

NOTICE OF MEETING
HILLSIDE REVIEW BOARD
CITY OF ST. GEORGE
WASHINGTON COUNTY, UTAH

Public Notice

Notice is hereby given that the Hillside Review Board of the City of St. George, Washington County, Utah, will hold meetings at the referenced site on **Wednesday, December 16, 2020** commencing on-site at 8:30 a.m.

The estimated site times are in bold.

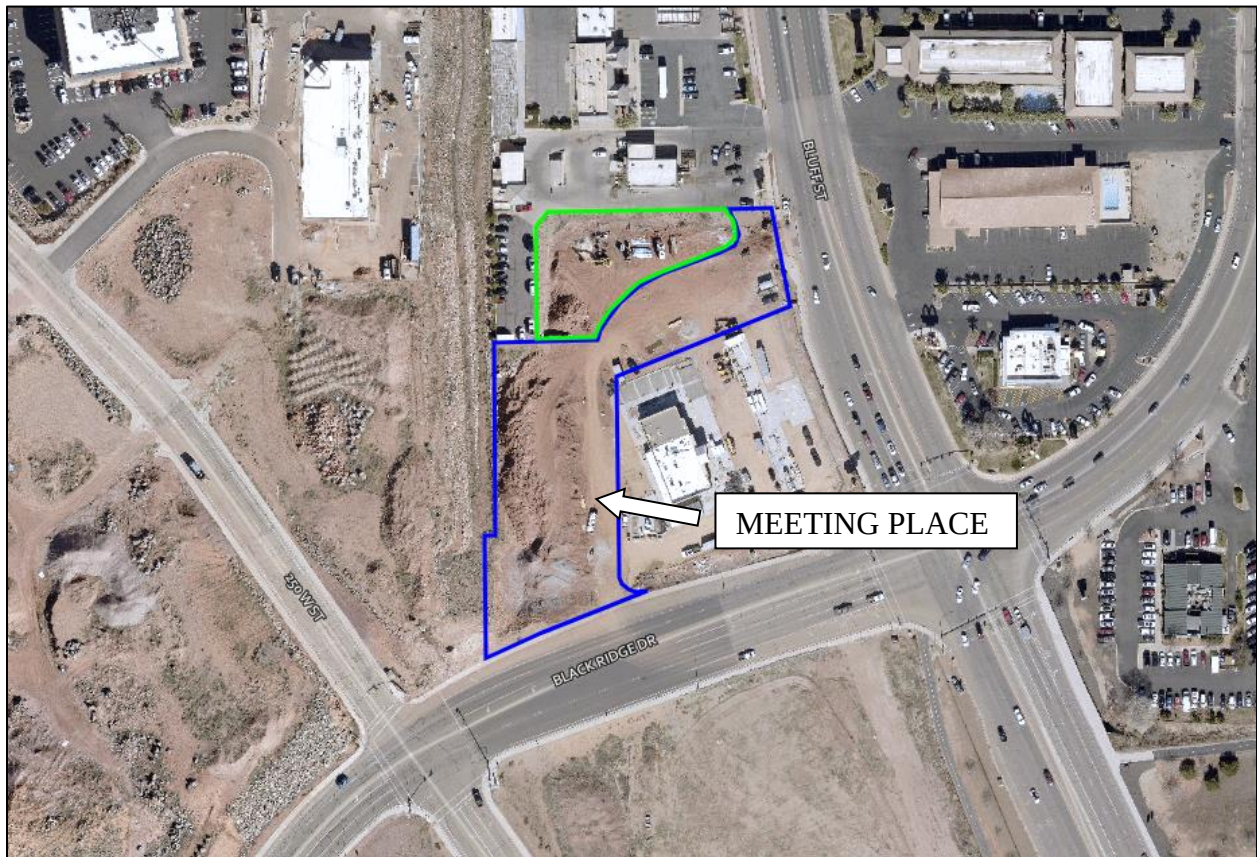
The agenda for the meetings are as follows:

1. Consider a request for a Hillside Development Permit to allow development of a restaurant/multi-tenant commercial building to be called “**Commerce Point North.**” The property is generally located at 1276 S Black Ridge Drive and 1190 S Bluff. The property is currently zoned C-2 (Highway Commercial). The owner is Commerce Point, LLC, the representative is Austin Atkin. Case No. 2020-HS-012. (*See ‘Meeting Place’ exhibit below*). **Meeting time approx. 8:30 am**
2. Consider approval of the meeting minutes from August 26, 2020, and November 18, 2020.

Dan Boles, AICP
Senior Planner
Development Services

Reasonable Accommodation: The City of St. George will make efforts to provide reasonable accommodations to disabled members of the public in accessing City programs. Please contact the City Human Resources Office at (435) 627-4674 at least 24 hours in advance if you have special needs.

Meeting Place Commerce Point North



HILLSIDE REVIEW BOARD AGENDA REPORT: **09/23/2020 (Tabled)**
HILLSIDE REVIEW BOARD AGENDA REPORT: **12/16/2020**

HILLSIDE DEVELOPMENT PERMIT

Commerce Point North

Case No. 2020-HS-012

Background: On September 23rd, the Board convened on site to review the proposal and discuss the details of the application. The discussion focused mainly on the landslide and the potential impacts and mitigation measures for a landslide mitigation. The Board, at that meeting, discussed the need for a more comprehensive report. An updated report has been created and submitted. As of the writing of this report, staff has not had a chance to review the report but will be prepared to discuss it at the meeting.

Request: This is a request for a Hillside Development Permit to allow development a Restaurant/Multi-Tenant Commercial Building

Stability Report: Project No. 18535

Owner: Commerce Point, LLC

Applicant: Austin Atkin

APN: SG-COMP-1-1, SG-COMP-1-3

Location: Approx. 1276 S Black Ridge Drive/1190 S Bluff Street

Acreage: Approx. 2.13 acres (Lot 1 = 0.54 acres) (Lot 2 = 1.59 acres)

Zoning: C-2

Adjacent zones: C-2 & PD-C

Powers & Duties: Section 10-13A(9) of the St. George City Code, “Hillside Review Board Powers and Duties” states that the Hillside Board can make recommendations for approval, conditional approval, and denial to the Planning Commission (PC) and City Council (CC).

Permit required: Section 10-13A(7) requires that all major development (i.e., cut greater than 4’, etc.) on slopes above 20% requires a ‘hillside development

permit' granted by the City Council upon recommendation from the Hillside Review Board and the Planning Commission.

COMMENTS

- Hazards:** The item of concern for the proposed site is potential for landslide movement. Soils will be reviewed with at the time building permit is reviewed.
- Site:** The site sits at the bottom of the hillside and, if approved, is proposed to have two buildings, one close to Black Ridge Drive and one adjacent to Bluff Street. The key question is how the applicant plans to deal with the tow of the slope being in the landslide area. For the board's consideration is attached a slope stability analysis and a grading plan.
- Landslide:** The ancient landslide is reported to not be moving currently, but factors of safety against future movement have to meet industry standards. If the site is to be developed, the developer should be aware of this condition and accept risk of future movement if the landslide reactivates.

MOTION (HSRB)

- HSRB Motion Options:** The hillside board can recommend several different options to the Planning Commission and the City Council:
1. Denial
 2. Approval as presented
 3. Approval with specific conditions and comments added as required.

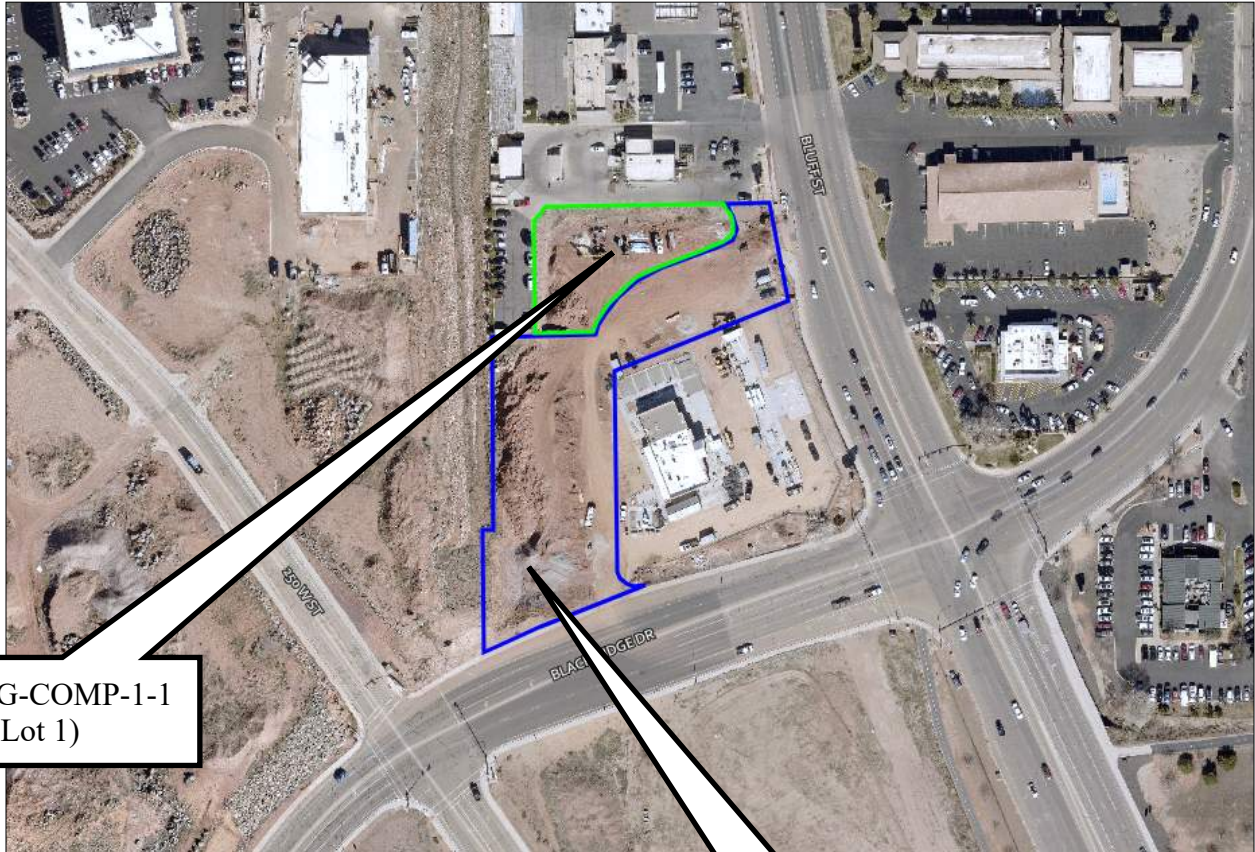
- Example Motion:** The hillside board recommends _____ of the request for a Hillside Development Permit to allow development of restaurant and retail building with comments and conditions.

1. Drainage _____
2. Landslide _____
3. _____
4. _____

Hillside Overlay Map



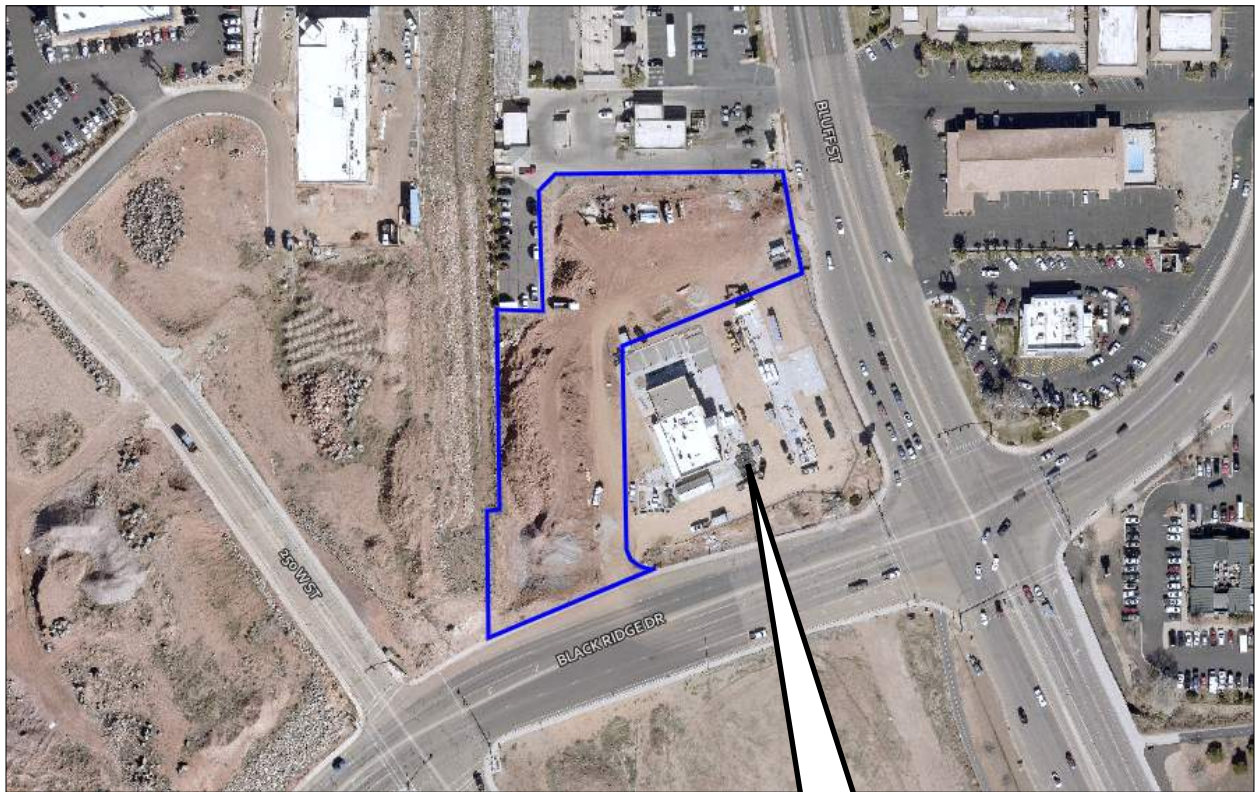
Vicinity Map



APN: SG-COMP-1-1
(Lot 1)

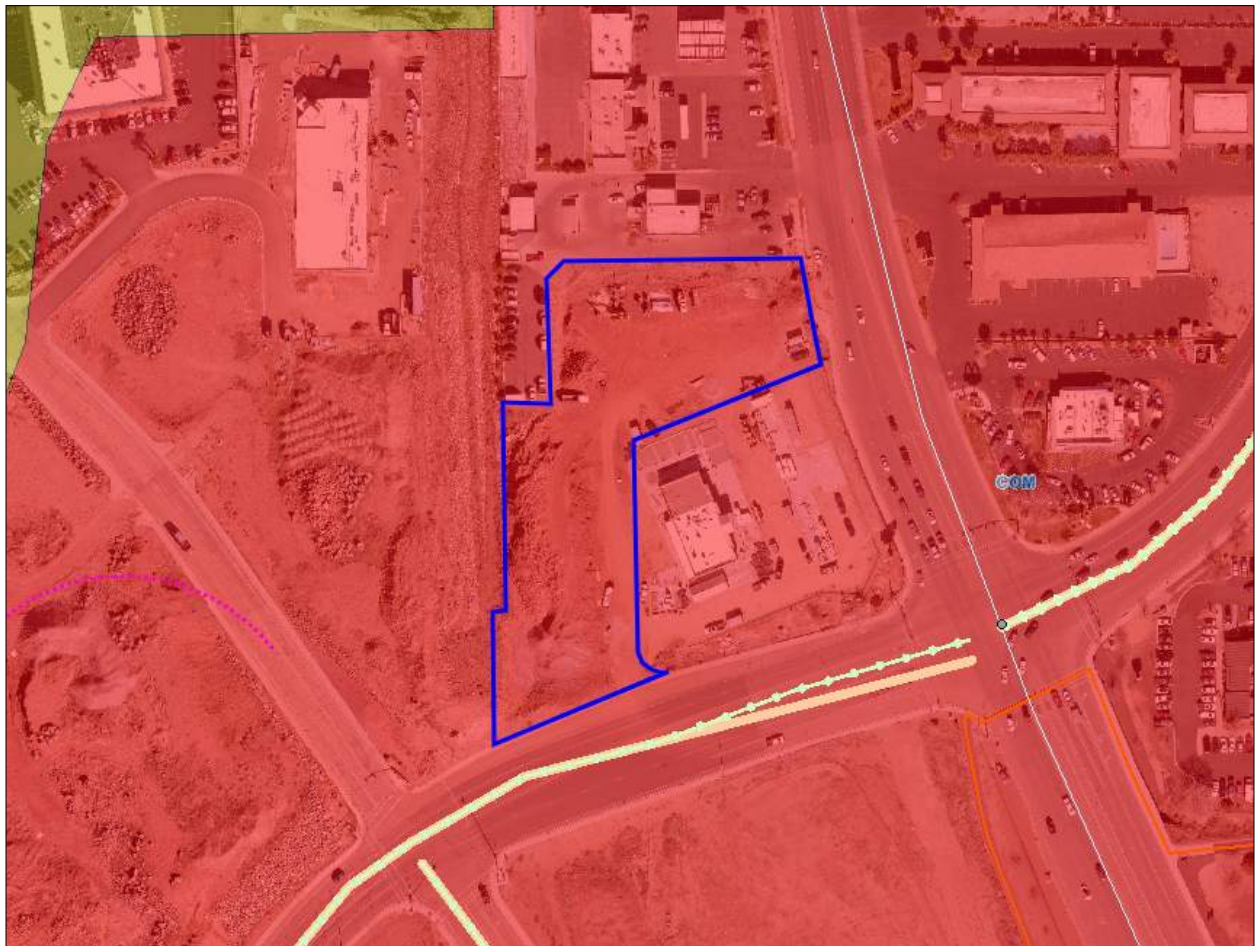
APN: SG-COMP-1-3
(Lot 2)

Site – Aerial

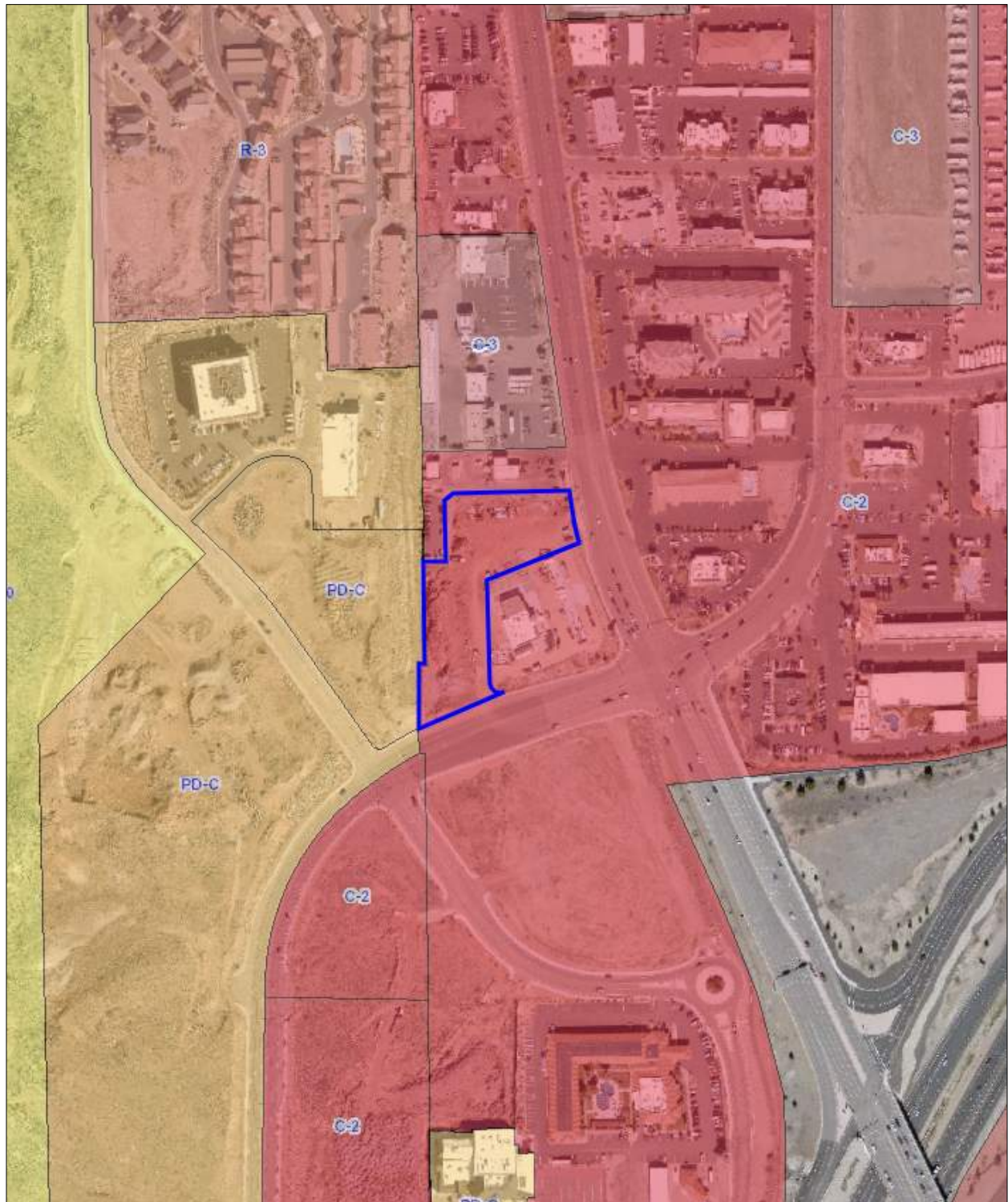


Maverik

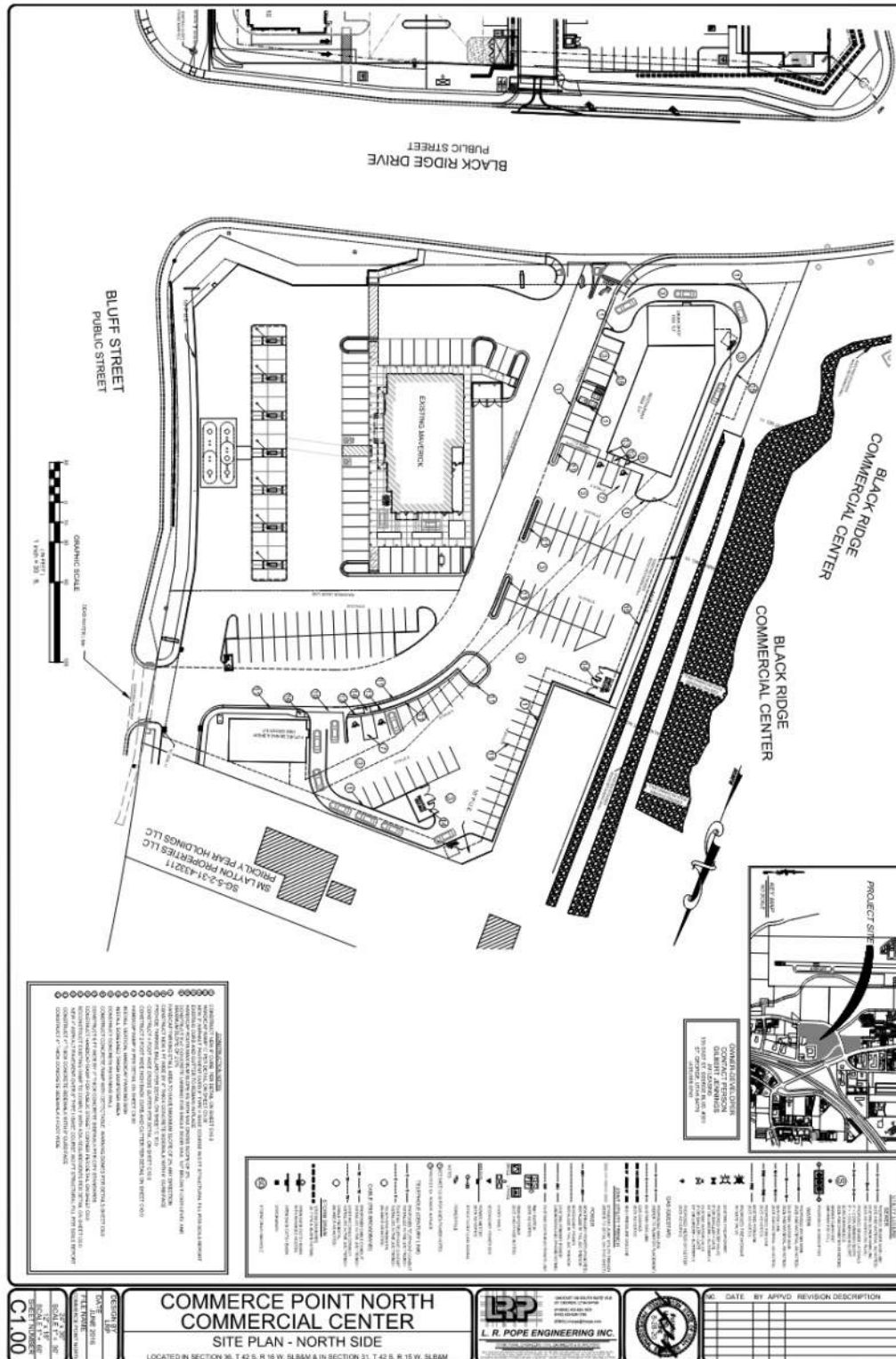
General Plan = COM (*Commercial*)

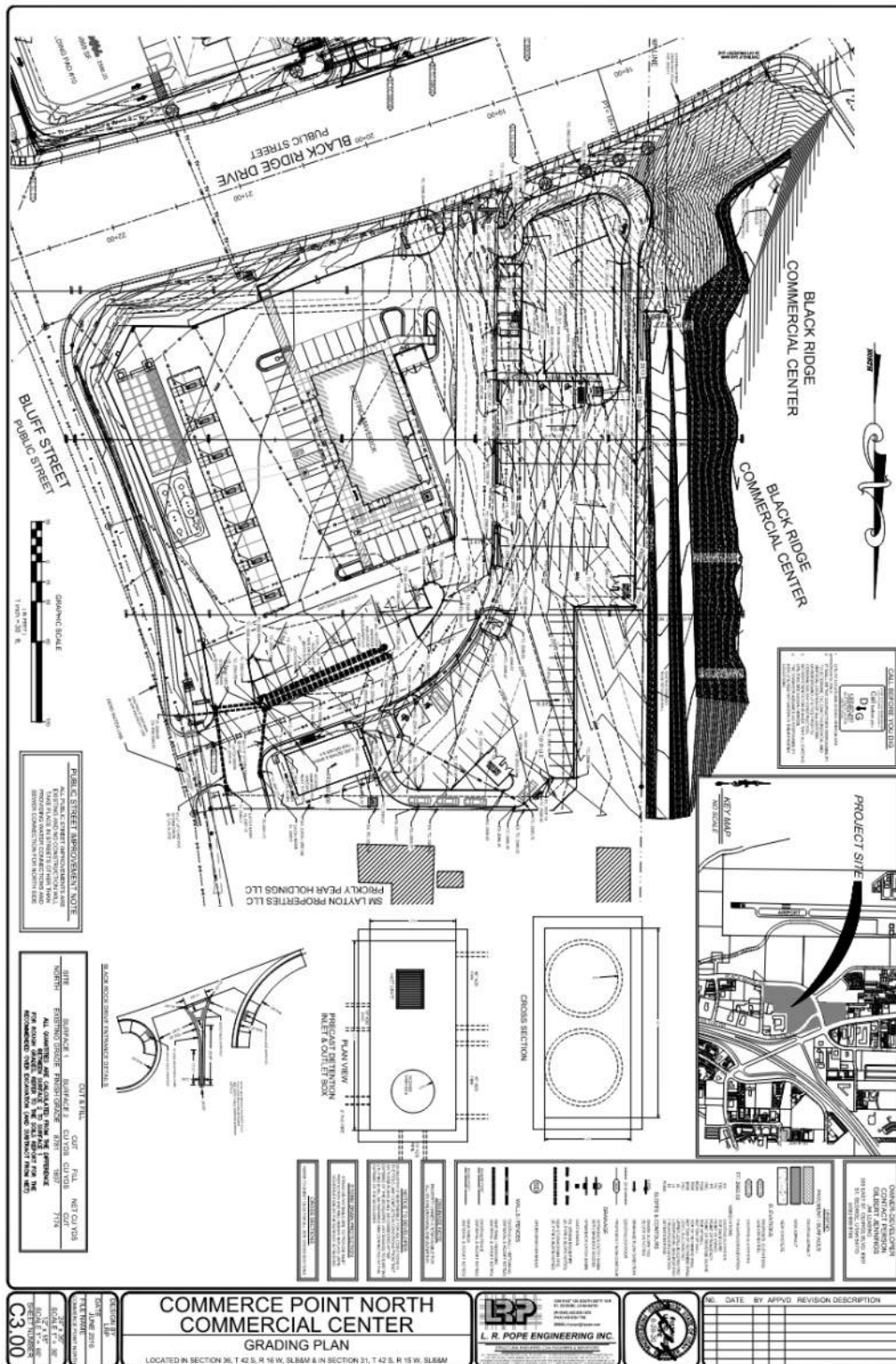


Zoning = PD-C



Concept Site Plan





Slope Stability Analysis



GEOTECHNICAL TESTING SERVICES, INC.
1509 South 270 East, Suite 8, St. George, UT 84790
(435) 628-9536 (435) 628-9589 – fax

May 24, 2018

Mr. Steve Jennings
Jennings Management, Inc.
335 East St. George Blvd., Suite 301
St. George, UT 84770

Subject: Slope Stability Analysis
Proposed Commerce Point Shopping Center - North Phase
Northwest Corner of Black Ridge Drive and
Bluff Street
St. George, Utah
GTS Project Number 18535

Dear Mr. Jennings:

We have completed our stability analysis of the proposed cut slope that is to be located along the west side of the above noted development. At the current time, the exact geometry of the slope is not known, but for this analysis, we have assumed that a retaining wall will be constructed near the property line as outlined in Table 1. It is our understanding that the property owners located west of the subject property are concerned that if the toe of the slope is cut away on the subject property that it will affect the slope stability of their properties. The approximate property lines are shown on Figure 1.

Table 1
Summary of Proposed Retaining
Wall Location

Section Number	Distance Between Property Line and Retaining Wall (ft)
10	21
11	35
12	4
13	20

Subsurface soils information was obtained from our Geotechnical Investigation performed for this property, GTS Project Number 18535, dated July 28, 2017. To investigate the subsurface soils, three 21.5- to 30.5-foot deep test holes were drilled and two 13.0- to 16-foot deep test pits were excavated across the western portions of the property. The subsurface soils encountered

generally consisted of stiff to very stiff, low to high plastic clay (CL and CH) encountered to the maximum depth of exploration, 30.5 feet. Groundwater was not encountered in our test holes and test pits at the time of our investigation.

We performed unconfined compression tests on samples recovered from our test holes. The unconfined compression tests were run as part of this study, however they were originally sampled for our Geotechnical Investigation. The test holes were drilled and sampled on June 12, 2017 and the unconfined compression testing was performed on December 27 and 28, 2017. In order to perform the unconfined compression tests, the samples were extracted from their liners. The extraction process caused some sample disturbance which can be observed in the reduction in the average dry densities of the samples when compared to the dry densities reported in our Geotechnical Investigation. The unconfined compressions ranged from 1,829 psf to 7,311 psf. Due to the sample disturbance, we feel that these numbers are lower than if they were compared to "fresh" samples that had less disturbance. The samples contained gravel and coarse sand sized particles that caused most of the disturbances. A summary of the test results can be found in Table 2.

TABLE 2
Summary of Laboratory Work

Test Hole Number	Sample Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Unconfined Compression (psf)
TH-1 *****	3.67	14.0	100.4	
TH-1 *****	6.17	15.2		
TH-1 *****	8.67	15.8	99.4	
TH-1 *****	21.0	10.3	101.4	
TH-2*****	6.17	12.5	108.0	
TH-2*****	8.67	17.7	97.7	
TH-2	11.17	18.8	85.4	1829
TH-2*****	15.8	15.8	89.7	
TH-2*****	16.17	15.7	93.0	
TH-2	20.67	12.9	96.5	2973*
TH-2	25.67	11.6	102.0	4191**
TH-3	5.83	11.7	91.1	2733***
TH-3	6.17	12.9	93.4	2733***

Test Hole Number	Sample Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Unconfined Compression (psf)
TH-3*****	8.67	12.2	118.2	
TH-3	10.8	8.6	104.5	7311***
TH-3	11.17	11.8		7311****
TH-3	15.67	9.3	104.0	3363***
TH-3	20.83	21.1	90.3	2172
Average Results for Geotechnical Investigation		16.4	101.0	
Average Results for Geotechnical Investigation Minus High and Low Density Readings			100.0	
Average Results for Unconfined Compression Testing		13.2	95.9	

- * Top portion (about 1/4) of sample broke away upon loading into the testing apparatus.
- ** About 1/4- to 1/2- inch deep crumbled gravel located in the side of the sample.
- *** Samples were dry and crumbling, did not hold together well.
- **** Bottom corner of sample broke away upon loading.
- ***** Moisture content and dry density information obtained during laboratory testing performed during the original Geotechnical Investigation, GTS Project Number 18535, dated July 28, 2017. Densities were measured while sample was still in the sample liner. All other densities measured during unconfined compression testing were measured after the samples were extracted from the liners.

For this study, the hillside was assumed to consist entirely of the clays encountered during our Geotechnical Investigation. A cohesion value of 2,700 psf and a friction angle of 0 was assumed for the clay. The cohesion value, based upon our observations of the test samples, is expected to be very conservative. The Modified Bishop Method was used for the analysis of the slope both in the existing state and in the proposed configuration. Four different sections were analyzed across the development as shown in Figure 1. Table 3 summarizes the results of the analysis. We analyzed the slope both in a global sense (see Figure 2 for an example of the global analysis) and locally (see Figure 3 for an example of the local analysis).

TABLE 3
Summary of the Slope
Stability Analysis

Section	Factor of Safety					
	Existing Geometry Global Analysis	Existing Geometry Local Analysis	Proposed Geometry Global Analysis	Proposed Geometry Local Analysis	Change In Factor of Safety - Global Analysis	Change in Factor of Safety - Local Analysis
10	2.900	3.056	2.746	2.746	0.154	0.310
11	3.143	3.701	3.018	3.184	0.125	0.517
12	2.683	2.803	2.596	2.674	0.087	0.129
13	3.546	3.681	3.447	3.378	0.099	0.303

It appears that the maximum reduction in the factor of safety due to the slope cuts is 0.517 which is along Section 11. Section 11 is the location of the maximum cut in the slope and it would be expected to have the greatest reduction in the factor of safety. All other reductions in the factor of safety are under 0.310.

It appears that the proposed cuts in the slope will not affect the stability of the slope to the point as to cause failure of the slope. Changes in the soil or loading conditions above the slope could affect the stability of the hill. The following factors are a partial list of conditions that might affect the stability of the slope at some point in the future. All property owners and managers, both located on the Commerce Point Development and the up slope properties should be made aware of these issues.

- Saturation of the down, mid, and/or up slope soils will cause the soils to weaken and could cause movement of the slope. Saturation of the soils also causes an increase in the weight of the soils which will increase the loading conditions of the slope. Care should be given to the landscaping of all properties, desert type landscaping is recommended. Storm water of the up slope properties should be carefully controlled and monitored and not be allowed to saturate into the subsurface soils. Water should not be allowed to flow over the slope.
- Over steeping of the existing slope will increase the loading conditions of the slope. Any changes of the exiting slope that are required for future development should be analyzed for their impact of the stability of the slope.
- Future development of the up slope properties could cause an increase in the loading conditions of the slope. Adding fill material or any type of building will increase loading and it should be analyzed for its impact on the stability of the slope. Removing material from the up slope properties should decrease the loading conditions and may increase the stability of the slope.

It is the responsibility of the current and future landowners of the property to the west to demonstrate that any proposed development will not impact the Commerce Point Commercial Center property. The over-steeping of the slope and construction of the rock wall/slope that was

Slope Stability Analysis
Commerce Point Commercial
St. George, Utah

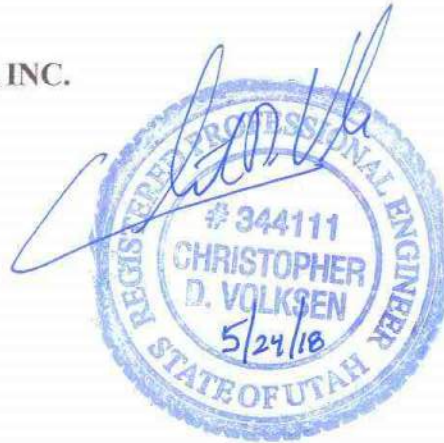
GTS Project Number 18535
May 24, 2018
Page 5

performed in the early 2000's is providing a large load to the slope. This load will most likely be the key to the driving force of the slide.

We appreciate the opportunity to be of service to you on this project. Please call us if you have any questions or need additional information.

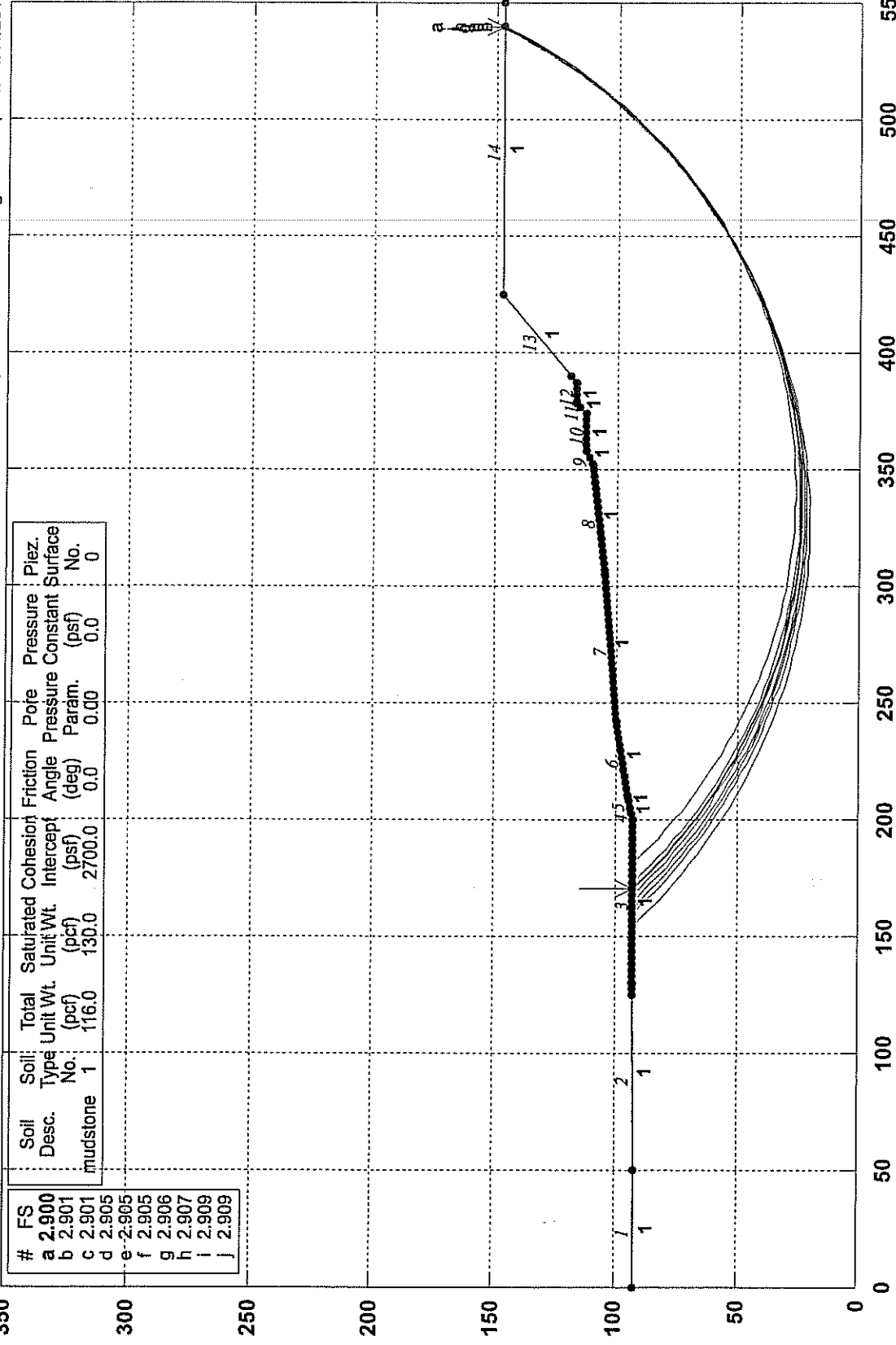
Very truly yours,
GEOTECHNICAL TESTING SERVICES, INC.

CHRISTOPHER D. VOLKSEN, P.E.
President
CDV/c



18535 - Commerce Point - N Phase Section 10 - Existing Grades

z:\18500\18535 - commerce point - jmi\North end stability analysis\18535 - section 10 - existing grade all mudstone.pl2 Run By: Geotechnical Testing Services, Inc. 1/11/2018 09:43PM

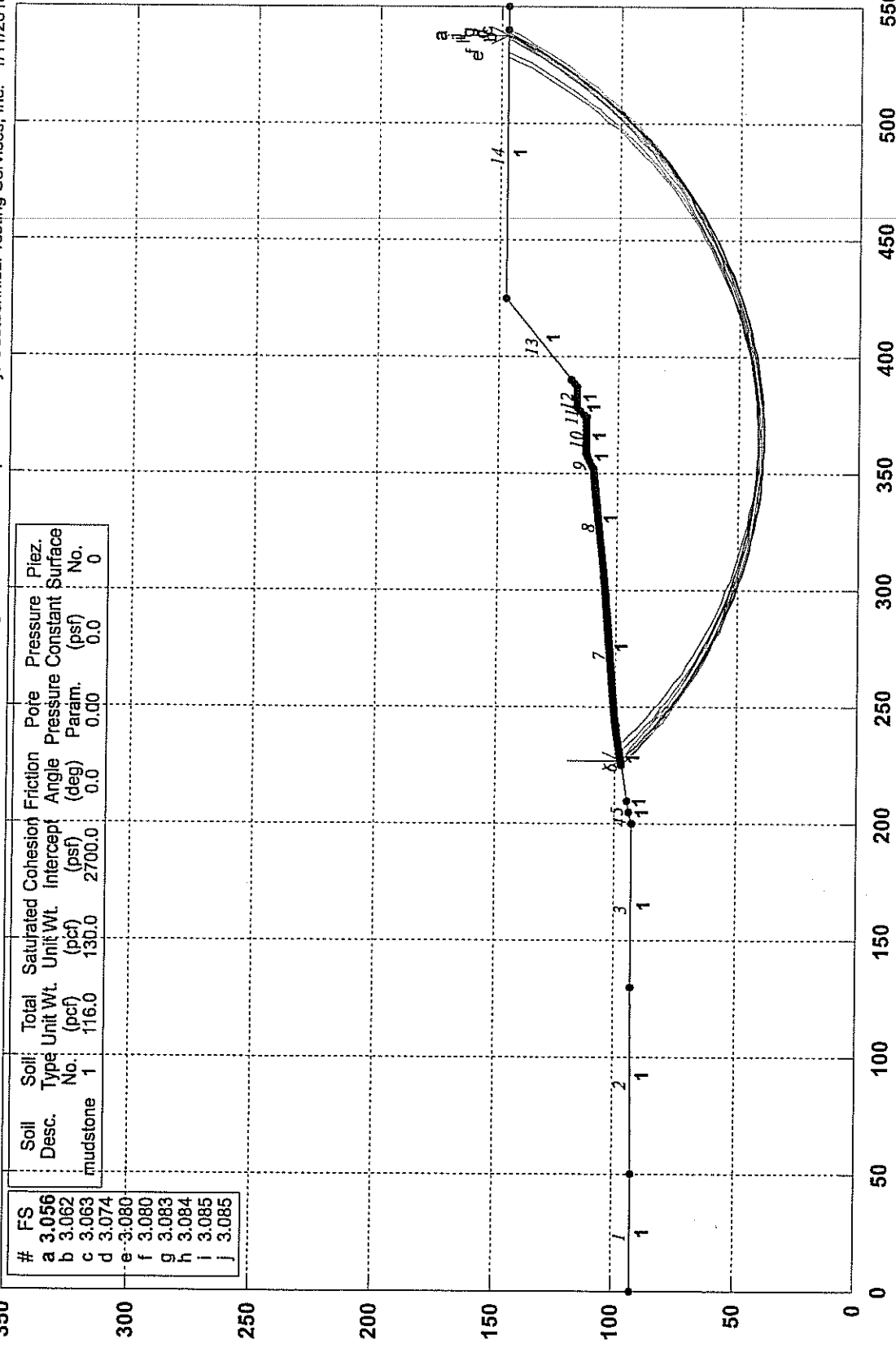


GSTABL7 v.2 FSmin=2.900
Safety Factors Are Calculated By The Modified Bishop Method

Figure 2

18535 - Commerce Point - N Phase Section10 - Existing Grades

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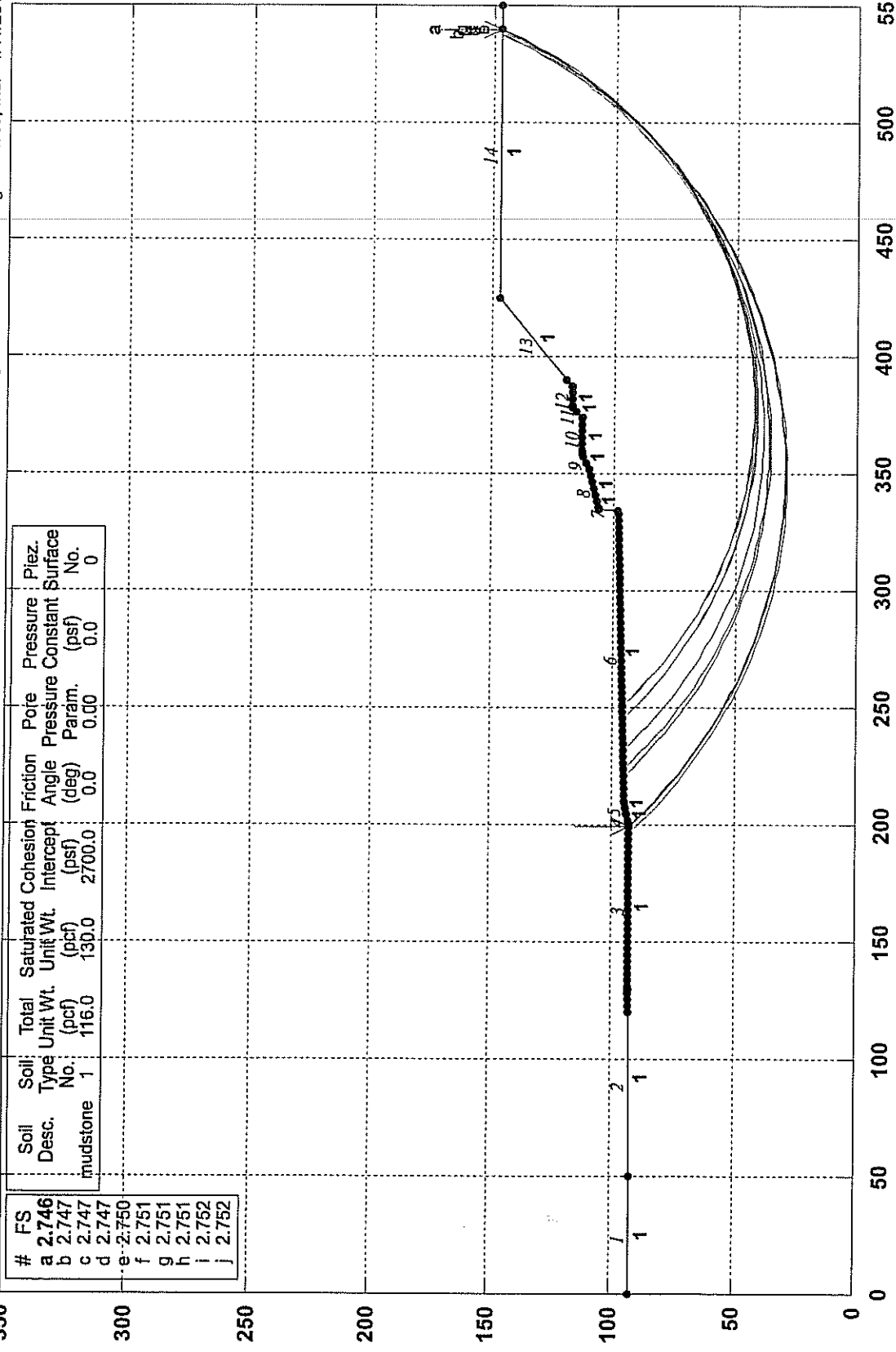


GSTABL7 v.2 FSmin=3.056
Safety Factors Are Calculated By The Modified Bishop Method

Figure 3

18535 - Commerce Point - N Phase Section10 - Proposed Grades

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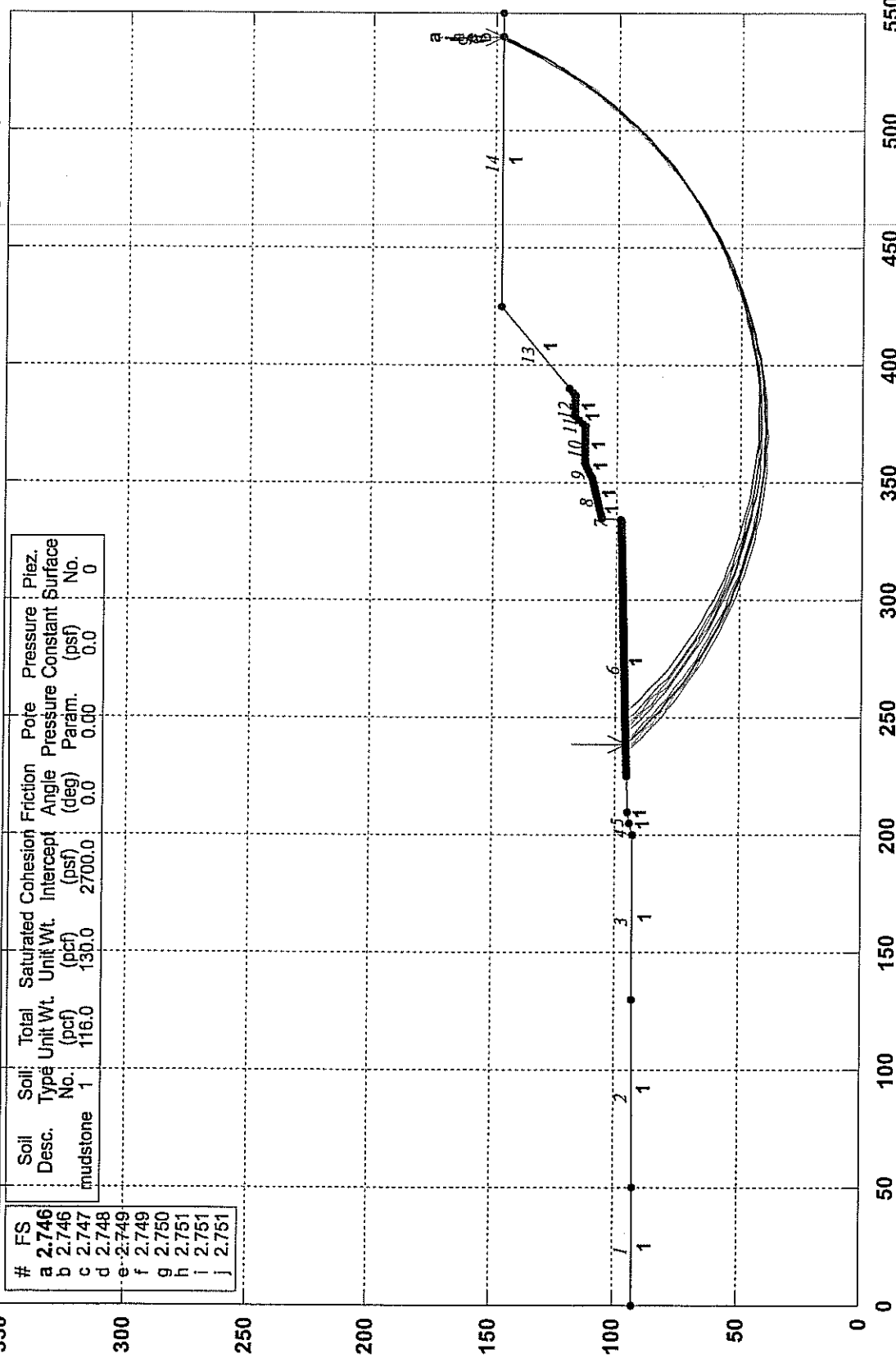


GSTABL7 v.2 FSmin=2.746
Safety Factors Are Calculated By The Modified Bishop Method

Figure 4

18535 - Commerce Point - N Phase Section10 - Proposed Grades

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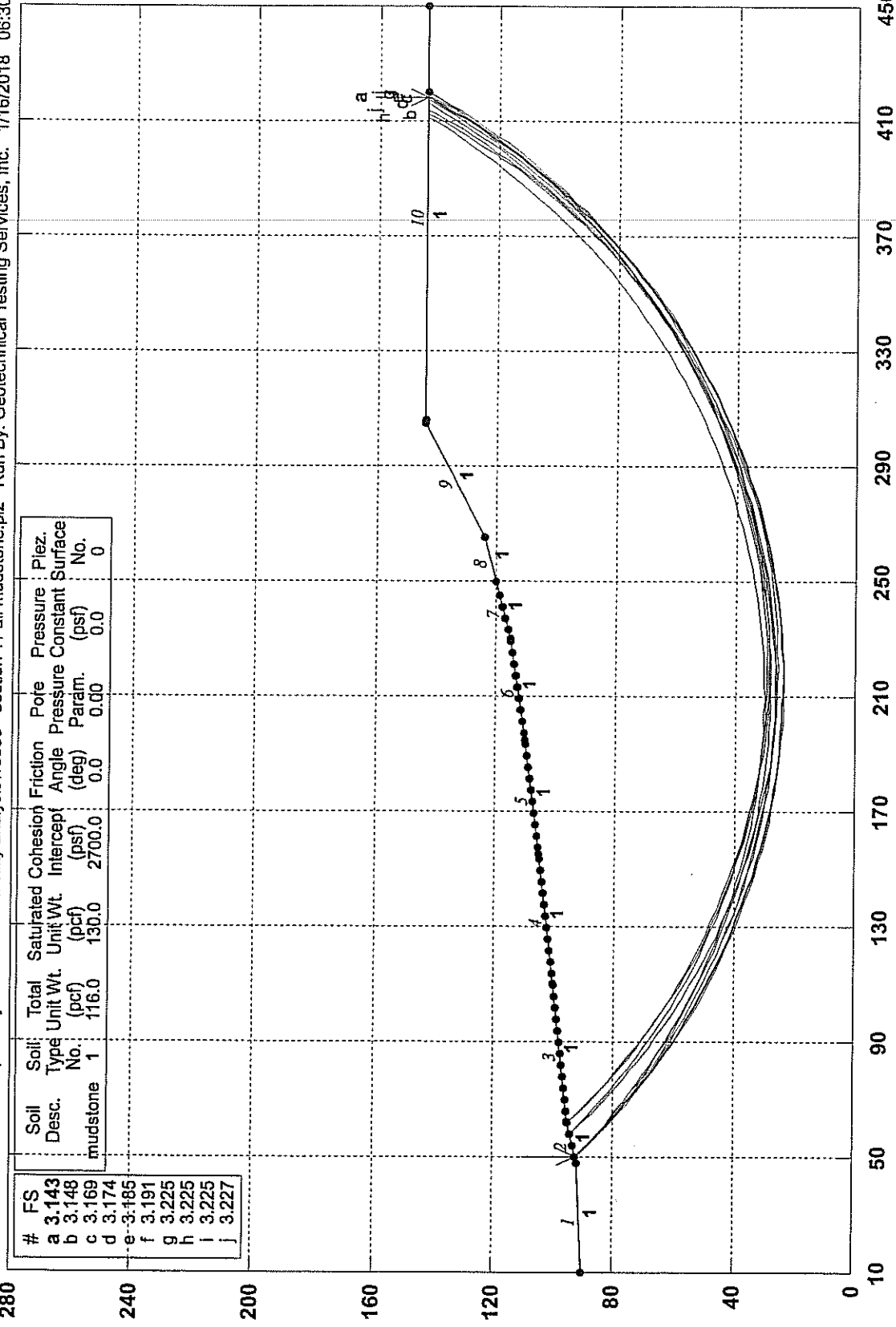


GSTABL7 v.2 FSmin=2.746
Safety Factors Are Calculated By The Modified Bishop Method

Figure 5

18535 - Commerce Point North End Section 11 - All Mudstone

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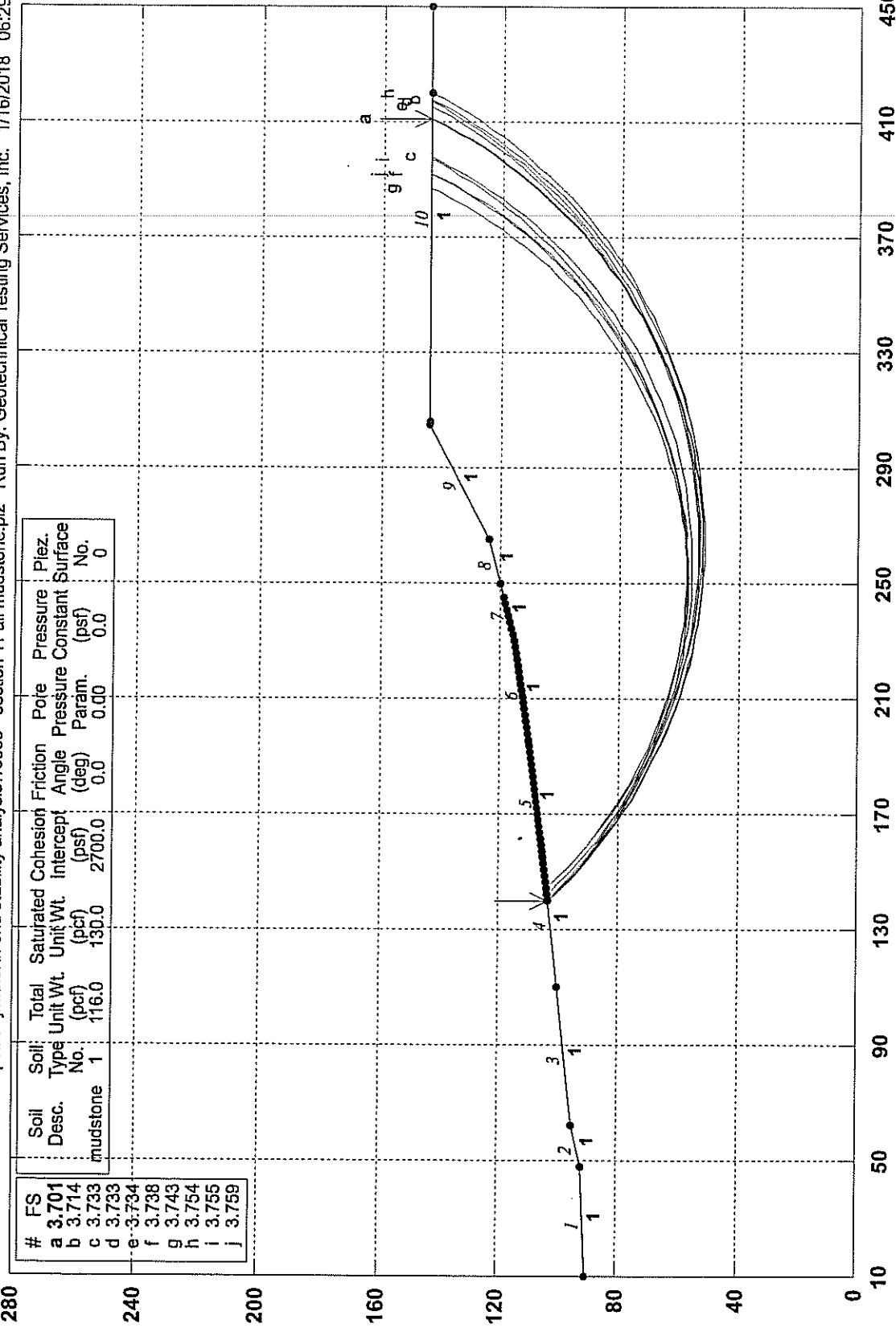


GSTABL7 v.2 FSmin=3.143
Safety Factors Are Calculated By The Modified Bishop Method

Figure 6

18535 - Commerce Point North End Section 11 - All Mudstone

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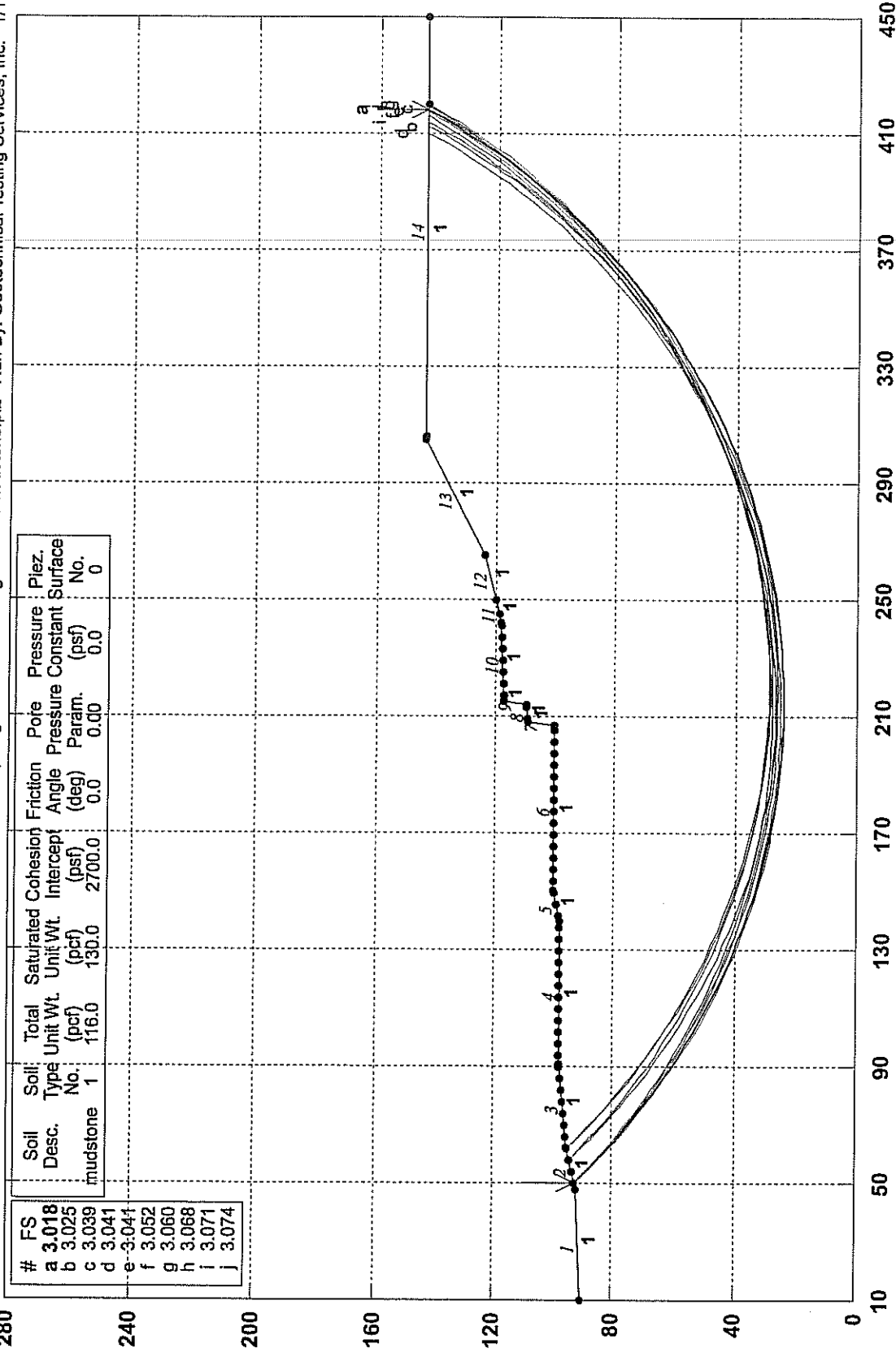


GSTABL7 v.2 FSmin=3.701
Safety Factors Are Calculated By The Modified Bishop Method

Figure 7

18535 - Commerce Point - Section 11 +1' to Pad Grade - 2 R-w's

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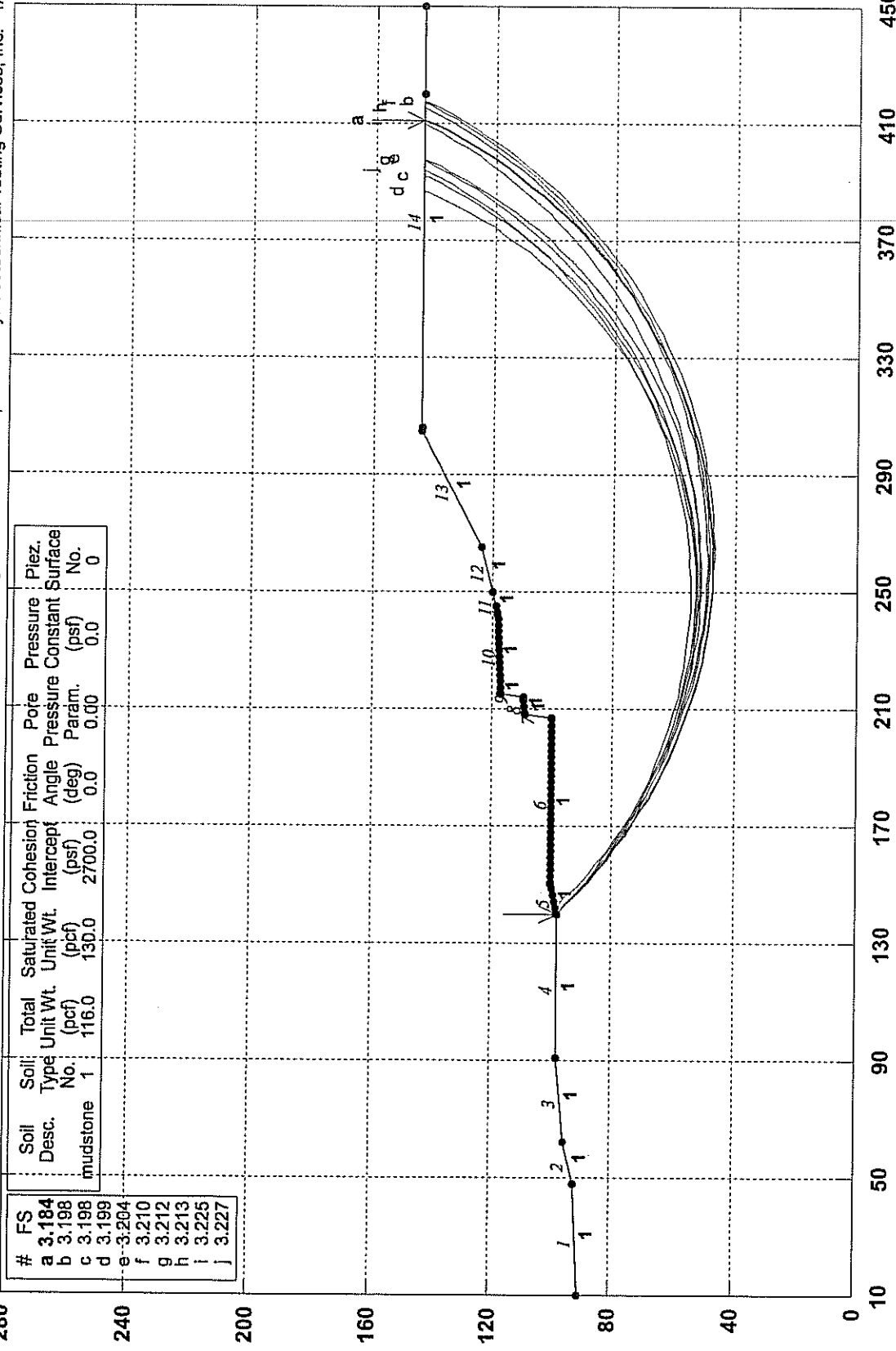


GSTABL7 v.2 FSmin=3.018
Safety Factors Are Calculated By The Modified Bishop Method

Figure 8

18535 - Commerce Point - Section 11 +1' to Pad Grade - 2 R-w's

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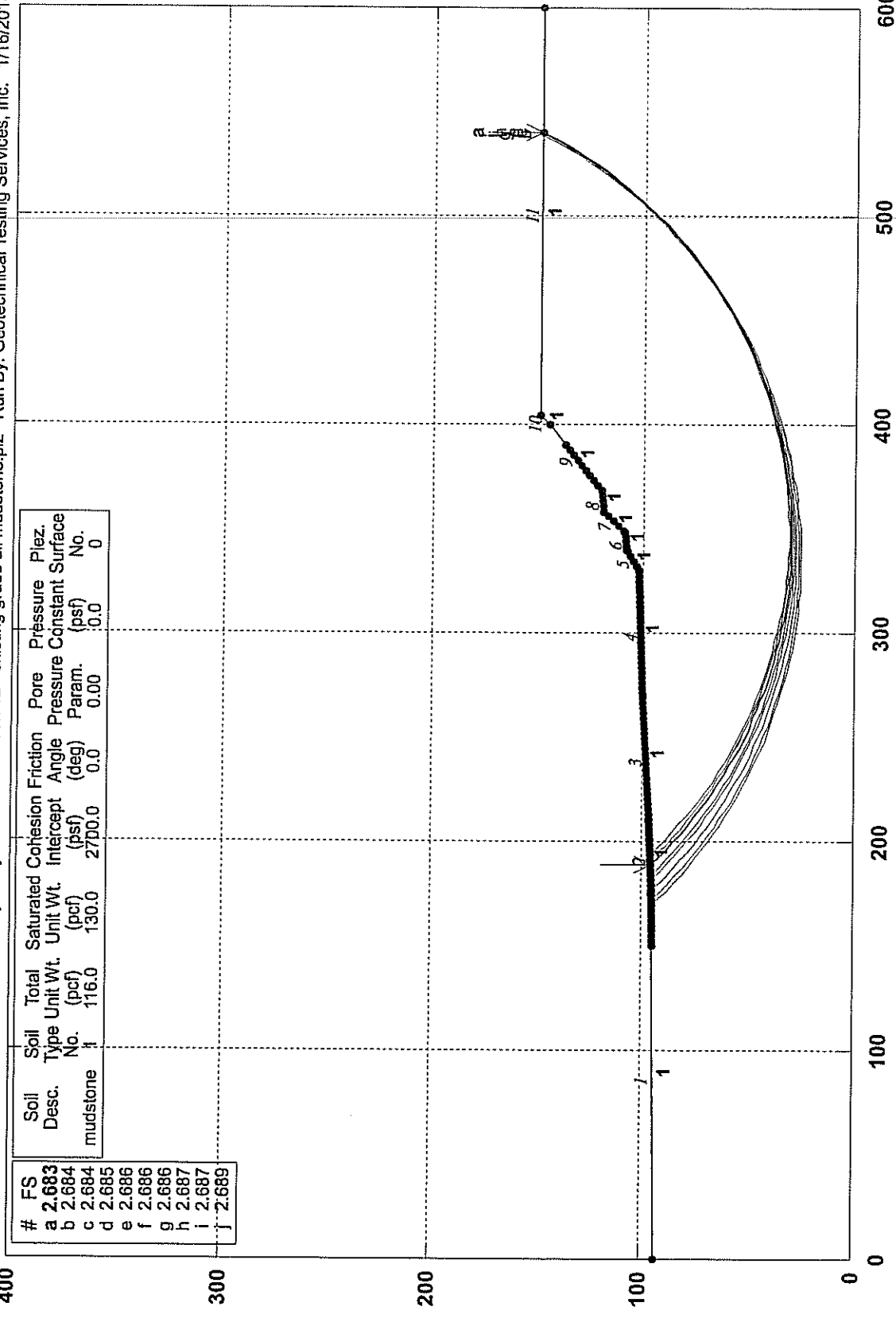


GSTABL7 v.2 FSmin=3.184
Safety Factors Are Calculated By The Modified Bishop Method

Figure 9

18535 - Commerce Point - N Phase Section 12 - existing grades

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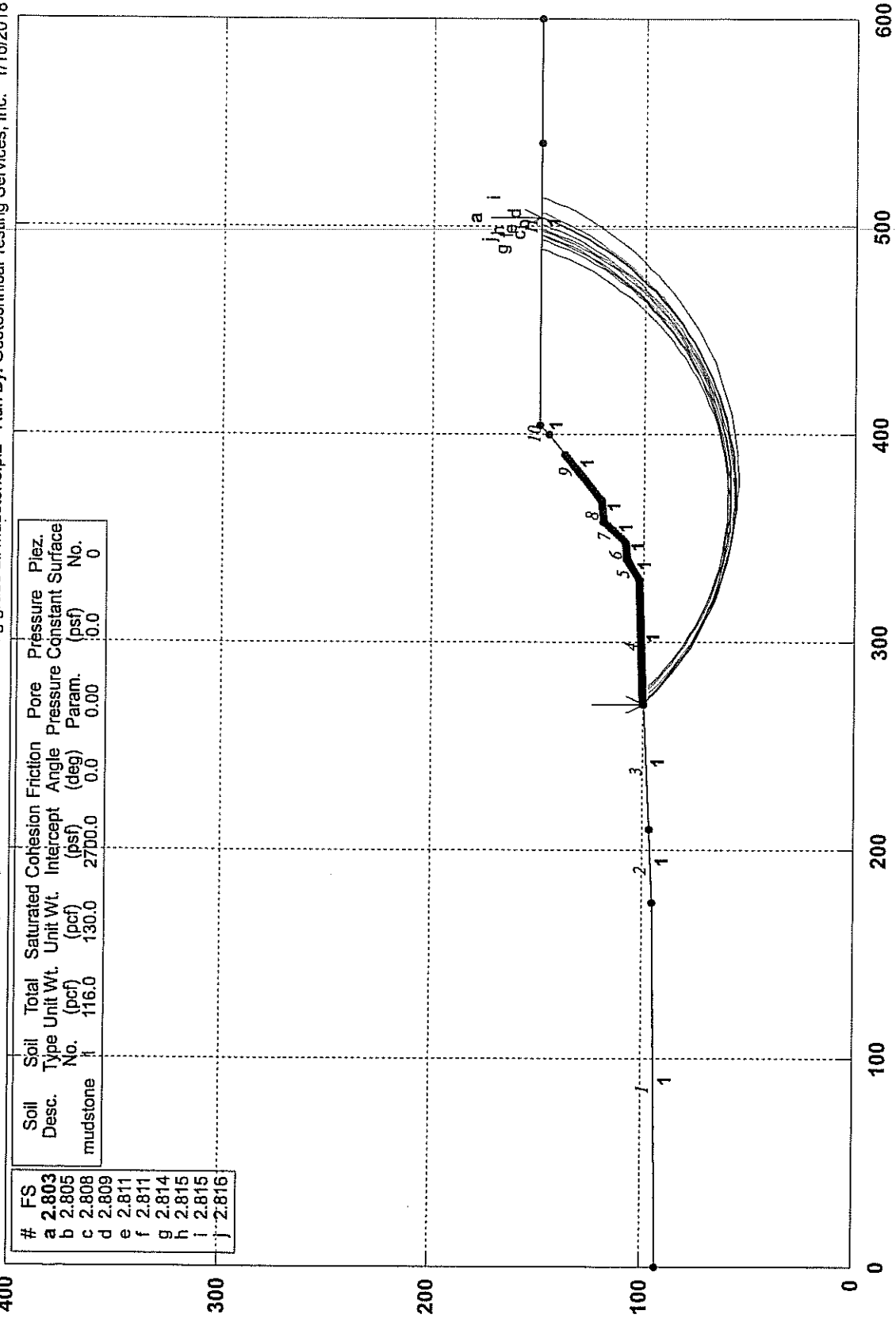


GSTABL7 v.2 FSmin=2.683
Safety Factors Are Calculated By The Modified Bishop Method

Figure 10

18535 - Commerce Point - N Phase Section12 - existing grades

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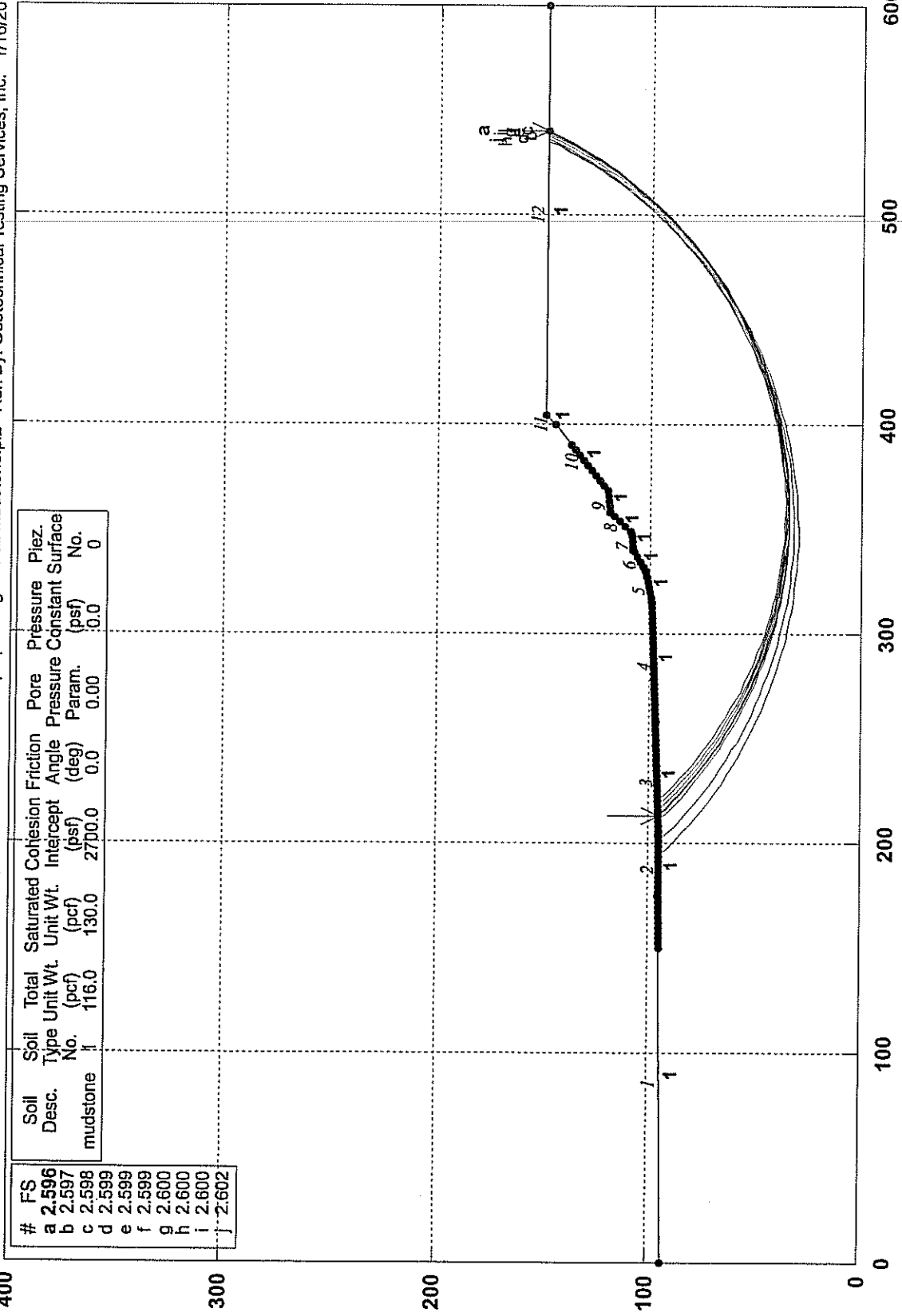


GSTABL7 v.2 FSmin=2.803
Safety Factors Are Calculated By The Modified Bishop Method

Figure 11

18535 - Commerce Point - N Phase Section12 - existing grades Proposed Grades

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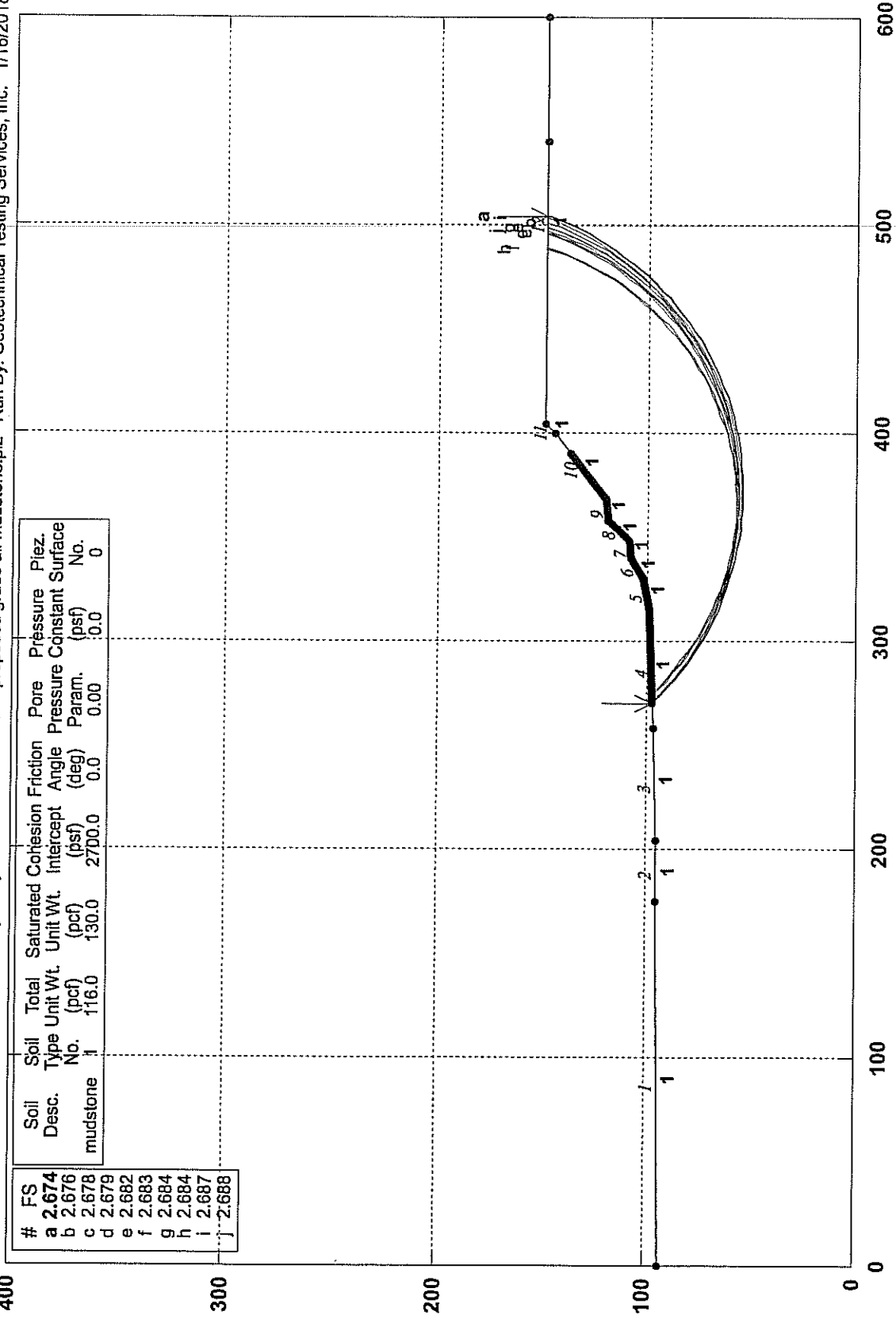


GSTABL7 v.2 FSmin=2.596
Safety Factors Are Calculated By The Modified Bishop Method

Figure 12

18535 - Commerce Point - N Phase Section12 - existing grades Proposed Grades

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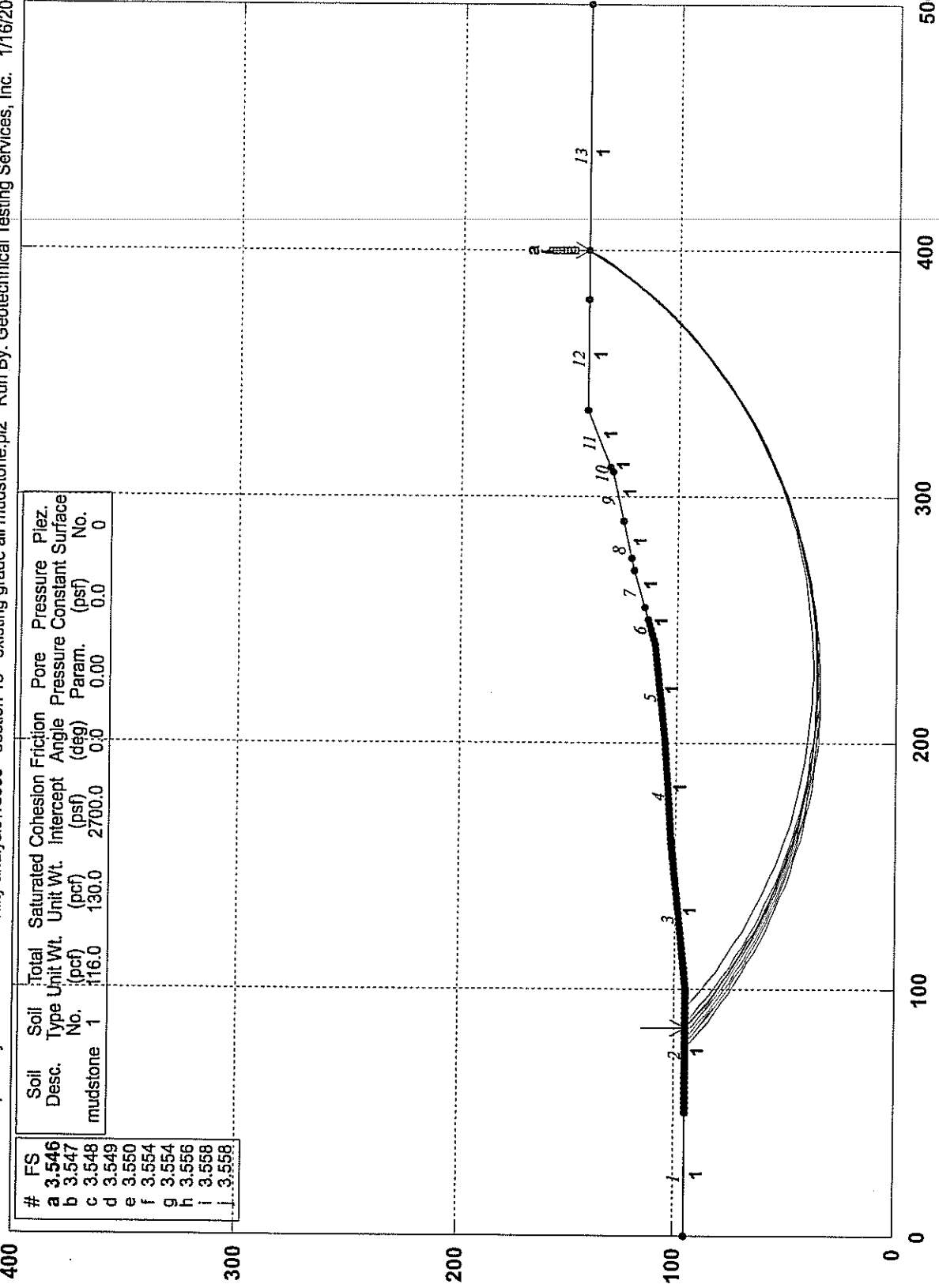


GSTABL7 v.2 FSmin=2.674
Safety Factors Are Calculated By The Modified Bishop Method

Figure 13

18535 - Commerce Point - N Phase Section 13 - existing grades

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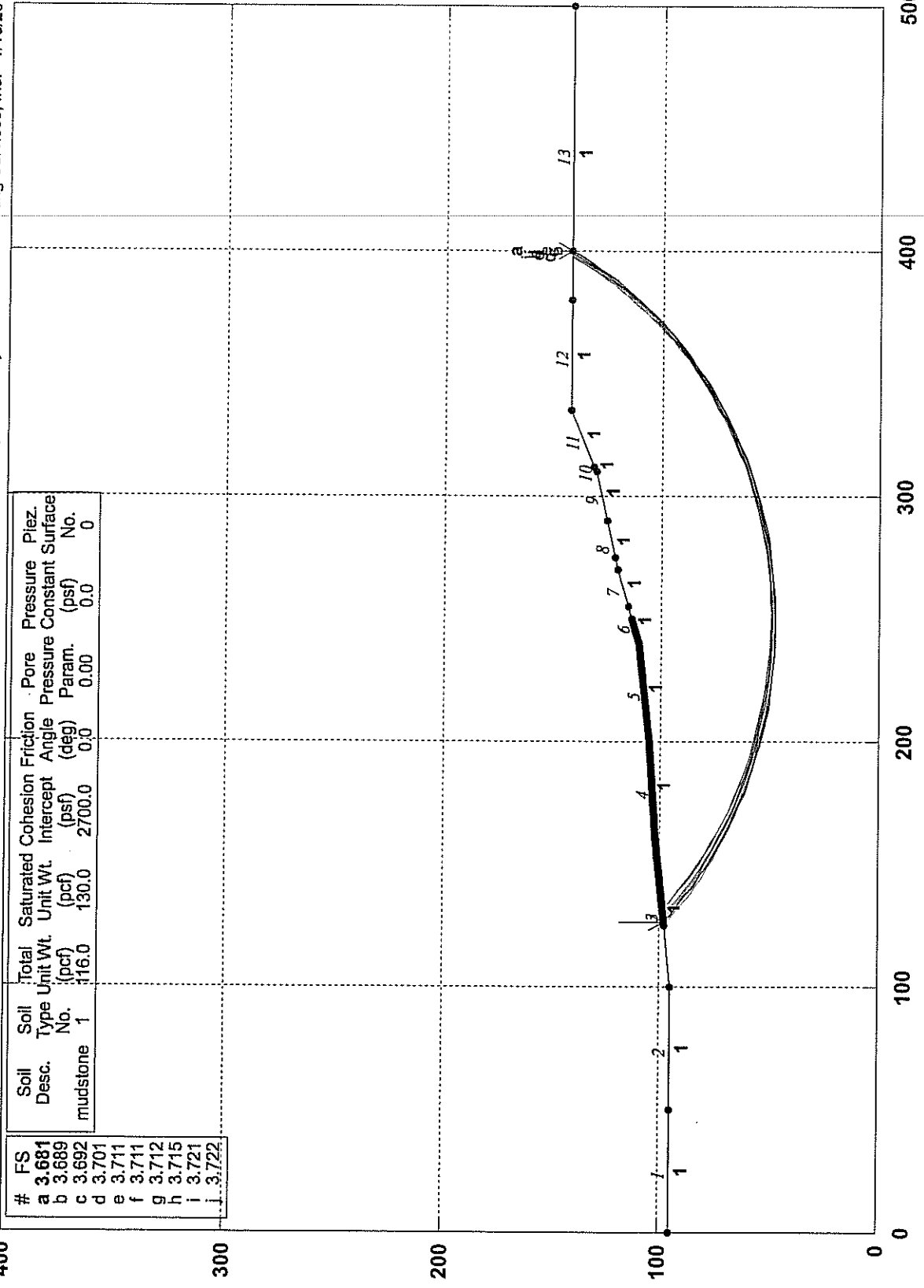
GSTABL7 v.2 FSmin=3.546

Safety Factors Are Calculated By The Modified Bishop Method

Figure 14

18535 - Commerce Point - N Phase Section 13 - existing grades

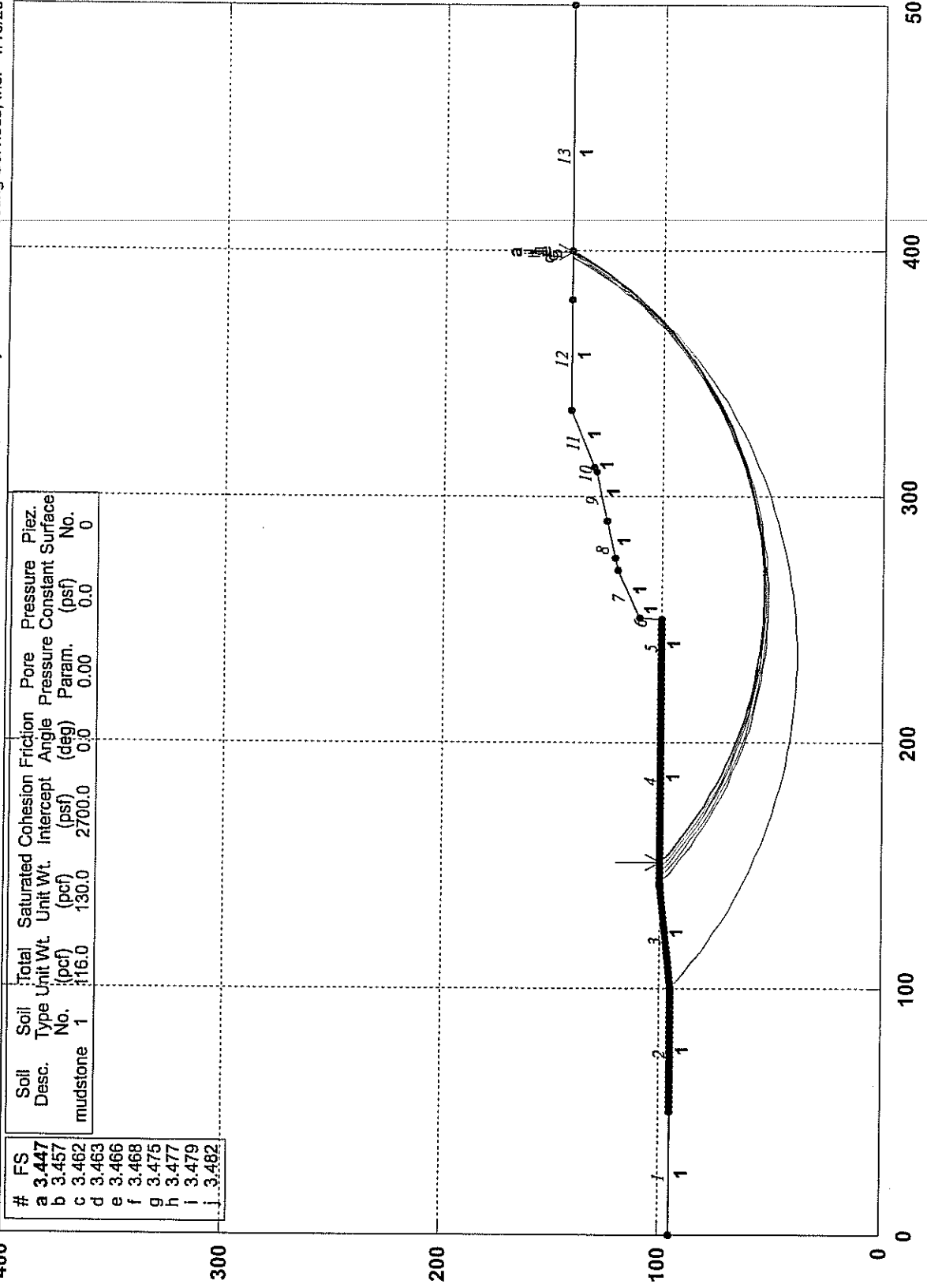
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GSTABL7 v.2 FSmin=3.681
Safety Factors Are Calculated By The Modified Bishop Method

18535 - Commerce Point - N Phase Section13 - Proposed grades

z:\18500\18535 - commerce point - jml\north end stability analysis\18535 - section 13 - existing grade all mudstone.pl2 Run By: Geotechnical Testing Services, Inc. 1/16/2018 07:22PM

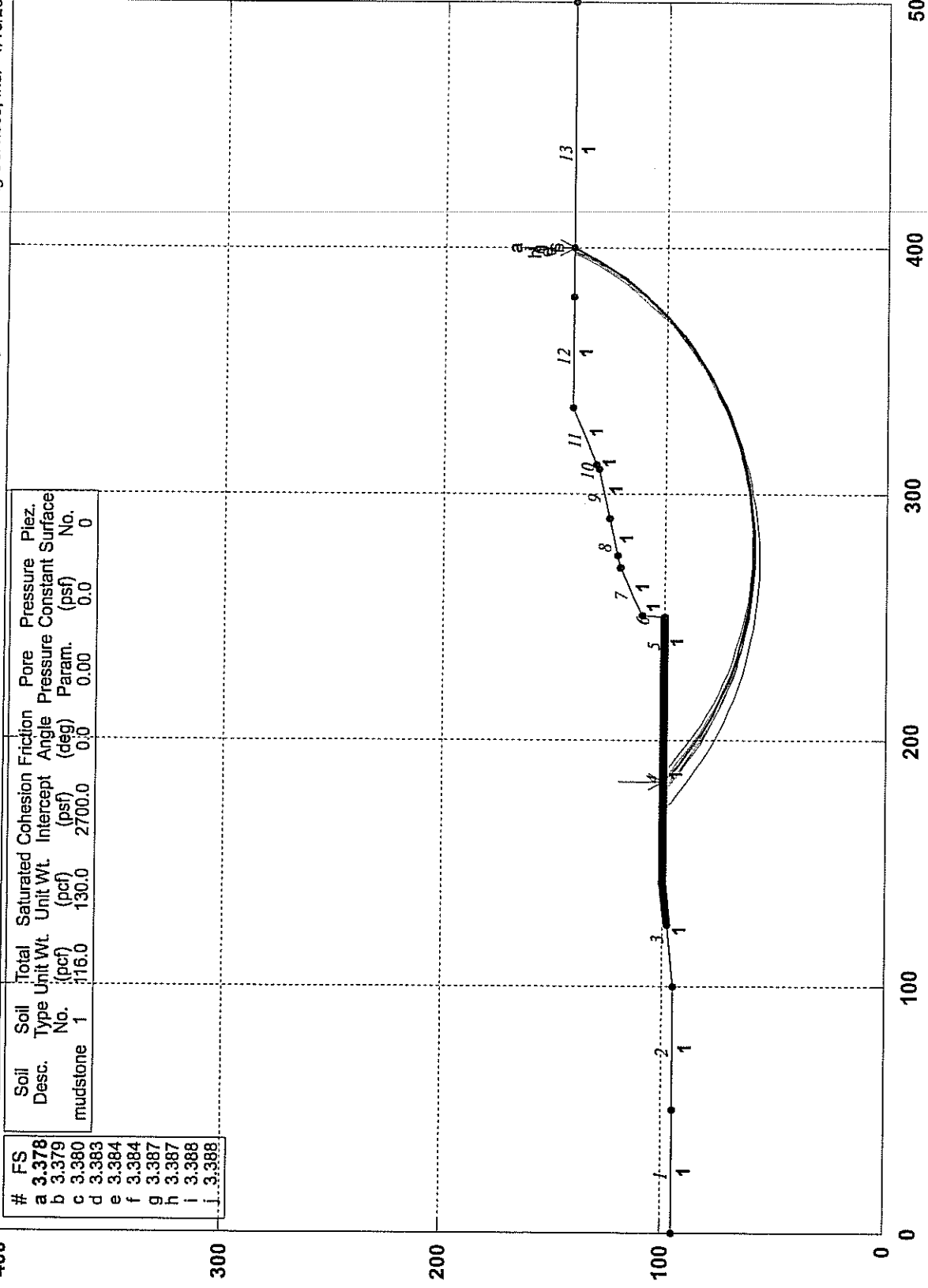


GSTABL7 v.2 FSmin=3.447
Safety Factors Are Calculated By The Modified Bishop Method

Figure 16

18535 - Commerce Point - N Phase Section 13 - Proposed grades

z:\18500's\18535 - commerce point - jml\north end stability analysis\18535 - section 13 - existing grade all mudstone.pl2 Run By: Geotechnical Testing Services, Inc. 1/16/2018 07:23PM



GSTABL7 v.2 FSmin=3.378
Safety Factors Are Calculated By The Modified Bishop Method

Figure 17

Updated Report (December 2020)



GEOTECHNICAL TESTING SERVICES, INC.
735 East Tabernacle Street, St. George, UT 84770
(435) 628-9536 office@gtsstg.com

December 8, 2020

Mr. Steve Jennings
Jennings Management, Inc.
335 East St. George Blvd., Suite 301
St. George, UT 84770

Subject: Slope Stability Analysis
Proposed Commerce Point Shopping Center - North Phase
Northwest Corner of Black Ridge Drive and
Bluff Street
St. George, Utah
GTS Project Number 18535

Dear Mr. Jennings:

As requested, we have analyzed the slope located west of the proposed development to determine if the proposed development will impact the stability of the existing slope. This analysis was performed because the St. George Hillside Committee was afraid that the proposed development would impact the slope.

An analysis was performed by Applied Geotechnical Engineering Consultants, Applied Geotech, (AGEC), Slope Stability Consultation, Blackstone Hotel Project, AGEC Project Number 2180187, dated September 23, 2019, on the existing slope for a proposed hotel project and they determined that the slope was not stable (Factor of Safety was less than 1) and that a secant wall would need to be constructed along the western property line of our subject property, to stabilize the slope enough to construct the hotel project. Based upon a review of their work, it appears that AGEC assumed that the elevation of our subject property was the elevation of the proposed pad, therefore, if the secant wall is constructed and the elevation of our subject pad is approximately 2602 feet, our subject site is stable.

The concern from the hillside committee was that if the hotel property is not developed and our subject site is, will our subject site affect the stability of the slope. In order to determine this we performed a stability analysis of the slope using GSTABL7. A fairly recent topography map was made of the area which is shown on Figure 1. It appears that AGEC used this topography map for their analysis, although the location of their cross-section is not known at this time. L.R. Pope was able to create several cross-sections through the slope and we chose cross-section 1+00 to perform our analysis because it passes through the proposed development. Using AGEC's profile data of the location of the different soils layers, we were able to create a profile of cross section 1+00 which is shown in Figure 2. It should be noted that there was some "smoothing" of the surface profile lines in areas where the topography fluctuated over short distances.

GSTABL7 uses Modified Bishops Method, Simplified Janbu Method, and Random search for its analysis. The analysis for both the Bishops and Janbu methods are shown in Table 1. The printout of the analysis is shown in Appendix A. We next altered the surface profile of the cross

section to reflect the proposed development. The proposed development requires an over-excavation below the proposed building; therefore, we altered the soil profile located below the building to be in conformance with the Geotechnical Investigation, GTS Project Number 18535, dated July 28, 2017. The profile that was created is shown in Figures 3 and 4. It should be noted that Figure 4 is our hand drawn profile used to input the data used to develop Figure 3. The material that was used to back fill the over-excavation is denoted as "Fill" in our analysis. We again ran Modified Bishops Method and Simplified Janbu Method and the results are summarized in Table 1. Appendix B contains a print out of the analysis. It should be noted that our analysis of the proposed slope indicated the installation of piers along the western side of the building. The piers "geometrically" put in place for our analysis but zero forces were assigned to them; therefore the analysis was run assuming the piers were not in place. Our Random analysis yielded higher factors of safety than the Bishops and Janbu analysis and therefore were not reported.

TABLE 1
Summary of Slope Stability Analysis

Analysis Method	Factor of Safety	
	Existing Slope	Proposed Slope
Modified Bishop Method	1.904	1.933
Simplified Janbu Method	1.862	1.888

It should be noted that our analysis did not show that the slope was unstable like AGECE's analysis. Their analysis showed a factor of safety of less than 1. We ran the exact cross section AGECE used for their analysis through GSTABL7 and our analysis again showed factors of safety greater than 1. Even though our factors of safety are greater than AGECE's, using the principles of dimensional analysis, we can state that the development proposed will not impact the stability of the slope. According to our analysis, the proposed development will improve the stability of the slope.

Even though the proposed development of the subject site will not affect the stability of the slope to the point as to cause failure, changes in the soil or loading conditions above the slope could affect the stability of the hill. The following factors are a partial list of conditions that might affect the stability of the slope at some point in the future. All property owners and managers, both located on the Commerce Point Development and the up slope properties should be made aware of these issues.

- Saturation of the down, mid, and/or up slope soils will cause the soils to weaken and could cause movement of the slope. Saturation of the soils also causes an increase in the weight of the soils which will increase the loading conditions of the slope. Care should be given to the landscaping of all properties, desert type landscaping is recommended. Storm water of

the up slope properties should be carefully controlled and monitored and not be allowed to saturate into the subsurface soils. Water should not be allowed to flow over the slope.

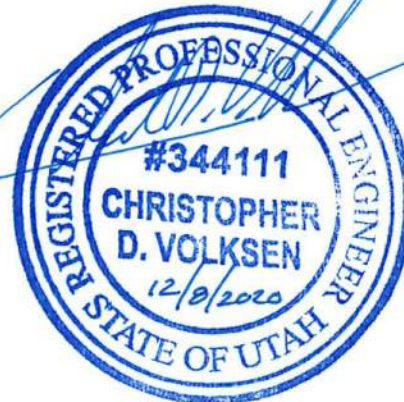
- Over steeping of the existing slope will increase the loading conditions of the slope. Any changes of the exiting slope that are required for future development should be analyzed for their impact of the stability of the slope.
- Future development of the up slope properties could cause an increase in the loading conditions of the slope. Adding fill material or any type of building will increase loading and it should be analyzed for its impact on the stability of the slope. Removing material from the up slope properties should decrease the loading conditions and may increase the stability of the slope.

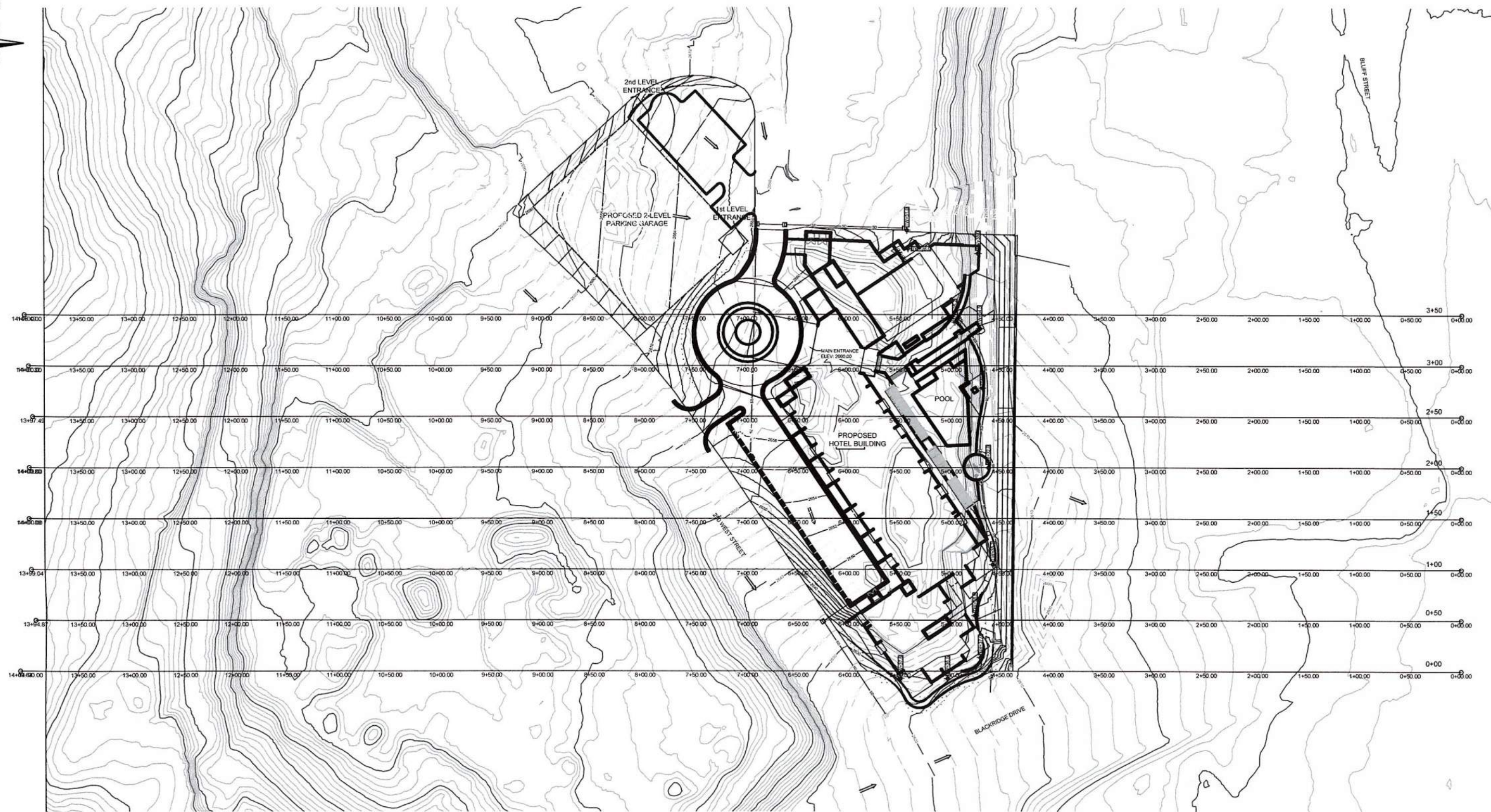
It is the responsibility of the current and future landowners of the property to the west to demonstrate that any proposed development will not impact the Commerce Point Commercial Center property.

We appreciate the opportunity to be of service to you on this project. Please call us if you have any questions or need additional information.

Very truly yours,
GEOTECHNICAL TESTING SERVICES, INC.

CHRISTOPHER D. VOLKSEN, P.E.
President
CDV/c





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SITE PLAN

Client: Jennings Management, Inc
Project: Slope Stability Analysis - North Phase
Location: Commerce Point Shopping Center, St. George, UT
Number: 18535

Figure 1

original Profile - Section 1+00

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Intercept (psf)	Friction Angle (deg)	Pore Pressure Param. (psf)	Pressure Constant (psf)	Piez. No.
Slide parent	1	125.	135.	200.	15.	0.	0.	W1
Sandston	2	130.	135.	0.	0.	0.	0.	W1
basalt	3	130.	135.	3000.	44.	0.	0.	W1
	4	135.	170.	30000.	45.	0.	0.	0

3700

3450

3200

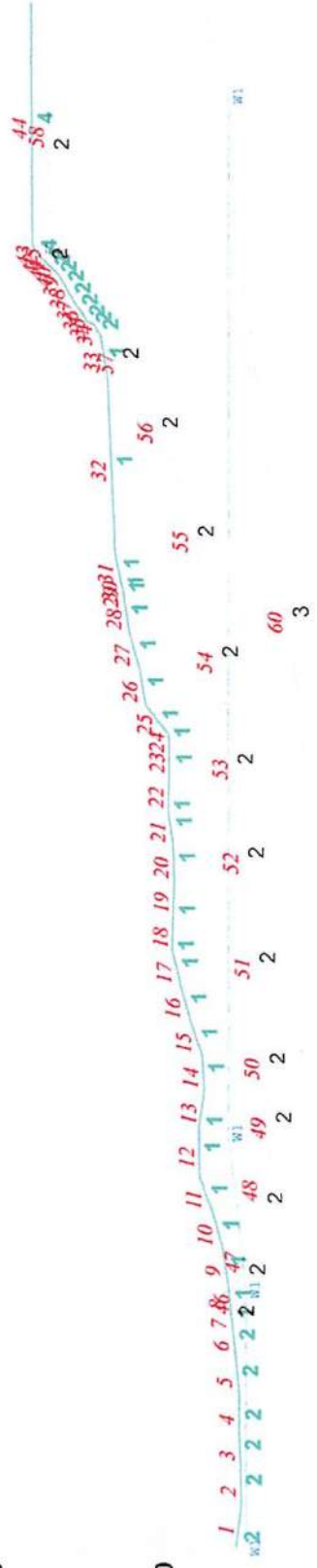
2950

2700

2450

2200

Segment Len. = 2540.0 ft



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ORIGINAL PROFILE STA 1+00

Client: Jennings Management, Inc
Project: Slope Stability Analysis - North Phase
Location: Commerce Point Shopping Center, St. George, UT
Number: 18535

Figure 2

Modified Profile - Section 1+00 JMI Pad mod with soil

z:\18500\sl\18535 - commerce point - jmi\north end stability analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel - modified with jmi pad profile 1+00 modified soil parameters add piles.plt Geometry Preview 12/8/2020

3700

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. No.
Slide parent	1	125.	135.	200.	15.	0.	0.	W1
Sandston	2	130.	135.	0.	0.	0.	0.	W1
basalt	3	130.	135.	3000.	44.	0.	0.	W1
Fill	4	135.	170.	30000.	45.	0.	0.	0
	5	135.	144.	800.	30.	0.	0.	0

3450

3200

2950

2700

2450

2200

0

250

500

750

1000

1250

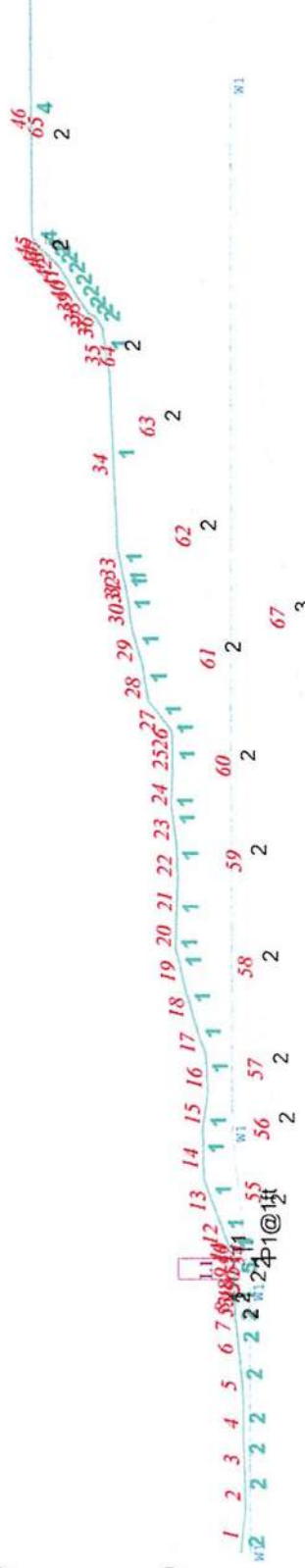
1500

1750

2000

2250

Segment Len. = 2540.0 ft

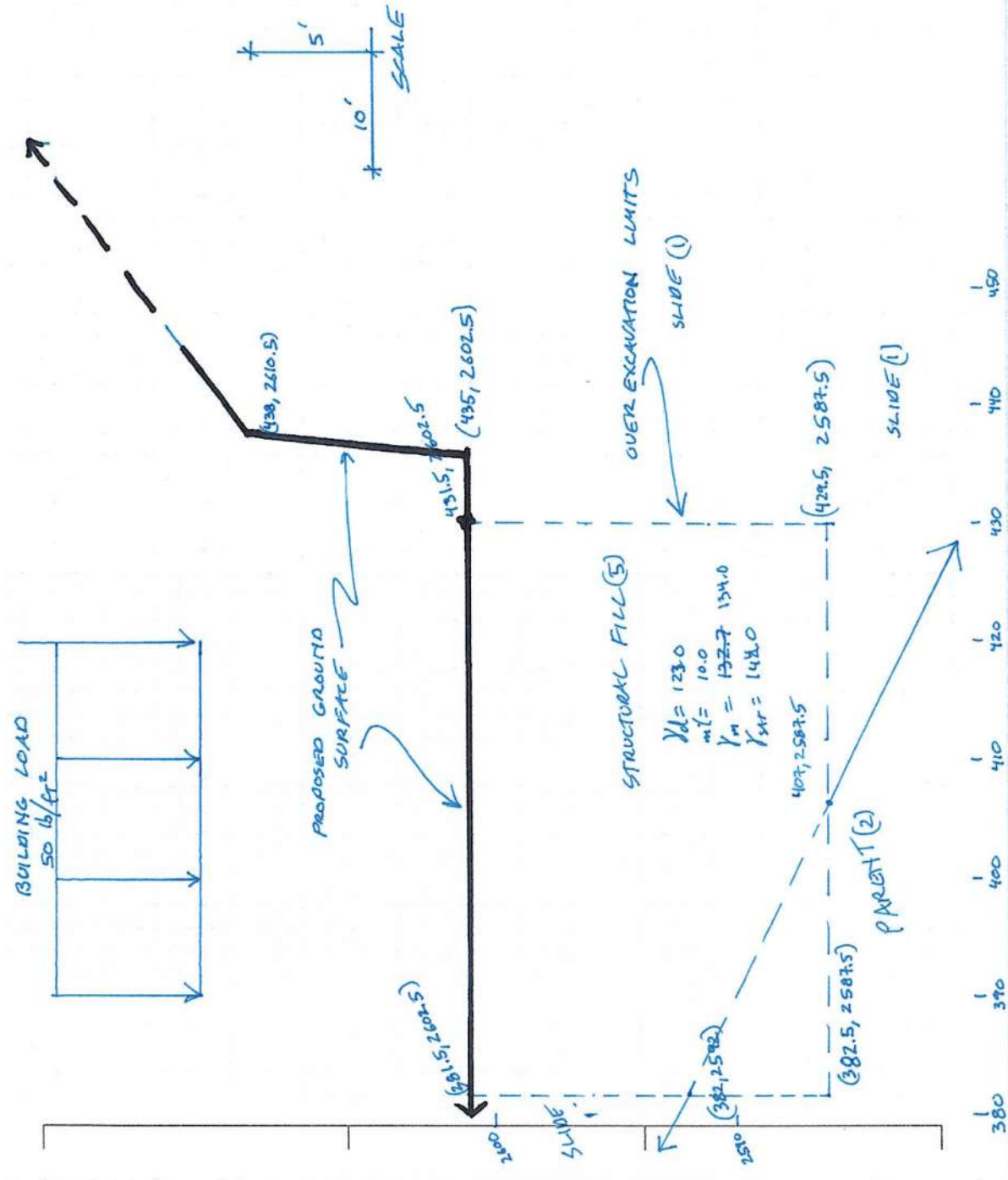


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MODIFIED PROFILE STA 1+00

Client: Jennings Management, Inc
Project: Slope Stability Analysis - North Phase
Location: Commerce Point Shopping Center, St. George, UT
Number: 18535

Figure 3



DETAIL OF BUILDING AREA STA 1+00

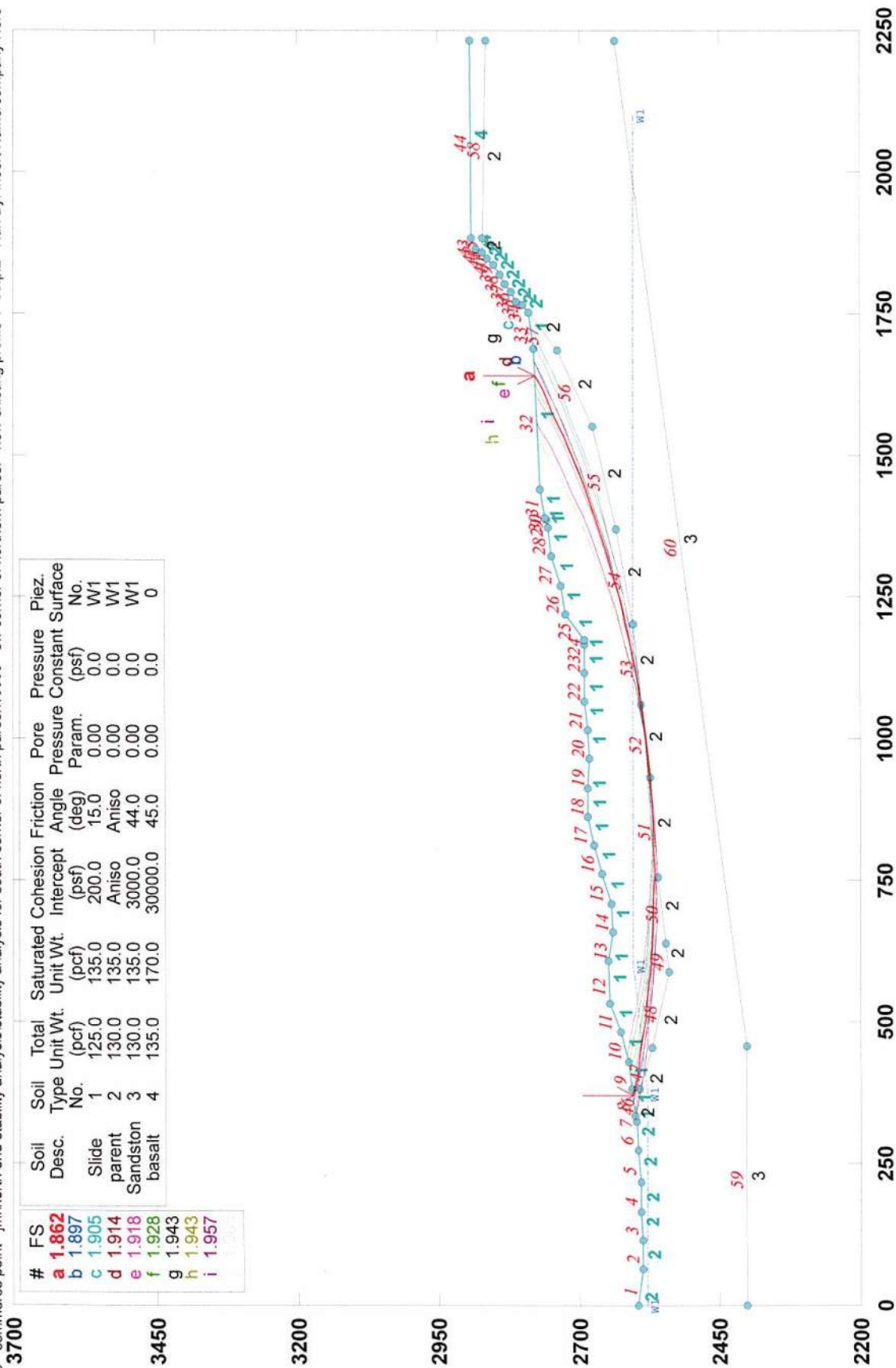
Client: Jennings Management, Inc
 Project: Slope Stability Analysis - North Phase
 Location: Commerce Point Shopping Center, St. George, UT
 Number: 18535

APPENDIX A

Analysis to Existing Slope Station 1+00

original Profile - Section 1+00

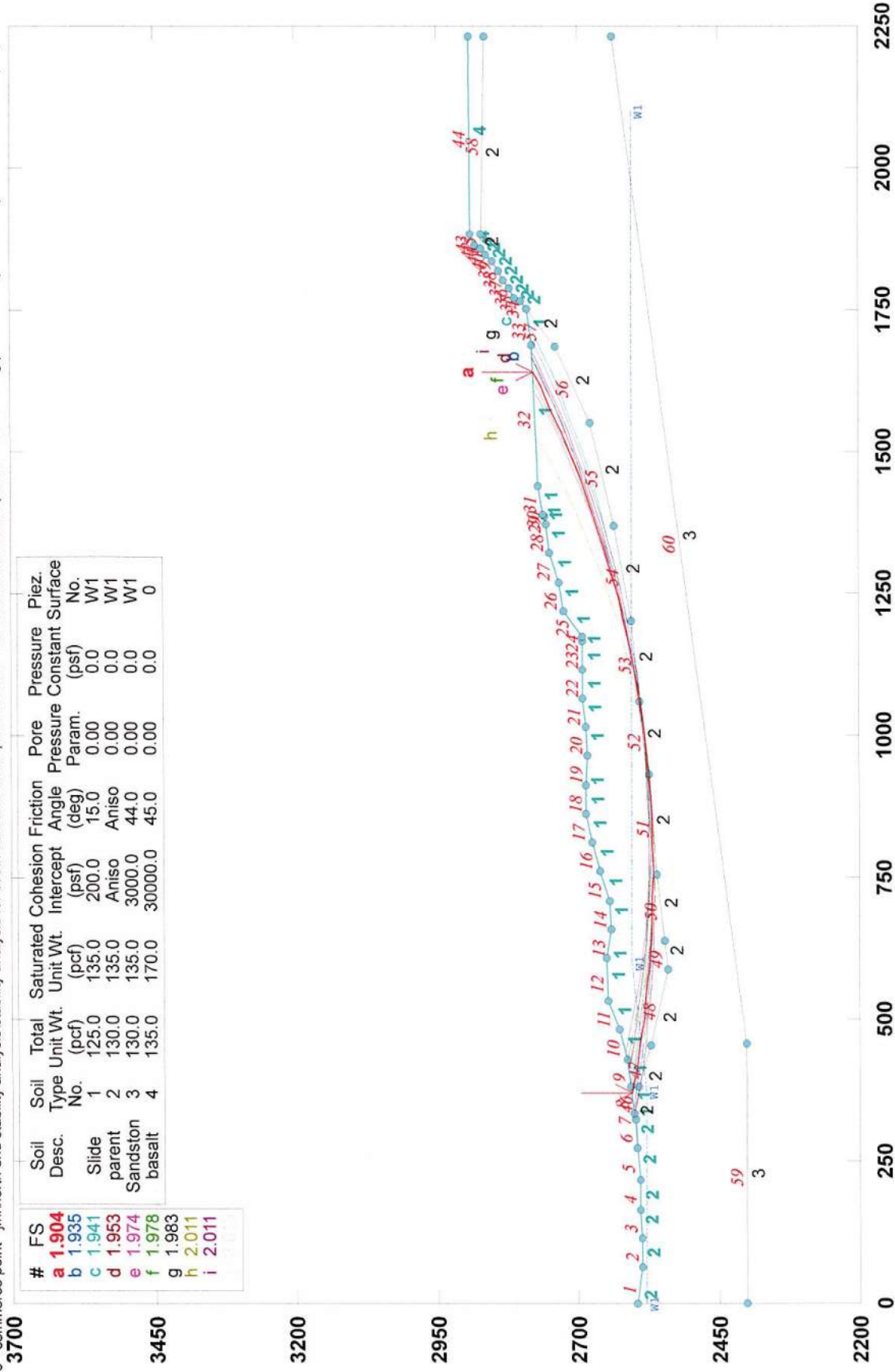
z:\18500's\18535 - commerce point - jmi\north end stability analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel - new existing profile 1+00.pl/2 Run By: Insert Name/company Here 12/8/2020 10



GSTABL7 v.2 FSmin=1.862
Safety Factors Are Calculated By The Simplified Janbu Method

original Profile - Section 1+00

z:\18500\18535 - commerce point - jmi\north end stability analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel - new existing profile 1+00.pl2 Run By: Insert Name/company Here 12/8/2020 08



GSTABL7 v.2 FSmin=1.904
Safety Factors Are Calculated By The Modified Bishop Method

*** GSTABL7 ***

** GSTABL7 by Dr. Garry H. Gregory, Ph.D., P.E., D.GE **
 ** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
 (Includes Spencer & Morgenstern-Price Type Analysis)
 Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
 Nonlinear Undrained Shear Strength, Curved Phi Envelope,
 Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
 Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

Analysis Run Date: 12/8/2020
 Time of Run: 09:57AM
 Run By: Insert Name/company Here
 Input Data Filename: Z:\18500's\18535 - Commerce Point - JMI\North end stability
 analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel
 Output Filename: Z:\18500's\18535 - Commerce Point - JMI\North end stability
 analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel
 Unit System: English
 Plotted Output Filename: Z:\18500's\18535 - Commerce Point - JMI\North end stability
 analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel

PROBLEM DESCRIPTION: original Profile - Section 1+00

BOUNDARY COORDINATES

44 Top Boundaries

60 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	2595.00	63.00	2587.00	2
2	63.00	2587.00	113.00	2588.00	2
3	113.00	2588.00	165.00	2590.00	2
4	165.00	2590.00	218.00	2590.00	2
5	218.00	2590.00	273.00	2595.00	2
6	273.00	2595.00	324.00	2600.00	2
7	324.00	2600.00	335.00	2602.00	1
8	335.00	2602.00	381.50	2606.00	1
9	381.50	2606.00	431.00	2613.00	1
10	431.00	2613.00	484.00	2628.00	1
11	484.00	2628.00	534.00	2647.00	1
12	534.00	2647.00	608.00	2648.00	1
13	608.00	2648.00	659.00	2640.00	1
14	659.00	2640.00	710.00	2643.00	1
15	710.00	2643.00	761.00	2660.00	1
16	761.00	2660.00	811.00	2674.00	1
17	811.00	2674.00	863.00	2686.00	1
18	863.00	2686.00	913.00	2685.00	1
19	913.00	2685.00	964.00	2683.00	1
20	964.00	2683.00	1015.00	2685.00	1
21	1015.00	2685.00	1066.00	2692.00	1
22	1066.00	2692.00	1115.00	2690.00	1
23	1115.00	2690.00	1167.00	2690.00	1
24	1167.00	2690.00	1175.00	2691.00	1
25	1175.00	2691.00	1218.00	2725.00	1
26	1218.00	2725.00	1269.00	2733.00	1
27	1269.00	2733.00	1323.00	2749.00	1
28	1323.00	2749.00	1374.00	2756.00	1
29	1374.00	2756.00	1386.00	2758.00	1
30	1386.00	2758.00	1390.00	2760.00	1
31	1390.00	2760.00	1439.00	2770.00	1
32	1439.00	2770.00	1687.00	2780.00	1
33	1687.00	2780.00	1752.00	2790.00	1
34	1752.00	2790.00	1767.00	2800.00	2
35	1767.00	2800.00	1772.00	2810.00	2
36	1772.00	2810.00	1787.00	2820.00	2
37	1787.00	2820.00	1802.00	2830.00	2
38	1802.00	2830.00	1820.00	2840.00	2
39	1820.00	2840.00	1837.00	2850.00	2

40	1837.00	2850.00	1847.00	2860.00	2
41	1847.00	2860.00	1857.00	2870.00	2
42	1857.00	2870.00	1865.00	2880.00	4
43	1865.00	2880.00	1882.00	2890.00	4
44	1882.00	2890.00	2232.00	2893.00	4
45	1857.00	2870.00	1882.00	2870.00	2
46	335.00	2602.50	382.00	2592.00	2
47	382.00	2592.00	456.00	2571.24	2
48	456.00	2571.24	588.00	2540.97	2
49	588.00	2540.97	638.00	2545.57	2
50	638.00	2545.57	757.00	2559.08	2
51	757.00	2559.08	931.00	2574.58	2
52	931.00	2574.58	1061.00	2591.46	2
53	1061.00	2591.46	1202.00	2604.83	2
54	1202.00	2604.83	1370.00	2636.42	2
55	1370.00	2636.42	1551.00	2676.21	2
56	1551.00	2676.21	1684.00	2738.22	2
57	1684.00	2738.22	1752.00	2790.00	2
58	1857.00	2870.00	2232.00	2863.00	2
59	0.00	2400.00	457.00	2400.00	3
60	457.00	2400.00	2232.00	2637.00	3

User Specified Y-Origin = 2200.00(ft)

Default X-Plus Value = 0.00(ft)

Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param. (psf)	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	200.0	15.0	0.00	0.0	1
2	130.0	135.0	0.0	0.0	0.00	0.0	1
3	130.0	135.0	3000.0	44.0	0.00	0.0	1
4	135.0	170.0	30000.0	45.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS

1 soil type(s)

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 6

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-90.0	535.00	28.00
2	5.0	535.00	28.00
3	5.1	0.00	8.50
4	10.0	0.00	8.50
5	10.0	535.00	28.00
6	90.0	535.00	28.00

ANISOTROPIC SOIL NOTES:

- (1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
- (2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
- (3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED

Unit Weight of Water = 62.40 (pcf)

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	2580.00
2	373.09	2580.00
3	600.00	2605.00
4	2100.00	2605.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
2100 Trial Surfaces Have Been Generated.

50 Surface(s) Initiate(s) From Each Of 42 Points Equally Spaced
Along The Ground Surface Between X = 200.00(ft)

and X = 450.00(ft)
 Each Surface Terminates Between X =1100.00(ft)
 and X =1732.00(ft)

Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is Y = 2540.00(ft)

44.00(ft) Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial

Failure Surfaces Evaluated. They Are

Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Total Number of Trial Surfaces Attempted = 2100

Number of Trial Surfaces With Valid FS = 2100

Statistical Data On All Valid FS Values:

FS Max = 4.097 FS Min = 1.904 FS Ave = 2.596

Standard Deviation = 0.382 Coefficient of Variation = 14.71 %

Failure Surface Specified By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	370.732	2605.074
2	413.968	2596.910
3	457.376	2589.719
4	500.935	2583.503
5	544.622	2578.266
6	588.416	2574.010
7	632.294	2570.737
8	676.234	2568.450
9	720.215	2567.149
10	764.214	2566.835
11	808.209	2567.508
12	852.178	2569.168
13	896.098	2571.814
14	939.948	2575.444
15	983.706	2580.057
16	1027.349	2585.651
17	1070.855	2592.222
18	1114.203	2599.768
19	1157.371	2608.284
20	1200.337	2617.767
21	1243.080	2628.210
22	1285.577	2639.611
23	1327.808	2651.961
24	1369.752	2665.256
25	1411.386	2679.489
26	1452.691	2694.651
27	1493.646	2710.737
28	1534.229	2727.737
29	1574.420	2745.643
30	1614.200	2764.447
31	1641.623	2778.170

Circle Center At X = 756.210 ; Y = 4528.087 ; and Radius = 1961.268

Factor of Safety
 *** 1.904 ***

Slice No.	Width (ft)	Weight (lbs)	Individual data on the		60 slices		Earthquake		
			Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Force Hor (lbs)	Force Ver (lbs)	Surcharge Load (lbs)
1	10.8	1991.8	0.0	0.0	0.	0.	0.0	0.0	0.0
2	32.5	33767.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	17.0	34695.3	0.0	0.0	0.	0.	0.0	0.0	0.0
4	26.4	81861.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	1.7	6650.3	0.0	0.0	0.	0.	0.0	0.0	0.0
6	24.9	115312.6	0.0	4917.4	0.	0.	0.0	0.0	0.0
7	16.9	99868.6	0.0	8956.8	0.	0.	0.0	0.0	0.0
8	33.1	249395.6	0.0	29715.5	0.	0.	0.0	0.0	0.0
9	10.6	92562.6	0.0	12880.5	0.	0.	0.0	0.0	0.0
10	43.8	401279.3	0.0	68702.4	0.	0.	0.0	0.0	0.0
11	11.6	111039.7	0.0	22180.2	0.	0.	0.0	0.0	0.0

12	8.0	77670.8	0.0	16095.1	0.	0.	0.0	0.0	0.0
13	24.3	234193.3	0.0	50707.4	0.	0.	0.0	0.0	0.0
14	26.7	249864.2	0.0	58334.4	0.	0.	0.0	0.0	0.0
15	17.2	160488.8	0.0	38877.4	0.	0.	0.0	0.0	0.0
16	33.8	325078.9	0.0	78096.4	0.	0.	0.0	0.0	0.0
17	10.2	102687.2	0.0	24041.7	0.	0.	0.0	0.0	0.0
18	40.8	454948.3	0.0	96702.5	0.	0.	0.0	0.0	0.0
19	3.2	38833.6	0.0	7652.4	0.	0.	0.0	0.0	0.0
20	44.0	565962.3	0.0	*****	0.	0.	0.0	0.0	0.0
21	2.8	38042.0	0.0	6524.9	0.	0.	0.0	0.0	0.0
22	41.2	583124.8	0.0	94134.5	0.	0.	0.0	0.0	0.0
23	10.8	159760.7	0.0	24021.1	0.	0.	0.0	0.0	0.0
24	33.1	486486.8	0.0	70727.0	0.	0.	0.0	0.0	0.0
25	16.9	243502.6	0.0	34380.1	0.	0.	0.0	0.0	0.0
26	20.6	291241.2	0.0	39934.2	0.	0.	0.0	0.0	0.0
27	6.3	88041.5	0.0	11817.9	0.	0.	0.0	0.0	0.0
28	24.1	327776.3	0.0	42691.2	0.	0.	0.0	0.0	0.0
29	19.7	262198.4	0.0	32124.6	0.	0.	0.0	0.0	0.0
30	31.3	407447.4	0.0	45157.2	0.	0.	0.0	0.0	0.0
31	12.3	158367.7	0.0	15645.9	0.	0.	0.0	0.0	0.0
32	33.7	429714.2	0.0	35693.3	0.	0.	0.0	0.0	0.0
33	5.0	63535.3	0.0	4382.3	0.	0.	0.0	0.0	0.0
34	4.9	61354.4	0.0	4027.3	0.	0.	0.0	0.0	0.0
35	2.2	27233.6	0.0	1731.0	0.	0.	0.0	0.0	0.0
36	41.2	491004.9	0.0	22992.1	0.	0.	0.0	0.0	0.0
37	0.8	9021.4	0.0	261.1	0.	0.	0.0	0.0	0.0
38	25.7	282126.4	0.0	4151.4	0.	0.	0.0	0.0	0.0
39	16.6	173462.2	0.0	0.0	0.	0.	0.0	0.0	0.0
40	9.6	97074.2	0.0	0.0	0.	0.	0.0	0.0	0.0
41	8.0	79208.0	0.0	0.0	0.	0.	0.0	0.0	0.0
42	25.3	272522.7	0.0	0.0	0.	0.	0.0	0.0	0.0
43	17.7	216572.6	0.0	0.0	0.	0.	0.0	0.0	0.0
44	25.1	319205.3	0.0	0.0	0.	0.	0.0	0.0	0.0
45	25.9	321669.3	0.0	0.0	0.	0.	0.0	0.0	0.0
46	16.6	203215.2	0.0	0.0	0.	0.	0.0	0.0	0.0
47	37.4	460172.0	0.0	0.0	0.	0.	0.0	0.0	0.0
48	4.8	58947.1	0.0	0.0	0.	0.	0.0	0.0	0.0
49	41.9	492467.1	0.0	0.0	0.	0.	0.0	0.0	0.0
50	4.2	47646.6	0.0	0.0	0.	0.	0.0	0.0	0.0
51	12.0	132361.1	0.0	0.0	0.	0.	0.0	0.0	0.0
52	4.0	43752.9	0.0	0.0	0.	0.	0.0	0.0	0.0
53	21.4	230837.9	0.0	0.0	0.	0.	0.0	0.0	0.0
54	27.6	285197.6	0.0	0.0	0.	0.	0.0	0.0	0.0
55	13.7	133725.7	0.0	0.0	0.	0.	0.0	0.0	0.0
56	41.0	351611.5	0.0	0.0	0.	0.	0.0	0.0	0.0
57	40.6	272843.8	0.0	0.0	0.	0.	0.0	0.0	0.0
58	40.2	190708.6	0.0	0.0	0.	0.	0.0	0.0	0.0
59	39.8	105503.6	0.0	0.0	0.	0.	0.0	0.0	0.0
60	27.4	21625.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	346.342	2602.976
2	389.684	2595.395
3	433.172	2588.703
4	476.788	2582.903
5	520.514	2577.998
6	564.331	2573.990
7	608.221	2570.880
8	652.165	2568.669
9	696.146	2567.359
10	740.144	2566.950
11	784.141	2567.442
12	828.119	2568.835
13	872.059	2571.129
14	915.943	2574.322
15	959.752	2578.414
16	1003.469	2583.401

17	1047.074	2589.283
18	1090.549	2596.057
19	1133.877	2603.720
20	1177.038	2612.269
21	1220.016	2621.700
22	1262.791	2632.009
23	1305.346	2643.192
24	1347.663	2655.244
25	1389.725	2668.161
26	1431.513	2681.936
27	1473.010	2696.565
28	1514.199	2712.040
29	1555.062	2728.355
30	1595.583	2745.504
31	1635.744	2763.479
32	1669.195	2779.282

Circle Center At X = 738.095 ; Y = 4714.530 ; and Radius = 2147.587

Factor of Safety

*** 1.935 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	389.025	2607.064
2	432.388	2599.604
3	475.891	2593.015
4	519.518	2587.298
5	563.251	2582.457
6	607.072	2578.493
7	650.964	2575.408
8	694.909	2573.203
9	738.889	2571.879
10	782.887	2571.436
11	826.884	2571.875
12	870.865	2573.196
13	914.809	2575.397
14	958.701	2578.479
15	1002.523	2582.439
16	1046.256	2587.276
17	1089.884	2592.989
18	1133.388	2599.575
19	1176.752	2607.031
20	1219.957	2615.354
21	1262.987	2624.542
22	1305.825	2634.590
23	1348.452	2645.494
24	1390.853	2657.250
25	1433.009	2669.853
26	1474.904	2683.299
27	1516.522	2697.581
28	1557.845	2712.694
29	1598.857	2728.632
30	1639.541	2745.388
31	1679.882	2762.957
32	1719.862	2781.330
33	1731.145	2786.792

Circle Center At X = 782.978 ; Y = 4767.327 ; and Radius = 2195.891

Factor of Safety

*** 1.941 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.049	2600.736
2	371.378	2593.083
3	414.854	2586.313
4	458.459	2580.429
5	502.175	2575.434
6	545.983	2571.330
7	589.865	2568.118

8	633.804	2565.799
9	677.781	2564.375
10	721.778	2563.846
11	765.776	2564.213
12	809.758	2565.474
13	853.705	2567.631
14	897.600	2570.681
15	941.423	2574.624
16	985.156	2579.458
17	1028.783	2585.180
18	1072.283	2591.790
19	1115.641	2599.283
20	1158.836	2607.657
21	1201.853	2616.908
22	1244.672	2627.032
23	1287.277	2638.026
24	1329.649	2649.884
25	1371.771	2662.603
26	1413.625	2676.175
27	1455.194	2690.597
28	1496.462	2705.861
29	1537.410	2721.962
30	1578.022	2738.893
31	1618.281	2756.647
32	1658.171	2775.217
33	1666.214	2779.162

Circle Center At X = 725.767 ; Y = 4726.015 ; and Radius = 2162.172

Factor of Safety
*** 1.953 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	443.903	2616.652
2	486.831	2607.001
3	530.006	2598.518
4	573.394	2591.206
5	616.964	2585.072
6	660.685	2580.121
7	704.523	2576.355
8	748.448	2573.778
9	792.426	2572.391
10	836.425	2572.196
11	880.414	2573.192
12	924.360	2575.380
13	968.230	2578.757
14	1011.993	2583.321
15	1055.616	2589.068
16	1099.067	2595.994
17	1142.315	2604.095
18	1185.327	2613.364
19	1228.073	2623.795
20	1270.521	2635.379
21	1312.639	2648.109
22	1354.397	2661.975
23	1395.764	2676.967
24	1436.710	2693.073
25	1477.205	2710.282
26	1517.219	2728.582
27	1556.723	2747.959
28	1595.687	2768.398
29	1610.938	2776.933

Circle Center At X = 821.627 ; Y = 4196.651 ; and Radius = 1624.523

Factor of Safety
*** 1.974 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	425.610	2612.238

2	468.716	2603.416
3	512.030	2595.672
4	555.522	2589.011
5	599.168	2583.436
6	642.939	2578.951
7	686.808	2575.560
8	730.748	2573.263
9	774.731	2572.063
10	818.731	2571.960
11	862.720	2572.954
12	906.670	2575.045
13	950.555	2578.231
14	994.346	2582.511
15	1038.017	2587.882
16	1081.541	2594.339
17	1124.890	2601.880
18	1168.037	2610.500
19	1210.956	2620.193
20	1253.620	2630.954
21	1296.003	2642.775
22	1338.077	2655.649
23	1379.817	2669.568
24	1421.198	2684.524
25	1462.192	2700.508
26	1502.775	2717.508
27	1542.921	2735.515
28	1582.606	2754.518
29	1621.805	2774.505
30	1627.522	2777.602

Circle Center At X = 800.837 ; Y = 4335.580 ; and Radius = 1763.718

Factor of Safety
*** 1.978 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	376.829	2605.598
2	420.132	2597.798
3	463.588	2590.896
4	507.177	2584.896
5	550.881	2579.800
6	594.681	2575.610
7	638.558	2572.328
8	682.494	2569.956
9	726.470	2568.494
10	770.466	2567.943
11	814.465	2568.304
12	858.447	2569.576
13	902.392	2571.759
14	946.284	2574.852
15	990.101	2578.853
16	1033.827	2583.760
17	1077.441	2589.573
18	1120.926	2596.287
19	1164.262	2603.900
20	1207.432	2612.410
21	1250.415	2621.812
22	1293.195	2632.102
23	1335.753	2643.276
24	1378.070	2655.329
25	1420.128	2668.256
26	1461.909	2682.051
27	1503.396	2696.708
28	1544.570	2712.222
29	1585.415	2728.586
30	1625.911	2745.792
31	1666.042	2763.832
32	1705.792	2782.700
33	1706.342	2782.976

Circle Center At X = 775.047 ; Y = 4692.173 ; and Radius = 2124.235

Factor of Safety

*** 1.983 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	413.415	2610.513
2	456.224	2600.345
3	499.318	2591.463
4	542.658	2583.873
5	586.206	2577.583
6	629.923	2572.599
7	673.770	2568.925
8	717.706	2566.563
9	761.694	2565.517
10	805.693	2565.788
11	849.664	2567.374
12	893.568	2570.275
13	937.366	2574.489
14	981.018	2580.010
15	1024.486	2586.834
16	1067.730	2594.956
17	1110.711	2604.368
18	1153.392	2615.061
19	1195.734	2627.026
20	1237.699	2640.252
21	1279.250	2654.728
22	1320.349	2670.440
23	1360.960	2687.375
24	1401.046	2705.517
25	1440.571	2724.849
26	1479.500	2745.356
27	1517.799	2767.017
28	1528.692	2773.617

Circle Center At X = 774.607 ; Y = 4035.336 ; and Radius = 1469.891

Factor of Safety

*** 2.011 ***

Failure Surface Specified By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	413.415	2610.513
2	456.675	2602.479
3	500.103	2595.410
4	543.678	2589.308
5	587.378	2584.178
6	631.181	2580.021
7	675.066	2576.839
8	719.011	2574.634
9	762.994	2573.408
10	806.993	2573.160
11	850.987	2573.891
12	894.954	2575.601
13	938.872	2578.288
14	982.719	2581.952
15	1026.474	2586.590
16	1070.115	2592.201
17	1113.620	2598.781
18	1156.968	2606.327
19	1200.137	2614.835
20	1243.107	2624.302
21	1285.855	2634.723
22	1328.361	2646.092
23	1370.603	2658.404
24	1412.561	2671.652
25	1454.214	2685.831
26	1495.542	2700.932
27	1536.523	2716.949
28	1577.137	2733.875

29	1617.365	2751.699
30	1657.187	2770.414
31	1675.529	2779.537

Circle Center At X = 796.128 ; Y = 4550.849 ; and Radius = 1977.719
Factor of Safety
*** 2.011 ***

Failure Surface Specified By 30 Coordinate Points

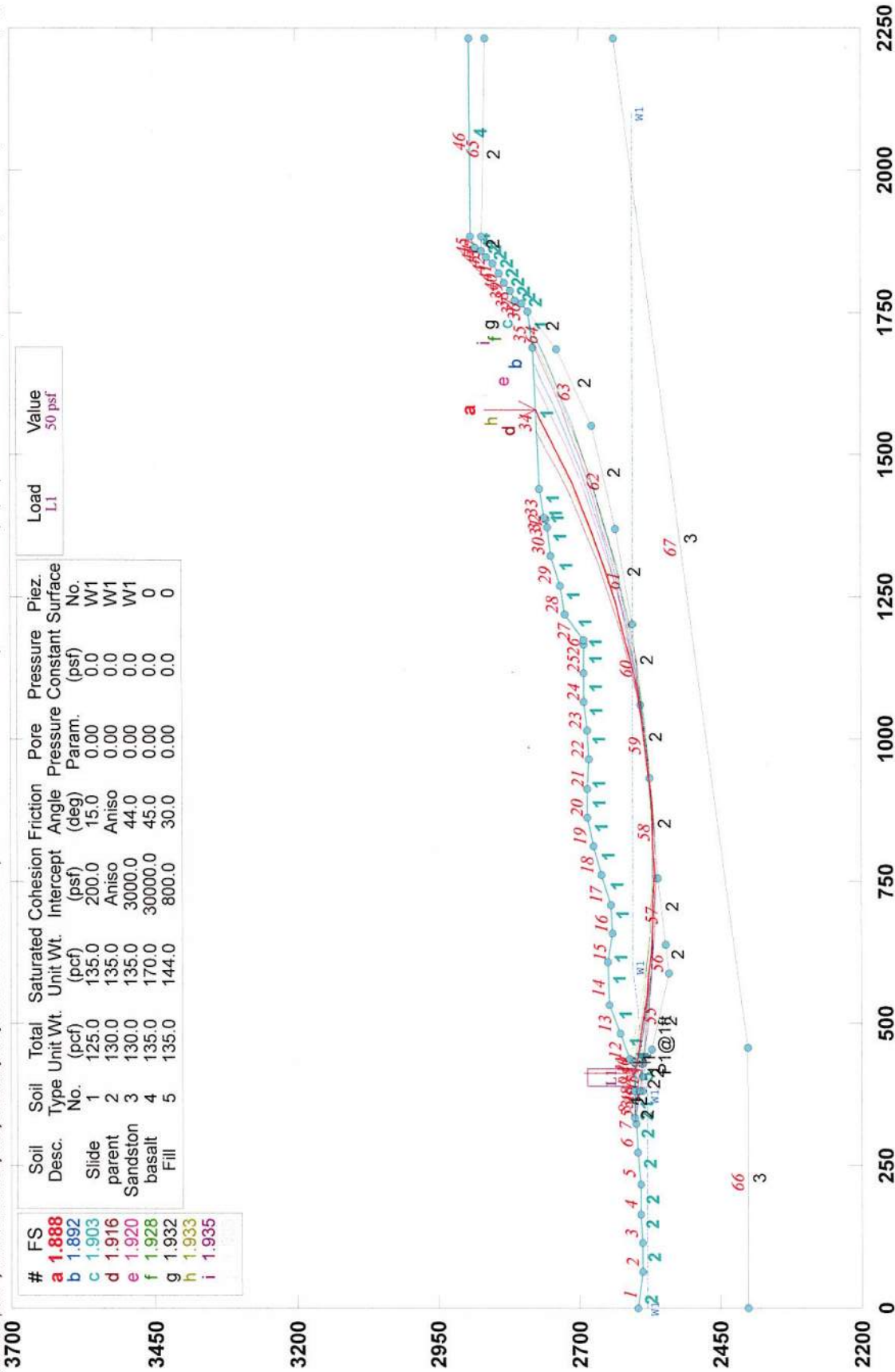
Point No.	X-Surf (ft)	Y-Surf (ft)
1	358.537	2604.025
2	401.584	2594.917
3	444.851	2586.921
4	488.310	2580.039
5	531.931	2574.278
6	575.686	2569.641
7	619.546	2566.131
8	663.481	2563.751
9	707.463	2562.501
10	751.463	2562.384
11	795.451	2563.398
12	839.399	2565.543
13	883.277	2568.818
14	927.056	2573.221
15	970.708	2578.749
16	1014.202	2585.397
17	1057.512	2593.163
18	1100.607	2602.040
19	1143.460	2612.022
20	1186.041	2623.104
21	1228.324	2635.277
22	1270.279	2648.534
23	1311.880	2662.865
24	1353.098	2678.263
25	1393.906	2694.715
26	1434.278	2712.212
27	1474.186	2730.741
28	1513.604	2750.291
29	1552.507	2770.848
30	1559.657	2774.865

Circle Center At X = 734.011 ; Y = 4271.946 ; and Radius = 1709.662
Factor of Safety
*** 2.013 ***
**** END OF GSTABL7 OUTPUT ****

APPENDIX B

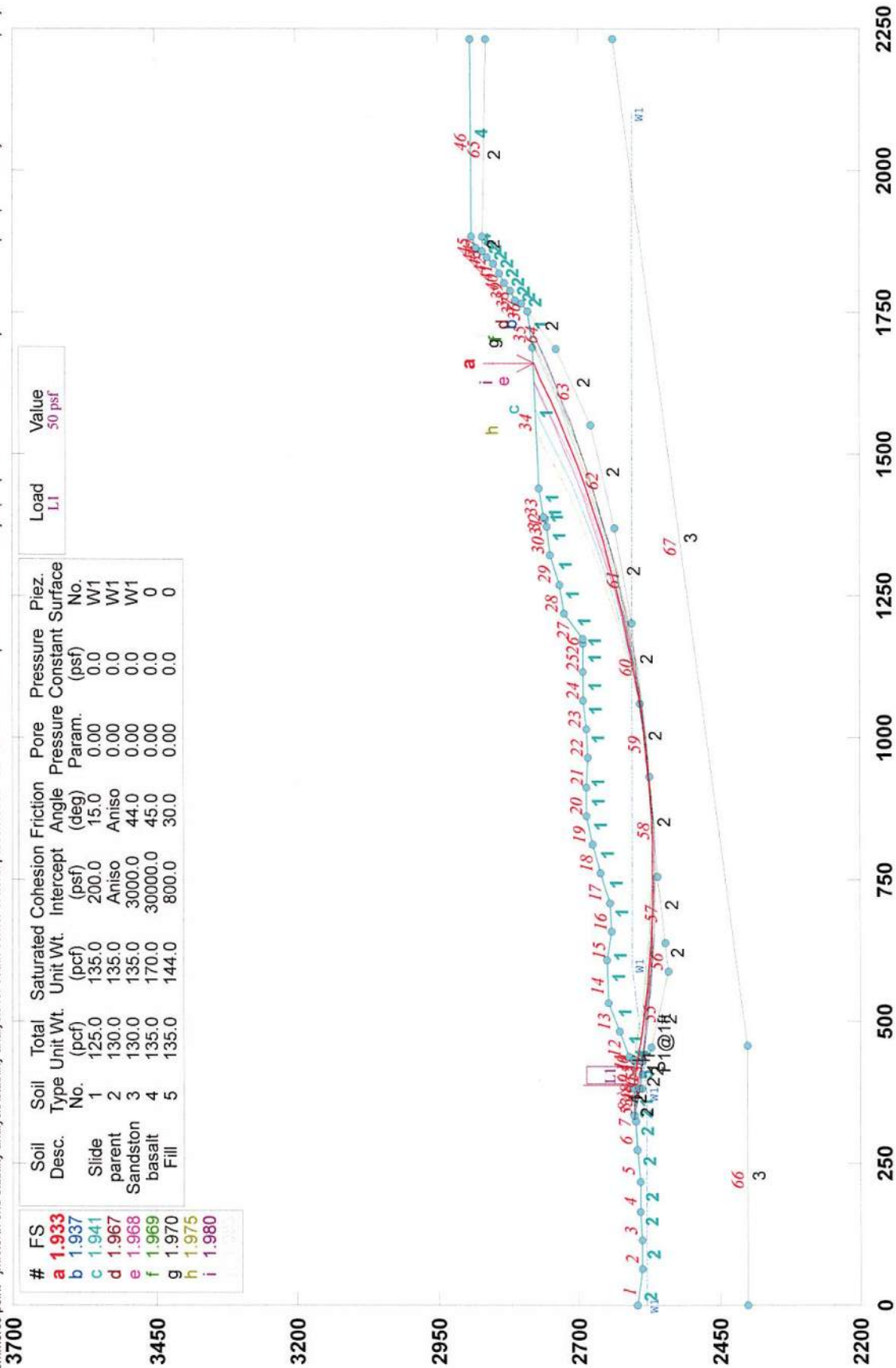
Analysis to Modified Slope Station 1+00

Modified Profile - Section 1+00 JMI Pad mod with soil



GSTABL7 v.2 FSmin=1.888
Safety Factors Are Calculated By The Simplified Janbu Method

Modified Profile - Section 1+00 JMI Pad mod with soil



*** GSTABL7 ***

** GSTABL7 by Dr. Garry H. Gregory, Ph.D., P.E., D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

Analysis Run Date: 12/8/2020
Time of Run: 10:09AM
Run By: Insert Name/company Here
Input Data Filename: Z:\18500's\18535 - Commerce Point - JMI\North end stability
analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel
Output Filename: Z:\18500's\18535 - Commerce Point - JMI\North end stability
analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel
Unit System: English
Plotted Output Filename: Z:\18500's\18535 - Commerce Point - JMI\North end stability
analysis\stability analysis for south corner of north parcel\18535 - sw corner of northern parcel
PROBLEM DESCRIPTION: Modified Profile - Section 1+00
JMI Pad mod with soil

BOUNDARY COORDINATES

46 Top Boundaries
67 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	2595.00	63.00	2587.00	2
2	63.00	2587.00	113.00	2588.00	2
3	113.00	2588.00	165.00	2590.00	2
4	165.00	2590.00	218.00	2590.00	2
5	218.00	2590.00	273.00	2595.00	2
6	273.00	2595.00	324.00	2600.00	2
7	324.00	2600.00	335.00	2602.00	2
8	335.00	2602.00	381.50	2602.50	1
9	381.50	2602.50	431.50	2602.50	5
10	431.50	2602.50	435.00	2605.50	1
11	435.00	2605.50	438.00	2610.50	1
12	438.00	2610.50	484.00	2628.00	1
13	484.00	2628.00	534.00	2647.00	1
14	534.00	2647.00	608.00	2648.00	1
15	608.00	2648.00	659.00	2640.00	1
16	659.00	2640.00	710.00	2643.00	1
17	710.00	2643.00	761.00	2660.00	1
18	761.00	2660.00	811.00	2674.00	1
19	811.00	2674.00	863.00	2686.00	1
20	863.00	2686.00	913.00	2685.00	1
21	913.00	2685.00	964.00	2683.00	1
22	964.00	2683.00	1015.00	2685.00	1
23	1015.00	2685.00	1066.00	2692.00	1
24	1066.00	2692.00	1115.00	2690.00	1
25	1115.00	2690.00	1167.00	2690.00	1
26	1167.00	2690.00	1175.00	2691.00	1
27	1175.00	2691.00	1218.00	2725.00	1
28	1218.00	2725.00	1269.00	2733.00	1
29	1269.00	2733.00	1323.00	2749.00	1
30	1323.00	2749.00	1374.00	2756.00	1
31	1374.00	2756.00	1386.00	2758.00	1
32	1386.00	2758.00	1390.00	2760.00	1
33	1390.00	2760.00	1439.00	2770.00	1
34	1439.00	2770.00	1687.00	2780.00	1
35	1687.00	2780.00	1752.00	2790.00	1
36	1752.00	2790.00	1767.00	2800.00	2
37	1767.00	2800.00	1772.00	2810.00	2
38	1772.00	2810.00	1787.00	2820.00	2

39	1787.00	2820.00	1802.00	2830.00	2
40	1802.00	2830.00	1820.00	2840.00	2
41	1820.00	2840.00	1837.00	2850.00	2
42	1837.00	2850.00	1847.00	2860.00	2
43	1847.00	2860.00	1857.00	2870.00	2
44	1857.00	2870.00	1865.00	2880.00	4
45	1865.00	2880.00	1882.00	2890.00	4
46	1882.00	2890.00	2232.00	2893.00	4
47	1857.00	2870.00	1882.00	2870.00	2
48	381.50	2602.50	382.00	2592.00	1
49	382.00	2592.00	382.50	2587.50	2
50	382.50	2587.50	407.00	2587.50	2
51	407.00	2587.50	429.50	2587.50	1
52	429.50	2587.50	431.50	2602.50	1
53	335.00	2602.00	382.00	2592.00	2
54	407.00	2587.50	456.00	2571.24	2
55	456.00	2571.24	588.00	2540.97	2
56	588.00	2540.97	638.00	2545.57	2
57	638.00	2545.57	757.00	2559.08	2
58	757.00	2559.08	931.00	2574.58	2
59	931.00	2574.58	1061.00	2591.46	2
60	1061.00	2591.46	1202.00	2604.83	2
61	1202.00	2604.83	1370.00	2636.42	2
62	1370.00	2636.42	1551.00	2676.21	2
63	1551.00	2676.21	1684.00	2738.22	2
64	1684.00	2738.22	1752.00	2790.00	2
65	1857.00	2870.00	2232.00	2863.00	2
66	0.00	2400.00	457.00	2400.00	3
67	457.00	2400.00	2232.00	2637.00	3

User Specified Y-Origin = 2200.00(ft)

Default X-Plus Value = 0.00(ft)

Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure Param.	Pressure Constant	Piez. Surface
No.	(pcf)	(pcf)	(psf)	(deg)		(psf)	No.
1	125.0	135.0	200.0	15.0	0.00	0.0	1
2	130.0	135.0	0.0	0.0	0.00	0.0	1
3	130.0	135.0	3000.0	44.0	0.00	0.0	1
4	135.0	170.0	30000.0	45.0	0.00	0.0	0
5	135.0	144.0	800.0	30.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS

1 soil type(s)

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 6

Direction Range	Counterclockwise Direction Limit	Cohesion Intercept	Friction Angle
No.	(deg)	(psf)	(deg)
1	-90.0	535.00	28.00
2	5.0	535.00	28.00
3	5.1	0.00	8.50
4	10.0	0.00	8.50
5	10.0	535.00	28.00
6	90.0	535.00	28.00

ANISOTROPIC SOIL NOTES:

- (1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
- (2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
- (3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED

Unit Weight of Water = 62.40 (pcf)

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
-----------	--------------	--------------

1	0.00	2580.00
2	373.09	2580.00
3	600.00	2605.00
4	2100.00	2605.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	390.00	420.00	50.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

PIER/PILE LOAD(S)

1 Pier/Pile Load(s) Specified

Pier/Pile No.	X-Pos (ft)	Y-Pos (ft)	Load (lbs)	Spacing (ft)	Inclination (deg)	Length (ft)
1	433.00	2603.79	0.0	1.0	90.00	30.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles Assuming A Uniform Distribution Of Load Horizontally Between Individual Piers/Piles.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified. 2100 Trial Surfaces Have Been Generated.

50 Surface(s) Initiate(s) From Each Of 42 Points Equally Spaced Along The Ground Surface Between X = 200.00(ft) and X = 450.00(ft) Each Surface Terminates Between X = 1100.00(ft) and X = 1732.00(ft)

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 2540.00(ft)

44.00(ft) Line Segments Define Each Trial Failure Surface. Following Are Displayed The Ten Most Critical Of The Trial

Failure Surfaces Evaluated. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Simplified Janbu Method * *

Total Number of Trial Surfaces Attempted = 2100

Number of Trial Surfaces With Valid FS = 2100

Statistical Data On All Valid FS Values:

FS Max = 3.441 FS Min = 1.888 FS Ave = 2.492

Standard Deviation = 0.327 Coefficient of Variation = 13.11 %

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	413.415	2602.500
2	456.594	2594.042
3	499.978	2586.706
4	543.538	2580.495
5	587.243	2575.414
6	631.066	2571.467
7	674.976	2568.656
8	718.944	2566.984
9	762.941	2566.450
10	806.937	2567.056
11	850.902	2568.802
12	894.808	2571.685
13	938.624	2575.704
14	982.321	2580.856
15	1025.870	2587.139
16	1069.242	2594.547
17	1112.408	2603.076
18	1155.338	2612.720
19	1198.004	2623.472
20	1240.377	2635.326
21	1282.429	2648.273
22	1324.132	2662.305
23	1365.457	2677.412
24	1406.377	2693.584
25	1446.865	2710.810
26	1486.893	2729.079

27 1526.434 2748.379
 28 1565.463 2768.696
 29 1577.930 2775.602

Factor of Safety
 *** 1.888 ***

Slice No.	Width (ft)	Weight (lbs)	Individual data on the		60 slices		Earthquake		
			Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Force Hor (lbs)	Force Ver (lbs)	Surcharge Load (lbs)
1	6.6	573.4	0.0	0.0	0.	0.	0.0	0.0	329.3
2	11.0	3533.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.5	209.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	3.5	2356.0	0.0	0.0	0.	0.	0.0	0.0	0.0
5	3.0	3758.1	0.0	0.0	0.	0.	0.0	0.0	0.0
6	18.6	42240.5	0.0	0.0	0.	0.	0.0	0.0	0.0
7	17.3	61321.6	0.0	0.0	0.	0.	0.0	0.0	0.0
8	10.1	45228.9	0.0	890.4	0.	0.	0.0	0.0	0.0
9	16.0	86642.7	0.0	5069.1	0.	0.	0.0	0.0	0.0
10	34.0	243153.2	0.0	24670.8	0.	0.	0.0	0.0	0.0
11	9.5	80173.8	0.0	10205.8	0.	0.	0.0	0.0	0.0
12	43.7	389620.8	0.0	63404.2	0.	0.	0.0	0.0	0.0
13	12.8	120084.6	0.0	23402.2	0.	0.	0.0	0.0	0.0
14	8.0	76528.6	0.0	15585.4	0.	0.	0.0	0.0	0.0
15	23.1	219947.2	0.0	46958.5	0.	0.	0.0	0.0	0.0
16	27.9	259687.4	0.0	60131.4	0.	0.	0.0	0.0	0.0
17	16.0	148117.0	0.0	35794.8	0.	0.	0.0	0.0	0.0
18	35.0	336843.7	0.0	80942.8	0.	0.	0.0	0.0	0.0
19	8.9	89851.3	0.0	21138.3	0.	0.	0.0	0.0	0.0
20	42.1	469568.7	0.0	*****	0.	0.	0.0	0.0	0.0
21	1.9	23510.5	0.0	4668.4	0.	0.	0.0	0.0	0.0
22	44.0	566497.1	0.0	*****	0.	0.	0.0	0.0	0.0
23	4.1	55522.4	0.0	9607.0	0.	0.	0.0	0.0	0.0
24	39.9	566383.3	0.0	92175.5	0.	0.	0.0	0.0	0.0
25	12.1	178846.9	0.0	27084.2	0.	0.	0.0	0.0	0.0
26	31.8	468333.1	0.0	68344.7	0.	0.	0.0	0.0	0.0
27	18.2	262106.2	0.0	37026.8	0.	0.	0.0	0.0	0.0
28	25.6	360037.3	0.0	48926.3	0.	0.	0.0	0.0	0.0
29	11.2	153856.1	0.0	20186.9	0.	0.	0.0	0.0	0.0
30	14.2	190375.4	0.0	24138.4	0.	0.	0.0	0.0	0.0
31	18.3	241840.9	0.0	29036.5	0.	0.	0.0	0.0	0.0
32	26.9	346784.0	0.0	37624.1	0.	0.	0.0	0.0	0.0
33	5.8	73500.8	0.0	7261.9	0.	0.	0.0	0.0	0.0
34	10.9	137079.3	0.0	12778.2	0.	0.	0.0	0.0	0.0
35	40.1	500791.0	0.0	36667.1	0.	0.	0.0	0.0	0.0
36	3.2	39928.3	0.0	2202.2	0.	0.	0.0	0.0	0.0
37	43.2	500020.7	0.0	16991.1	0.	0.	0.0	0.0	0.0
38	2.6	28131.6	0.0	270.7	0.	0.	0.0	0.0	0.0
39	6.0	64003.0	0.0	256.3	0.	0.	0.0	0.0	0.0
40	34.4	348547.5	0.0	0.0	0.	0.	0.0	0.0	0.0
41	11.7	110514.2	0.0	0.0	0.	0.	0.0	0.0	0.0
42	8.0	73833.2	0.0	0.0	0.	0.	0.0	0.0	0.0
43	23.0	228661.7	0.0	0.0	0.	0.	0.0	0.0	0.0
44	20.0	227019.2	0.0	0.0	0.	0.	0.0	0.0	0.0
45	22.4	264495.9	0.0	0.0	0.	0.	0.0	0.0	0.0
46	28.6	325666.5	0.0	0.0	0.	0.	0.0	0.0	0.0
47	13.4	149037.1	0.0	0.0	0.	0.	0.0	0.0	0.0
48	40.6	445726.6	0.0	0.0	0.	0.	0.0	0.0	0.0
49	1.1	12303.5	0.0	0.0	0.	0.	0.0	0.0	0.0
50	41.3	424273.1	0.0	0.0	0.	0.	0.0	0.0	0.0
51	8.5	81492.6	0.0	0.0	0.	0.	0.0	0.0	0.0
52	12.0	110761.2	0.0	0.0	0.	0.	0.0	0.0	0.0
53	4.0	36339.6	0.0	0.0	0.	0.	0.0	0.0	0.0
54	16.4	146011.4	0.0	0.0	0.	0.	0.0	0.0	0.0
55	32.6	269738.4	0.0	0.0	0.	0.	0.0	0.0	0.0
56	7.9	59991.7	0.0	0.0	0.	0.	0.0	0.0	0.0
57	40.0	256077.3	0.0	0.0	0.	0.	0.0	0.0	0.0
58	39.5	168047.8	0.0	0.0	0.	0.	0.0	0.0	0.0

59	39.0	76959.9	0.0	0.0	0.	0.	0.0	0.0	0.0
60	12.5	4989.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	389.025	2602.500
2	432.371	2594.947
3	475.872	2588.334
4	519.505	2582.667
5	563.251	2577.947
6	607.089	2574.176
7	650.999	2571.356
8	694.959	2569.489
9	738.950	2568.575
10	782.950	2568.615
11	826.939	2569.609
12	870.896	2571.556
13	914.800	2574.456
14	958.631	2578.307
15	1002.368	2583.106
16	1045.992	2588.853
17	1089.480	2595.544
18	1132.813	2603.177
19	1175.970	2611.747
20	1218.932	2621.250
21	1261.677	2631.683
22	1304.186	2643.039
23	1346.439	2655.315
24	1388.416	2668.503
25	1430.097	2682.599
26	1471.463	2697.594
27	1512.494	2713.483
28	1553.171	2730.258
29	1593.475	2747.910
30	1633.386	2766.432
31	1658.711	2778.859

Factor of Safety
*** 1.892 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	334.146	2601.845
2	377.561	2594.692
3	421.102	2588.353
4	464.754	2582.830
5	508.502	2578.125
6	552.330	2574.239
7	596.223	2571.174
8	640.166	2568.930
9	684.143	2567.509
10	728.139	2566.912
11	772.138	2567.137
12	816.126	2568.186
13	860.086	2570.058
14	904.003	2572.752
15	947.863	2576.267
16	991.649	2580.602
17	1035.346	2585.756
18	1078.939	2591.726
19	1122.412	2598.511
20	1165.751	2606.109
21	1208.941	2614.516
22	1251.965	2623.729
23	1294.810	2633.747
24	1337.460	2644.563
25	1379.899	2656.177
26	1422.115	2668.582
27	1464.090	2681.775

28	1505.811	2695.751
29	1547.264	2710.505
30	1588.433	2726.032
31	1629.305	2742.327
32	1669.864	2759.384
33	1710.097	2777.197
34	1730.507	2786.693

Factor of Safety

*** 1.903 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	401.220	2602.500
2	444.290	2593.504
3	487.592	2585.696
4	531.092	2579.083
5	574.758	2573.670
6	618.556	2569.461
7	662.454	2566.458
8	706.417	2564.665
9	750.413	2564.083
10	794.409	2564.711
11	838.370	2566.551
12	882.264	2569.599
13	926.058	2573.854
14	969.718	2579.313
15	1013.212	2585.971
16	1056.505	2593.824
17	1099.566	2602.865
18	1142.362	2613.088
19	1184.860	2624.485
20	1227.029	2637.047
21	1268.836	2650.765
22	1310.249	2665.629
23	1351.238	2681.626
24	1391.771	2698.746
25	1431.818	2716.974
26	1471.347	2736.298
27	1510.330	2756.702
28	1541.512	2774.134

Factor of Safety

*** 1.916 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	401.220	2602.500
2	444.467	2594.396
3	487.893	2587.314
4	531.474	2581.257
5	575.186	2576.229
6	619.004	2572.233
7	662.905	2569.271
8	706.862	2567.345
9	750.853	2566.455
10	794.853	2566.602
11	838.837	2567.786
12	882.781	2570.007
13	926.661	2573.263
14	970.451	2577.552
15	1014.128	2582.872
16	1057.668	2589.220
17	1101.046	2596.593
18	1144.238	2604.986
19	1187.220	2614.394
20	1229.969	2624.813
21	1272.460	2636.237
22	1314.670	2648.659
23	1356.575	2662.073

24	1398.153	2676.471
25	1439.380	2691.844
26	1480.233	2708.185
27	1520.690	2725.485
28	1560.727	2743.733
29	1600.323	2762.920
30	1629.003	2777.661

Factor of Safety
*** 1.920 ***

Failure Surface Specified By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	431.707	2602.678
2	475.085	2595.301
3	518.610	2588.858
4	562.265	2583.352
5	606.027	2578.785
6	649.877	2575.159
7	693.795	2572.476
8	737.761	2570.737
9	781.754	2569.944
10	825.754	2570.095
11	869.740	2571.192
12	913.693	2573.234
13	957.591	2576.219
14	1001.416	2580.147
15	1045.145	2585.015
16	1088.760	2590.822
17	1132.241	2597.564
18	1175.566	2605.240
19	1218.717	2613.844
20	1261.672	2623.373
21	1304.414	2633.823
22	1346.920	2645.189
23	1389.173	2657.465
24	1431.152	2670.646
25	1472.839	2684.727
26	1514.213	2699.699
27	1555.256	2715.557
28	1595.948	2732.293
29	1636.272	2749.899
30	1676.208	2768.368
31	1705.978	2782.920

Factor of Safety
*** 1.928 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	346.342	2602.122
2	389.751	2594.936
3	433.289	2588.576
4	476.940	2583.045
5	520.688	2578.345
6	564.518	2574.478
7	608.413	2571.445
8	652.358	2569.246
9	696.337	2567.883
10	740.334	2567.357
11	784.333	2567.667
12	828.318	2568.813
13	872.273	2570.796
14	916.183	2573.614
15	960.031	2577.266
16	1003.802	2581.751
17	1047.479	2587.067
18	1091.048	2593.213
19	1134.492	2600.186
20	1177.796	2607.983

21	1220.943	2616.602
22	1263.919	2626.040
23	1306.708	2636.293
24	1349.294	2647.358
25	1391.662	2659.231
26	1433.796	2671.907
27	1475.682	2685.381
28	1517.305	2699.649
29	1558.648	2714.707
30	1599.698	2730.547
31	1640.439	2747.165
32	1680.857	2764.554
33	1720.937	2782.708
34	1728.735	2786.421

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	437.805	2610.175
2	480.723	2600.477
3	523.903	2592.023
4	567.310	2584.822
5	610.907	2578.880
6	654.657	2574.201
7	698.525	2570.789
8	742.473	2568.647
9	786.464	2567.778
10	830.462	2568.181
11	874.430	2569.856
12	918.332	2572.802
13	962.129	2577.017
14	1005.787	2582.497
15	1049.267	2589.237
16	1092.535	2597.232
17	1135.553	2606.475
18	1178.286	2616.958
19	1220.698	2628.673
20	1262.753	2641.610
21	1304.417	2655.757
22	1345.654	2671.104
23	1386.430	2687.636
24	1426.710	2705.341
25	1466.462	2724.204
26	1505.651	2744.208
27	1544.246	2765.338
28	1560.576	2774.902

Factor of Safety
*** 1.933 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.049	2600.736
2	371.467	2593.606
3	415.014	2587.305
4	458.672	2581.834
5	502.427	2577.196
6	546.263	2573.393
7	590.162	2570.425
8	634.111	2568.294
9	678.092	2567.001
10	722.089	2566.546
11	766.088	2566.929
12	810.071	2568.150
13	854.022	2570.209
14	897.927	2573.105
15	941.768	2576.837
16	985.531	2581.404

17	1029.198	2586.803
18	1072.755	2593.033
19	1116.185	2600.092
20	1159.473	2607.977
21	1202.602	2616.686
22	1245.558	2626.214
23	1288.325	2636.559
24	1330.887	2647.717
25	1373.228	2659.684
26	1415.334	2672.455
27	1457.189	2686.026
28	1498.778	2700.392
29	1540.085	2715.547
30	1581.096	2731.487
31	1621.796	2748.206
32	1662.171	2765.696
33	1696.865	2781.518

Factor of Safety
*** 1.935 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	401.220	2602.500
2	444.433	2594.219
3	487.837	2586.998
4	531.404	2580.842
5	575.109	2575.753
6	618.925	2571.736
7	662.826	2568.793
8	706.787	2566.925
9	750.780	2566.133
10	794.779	2566.418
11	838.758	2567.781
12	882.690	2570.219
13	926.549	2573.732
14	970.310	2578.317
15	1013.945	2583.972
16	1057.429	2590.693
17	1100.735	2598.476
18	1143.837	2607.317
19	1186.711	2617.211
20	1229.329	2628.150
21	1271.667	2640.130
22	1313.699	2653.142
23	1355.400	2667.179
24	1396.745	2682.233
25	1437.708	2698.293
26	1478.267	2715.352
27	1518.396	2733.398
28	1558.071	2752.421
29	1597.269	2772.409
30	1605.200	2776.702

Factor of Safety
*** 1.935 ***

**** END OF GSTABL7 OUTPUT ****

HILLSIDE REVIEW BOARD
CITY OF ST GEORGE
WASHINGTON COUNTY, UTAH
AUGUST 26, 2020

PRESENT: Chairman Dave Black
James Dotson
James Sullivan

CITY STAFF:

Assistant Public Works Director Wes Jenkins
Senior Planner Dan Boles
Development Office Supervisor Brenda Hatch

EXCUSED: Shawn Patten

1. Consider a request for a Hillside Development Permit to allow development of a multi-family housing subdivision to be called “**The Cove.**” The property is generally located west of Bluff Street at approximately 300 West and 900 South. The property is currently zoned C-2 (Highway Commercial). The owner is Cove Towers LLC, the applicant is Brent Holdaway, and the representative is Bush & Gudgell, Inc. Case No. 2020-HS-007. (*See ‘Meeting Place’ exhibit below*).

Item Representatives Present: Wayne Rogers, Rick Myer, Reed Scow and Brent Holdaway.

Dan Boles presented the following:

Dan Boles – We were here last month, can someone from the developer’s side explain where we are at?

Rick Myer – The big thing that changed was the cut of the hill. Instead of doing those crazy walls, we came up with a cross section with Wayne Rogers for how to catch that slope up the hillside quicker. We came out and staked along up the hillside where that daylight line would be.

Wayne Rogers – Basically the cuts will be 15 to 30 feet max at the toe of that, then we will put an 8-foot rock wall at the bottom. It will have an exposed bedrock face for a short 10- or 15-foot max distance with a short wall at the top with a catch behind it for drainage. The only place drainage really gets heavy is just right here where you can see, we will have a catch up there to get it down into the parking and drain system. The way the buildings are designed through there most of the cuts behind the building, the exposed bedrock will be hidden behind the building.

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Wes Jenkins – So you'll have an 8-foot rock wall and then a bedrock slope?

Wayne Rogers – Yes. That's stable its rock, it's not superficial stuff or blue clay. Our landslide deposit right there was superficial, more of a surface material came off and we've already addressed that.

Wes Jenkins – Remind me how you addressed that?

Wayne Rogers – Just that it wasn't a concern. That was the conclusion. You can see where the stakes start and go up, they don't even exceed the disturbed zone. Basically, catch the disturb zone all the way through and then just a little above the disturb zone on the left. Matching where are test pits are, it's bedrock everywhere but right in the drainage which is the flatter zone right there. That's where we will catch, our upper wall right through there may end up being about an 8-foot wall to just to make that stable. We will just have to follow that bedrock surface as we come around.

Dave Black – I think when we met last time, we had given them the direction that we hoped they could limit their cuts to the disturbed area and I think they have done that.

Wayne Rogers – The way we did it before I would estimate we were going about 30 feet up the slope last time. This time it is a lot less. That was the direction we got last time.

James Sullivan – From the tests you've done then you'll be in bedrock most of the time?

Wayne Rogers – Yes, we did 4 along that face up there and we hit bedrock at 3 feet, 1 foot, 7 feet and 3 feet. The 7 feet is right back in there where the drainage is. As you can see the cuts are anticipated, there shouldn't be a whole lot of surprises with that. Stability wise it should be good because it is bedrock.

Dave Black – On your wall detail, you show some gunite on the upper wall. But I wonder if you want to incorporate something like that on the lower one. It's facing on rock.

Wayne Rogers – The reason we didn't, and I don't disagree with you on that, is because the area of the influence of water from that is just right here. There is not a lot of water that's going to get through that one, where this one here has the whole slope coming down to it.

Dave Black – I wonder if we have a 30-foot wall if we need some type of a safety fence or something behind it? I don't know if you envision anyone getting behind it. Maybe T posts with wire stretched through, see through not visible like in Horseman Park.

Wayne Rogers – If there was a trail behind it, I think it would be a must.

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Rick Meyer – One of the big differences between this one and the one at Horseman's Park is that it's kind of flattish up on top, right, so if you have someone riding a 4-wheeler, then you might not see it until they are right on it.

James Dotson - It would take some effort to get down to this one.

Rick Meyer – I think when we get it constructed up there and it looks like there is a hazard, we will try to be safe. I would just put that as a note, something to look at during construction. If we get up there and it looks like there is a place for people to walk or hike behind it then let's address it.

Dave Black – Maybe something along the power pole area where the stakes are.

Wes Jenkins – So that's not even part of your project?

Wayne Rogers – No I don't think so, maybe where that road comes across, we could put a little fence right there.

James Dotson – Do you anticipate that cut slope in that section, in the best-case scenario, what happens when you get to these changes in grade across there? That bedrock is going to change the depth. What if you get there and there is not bedrock? But now we've got a big cut. How are you going to deal with that? Does the top wall just get taller?

Wayne Rogers – Yes, that is why this says varies on top. I don't see us having to do a two tier at the bottom because we will be down into the cut so far that we know we will be at bedrock down at the bottom. The top is why it says varies. And again, we had the one test that said 7 feet. So it may go up to 7 feet, the others were all 1 to 3 feet so we will pick them up really shallow. We would just modify the height of the wall if needed.

James Dotson – And fill behind it?

Wayne Rogers – Yes.

Wes Jenkins – So you don't see yourself ever needing to go above the non-disturb line?

Wayne Rogers – That's the goal. If the wall changes it's going to go lower, the zone in the middle is going to get less. The top is set, the slope of that is such that we are probably a little bit flatter than a wall, so it won't go up in slope anymore.

James Dotson – So you won't see a clean-cut line, that wall is going to get shorter and then it may come across there?

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Wayne Rogers – Yes you will have the bottom one that comes around the base of it and it's going to change as the slope changes. It's not the straight square thing that I always like.

Dave Black – Are you using boulders or stacked block?

Wayne Rogers – Rock.

James Dotson - And you can go 8 feet with those?

Wayne Rogers – Yes.

Wes Jenkins – So you don't have any geo grid behind that.

Wayne Rogers – On the bottom piece? Because it will be facing bedrock.

Wes Jenkins – So you are saying it's really more of a facing of the bedrock?

Wayne Rogers – Yes it keeps the stability higher than if we stepped that out and put a wall in there. We are trying to keep that slope stable with the natural strength.

Dave Black – I think that since it's limited to the disturbed area it makes a justification for approval. I think you've done a good job.

Wes Jenkins – We do this with all projects, with that exposed face we will require a letter from Wayne at the end indicating that it is a stable slope. We're going steeper than the 2:1, so a letter is required.

Dave Black – The other thing we talked about is some type of statement that the rock fall hazard mitigation is dealt with in the parking area and the set back of the building because it was in the rock fall hazard area.

Wayne Rogers – It runs into the parking lot barely. By the time it comes over that edge and hits.

MOTION: James Sullivan made a motion to recommend approval to Planning Commission and City Council of a Hillside Development Permit for The Cove with the understanding that there will be a letter from AGEK that the slope has been stabilized and mitigated and that the rock fall hazards have been mitigated and taken care of.

SECOND: James Dotson

VOTE:

AYES (3)

Dave Black

James Dotson

HILLSIDE REVIEW BOARD
CITY OF ST GEORGE
WASHINGTON COUNTY, UTAH
AUGUST 26, 2020

James Sullivan
NAYS (0)
Motion Carries unanimous recommend approval

2. Consider a request to amend a Hillside Development Permit for Hillside Professional. Case No. 2020-HS-010.

Item Representatives Present: Wayne Rodgers and Brandee Walker

Brandee Walker – Wes asked us to redefine the 30-39%

Wes Jenkins – Indicated on the map where the areas were that they are considering man made cuts.

Brandee Walker – Between the two of them if you take off the part that is the natural slope, we are only disturbing 2% that is not the man-made portion.

Dave Black – So in order to get your site distance what will you need to do?

Brandee Walker – We curved the parking lot out and pushed the parking back in. It will be nice and flat then we will have the rock wall at the edge of the parking there.

Wes Jenkins – Her request is that this part of the slope man made and should be counted towards the 30-39%.

MOTION: James Dotson made a motion to recommend approval to Planning Commission and City Council for a Hillside Development Permit for Hillside Professional recognizing that the man made slope should not be counted in the 30-39% and are not part of the continuous topography out there, to allow an increasing in disturbing a little more than the 40%.

SECOND: James Sullivan

VOTE:

AYES (3)

Dave Black

James Dotson

James Sullivan

NAYS (0)

Motion Carries unanimous recommend approval

3. Consider approval of the meeting minutes from July 15, 2020.

MOTION: James Sullivan made a motion to approve the meeting minutes from July 15,

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AUGUST 26, 2020

2020.

SECOND: James Dotson

VOTE:

AYES (3)

Dave Black

James Dotson

James Sullivan

NAYS (0)

Motion Carries unanimous recommend

HILLSIDE REVIEW BOARD
CITY OF ST GEORGE
WASHINGTON COUNTY, UTAH
November 18, 2020

PRESENT: Chairman Dave Black
James Dotson
James Sullivan
Shawn Patten

CITY STAFF:
Assistant Public Works Director Wes Jenkins
Planner III Dan Boles
Development Office Supervisor Brenda Hatch

EXCUSED:

1. Consider a request for a Hillside Development Permit to allow for the development of a proposed single-family residential development within Stone Cliff. The representative is Brandee Walker with Civil Science. Case No. 2020-HS-011.

Chanse Snow – This section to the other side of the house was already approved, then they finally acquired the Schmutz parcel. They are asking to get that approved and on the other side of here there is a little drainage that has a little slope in it. I don't know if you would call it hillside, but it's kind of more to the inside and not a protruding effect. When this got exchanged they had an excess credit of 2.73 acres. Even with all of this we still have a credit so it's my understanding that Stone Cliff is willing to forgo whatever is remaining to have it said and done on this hillside. This will be the last time Stone Cliff will be involved with hillside.

Dan Boles – I believe that is going to be memorialized in a development agreement.

Chanse Snow – Yes, that is what we were going to do in legal terms.

Dave Black – What does the credit mean?

Chanse Snow – So you go per slope, basically what we have agreed to is that you just combine all the percentages to one lump sum and then exchange it for whatever is needed for credit. So, say once we do all that, add all these slopes up with percentages, that's what we came up with was the excess credit, which Stone Cliff will not need.

James Sullivan – So basically you can develop a certain amount of the percentage of land that is in the slope and you've calculated the whole area. You'll be developing less than you can.

Chanse Snow – Yes, and then that site that they used for the exchange, which is just above The Boulders, will be untouchable. It will have an easement over it.

Dave Black – So when we met before and there was an approval or a recommendation for approval from the hillside for this piece, has any of the plans changed or been updated for this area since then?

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Chanse Snow – The only thing we did finally design for this Smoot parcel.

Kason – They were also working on commercial down there but then we decided to keep it all residential.

Dave Black – But like lot layout, street layout?

Kason – We added about 2 and a half lots with the Schmutz parcel.

Dave Black – I guess my question is, is this the lot layout that you have right here, the location of the streets and the number of lots the same as what we looked at before?

Chanse Snow – The only thing that is different is this was commercial, and we added this and almost three lots with the Schmutz parcel.

Dave Black – Typically when we approve there are some conditions, it's not just a blanket approval.

Kason – This is what we would like to have done, is these bigger lots on this frontage.

Wes Jenkins – Their request, most of the hillside is here along the frontage of 1450, is to be able to disturb all of this and by dedicating this over here that has developable property, they want to take that credit that they could develop and put it here so they can disturb all of this.

Kason – And a good portion of that has already been approved.

Dave Black – I didn't know if like in here there was maybe a feature we wanted to save, and we talked about it and voted on it, but we don't have those minutes. So, I didn't want to contradict something we had discussed before.

Dan Boles – You can always say that any previous conditions would apply.

Dave Black – And there may not have been anything. I know we talked about this area specifically and it looks like that you are leaving these particular ridges alone on the plan.

Chanse Snow – These actually will be cut down and built up.

Dave Black – So that is different.

Discussion continued on original minutes and layout.

Dave Black – So with your track record, you guys have done a really good job with your landscaping, it looks really nice up and down the road here. Are we going to be able to see something like that? These are going to be back yards along 1450.

Kason Traveller – There is a 10 ft landscape strip before we start any walls.

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Dan Boles – Double frontage lots require a landscape strip and a block wall.

James Langston – How high above 1450 are those lots going to sit? Will there be rock walls?

Kason Traveller – This corner over here is for drainage purposed, but from the entrance going up, you'll see the steps up and the lots. They will be landscaped just like everything else is in Stone Cliff.

Wes Jenkins – They don't own the property over there, the LDS Church owns one piece and Dixie Power owns the other. They will have to reconfigure there.

Kason Traveller – We have a good relationship with Ladell at Dixie Power, we talked with Wes about the little corner piece that the City has there and landscape that. They are going to make that substation lower profile; we will work with them to beautify that corner.

Discussion continued on beautifying the corner.

James Dotson – So on this new section on the end, we approved the middle section, but I didn't see a slope analysis to show us what is in this newer section off the point.

Kason Traveller – It's 0.3 and I think it's just barely over 20%, so you got a lot of 0 to 20.

Chanse Snow – If you see that man-made dam in the wash, right there is a little bit of the percentage over 20.

Wes Jenkins – It looks like they created an area right there to capture water for grazing their cows. It's kind of a man-made structure that they made to collect the water from off the hillside. That's where the 20% – 40% is.

Chanse Snow – Some of that 3 acres has already been disturbed; the Schmutz had a silo.

Kason Traveller – The initial goal is to have all of this landscaped and not have a weed patch as a view for Stone Cliff.

Dave Black – I think that when we have looked at isolated steep slopes and they're non-contiguous we haven't had a problem taking those away, unless they were a rock outcrop. Quite often we have tried to preserve some natural rock outcrops. I think that as a committee we would have to look to see if there is anything that warrants or merits preservation as a rock outcropping. I think of for instance where they are developing at the Divario site, it won't be nearly as visible as this and there were some rock outcroppings that we wanted to save, maybe there's not. It seems like we tried to preserve this area here before, and I might be wrong. What is the committee's feeling? Do you see any rock outcrops that are worth preserving? Because this means it will all go away.

Shawn Patten – I think it's kind of sad to see all this disappear, but it sounds like hillside already approved it.

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James Dotson – That’s why it would be nice to have the minutes so that we are not contradicting what was already approved.

Dave Black – James did you meet here the last time?

James Sullivan – Yes, I was. I don’t remember anything significant that we tried to preserve. There wasn’t anything that we carved out or said don’t disturb this area. I was just looking at the map here and the only thing, when I was looking earlier on the computer the only thing I saw was right around that detention basin. I don’t think there is anything at this point worth saving. Speaking from their track record and what they’ve done with the whole hillside, they’ve done well.

Dave Black – If it worked out that this was the entrance and we could save these two sides then it would be good, but this isn’t the entrance. The entrance is down there.

James Dotson – Do you plan on dressing up that entrance kind of like this one? Is there going to be a guard shack and a gate?

Kason Traveller – Not to that size, probably half that size.

Chanse Snow – Like I say, Stone Cliff are not scared of making things nice.

Dave Black – That’s gives me a lot of comfort and that’s why maybe we are more willing to let things go, because we know what we will get in the end.

Kason Traveller – Especially on this route, once the temple is done, this will be driven a lot.

Dan Boles – This area where we are at right now isn’t really even part of the application. This area has been approved already. It’s really just those two other areas.

MOTION: James Sullivan made a motion to recommend approval to the Planning Commission and City Council of a hillside development permit for Stone Cliff and contingent upon working out any drainage or hillside rockfall issues and any other issues be addressed with staff.

SECOND: James Dotson

VOTE:

AYES (4)

Dave Black

James Dotson

James Sullivan

Shawn Patten

NAYS (0)

Motion Carries unanimous recommend approval

2. Consider the minutes of the August 26, 2020 & September 23, 2020 Hillside Review Board meeting.
No motion was made.