights.

CNI processed the drone survey photos using Pix4D to achieve a high-density point cloud. Figure 4 shows the drone photo orthomosaic and the corresponding sparse Digital Surface Model (DSM). The drone survey and processed point cloud specifications are presented in Table 2. A full suite of GPS survey points was not available during photogrammetric processing. These will be delivered at a later date when a surveyor is on site. The locational accuracy with the existing pit control points is sufficient for the 2D analysis. For future use in a comparative point cloud analysis with a future drone flight, the drone data will be reprocessed when the survey points are available.

The drone survey orthomosaic, point cloud, and topographic contours that accompany this report will be made available for download from CNI's file sharing website due to their large

file size.

Table 2. Specifications for the CHMRP Drone Survey

Number of Photos	Area Surveyed (mi^2)	Average Ground Sampling distance (in)	Number of 3D Points in Point Cloud	Average Point Cloud Density (per ft^3)
555	0.09	0.7	429,309,306	42.2

6.0 LIMIT EQUILIBRIUM ANALYSIS

Two cross sections were selected for study utilizing a static and pseudo-static limit-equilibrium method to estimate the existing factor of safety of the slope and to evaluate the potential effects of seismic loading on the slope stability. The cross sections selected intersect the two most critical slope geometries: the tallest and steepest pit walls. Both cross sections intersect the Diamond Tail Sandstone (Tdt) as mapped in the pit wall. Latite porphyry and the mineralized breccia do outcrop in the east wall; however, the Tdt has a lower mapped rock quality and represents a more conservative case. The cross section plan map traces are shown on Figure 1. Subsurface geology data is unavailable for this area. Topography below the pit lake has been inferred; no topographic data below the water level is available.

6.1 Model Inputs

6.1.1 Rock-Mass Properties

The CNI method for deriving rock-mass strength estimates is based on a combination of intact rock and fracture shear strengths according to the degree of fracturing in a rock mass as measured by the Rock Quality Designation (RQD). The full methodology used for this analysis is published in the technical paper *A practical nonlinear strength criterion for rock masses and other geological materials* (Cylwik et al., 2023).

No rock strength testing data is extant for the site, so rock strength was derived from a combination of sources. Intact rock strength was determined during the site visit using the ISRM relationship between in-field hardness tests and the approximate range of unconfined compressive strength (UCS). Similarly, RQD and joint parameters are based on in-pit bench face characterization. A nominal friction angle for a metamorphosed sandstone was assigned to

the Diamond Tail sandstone based on CNI's rock strength lab testing experience from other sites. The linear rock-mass strength properties used to calculate the normal and shear stress curves for the Slide 2 analysis are shown in Table 5-1.

Table 3. Estimated Rock Mass Properties

Rock Type	Density (pcf)	Friction Angle (°)	Cohesion (psf)	Compressive Strength (psf)
Diamond Tail Sandstone	160	35.2	26208	67,392

6.1.2 Hydrology

The 1995 report *Cunningham Hill Mine Residue Pile, Waste Rock Pile, and Pit Perimeter Drilling Activities* (Schafer), provided by LAC, contains two monitor wells drilled on the north and east margins of the open pit. A static water elevation of approximately 6795 feet is the highest shown in either well. This is nearly the same elevation as the existing pit lake. No seeps were recorded in the pit wall during CNI's site visit, so the interpreted hydrologic surface used for the analysis is roughly horizontal from the pit lake elevation back behind the portion of the wall covered by the analysis.

6.1.3 Design Seismic Coefficient

Pseudo-static analyses are performed in limit equilibrium analyses to simulate the effect of seismic loading on the overall slope stability. In the analysis, a seismic coefficient is applied that acts as a static acceleration of the slope towards the excavation. The seismic coefficient is not equal to the PGA. The most common method of determining the appropriate seismic coefficient for an open pit stability study is to use half (1/2) of the design PGA as the seismic coefficient (Read and Stacey, 2009).

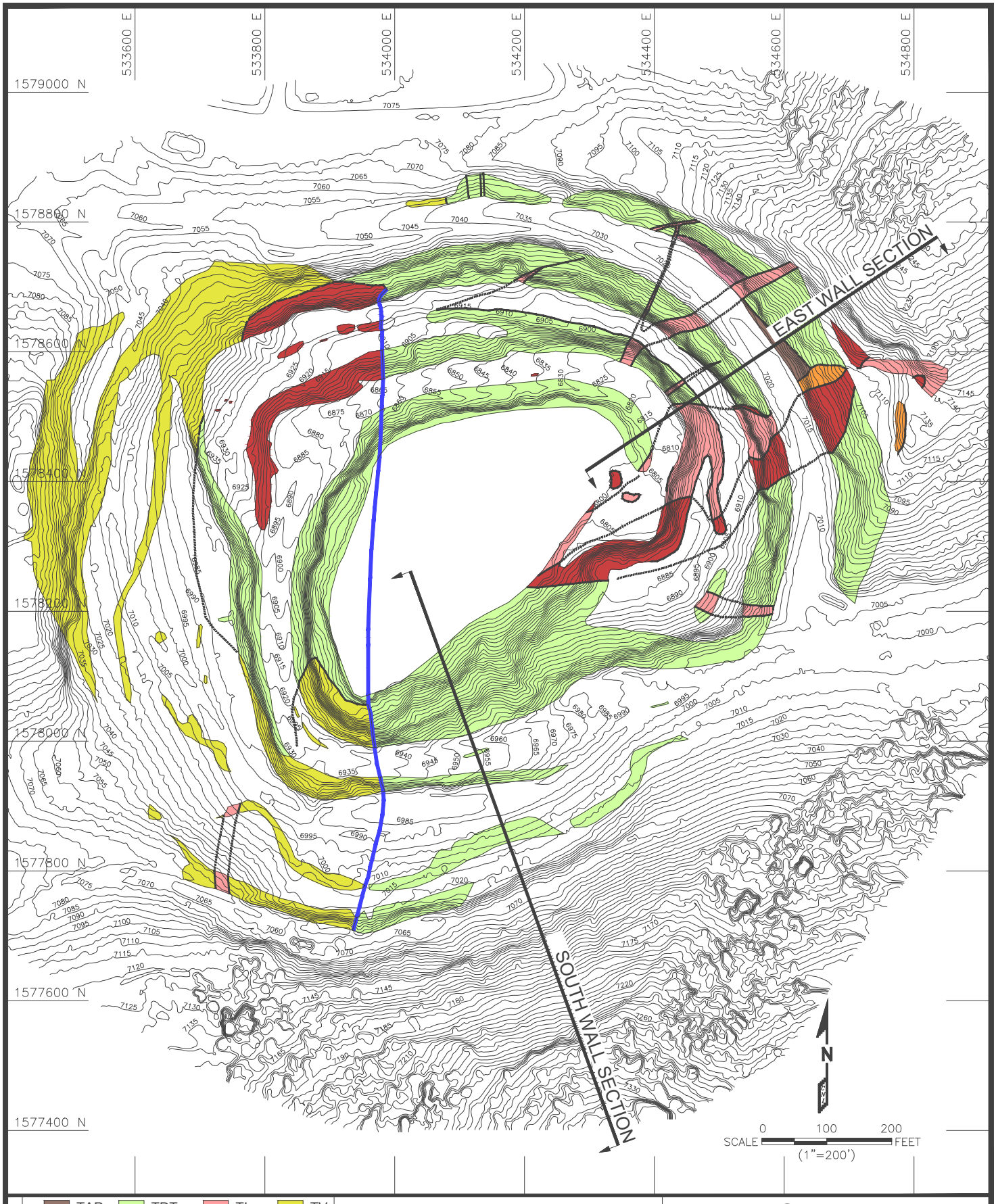
A modified peak ground acceleration (PGA) value of 0.13 g for the project area was taken from the USGS web services database for the project area. This value is for ground motions that have a 2% probability of exceedance in 50 years. Therefore, a seismic coefficient of 0.065 was used for this model. The seismic hazard report for this area can be found in the attached appendix.

6.2 Summary of Limit Equilibrium Results

The limit equilibrium analysis results for cross sections CHMRP – South Wall and CHMRP – East Wall are shown in Table 5-2. Sections for the South wall are shown in Figures 5 and 6. Figures 7 and 8 show the East wall cases. For both cross sections, in both the static case and the case with a seismic load, the factor of safety (FOS) is shown to be 2.0 or greater. Based on the factor of safety values, no slope instability is expected. The results are consistent with the expectations for this site given the strong rock, lack of unfavorable structure sets, and low hydrologic surface elevation. The observed long-term performance of the pit walls is also commensurate with high factor of safety values; they have demonstrated a long stand-up time with no maintenance and no recorded signs of slope instability. Automated reports generated by the RocScience Slide2 software can be found in the appendix.

Table 4. Summary of Limit Equilibrium Analysis Results

Cross Section Title	Water Surface	Static FOS	Seismic Hz Load 0.065g
CHMRP – South Wall	Water Table	2.2 (Fig. 5)	2.0 (Fig. 6)
CHMRP – East Wall	Water Table	2.5 (Fig. 7)	2.3 (Fig. 8)



LEGEND

TAP TDT TI TV
TBX TDTSH TLP
CONTACT
CONTACT-APPROXIMATELY LOCATED
CONTACT-CONCEALED
EDGE RUBBLE
FAULT

CALL & NICHOLAS, INC.
TUCSON, ARIZONA USA

DRAWN LMC | DATE 07/23 | REVISED 8/3/2023 1:28 PM

\USERS\SDEBRUIN\APPDATA\LOCAL\TEMP\ACPUBLISH_23392\FIG-1_GEO MAP FIT TO 5 CONT SURF CONTOURS_V2.DWG

CHMRP
JULY 2023 TOPO MAP WITH 1995 GEOLOGY

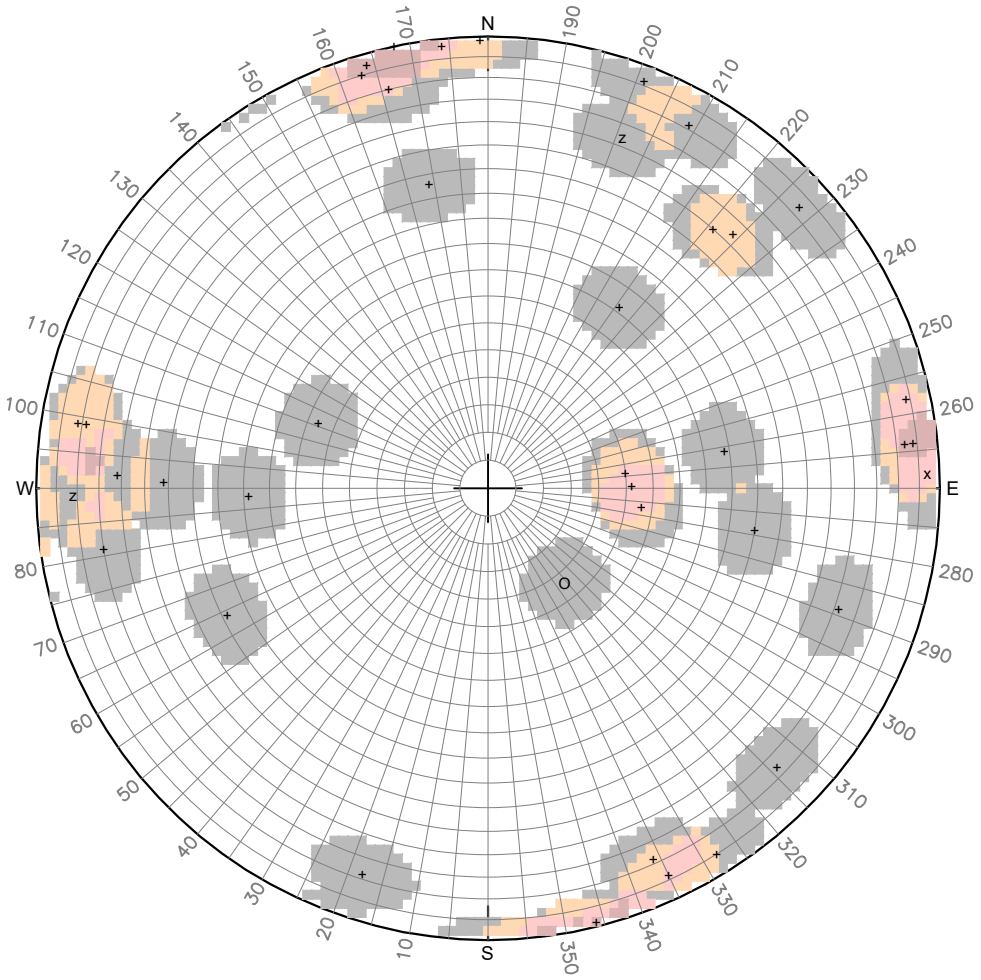
NAD27 NM-C

SCALE 1"=200'

FIGURE 1

SCHMIDT EQUAL AREA

LOWER HEMISPHERE



LEGEND

File Used: CHMRP_Mapping.len

No. Points: 40

Structure:

- O Bedding Joint Set
- D Dike
- x Fault
- \+ Joint Set
- z Single Joint

STRUCTURE CONCENTRATION:

	0.0% ~ 1.0%
	1.0% ~ 2.0%
	2.0% ~ 3.0%
	3.0% ~ 4.0%
	4.0% ~ 5.0%
	5.0% ~ 6.0%
	6.0% ~ 7.0%
	7.0% ~ 8.0%
	8.0% ~ 9.0%
	9.0% ~ 10.0%
	>10%

LEGEND

CALL & NICHOLAS, INC.
TUCSON, ARIZONA USA

DRAWN LMC | DATE 06/14 | REVISED 7/26/2023 11:31 AM

\NDA\CHMRP\2023\MEMO\SCHMIDT PLOTS\TDT_STEREONET.DWG

CHMRP - DIAMOND TAIL SS STRUCTURE MAPPING

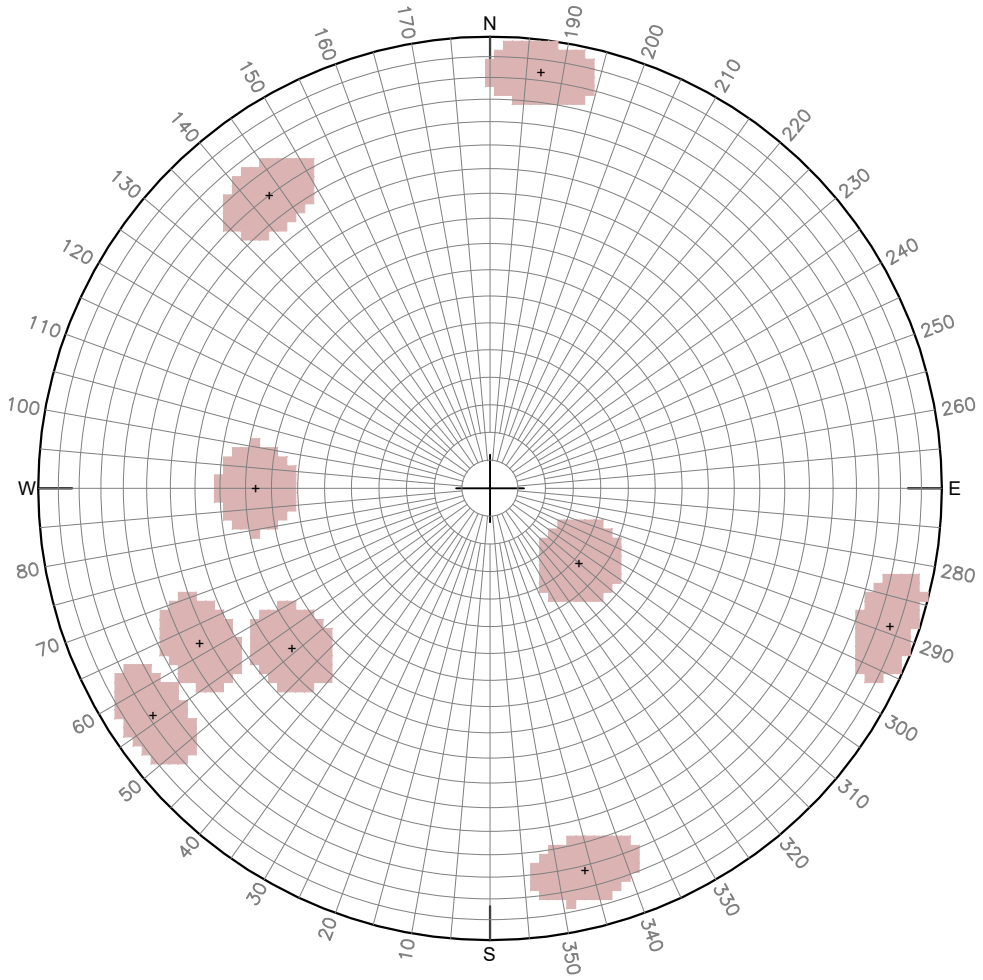
CNI

SCALE N.T.S.

FIGURE 2

SCHMIDT EQUAL AREA

LOWER HEMISPHERE



LEGEND

File Used: CHMRP_Mapping.len

No. Points: 9

Structure:

- O Bedding Joint Set
- D Dike
- x Fault
- \+ Joint Set
- z Single Joint

STRUCTURE CONCENTRATION:

	0.0% ~ 1.0%
	1.0% ~ 2.0%
	2.0% ~ 3.0%
	3.0% ~ 4.0%
	4.0% ~ 5.0%
	5.0% ~ 6.0%
	6.0% ~ 7.0%
	7.0% ~ 8.0%
	8.0% ~ 9.0%
	9.0% ~ 10.0%
	>10%

LEGEND

CALL & NICHOLAS, INC.
TUCSON, ARIZONA USA

DRAWN LMC | DATE 06/14 | REVISED 7/26/2023 11:29 AM

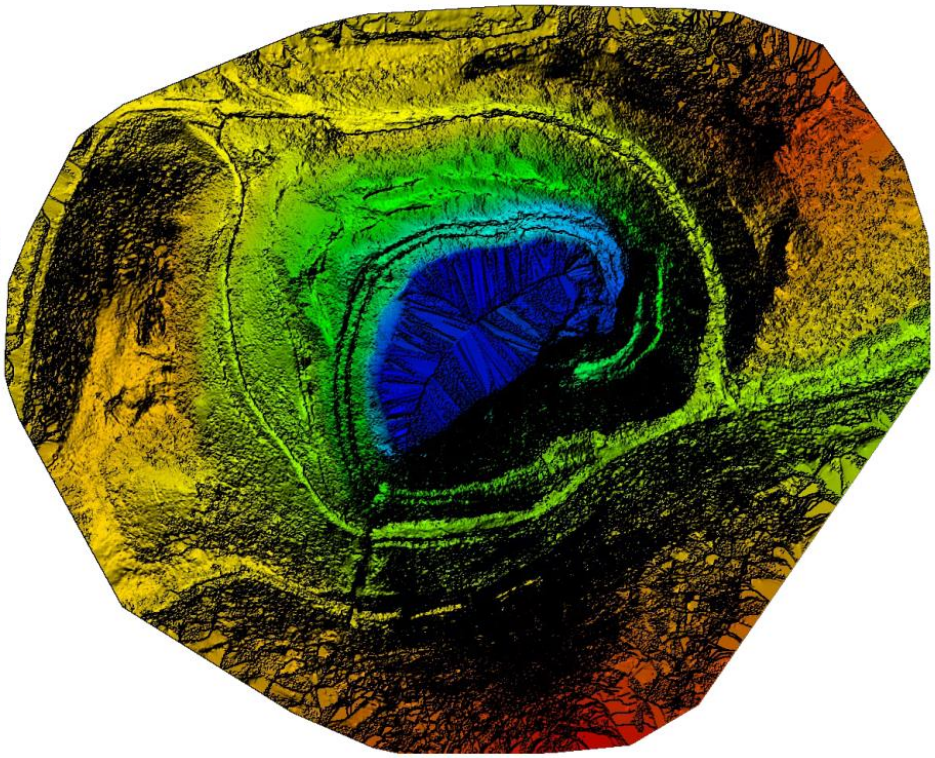
\NDA\CHMRP\2023\MEMO\SCHMIDT PLOTS\TBX_STEREONET.DWG

CHMRP - VOLCANIC BRECCIA STRUCTURE MAPPING

CNI

SCALE N.T.S.

FIGURE 3

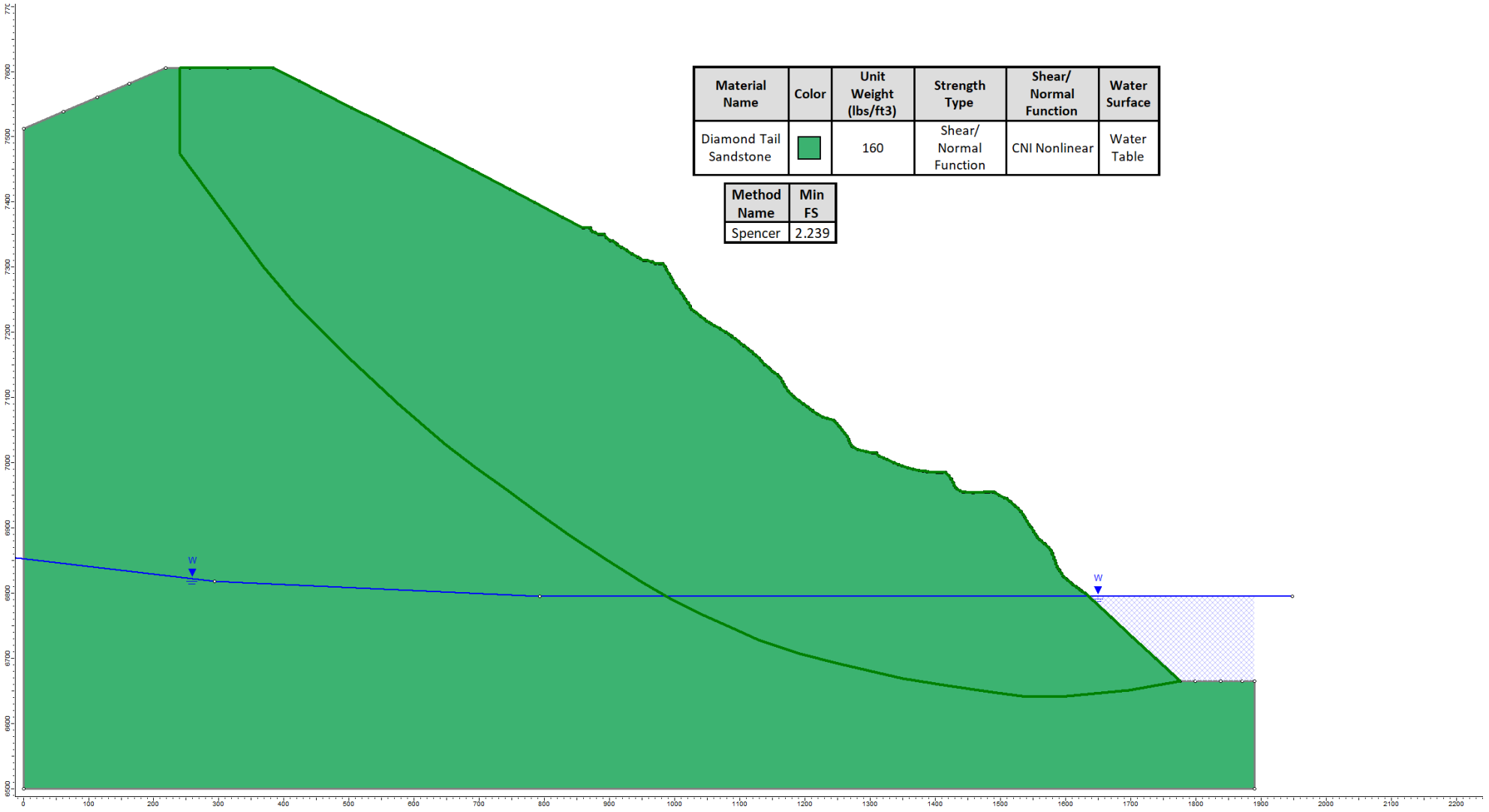


LEGEND

CALL & NICHOLAS

CHMRP
DRONE SURVEY ORTHOMOSAIC
AND CORRESPONDING DSM
CNI

DRAWN	DATE	SCALE	
SMD	7/26/2023	N.T.S	FIGURE 4



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear/ Normal Function	Water Surface
Diamond Tail Sandstone		160	Shear/ Normal Function	CNI Nonlinear	Water Table

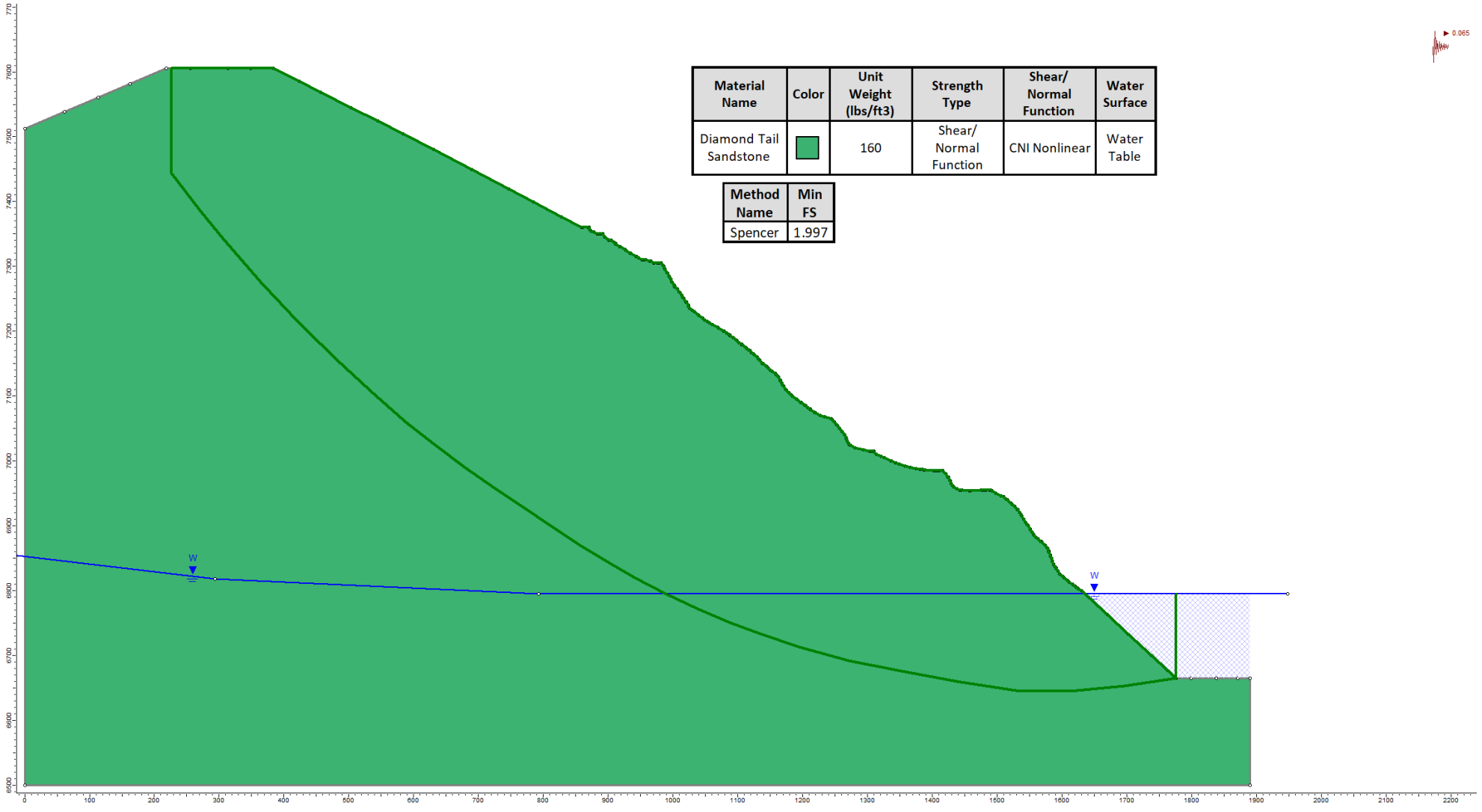
Method Name	Min FS
Spencer	2.239

LEGEND

CALL & NICHOLAS

CHMRP 2D LE ANALYSIS
SOUTH WALL
STATIC
CNI

DRAWN	DATE	SCALE	
SMD	8/9/2023	N.T.S	FIGURE 5



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear/ Normal Function	Water Surface
Diamond Tail Sandstone		160	Shear/ Normal Function	CNI Nonlinear	Water Table

Method Name	Min FS
Spencer	1.997

LEGEND

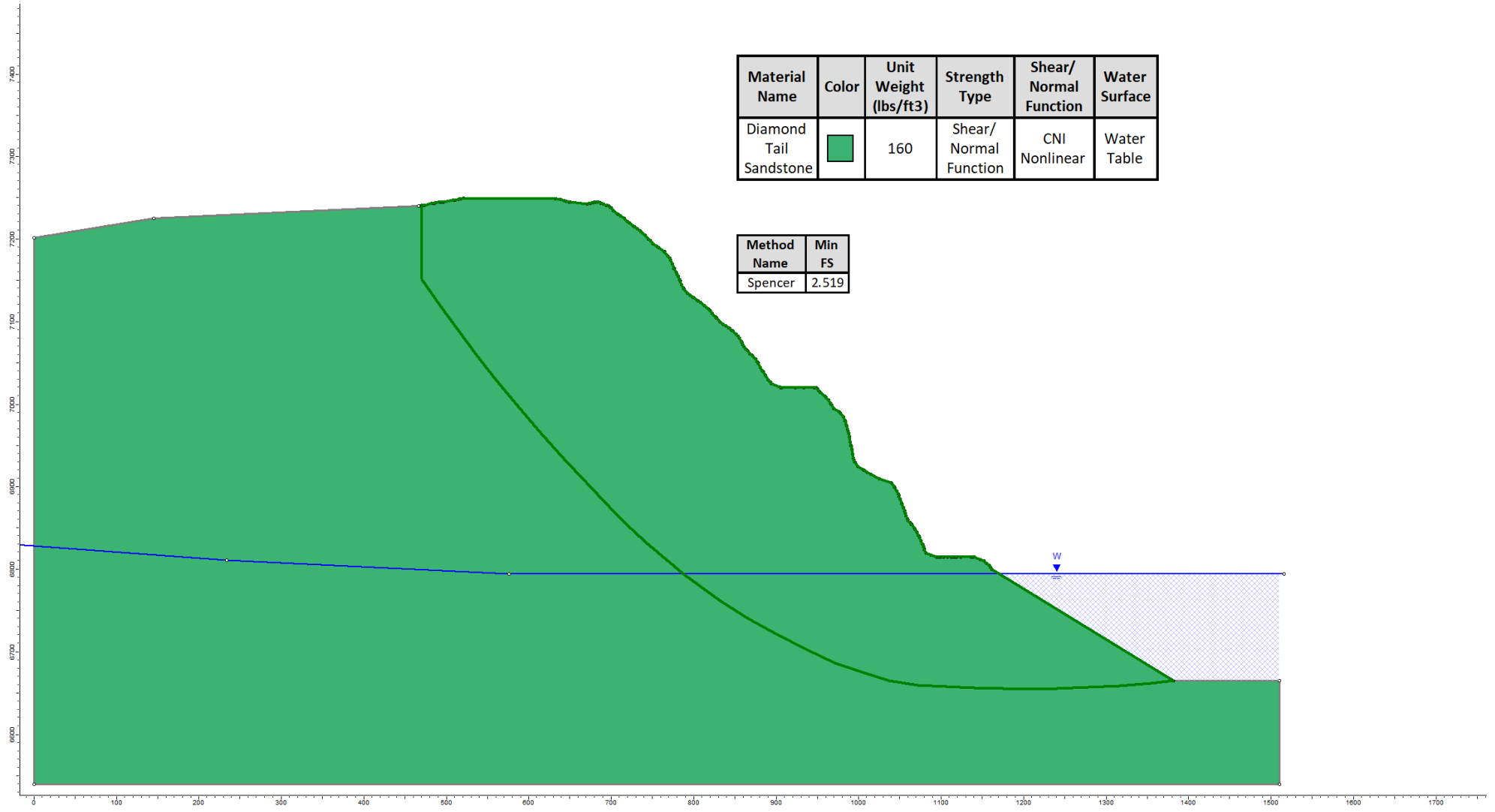
CALL & NICHOLAS

CHMRP 2D LE ANALYSIS
SOUTH WALL
SEISMIC LOAD Hz 0.065g
CNI

DRAWN	DATE	SCALE	
SMD	8/9/2023	N.T.S	FIGURE 6

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear/ Normal Function	Water Surface
Diamond Tail Sandstone		160	Shear/ Normal Function	CNI Nonlinear	Water Table

Method Name	Min FS
Spencer	2.519



LEGEND

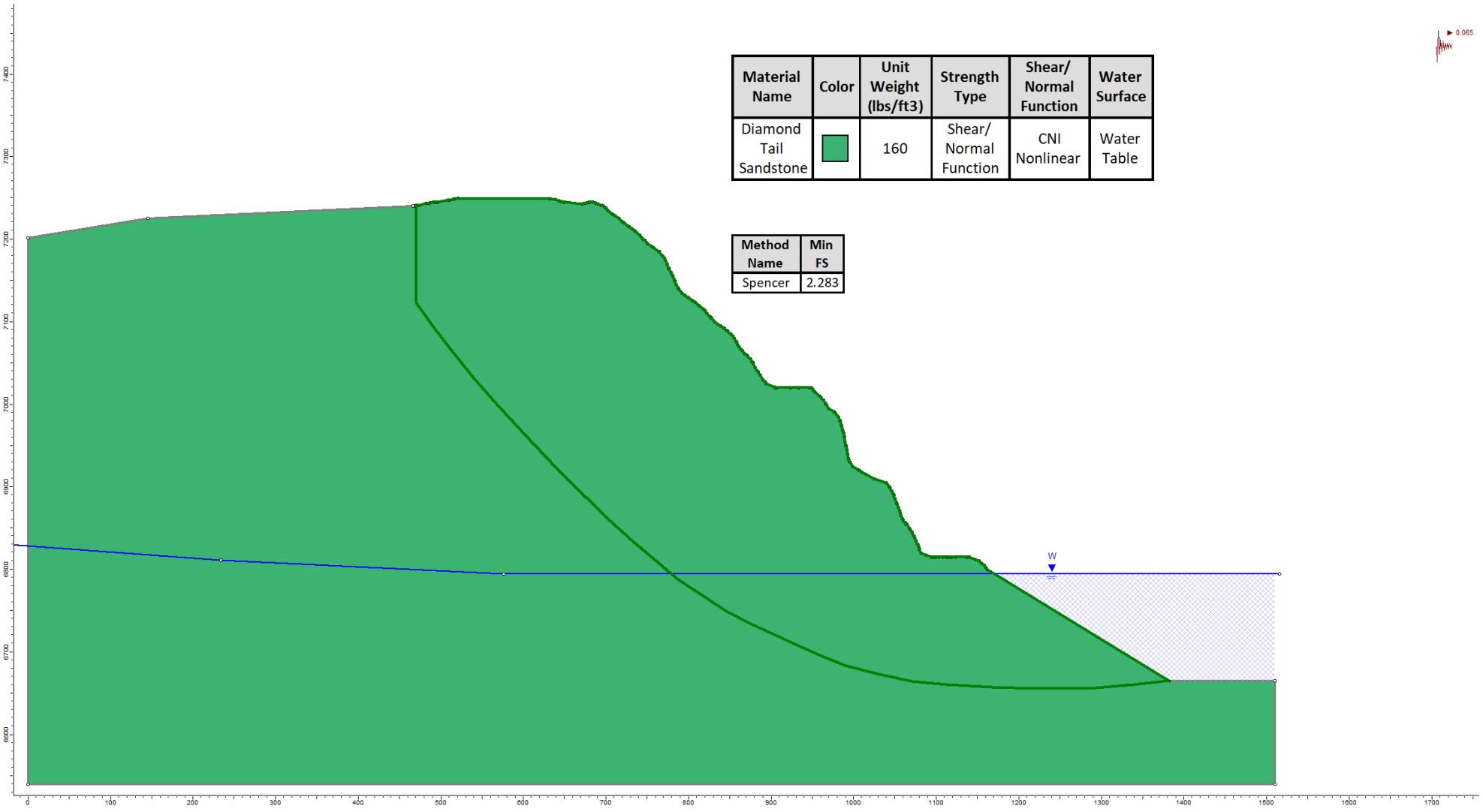
CALL & NICHOLAS

CHMRP 2D LE ANALYSIS
EAST WALL
STATIC
CNI

DRAWN	DATE	SCALE	
SMD	8/9/2023	N.T.S	FIGURE 7

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear/ Normal Function	Water Surface
Diamond Tail Sandstone		160	Shear/ Normal Function	CNI Nonlinear	Water Table

Method Name	Min FS
Spencer	2.283



LEGEND

CALL & NICHOLAS

CHMRP 2D LE ANALYSIS
EAST WALL
SEISMIC LOAD Hz 0.065g
CNI

DRAWN	DATE	SCALE	
SMD	8/9/2023	N.T.S	FIGURE 8

APPENDIX

CHMRP ROCSCIENCE SLIDE2 LIMIT EQUILIBRIUM
AUTOMATICALLY GENERATED REPORT
SOUTH WALL

rocscience

CHMRP - South Wall_TD
Slide2 - An Interactive Slope Stability Program
Date Created: 7/25/2023, 5:12:34 PM
Software Version: 9.028

Table of Contents

Slide2 Analysis Information

CHMRP - South Wall_TD

Project Summary

File Name:	CHMRP - South Wall_TD.slmd
Slide2 Modeler Version:	9.028
Project Title:	Slide2 - An Interactive Slope Stability Program
Date Created:	7/25/2023, 5:12:34 PM

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Group 1 with tension crack	Master Scenario	Spencer: 2.239330	00h:00m:26.32s
	G1 wo tension crack	Spencer: 2.251870	00h:00m:35.535s
	G1 w tc, 0.065 horiz seis	Spencer: 1.996780	00h:00m:30.690s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

All Open Scenarios

Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes
Eliminate vertical segments in non-circular search	Yes

Groundwater Analysis

All Open Scenarios

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

Random Numbers

All Open Scenarios

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

Surface Options

All Open Scenarios

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	12
Maximum Iterations:	500
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Group 1 with tension crack - G1 w tc, 0.065 horiz seis

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.065

All other Scenarios

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Diamond Tail Sandstone	
Color	
Strength Type	Shear/Normal Function
Unit Weight	160 lbs/ft3
Shear/Normal Function	CNI Nonlinear
Water Surface	Assigned per scenario
Hu Type	Custom
Hu	1
Specify alternate strength type above water surface	No

Shear Normal Functions

Name: CNI Nonlinear

Effective Normal (psf)	Shear (psf)
-8705.76	0.287098
-8270.47	1780.51
-7399.9	3808.18
-6529.32	5423
-5658.74	6844.82
-4788.17	8145
-3917.59	9358.37
-3047.02	10505.2
-2176.44	11598.8
-1305.86	12648.2
0	14153.8
2091.28	16427.6
4182.56	18568.8
6273.85	20605.1
8365.13	22555.4
10456.4	24433.3
12547.7	26248.9
14639	28010.3
16730.3	29723.7
18821.5	31394.1
20912.8	33025.9
23004.1	34622.6
25095.4	36187.1
27186.7	37722.1
29277.9	39229.7
31369.2	40712
33460.5	42170.6
35551.8	43607.2
37643.1	45022.9
39734.4	46419.1
41825.6	47796.9
43916.9	49157.2
46008.2	50500.9

48099.5	51829
50190.8	53142
52282	54440.8
54373.3	55725.9
56464.6	56998
58555.9	58257.5
60647.2	59505
62738.5	60741
75286.1	67937.6
87833.8	74809.2
100382	81410.2
112929	87781
125477	93952
138025	99947.7
150572	105787
163120	111487
175668	117059
188215	122516
200763	127867
213311	133119
225858	138282
238406	143359
250954	148358
263501	153283
276049	158139
288597	162929
301145	167657
313692	172327
326240	176941
347153	184514
368066	191952
388978	199263
409891	206457
430804	213541
451717	220522
472630	227406
493542	234198
514455	240904
535368	247527
556281	254073
577194	260544
598107	266945
619019	273278
639932	279547
660845	285753
681758	291900
702671	297990
723583	304025
744496	310008
765409	315939
786322	321821
807235	327656
828148	333444

849060	339189
869973	344890
890886	350550

Materials In Use

Material	Group 1 with tension crack	G1 wo tension crack	G1 w tc, 0.065 horiz seis
Diamond Tail Sandstone	✓	✓	✓

Global Minimums

Group 1 with tension crack - Master Scenario

Method: spencer

FS	2.239330
Axis Location:	1937.388, 8692.858
Left Slip Surface Endpoint:	240.764, 7473.140
Right Slip Surface Endpoint:	1776.186, 6665.000
Left Slope Intercept:	240.764 7605.105
Right Slope Intercept:	1776.186 6795.000
Resisting Moment:	1.78147e+11 lb-ft
Driving Moment:	7.95538e+10 lb-ft
Resisting Horizontal Force:	7.23228e+07 lb
Driving Horizontal Force:	3.22966e+07 lb
Total Slice Area:	541626 ft2
Surface Horizontal Width:	1535.42 ft
Surface Average Height:	352.754 ft

Group 1 with tension crack - G1 wo tension crack

Method: spencer

FS	2.251870
Axis Location:	1886.819, 8735.970
Left Slip Surface Endpoint:	163.663, 7581.894
Right Slip Surface Endpoint:	1776.186, 6665.000
Left Slope Intercept:	163.663 7581.894
Right Slope Intercept:	1776.186 6795.000
Resisting Moment:	1.86258e+11 lb-ft
Driving Moment:	8.27125e+10 lb-ft
Resisting Horizontal Force:	7.43656e+07 lb
Driving Horizontal Force:	3.30239e+07 lb
Total Slice Area:	555912 ft2
Surface Horizontal Width:	1612.52 ft
Surface Average Height:	344.747 ft

Group 1 with tension crack - G1 w tc, 0.065 horiz seis

Method: spencer

FS	1.996780
Axis Location:	1937.563, 8692.507
Left Slip Surface Endpoint:	226.129, 7443.633
Right Slip Surface Endpoint:	1776.186, 6665.000
Left Slope Intercept:	226.129 7605.105
Right Slope Intercept:	1776.186 6795.000
Resisting Moment:	1.78645e+11 lb-ft
Driving Moment:	8.94665e+10 lb-ft
Resisting Horizontal Force:	7.33709e+07 lb
Driving Horizontal Force:	3.67446e+07 lb
Total Slice Area:	554772 ft2
Surface Horizontal Width:	1550.06 ft
Surface Average Height:	357.904 ft

Global Minimum Coordinates

Group 1 with tension crack - Master Scenario

Method: spencer

X	Y
240.764	7473.14
283.471	7415.26
326.178	7357.78
368.885	7300.31
414.853	7246.12
460.842	7200.5
506.081	7155.62
576.828	7088.96
647.575	7027.99
695.054	6992.35
742.533	6957.85
790.012	6923.34
837.492	6888.84
894.095	6852.35
950.699	6815.86
995.561	6790.49
1040.11	6768.14
1084.66	6748.36
1129.21	6728.59
1192.27	6707.04
1255.34	6690.81
1350.56	6668.91
1419.44	6657.75
1488.19	6647.92
1540.22	6641.54
1592.25	6641.2
1644.61	6646.15
1696.98	6651.11
1776.19	6665
1776.19	6795

Group 1 with tension crack - G1 wo tension crack

Method: spencer

X	Y
163.663	7581.89
190.019	7538.52
216.409	7496.65
269.188	7420.14
321.956	7350.25
374.725	7284.75
430.83	7220.52
486.936	7162.49
537.637	7115.19
590.215	7069.47
641.218	7027.98
689.916	6989.41
738.613	6952.16
816.862	6897.7
895.112	6849.07
948.765	6816.61
1001.84	6785.91
1056.69	6758.24
1112.38	6732.33
1194.28	6702.96
1276.17	6679.84
1360.71	6664.12
1445.25	6650.66
1513.46	6641.08
1581.67	6635.51
1649.88	6642.18
1713.78	6651.25
1776.19	6665
1776.19	6795

Group 1 with tension crack - G1 w tc, 0.065 horiz seis

Method: spencer

X	Y
226.129	7443.63
269.698	7387.38
305.845	7342.94
363.591	7276.23
425.195	7210.37
487.259	7150.52
537.579	7104.47
588.434	7059.7
633.665	7024
678.983	6990.22
724.338	6958.67
769.692	6927.96
812.41	6899.03
855.127	6871.08
897.845	6845.36
940.562	6820.65
989.368	6795.63
1038.17	6771.66
1086.98	6751.12
1135.93	6732.87
1195.11	6712.68
1271.1	6692.61
1347.07	6677.14
1438.29	6659.63
1529.51	6646.04
1612.98	6644.86
1696.44	6653.31
1776.19	6665
1776.19	6795

Global Minimum Support Data

All Open Scenarios

No Supports Present

Valid and Invalid Surfaces

Group 1 with tension crack - Master Scenario

Method: spencer

Number of Valid Surfaces:	22853
Number of Invalid Surfaces:	2203

Error Codes

Error Code -106 reported for 11 surfaces
Error Code -108 reported for 121 surfaces
Error Code -111 reported for 531 surfaces
Error Code -121 reported for 470 surfaces
Error Code -1000 reported for 1070 surfaces

Group 1 with tension crack - G1 wo tension crack

Method: spencer

Number of Valid Surfaces:	21765
Number of Invalid Surfaces:	3293

Error Codes

Error Code -108 reported for 89 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 870 surfaces
Error Code -121 reported for 966 surfaces
Error Code -124 reported for 2 surfaces
Error Code -1000 reported for 1365 surfaces

Group 1 with tension crack - G1 w tc, 0.065 horiz seis

Method: spencer

Number of Valid Surfaces:	22303
Number of Invalid Surfaces:	2753

Error Codes

Error Code -106 reported for 12 surfaces
Error Code -108 reported for 85 surfaces
Error Code -111 reported for 691 surfaces
Error Code -121 reported for 543 surfaces
Error Code -1000 reported for 1422 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.

-111 = Safety factor equation did not converge

-121 = Concave failure surface, only convex surfaces have been defined as being allowed.

-124 = A slice has a width less than the minimum acceptable value.

-1000 = No valid slip surface is generated

Slice Data

Group 1 with tension crack - Master Scenario

Global Minimum Query (spencer) - Safety Factor: 2.23933

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	42.7072	1.0995e+06	-53.58	Diamond Tail Sandstone	15043.9	41.9223	10715.3	23995.2	9968.53	0	9968.53	24491.9	24491.9
2	42.7072	1.49363e+06	-53.3844	Diamond Tail Sandstone	16016.8	39.3273	12560.9	28127.9	14782.5	0	14782.5	31686	31686
3	42.7072	1.88635e+06	-53.3844	Diamond Tail Sandstone	16708	37.9642	14275.8	31968.3	19557.4	0	19557.4	38768.9	38768.9
4	22.9841	1.16812e+06	-49.692	Diamond Tail Sandstone	17767.5	36.2781	16282	36460.8	25468.2	0	25468.2	44661.9	44661.9
5	22.9841	1.23436e+06	-49.692	Diamond Tail Sandstone	17767.5	36.2781	16816.3	37657.2	27098.3	0	27098.3	46921.8	46921.8
6	45.9886	2.60999e+06	-44.7722	Diamond Tail Sandstone	18832.4	34.8953	18478.6	41379.7	32326.6	0	32326.6	50658.9	50658.9
7	22.6196	1.34458e+06	-44.7722	Diamond Tail Sandstone	19186.3	34.4855	18995.5	42537.2	33994.2	0	33994.2	52839.3	52839.3
8	22.6196	1.38471e+06	-44.7722	Diamond Tail Sandstone	19186.3	34.4855	19333.1	43293.3	35094.9	0	35094.9	54274.9	54274.9
9	35.3733	2.24091e+06	-43.2962	Diamond Tail Sandstone	19539.3	34.0972	20081.5	44969.2	37563.6	0	37563.6	56485	56485
10	35.3733	2.32907e+06	-43.2962	Diamond Tail Sandstone	19891.1	33.7284	20555.2	46029.8	39151.2	0	39151.2	58518.8	58518.8
11	35.3733	2.40763e+06	-40.7514	Diamond Tail Sandstone	20590.7	33.0426	21586.4	48339.1	42659.2	0	42659.2	61260.2	61260.2
12	35.3733	2.47502e+06	-40.7514	Diamond Tail Sandstone	20938.4	32.7228	21953.8	49161.8	43924.1	0	43924.1	62841.6	62841.6
13	23.7395	1.69376e+06	-36.8968	Diamond Tail Sandstone	21628.9	32.1233	23156.6	51855.3	48141.4	0	48141.4	65525.8	65525.8
14	23.7395	1.71407e+06	-36.8968	Diamond Tail Sandstone	21628.9	32.1233	23325.4	52233.2	48743.4	0	48743.4	66254.5	66254.5
15	23.7397	1.73331e+06	-36.0069	Diamond Tail Sandstone	21628.9	32.1233	23703.7	53080.5	50092.6	0	50092.6	67318.8	67318.8
16	23.7397	1.75145e+06	-36.0069	Diamond Tail Sandstone	21971.7	31.8418	23855.1	53419.4	50637.5	0	50637.5	67973.6	67973.6
17	23.7397	1.7696e+06	-36.0069	Diamond Tail Sandstone	21971.7	31.8418	24006.2	53757.7	51182.3	0	51182.3	68628.3	68628.3
18	23.7397	1.78774e+06	-36.0069	Diamond Tail Sandstone	21971.7	31.8418	24157.2	54096	51726.9	0	51726.9	69282.6	69282.6
19	23.7397	1.80589e+06	-36.0069	Diamond Tail Sandstone	21971.7	31.8418	24308.3	54434.4	52271.7	0	52271.7	69937.3	69937.3
20	23.7397	1.82403e+06	-36.0069	Diamond Tail Sandstone	22312.9	31.5712	24457.9	54769.4	52817	0	52817	70591.2	70591.2

21	28.3018	2.19481e+06	-32.807	Diamond Tail Sandstone	22652.4	31.3108	25406.6	56893.7	56293.3	0	56293.3	72671.1	72671.1
22	28.3018	2.22652e+06	-32.807	Diamond Tail Sandstone	22990.2	31.0599	25631.6	57397.7	57128.4	0	57128.4	73651.3	73651.3
23	28.3018	2.23481e+06	-32.807	Diamond Tail Sandstone	22990.2	31.0599	25690.3	57529	57346.6	0	57346.6	73907.3	73907.3
24	28.3018	2.23816e+06	-32.807	Diamond Tail Sandstone	22990.2	31.0599	25714	57582.2	57434.8	0	57434.8	74010.9	74010.9
25	36.8866	2.95687e+06	-29.4891	Diamond Tail Sandstone	23660.9	30.5843	26782.9	59975.8	61443.7	0	61443.7	76590	76590
26	7.97538	633322	-29.4891	Diamond Tail Sandstone	23660.9	30.5843	26592.3	59548.9	60862.1	140.648	60721.5	75900.6	75759.9
27	44.5483	3.35167e+06	-26.6464	Diamond Tail Sandstone	23326.4	30.8179	26213.1	58699.7	60275.9	978.791	59297.1	73429	72450.2
28	22.2745	1.61539e+06	-23.9325	Diamond Tail Sandstone	23326.4	30.8179	26027.3	58283.7	60584.6	1984.65	58599.9	72135.9	70151.3
29	22.2745	1.60269e+06	-23.9325	Diamond Tail Sandstone	22990.2	31.0599	25733.3	57625.3	60107.7	2601.53	57506.2	71528.6	68927.1
30	44.549	3.13874e+06	-23.9325	Diamond Tail Sandstone	22652.4	31.3108	25145.2	56308.5	58857.9	3526.84	55331	70017.7	66490.9
31	31.5319	2.12895e+06	-18.8712	Diamond Tail Sandstone	22652.4	31.3108	25439.7	56967.9	60895.3	4479.99	56415.3	69591	65111
32	31.5319	2.00453e+06	-18.8712	Diamond Tail Sandstone	21971.7	31.8418	24292.7	54399.3	57367.7	5152.54	52215.2	65671.3	60518.8
33	31.532	1.91579e+06	-14.4271	Diamond Tail Sandstone	22312.9	31.5712	24488.4	54837.5	58669.4	5741.91	52927.5	64969.2	59227.3
34	31.532	1.866e+06	-14.4271	Diamond Tail Sandstone	21971.7	31.8418	23930.8	53588.9	57158.6	6248.1	50910.5	63315	57066.9
35	47.6127	2.59929e+06	-12.9518	Diamond Tail Sandstone	21284.4	32.4167	22883.1	51242.8	54019.3	6842.83	47176.5	59282	52439.2
36	47.6127	2.51859e+06	-12.9518	Diamond Tail Sandstone	20938.4	32.7228	22212	49740	52349.9	7526.12	44823.8	57458.3	49932.2
37	34.4403	1.78525e+06	-9.20834	Diamond Tail Sandstone	21284.4	32.4167	22641.3	50701.3	54365.6	8041.96	46323.6	58036.1	49994.1
38	34.4403	1.78945e+06	-9.20834	Diamond Tail Sandstone	21284.4	32.4167	22569.3	50540	54460.2	8390.35	46069.8	58119	49728.6
39	34.3763	1.68773e+06	-8.13272	Diamond Tail Sandstone	20590.7	33.0426	21890.3	49019.7	52423.4	8717.82	43705.5	55551.6	46833.7
40	34.3763	1.67282e+06	-8.13272	Diamond Tail Sandstone	20590.7	33.0426	21664.1	48513.1	51951.1	9024.36	42926.7	55047	46022.6
41	26.0135	1.25944e+06	-6.99362	Diamond Tail Sandstone	20590.7	33.0426	21783.7	48780.9	52615.8	9277.19	43338.6	55288.1	46010.9
42	26.0135	1.18826e+06	-6.99362	Diamond Tail Sandstone	20241.6	33.3774	20886.2	46771.2	49745	9476.32	40268.7	52307.1	42830.8
43	26.0144	1.04478e+06	-0.378884	Diamond Tail Sandstone	19891.1	33.7284	20680.1	46309.5	49151.4	9581.25	39570.1	49288.1	39706.9
44	26.0144	903970	-0.378884	Diamond Tail Sandstone	18832.4	34.8953	18791.5	42080.3	42923	9591.98	33331.1	43047.3	33455.3
45	26.1827	738936	5.41027	Diamond Tail Sandstone	18477.7	35.3288	17754.6	39758.3	39543.5	9519.98	30023.5	37862	28342

46	26.1827	644406	5.41027	Diamond Tail Sandstone	17767.5	36.2781	16339.3	36589	35008.1	9365.25	25642.9	33460.6	24095.4
47	26.1827	566375	5.41027	Diamond Tail Sandstone	17059.4	37.361	15332.4	34334.2	31836.9	9210.51	22626.4	30384.8	21174.3
48	26.1827	494059	5.41027	Diamond Tail Sandstone	16708	37.9642	14447.5	32352.8	29106.1	9055.78	20050.3	27737.8	18682
49	39.6026	599763	9.94369	Diamond Tail Sandstone	16708	37.9642	14225	31854.4	28173.2	8761.79	19411.4	25679.4	16917.6
50	39.6026	414092	9.94369	Diamond Tail Sandstone	15680.8	40.1054	12501.2	27994.4	22948.6	8328.55	14620	20756.9	12428.4

Group 1 with tension crack - G1 wo tension crack

Global Minimum Query (spencer) - Safety Factor: 2.25187

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	26.3563	115034	-58.7169	Diamond Tail Sandstone	14222.3	50.3215	5571.01	12545.2	-1391.29	0	-1391.29	7777.51	7777.51
2	26.3894	342373	-57.7744	Diamond Tail Sandstone	14286.4	45.6759	7508.07	16907.2	2559.68	0	2559.68	14470.5	14470.5
3	26.3896	538557	-55.4028	Diamond Tail Sandstone	14754.2	43.0021	9330.49	21011.1	6709.17	0	6709.17	20235.9	20235.9
4	26.3896	700226	-55.4028	Diamond Tail Sandstone	15043.9	41.9223	10551.7	23761	9707.78	0	9707.78	25004.9	25004.9
5	26.3841	854587	-52.9443	Diamond Tail Sandstone	15680.8	40.1054	12097.8	27242.6	13727.5	0	13727.5	29749.3	29749.3
6	26.3841	1.00209e+06	-52.9443	Diamond Tail Sandstone	16016.8	39.3273	13176.6	29672.1	16667.4	0	16667.4	34118	34118
7	26.3844	1.14499e+06	-51.1457	Diamond Tail Sandstone	16708	37.9642	14546.8	32757.5	20568.9	0	20568.9	38626.4	38626.4
8	26.3844	1.28325e+06	-51.1457	Diamond Tail Sandstone	17412.8	36.8007	15526.5	34963.7	23460.2	0	23460.2	42733.9	42733.9
9	28.0526	1.49562e+06	-48.8615	Diamond Tail Sandstone	18122.6	35.7887	16883.6	38019.7	27599.6	0	27599.6	46927.4	46927.4
10	28.0526	1.57992e+06	-48.8615	Diamond Tail Sandstone	18477.7	35.3288	17441.2	39275.3	29342.3	0	29342.3	49308.4	49308.4
11	56.1056	3.37488e+06	-45.9655	Diamond Tail Sandstone	19186.3	34.4855	18806.9	42350.6	33722.5	0	33722.5	53174.2	53174.2
12	25.3505	1.60762e+06	-43.013	Diamond Tail Sandstone	19891.1	33.7284	20099.1	45260.6	37999.2	0	37999.2	56750.4	56750.4
13	25.3505	1.65194e+06	-43.013	Diamond Tail Sandstone	19891.1	33.7284	20432.9	46012.2	39124.9	0	39124.9	58187.6	58187.6
14	26.289	1.75641e+06	-41.0092	Diamond Tail Sandstone	20241.6	33.3774	21216.3	47776.4	41794.5	0	41794.5	60243.5	60243.5
15	26.289	1.79698e+06	-41.0092	Diamond Tail Sandstone	20590.7	33.0426	21513	48444.5	42821.2	0	42821.2	61528.3	61528.3
16	25.5018	1.77732e+06	-39.1265	Diamond Tail Sandstone	20938.4	32.7228	22217.5	50031	45276.6	0	45276.6	63349.4	63349.4
17	25.5018	1.80728e+06	-39.1265	Diamond Tail Sandstone	21284.4	32.4167	22446.7	50547	46080.6	0	46080.6	64339.8	64339.8
18	48.6976	3.53034e+06	-38.3838	Diamond Tail Sandstone	21284.4	32.4167	22940.7	51659.4	47832.5	0	47832.5	66004.5	66004.5
19	24.3488	1.80181e+06	-37.4086	Diamond Tail Sandstone	21628.9	32.1233	23470	52851.4	49727.7	0	49727.7	67677.4	67677.4
20	24.3488	1.82451e+06	-37.4086	Diamond Tail Sandstone	21971.7	31.8418	23651.9	53261.1	50382.4	0	50382.4	68471.3	68471.3
21	39.1245	2.97081e+06	-34.8397	Diamond Tail Sandstone	22312.9	31.5712	24477.6	55120.3	53387.9	0	53387.9	70425.4	70425.4
22	39.1245	3.01258e+06	-34.8397	Diamond Tail Sandstone	22312.9	31.5712	24689.7	55597.9	54165.2	0	54165.2	71350.3	71350.3

23	39.1246	3.04522e+06	-31.8601	Diamond Tail Sandstone	22990.2	31.0599	25593.5	57633.2	57519.5	0	57519.5	73425.3	73425.3
24	39.1246	3.08944e+06	-31.8601	Diamond Tail Sandstone	22990.2	31.0599	25822.5	58148.9	58375.7	0	58375.7	74423.8	74423.8
25	26.8266	2.12726e+06	-31.171	Diamond Tail Sandstone	23326.4	30.8179	26061.9	58688	59277.6	0	59277.6	75043.2	75043.2
26	26.8266	2.12568e+06	-31.171	Diamond Tail Sandstone	23326.4	30.8179	26049.9	58661	59232.3	0	59232.3	74990.7	74990.7
27	37.3679	2.99675e+06	-30.0435	Diamond Tail Sandstone	23660.9	30.5843	26528.4	59738.6	61042.3	0	61042.3	76385.4	76385.4
28	15.7093	1.24193e+06	-30.0435	Diamond Tail Sandstone	23326.4	30.8179	26222.5	59049.6	60167	283.402	59883.6	75333.2	75049.8
29	27.422	2.07471e+06	-26.7789	Diamond Tail Sandstone	23326.4	30.8179	26134.1	58850.7	60549	998.658	59550.3	73738.2	72739.5
30	27.422	2.00581e+06	-26.7789	Diamond Tail Sandstone	22990.2	31.0599	25366.3	57121.5	58532.2	1862.22	56669.9	71333.8	69471.6
31	27.8466	2.01803e+06	-24.9439	Diamond Tail Sandstone	22990.2	31.0599	25438.7	57284.7	59638.9	2698.1	56940.8	71470.8	68772.7
32	27.8466	1.99009e+06	-24.9439	Diamond Tail Sandstone	22652.4	31.3108	24999.2	56295	58815.4	3506.3	55309.1	70443	66936.7
33	40.9485	2.8262e+06	-19.7276	Diamond Tail Sandstone	22990.2	31.0599	25459.1	57330.5	61385.3	4368.54	57016.8	70514.9	66146.3
34	40.9485	2.64195e+06	-19.7276	Diamond Tail Sandstone	21971.7	31.8418	24131.1	54340.2	57405	5284.82	52120.2	66058.4	60773.5
35	40.9488	2.49825e+06	-15.7681	Diamond Tail Sandstone	21971.7	31.8418	23955.2	53944	57586	6103.72	51482.3	64350.2	58246.5
36	40.9488	2.38332e+06	-15.7681	Diamond Tail Sandstone	21628.9	32.1233	23025.8	51851.2	54960.1	6825.23	48134.9	61462	54636.7
37	42.2693	2.30163e+06	-10.5355	Diamond Tail Sandstone	21628.9	32.1233	23057.1	51921.7	55678.6	7431.26	48247.3	59966.8	52535.5
38	42.2693	2.24018e+06	-10.5355	Diamond Tail Sandstone	21284.4	32.4167	22504.1	50676.4	54206.3	7921.81	46284.5	58391.6	50469.8
39	42.2695	2.21056e+06	-9.04374	Diamond Tail Sandstone	21284.4	32.4167	22517.5	50706.4	54708.8	8376.99	46331.8	58292.8	49915.8
40	42.2695	2.15333e+06	-9.04374	Diamond Tail Sandstone	20938.4	32.7228	21999.4	49539.7	53309	8796.81	44512.2	56810.6	48013.8
41	34.104	1.67059e+06	-7.99405	Diamond Tail Sandstone	20590.7	33.0426	21559.8	48549.8	52139.4	9156.15	42983.2	55167.1	46011
42	34.104	1.67614e+06	-7.99405	Diamond Tail Sandstone	20590.7	33.0426	21514.1	48446.9	52279.9	9455.01	42824.9	55301.3	45846.2
43	34.1041	1.55132e+06	-4.66655	Diamond Tail Sandstone	20241.6	33.3774	21108.7	47534.1	51117.9	9691.29	41426.7	52841	43149.7
44	34.1041	1.32198e+06	-4.66655	Diamond Tail Sandstone	19186.3	34.4855	18892.8	42544.1	43869	9865	34004	45411.2	35546.2
45	34.1043	1.03533e+06	5.57973	Diamond Tail Sandstone	18832.4	34.8953	18276.5	41156.2	41854.1	9847.91	32006.2	40068.6	30220.7
46	34.1043	859232	5.57973	Diamond Tail Sandstone	17767.5	36.2781	16297.4	36699.6	35433.6	9640	25793.6	33841.4	24201.4
47	31.951	682714	8.08312	Diamond Tail Sandstone	17412.8	36.8007	15608.5	35148.4	33101.5	9394.48	23707.1	30884.8	21490.3

48	31.951	567297	8.08312	Diamond Tail Sandstone	16708	37.9642	14419.1	32470	29311.7	9111.32	20200.4	27263.9	18152.6
49	31.2038	436534	12.4226	Diamond Tail Sandstone	16708	37.9642	14119.3	31794.8	28090.4	8755.29	19335.1	24980.2	16224.9
50	31.2038	314262	12.4226	Diamond Tail Sandstone	16016.8	39.3273	12625.1	28430.1	23477.7	8326.39	15151.3	20696.7	12370.3

Group 1 with tension crack - G1 w tc, 0.065 horiz seis

Global Minimum Query (spencer) - Safety Factor: 1.99678

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	43.5689	1.32168e+06	-52.2393	Diamond Tail Sandstone	15355	40.9647	12722.4	25403.9	11574.3	0	11574.3	27999.2	27999.2
2	36.1472	1.38771e+06	-50.8754	Diamond Tail Sandstone	16016.8	39.3273	14635.1	29223.1	16119.3	0	16119.3	34112.1	34112.1
3	28.8728	1.28814e+06	-49.1235	Diamond Tail Sandstone	16708	37.9642	16274.9	32497.3	20235.5	0	20235.5	39039.2	39039.2
4	28.8728	1.44225e+06	-49.1235	Diamond Tail Sandstone	17059.4	37.361	17330.3	34604.8	22980.8	0	22980.8	43004.1	43004.1
5	30.8019	1.69752e+06	-46.9115	Diamond Tail Sandstone	18122.6	35.7887	18904.3	37747.8	27222.3	0	27222.3	47432	47432
6	30.8019	1.80013e+06	-46.9115	Diamond Tail Sandstone	18122.6	35.7887	19555.4	39047.8	29025.6	0	29025.6	49931.3	49931.3
7	31.0321	1.89258e+06	-43.9588	Diamond Tail Sandstone	18832.4	34.8953	20857.6	41648	32711.1	0	32711.1	52824.1	52824.1
8	31.0321	1.96382e+06	-43.9588	Diamond Tail Sandstone	19186.3	34.4855	21315	42561.3	34029.4	0	34029.4	54583.4	54583.4
9	25.1601	1.64203e+06	-42.4634	Diamond Tail Sandstone	19539.3	34.0972	22129.9	44188.6	36410.6	0	36410.6	56663	56663
10	25.1601	1.68389e+06	-42.4634	Diamond Tail Sandstone	19539.3	34.0972	22463.1	44853.9	37393.4	0	37393.4	57950.7	57950.7
11	25.4276	1.74251e+06	-41.3548	Diamond Tail Sandstone	19891.1	33.7284	23103.5	46132.6	39305.1	0	39305.1	59641.3	59641.3
12	25.4276	1.7816e+06	-41.3548	Diamond Tail Sandstone	20241.6	33.3774	23411.3	46747.3	40232.7	0	40232.7	60839.8	60839.8
13	45.2305	3.24636e+06	-38.2858	Diamond Tail Sandstone	20938.4	32.7228	24666.2	49253	44065.8	0	44065.8	63536.1	63536.1
14	22.6592	1.657e+06	-36.7056	Diamond Tail Sandstone	21284.4	32.4167	25419.3	50756.8	46411.4	0	46411.4	65362.2	65362.2
15	22.6592	1.67508e+06	-36.7056	Diamond Tail Sandstone	21284.4	32.4167	25585.1	51087.8	46932.2	0	46932.2	66006.6	66006.6
16	45.3547	3.39892e+06	-34.8218	Diamond Tail Sandstone	21628.9	32.1233	26372.1	52659.2	49421.9	0	49421.9	67765.8	67765.8
17	22.6772	1.71968e+06	-34.1016	Diamond Tail Sandstone	21971.7	31.8418	26782.9	53479.5	50734.2	0	50734.2	68868.6	68868.6
18	22.6772	1.73216e+06	-34.1016	Diamond Tail Sandstone	21971.7	31.8418	26899.4	53712.2	51108.8	0	51108.8	69322.2	69322.2
19	42.7175	3.29677e+06	-34.1016	Diamond Tail Sandstone	21971.7	31.8418	27067.5	54047.8	51649.2	0	51649.2	69976.4	69976.4
20	42.7175	3.33771e+06	-33.1994	Diamond Tail Sandstone	22312.9	31.5712	27553.4	55018.1	53221.4	0	53221.4	71251.5	71251.5
21	42.7176	3.38994e+06	-31.0542	Diamond Tail Sandstone	22652.4	31.3108	28497.5	56903.2	56308.8	0	56308.8	73468.5	73468.5
22	42.7172	3.39634e+06	-30.0454	Diamond Tail Sandstone	22990.2	31.0599	28853.6	57614.2	57487.8	0	57487.8	74176.9	74176.9

23	24.4031	1.94015e+06	-27.1455	Diamond Tail Sandstone	23326.4	30.8179	29794.9	59493.8	60628.3	0	60628.3	75905	75905
24	24.4031	1.95948e+06	-27.1455	Diamond Tail Sandstone	23660.9	30.5843	29972.5	59848.5	61228.2	0	61228.2	76595.9	76595.9
25	1.27733	101398	-26.1566	Diamond Tail Sandstone	23660.9	30.5843	30091.6	60086.3	61630.7	0	61630.7	76409.3	76409.3
26	23.7644	1.83236e+06	-26.1566	Diamond Tail Sandstone	23326.4	30.8179	29460.8	58826.7	59874.1	364.071	59510	74342.9	73978.8
27	23.7644	1.74974e+06	-26.1566	Diamond Tail Sandstone	22652.4	31.3108	28433.2	56774.9	57190.1	1092.35	56097.7	71154.3	70061.9
28	24.4038	1.75926e+06	-22.8254	Diamond Tail Sandstone	22990.2	31.0599	28916.4	57739.6	59473	1776.96	57696	71643.4	69866.4
29	24.4038	1.74136e+06	-22.8254	Diamond Tail Sandstone	22652.4	31.3108	28537.6	56983.4	58858.5	2417.88	56440.6	70869.5	68451.6
30	24.4743	1.71637e+06	-20.4444	Diamond Tail Sandstone	22990.2	31.0599	28809.3	57525.9	60364.1	3022.99	57341.1	71103.6	68080.6
31	24.4743	1.67472e+06	-20.4444	Diamond Tail Sandstone	22652.4	31.3108	28196.4	56302	58912.7	3592.3	55320.4	69423.7	65831.4
32	29.5889	1.95091e+06	-18.8387	Diamond Tail Sandstone	22312.9	31.5712	27873.8	55657.9	58454.4	4191.92	54262.5	67964.5	63772.5
33	29.5889	1.83398e+06	-18.8387	Diamond Tail Sandstone	21971.7	31.8418	26618.1	53150.5	55026.2	4821.86	50204.3	64107.8	59285.9
34	37.9971	2.25621e+06	-14.7923	Diamond Tail Sandstone	21971.7	31.8418	26967.9	53849	56779	5449.89	51329.1	63900.4	58450.5
35	37.9971	2.16501e+06	-14.7923	Diamond Tail Sandstone	21628.9	32.1233	26068.6	52053.2	54532.7	6076	48456.7	61416.5	55340.5
36	37.9857	2.00467e+06	-11.5117	Diamond Tail Sandstone	21284.4	32.4167	25670	51257.4	53829.8	6630.43	47199.3	59057.9	52427.5
37	37.9857	1.96472e+06	-11.5117	Diamond Tail Sandstone	20938.4	32.7228	25175.8	50270.5	52762.6	7113.18	45649.4	57890	50776.9
38	30.4053	1.54268e+06	-10.864	Diamond Tail Sandstone	20938.4	32.7228	24923	49765.7	52400.5	7536.62	44863.9	57183.7	49647.1
39	30.4053	1.54579e+06	-10.864	Diamond Tail Sandstone	20938.4	32.7228	24823.9	49567.9	52456.7	7900.74	44556	57220.9	49320.1
40	30.4053	1.51603e+06	-10.864	Diamond Tail Sandstone	20590.7	33.0426	24382.8	48687.1	51459.3	8264.87	43194.4	56138.8	47873.9
41	45.6075	2.17797e+06	-8.47263	Diamond Tail Sandstone	20590.7	33.0426	24321.9	48565.5	51666.2	8658.9	43007.3	55289.3	46630.4
42	45.6075	2.15443e+06	-8.47263	Diamond Tail Sandstone	20590.7	33.0426	23993.9	47910.6	51083.3	9082.83	42000.5	54657.5	45574.7
43	27.8235	1.16127e+06	-0.810325	Diamond Tail Sandstone	20590.7	33.0426	24599.4	49119.6	53166.3	9307.08	43859.2	53514.2	44207.1
44	27.8235	1.00354e+06	-0.810325	Diamond Tail Sandstone	19539.3	34.0972	22408.8	44745.4	46564.6	9331.63	37233	46881.6	37549.9
45	27.8235	803246	-0.810325	Diamond Tail Sandstone	18122.6	35.7887	19448.6	38834.6	38085.9	9356.19	28729.8	38361	29004.8
46	27.822	693480	5.78186	Diamond Tail Sandstone	18477.7	35.3288	19942.4	39820.6	39392	9280.57	30111.5	37372.7	28092.2
47	27.822	601827	5.78186	Diamond Tail Sandstone	17767.5	36.2781	18707.6	37354.9	35791	9104.78	26686.2	33896.7	24792

48	27.822	519362	5.78186	Diamond Tail Sandstone	17412.8	36.8007	17752.9	35448.7	33037.4	8928.99	24108.4	31239.8	22310.8
49	39.872	594769	8.3365	Diamond Tail Sandstone	17412.8	36.8007	17380.7	34705.5	31773.7	8658.81	23114.9	29226.8	20568
50	39.872	413884	8.3365	Diamond Tail Sandstone	16708	37.9642	15728.3	31405.9	27130.8	8294.23	18836.5	24826	16531.8

Interslice Data

Group 1 with tension crack - Master Scenario

Global Minimum Query (spencer) - Safety Factor: 2.23933

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	240.764	7473.14	0	0	0
2	283.471	7415.26	119402	53536	24.1499
3	326.178	7357.78	432552	193943	24.15
4	368.885	7300.31	946888	424556	24.15
5	391.869	7273.22	1.26271e+06	566159	24.1499
6	414.853	7246.12	1.61041e+06	722058	24.15
7	460.842	7200.5	2.23548e+06	1.00232e+06	24.15
8	483.462	7178.06	2.56866e+06	1.15171e+06	24.15
9	506.081	7155.62	2.9189e+06	1.30874e+06	24.1499
10	541.455	7122.29	3.46053e+06	1.5516e+06	24.1501
11	576.828	7088.96	4.03833e+06	1.81066e+06	24.15
12	612.201	7058.48	4.57505e+06	2.05131e+06	24.15
13	647.575	7027.99	5.13733e+06	2.30342e+06	24.15
14	671.314	7010.17	5.44558e+06	2.44163e+06	24.15
15	695.054	6992.35	5.76056e+06	2.58286e+06	24.15
16	718.793	6975.1	6.06205e+06	2.71804e+06	24.15
17	742.533	6957.85	6.36935e+06	2.85582e+06	24.15
18	766.273	6940.59	6.68247e+06	2.99621e+06	24.15
19	790.012	6923.34	7.00139e+06	3.13921e+06	24.15
20	813.752	6906.09	7.32613e+06	3.28481e+06	24.15
21	837.492	6888.84	7.65672e+06	3.43304e+06	24.15
22	865.793	6870.59	7.96469e+06	3.57112e+06	24.15
23	894.095	6852.35	8.28153e+06	3.71318e+06	24.15
24	922.397	6834.1	8.60069e+06	3.85628e+06	24.15
25	950.699	6815.86	8.92078e+06	3.99981e+06	24.15
26	987.586	6795	9.21458e+06	4.13154e+06	24.15
27	995.561	6790.49	9.277e+06	4.15952e+06	24.15
28	1040.11	6768.14	9.45662e+06	4.24006e+06	24.15
29	1062.38	6758.25	9.4758e+06	4.24866e+06	24.15
30	1084.66	6748.36	9.49682e+06	4.25808e+06	24.15
31	1129.21	6728.59	9.54035e+06	4.2776e+06	24.15
32	1160.74	6717.82	9.39452e+06	4.21221e+06	24.15
33	1192.27	6707.04	9.24684e+06	4.146e+06	24.15
34	1223.8	6698.93	8.9506e+06	4.01317e+06	24.15
35	1255.34	6690.81	8.65968e+06	3.88274e+06	24.15
36	1302.95	6679.86	8.16167e+06	3.65944e+06	24.15
37	1350.56	6668.91	7.67734e+06	3.44228e+06	24.15
38	1385	6663.33	7.2011e+06	3.22876e+06	24.1501
39	1419.44	6657.75	6.72788e+06	3.01658e+06	24.15
40	1453.82	6652.83	6.2329e+06	2.79464e+06	24.15
41	1488.19	6647.92	5.74338e+06	2.57516e+06	24.15
42	1514.21	6644.73	5.34461e+06	2.39636e+06	24.15
43	1540.22	6641.54	4.96003e+06	2.22393e+06	24.15
44	1566.24	6641.37	4.43051e+06	1.98651e+06	24.1501
45	1592.25	6641.2	3.94905e+06	1.77063e+06	24.15
46	1618.43	6643.67	3.38613e+06	1.51824e+06	24.15
47	1644.61	6646.15	2.86941e+06	1.28655e+06	24.1499
48	1670.8	6648.63	2.35826e+06	1.05737e+06	24.15
49	1696.98	6651.11	1.8404e+06	825180	24.15
50	1736.58	6658.06	909866	407956	24.15
51	1776.19	6665	527281	0	0

Group 1 with tension crack - G1 wo tension crack

Global Minimum Query (spencer) - Safety Factor: 2.25187

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	163.663	7581.89	0	0	0
2	190.019	7538.52	-207182	-89955.4	23.4698
3	216.409	7496.65	-298156	-129455	23.4698
4	242.798	7458.39	-287706	-124918	23.4698
5	269.188	7420.14	-194762	-84562.9	23.4698
6	295.572	7385.19	-34283.9	-14885.6	23.4698
7	321.956	7350.25	200455	87034.6	23.4698
8	348.34	7317.5	490318	212889	23.4698
9	374.725	7284.75	849028	368635	23.4697
10	402.777	7252.64	1.26172e+06	547821	23.4698
11	430.83	7220.52	1.71474e+06	744515	23.4698
12	486.936	7162.49	2.61646e+06	1.13603e+06	23.4698
13	512.286	7138.84	3.00563e+06	1.305e+06	23.4698
14	537.637	7115.19	3.41297e+06	1.48186e+06	23.4698
15	563.926	7092.33	3.81064e+06	1.65452e+06	23.4697
16	590.215	7069.47	4.22398e+06	1.83399e+06	23.4698
17	615.716	7048.73	4.59663e+06	1.99579e+06	23.4698
18	641.218	7027.98	4.98011e+06	2.16229e+06	23.4698
19	689.916	6989.41	5.70809e+06	2.47837e+06	23.4698
20	714.265	6970.79	6.06265e+06	2.63231e+06	23.4697
21	738.613	6952.16	6.42497e+06	2.78963e+06	23.4698
22	777.738	6924.93	6.92118e+06	3.00507e+06	23.4697
23	816.862	6897.7	7.43025e+06	3.22611e+06	23.4698
24	855.987	6873.38	7.82751e+06	3.39859e+06	23.4698
25	895.112	6849.07	8.23663e+06	3.57622e+06	23.4698
26	921.938	6832.84	8.49945e+06	3.69033e+06	23.4697
27	948.765	6816.61	8.76185e+06	3.80427e+06	23.4698
28	986.133	6795	9.0898e+06	3.94666e+06	23.4698
29	1001.84	6785.91	9.22453e+06	4.00515e+06	23.4697
30	1029.26	6772.08	9.34582e+06	4.05782e+06	23.4698
31	1056.69	6758.24	9.46026e+06	4.10751e+06	23.4698
32	1084.53	6745.28	9.52432e+06	4.13532e+06	23.4698
33	1112.38	6732.33	9.58994e+06	4.16381e+06	23.4698
34	1153.33	6717.65	9.44881e+06	4.10253e+06	23.4698
35	1194.28	6702.96	9.30361e+06	4.03949e+06	23.4698
36	1235.22	6691.4	8.98852e+06	3.90268e+06	23.4698
37	1276.17	6679.84	8.68113e+06	3.76922e+06	23.4698
38	1318.44	6671.98	8.14423e+06	3.5361e+06	23.4697
39	1360.71	6664.12	7.61912e+06	3.30811e+06	23.4698
40	1402.98	6657.39	7.0354e+06	3.05466e+06	23.4697
41	1445.25	6650.66	6.46415e+06	2.80664e+06	23.4698
42	1479.36	6645.87	5.97859e+06	2.59582e+06	23.4698
43	1513.46	6641.08	5.49527e+06	2.38596e+06	23.4697
44	1547.56	6638.3	4.91768e+06	2.13518e+06	23.4697
45	1581.67	6635.51	4.39548e+06	1.90845e+06	23.4697
46	1615.77	6638.85	3.63273e+06	1.57728e+06	23.4698
47	1649.88	6642.18	2.95351e+06	1.28237e+06	23.4698
48	1681.83	6646.72	2.25315e+06	978285	23.4698
49	1713.78	6651.25	1.55342e+06	674472	23.4698
50	1744.98	6658.13	763555	331524	23.4698
51	1776.19	6665	527281	0	0

Group 1 with tension crack - G1 w tc, 0.065 horiz seis

Global Minimum Query (spencer) - Safety Factor: 1.99678

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	226.129	7443.63	0	0	0
2	269.698	7387.38	182642	101775	29.1282
3	305.845	7342.94	460167	256424	29.1284
4	334.718	7309.58	749034	417392	29.1283
5	363.591	7276.23	1.10903e+06	617995	29.1283
6	394.393	7243.3	1.53348e+06	854515	29.1283
7	425.195	7210.37	2.00392e+06	1.11667e+06	29.1284
8	456.227	7180.44	2.45854e+06	1.37e+06	29.1284
9	487.259	7150.52	2.94304e+06	1.63998e+06	29.1283
10	512.419	7127.49	3.33135e+06	1.85636e+06	29.1283
11	537.579	7104.47	3.73662e+06	2.0822e+06	29.1284
12	563.007	7082.09	4.14214e+06	2.30817e+06	29.1283
13	588.434	7059.7	4.56313e+06	2.54276e+06	29.1283
14	633.665	7024	5.23175e+06	2.91534e+06	29.1283
15	656.324	7007.11	5.5475e+06	3.09129e+06	29.1283
16	678.983	6990.22	5.86947e+06	3.2707e+06	29.1283
17	724.338	6958.67	6.45346e+06	3.59612e+06	29.1283
18	747.015	6943.31	6.73687e+06	3.75405e+06	29.1283
19	769.692	6927.96	7.02421e+06	3.91417e+06	29.1283
20	812.41	6899.03	7.57612e+06	4.22172e+06	29.1283
21	855.127	6871.08	8.10376e+06	4.51574e+06	29.1283
22	897.845	6845.36	8.55515e+06	4.76727e+06	29.1283
23	940.562	6820.65	8.96377e+06	4.99497e+06	29.1283
24	964.965	6808.14	9.12138e+06	5.0828e+06	29.1283
25	989.368	6795.63	9.28342e+06	5.17309e+06	29.1283
26	990.646	6795	9.29024e+06	5.17689e+06	29.1283
27	1014.41	6783.33	9.40802e+06	5.24253e+06	29.1283
28	1038.17	6771.66	9.51354e+06	5.30132e+06	29.1283
29	1062.58	6761.39	9.53307e+06	5.31221e+06	29.1283
30	1086.98	6751.12	9.55438e+06	5.32408e+06	29.1283
31	1111.46	6741.99	9.51158e+06	5.30023e+06	29.1283
32	1135.93	6732.87	9.46784e+06	5.27586e+06	29.1283
33	1165.52	6722.77	9.36e+06	5.21577e+06	29.1283
34	1195.11	6712.68	9.24711e+06	5.15286e+06	29.1283
35	1233.11	6702.64	8.93877e+06	4.98104e+06	29.1283
36	1271.1	6692.61	8.63613e+06	4.8124e+06	29.1283
37	1309.09	6684.87	8.20778e+06	4.5737e+06	29.1283
38	1347.07	6677.14	7.78736e+06	4.33943e+06	29.1283
39	1377.48	6671.3	7.43561e+06	4.14342e+06	29.1283
40	1407.88	6665.47	7.08741e+06	3.94939e+06	29.1283
41	1438.29	6659.63	6.74487e+06	3.75851e+06	29.1283
42	1483.9	6652.84	6.12818e+06	3.41487e+06	29.1283
43	1529.51	6646.04	5.52096e+06	3.0765e+06	29.1283
44	1557.33	6645.65	4.93292e+06	2.74882e+06	29.1283
45	1585.15	6645.26	4.39298e+06	2.44794e+06	29.1283
46	1612.98	6644.86	3.91905e+06	2.18385e+06	29.1283
47	1640.8	6647.68	3.29758e+06	1.83754e+06	29.1283
48	1668.62	6650.5	2.68517e+06	1.49629e+06	29.1284
49	1696.44	6653.31	2.05744e+06	1.14649e+06	29.1283
50	1736.31	6659.16	1.03349e+06	575902	29.1283
51	1776.19	6665	527281	0	0

Discharge Sections

Entity Information

Group 1 with tension crack

Shared Entities

Type	Coordinates (x,y)
	0, 6500 1890, 6500 1890, 6665 1871.7, 6665 1838.13, 6665 1799.51, 6665 1776.19, 6665 1763.48, 6676.76 1737.91, 6700.43 1702.66, 6733.05 1670.28, 6763.02 1630.23, 6800.09 1625.65, 6803.06 1623.98, 6804.09 1622.67, 6805 1620.02, 6807.04 1616.97, 6809.29 1616.07, 6810 1611.68, 6813.39 1609.67, 6815 1608.43, 6815.99 1603.42, 6820 1601.14, 6821.83 1597.23, 6825 1596.26, 6826.39 1593.83, 6830 1591.51, 6833.85 1590.77, 6835 1589.29, 6837.31 1587.44, 6840 1586.92, 6841.23 1585.21, 6845 1584.75, 6846.29 1583.68, 6850 1582.59, 6853.48 1582.15, 6855 1580.48, 6859.56 1580.3, 6860 1579.82, 6861.17 1579.65, 6861.58 1578.23, 6865 1577.47, 6866.13 1574.64, 6870 1574.14, 6870.52

1569.06, 6875
1567.8, 6876.02
1567.39, 6876.36
1563.19, 6880
1560.16, 6882.67
1557.61, 6885
1555.93, 6887.19
1553.92, 6890
1551.39, 6894.36
1551.01, 6895
1550.72, 6895.48
1547.97, 6900
1546.37, 6902.25
1544.31, 6905
1541.08, 6909.82
1540.95, 6910
1540.9, 6910.1
1538.24, 6915
1536.96, 6917.19
1535.33, 6920
1531.73, 6924.85
1531.61, 6925
1531.43, 6925.19
1526.9, 6930
1523.58, 6933.07
1521.34, 6935
1520.79, 6935.52
1516.06, 6940
1514.14, 6941.51
1509.82, 6945
1505.68, 6946.68
1498.24, 6950
1492.45, 6953.81
1490.51, 6955
1488.12, 6955
1483.22, 6955
1480.92, 6955
1479.13, 6955
1476.36, 6955
1475.54, 6954.85
1459.35, 6953.81
1456.62, 6953.91
1446.26, 6955
1444.15, 6955
1443.86, 6955
1442.26, 6955.62
1438.54, 6957.04
1432.79, 6960
1431.57, 6961.78
1429.55, 6965
1427.67, 6968.8
1427.1, 6970
1425.36, 6973.79
1424.8, 6975
1424.52, 6975.44
1421.54, 6980
1415.73, 6985
1411.56, 6985
1409.5, 6985

1406.54, 6985
1405.02, 6985
1404.76, 6985
1404.46, 6985
1403.22, 6985
1402.34, 6985
1401.67, 6985
1389.28, 6986.35
1388.14, 6986.51
1387.5, 6986.6
1384.93, 6986.97
1380.98, 6987.55
1374.68, 6988.53
1365.6, 6990
1357.85, 6992.2
1349.4, 6995
1344.41, 6997.1
1343.11, 6997.64
1337.48, 7000
1335.84, 7000.71
1325.64, 7005
1320.84, 7007.1
1314.24, 7010
1310.12, 7014.75
1309.89, 7015
1308.71, 7015
1305.94, 7015
1304.73, 7015
1304.62, 7015
1303.18, 7015
1294.25, 7017.02
1281.35, 7020
1273.76, 7024.3
1272.33, 7025
1271.06, 7027.32
1269.35, 7030
1268.14, 7032.96
1267.3, 7035
1266.96, 7035.85
1265, 7040
1261.42, 7044.81
1261.28, 7045
1261.16, 7045.14
1257.1, 7050
1253.71, 7054
1252.86, 7055
1251.78, 7056.24
1249.03, 7060
1245.68, 7063.16
1243.9, 7065
1233.52, 7068.16
1227.07, 7070
1219.74, 7074.24
1219.52, 7074.36
1218.45, 7075
1212.45, 7079.43
1211.61, 7080.05
1211.2, 7080.37
1208.39, 7082.49

External Boundary	1205.1, 7085 1202.83, 7086.54 1197.84, 7090 1197.13, 7090.49 1190.91, 7095 1184.27, 7099.92 1184.17, 7100 1184.03, 7100.12 1182.04, 7102.05 1178.7, 7105 1174.63, 7109.61 1174.29, 7110 1174.09, 7110.28 1170.75, 7115 1169.25, 7117.79 1168, 7120 1166.29, 7123.71 1165.6, 7124.67 1165.41, 7125 1162.81, 7129.2 1162.18, 7130 1159.7, 7132.74 1158.89, 7133.72 1157.96, 7135 1152.68, 7138.19 1150.18, 7140 1146.55, 7143.51 1144.96, 7145 1143.84, 7145.96 1138.66, 7150 1137.99, 7150.56 1133.6, 7155 1132.17, 7157.01 1129.94, 7160 1124.72, 7164.64 1124.32, 7165 1121.08, 7167.76 1118.49, 7170 1116.77, 7171.57 1114.05, 7173.59 1112.24, 7175 1107.13, 7178.89 1106.22, 7179.53 1105.62, 7180 1102.08, 7182.38 1098.68, 7185 1097.48, 7185.99 1092.73, 7190 1087.84, 7193.85 1087.52, 7194.1 1086.35, 7195 1082.65, 7197.53 1079.04, 7200 1078.86, 7200 1078.2, 7200.37 1070.21, 7205 1068.55, 7205.88 1061.34, 7210 1056.08, 7213.23

1052.95, 7215
1049.27, 7217.61
1045.72, 7220
1039.62, 7224.7
1039.24, 7225
1038.47, 7225.6
1032.61, 7230
1029.98, 7232.15
1026.17, 7235
1024.14, 7238.71
1023.45, 7240
1021.25, 7244.02
1020.73, 7245
1020.34, 7245.54
1017.24, 7250
1015.38, 7252.57
1013.56, 7255
1010.69, 7259.21
1010.13, 7260
1009.83, 7260.45
1006.73, 7265
1003.33, 7268.82
1002.89, 7269.28
1002.66, 7269.5
1002.22, 7270
1001.46, 7271.13
998.723, 7275
998.273, 7276.1
996.672, 7280
995.229, 7283.02
994.235, 7285
991.406, 7289.22
990.853, 7290
990.615, 7290.41
987.948, 7295
987.043, 7297.26
985.968, 7300
985, 7301.68
982.056, 7305
981.379, 7305
977.89, 7305
977.66, 7305
977.452, 7305
976.834, 7305
976.217, 7305
976.084, 7305
975.675, 7305
970.669, 7305
969.594, 7305
966.076, 7308.07
963.934, 7308.29
957.394, 7310
956.475, 7310
955.329, 7310
954.607, 7310
954.172, 7310
952.191, 7310
952.036, 7310
946.562, 7313.25

	943.699, 7315 943.574, 7315.11 943.189, 7315.25 934.736, 7320 933.546, 7320.71 927.35, 7325 925.409, 7326.43 918.578, 7330 917.931, 7330 917.467, 7330 912.312, 7334.35 911.358, 7335 911.188, 7335 908.549, 7337.69 904.642, 7339.97 904.378, 7340 901.133, 7340 899.434, 7341.76 894.866, 7345.06 892.302, 7350 889.294, 7350 887.336, 7350 883.688, 7350 883.108, 7350 877.726, 7352.98 874.13, 7354.53 873.095, 7355 872.322, 7356.29 870.428, 7360 870.257, 7360 869.164, 7360 868.465, 7360 860.99, 7360 859.265, 7360 828.116, 7376.37 785.101, 7398.97 746.882, 7419.06 689.691, 7449.11 630.56, 7480.19 583.691, 7504.82 544.772, 7524.35 503.861, 7544.88 456.438, 7568.68 423.402, 7585.27 383.876, 7605.1 348.943, 7605.1 313.29, 7605.1 255.784, 7605.1 218.38, 7605.1 162.007, 7581.19 113.213, 7560.49 61.2296, 7538.44 1.97e-14, 7512.47

Scenario-based Entities

Type	Coordinates (x,y)	Master Scenario	G1 wo tension crack	G1 w tc, 0.065 horiz seis
Water Table	-38.0003, 6857.31 293.336, 6818.59 792.82, 6795 1948.27, 6795	Assigned to: Diamond Tail Sandstone	Assigned to: Diamond Tail Sandstone	Assigned to: Diamond Tail Sandstone

CHMRP ROCSCIENCE SLIDE2 LIMIT EQUILIBRIUM
AUTOMATICALLY GENERATED REPORT
EAST WALL

rocscience

CHMRP - East Wall_TD
Slide2 - An Interactive Slope Stability Program
Date Created: 7/25/2023, 4:18:48 PM
Software Version: 9.028

Table of Contents

Slide2 Analysis Information

CHMRP - East Wall_TD

Project Summary

File Name:	CHMRP - East Wall_TD.slmd
Slide2 Modeler Version:	9.028
Project Title:	Slide2 - An Interactive Slope Stability Program
Date Created:	7/25/2023, 4:18:48 PM

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Group 3 with TC	Master Scenario	Spencer: 2.519440	00h:00m:23.15s
	G3 without TC	Spencer: 2.549900	00h:00m:29.319s
	G3 with TC, 0.065 horizontal	Spencer: 2.282870	00h:00m:33.737s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

All Open Scenarios

Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes
Eliminate vertical segments in non-circular search	Yes

Groundwater Analysis

All Open Scenarios

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

Random Numbers

All Open Scenarios

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

Surface Options

All Open Scenarios

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	12
Maximum Iterations:	500
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Group 3 with TC - G3 with TC, 0.065 horizontal

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.065

All other Scenarios

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Diamond Tail Sandstone	
Color	
Strength Type	Shear/Normal Function
Unit Weight	160 lbs/ft3
Shear/Normal Function	CNI Nonlinear
Water Surface	Assigned per scenario
Hu Type	Custom
Hu	1
Specify alternate strength type above water surface	No

Shear Normal Functions

Name: CNI Nonlinear

Effective Normal (psf)	Shear (psf)
-8705.76	0.287098
-8270.47	1780.51
-7399.9	3808.18
-6529.32	5423
-5658.74	6844.82
-4788.17	8145
-3917.59	9358.37
-3047.02	10505.2
-2176.44	11598.8
-1305.86	12648.2
0	14153.8
2091.28	16427.6
4182.56	18568.8
6273.85	20605.1
8365.13	22555.4
10456.4	24433.3
12547.7	26248.9
14639	28010.3
16730.3	29723.7
18821.5	31394.1
20912.8	33025.9
23004.1	34622.6
25095.4	36187.1
27186.7	37722.1
29277.9	39229.7
31369.2	40712
33460.5	42170.6
35551.8	43607.2
37643.1	45022.9
39734.4	46419.1
41825.6	47796.9
43916.9	49157.2
46008.2	50500.9

48099.5	51829
50190.8	53142
52282	54440.8
54373.3	55725.9
56464.6	56998
58555.9	58257.5
60647.2	59505
62738.5	60741
75286.1	67937.6
87833.8	74809.2
100382	81410.2
112929	87781
125477	93952
138025	99947.7
150572	105787
163120	111487
175668	117059
188215	122516
200763	127867
213311	133119
225858	138282
238406	143359
250954	148358
263501	153283
276049	158139
288597	162929
301145	167657
313692	172327
326240	176941
347153	184514
368066	191952
388978	199263
409891	206457
430804	213541
451717	220522
472630	227406
493542	234198
514455	240904
535368	247527
556281	254073
577194	260544
598107	266945
619019	273278
639932	279547
660845	285753
681758	291900
702671	297990
723583	304025
744496	310008
765409	315939
786322	321821
807235	327656
828148	333444

849060	339189
869973	344890
890886	350550

Materials In Use

Material	Group 3 with TC	G3 without TC	G3 with TC, 0.065 horizontal
Diamond Tail Sandstone	✓	✓	✓

Global Minimums

Group 3 with TC - Master Scenario

Method: spencer

FS	2.519440
Axis Location:	1496.876, 7871.266
Left Slip Surface Endpoint:	470.619, 7151.039
Right Slip Surface Endpoint:	1381.455, 6664.995
Left Slope Intercept:	470.619 7240.883
Right Slope Intercept:	1381.455 6795.000
Resisting Moment:	4.90335e+10 lb-ft
Driving Moment:	1.9465e+10 lb-ft
Resisting Horizontal Force:	3.20316e+07 lb
Driving Horizontal Force:	1.27157e+07 lb
Total Slice Area:	216120 ft2
Surface Horizontal Width:	910.836 ft
Surface Average Height:	237.276 ft

Group 3 with TC - G3 without TC

Method: spencer

FS	2.549900
Axis Location:	1475.151, 7910.141
Left Slip Surface Endpoint:	422.816, 7238.009
Right Slip Surface Endpoint:	1381.455, 6664.995
Left Slope Intercept:	422.816 7238.009
Right Slope Intercept:	1381.455 6795.000
Resisting Moment:	5.24141e+10 lb-ft
Driving Moment:	2.05554e+10 lb-ft
Resisting Horizontal Force:	3.30254e+07 lb
Driving Horizontal Force:	1.29516e+07 lb
Total Slice Area:	223013 ft2
Surface Horizontal Width:	958.639 ft
Surface Average Height:	232.635 ft

Group 3 with TC - G3 with TC, 0.065 horizontal

Method: spencer

FS	2.282870
Axis Location:	1493.925, 7876.546
Left Slip Surface Endpoint:	470.011, 7122.425
Right Slip Surface Endpoint:	1381.455, 6664.995
Left Slope Intercept:	470.011 7240.730
Right Slope Intercept:	1381.455 6795.000
Resisting Moment:	4.89708e+10 lb-ft
Driving Moment:	2.14646e+10 lb-ft
Resisting Horizontal Force:	3.24498e+07 lb
Driving Horizontal Force:	1.42232e+07 lb
Total Slice Area:	220647 ft2
Surface Horizontal Width:	911.444 ft
Surface Average Height:	242.085 ft

Global Minimum Coordinates

Group 3 with TC - Master Scenario

Method: spencer

X	Y
470.619	7151.04
492.75	7119.73
514.881	7089.29
537.012	7059.33
559.737	7030.51
587.209	6997.02
614.656	6965.35
642.374	6934.46
670.093	6904.71
697.324	6875.91
724.554	6848.98
744.379	6830.96
788.003	6794.02
831.627	6762.11
866.524	6740.26
901.422	6721.17
936.465	6703.02
971.508	6686.9
1004.34	6675.11
1037.17	6665.56
1071.65	6659.61
1106.14	6658.21
1140.54	6656.8
1174.94	6655.4
1201.96	6654.97
1240.01	6655.79
1278.06	6657.2
1316.11	6659.25
1354.16	6662.38
1381.46	6664.99
1381.46	6795

Group 3 with TC - G3 without TC

Method: spencer

X	Y
422.816	7238.01
444.565	7194.53
475.727	7145.19
506.884	7100.24
540.046	7053.71
573.203	7012.06
602.918	6975.13
632.63	6941.03
660.918	6908.59
689.207	6878.48
716.162	6849.8
743.117	6823.26
776.727	6794.54
816.15	6766.17
855.57	6739.9
886.539	6722.03
917.505	6705.53
948.472	6689.16
979.436	6675.04
1010.44	6665.1
1041.67	6657.79
1079.76	6653.27
1117.41	6651.91
1155	6650.55
1192.83	6649.75
1242.79	6651.25
1292.68	6654.55
1338.26	6659.31
1381.46	6664.99
1381.46	6795

Group 3 with TC - G3 with TC, 0.065 horizontal

Method: spencer

X	Y
470.011	7122.42
490.142	7095.27
510.273	7068.13
538.958	7032.88
567.639	7000.65
587.789	6978.7
607.665	6957.05
647.429	6915.63
676.585	6886.82
705.742	6858.57
730.458	6835.53
755.174	6814.77
786.989	6788.55
818.8	6766.8
846.652	6749.07
874.501	6734.71
903.475	6721.14
932.449	6708.16
961.424	6695.17
990.391	6683.48
1030.57	6673.28
1070.76	6664.45
1113.45	6660.86
1168.01	6656.96
1222.57	6655.55
1258.24	6655.51
1294.4	6656.79
1338.92	6660.26
1381.46	6664.99
1381.46	6795

Global Minimum Support Data

All Open Scenarios

No Supports Present

Valid and Invalid Surfaces

Group 3 with TC - Master Scenario

Method: spencer

Number of Valid Surfaces:	20995
Number of Invalid Surfaces:	4061

Error Codes

Error Code -108 reported for 123 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 538 surfaces
Error Code -113 reported for 611 surfaces
Error Code -121 reported for 845 surfaces
Error Code -1000 reported for 1943 surfaces

Group 3 with TC - G3 without TC

Method: spencer

Number of Valid Surfaces:	21854
Number of Invalid Surfaces:	3203

Error Codes

Error Code -108 reported for 85 surfaces
Error Code -111 reported for 1188 surfaces
Error Code -121 reported for 781 surfaces
Error Code -124 reported for 2 surfaces
Error Code -1000 reported for 1147 surfaces

Group 3 with TC - G3 with TC, 0.065 horizontal

Method: spencer

Number of Valid Surfaces:	20566
Number of Invalid Surfaces:	4492

Error Codes

Error Code -108 reported for 73 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 941 surfaces
Error Code -113 reported for 663 surfaces
Error Code -121 reported for 1174 surfaces
Error Code -1000 reported for 1640 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.

-111 = Safety factor equation did not converge

-113 = Surface intersects outside slope limits.

-121 = Concave failure surface, only convex surfaces have been defined as being allowed.

-124 = A slice has a width less than the minimum acceptable value.

-1000 = No valid slip surface is generated

Slice Data

Group 3 with TC - Master Scenario

Global Minimum Query (spencer) - Safety Factor: 2.51944

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	22.1308	381333	-54.7499	Diamond Tail Sandstone	14496.2	44.237	8007.69	20174.9	5832.01	0	5832.01	17162.6	17162.6
2	22.1309	502525	-53.9799	Diamond Tail Sandstone	15043.9	41.9223	9131.52	23006.3	8867.29	0	8867.29	21426.5	21426.5
3	22.131	621234	-53.5405	Diamond Tail Sandstone	15355	40.9647	10170.6	25624.1	11828	0	11828	25593	25593
4	22.725	745064	-51.7479	Diamond Tail Sandstone	16016.8	39.3273	11273.9	28404	15119.5	0	15119.5	29419.4	29419.4
5	27.4722	1.037e+06	-50.6342	Diamond Tail Sandstone	16360	38.617	12329.1	31062.5	18406.4	0	18406.4	33434.4	33434.4
6	13.7233	571898	-49.0872	Diamond Tail Sandstone	17059.4	37.361	13273.4	33441.6	21457.2	0	21457.2	36773.6	36773.6
7	13.7233	606491	-49.0872	Diamond Tail Sandstone	17059.4	37.361	13718.6	34563.1	22926.2	0	22926.2	38756.2	38756.2
8	13.8594	647013	-48.1023	Diamond Tail Sandstone	17412.8	36.8007	14323	36085.9	24960.2	0	24960.2	40924.7	40924.7
9	13.8594	679348	-48.1023	Diamond Tail Sandstone	17767.5	36.2781	14728.4	37107.4	26349.2	0	26349.2	42765.6	42765.6
10	13.8595	705990	-47.0182	Diamond Tail Sandstone	18122.6	35.7887	15256.3	38437.3	28178.7	0	28178.7	44549.5	44549.5
11	13.8595	735232	-47.0182	Diamond Tail Sandstone	18477.7	35.3288	15622.4	39359.6	29461.2	0	29461.2	46224.8	46224.8
12	13.6152	755307	-46.6103	Diamond Tail Sandstone	18477.7	35.3288	16115.6	40602.3	31214.5	0	31214.5	48262.4	48262.4
13	13.6152	783057	-46.6103	Diamond Tail Sandstone	18832.4	34.8953	16462.6	41476.6	32465.3	0	32465.3	49880.4	49880.4
14	27.2305	1.59475e+06	-44.6799	Diamond Tail Sandstone	19186.3	34.4855	17013.4	42864.3	34470.3	0	34470.3	51294.7	51294.7
15	19.8249	1.17355e+06	-42.2646	Diamond Tail Sandstone	19539.3	34.0972	17581.8	44296.2	36569.6	0	36569.6	52547.9	52547.9
16	42.4626	2.48122e+06	-40.2623	Diamond Tail Sandstone	19539.3	34.0972	17818.2	44891.9	37449.5	0	37449.5	52540.3	52540.3
17	1.16119	64309.1	-40.2623	Diamond Tail Sandstone	19186.3	34.4855	17253.5	43469.2	35381.6	30.6156	35350.9	49994.1	49963.5
18	21.812	1.20079e+06	-36.1838	Diamond Tail Sandstone	19539.3	34.0972	17776.9	44787.9	37854.8	559.081	37295.8	50857.9	50298.8
19	21.812	1.1929e+06	-36.1838	Diamond Tail Sandstone	19539.3	34.0972	17455.5	43978	37654.3	1554.64	36099.6	50422.2	48867.5
20	17.4486	941756	-32.0432	Diamond Tail Sandstone	19539.3	34.0972	17811.3	44874.6	39817.2	2393.17	37424	50965.6	48572.4

21	17.4486	920693	-32.0432	Diamond Tail Sandstone	19539.3	34.0972	17389.9	43812.9	38930.4	3074.67	35855.7	49815	46740.3
22	17.4487	886078	-28.6891	Diamond Tail Sandstone	19539.3	34.0972	17366.8	43754.5	39482.8	3713.33	35769.5	48986.5	45273.2
23	17.4487	844302	-28.6891	Diamond Tail Sandstone	18832.4	34.8953	16692.9	42056.7	37606.3	4309.16	33297.1	46741.2	42432.1
24	17.5216	851283	-27.3758	Diamond Tail Sandstone	19186.3	34.4855	16791.5	42305.2	38546.5	4890.15	33656.4	47241.4	42351.2
25	17.5216	875915	-27.3758	Diamond Tail Sandstone	19186.3	34.4855	16948.3	42700.3	39687.9	5456.3	34231.6	48464	43007.7
26	17.5216	897500	-24.7104	Diamond Tail Sandstone	19539.3	34.0972	17519.1	44138.3	42327.4	5990.94	36336.4	50389.1	44398.1
27	17.5216	879958	-24.7104	Diamond Tail Sandstone	19186.3	34.4855	17159.6	43232.5	41500.5	6494.06	35006.4	49396.8	42902.7
28	16.4155	788952	-19.7461	Diamond Tail Sandstone	19539.3	34.0972	17362.5	43743.8	42683.1	6929.47	35753.6	48915.6	41986.1
29	16.4155	673022	-19.7461	Diamond Tail Sandstone	18122.6	35.7887	15535.1	39139.7	36450.2	7297.16	29153	42026.6	34729.5
30	16.4156	640168	-16.2251	Diamond Tail Sandstone	18122.6	35.7887	15463	38958.2	36531.3	7630.05	28901.3	41031.1	33401
31	16.4156	632398	-16.2251	Diamond Tail Sandstone	18122.6	35.7887	15250	38421.5	36085	7928.13	28156.9	40522.8	32594.7
32	17.2412	632198	-9.77987	Diamond Tail Sandstone	18477.7	35.3288	15677.6	39498.8	37827.5	8169.89	29657.6	40529.8	32359.9
33	17.2412	538967	-9.77987	Diamond Tail Sandstone	17412.8	36.8007	14053.9	35407.9	32409.2	8355.34	24053.9	34831.7	26476.3
34	17.2414	460517	-2.33561	Diamond Tail Sandstone	17059.4	37.361	13719.2	34564.7	31398.3	8470	22928.3	31957.9	23487.9
35	17.2414	432361	-2.33561	Diamond Tail Sandstone	17059.4	37.361	13155.3	33144.1	29581.5	8513.88	21067.6	30118	21604.2
36	17.201	432484	-2.33561	Diamond Tail Sandstone	17059.4	37.361	13162.6	33162.3	29649.2	8557.71	21091.4	30186	21628.3
37	17.201	434397	-2.33561	Diamond Tail Sandstone	17059.4	37.361	13185	33218.8	29766.9	8601.49	21165.4	30304.7	21703.2
38	17.201	424842	-2.33561	Diamond Tail Sandstone	16708	37.9642	12980.2	32702.8	29144	8645.26	20498.7	29673.4	21028.2
39	17.201	391014	-2.33561	Diamond Tail Sandstone	16360	38.617	12285.2	30951.7	26956.6	8689.04	18267.6	27457.7	18768.7
40	27.0165	574652	-0.914772	Diamond Tail Sandstone	16360	38.617	12019.4	30282.2	26153.8	8724.39	17429.5	26345.8	17621.4
41	19.0248	378399	1.24205	Diamond Tail Sandstone	16360	38.617	11912.1	30011.8	25815.9	8724.98	17090.9	25557.7	16832.7
42	19.0248	355411	1.24205	Diamond Tail Sandstone	16016.8	39.3273	11533.6	29058.2	24617.2	8699.24	15917.9	24367.1	15667.9
43	19.0248	331979	2.12176	Diamond Tail Sandstone	16016.8	39.3273	11271.2	28397.1	23775.5	8664.38	15111.1	23357.9	14693.6
44	19.0248	308101	2.12176	Diamond Tail Sandstone	15680.8	40.1054	10864.5	27372.4	22502	8620.4	13881.6	22099.5	13479.1
45	19.0251	283741	3.08498	Diamond Tail Sandstone	15680.8	40.1054	10578.7	26652.5	21593.2	8566.42	13026.8	21023.1	12456.7

46	19.0251	258887	3.08498	Diamond Tail Sandstone	15355	40.9647	10137.2	25540.1	20233.7	8502.43	11731.2	19687.3	11184.9
47	19.0251	233213	4.70056	Diamond Tail Sandstone	15355	40.9647	9893.17	24925.3	19444.7	8421.64	11023	18631.2	10209.6
48	19.0251	206719	4.70056	Diamond Tail Sandstone	15043.9	41.9223	9397.23	23675.8	17936.8	8324.02	9612.8	17164.1	8840.11
49	13.65	131791	5.46394	Diamond Tail Sandstone	15043.9	41.9223	9057.14	22818.9	16893	8234.48	8658.55	16026.7	7792.2
50	13.65	117752	5.46394	Diamond Tail Sandstone	14754.2	43.0021	8866.31	22338.1	16285.2	8153	8132.19	15437.1	7284.09

Group 3 with TC - G3 without TC

Global Minimum Query (spencer) - Safety Factor: 2.5499

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	21.749	77395.7	-63.4264	Diamond Tail Sandstone	14222.3	50.3215	4578.79	11675.4	-2112.83	0	-2112.83	7041.31	7041.31
2	15.5808	142534	-57.7246	Diamond Tail Sandstone	14153.8	47.3946	6061.33	15455.8	1197.47	0	1197.47	10794.7	10794.7
3	15.5808	206806	-57.7246	Diamond Tail Sandstone	14286.4	45.6759	6866.76	17509.6	3148.01	0	3148.01	14020.5	14020.5
4	15.5788	272975	-55.2722	Diamond Tail Sandstone	14496.2	44.237	7927.79	20215.1	5873.26	0	5873.26	17310.6	17310.6
5	15.5788	334468	-55.2722	Diamond Tail Sandstone	14754.2	43.0021	8672.43	22113.8	7891.68	0	7891.68	20403.3	20403.3
6	16.5808	424422	-54.5224	Diamond Tail Sandstone	15043.9	41.9223	9525.27	24288.5	10295.2	0	10295.2	23660.2	23660.2
7	16.5808	489713	-54.5224	Diamond Tail Sandstone	15355	40.9647	10233.6	26094.6	12369.9	0	12369.9	26728.8	26728.8
8	16.5787	547864	-51.4743	Diamond Tail Sandstone	16016.8	39.3273	11292.1	28793.6	15595	0	15595	29778	29778
9	16.5787	602839	-51.4743	Diamond Tail Sandstone	16360	38.617	11888.2	30313.8	17469	0	17469	32400.8	32400.8
10	14.8573	586726	-51.1841	Diamond Tail Sandstone	16708	37.9642	12486.2	31838.5	19391.1	0	19391.1	34912	34912
11	14.8573	630420	-51.1841	Diamond Tail Sandstone	17059.4	37.361	12999.5	33147.5	21072	0	21072	37231	37231
12	14.8558	672356	-48.9291	Diamond Tail Sandstone	17412.8	36.8007	13862.4	35347.8	23973.6	0	23973.6	39880.7	39880.7
13	14.8558	712653	-48.9291	Diamond Tail Sandstone	17767.5	36.2781	14335.6	36554.4	25595.7	0	25595.7	42045.8	42045.8
14	28.2888	1.45444e+06	-48.9105	Diamond Tail Sandstone	18122.6	35.7887	14930.4	38071	27670.7	0	27670.7	44792	44792
15	28.2888	1.58617e+06	-46.7842	Diamond Tail Sandstone	18832.4	34.8953	16110.1	41079.2	31895.8	0	31895.8	49041.8	49041.8
16	26.9553	1.59796e+06	-46.7842	Diamond Tail Sandstone	19186.3	34.4855	16656.5	42472.3	33899.7	0	33899.7	51627.3	51627.3
17	26.9544	1.62726e+06	-44.5476	Diamond Tail Sandstone	19539.3	34.0972	17262.3	44017.2	36157.5	0	36157.5	53149.3	53149.3
18	16.5363	1.00144e+06	-40.5164	Diamond Tail Sandstone	19891.1	33.7284	18036.1	45990.2	39091.9	0	39091.9	54505.1	54505.1
19	16.5363	998236	-40.5164	Diamond Tail Sandstone	19891.1	33.7284	18001.2	45901.3	38958.8	0	38958.8	54342.2	54342.2
20	0.5376	31745.8	-40.5164	Diamond Tail Sandstone	19891.1	33.7284	17761.5	45290	38057.4	14.266	38043.2	53235.9	53221.7
21	19.7114	1.12666e+06	-35.7418	Diamond Tail Sandstone	19891.1	33.7284	18132.4	46235.8	39930.9	471.199	39459.7	52980.4	52509.2
22	19.7114	1.1079e+06	-35.7418	Diamond Tail Sandstone	19891.1	33.7284	17733	45217.4	39290.8	1356.4	37934.4	52052.9	50696.5

23	19.7103	1.09417e+06	-33.6822	Diamond Tail Sandstone	19891.1	33.7284	17732.5	45216.1	40141.3	2208.85	37932.5	51959.5	49750.6
24	19.7103	1.08228e+06	-33.6822	Diamond Tail Sandstone	19539.3	34.0972	17407.7	44387.8	39733.4	3028.55	36704.8	51335	48306.5
25	15.4841	823430	-29.9833	Diamond Tail Sandstone	19539.3	34.0972	17487.5	44591.4	40722.7	3717.14	37005.6	50812.3	47095.2
26	15.4841	796208	-29.9833	Diamond Tail Sandstone	19186.3	34.4855	16977.6	43291.1	39366.3	4274.6	35091.7	49161.7	44887.1
27	15.4833	764778	-28.0426	Diamond Tail Sandstone	19186.3	34.4855	16710.5	42610	38910.8	4810.66	34100.1	47811.8	43001.2
28	15.4833	769439	-28.0426	Diamond Tail Sandstone	19186.3	34.4855	16641	42432.9	39167.6	5325.29	33842.3	48031.6	42706.4
29	15.4835	789191	-27.8724	Diamond Tail Sandstone	19186.3	34.4855	16809.2	42861.9	40304.9	5838.09	34466.8	49194.6	43356.5
30	15.4835	809477	-27.8724	Diamond Tail Sandstone	19186.3	34.4855	16959.2	43244.2	41372.4	6349.06	35023.4	50341.4	43992.3
31	15.4818	809173	-24.5026	Diamond Tail Sandstone	19539.3	34.0972	17373.1	44299.7	43399.5	6824.7	36574.8	51317.8	44493.1
32	15.4818	782939	-24.5026	Diamond Tail Sandstone	19186.3	34.4855	16878.5	43038.4	41988.8	7265.01	34723.8	49681.7	42416.7
33	15.5017	722236	-17.7914	Diamond Tail Sandstone	19186.3	34.4855	16903.7	43102.8	42457.9	7640.37	34817.5	47882.3	40241.9
34	15.5017	633715	-17.7914	Diamond Tail Sandstone	18477.7	35.3288	15402.1	39273.9	37291	7950.78	29340.2	42233.6	34282.8
35	31.2288	1.24203e+06	-13.1665	Diamond Tail Sandstone	18477.7	35.3288	15691.4	40011.5	38714.8	8333.91	30380.9	42385.5	34051.6
36	19.0457	684938	-6.77363	Diamond Tail Sandstone	18477.7	35.3288	15531.4	39603.6	38437.9	8632.42	29805.5	40282.6	31650.2
37	19.0457	577996	-6.77363	Diamond Tail Sandstone	17412.8	36.8007	13826.8	35257	32625.7	8773.58	23852.2	34268	25494.5
38	18.8234	494868	-2.0678	Diamond Tail Sandstone	17059.4	37.361	13190.4	33634.2	30574.9	8865.37	21709.5	31051.1	22185.7
39	18.8234	490174	-2.0678	Diamond Tail Sandstone	17059.4	37.361	13093.9	33388.1	30294.9	8907.77	21387.1	30767.7	21859.9
40	18.799	491581	-2.0678	Diamond Tail Sandstone	17059.4	37.361	13115.6	33443.4	30409.8	8950.16	21459.6	30883.3	21933.1
41	18.799	485805	-2.0678	Diamond Tail Sandstone	17059.4	37.361	13000	33148.6	30066	8992.51	21073.5	30535.3	21542.8
42	18.9143	450848	-1.21434	Diamond Tail Sandstone	16708	37.9642	12431.2	31698.2	28237.4	9026.2	19211.2	28500.9	19474.7
43	18.9143	423926	-1.21434	Diamond Tail Sandstone	16360	38.617	11967.4	30515.8	26773.2	9051.21	17722	27026.9	17975.7
44	24.9781	526215	1.72638	Diamond Tail Sandstone	16360	38.617	11976.6	30539.1	26791.4	9040.23	17751.1	26430.4	17390.1
45	24.9781	485746	1.72638	Diamond Tail Sandstone	16016.8	39.3273	11480.2	29273.3	25173.8	8993.26	16180.5	24827.8	15834.5
46	49.8951	841980	3.7827	Diamond Tail Sandstone	15680.8	40.1054	10961.8	27951.6	23435.9	8866.84	14569.1	22711.2	13844.3
47	22.7868	324457	5.96088	Diamond Tail Sandstone	15680.8	40.1054	10398.3	26514.5	21552.6	8689.68	12862.9	20466.9	11777.2

48	22.7868	284606	5.96088	Diamond Tail Sandstone	15355	40.9647	9800.45	24990.2	19639	8541.22	11097.8	18615.7	10074.5
49	21.5987	231965	7.49683	Diamond Tail Sandstone	15043.9	41.9223	9388.35	23939.4	18284.7	8378.31	9906.38	17049.2	8670.91
50	21.5987	194132	7.49683	Diamond Tail Sandstone	14754.2	43.0021	8745.65	22300.5	16292.8	8200.95	8091.86	15141.9	6940.96

Group 3 with TC - G3 with TC, 0.065 horizontal

Global Minimum Query (spencer) - Safety Factor: 2.28287

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	20.1307	431312	-53.4442	Diamond Tail Sandstone	14754.2	43.0021	9528.02	21751.2	7502.83	0	7502.83	20353	20353
2	20.1307	528780	-53.4442	Diamond Tail Sandstone	15043.9	41.9223	10447.9	23851.2	9808.24	0	9808.24	23899.1	23899.1
3	14.3426	435380	-50.8599	Diamond Tail Sandstone	15680.8	40.1054	11612.3	26509.3	12856.8	0	12856.8	27125.3	27125.3
4	14.3426	477880	-50.8599	Diamond Tail Sandstone	15680.8	40.1054	12169	27780.2	14365.7	0	14365.7	29318.2	29318.2
5	14.3406	516327	-48.3351	Diamond Tail Sandstone	16360	38.617	13097.4	29899.7	16950.6	0	16950.6	31669	31669
6	14.3406	553109	-48.3351	Diamond Tail Sandstone	16360	38.617	13580.8	31003.3	18332.1	0	18332.1	33593.8	33593.8
7	20.1503	838217	-47.4461	Diamond Tail Sandstone	16708	37.9642	14307.3	32661.8	20446.2	0	20446.2	36030.4	36030.4
8	19.8757	895741	-47.4461	Diamond Tail Sandstone	17059.4	37.361	14949.2	34127	22355	0	22355	38638.4	38638.4
9	19.882	963022	-46.1647	Diamond Tail Sandstone	17412.8	36.8007	15818.6	36111.9	24995	0	24995	41470.2	41470.2
10	19.882	1.02446e+06	-46.1647	Diamond Tail Sandstone	17767.5	36.2781	16381.4	37396.7	26743.3	0	26743.3	43804.7	43804.7
11	29.1565	1.59907e+06	-44.6647	Diamond Tail Sandstone	18477.7	35.3288	17296.3	39485.1	29638.3	0	29638.3	46733.3	46733.3
12	14.578	850310	-44.0902	Diamond Tail Sandstone	18832.4	34.8953	18050.4	41206.8	32078.5	0	32078.5	49564.6	49564.6
13	14.578	868929	-44.0902	Diamond Tail Sandstone	18832.4	34.8953	18280.3	41731.6	32831	0	32831	50539.8	50539.8
14	24.7165	1.48605e+06	-42.9961	Diamond Tail Sandstone	19186.3	34.4855	18616.2	42498.3	33937.7	0	33937.7	51295.2	51295.2
15	24.716	1.49194e+06	-40.0198	Diamond Tail Sandstone	19539.3	34.0972	19317.3	44098.8	36278	0	36278	52498.5	52498.5
16	23.9927	1.43671e+06	-39.4943	Diamond Tail Sandstone	19539.3	34.0972	19341.9	44155.1	36361.2	0	36361.2	52302.2	52302.2
17	7.82241	448674	-39.4943	Diamond Tail Sandstone	19186.3	34.4855	18805.8	42931.2	34768.7	201.078	34567.7	50267.9	50066.8
18	15.9052	890822	-34.3633	Diamond Tail Sandstone	19539.3	34.0972	19474.3	44457.2	37548.9	741.541	36807.4	50864.9	50123.3
19	15.9052	888086	-34.3633	Diamond Tail Sandstone	19539.3	34.0972	19244.9	43933.5	37454.1	1420.18	36033.9	50613.2	49193
20	13.9263	767087	-32.4841	Diamond Tail Sandstone	19539.3	34.0972	19305.2	44071.2	38273.4	2036.13	36237.2	50564.6	48528.5
21	13.9263	759718	-32.4841	Diamond Tail Sandstone	19186.3	34.4855	19033.3	43450.6	37913.3	2589.41	35323.9	50031.5	47442.1
22	13.9242	748811	-27.2772	Diamond Tail Sandstone	19891.1	33.7284	19808.8	45221	41029.9	3090.05	37939.8	51244	48153.9

23	13.9242	722289	-27.2772	Diamond Tail Sandstone	19539.3	34.0972	19246.4	43937.1	39577.2	3538.07	36039.1	49501.3	45963.2
24	14.4872	723050	-25.0938	Diamond Tail Sandstone	19539.3	34.0972	19113.7	43634.1	39565.3	3973.75	35591.5	48516.3	44542.5
25	14.4872	696290	-25.0938	Diamond Tail Sandstone	19186.3	34.4855	18547.7	42341.9	38107	4397.1	33709.9	46792.9	42395.8
26	14.4872	700541	-24.14	Diamond Tail Sandstone	19186.3	34.4855	18683.4	42651.8	38972.4	4811.34	34161.1	47345.5	42534.2
27	14.4872	715314	-24.14	Diamond Tail Sandstone	19186.3	34.4855	18804	42927	39778.2	5216.48	34561.7	48205.3	42988.9
28	28.9747	1.46246e+06	-24.14	Diamond Tail Sandstone	19186.3	34.4855	18881.2	43103.4	40642.7	5824.18	34818.5	49104.5	43280.3
29	14.4835	708384	-21.979	Diamond Tail Sandstone	19186.3	34.4855	18769.6	42848.6	40859.2	6411.71	34447.5	48434.6	42022.9
30	14.4835	674350	-21.979	Diamond Tail Sandstone	18832.4	34.8953	18069	41249.1	38915.6	6776.47	32139.1	46208.2	39431.8
31	20.0917	790693	-14.2469	Diamond Tail Sandstone	18477.7	35.3288	17598.3	40174.7	37729.2	7118.02	30611.2	42197.6	35079.6
32	20.0917	760270	-14.2469	Diamond Tail Sandstone	18122.6	35.7887	17056.6	38937.9	36309.5	7436.35	28873.1	40640.3	33204
33	20.0909	737453	-12.3862	Diamond Tail Sandstone	18122.6	35.7887	16997.1	38802.2	36418.1	7733.18	28684.9	40150.9	32417.7
34	20.0909	625197	-12.3862	Diamond Tail Sandstone	17412.8	36.8007	15190.2	34677.2	31085.7	8008.5	23077.2	34421.6	26413.1
35	21.3448	552902	-4.8097	Diamond Tail Sandstone	17059.4	37.361	14823.7	33840.6	30182.1	8202.2	21979.9	31429.4	23227.2
36	21.3448	523469	-4.8097	Diamond Tail Sandstone	16708	37.9642	14279.1	32597.3	28677.8	8314.27	20363.5	29879.3	21565
37	18.1892	450482	-4.08597	Diamond Tail Sandstone	17059.4	37.361	14474.3	33042.9	29346	8410.84	20935.1	30379.9	21969.1
38	18.1892	450934	-4.08597	Diamond Tail Sandstone	16708	37.9642	14451.3	32990.4	29359.2	8491.92	20867.3	30391.6	21899.6
39	18.1892	425227	-4.08597	Diamond Tail Sandstone	16708	37.9642	13890.5	31710.1	27799.5	8573	19226.5	28791.8	20218.8
40	18.1854	394795	-1.48166	Diamond Tail Sandstone	16708	37.9642	13777.7	31452.8	27525	8628.21	18896.7	27881.3	19253.1
41	18.1854	376222	-1.48166	Diamond Tail Sandstone	16360	38.617	13457.4	30721.5	26637	8657.57	17979.4	26985.1	18327.5
42	18.1854	357734	-1.48166	Diamond Tail Sandstone	16360	38.617	13138.9	29994.4	25756.1	8686.92	17069.2	26095.9	17409
43	17.8347	332253	-0.0717213	Diamond Tail Sandstone	16360	38.617	13085.8	29873.1	25619.6	8702.29	16917.3	25636	16933.7
44	17.8347	313219	-0.0717213	Diamond Tail Sandstone	16016.8	39.3273	12739.4	29082.4	24651.2	8703.68	15947.5	24667.2	15963.5
45	18.0828	297182	2.03116	Diamond Tail Sandstone	16016.8	39.3273	12789.9	29197.7	24772.7	8684.37	16088.3	24319.1	15634.7
46	18.0828	275694	2.03116	Diamond Tail Sandstone	16016.8	39.3273	12393.5	28292.7	23628.1	8644.35	14983.7	23188.5	14544.2
47	22.2587	308174	4.45492	Diamond Tail Sandstone	16016.8	39.3273	12409.8	28329.9	23599.3	8570.24	15029	22632.4	14062.2

48	22.2587	272250	4.45492	Diamond Tail Sandstone	15680.8	40.1054	11837.9	27024.5	21930.5	8462.02	13468.5	21008.2	12546.2
49	21.2667	225347	6.35627	Diamond Tail Sandstone	15680.8	40.1054	11632.9	26556.4	21246.7	8334	12912.7	19950.8	11616.8
50	21.2667	190131	6.35627	Diamond Tail Sandstone	15355	40.9647	11157.6	25471.4	19838.3	8186.18	11652.1	18595.4	10409.2

Interslice Data

Group 3 with TC - Master Scenario

Global Minimum Query (spencer) - Safety Factor: 2.51944

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	470.619	7151.04	0	0	0
2	492.75	7119.73	5067.56	2136.02	22.8558
3	514.881	7089.29	72494.2	30556.9	22.8558
4	537.012	7059.33	201256	84831.1	22.8558
5	559.737	7030.51	380374	160331	22.8559
6	587.209	6997.02	657370	277087	22.8558
7	600.932	6981.19	814649	343382	22.8559
8	614.656	6965.35	989070	416901	22.8558
9	628.515	6949.91	1.17576e+06	495593	22.8558
10	642.374	6934.46	1.37828e+06	580956	22.8558
11	656.234	6919.59	1.5855e+06	668301	22.8558
12	670.093	6904.71	1.80671e+06	761544	22.8558
13	683.709	6890.31	2.03645e+06	858380	22.8558
14	697.324	6875.91	2.27947e+06	960816	22.8558
15	724.554	6848.98	2.74351e+06	1.15641e+06	22.8558
16	744.379	6830.96	3.05315e+06	1.28693e+06	22.8559
17	786.842	6795	3.64189e+06	1.53509e+06	22.8559
18	788.003	6794.02	3.65661e+06	1.54129e+06	22.8558
19	809.815	6778.06	3.87207e+06	1.63211e+06	22.8558
20	831.627	6762.11	4.09136e+06	1.72454e+06	22.8558
21	849.076	6751.19	4.21483e+06	1.77659e+06	22.8559
22	866.524	6740.26	4.33599e+06	1.82766e+06	22.8559
23	883.973	6730.72	4.40939e+06	1.85859e+06	22.8558
24	901.422	6721.17	4.47665e+06	1.88694e+06	22.8558
25	918.943	6712.09	4.5316e+06	1.91011e+06	22.8559
26	936.465	6703.02	4.59415e+06	1.93647e+06	22.8558
27	953.986	6694.96	4.62788e+06	1.95069e+06	22.8558
28	971.508	6686.9	4.66125e+06	1.96476e+06	22.8559
29	987.924	6681	4.6272e+06	1.9504e+06	22.8558
30	1004.34	6675.11	4.58647e+06	1.93324e+06	22.8559
31	1020.75	6670.33	4.50666e+06	1.8996e+06	22.8559
32	1037.17	6665.56	4.42822e+06	1.86653e+06	22.8558
33	1054.41	6662.59	4.26981e+06	1.79976e+06	22.8558
34	1071.65	6659.61	4.12336e+06	1.73803e+06	22.8558
35	1088.89	6658.91	3.90844e+06	1.64744e+06	22.8558
36	1106.14	6658.21	3.70199e+06	1.56042e+06	22.8558
37	1123.34	6657.51	3.49595e+06	1.47357e+06	22.8558
38	1140.54	6656.8	3.2896e+06	1.3866e+06	22.8559
39	1157.74	6656.1	3.08635e+06	1.30092e+06	22.8558
40	1174.94	6655.4	2.89326e+06	1.21953e+06	22.8558
41	1201.96	6654.97	2.56751e+06	1.08223e+06	22.8559
42	1220.98	6655.38	2.31123e+06	974202	22.8558
43	1240.01	6655.79	2.05411e+06	865823	22.8558
44	1259.03	6656.5	1.78683e+06	753166	22.8559
45	1278.06	6657.2	1.51967e+06	640552	22.8558
46	1297.08	6658.23	1.24311e+06	523983	22.8559
47	1316.11	6659.25	967822	407945	22.8558
48	1335.13	6660.82	678965	286190	22.8559
49	1354.16	6662.38	393372	165810	22.8559
50	1367.81	6663.69	185927	78369.9	22.8559
51	1381.46	6664.99	527323	0	0

Group 3 with TC - G3 without TC

Global Minimum Query (spencer) - Safety Factor: 2.5499

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	422.816	7238.01	0	0	0
2	444.565	7194.53	-191454	-75415.9	21.5
3	460.146	7169.86	-256353	-100980	21.5
4	475.727	7145.19	-285682	-112533	21.5
5	491.306	7122.71	-277184	-109186	21.5001
6	506.884	7100.24	-234922	-92538.4	21.5
7	523.465	7076.97	-153345	-60404.2	21.5
8	540.046	7053.71	-35243.1	-13882.7	21.5001
9	556.625	7032.88	102286	40291.6	21.5
10	573.203	7012.06	268953	105944	21.5001
11	588.061	6993.59	441562	173937	21.5001
12	602.918	6975.13	637589	251154	21.5001
13	617.774	6958.08	840329	331015	21.5
14	632.63	6941.03	1.06369e+06	419001	21.5001
15	660.918	6908.59	1.53897e+06	606216	21.5
16	689.207	6878.48	2.04354e+06	804974	21.5001
17	716.162	6849.8	2.56709e+06	1.01121e+06	21.5001
18	743.117	6823.26	3.06113e+06	1.20581e+06	21.5
19	759.653	6809.13	3.31531e+06	1.30594e+06	21.5001
20	776.189	6795	3.56818e+06	1.40555e+06	21.5001
21	776.727	6794.54	3.57612e+06	1.40867e+06	21.5
22	796.438	6780.35	3.78516e+06	1.49102e+06	21.5001
23	816.15	6766.17	3.99299e+06	1.57288e+06	21.5
24	835.86	6753.03	4.17078e+06	1.64292e+06	21.5001
25	855.57	6739.9	4.34962e+06	1.71337e+06	21.5001
26	871.054	6730.96	4.44265e+06	1.75001e+06	21.5
27	886.539	6722.03	4.53146e+06	1.78499e+06	21.5
28	902.022	6713.78	4.59364e+06	1.80949e+06	21.5001
29	917.505	6705.53	4.65901e+06	1.83524e+06	21.5001
30	932.989	6697.35	4.72878e+06	1.86272e+06	21.5
31	948.472	6689.16	4.80497e+06	1.89273e+06	21.5
32	963.954	6682.1	4.84225e+06	1.90742e+06	21.5001
33	979.436	6675.04	4.87722e+06	1.92119e+06	21.5
34	994.938	6670.07	4.82639e+06	1.90117e+06	21.5
35	1010.44	6665.1	4.77314e+06	1.88019e+06	21.5
36	1041.67	6657.79	4.56594e+06	1.79858e+06	21.5001
37	1060.71	6655.53	4.35709e+06	1.71631e+06	21.5001
38	1079.76	6653.27	4.16755e+06	1.64165e+06	21.5001
39	1098.58	6652.59	3.94004e+06	1.55203e+06	21.5001
40	1117.41	6651.91	3.71416e+06	1.46305e+06	21.5
41	1136.21	6651.23	3.48824e+06	1.37406e+06	21.5001
42	1155	6650.55	3.26426e+06	1.28583e+06	21.5001
43	1173.92	6650.15	3.04029e+06	1.1976e+06	21.5
44	1192.83	6649.75	2.81875e+06	1.11034e+06	21.5001
45	1217.81	6650.5	2.47867e+06	976375	21.5
46	1242.79	6651.25	2.13747e+06	841973	21.5
47	1292.68	6654.55	1.3982e+06	550768	21.5001
48	1315.47	6656.93	1.0379e+06	408841	21.5001
49	1338.26	6659.31	683511	269243	21.5001
50	1359.86	6662.15	337498	132944	21.5
51	1381.46	6664.99	527323	0	0

Group 3 with TC - G3 with TC, 0.065 horizontal

Global Minimum Query (spencer) - Safety Factor: 2.28287

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	470.011	7122.42	0	0	0
2	490.142	7095.27	39790.1	20735.2	27.5247
3	510.273	7068.13	129975	67731.9	27.5247
4	524.615	7050.5	218183	113699	27.5248
5	538.958	7032.88	327756	170799	27.5248
6	553.299	7016.76	446522	232689	27.5247
7	567.639	7000.65	583005	303813	27.5247
8	587.789	6978.7	797748	415719	27.5247
9	607.665	6957.05	1.04261e+06	543319	27.5247
10	627.547	6936.34	1.30804e+06	681642	27.5248
11	647.429	6915.63	1.60248e+06	835077	27.5247
12	676.585	6886.82	2.05585e+06	1.07133e+06	27.5246
13	691.164	6872.7	2.30081e+06	1.19899e+06	27.5248
14	705.742	6858.57	2.55425e+06	1.33106e+06	27.5247
15	730.458	6835.53	2.97248e+06	1.54901e+06	27.5248
16	755.174	6814.77	3.34457e+06	1.74291e+06	27.5248
17	779.167	6795	3.69256e+06	1.92425e+06	27.5247
18	786.989	6788.55	3.79866e+06	1.97954e+06	27.5247
19	802.894	6777.68	3.95497e+06	2.06099e+06	27.5246
20	818.8	6766.8	4.11371e+06	2.14372e+06	27.5247
21	832.726	6757.94	4.23388e+06	2.20634e+06	27.5247
22	846.652	6749.07	4.35416e+06	2.26902e+06	27.5247
23	860.576	6741.89	4.4214e+06	2.30406e+06	27.5247
24	874.501	6734.71	4.48432e+06	2.33685e+06	27.5247
25	888.988	6727.92	4.52264e+06	2.35682e+06	27.5247
26	903.475	6721.14	4.55753e+06	2.375e+06	27.5247
27	917.962	6714.65	4.58523e+06	2.38943e+06	27.5247
28	932.449	6708.16	4.61737e+06	2.40618e+06	27.5247
29	961.424	6695.17	4.69271e+06	2.44544e+06	27.5247
30	975.907	6689.32	4.70555e+06	2.45214e+06	27.5248
31	990.391	6683.48	4.71497e+06	2.45705e+06	27.5248
32	1010.48	6678.38	4.60501e+06	2.39974e+06	27.5247
33	1030.57	6673.28	4.49671e+06	2.34331e+06	27.5248
34	1050.67	6668.86	4.3636e+06	2.27394e+06	27.5247
35	1070.76	6664.45	4.23598e+06	2.20744e+06	27.5248
36	1092.1	6662.66	4.00949e+06	2.08941e+06	27.5247
37	1113.45	6660.86	3.79001e+06	1.97504e+06	27.5248
38	1131.63	6659.56	3.59396e+06	1.87287e+06	27.5247
39	1149.82	6658.26	3.39837e+06	1.77094e+06	27.5247
40	1168.01	6656.96	3.20929e+06	1.67241e+06	27.5247
41	1186.2	6656.49	2.99379e+06	1.56011e+06	27.5247
42	1204.38	6656.02	2.77392e+06	1.44553e+06	27.5247
43	1222.57	6655.55	2.54959e+06	1.32863e+06	27.5247
44	1240.4	6655.53	2.30964e+06	1.20359e+06	27.5247
45	1258.24	6655.51	2.0663e+06	1.07678e+06	27.5247
46	1276.32	6656.15	1.79241e+06	934054	27.5248
47	1294.4	6656.79	1.5165e+06	790272	27.5247
48	1316.66	6658.52	1.14048e+06	594323	27.5248
49	1338.92	6660.26	764825	398562	27.5247
50	1360.19	6662.63	381932	199031	27.5248
51	1381.46	6664.99	527323	0	0

Discharge Sections

Entity Information

Group 3 with TC

Shared Entities

Type	Coordinates (x,y)
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Scenario-based Entities

Type	Coordinates (x,y)	Master Scenario	G3 without TC	G3 with TC, 0.065 horizontal
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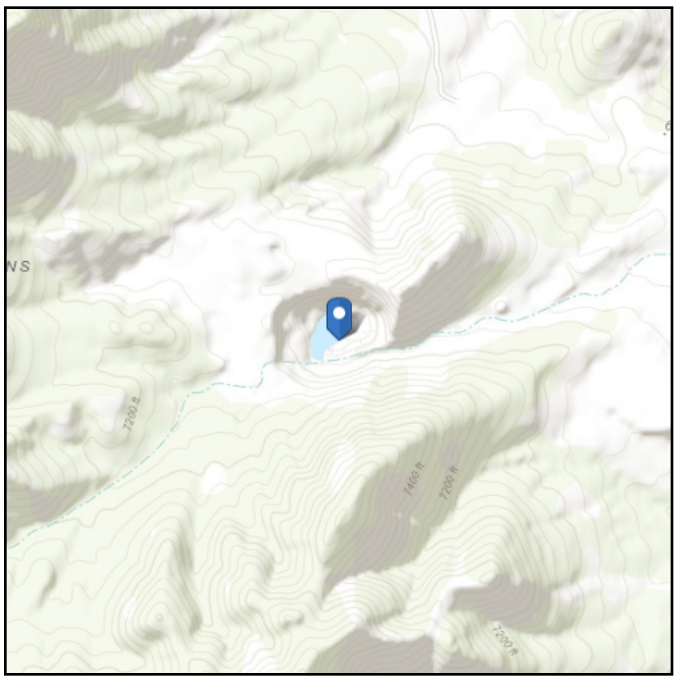
ASCE SEISMIC DESIGN HAZARDS REPORT

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-22	**Latitude:**	35.337855
Risk Category:	I	**Longitude:**	-106.136064
Soil Class:	A - Hard Rock	**Elevation:**	6793.01366241252 ft (NAVD 88)



Seismic

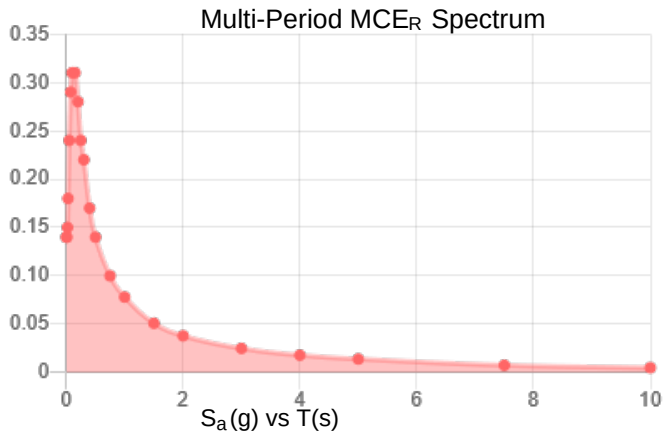
A - Hard Rock

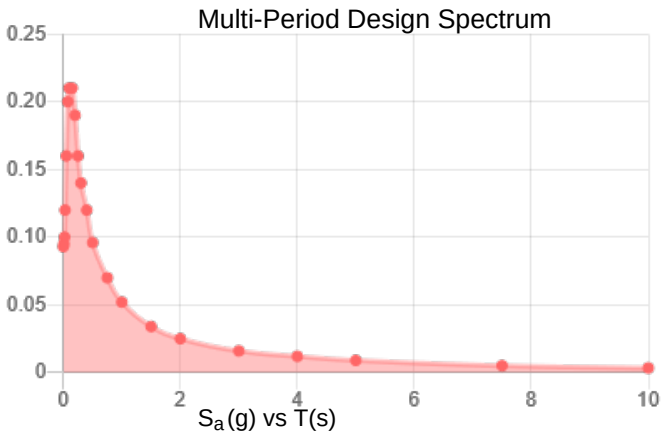
Site Soil Class:

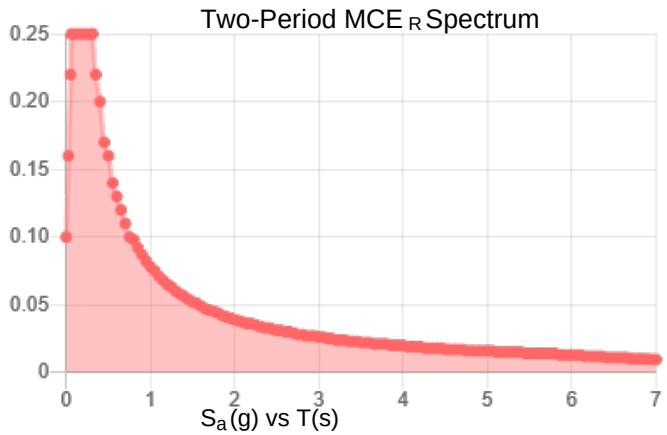
Results:

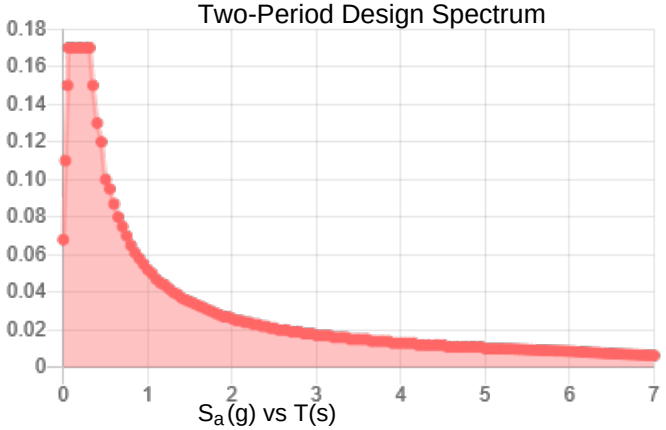
PGA_M :	0.13	T_L :	6
S_{MS} :	0.25	S_S :	0.41
S_{M1} :	0.078	S_1 :	0.12
S_{DS} :	0.17	V_{S30} :	1500
S_{D1} :	0.052		

Seismic Design Category: B









MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: **Fri Jul 21 2023**

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

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CUNNINGHAM HILL MINE
RESIDUE PILE, WASTE ROCK PILE, AND PIT PERIMETER DRILLING ACTIVITIES

Prepared for:

LAC Minerals (USA), Inc.

Pegasus Gold Corporation

Prepared by:

Schafer and Associates
Bozeman, Montana

Date:

December 14, 1995

ref:u:\170\rpt\sum1295.rv5

TABLE OF CONTENTS

LIST OF TABLES

TABLE **PAGE**

LIST OF FIGURES

1.0 INTRODUCTION

This report provides an update on the drilling program at the Cunningham Hill Mine. The drilling program began on November 15, 1995. Stewart Brothers Drilling provided the drilling rig and equipment, with oversight by Josh Rosen with Schafer and Associates. Two boreholes were drilled through the residue pile, one borehole was drilled through the waste rock pile, and two monitor wells were installed downgradient of the open pit. Borehole logs are included in Appendix A and details of the drilling are as follows.

2.0 RESIDUE PILE BOREHOLES

Two boreholes were drilled to the base of the residue pile and into the underlying andesite porphyry bedrock. The boreholes were positioned to intercept pre-residue-pile drainages to maximize the chances of intercepting any groundwater that may be present. Undisturbed split spoon samples were collected every 10 feet in the residue pile. These samples were shipped to Energy Labs in Billings, Montana, for acid base accounting (ABA), nitrate, and cyanide analysis. Samples also were shipped to Schafer and Associate's laboratory for column leaching tests.

BOREHOLE RP-1

Borehole RP-1 was positioned to intercept the pre-mining drainage (now filled with spent ore material). The borehole was drilled with a casing air-hammer rig with the casing being driven as the borehole was advanced. The base of the residue pile was intercepted at 116 feet below ground surface (bgs). Two feet of caliche-cemented colluvium were encountered, followed by andesite porphyry bedrock to the total depth of the borehole at 205 feet bgs. Water was first encountered during drilling at a depth of 175 feet, and the water rose to a static level of 137 feet bgs, 21 feet below the base of the residue pile. The borehole was allowed to stay open for 3 days.

A submersible pump was lowered into the borehole and the borehole was developed by pumping. A slug test was performed to determine aquifer parameters. The results are included in Appendix B. The calculated hydraulic conductivity of andesite bedrock is low at 0.2 ft/day (7.1×10^{-5} cm/sec). Water quality samples were then collected and shipped to Energy Laboratory in Billings, Montana, for chemical analysis. The drive casing was then removed and the borehole was abandoned by pressure-grouting.

The laboratory results are included in Appendix C. They show that nitrate, cyanide, and sulfate are elevated. In one sample, nitrate is 89 mg/l, total cyanide is 21.6 mg/l, WAD cyanide is 2.6 mg/l, and sulfate is 1800 mg/l. The pH is neutral at 6.8, and the water is strongly alkaline (415 mg/l).

BOREHOLE RP-2

Borehole RP-2 was positioned south of RP-1. The borehole was drilled with a casing air-hammer rig with the casing being driven as the borehole was advanced. The base of the residue pile was intercepted at 85 feet bgs. Several feet of caliche-cemented colluvium were encountered, followed by andesite porphyry bedrock to the total depth of the borehole at 245 feet bgs. No water was encountered during drilling. The borehole was left open overnight (18 hours) and remained dry, indicating that the groundwater is at depth under this portion of the residue pile.

Schematic sections through the residue pile are attached as Figures 2 and 3. Figure 2 shows that the water encountered in RP-1 is probably perched groundwater associated with water migration beneath the drainage.

Based on the information presented above, the following conclusions can be made:

- No groundwater was encountered in the residue pile or the underlying alluvium. Groundwater was encountered 21 feet below the residue pile in borehole RP-1. No groundwater was encountered in borehole RP-2, even though this borehole was deeper than RP-1.

- Water quality analysis indicates that seepage from the pile is not acidic and maintains a neutral pH of 6.8.

WASTE ROCK PILE BOREHOLE

One borehole was completed through the waste rock pile to determine if groundwater was present within the waste rock material. The borehole was designated WR-1 and was positioned to intercept the centerline of Dolores Gulch, now filled with waste rock material. The borehole was drilled with a casing hammer rig with the casing being driven as the borehole was advanced. The borehole intercepted waste rock to a depth of 145 feet, followed by 10 feet of alluvium and then andesite porphyry bedrock from 155 feet to 160 feet bgs where the borehole was terminated. No water was encountered during drilling. Temporary PVC casing (4-inch) was placed in the borehole and the drive casing was removed. The borehole was allowed to stand open for one week. Groundwater seeped into the borehole overnight to a level of 155 feet bgs. Over the next several days the water level continued to rise and stabilized at a depth of 148.7 feet bgs. This level is 3 to 4 feet below the base of the waste rock pile. No water was encountered during drilling and it took several days for water to enter the borehole and stabilize, indicating that the hydraulic conductivity of the formation materials is very low.

Schematic sections through the waste rock pile are attached as Figures 4 and 5. The figures show the relationship of groundwater to the base of the waste rock pile. The water encountered is probably perched or shallow alluvial groundwater associated with the pre-mining course of Dolores Gulch.

Water was bailed from the borehole and samples collected for analysis of water quality parameters. Results of water quality analysis are included in Appendix C. The pH of the water was 3.8 s.u., the electrical conductivity (EC) was 10,070 µmhos/cm, and the sulfate concentration was 27,700 mg/l, which is similar to ARD chemistry of water collected at the toe of the waste rock pile. After measurement of the static water level and sample collection, the PVC casing was removed and the borehole was abandoned by pressure-grouting.

Based on the information presented above, the following conclusions can be made:

- No groundwater was encountered in the waste rock pile. Groundwater was encountered 3 to 4 feet below the base of the waste rock in alluvial material at the base of Dolores Gulch. This water is probably perched water of limited lateral and vertical extent.

- The chemistry of the water collected from borehole WR-1 is similar to that observed in the water collected at the toe of the waste rock pile.

3.0 MONITOR WELLS DOWNGRADIENT OF THE OPEN PIT

Two monitor wells were installed on the north and east margins of the open pit. The wells have been designated as PW-1 and PW-2. The wells were installed to monitor water levels and water quality in the vicinity of the open pit. At present the open pit occupies a depression in the groundwater surface, with groundwater flow directed toward the open pit. As the pit refills, the water may reach a level at which it will migrate away from the open pit toward either or both Dolores Gulch and Cunningham Gulch. The two monitor wells are positioned in these two regions, with PW-1 located between the open pit and Dolores Gulch and PW-2 positioned between the open pit and Cunningham Gulch. Location coordinates for the two wells are listed in Table 3.1.

MONITOR WELL PW-1

Well PW-1 is located on the north margin of the open pit between the pit and the waste rock pile. The borehole is 8.75 inches in diameter and extends to a depth of 300 feet. The borehole intercepts metamorphosed sandstone and siltstone of the Eocene-age, Galisteo Formation, and several latite dikes.

The well was completed with 5-inch, schedule-80 PVC and 60 feet of perforated pipe (0.040-inch slot). Filter pack was tremied into the annulus from total depth to 10 feet above the top of the screen, followed by 3 feet of bentonite pellets and bentonite grout to 5 feet below ground surface. The upper portion of the annulus was filled with concrete, and the well head is protected with a steel casing.

Static water level is 234 feet bgs, or 6791 feet above mean sea level (Table 3.1). This is 3 feet above the water level in the open pit at 6788 feet msl (Figure 4). The well was developed by bailing. Water quality samples were collected and a short-term recovery test was performed to allow estimation of aquifer parameters. The results are included in Appendix B, and indicate a hydraulic conductivity of 8.7×10^{-2} ft/day (3.1×10^{-5} cm/sec). Field measurements of water chemistry indicate a pH of 6.97 and an EC of 1030 µmhos/cm. A dedicated submersible sampling pump will be installed in the well.

Table 3.1. Well coordinates and water level elevations in PW-1 and PW-2.

Well Name	Well Coordinates			Depth to Water (ft)[1]	Static Water Elevation (ft/msl)
	Northing	Easting	Elevation		
PW-1	1579471.81	534556.08	7025.49	234	6791.49
PW-2	1578936.51	534880.36	7001.51	208	6793.51

[1] *Measured in December 1995.*

MONITOR WELL PW-2

Well PW-2 is located on the east margin of the open pit between the pit and Cunningham Gulch. The borehole is 8.75 inches in diameter and extends to a depth of 280 feet. The borehole intercepts metamorphosed sandstone and siltstone rocks of the Eocene-age, Galisteo Formation. Two prior boreholes had to be abandoned due to unstable drilling and borehole collapse. The first borehole reached a depth of 100 feet bgs, where a fracture zone was encountered. Continued caving of the formation prevented further downhole progress and the borehole was abandoned. A small amount of perched water was encountered in the fracture zone from 90 to 100 feet bgs. A second borehole was begun, but unstable soils at the surface prevented further downhole progress. Rather than settling surface casing (requiring a 16-inch diameter borehole), the rig was moved over and the third borehole was successfully completed to total depth.

The well was completed with 5-inch, schedule-80 PVC and 60 feet of perforated pipe (0.040-inch slot). Filter pack was tremied into the annulus from total depth to 10 feet above the top of the screen, followed by 3 feet of bentonite pellets and bentonite grout to 5 feet below ground surface. The upper portion of the annulus was filled with concrete, and the well head is protected with steel casing.

Static water level is 208 feet bgs, or approximately 6794 feet msl, which is approximately 6 feet above the pit water level at 6788 feet msl (Figure 6). The well was developed by bailing. Water quality samples were collected and a short-term recovery test was performed to allow estimation of aquifer parameters. The hydrologic test results are included in Appendix B, and indicate a hydraulic conductivity of 8.8×10^{-2} ft/day (3.1×10^{-5} cm/sec). Field measurements of water chemistry indicate a pH of 7.03 and an EC of 620 µmhos/cm. A dedicated submersible sampling pump will be installed in the well.

4.0 CONCLUSIONS

Based on the results of the investigation, the following conclusions can be made.

RESIDUE PILE

- No groundwater was encountered in the residue pile or the underlying alluvium. Groundwater was encountered 21 feet below the residue pile in borehole RP-1. No groundwater was encountered in borehole RP-2, even though this borehole was deeper than RP-1.

- Water quality analysis indicates that seepage from the pile is not acidic and maintains a neutral pH of 6.8.

- The groundwater recovery system downgradient of the residue pile collects groundwater with elevated cyanide and nitrate. This water is treated by land application. Increased pumping rates are planned for this system pending agency approval. The effectiveness of the recovery system will be enhanced by the increased pumping rates.

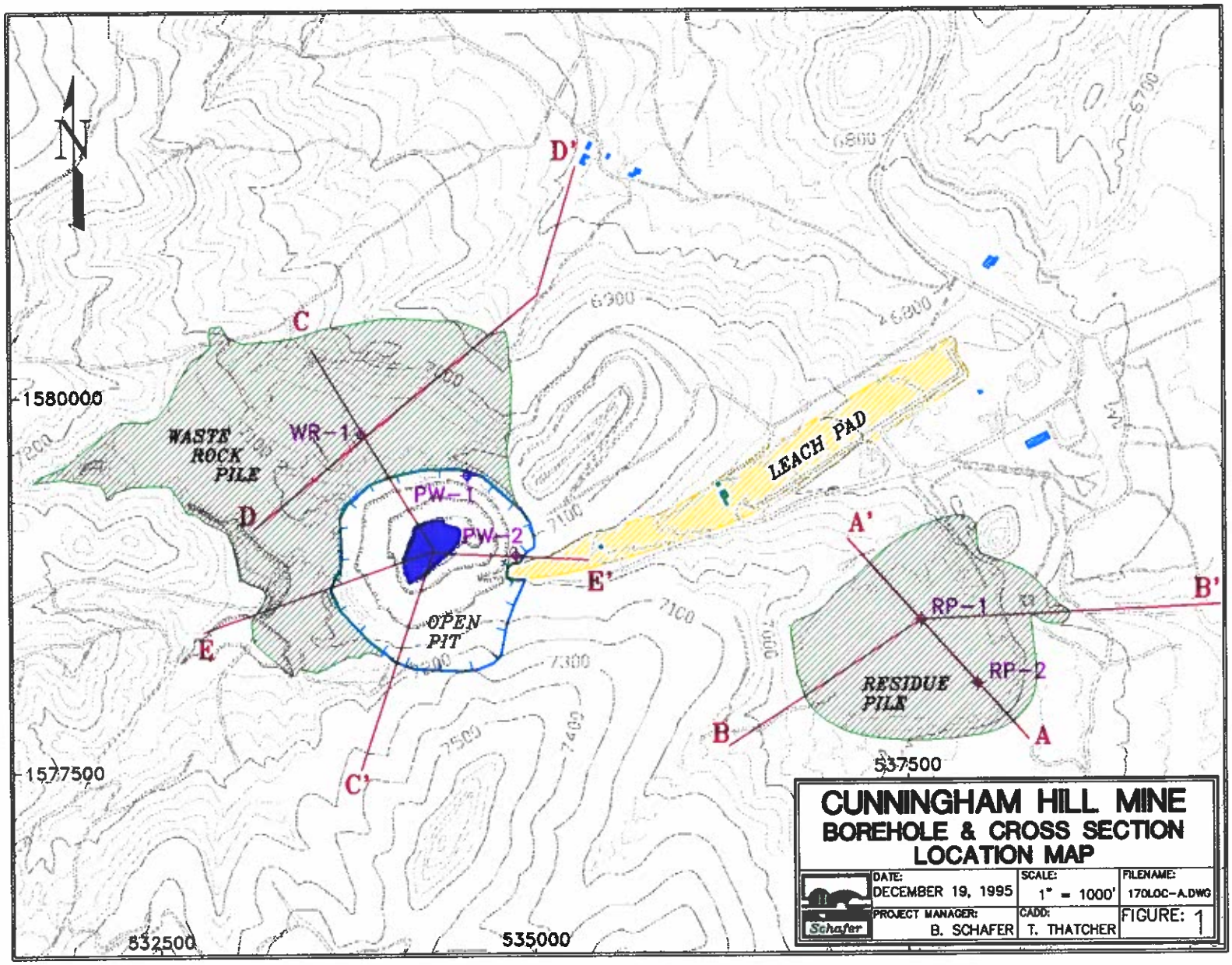
WASTE ROCK PILE

- No groundwater was encountered in the waste rock pile. Groundwater was encountered 3 to 4 feet below the base of the waste rock in alluvial material at the base of Dolores Gulch.

- The chemistry of the water collected from borehole WR-1 is similar to that observed in the water collected at the toe of the waste rock pile.

OPEN PIT AREA

- Two monitor wells were installed on the periphery of the open pit. Depth to water in PW-1 is 234 feet, and PW-2 is 208 feet. The water level in PW-1 is 6793 feet msl, 5 feet higher than the water level in the open pit. The water level in PW-2 is 6794 feet msl, 6 feet higher than the water level in the open pit.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D'
C
1580000
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WR-1
PW-1
PW-2
D
LEACH PAD
A'
B'
E'
E
OPEN PIT
RP-1
RP-2
RESIDUE PILE
B
A
C'
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537500
532500
535000
CUNNINGHAM HILL MINE
BOREHOLE & CROSS SECTION
LOCATION MAP
DATE: DECEMBER 19, 1995
SCALE: 1" = 1000'
FILENAME: 170LOC-A.DWG
PROJECT MANAGER: B. SCHAFER
CADD: T. THATCHER
FIGURE: 1
Schafer

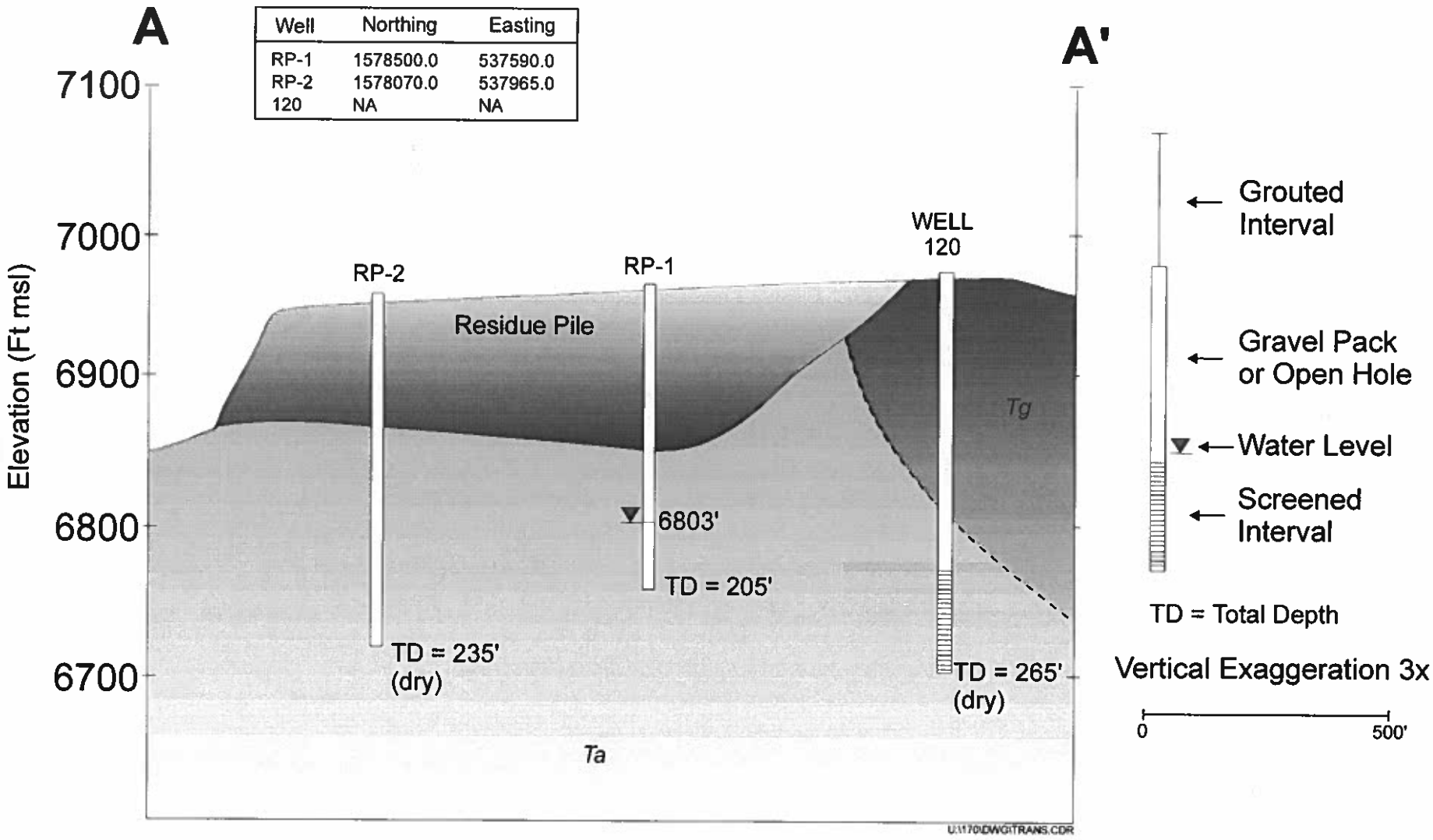


Figure 2: Section Through Residue Pile -- A to A'

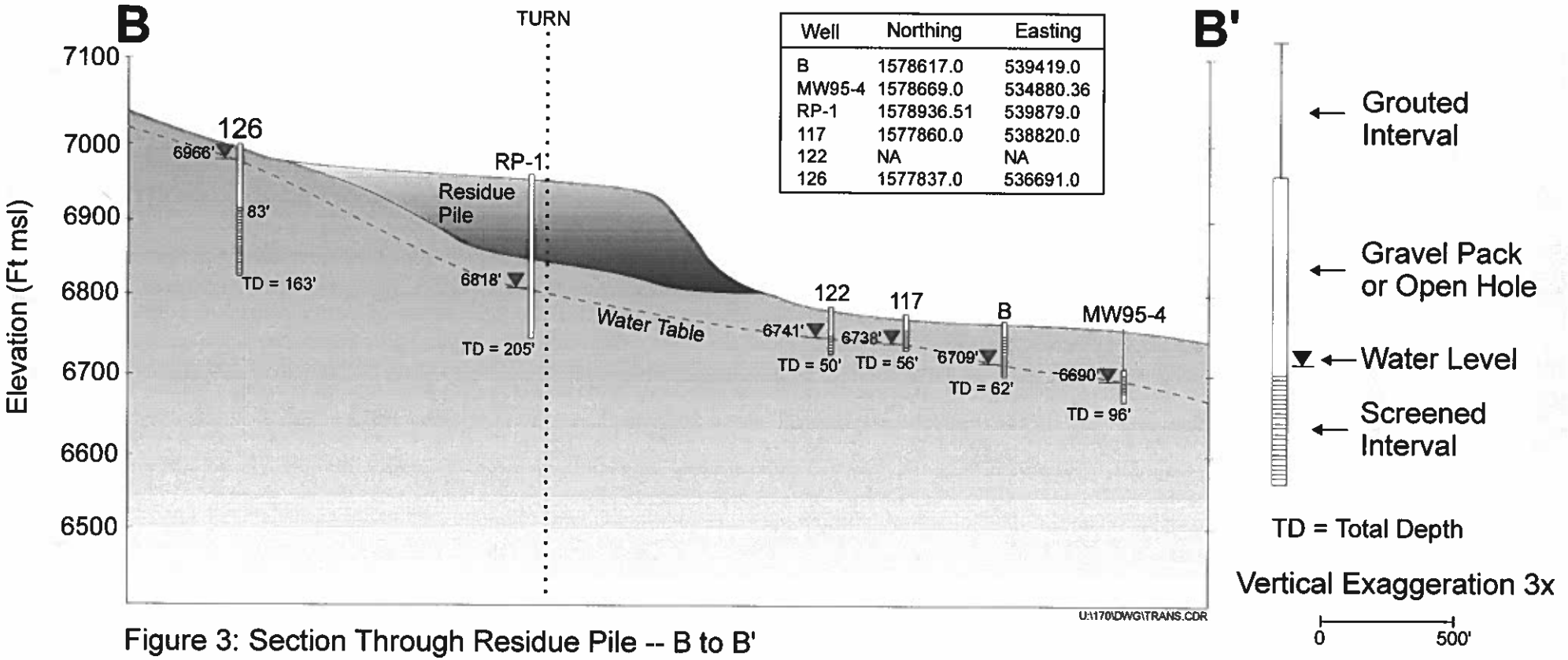


Figure 3: Section Through Residue Pile -- B to B'

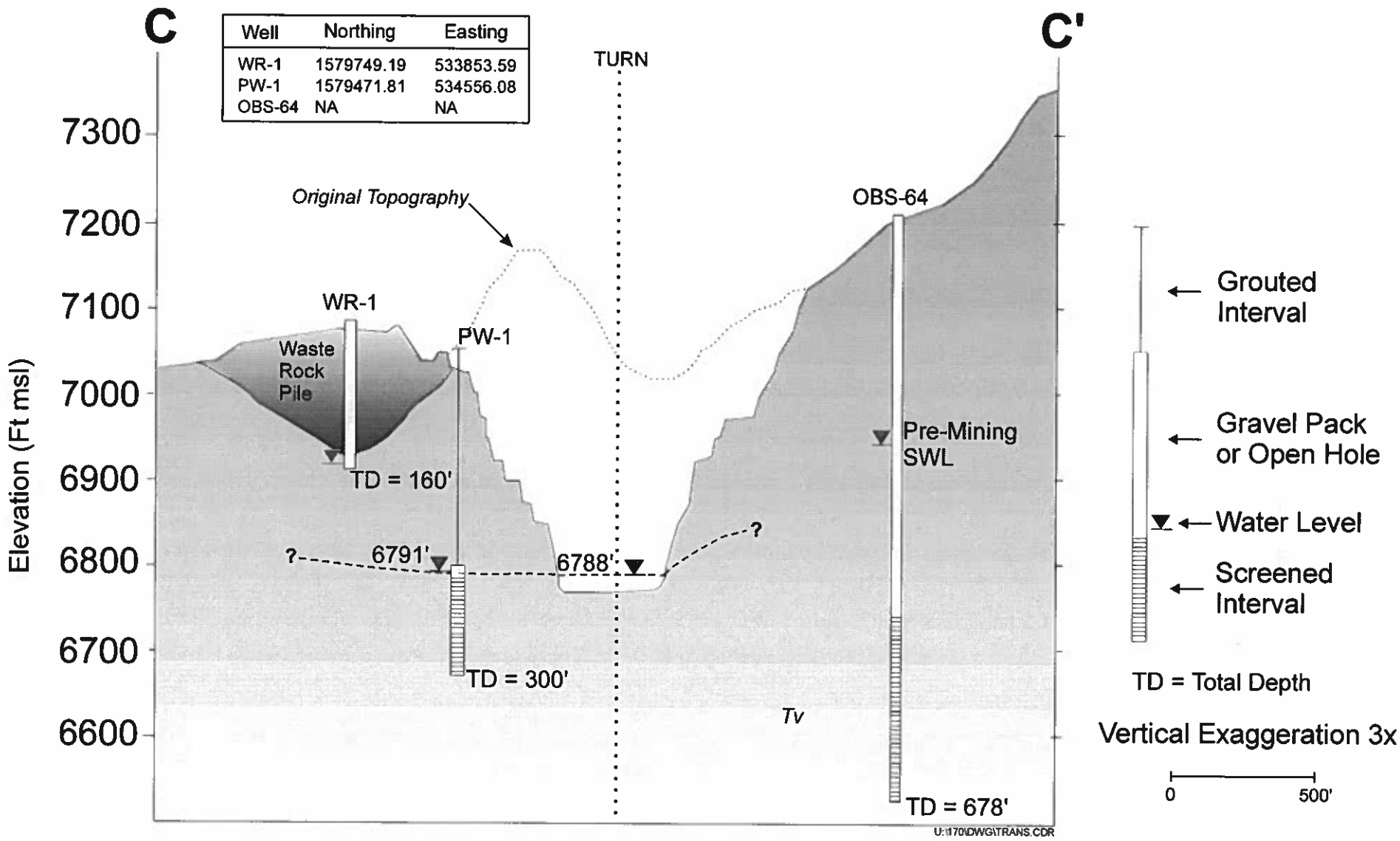


Figure 4: Section Through Waste Rock Pile and Open Pit -- C TO C'

Well	Northing	Easting
WR-1	1579749.19	533853.59
EG-9	1581299.0	535201.0
EG-15	1580503.0	534893.0
EG-17	NA	NA
EG-20	1580767.0	534957.0
EG-28	1581158.0	535086.0

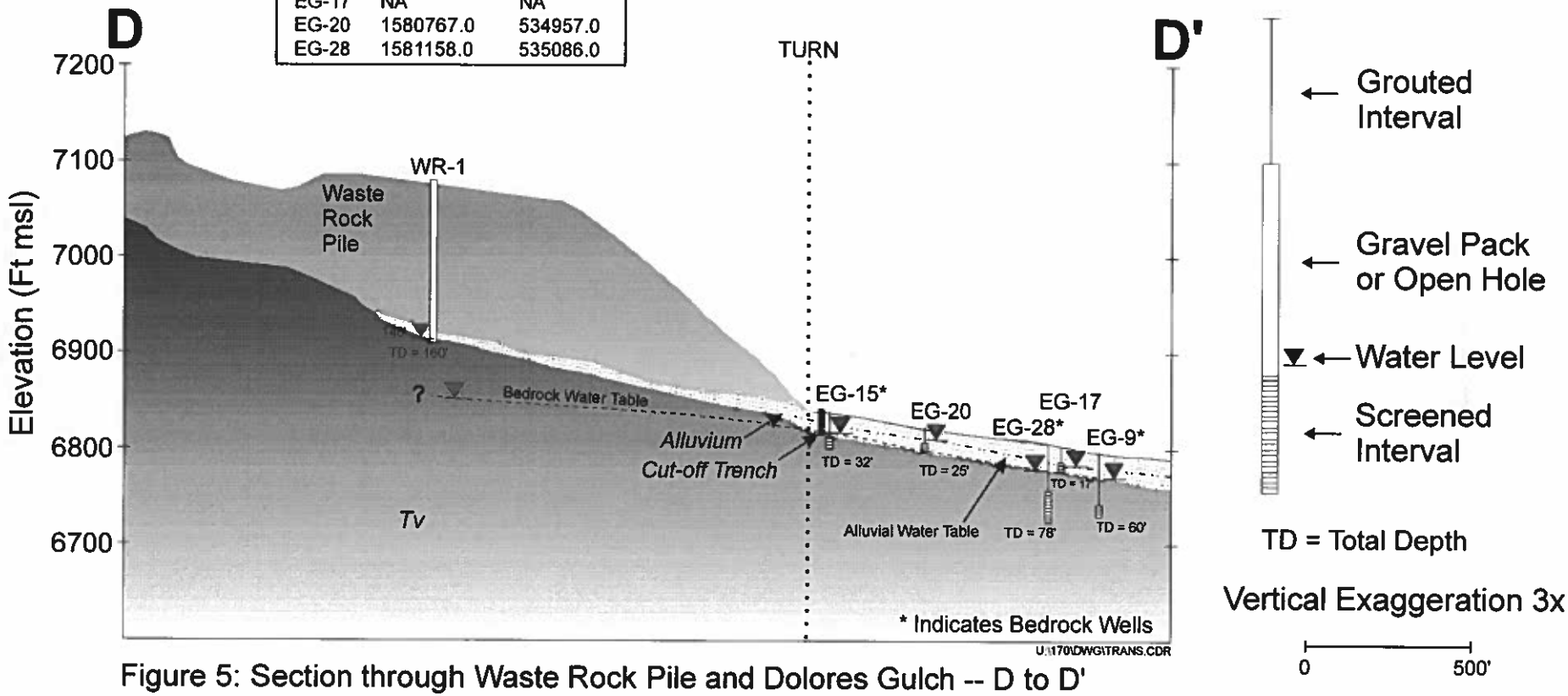


Figure 5: Section through Waste Rock Pile and Dolores Gulch -- D to D'

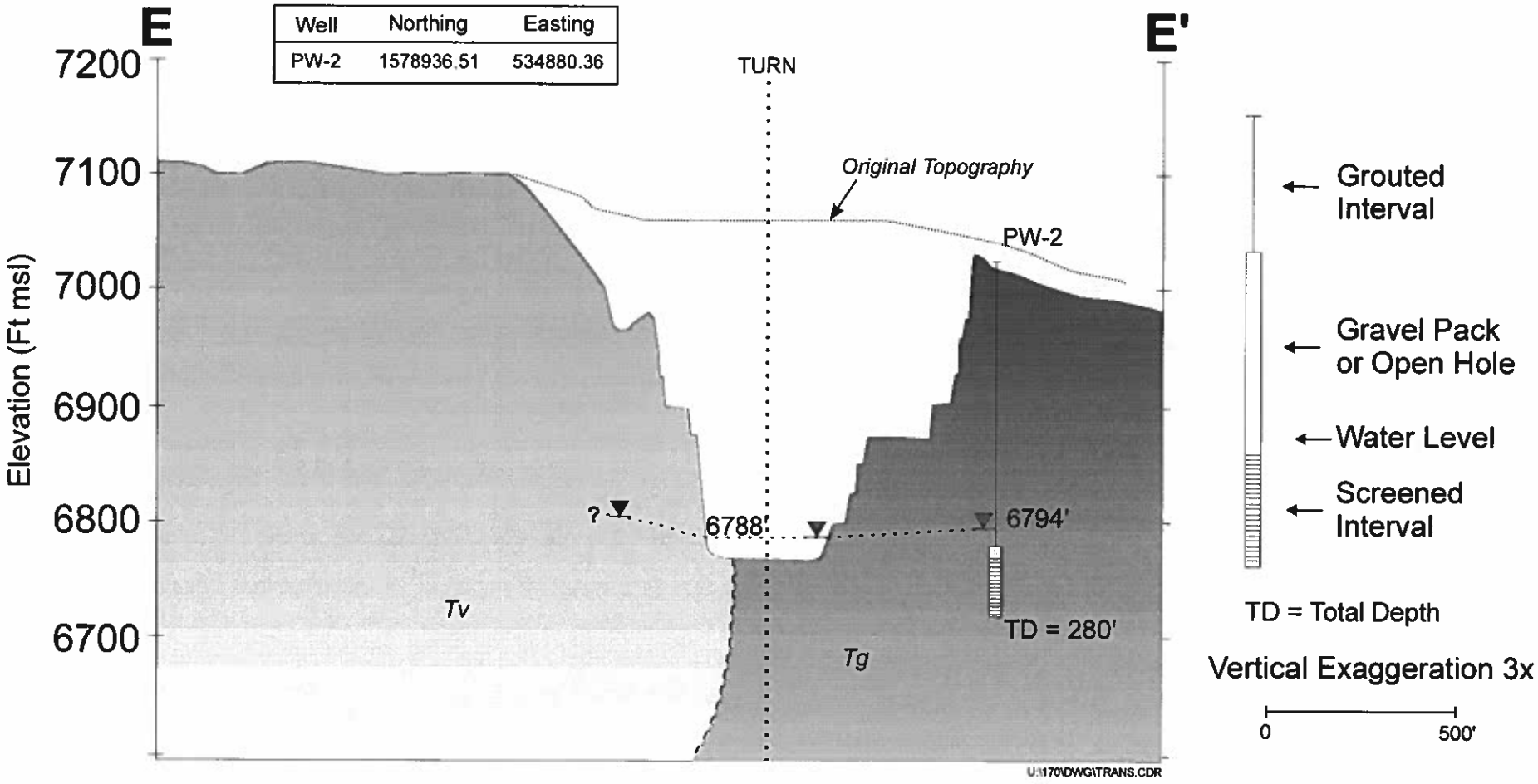


Figure 6: Section through Open Pit -- E TO E'

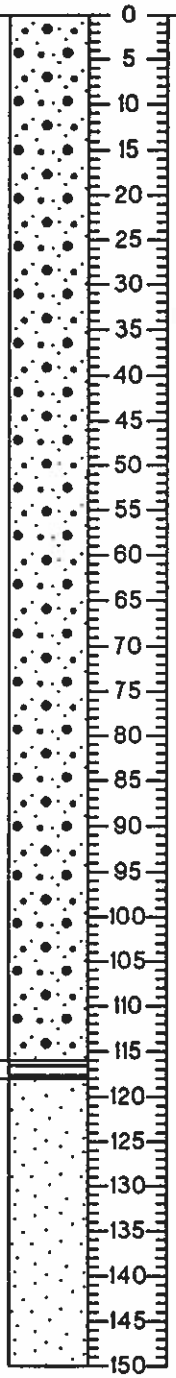
APPENDIX A

Borehole Logs

Hole No. RP-1

PROJECT: Cunningham Hill
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: 175 ft.
FINAL H2o DEPTH: 137.5 ft.

DATE DRILLLED: 11/16/95
LOGGED BY: JDR
SAMPLER: Josh Rosen,. Tim Gelhaus
HOLE ELEV.: 6955 MSL
TOTAL DEPTH: 205 ft.

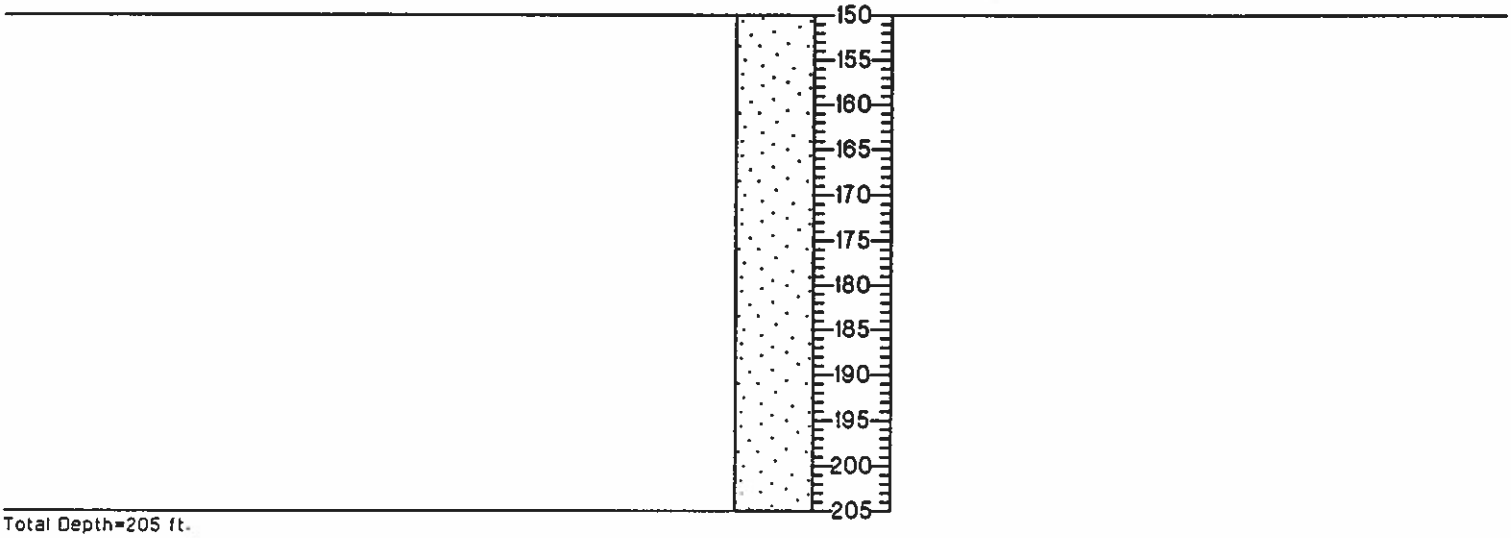
DESCRIPTION	GRAPHIC LOG	DRILLING NOTES
Spent Ore Material (0 to 116 ft.): Light Olive Gray. Oxidation increases with depth.		Grab samples collected every 5 ft. for paste pH, and split spoons collected every 10 ft. for ABA, nitrate, and cyanide analysis.
		Borehole Abandonded 11/17/95 by pressure grout.
Caliche/colluvium (116-118): White caliche or calcareous sandstone; wood debris (tree?)		
Andesite Porphyry (116 to 205 ft.): Light Olive Gray. Occasional gray clay seams.		▽=137.5 ft.

Hole No. RP-1

PROJECT: Cunningham Hill
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: 175 ft.
FINAL H2o DEPTH: 137.5 ft.

DATE DRILLLED: 11/16/95
LOGGED BY: JDR
SAMPLER: Josh Rosen, Tim Gelhaus
HOLE ELEV.: 6955 MSL
TOTAL DEPTH: 205 ft.

DESCRIPTION	GRAPHIC LOG	DRILLING NOTES

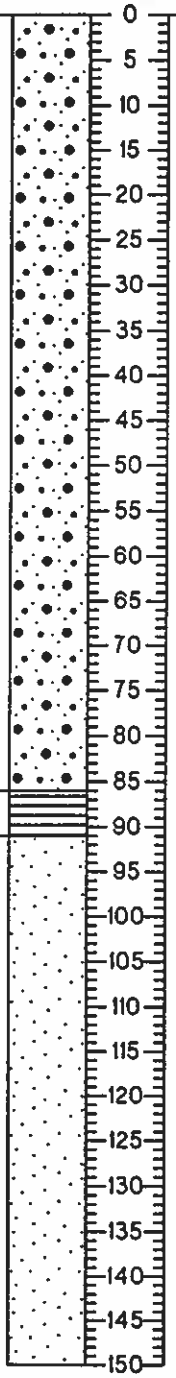


Total Depth=205 ft.

Hole No. RP-2

PROJECT: Cunningham Mine
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: dry ft.
FINAL H2o DEPTH: dry ft.

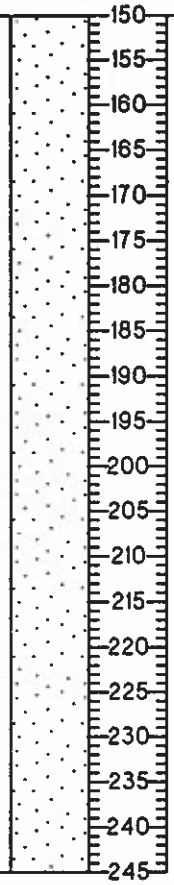
DATE DRILLLED: 11/19/95
LOGGED BY: JDR
SAMPLER: Josh Rosen, Tim Gelhaus
HOLE ELEV.: 6955 MSL
TOTAL DEPTH: 245 ft.

DESCRIPTION	GRAPHIC LOG	DRILLING NOTES
Spent Ore Material (0 to 86 ft.): Light Olive Gray. Slight oxidation throughout.		Grab samples collected every 5 ft. for paste pH, and split spoons collected every 10 ft. for ABA, nitrate, and cyanide analysis.
		No groundwater encountered during drilling. Borehole left open for 18 hours and remained dry.
Caliche/Colluvium (86 to 91 ft.): White caliche or calcareous sandstone mixed with Dark Reddish Brown sandy clay.		
Andesite Porphyry (91 to 245 ft.): Light Olive Gray. Occasional gray clay seams.		

Hole No. RP-2

PROJECT: Cunningham Mine
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: dry ft.
FINAL H2o DEPTH: dry ft.

DATE DRILLLED: 11/19/95
LOGGED BY: JDR
SAMPLER: Josh Rosen, Tim Gelhaus
HOLE ELEV.: 6955 MSL
TOTAL DEPTH: 245 ft.

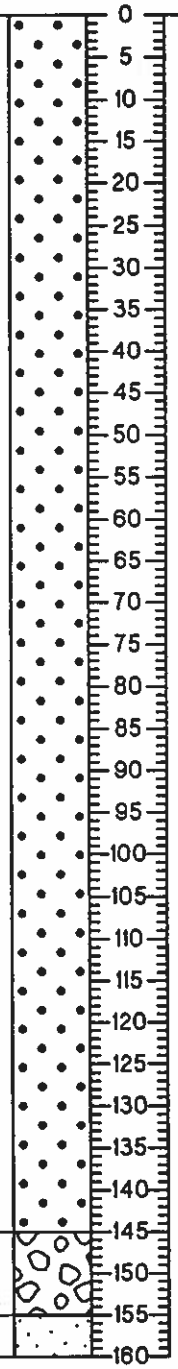
DESCRIPTION	GRAPHIC LOG	DRILLING NOTES
		Borehole Abandoned 11/20/95.

Total Depth=245 ft.

Hole No. WR-1

PROJECT: Cunningham Mine
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: dry ft.
FINAL H2o DEPTH: 155.33 ft.

DATE DRILLLED: 11/27/95
LOGGED BY: JDR
SAMPLER: Josh Rosen, Tim Gelhaus
HOLE ELEV.: 7074.29 BGS
TOTAL DEPTH: 160 ft.

DESCRIPTION	GRAPHIC LOG	DRILLING NOTES
Waste Rock Material (0 to 145 ft.): Colors range from Light Brown to Grayish Black. No water encountered.		Grab samples collected every 5 ft. for paste pH.
		Borehole Abandoned 12/5/95.
Alluvium (145 to 155 ft.): Subangular to subrounded particles of bedrock below.		▽=148.7 ft. Water encountered in alluvium beneath waste rock pile.
Andesite Porphyry (155 to 160 ft.): Medium bluish gray mottled with bluish white and grayish black phenocrysts.		
Total depth=160 ft.		

Hole No. PW-1

PROJECT: Cunningham Hill
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: 195 ft.
FINAL H2o DEPTH: 248.12 ft.

DATE DRILLLED: 11/28/95
LOGGED BY: JDR
SAMPLER: Josh Rosen, Tim Gelhaus
HOLE ELEV.: 7024.734 MSL
TOTAL DEPTH: 297.3 ft.

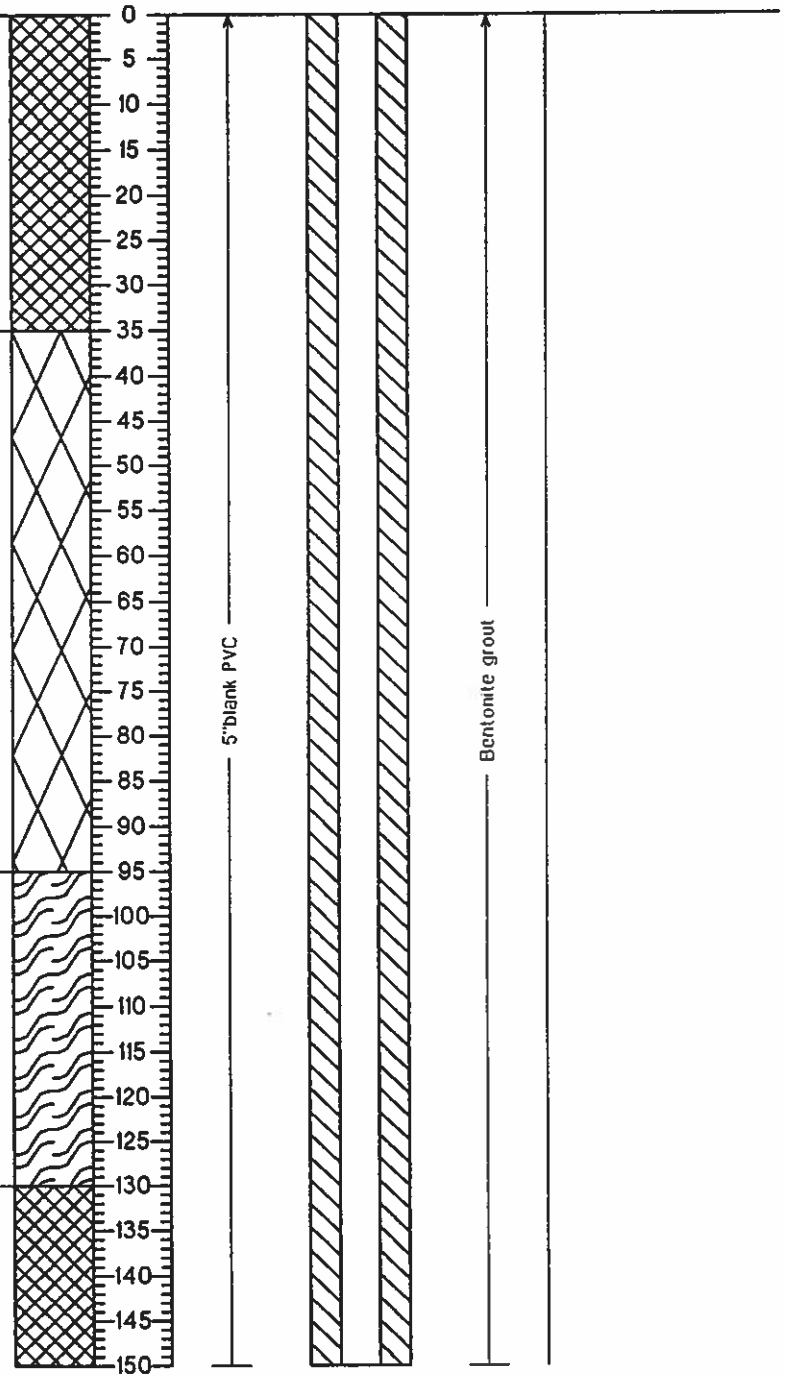
DESCRIPTION	GRAPHIC LOG	WELL CONSTRUCTION DETAIL	DRILLING NOTES

Fine grained crystalline rock (0 to 35 ft.) Metamorphosed Galisteo Formation.

Fine grained crystalline rock (35 to 95 ft.): Breccia of hornfels.

Latite (95 to 130 ft.): Igneous intrusive.

Fine grained crystalline rock (130 to 165 ft.): Metamorphosed Galisteo Formation.



Hole No. PW-1

PROJECT: Cunningham Hill
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: 195 ft.
FINAL H2o DEPTH: 248.12 ft.

DATE DRILLLED: 11/28/95
LOGGED BY: JDR
SAMPLER: Josh Rosen, Tim Gelhaus
HOLE ELEV.: 7024.734 MSL
TOTAL DEPTH: 297.3 ft.

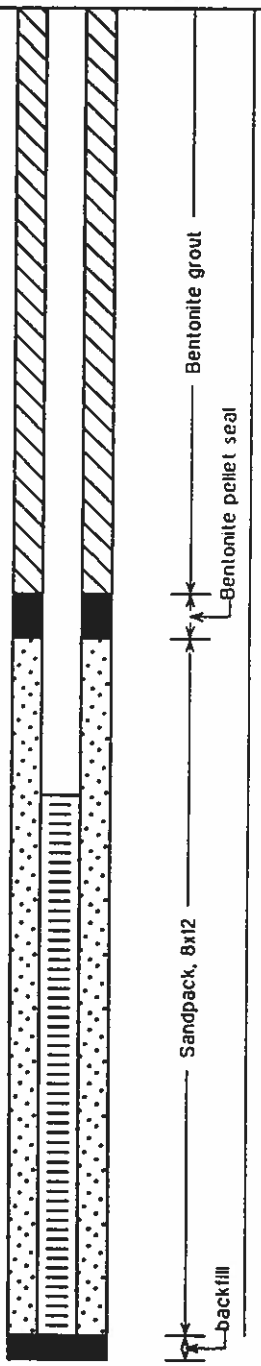
DESCRIPTION

Fine grained crystalline rock (165 to 300 ft.): Metamorphosed Galisteo Formation.

Total Depth=300 ft.

GRAPHIC LOG

WELL CONSTRUCTION DETAIL



DRILLING NOTES

Trace of water at 195 ft.

Trace of water at 245 ft.

▽=248.12 ft.

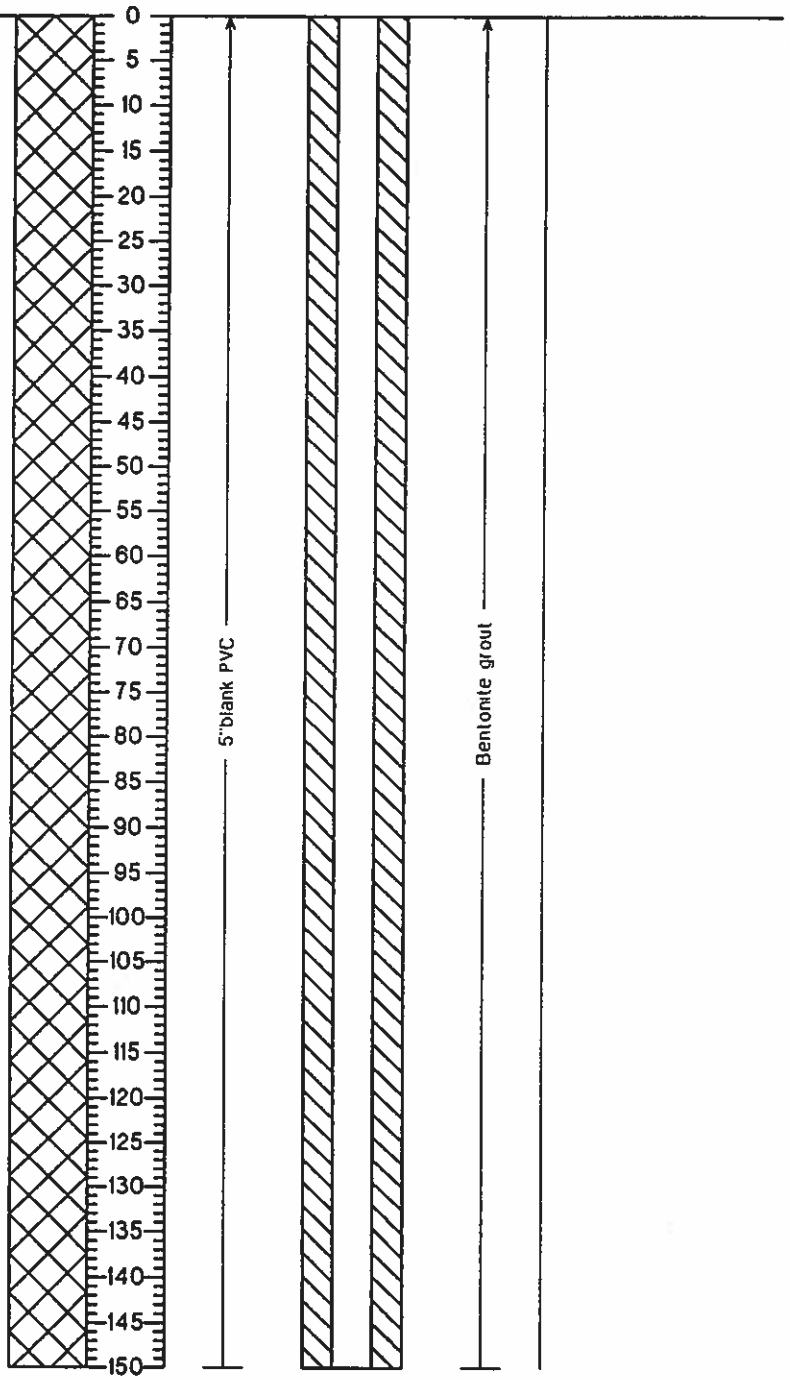
Hole No. PW-2

PROJECT: Cunningham Mine
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: dry ft.
FINAL H2o DEPTH: 212.33 ft.

DATE DRILLLED: 12/3/95
LOGGED BY: JDR
SAMPLER: Josh Rosen, Tim Gelhaus
HOLE ELEV.: 7000.242 MSL
TOTAL DEPTH: 280 ft.

DESCRIPTION	GRAPHIC LOG	WELL CONSTRUCTION DETAIL	DRILLING NOTES

Fine grained crystalline rock (0 to 185 ft.): Galisteo Formation.



Hole No. PW-2

PROJECT: Cunningham Mine
DRILL RIG: Air Rotary
HOLE DIA.: 8 3/4 in.
INITIAL H2o DEPTH: dry ft.
FINAL H2o DEPTH: 212.33 ft.

DATE DRILLLED: 12/3/95
LOGGED BY: JDR
SAMPLER: Josh Rosen, Tim Gelhaus
HOLE ELEV.: 7000.242 MSL
TOTAL DEPTH: 280 ft.

DESCRIPTION

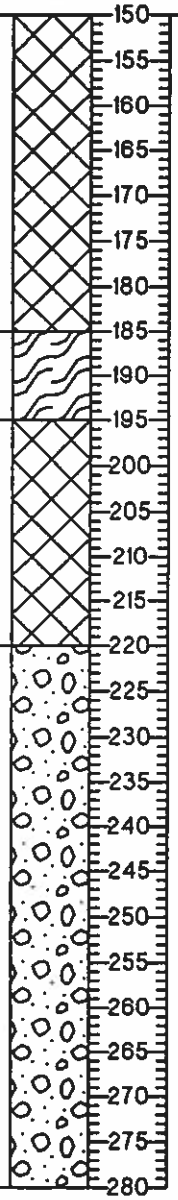
Latite (185 to 195 ft.): Igneous intrusive.

Galisteo Formation (195 to 220 ft.)

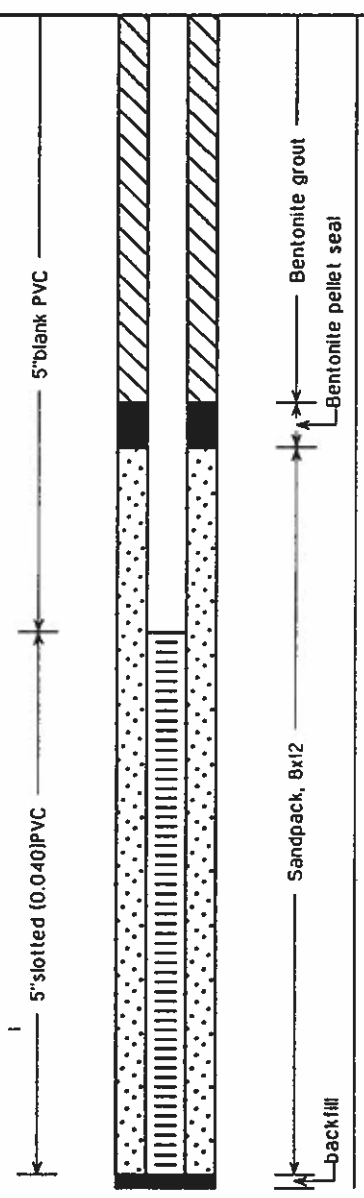
Porphyrytic Rock (220 to 280 ft.): Mottled, mineralized.

Total Depth=280 ft.

GRAPHIC LOG



WELL CONSTRUCTION DETAIL

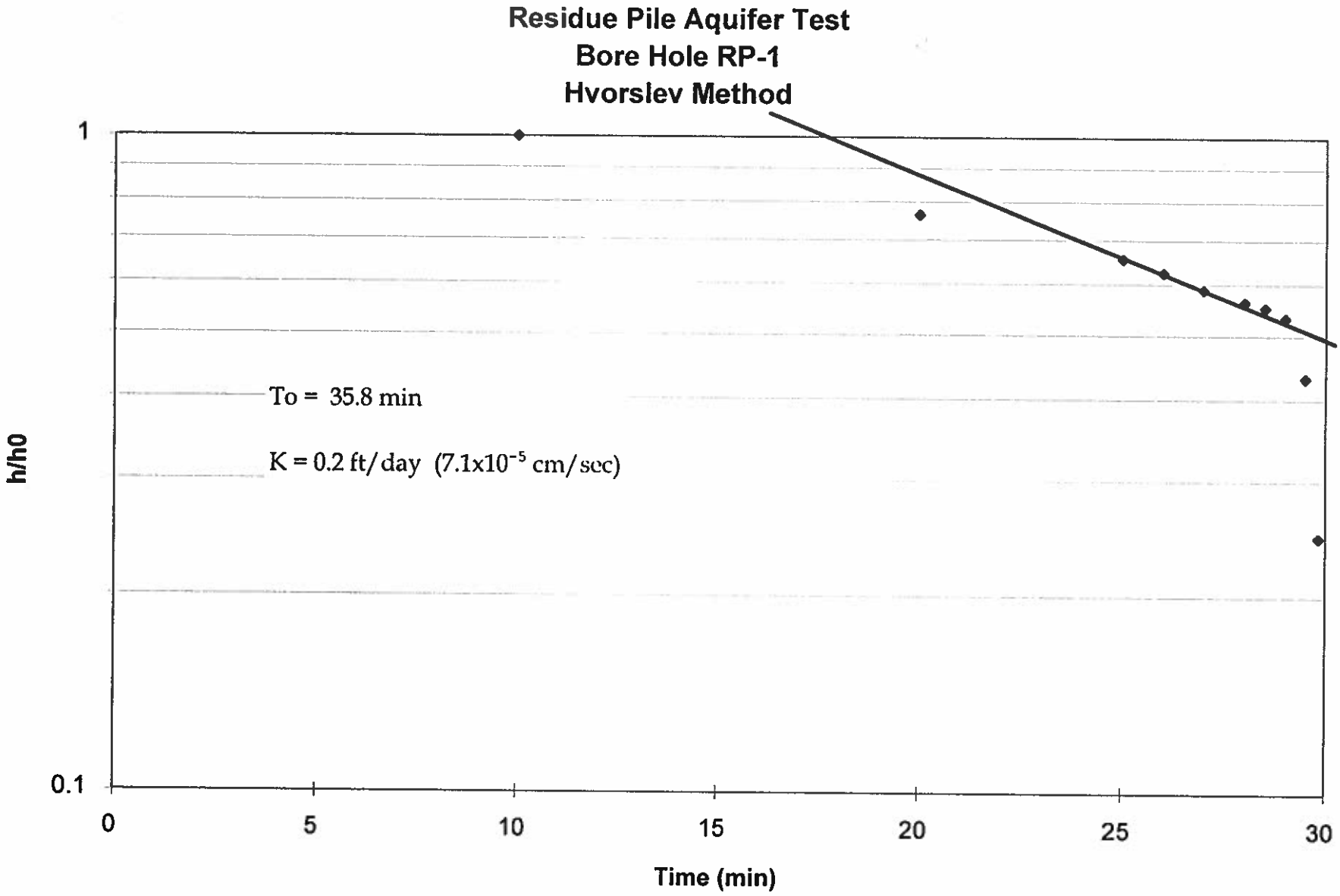


DRILLING NOTES

▽=212.33 ft.

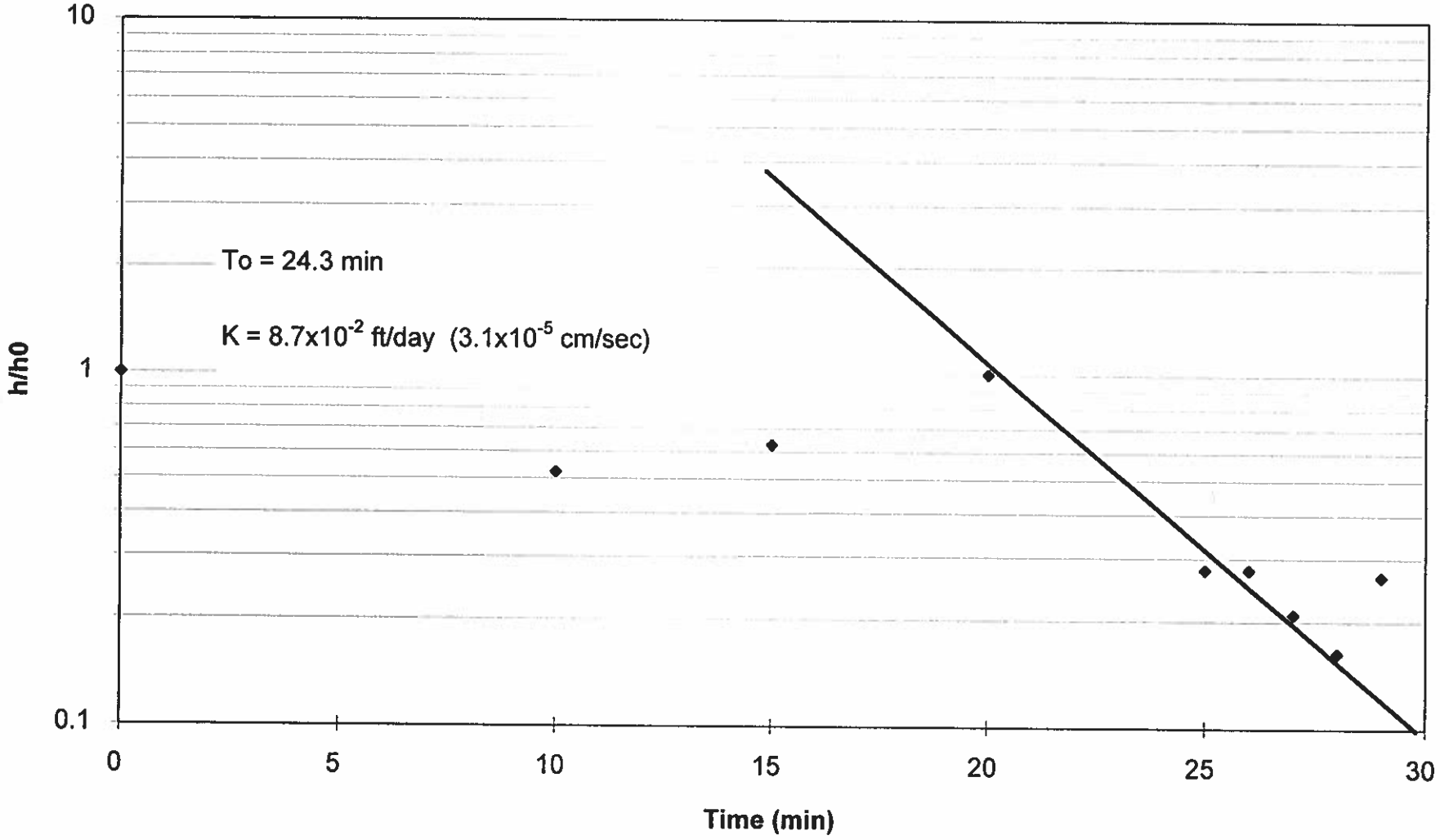
APPENDIX B

Aquifer Test Results



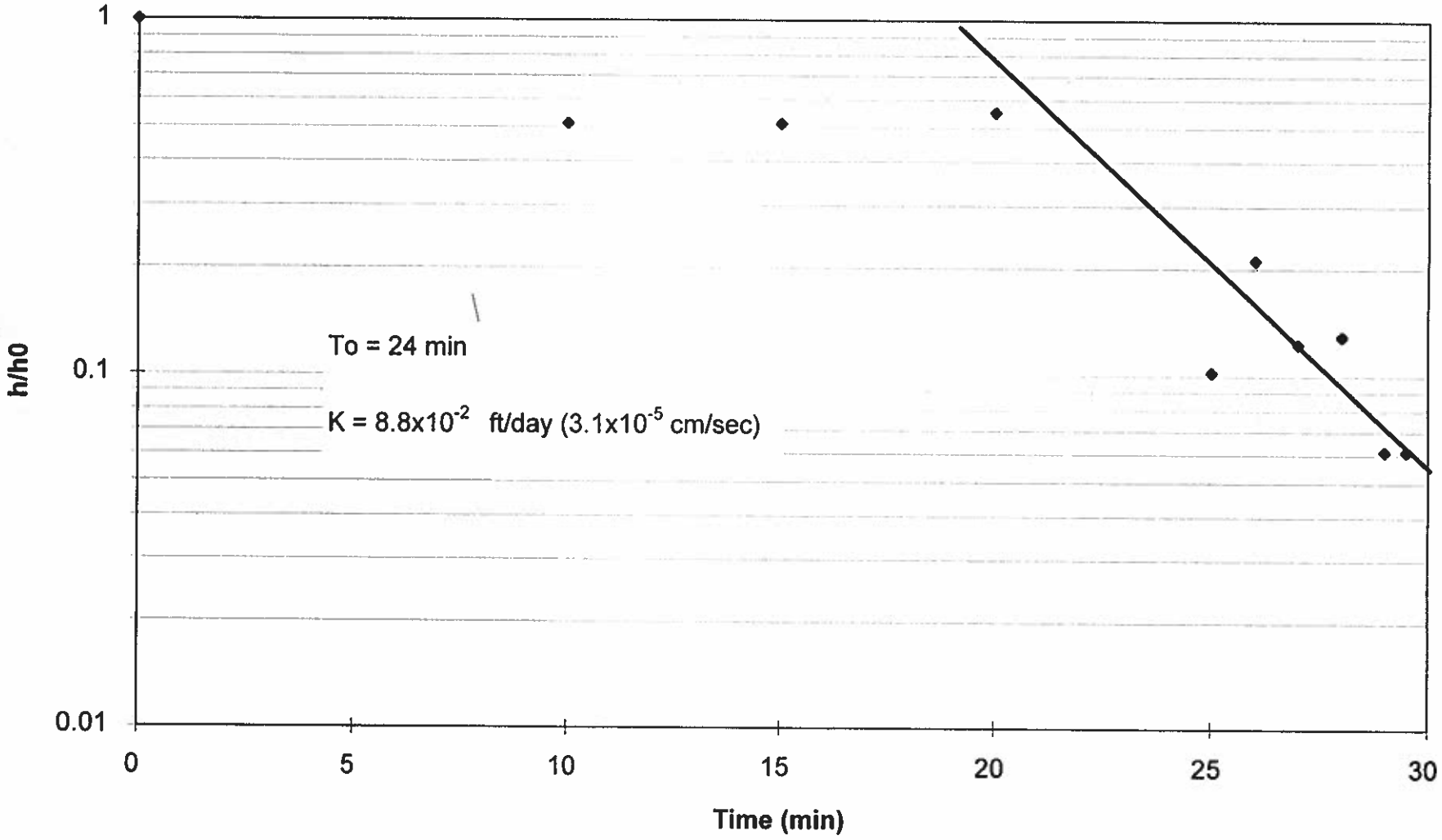
u:\170\dat\AQTEST.XLS

Cunningham Hill Aquifer Test
Monitoring Well PW-1
Hvorslev Method



u:\170\dat\AQTEST.XLS

Cunningham Hill Aquifer Test
Monitoring Well PW-2
Hvorslev Method



u:\170\dat\AQTEST.XLS

APPENDIX C

Laboratory Results

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: David King
ADDRESS: Schafer & Associates
P. O. Box 6186
Bozeman, MT 59715

LAB NO.: 95-69355
DATE: 12/05/95 cdt

WATER ANALYSIS

Ortiz/Cunningham Hill
Residual Pile 1
Sampled 11/18/95 @ 1230
Submitted 11/20/95

Constituent	mg/l (ppm)		Date Analyzed
Potassium	2		11/21/95
Sodium	181		11/21/95
Calcium	756		11/21/95
Magnesium	129		11/21/95
Sulfate	1800		11/21/95
Chloride	123		11/21/95
Carbonate	0		11/21/95
Bicarbonate	507		11/21/95
Total Dissolved Solids @ 180°C	3680		11/21/95
Total Alkalinity as $CaCO_3$	415		11/21/95
Specific Conductance @ 25°C	3880	µmhos/cm	11/20/95
pH	6.8	s.u.	11/20/95
Fluoride	0.46		11/27/95
Nitrate plus Nitrite as N	92.8		11/22/95
Total Cyanide	25.2		11/29/95
Weak Acid Dissociable Cyanide	5.20		11/29/95
Dissolved Metals			
Aluminum	<0.1		11/21/95
Arsenic	<0.005		11/21/95
Barium	0.2		11/21/95
Cadmium	<0.001		11/21/95
Chromium	<0.01		11/21/95
Copper	0.17		11/21/95
Iron	23.5		11/21/95
Lead	<0.01		11/21/95
Manganese	1.95		11/21/95
Mercury	<0.001		11/22/95
Molybdenum	0.089		11/21/95
Nickel	0.04		11/21/95
Selenium	0.045		11/21/95
Silica	27.2		11/21/95
Silver	<0.005		11/21/95
Zinc	0.29		11/21/95

ENERGY LABORATORIES, INC.
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FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: David King
ADDRESS: Schafer & Associates
P. O. Box 6186
Bozeman, MT 59715

LAB NO.: 95-69356
DATE: 12/05/95 cdt

WATER ANALYSIS

Ortiz/Cunningham Hill
Residual Pile 1
Sampled 11/18/95 @ 1245
Submitted 11/20/95

Constituent			Date Analyzed
Nitrate plus Nitrite as N	89.0	mg/l (ppm)	11/22/95
Total Cyanide	21.6	mg/l (ppm)	11/28/95
Weak Acid Dissociable Cyanide	2.60	mg/l (ppm)	11/28/95

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: David King
ADDRESS: Schafer & Associates, Inc.
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 95-70290
DATE: 12/12/95 lm

WATER ANALYSIS

Cunningham Hill Mine, Reclamation Project, WR-1
Sampled 12/04/95 @ 1407-28
Submitted 12/05/95

Constituent	mg/l (ppm)		Date Analyzed
Potassium	2		12/07/95
Sodium	52		12/07/95
Calcium	508		12/07/95
Magnesium	2300		12/07/95
Sulfate	27700		12/06/95
Chloride	51		12/06/95
Carbonate	0		12/06/95
Bicarbonate	0		12/06/95
Total Dissolved Solids @ 180° C	38700		12/06/95
Total Alkalinity as $CaCO_3$	0		12/06/95
Specific Conductance @ 25° C	17400	µmhos/cm	12/05/95
pH	3.5	s.u.	12/06/95
Fluoride	26.0		12/11/95
Nitrate plus Nitrite as N	0.14		12/05/95
Total Cyanide	0.033		12/06/95
Weak Acid Dissociable Cyanide	0.033		12/07/95
Dissolved Metals			
Aluminum	2540		12/06/95
Arsenic	<0.1[1]		12/08/95
Barium	<0.1		12/06/95
Cadmium	1.21		12/06/95
Chromium	0.2		12/06/95
Copper	91.5		12/06/95
Iron	660		12/06/95
Lead	<0.1[1]		12/06/95
Manganese	1510		12/06/95
Mercury	<0.002[1]		12/07/95
Molybdenum	<0.05[1]		12/06/95
Nickel	7.6		12/06/95
Selenium	0.013		12/08/95
Silica	183		12/06/95
Silver	<0.05[1]		12/06/95
Zinc	104		12/06/95

[1] Detection limit raised due to matrix interference.

Lab Nos. 95-70290

QUALITY ASSURANCE DATA PACKAGE

This report includes the results of quality assurance tests performed with the sample analyses. They are performed to determine if the methodology is in control and to monitor the laboratory's ability to produce accurate and precise results.

Constituent	Duplicate Analysis -------mg/l (ppm)------- Original	Duplicate	Spiked Analysis, % Recovery	Blank Analysis, mg/l (ppm)	-----Calibration Verification----- Sample Analysis, mg/l (ppm)	Acceptance Range, mg/l (ppm)	Date Analyzed
Potassium	2	1	102	<1	21	18-22	12/07/95
Sodium	52	52	99	<1	50	45-55	12/07/95
Calcium	508	508	96	<1	50	45-55	12/07/95
Magnesium	2300	2320	100	<1	50	45-55	12/07/95
Sulfate	21500	23300	101	<1	326	286-350	12/06/95
Chloride	51	53	100	<1	73	69-85	12/06/95
Total Dissolved Solids @ 180° C	222	218	102	<10	N/A	N/A	12/06/95
Total Alkalinity as $CaCO_3$	129	128	102	2	106	85-115	12/06/95
Specific Conductance @ 25° C μmhos/cm	268	268	N/A	1	N/A	N/A	12/05/95
pH, s.u.	7.6	7.6	N/A	N/A	N/A	N/A	12/05/95
Fluoride	26.0	25.2	103	<0.10	2.35	2.11-2.43	12/11/95
Nitrate plus Nitrite as N	8.10	8.10	87	<0.05	2.61	2.05-3.10	12/05/95
Total Cyanide	0.012	0.011	102	<0.005	0.242	0.138-0.341	12/06/95
Weak Acid Dissociable Cyanide	0.011	0.011	95	<0.005	0.262	0.138-0.341	12/07/95
Dissolved Metals							
Aluminum	<0.1	<0.1	109	<0.1	1.0	0.9-1.2	12/06/95
Arsenic	0.025	0.023	108	<0.005	0.023	0.019-0.026	12/08/95
Barium	<0.1	<0.1	105	<0.1	1.0	0.9-1.2	12/06/95
Cadmium	<0.001	<0.001	105	<0.001	0.988	0.85-1.15	12/06/95
Chromium	<0.01	<0.01	102	<0.01	0.99	0.85-1.15	12/06/95
Copper	<0.01	<0.01	106	<0.01	0.99	0.85-1.15	12/06/95
Iron	<0.03	<0.03	102	<0.03	0.98	0.85-1.15	12/06/95
Lead	<0.01	<0.01	101	<0.01	0.95	0.85-1.15	12/06/95
Manganese	<0.01	<0.01	101	<0.01	1.00	0.85-1.15	12/06/95
Mercury	<0.001	<0.001	93	<0.001	0.003	0.002-0.003	12/07/95
Molybdenum	<0.005	<0.005	101	<0.005	0.985	0.85-1.15	12/06/95
Nickel	<0.01	<0.01	102	<0.01	0.99	0.85-1.15	12/06/95
Selenium	<0.005	<0.005	97	<0.005	0.102	0.081-0.128	12/08/95
Silica	11.3	11.3	107	<0.1	9.9	8.5-11.5	12/06/95
Silver	<0.005	<0.005	97	<0.005	1.00	0.85-1.15	12/06/95
Zinc	0.02	0.02	96	<0.01	0.96	0.85-1.15	12/06/95

Lab No. 95-70290

Date: 12/05/95

Received by: Randa Hoelscher

Logged In by: Randa Hoelscher

SAMPLE CONDITION QA/QC REPORT

This report provides information about the condition of the sample(s) and associated sample custody information on receipt at the laboratory.

Chain of Custody Form	Yes	Comments:
Completed & Signed	Yes	Comments:
Chain of Custody Seal	No	Comments:
Intact		Comments:
Signature Match Chain of Custody vs. Seal		Comments:
Samples Received Cold	Yes	Comments:
Samples Received Within Holding Time	Yes	Comments:
Samples Received in Proper Containers and Properly Preserved	No	Comments: Sample #WR-1 for cyanide analysis was inadequately preserved.

Client Notified About Sample Discrepancies

Who: David King By: Randa Hoelscher Date/Time: 12/06/95

Additional Comments: RUSH status added

Method of Shipment Federal Express - 4561490452

ENERGY LABORATORIES, INC
P.O. Box 30916 1120 South 27th Street
Billings, Montana 59107

toll-free 800-735-4489
voice 406-252-6325
fax 406-252-6069

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

P.O. #

Project Name / Address: Cunningham Hill Mine Reclamation Project

Contact Name & Phone: Tim Gelhaus/505-471-0434

Sampler's signature: Jim Gelhaus

Invoice to:

Report to:

DATE	TIME	composite	grab sample	SAMPLE I.D.	number of containers	Sample Type: A W S V U O (Air Water Soils/solids Vegetation Urine Other)	Analysis Requested: Major Ions	Trace Metals	Nitrates	-CN					Comments, Special Instructions, etc.
12/4/95	2:07			WR-1		W		X							Samples that are
	2:16			WR-1					X						filtered: Trace Metals
	2:26			WR-1			X								and Nitrates.
↓	2:28			WR-1		↓				X					Samples preserved:
															Trace metals, Nitrates,
															-CN.
				12/06/95 Rush added per											
				David King											

1. Relinquished (signature)	Date	Time	Received by: (signature)	3. Relinquished (signature)	Date	Time	Received by (signature):
Jim Gelhaus	12/4/95	3:00					
2. Relinquished (signature)	**Date**	**Time**	**Received by: (signature)**	**4. Relinquished (signature)**	**Date**	**Time**	**Received for laboratory by (signature):**
					12/05/95	1150	Lorna Loeliche