GeoStrata

Engineering & Geosciences

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Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT

GeoStrata Job No. 1161-001

August 30, 2016

Prepared for:

Deseret Power
10714 South Jordan Gateway, Suite 300
South Jordan, UT 84095
Attn: Mr. Phil Solomon, PE

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Prepared for:

Deseret Power
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South Jordan, Utah 84095

Geotechnical Investigation
Bonanza Ash Pile Studies
Bonanza, Utah

GeoStrata Job No. 1161-003

J. Scott Seal, P.E.
Project Engineer

Hram Alba, P.E., P.G.
Principal

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August 30, 2016

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for an engineering stability assessment of the ash piles at the Bonanza Power Plant located in Bonanza, Utah. The purpose for our study is to provide a stability assessment of the existing pile heights.

As a part of this investigation, three boreholes were advanced at the site to depths ranging from 21 ½ feet to 96 ½ feet below the existing site grade. One boring was located in the principal fly ash pile and was advanced to a depth of 96 ½ feet below the existing site grade. Two additional boring were located in the bottom ash pile and were advanced to depths ranging from 21 ½ to 26 ½ feet below existing grade. The borings were located in relatively new deposits of both the principal fly ash pile and bottom ash pile.

The fly ash in the principal fly ash pile classified as a Sandy SILT (ML). The bottom ash in the bottom ash pile classified as a Silty SAND (SM).

As part of this investigation, global slope stability was assessed. Slopes with safety factors of at least 1.5 and 1.0 for static and pseudo static conditions are typically considered stable. Our analyses indicate that factors of safety of at least 1.5 and 1.0 are achieved for both the principal fly ash pile and bottom fly ash pile at the existing pile heights.

Based on our understanding of the proposed project, the subsurface conditions observed during field exploration, the results of laboratory testing, and our engineering analyses both the principal fly ash pile and bottom ash pile are stable both static and pseudo static at the existing pile heights.

NOTE: The scope of services provided within this report are limited to the assessment of the subsurface conditions at the subject site. The executive summary is provided solely for purposes of overview and is not intended to replace the report of which it is part and should not be used separately from the report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for an engineering stability assessment of the ash piles at the Bonanza Power Plant located in Bonanza, Utah. The purpose for our study is to provide a stability assessment of the existing pile heights.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report. Our services were performed in accordance with our proposal, dated April 26, 2016 and your signed authorization.

The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of this report (Section 7.1).

2.2 PROJECT DESCRIPTION

The ash piles are located at the Bonanza Power Plant located in Bonanza, Utah approximately 35 miles north east of Vernal, Utah (see Plate A-1, *Site Vicinity Map*). Two existing fly ash piles are located at the plant site; the principal fly ash pile is located at the far northern portion of the site. A second bottom ash pile is located south of the plant site south and west of the cooling towers. The principal fly ash pile is shown to be approximately 90 feet high with the bottom ash pile being 30 feet high at its current maximum height.

3.0 METHODS OF STUDY

3.1 FIELD INVESTIGATION

As a part of this investigation, three boreholes were advanced at the site to depths ranging from 21 ½ feet to 96 ½ feet below the existing site grade. The approximate locations of the explorations are shown on Plate A-2a and A-2b, (Exploration Location Map) in Appendix A. One boring was located in the principal fly ash pile and was advanced to a depth of 96½ feet below the existing site grade. Two additional boring were located in the bottom ash pile and were advanced to depths ranging from 21½ to 26½ feet below existing grade. The borings were located in relatively new deposits of both the principal fly ash pile and bottom ash pile. Subsurface soil conditions as encountered in the exploration were logged at the time of our investigation by a geotechnical engineer and are presented on the enclosed Boring Logs, Plates B-1 to B-6 in Appendix B. A Soils Symbols Description Key used in the boring logs is included as Plate B-7.

The boreholes were advanced using a CME-75 truck mounted drill rig equipped with a hollow stem auger drilling system. Soil sampling occurred at 5 to 10 foot intervals. Only disturbed samples were obtained through the use of a standard split spoon and California samplers driven a length of 18 inches. All samples were transported to our laboratory to evaluate the engineering properties of the ash. The native soils were classified according to the Unified Soil Classification System (USCS) by the Geotechnical Engineer. Classifications for the individual soil units are shown on the attached Boring Logs.

3.2 LABORATORY INVESTIGATION

Geotechnical laboratory tests were conducted on selected soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of fly ash materials. Laboratory tests conducted during this investigation include:

- Grain Size Distribution Analysis (ASTM D422)
- Direct Shear Test (ASTM D3080)
- Moisture-Density Test

The results of laboratory tests are presented on the boring logs in Appendix B (Plates B-1 and B-6), the Lab Summary Report (Plate C-1) and on the test result plates presented in Appendix C (Plates C-2 and C-5).

3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, and classification. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care.

4.0 GENERALIZED SITE CONDITIONS

4.1 SURFACE CONDITIONS

As mentioned previously the ash piles are located at the Bonanza Power Plant located in Bonanza, Utah. Two existing ash piles are located at the plant site, the principal fly ash pile is located at the far northern portion of the site. A second bottom ash pile is located south of the plant site south and west of the cooling towers. The principal fly ash pile is shown to be approximately 90 feet high with the bottom ash pile being 30 feet high at its current maximum height. A conveyor belt and associated equipment is located on the principal fly ash pile. No structures or other improvements were observed on the bottom ash piles.

4.2 SUBSURFACE CONDITIONS

As previously discussed, the subsurface soil conditions were explored at the site by drilling three boreholes to depths of 21 ½ to 96 ½ feet below existing site grade, one on the primary fly ash pile and two on the bottom ash pile. The soils encountered in the boreholes were visually classified and logged during our field investigation and are included on the boring log in Appendix B (Plates B-1 and B-6). The subsurface conditions encountered during our investigation are discussed below.

4.2.1 Soils

B-1 was the boring advanced in the principal fly ash pile. The native soil was observed at a depth of 87 feet below existing site grade and classified as a Silty CLAY (CL). The fly ash in the pile classified as a Sandy SILT (ML). B-2 and B-3 were the borings advanced in the bottom ash pile. The native soil was observed at depths ranging from 20 ½ to 25 feet below existing site grade and classified as a Sandy SILT (ML). The bottom ash in these piles classified as a Silty SAND (SM).

The stratification lines shown on the enclosed borehole logs represent the approximate boundary between soil types (Plates B-1 and B-6). The actual in-situ transition may be gradual. Care should be taken in interpolating subsurface conditions between and beyond the exploration locations.

4.2.2 Strength of Earth Materials

Two direct shear tests were completed on the samples of ash obtained from the primary fly ash pile. The results of the test indicated that the soils tested have shear strength parameters consisting of an internal friction angle of 31 to 35 degrees and cohesion of 300 to 510 psf. Two direct shear tests were completed on the samples of ash obtained from the bottom ash pile. The results of these tests indicated that the soil tested has a shear strength parameters consisting of an internal friction angle of 36 and 39 degrees and cohesion of 685 and 710 psf. Results of these tests may be found on Plates C-3 to C-6.

5.0 GEOLOGIC CONDITIONS

5.1 SEISMICITY

Seismic hazard maps depicting probabilistic ground motions and spectral response have been developed for the United States by the U.S. Geological Survey as part of NEHRP/NSHMP (Frankel et al, 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2012). Spectral responses for the Maximum Considered Earthquake (MCE) are shown in the table below. These values generally correspond to a two percent probability of exceedance in 50 years (2PE50) for a "firm rock" site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on our field exploration, it is our opinion that this location is best described as a Site Class D which represents a "stiff soil" profile. The spectral accelerations are shown in the table below. The spectral accelerations are calculated based on the site's approximate latitude and longitude of 40.1069° and –109.2820 respectively and the United States Geological Survey web based application. Based on the IBC, the site coefficients are F_a=1.58 and F_v= 2.40 From this procedure the peak ground acceleration (PGA) is estimated to be 0.17g.

MCE Seismic Response Spectrum Spectral Acceleration Values for IBC Site Class D[a]

Site Location: **Latitude = 40.1069 N** **Longitude = -109.2820 W**	**Site Class D Site Coefficients:** **Fa = 1.58** **Fv = 2.40**
Spectral Period (sec)	**Response Spectrum Spectral Acceleration (g)**
0.2	$\mathbf{S_{MS}}$=(F_a*S_s=1.58*0.27) = 0.43
1.0	$\mathbf{S_{M1}}$=(F_v*S_1=2.40*0.08) = 0.19

[a] IBC 1615.1.3 recommends scaling the MCE values by 2/3 to obtain the design spectral response acceleration values; values reported in the table above have not been reduced.

6.0 ENGINEERING CONCLUSIONS AND RECOMMENDATIONS

6.1 SLOPE STABILITY

A global stability assessment was conducted on the slope of the principal fly ash pile as well as on the bottom ash pile. The slope profile for the principal fly ash pile used in our assessment was obtained from the client-provided contour map titled "Desert Power Fly Ash Pile as of March 29, 2016." The slope profile for the bottom ash pile used in our assessment was obtained from the client-provided contour map titled "Deseret Generation Bottom Ash Pile As of March 23, 2016." The stability of the profile was modeled using SLIDE, a computer program incorporating (among others) Bishop's Simplified Method of analysis. Calculations for stability were developed by searching for the minimum factor of safety for a circular-type failure. Homogeneous earth materials and arcuate failure surfaces were assumed. The stability analysis was conducted on representative cross-sections drawn through the steepest section of each pile, designated as Principal Fly Ash Profile and Bottom Ash Profile (see Plate A-2a and A-2b in Appendix A).

Seismic screening was completed using one-half of the deterministic median (50th percentile) peak ground acceleration (PGA) for the area resulting from a characteristic earthquake of 7.3 Mw. As described in the **Seismicity** subsection of this report (Section 5.1) the peak ground acceleration (PGA) estimated for this site is 0.17g

As mentioned previously, direct shear tests were performed on remolded samples of the ash collected from the ash piles. The samples obtained from the primary fly ash pile classify as Sandy SILT (ML). Our direct shear testing indicates that the samples tested have a cohesion ranging from 300 to 510 psf and an internal friction angle ranging from 31 to 35 degrees. For our slope stability analysis, the average value (33 degrees) was used. The average cohesion for the two samples was 405 psf. In order to account for variations within the ash, we have elected to utilize a reduced value of 200 psf for cohesion in our analysis.

For the bottom ash pile, the samples obtained for testing classify as Silty SAND (SM). Our direct shear testing indicated that the samples tested have a cohesion value ranging from 685 and 710 psf and an internal friction angle ranging from 36 to 39 degrees. For the analysis the internal friction angle of 36 was used. As before, we have elected to use 200 psf for cohesion in our analysis.

The native soils encountered underneath the piles classified as Silty CLAY (CL) and Sandy SILT (ML). As with the ash, representative samples were obtained during our field investigation and tested for strength properties. Results of our direct shear testing indicate that the samples tested had internal friction angles ranging from 30 to 31 degrees and cohesion values ranging from 55 to 400 psf. For our analysis, we have elected to utilize a friction angle of 30 degrees and a cohesion value of 100 psf.

No groundwater was observed in the borings; therefore no groundwater was modeled in our analyses.

For the principal fly ash pile the results of our analysis indicated factors of safety of 2.38 and 1.81 for the static and pseudo static conditions, respectively. For the bottom ash pile the results of our analysis indicated factors of safety of 2.07 and 1.71 for the static and pseudo static conditions, respectively. Slopes with safety factors of at least 1.5 and 1.0 for static and pseudo static conditions are typically considered stable. It is therefore our opinion that both the principal fly ash pile and bottom ash pile are acceptable at the existing pile heights. Results of our global stability are presented in Plates D-1 to D-4.

6.2 GENERAL CONCLUSIONS

Based on our understanding of the proposed project, the subsurface conditions observed during field exploration, the results of laboratory testing, and our engineering analyses both the principal fly ash pile and bottom ash pile are stable both static and pseudo static conditions at the existing pile heights.

We have performed additional modeling to define what heights and angles the piles could be constructed and still achieve the acceptable factors of the safety. The following table presents the results of this additional analysis.

Bottom Ash Pile - 1.5H:1V		
Condition	Static	Pstatic
F.S.	1.64	1.44

Bottom Ash Pile - 50 Feet High		
Condition	Static	Pstatic
F.S.	1.92	1.57

Fly Ash Pile - 2H:1V		
Condition	Static	Pstatic
F.S	1.71	1.4

Fly Ash Pile - 100 Feet High		
Condition	Static	Pstatic
F.S.	2.34	1.78

7.0 CLOSURE

7.1 LIMITATIONS

The recommendations contained in this report are based on our limited field exploration, laboratory testing, and understanding of the project. The subsurface data used in the preparation of this report were obtained from the explorations made for this investigation. It is possible that variations in the soil could exist between the points explored. If any conditions are encountered at this site that are different from those described in this report, we should be immediately notified so that we may make any necessary revisions to recommendations contained in this report.

GeoStrata performed its services in accordance with the current standard of care and diligence normally practiced by similarly situated professionals in performing services of a similar nature, in the same locality, under similar circumstances. No other warranties or guarantees, expressed or implied is provided.

It is the Client's responsibility to see that all parties to the project are made aware of this report in its entirety.

7.2 ADDITIONAL SERVICES

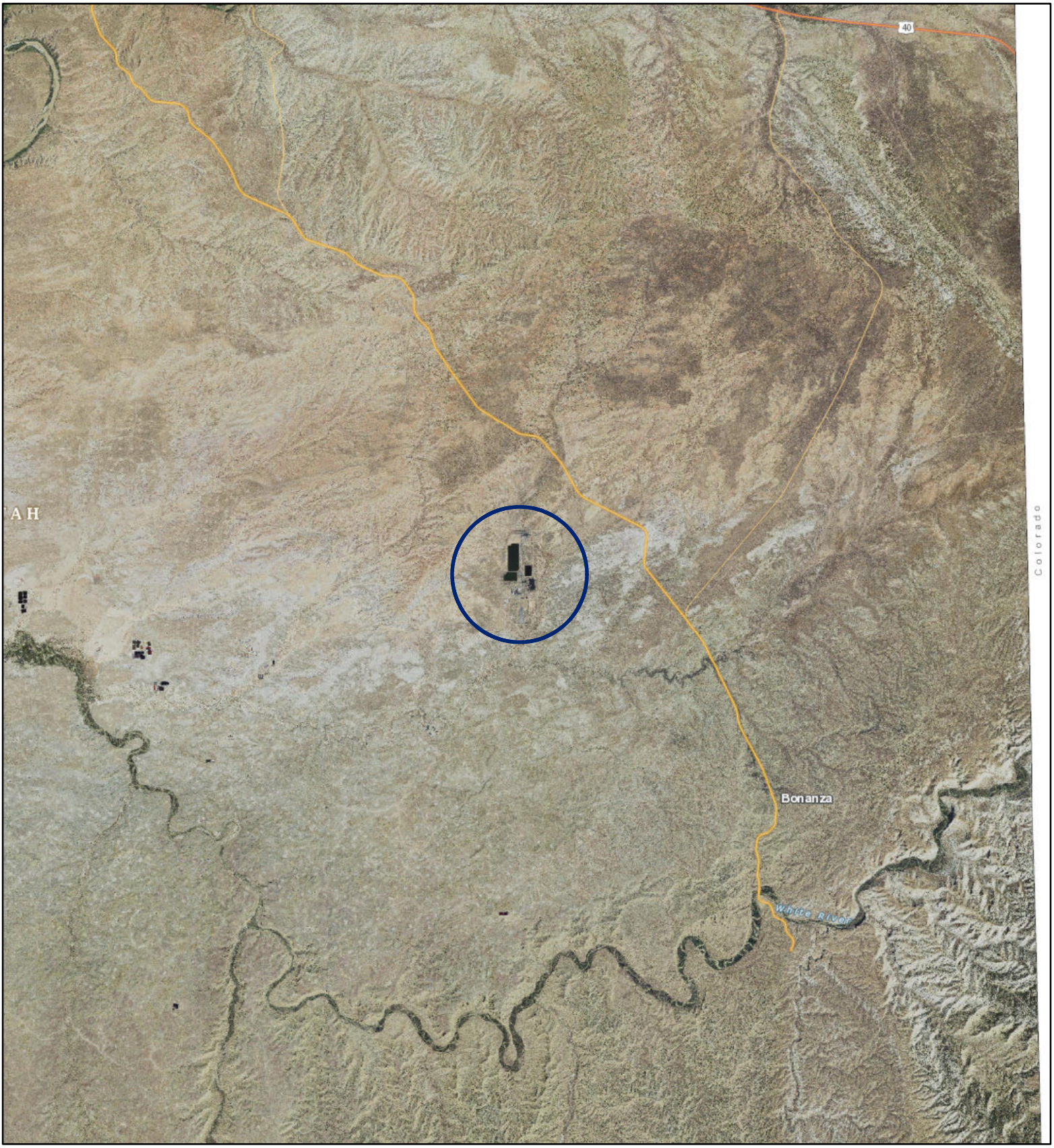
We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please do not hesitate to contact us at your convenience at (801) 501-0583.

8.0 REFERENCES CITED

Federal Emergency Management Agency [FEMA], 1997, *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures,* FEMA 302, Washington, D.C.

Frankel, A., Mueller, C., Barnard, T., Perkins, D., Leyendecker, E.V., Dickman, N., Hanson, S., and Hopper, M., 1996, *National Seismic-hazard Maps: Documentation*, U.S. Geological Survey Open-File Report 96-532, June.

International Building Code [IBC], 2012, International Code Council, Inc.



0 1.5 3 6 9 12 Miles

1:200,000

Base Map:
Utah AGRC Hybrid Base Map

N

GeoStrata

Legend

Approximate Site Location

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Bonanza, UT
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Site Vicinity Map

Plate A-1

0 200 400 800 1,200 1,600 Feet

1:5,000

Base Map:
Utah AGRC Hybrid Base Map

N

GeoStrata

Legend

- Approximate Borehole Location
- Slope Profile

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number: 1161-001

Exploration Location Map

Plate A-2a

0 200 400 800 1,200 1,600 Feet

1:5,000

Base Map:
Utah AGRC Hybrid Base Map

N

GeoStrata

Legend

- Approximate Borehole Location
- Slope Profile

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number: 1161-001

Exploration Location Map

Plate A-2b

DATE
STARTED: 5/5/16
COMPLETED: 5/5/16
BACKFILLED: 5/5/16

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number 1161-001

GeoStrata Rep: J. Mattson
Rig Type: CME 75
Boring Type: Hollow Stem Auger

BORING NO: B-1
Sheet 1 of 4

LOCATION
EASTING NORTHING ELEVATION

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits: Plastic Limit / Moisture Content / Liquid Limit 10 20 30 40 50 60 70 80 90
0	0					FILL; ASH; Sandy SILT - dark grey to black, slightly moist									
1	5														
2															
3	10						21	36							
4															
5	15														
6	20						32	32		78.9	15.3	69.8			
7															
8	25														
9															

N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

LOG OF BORING - PLATE (B) BORING LOGS.GPJ GEOSTRATA.GDT 6/8/16

GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate

B - 1

DATE
STARTED: 5/5/16
COMPLETED: 5/5/16
BACKFILLED: 5/5/16

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number 1161-001

GeoStrata Rep: J. Mattson
Rig Type: CME 75
Boring Type: Hollow Stem Auger

BORING NO: B-1
Sheet 2 of 4

LOCATION
EASTING NORTHING ELEVATION

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits: Plastic Limit / Moisture Content / Liquid Limit 10 20 30 40 50 60 70 80 90
30							21	27							
10	35														
11															
12	40						20	14		62.8	18.0	67.3			
13															
45															
14															
15															
50							19	19							
16															
55															
17															
18															

N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

LOG OF BORING - PLATE (B) BORING LOGS.GPJ GEOSTRATA.GDT 6/8/16

GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
B - 2

DATE
STARTED: 5/5/16
COMPLETED: 5/5/16
BACKFILLED: 5/5/16

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number 1161-001

GeoStrata Rep: J. Mattson
Rig Type: CME 75
Boring Type: Hollow Stem Auger

BORING NO: B-1
Sheet 3 of 4

LOCATION
EASTING NORTHING ELEVATION

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits: Plastic Limit / Moisture Content / Liquid Limit 10 20 30 40 50 60 70 80 90
19	60						19	10		72.0	22.8	67.3			
20	65														
21	70						12	9							
22															
23	75														
24															
25	80						21	9		76.3	25.9	67.3			
26	85														
27					CL	Silty CLAY - stiff, grey, moist									

N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

LOG OF BORING - PLATE (B) BORING LOGS.GPJ GEOSTRATA.GDT 6/8/16

GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate

B - 3

DATE
STARTED: 5/5/16
COMPLETED: 5/5/16
BACKFILLED: 5/5/16

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number 1161-001

GeoStrata Rep: J. Mattson
Rig Type: CME 75
Boring Type: Hollow Stem Auger

BORING NO: B-1
Sheet 4 of 4

LOCATION
EASTING NORTHING ELEVATION

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits: Plastic Limit / Moisture Content / Liquid Limit 10 20 30 40 50 60 70 80 90
28	90						15	10							
29	95				ML	Sandy SILT - very stiff, grey, moist	26	16							
30						Bottom of Boring @ 96.5 Feet									
31	100														
32	105														
33															
34	110														
35															
36	115														

N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

LOG OF BORING - PLATE (B) BORING LOGS.GPJ GEOSTRATA.GDT 6/8/16

GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
B - 4

DATE
STARTED: 5/5/16
COMPLETED: 5/5/16
BACKFILLED: 5/5/16

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number 1161-001

GeoStrata Rep: J. Mattson
Rig Type: CME 75
Boring Type: Hollow Stem Auger

BORING NO: B-2
Sheet 1 of 1

LOCATION
EASTING NORTHING ELEVATION

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits: Plastic Limit / Moisture Content / Liquid Limit 10 20 30 40 50 60 70 80 90
0	0					FILL; BOTTOM ASH; Silty SAND - dark grey to black, slightly moist									
1	5						8	24							
2															
3	10						100	100	68.1		15.7	42.9			
4															
5	15						14	26							
6	20						100	100	83.0		22.8				
7															
8	25				ML	Sandy SILT - very stiff, medium brown, moist	19	39							
9						Bottom of Boring @ 26.5 Feet									

N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

LOG OF BORING - PLATE (B) BORING LOGS.GPJ GEOSTRATA.GDT 6/8/16

GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
B - 5

DATE
STARTED: 5/5/16
COMPLETED: 5/5/16
BACKFILLED: 5/5/16

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number 1161-001

GeoStrata Rep: J. Mattson
Rig Type: CME 75
Boring Type: Hollow Stem Auger

BORING NO: B-3
Sheet 1 of 1

LOCATION
EASTING NORTHING ELEVATION

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits: Plastic Limit / Moisture Content / Liquid Limit 10 20 30 40 50 60 70 80 90
0	0					FILL; BOTTOM ASH; Silty SAND - dark grey to black, slightly moist									
1	5						22	30		72.7	12.3				
2															
3	10						15	31							
4															
5	15						32	42		89.6	13.6				
6	20					ML Sandy SILT - stiff, red brown, moist	9	20							
7						Bottom of Boring @ 21.5 Feet									
8	25														
9															

N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

LOG OF BORING - PLATE (B) BORING LOGS.GPJ GEOSTRATA.GDT 6/8/16

GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
B - 6

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

LOG KEY SYMBOLS

BORING SAMPLE LOCATION

TEST-PIT SAMPLE LOCATION

WATER LEVEL (level after completion)

WATER LEVEL (level where first encountered)

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKELY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

STRATIFICATION

DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL		TORVANE	POCKET PENETROMETER	FIELD TEST
CONSISTENCY	SPT (blows/ft)	UNTRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

GeoStrata

Soil Symbols Description Key

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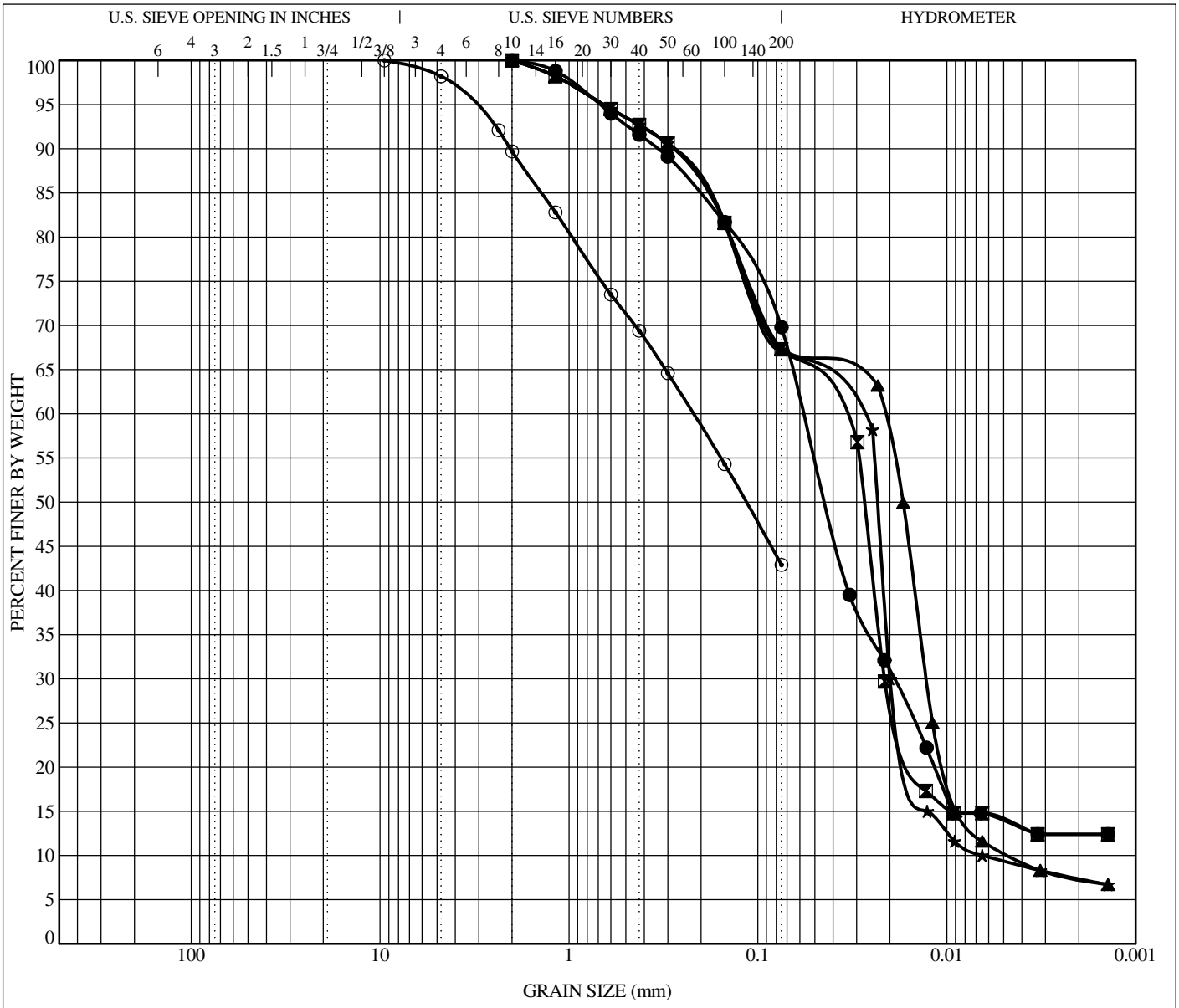
Plate B-7

Boring No.	Sample Depth (feet)	USCS Soil Classification	Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation				Direct Shear	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Friction Angle (^{0})	Cohesion (psf)
B-1	20	ASH - ML	15.3	78.9	0.0	30.2	57.4	12.4		
B-1	40	ASH - ML	18	62.8	0.0	32.7	54.9	12.4		
B-1	60	ASH - ML	22.8	72	0.0	32.7	59.9	7.4	31	510
B-1	80	ASH - ML	25.9	76.3	0.0	32.7	59.9	7.4	35	300
B-2	10	BOTTOM ASH - SM	15.7	68.1	1.8	55.3	42.9		36	685
B-2	20	BOTTOM ASH - SM	22.8	83						
B-3	5	BOTTOM ASH - SM	12.3	72.7						
B-3	15	BOTTOM ASH - SM	13.6	89.6					39	710
Fly Ash Pile	Foundation Soil	SM							31	55
Bottom Ash Pile	Foundation Soil	SM							30	400

Lab Summary Report

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, UT
Project Number: 1161-001

Plate C - 1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location	Depth	Classification	LL	PL	PI	Cc	Cu
●	**B-1**	**20.0**	**ASH; Sandy SILT (ML)**					
⊠	**B-1**	**40.0**	**ASH; Sandy SILT (ML)**					
▲	**B-1**	**60.0**	**ASH; Sandy SILT (ML)**				**1.65**	**4.67**
★	**B-1**	**80.0**	**ASH; Sandy SILT (ML)**				**2.00**	**4.73**
⊙	**B-2**	**10.0**	**BOTTOM ASH; Silty SAND (SM)**					

	Sample Loctaion	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-1**	**20.0**	**2**	**0.057**	**0.019**		**0.0**	**30.2**	**57.4**	**12.4**
⊠	**B-1**	**40.0**	**2**	**0.039**	**0.021**		**0.0**	**32.7**	**54.9**	**12.4**
▲	**B-1**	**60.0**	**2**	**0.022**	**0.013**	**0.005**	**0.0**	**32.7**	**59.9**	**7.4**
★	**B-1**	**80.0**	**2**	**0.031**	**0.02**	**0.007**	**0.0**	**32.7**	**59.9**	**7.4**
⊙	**B-2**	**10.0**	**9.5**	**0.22**			**1.8**	**55.3**	**42.9**	

GeoStrata

GRAIN SIZE DISTRIBUTION - ASTM D422

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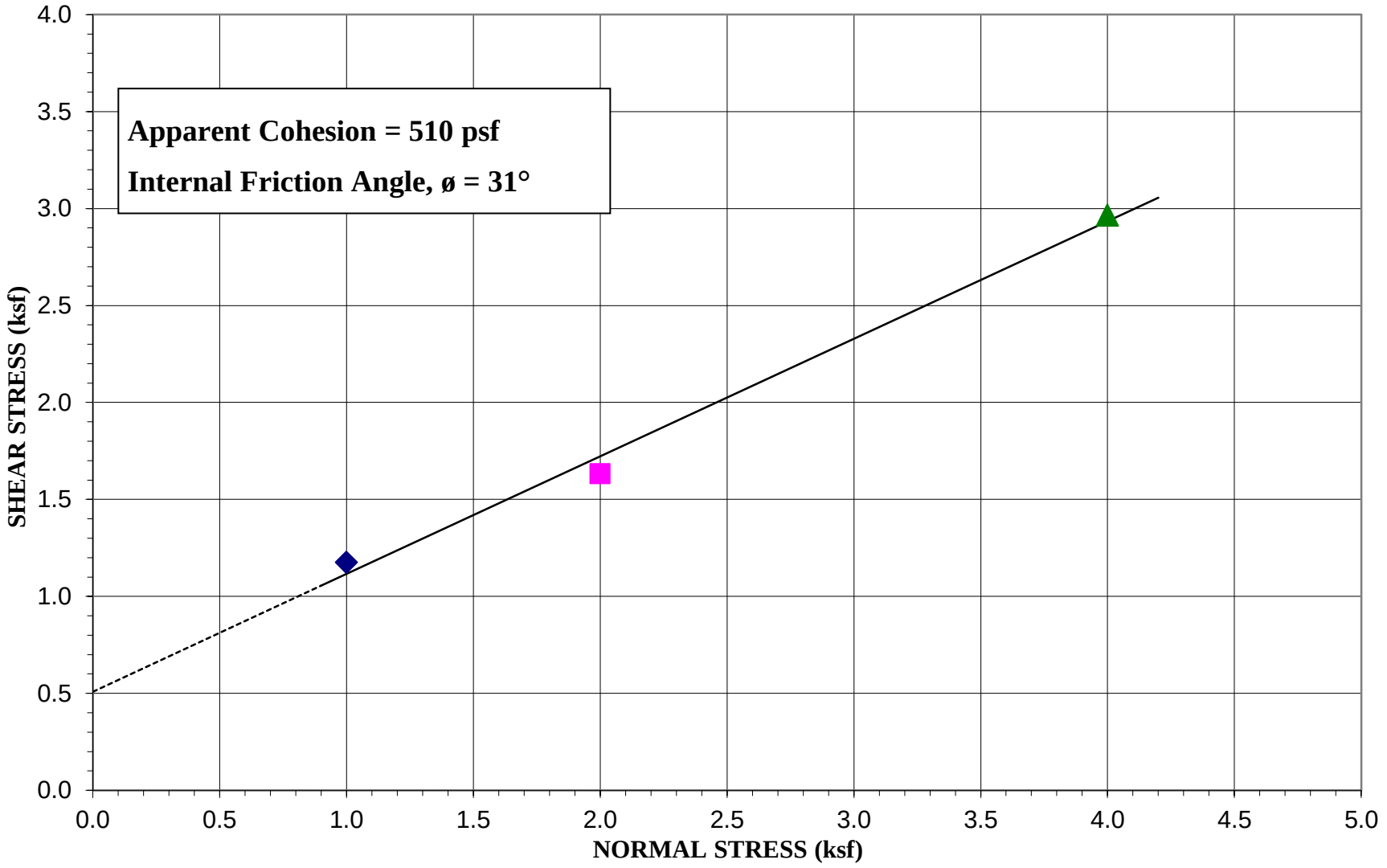
Bonanza, UT
Project Number: 1161-001

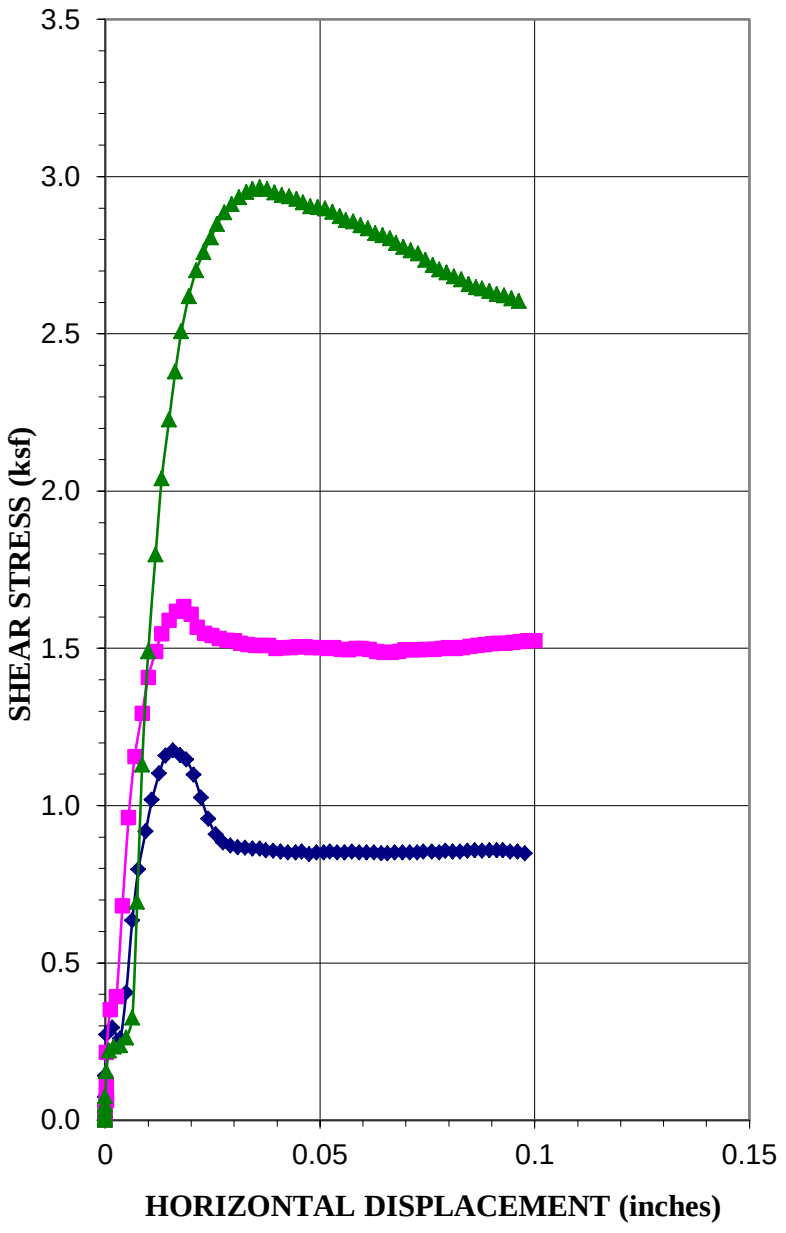
Plate

C - 3

C_GSD BORING LOGS.GPJ GEOSTRATA.GDT 6/30/16

DIRECT SHEAR TEST





Sample Location:	B-1 @ 60 feet
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	1 (◆)	2 (■)	3 (▲)
Sample Type	Remolded		
Initial Height, in.	1.18	1.18	1.18
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	73.4	74.9	74.0
Dry Density After, pcf	74.8	76.3	75.1
Moisture % Before	24.4	22.1	22.5
Moisture % After	39.8	33.9	46.6
Saturation, % Before	51.5	48.5	48.4
Saturation, % After	87.0	76.8	102.7
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	1.17	1.63	2.96
Strain Rate	0.0033 IN/MIN		

Sample Properties	
Cohesion, psf	510
Friction Angle, ϕ	31
Liquid Limit, %	-
Plasticity Index, %	-
Percent Gravel	0.0
Percent Sand	32.7
Percent Passing No. 200 sieve	67.3
Classification	ASH (ML)

PROJECT: Bonanza Ash Pile Studies

PROJECT NO.: 1161-001

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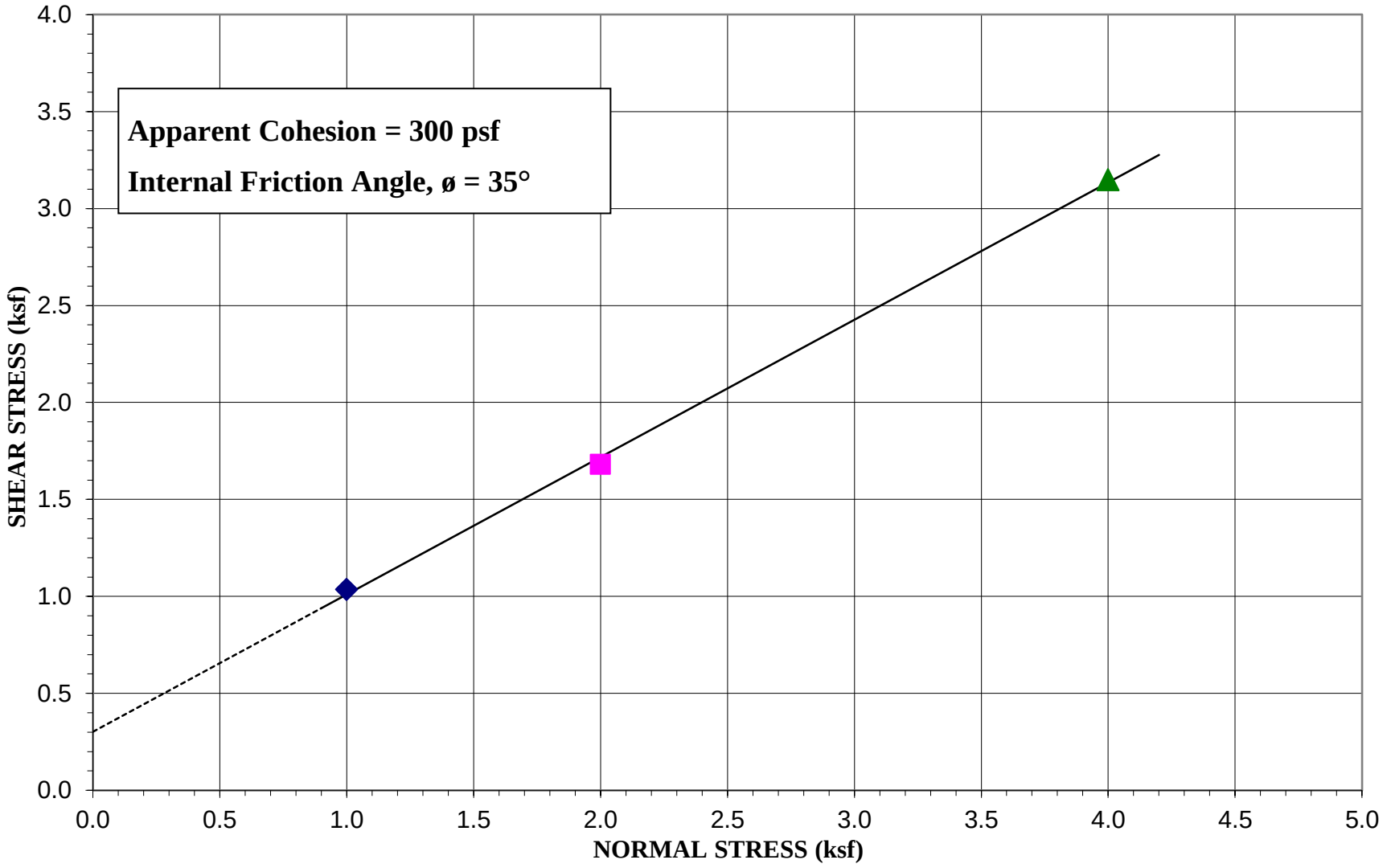
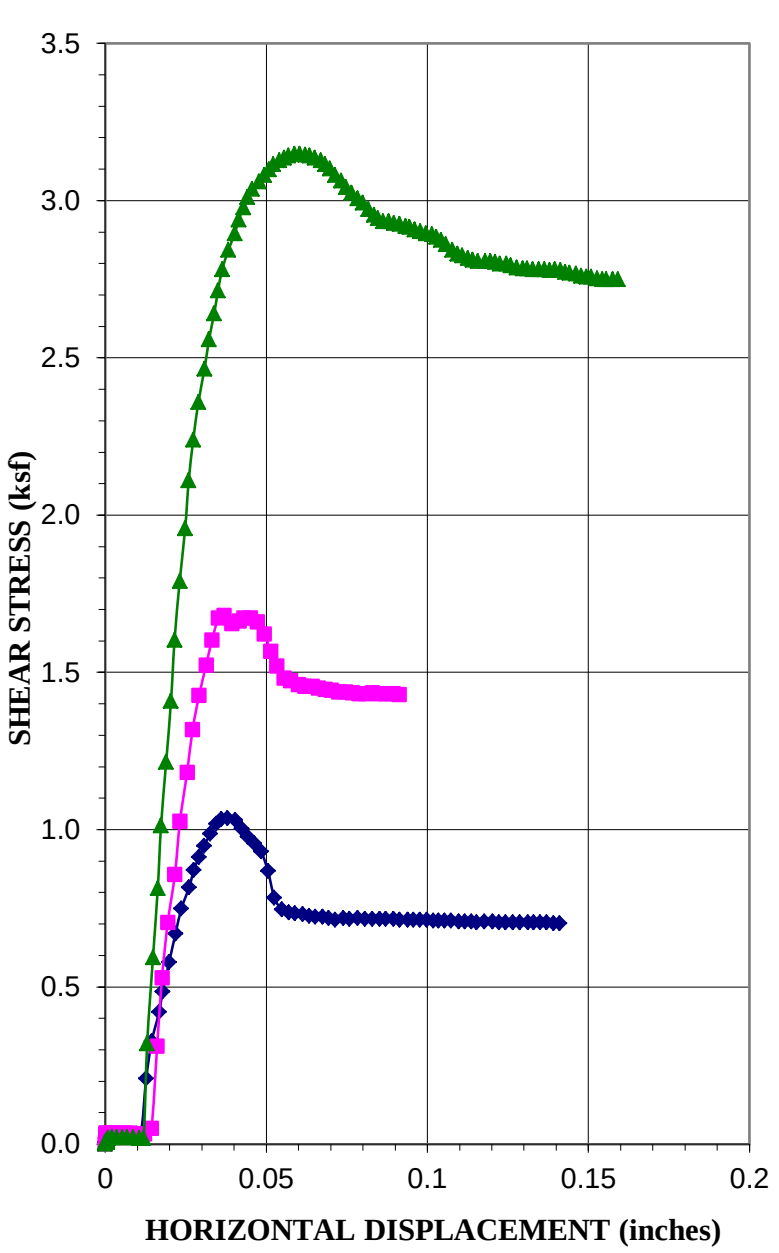
Plate C-3

DIRECT SHEAR TEST





Source:	B-1 @ 80 feet
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	1.15	1.15	1.15
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	75.3	76.8	76.0
Dry Density After, pcf	76.7	78.2	77.1
Moisture % Before	24.4	22.1	22.5
Moisture % After	39.8	33.9	46.6
Saturation, % Before	54.0	50.8	50.7
Saturation, % After	91.3	80.6	107.8
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	1.04	1.68	3.15
Strain Rate	0.0033 IN/MIN		

Sample Properties	
Cohesion, psf	300
Friction Angle, ϕ	35
Liquid Limit, %	-
Plasticity Index, %	-
Percent Gravel	0.0
Percent Sand	32.7
Percent Passing No. 200 sieve	67.3
Classification	ASH (ML)

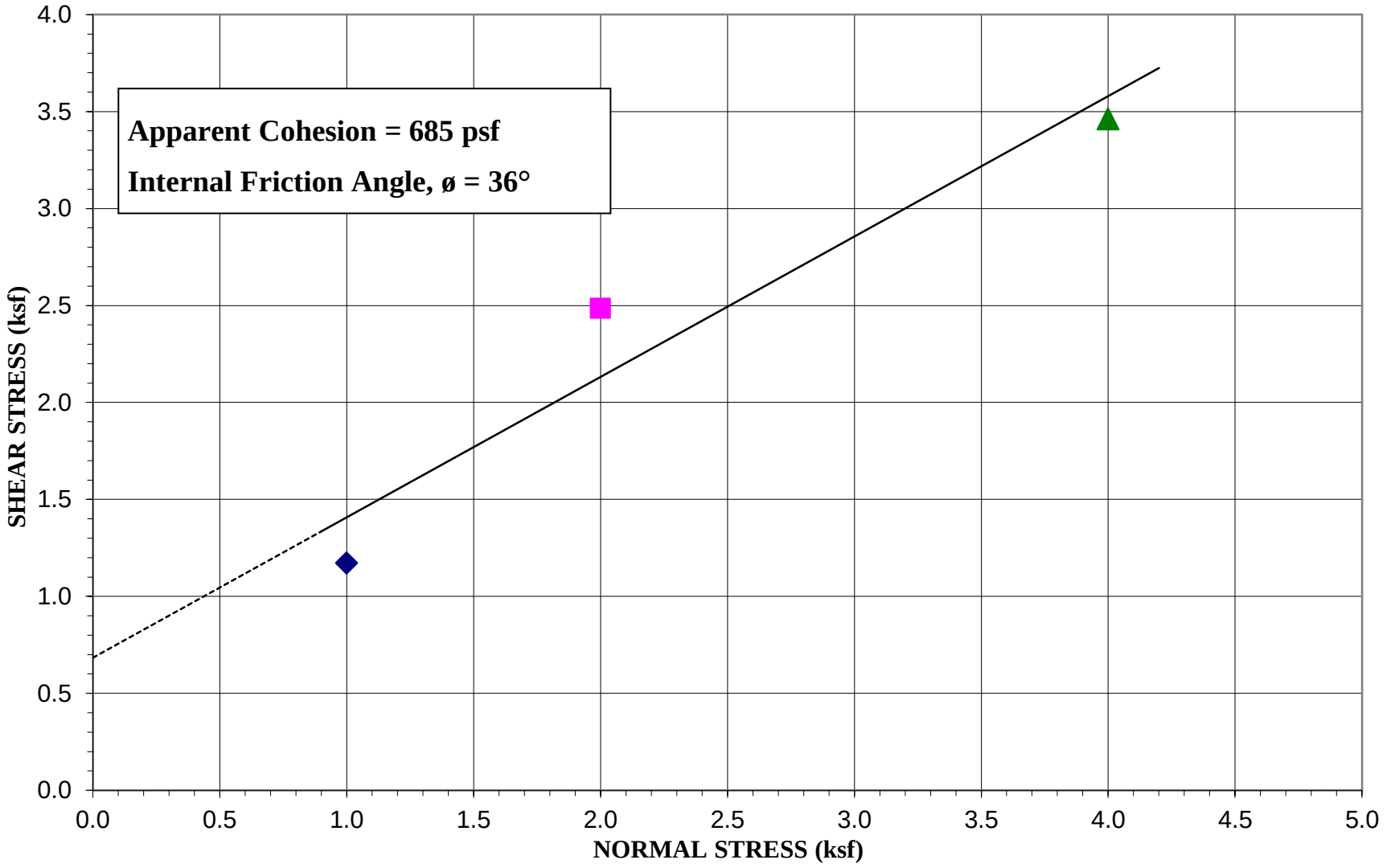
PROJECT: Bonanza Ash Pile Studies

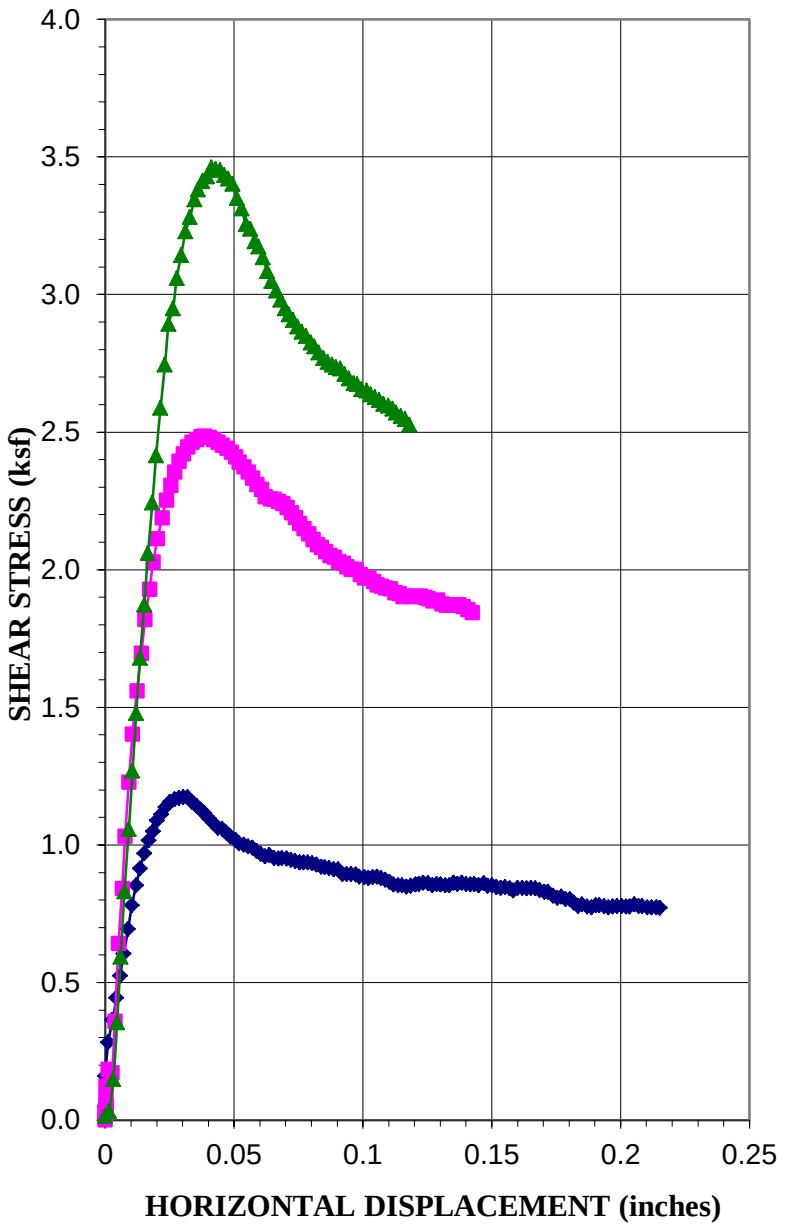
PROJECT NO.: 1161-001

GeoStrata

Plate C-4

DIRECT SHEAR TEST





Sample Location:	B-2 @ 10 feet
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	1.18	1.18	1.18
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	57.5	57.5	55.4
Dry Density After, pcf	58.9	58.8	56.8
Moisture % Before	14.3	15.4	18.9
Moisture % After	30.4	30.5	30.4
Saturation, % Before	20.2	21.8	25.2
Saturation, % After	44.5	44.5	42.2
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	1.17	2.49	3.46
Strain Rate	0.0033 IN/MIN		

Sample Properties	
Cohesion, psf	685
Friction Angle, ϕ	36
Liquid Limit, %	-
Plasticity Index, %	-
Percent Gravel	1.8
Percent Sand	55.3
Percent Passing No. 200 sieve	42.9
Classification	BOTTOM ASH (SM)

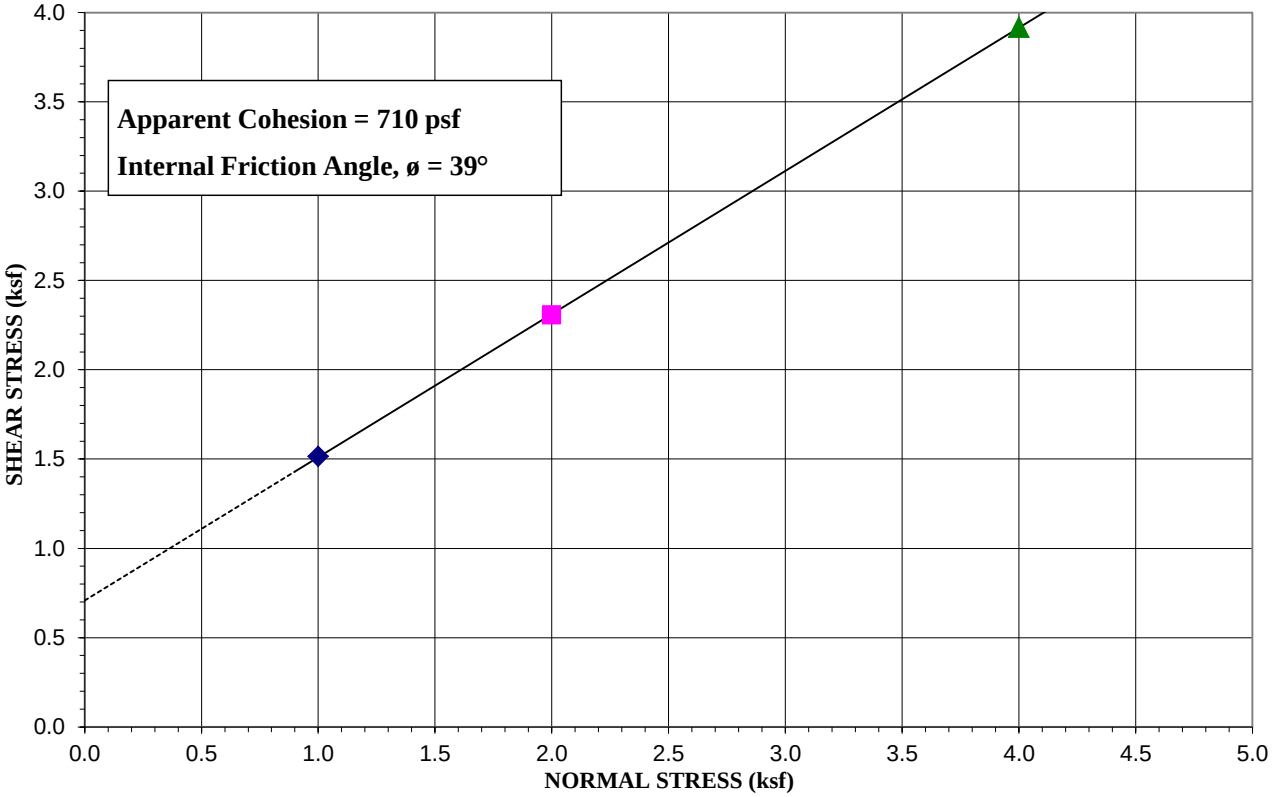
PROJECT: Bonanza Ash Pile Studies

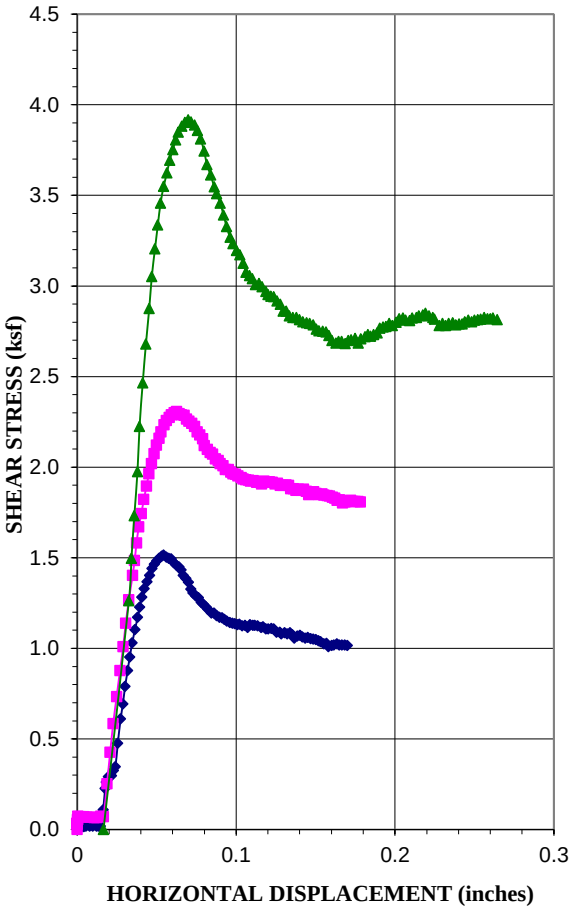
PROJECT NO.: 1161-001

GeoStrata

Plate C-5

DIRECT SHEAR TEST





Source:	B-3 @ 15 feet
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	1.15	1.15	1.15
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	80.0	81.9	81.8
Dry Density After, pcf	81.0	82.8	82.7
Moisture % Before	10.5	12.1	12.5
Moisture % After	28.2	28.1	28.7
Saturation, % Before	26.0	31.4	32.4
Saturation, % After	71.7	74.6	76.0
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	1.51	2.31	3.92
Strain Rate	0.0033 IN/MIN		

Sample Properties	
Cohesion, psf	710
Friction Angle, ϕ	39
Liquid Limit, %	-
Plasticity Index, %	-
Percent Gravel	-
Percent Sand	-
Percent Passing No. 200 sieve	-
Classification	BOTTOM ASH (SM)

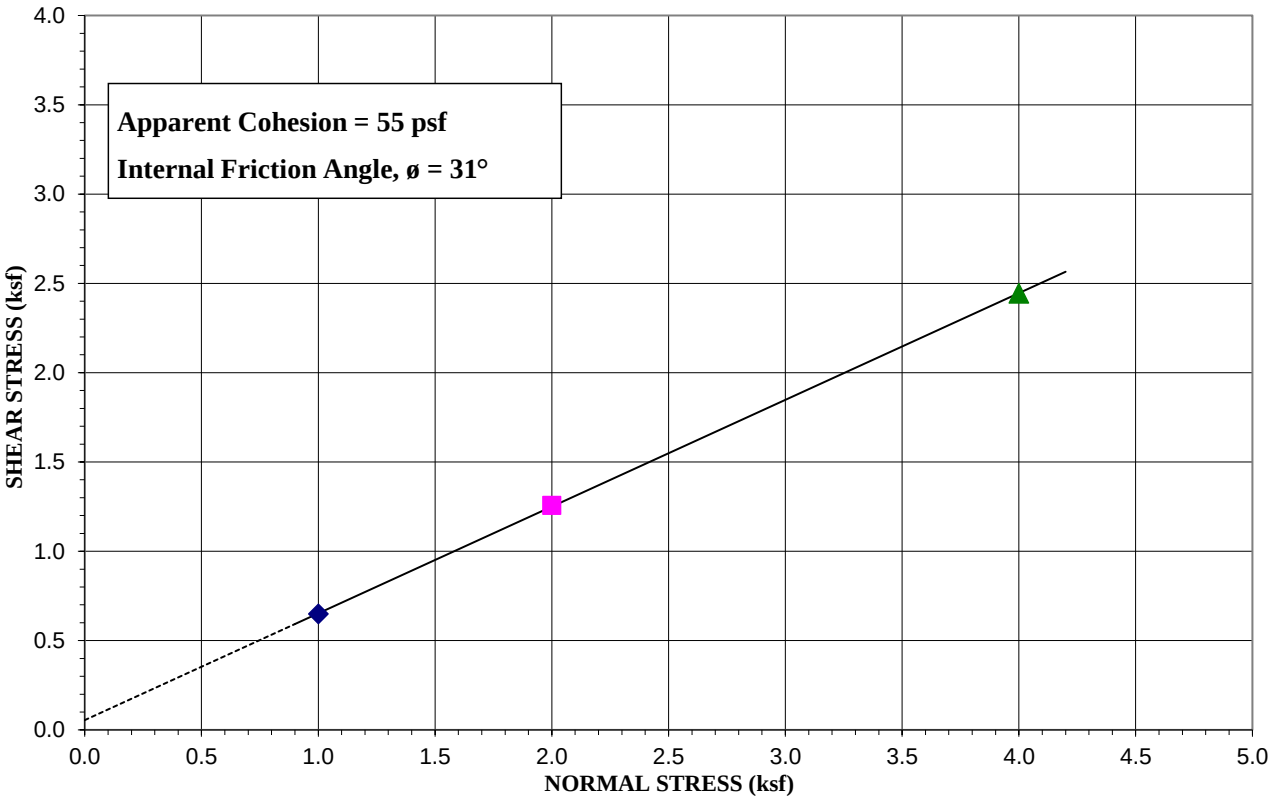
PROJECT: Bonanza Ash Pile Studies

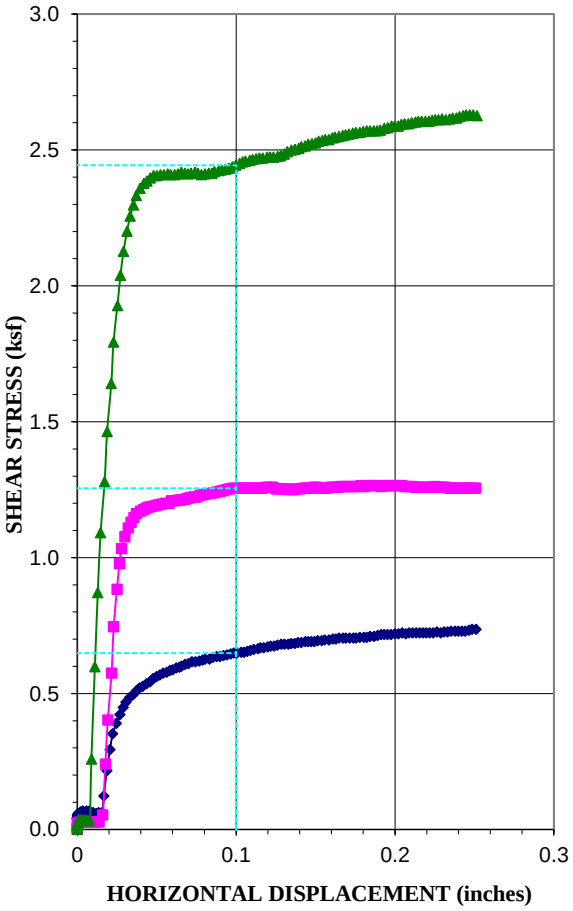
PROJECT NO.: 1161-001

GeoStrata

Plate C-6

DIRECT SHEAR TEST





Source:	Fly Ash Soil Sample
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	0.93	0.93	0.93
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	118.6	118.4	118.9
Dry Density After, pcf	120.1	120.3	120.8
Moisture % Before	8.5	10.6	8.5
Moisture % After	20.9	17.3	16.4
Saturation, % Before	57.1	70.7	58.0
Saturation, % After	147.0	122.0	117.9
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	0.65	1.26	2.44
Strain Rate	0.003333 IN/MIN		

Sample Properties	
Cohesion, psf	55
Friction Angle, ϕ	31
Liquid Limit, %	
Plasticity Index, %	
Percent Gravel	
Percent Sand	
Percent Passing No. 200 sieve	
Classification	

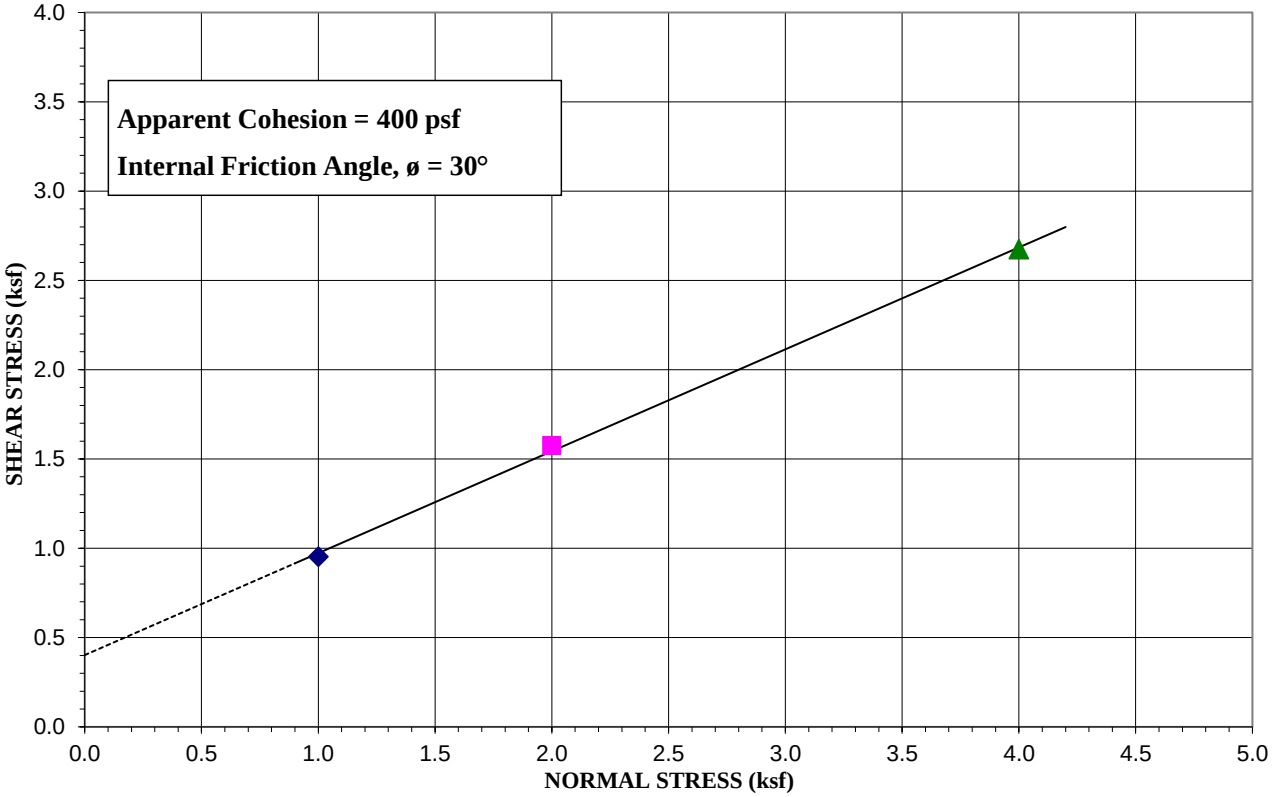
PROJECT: Bonanza Ash Pile Studies

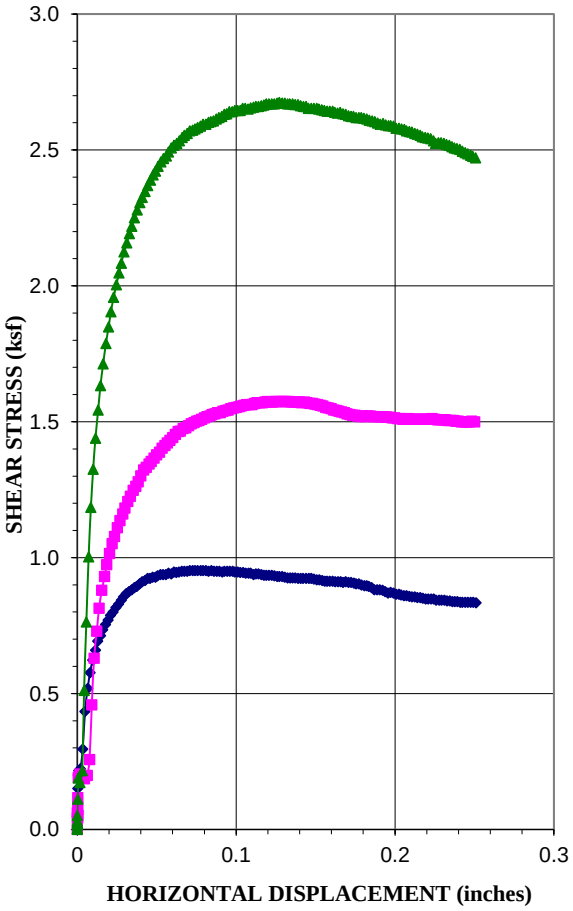
PROJECT NO.: **1161-001**

GeoStrata

Plate C-7

DIRECT SHEAR TEST





Sample Location:	Bottom Ash Soil Sample
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	1	1	1
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	108.4	109.5	109.6
Dry Density After, pcf	110.3	111.3	111.5
Moisture % Before	5.1	4.5	4.1
Moisture % After	19.3	18.6	16.8
Saturation, % Before	25.7	23.5	21.3
Saturation, % After	102.5	101.8	91.9
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	0.95	1.57	2.67
Strain Rate	0.003333 IN/MIN		

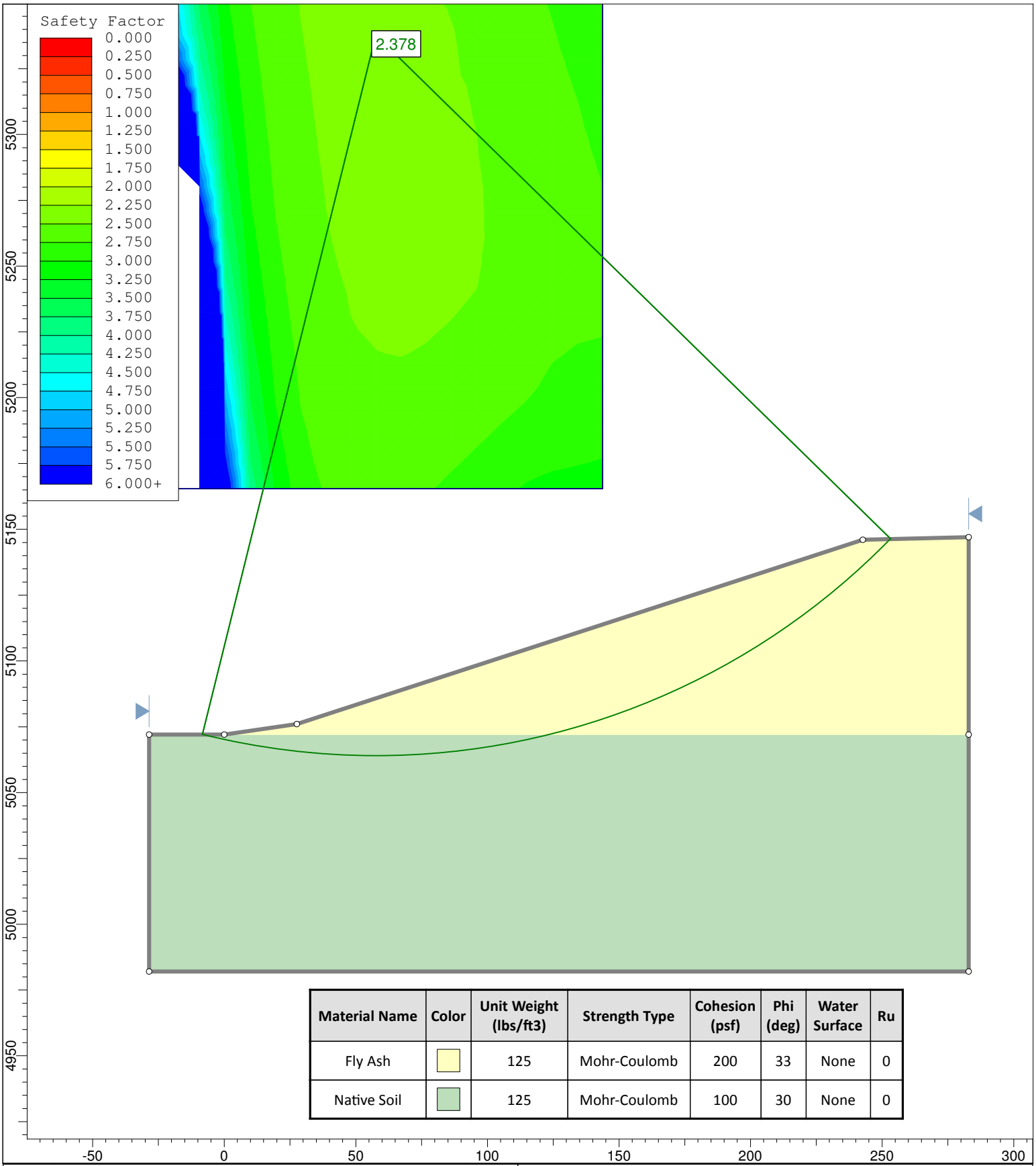
Sample Properties	
Cohesion, psf	400
Friction Angle, ϕ	30
Liquid Limit, %	---
Plasticity Index, %	---
Percent Gravel	---
Percent Sand	---
Percent Passing No. 200 sieve	---
Classification	

PROJECT: Bonanza Ash Pile Studies

PROJECT NO.: **1161-001**

GeoStrata

Plate C-8



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fly Ash		125	Mohr-Coulomb	200	33	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Primary Fly Ash Pile - Static

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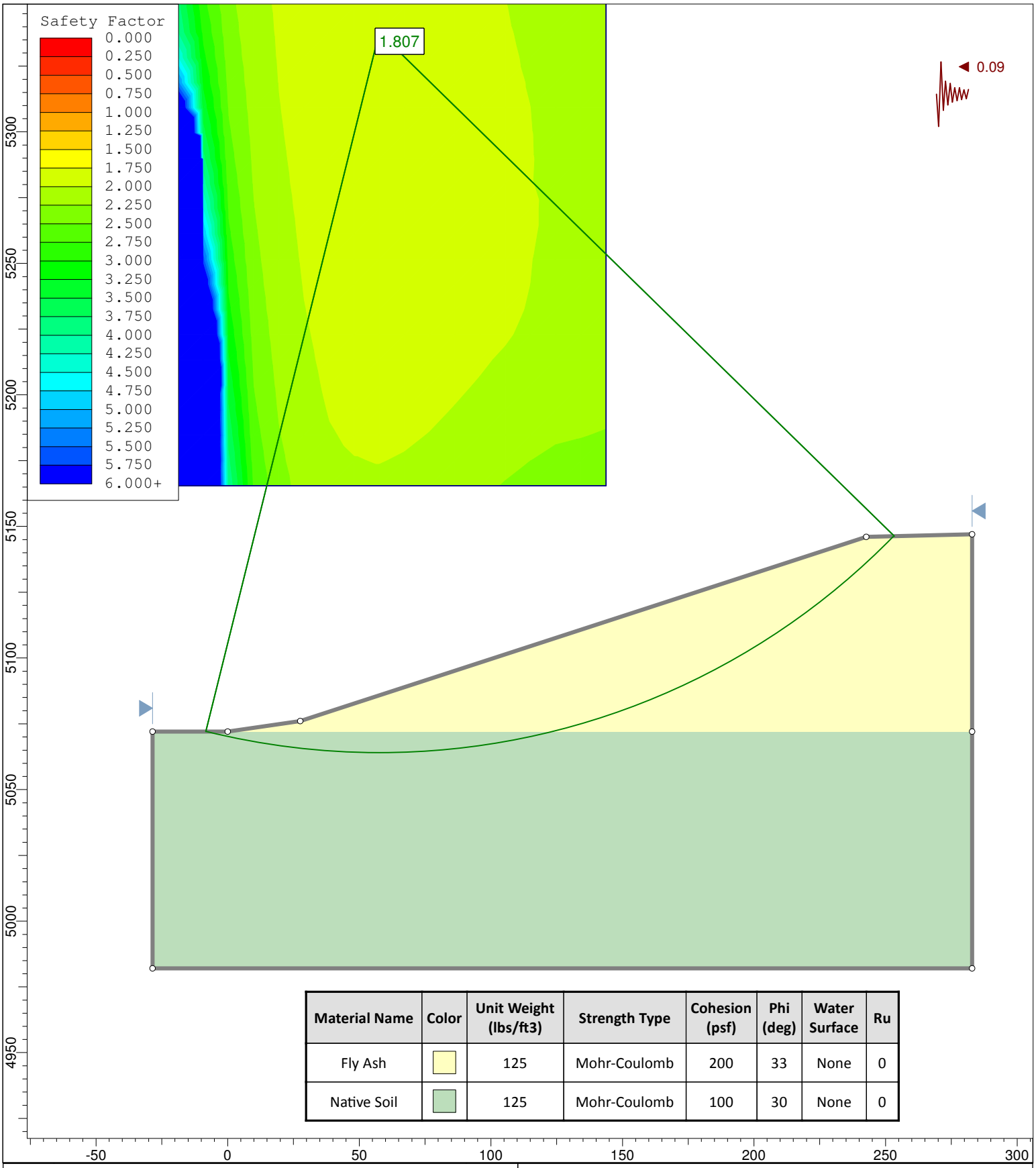
Bonanza Ash Pile Studies
Bonanza, Utah
Project No. 1161-001

Plate D-1



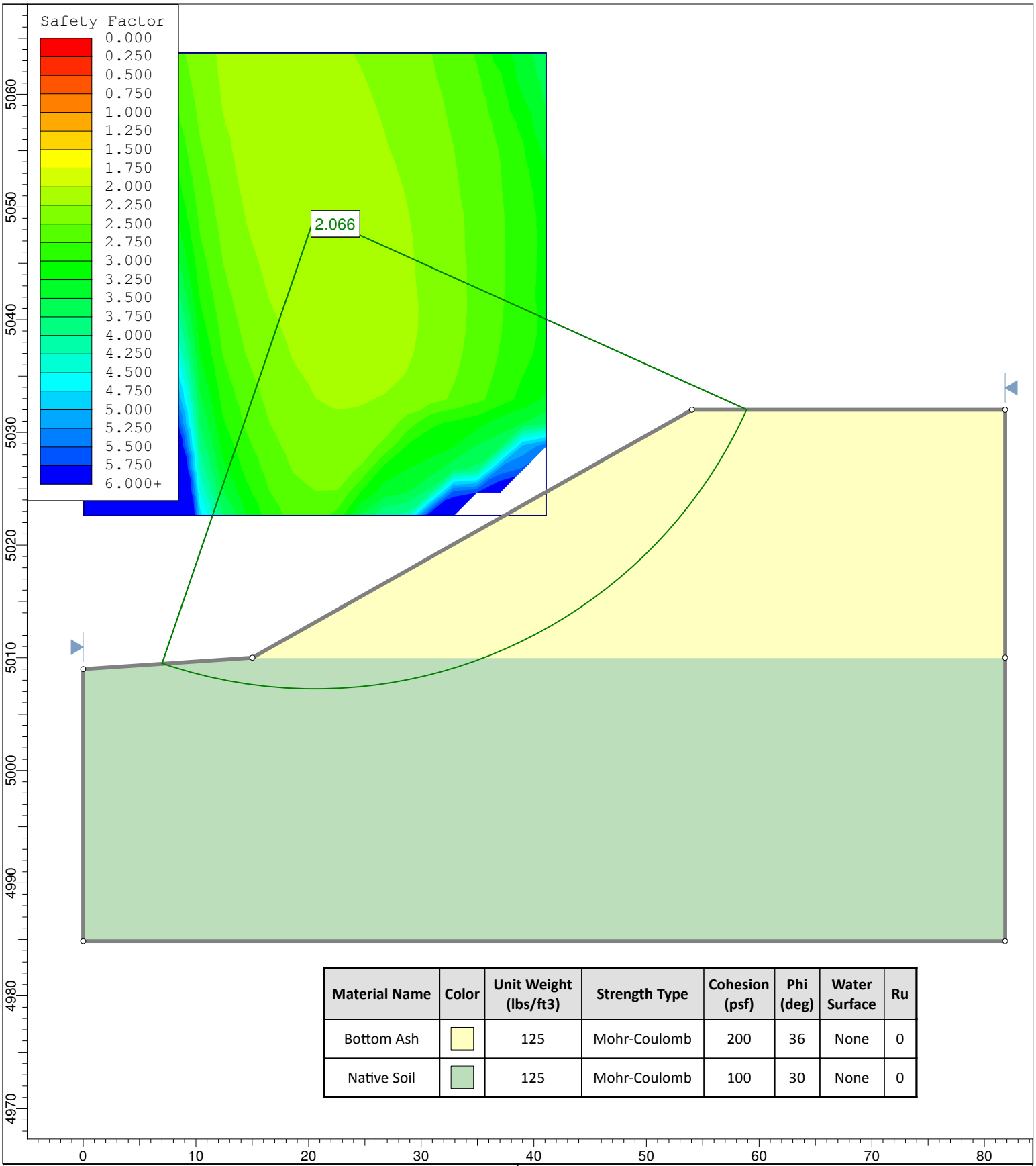
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fly Ash		125	Mohr-Coulomb	200	33	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Primary Fly Ash Pile - Pseudo Static

Deseret G & T
Bonanza Ash Pile Studies
Bonanza, Utah
Project No. 1161-001

Plate D-2



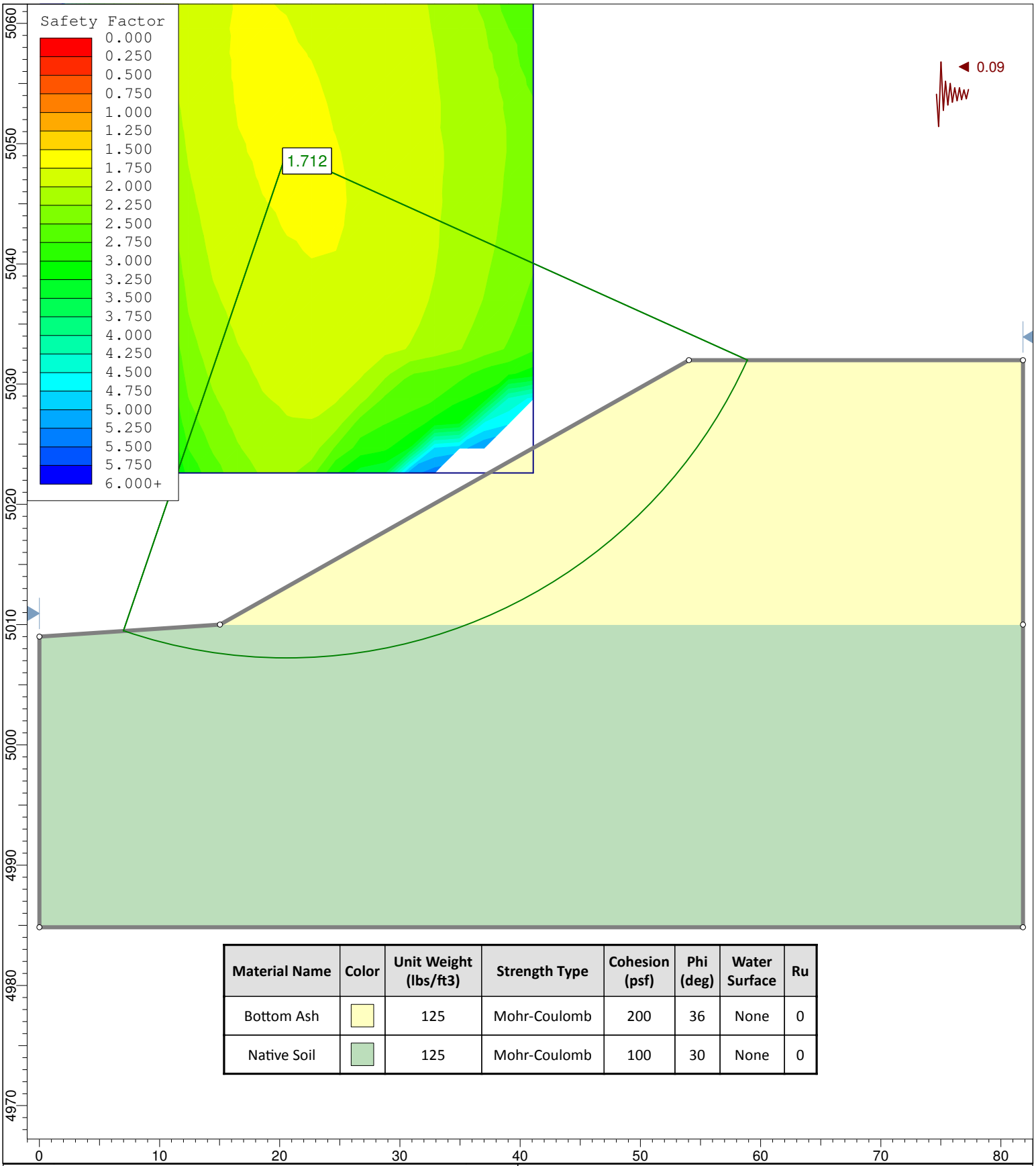
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Bottom Ash		125	Mohr-Coulomb	200	36	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Bottom Ash Pile - Static

Deseret G & T
Bonanza Ash Pile Studies
Bonaza, Utah
Project No. 1161.001

Plate D-3



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Bottom Ash		125	Mohr-Coulomb	200	36	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Bottom Ash Pile - Pseudo Static

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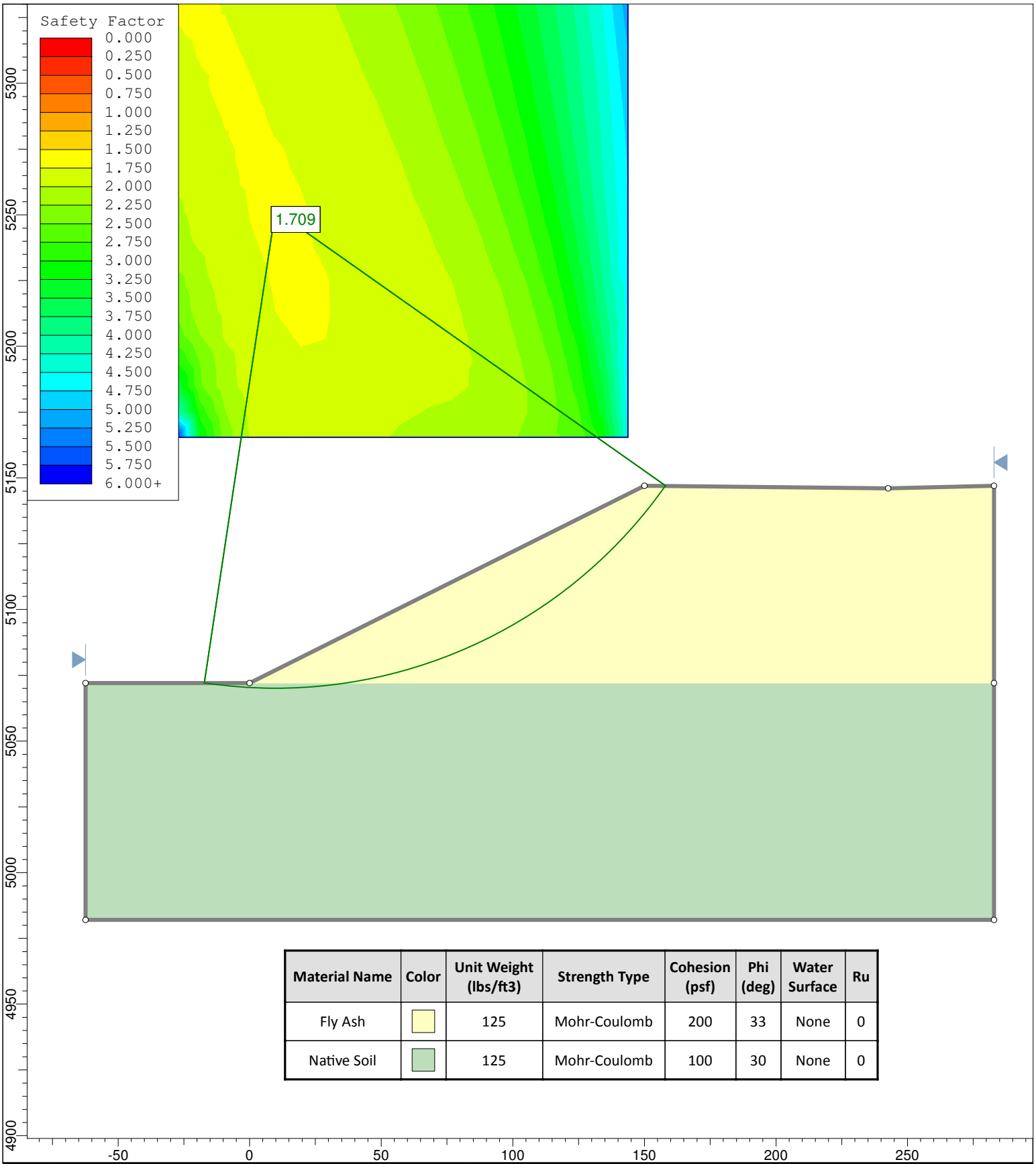
Bonaza, Utah
Project No. 1161.001

Plate D-4



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fly Ash		125	Mohr-Coulomb	200	33	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

Primary Fly Ash Pile -Static 2to1

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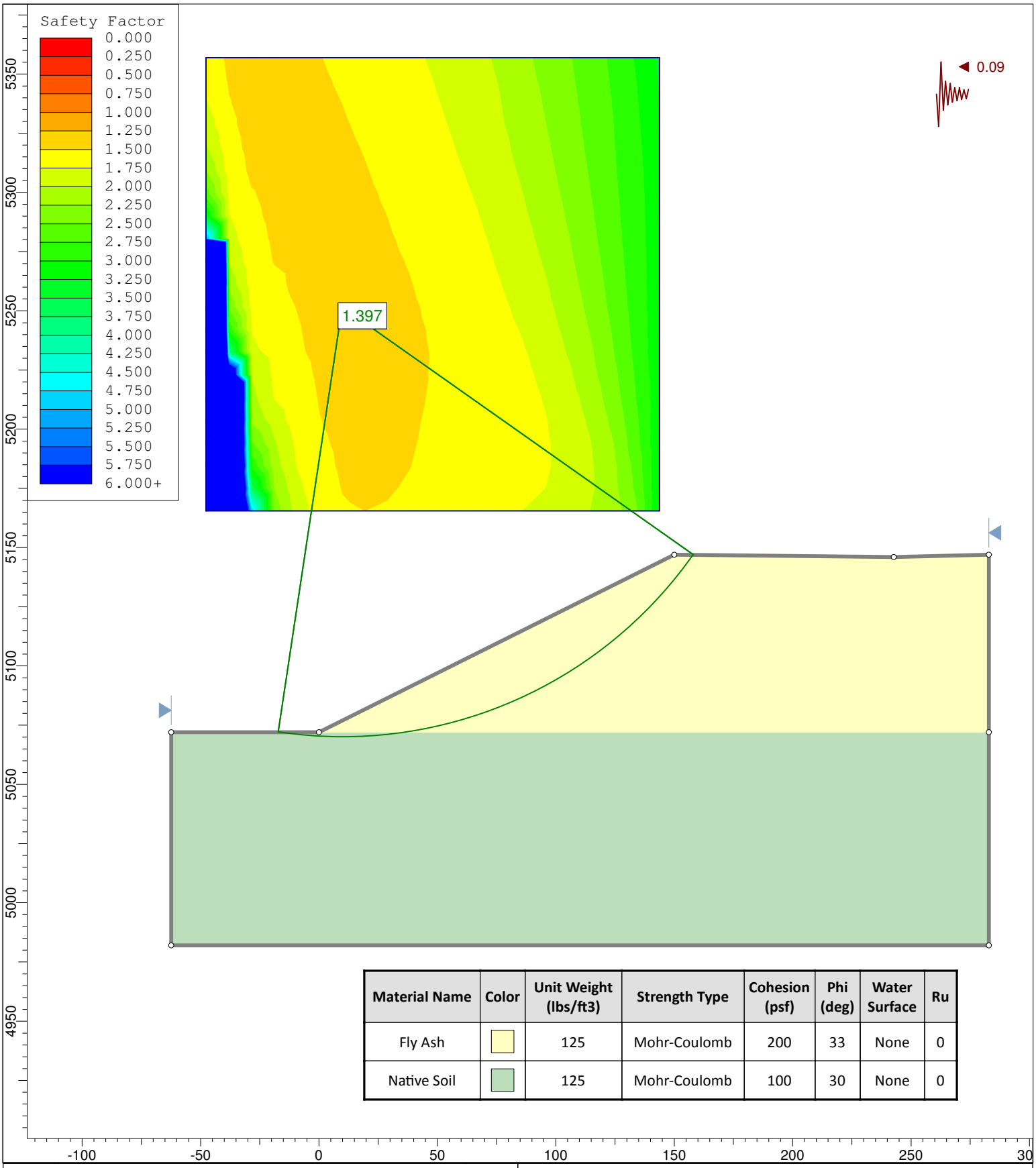
Bonanza Ash Pile Studies
Bonanza, Utah
Project No. 1161-001

Plate D-5



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fly Ash		125	Mohr-Coulomb	200	33	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Primary Fly Ash Pile -PStatic 2to1

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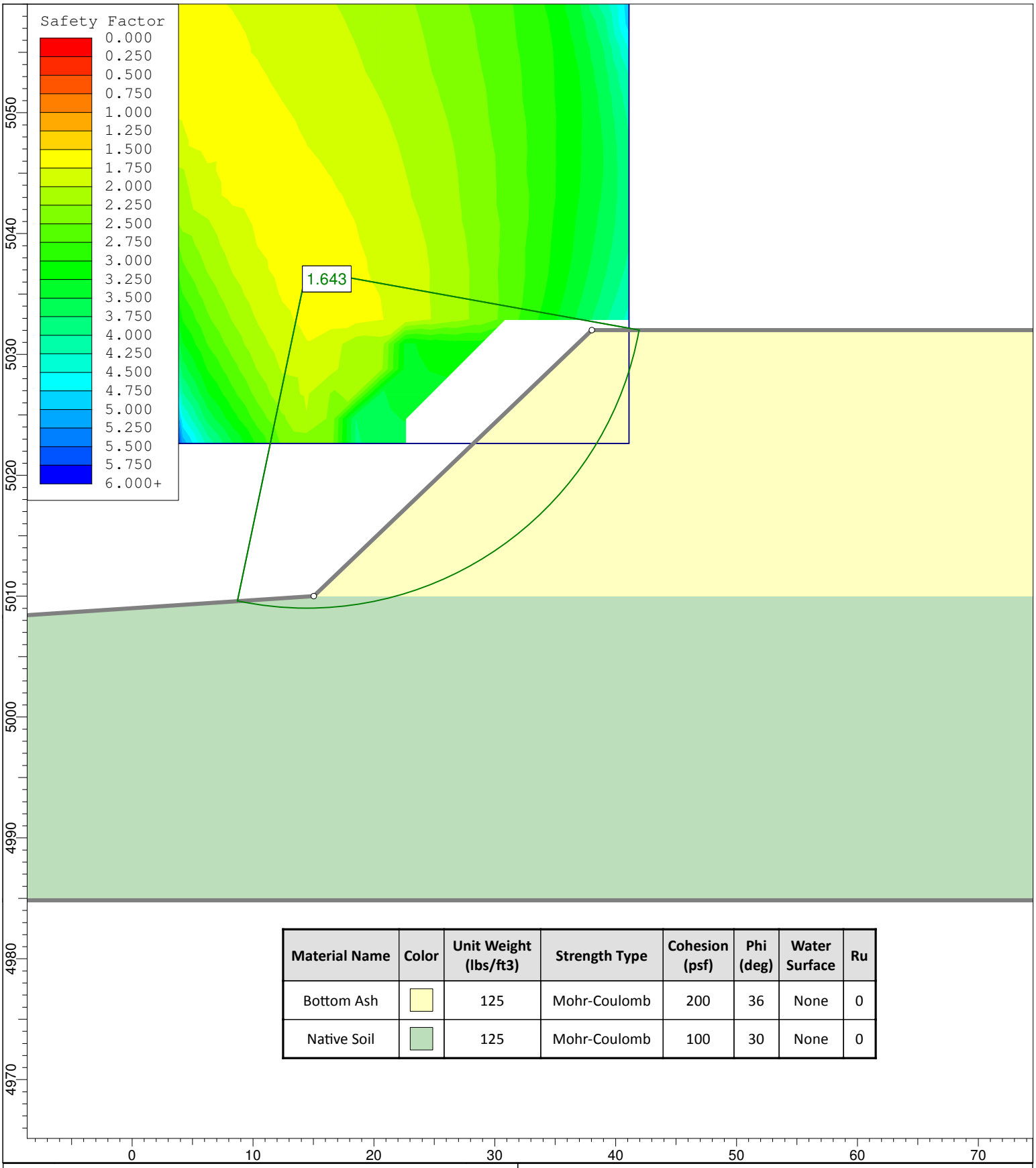
Plate D-6



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Bottom Ash		125	Mohr-Coulomb	200	36	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Bottom Ash Pile - Static 1.5 to 1

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Bonanza Ash Pile Studies
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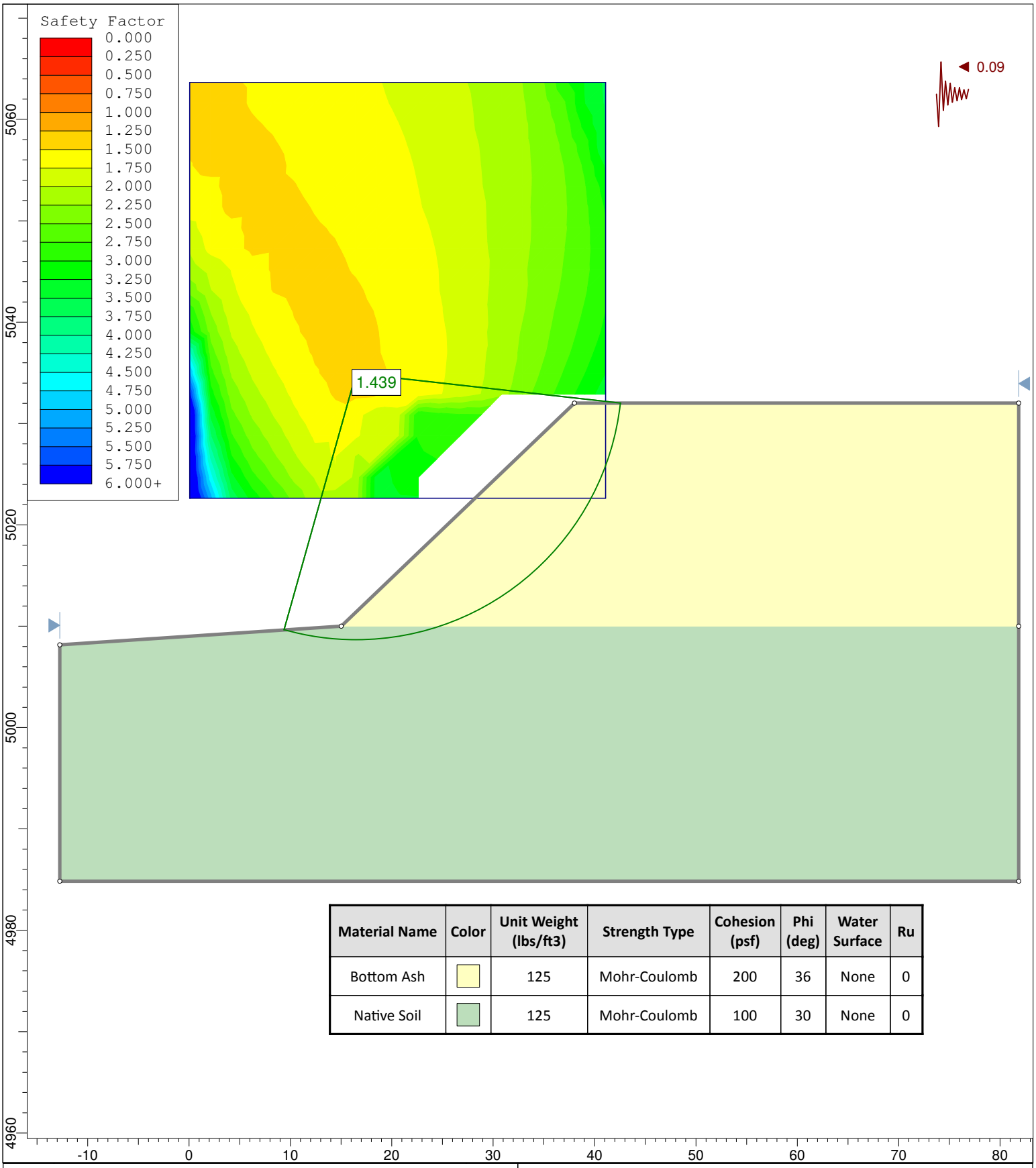
Plate D-7



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Bottom Ash		125	Mohr-Coulomb	200	36	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

Bottom Ash Pile - PStatic 1.5 to 1

Deseret G & T
Bonanza Ash Pile Studies
Bonaza, Utah
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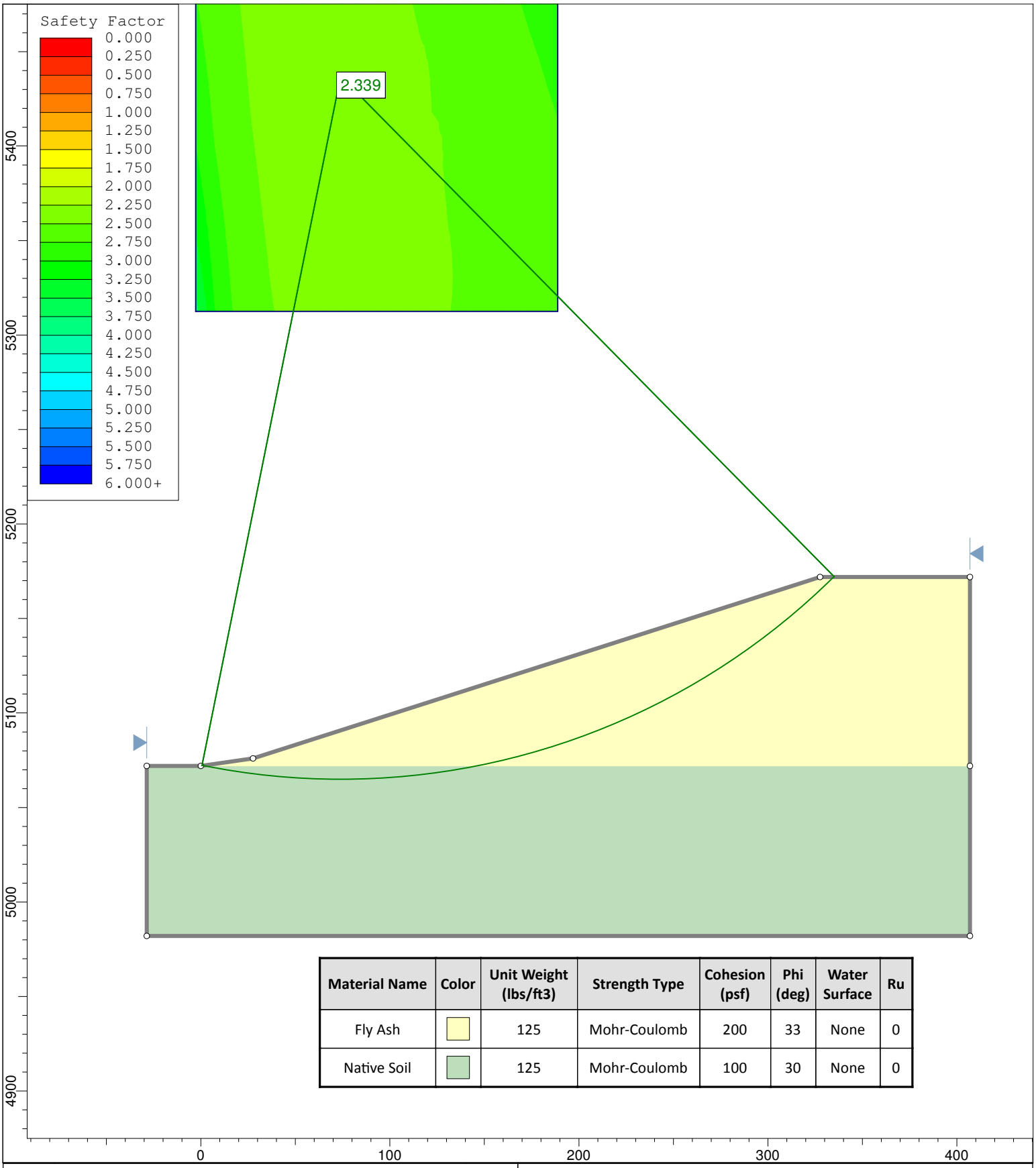
Plate D-8



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fly Ash		125	Mohr-Coulomb	200	33	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Primary Fly Ash Pile - Static 100 Feet

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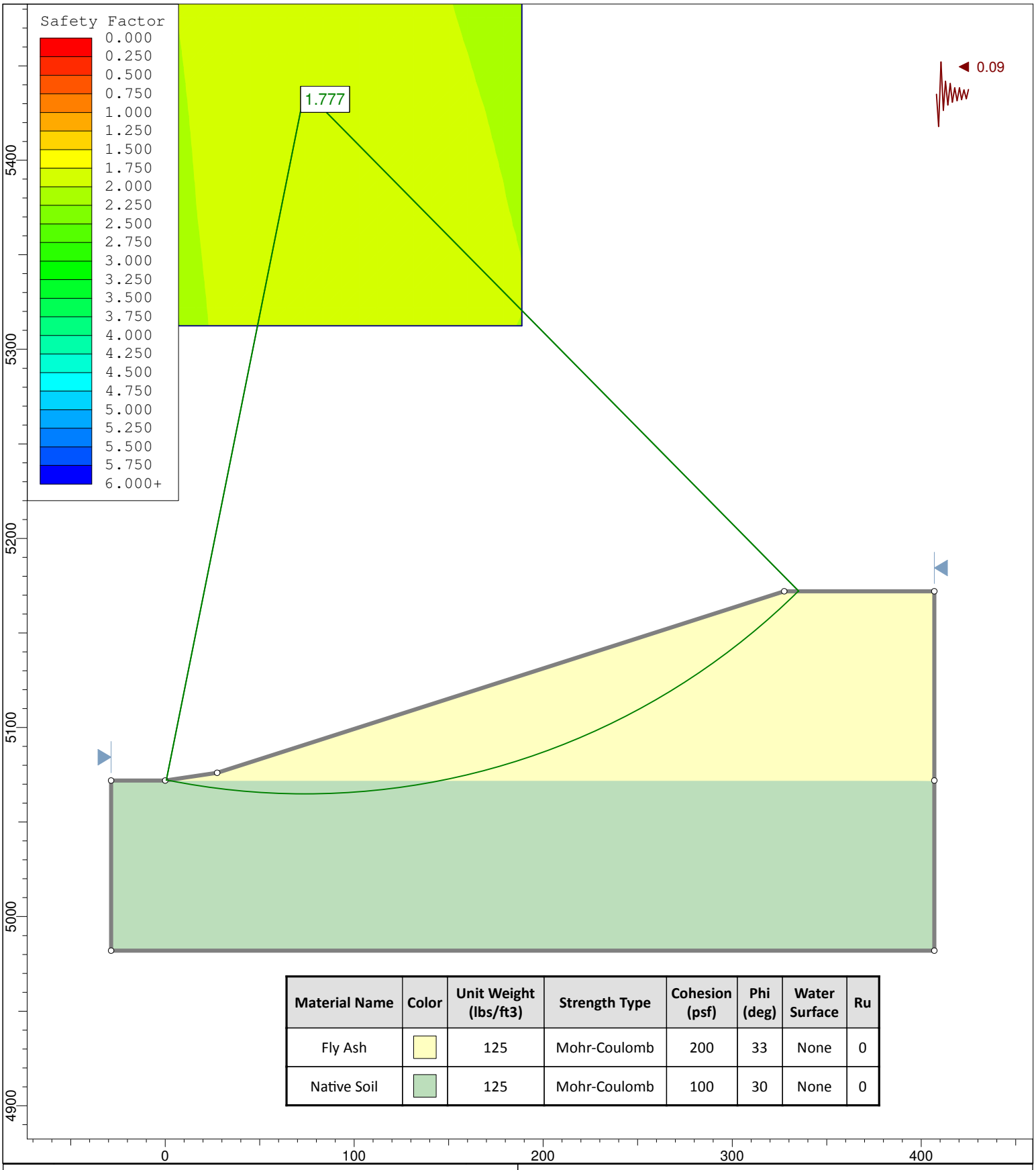
Plate D-9



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fly Ash		125	Mohr-Coulomb	200	33	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

Primary Fly Ash Pile - PStatic 100 Feet

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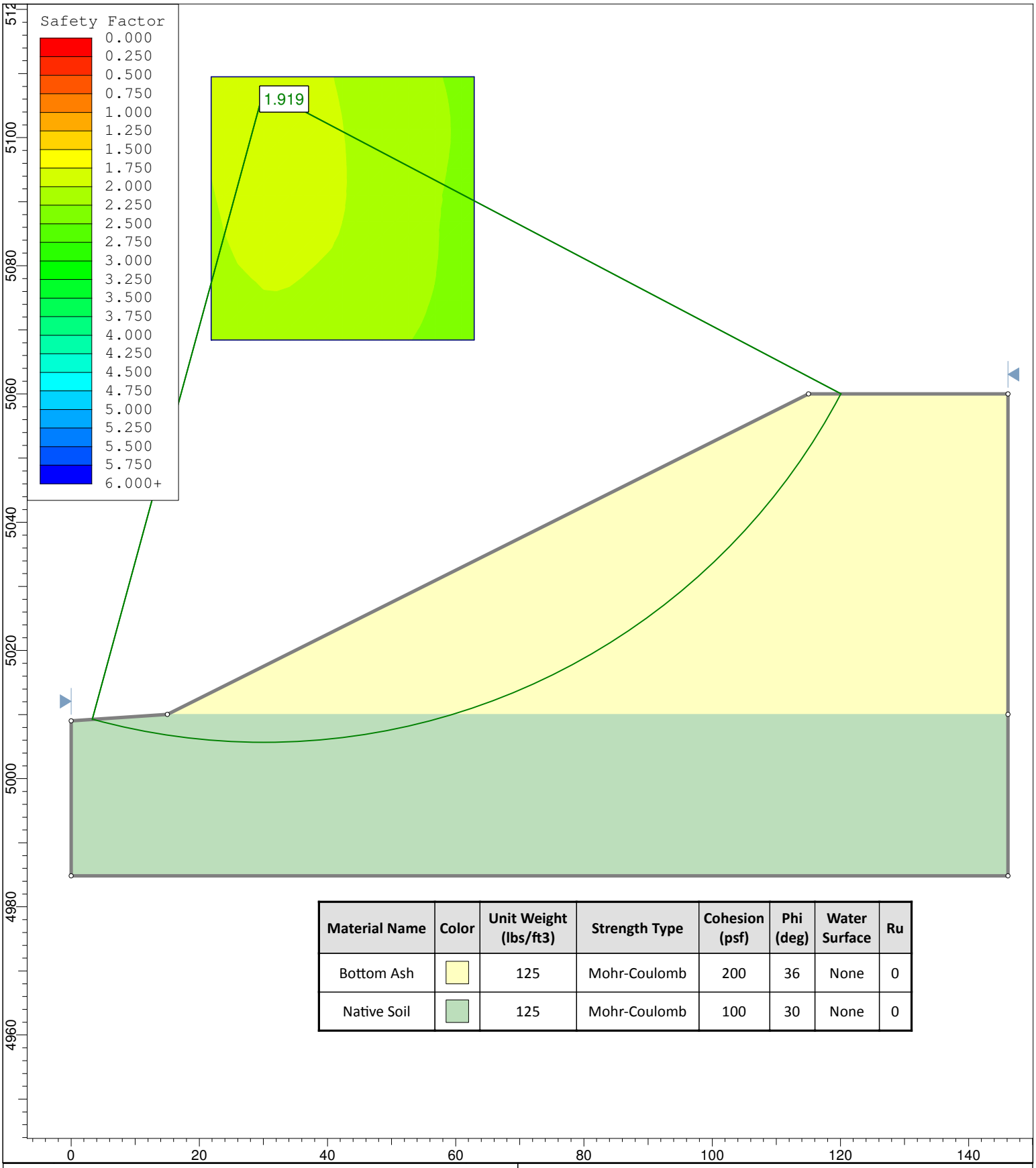
Plate D-10



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Bottom Ash		125	Mohr-Coulomb	200	36	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Bottom Ash Pile - Static 50 Feet Tall

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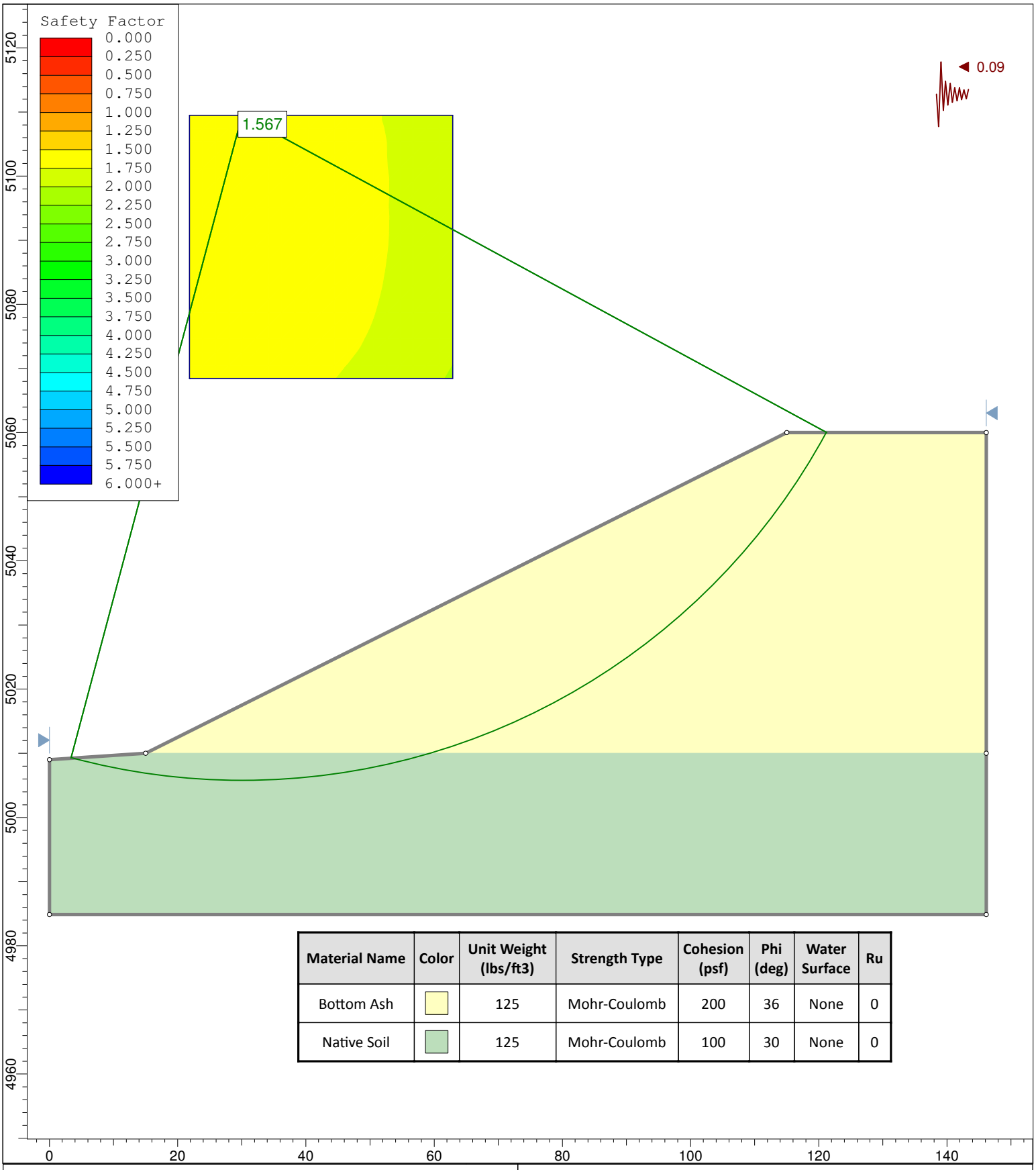
Plate D-11



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Bottom Ash		125	Mohr-Coulomb	200	36	None	0
Native Soil		125	Mohr-Coulomb	100	30	None	0

GeoStrata

Bottom Ash Pile - PStatic 50 Feet Tall

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Plate D-12