Stoney-Miller Consultants
Response to City of Laguna Niguel, Geotechnical Review Sheet, Dated March 20, 2015

Euland Capital Enterprises

Response to City of Laguna Niguel,
Geotechnical Review Sheet,
dated March 20, 2015
SunPointe, Tentative Tract 17433,
Colinas Sur, Laguna Niguel, California

Project No. 13662-05
Report No. 15-13851
dated April 24, 2015

Binder 1 of 2

STONEY-MILLER CONSULTANTS, INC

GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

April 24, 2015

Euland Capital Enterprises
59 Honeyflower
Irvine, California 92620-3327

Project No: 13662-05
Report No: 15-13851

Attention: Mr. David Shieh

Subject: **Response to City of Laguna Niguel, Geotechnical Review Sheet, dated March 20, 2015**
SunPointe, Tentative Tract 17433
Colinas Sur, Laguna Niguel, California

Reference: Stoney-Miller Consultants, Inc. 2015, "Feasibility Geotechnical Investigation, Review of 50-Scale Site Layout Plan, Sunpointe, Tentative Tract 17433, Colinas Sur, Laguna Niguel, California," Project No. 13662-05, Report No. 14-13813R, dated February 17.

This letter is in response to the City of Laguna Niguel Geotechnical Review Sheet dated March 20, 2015. The review requested additional information on nineteen (19) items associated with the above-referenced report. A copy of the review sheet is provided in Appendix A.

Our response is presented following the comment.

Item 1: *Scope of Review: The report clearly indicates that this is a feasibility geotechnical investigation only, and that final design will be conducted at a later date. As a result, review comments are only focused on feasibility. Additional investigation, analysis, and review will be needed if final site design is pursued.*

Response: Although this is considered a feasibility study, the primary purpose of the work is to reach an understanding on the underlying geologic conditions and deep gross stability of the site based on our evaluation of the lettered cross sections A through G. Our goal is that deep stability of the property will not be revisited in subsequent studies, provided proposed grades are essentially maintained through the final design process.

It is our opinion that the site surficial to intermediate depth conditions (typically 50 feet or less) would be subject to further investigation, analysis, and review based on the specific site development plans.

Item 2: *Due to the limited level of study and analysis, it cannot be definitively shown if the site can be constructed as currently planned while staying within the property boundaries.*

Response: As previously stated, the goal of this and the referenced report is to provide an interpretation of the deep, gross geologic structure of the property and present analyses of the deep site stability in support of development. Details regarding the remedial measures required to provide surficial and intermediate depth stability will be provided in future Grading Plan Review reports.

Precautions to preserve the offsite areas will be determined as development planning is finalized within the site boundaries. We envision grading will need to be assisted with buried pier walls, slot cuts, shoring, geogrids, and/or lime-treated soils to improve temporary and long-term stability. Boundary conditions not gradable are planned for buried caisson walls to achieve stability. Groundwater effects on site stability are to be mitigated by installation of a chimney drain along the western site boundary and an interconnected subdrain system that outlets to the storm drain system. All these proposed features will be addressed in detail after the suitability of the overall development platform reaches concurrence with the City.

Item 3: *Geologic Map:*

a. Upper landslide contact is not consistent with borings, which show landslide extends further uphill. Please revise.

b. Borings missing from map: SMC CPT-3, ICG BH-11.

c. Explanation states that the logs for "GB" borings are unavailable. If no useful data is available, shouldn't the borings be deleted from the map?

d. Numerous borings are shown on map and missing in the Appendix. Please check and include missing boring logs, or delete borings from map if the data is unavailable.

Response:

a. The map and cross sections have been modified for consistency.

b. Cone Penetration Test CPT-3 (1990) was obtained during our study of Tract 10896. The log for CPT-3 (1990) is included in Appendix B and the location has been added to the Geologic Map. Boring ICG BH-11 was included on the geologic map but is partially obscured by a geologic contact line.

c. The location of the "GB" borings were included for historical purposes as they were shown in work by others, and may have contributed to earlier

interpretations of the site geology. We have deleted these borings from the geologic map.

d. We have reviewed the geologic map and Appendix B for consistency. Boring RW-1was incomplete in the report but is provided in Appendix B. Boring P-7 was missing from the report but is provided in Appendix B. Borings SMC B-5, SMC B-6, ICG BH-1, ICG B-3, and ICG B-4 are located at the north end of the existing Mercerdes Benz facility and Star Drive. A map showing the location of these borings is included in Appendix B.

Item 4: *Cross Section B-B': Given that the base of landslide and rupture surface have not been defined with certainty, please utilize larger search boxes throughout to evaluate shallower or steeper failure surfaces in the stability analyses. Larger search box is also needed near toe of failure surface in the stability analyses.*

Response: Our office concurs with the reviewer, in that the western-most deep landslide (Qls?) is not defined with certainty. In our interpretation, it does not likely exist.

Our study has utilized approximately 45 borings on the Euland property, and 10 borings near the toe of the eastern descending slope. A total of 47 borings, including about 3,800 lineal feet, were subject to direct examination by downhole logging or continuous coring. This exploration led to 740 separate geologic structural measurements collected during the prior subsurface studies. Based on our review and interpretation of the logging, we have found a contrast in interpretation and lack of reasonably low-angle basal rupture observations indicative of a block or slump failure. Based on the logged descriptions and measurements, we have added color bands to the important borings along the section lines to demonstrate our interpretations of landslide deposits (red), possible landslide or bedrock deposits (yellow), and bedrock deposits (green). The majority of this information has been added to the borings on the enclosed geologic cross sections for ease of interpretation and review.

The structural measurements, or attitudes, from the borings typically represent six features: bedding, clay seams, rupture surfaces, shears, fractures, and joints. For clarity, these features are shown in color separately on the cross sections, except for the joints and fractures which are shown in grayscale.

In addition, we have plotted the poles of structural measurements on lower hemisphere stereonet projections of the following: bedding and clayseam (see Figure 1) and rupture/shear and joints (see Figure 2). The bedding and clay seam geologic data appear in the pole projection plots as generally horizontal with a

slight dip to the west. This orientation is consistent with the published literature for bedrock in this area; however, the plotted attitudes were largely obtained in material presumed to be deep landslide material. A similar projection of the rupture surface/shear attitudes and joint attitudes is also provided. Oddly, the rupture surfaces and shears are shown to be predominantly high-angle and consistent with a secondary set of the joint data. In comparison with the descriptions of the material exposed in the deeper sections of the borings and cores, it is our opinion the deeper western failure (Qls?) is most likely intact bedrock, and not a failure.

We have re-interpreted landsliding into "most probable" and "queried" configurations based on our interpretation of the geologic data set and consistent with the geologic environment over time. We interpret an elevation of about 110 to 120 feet above mean sea level (amsl) to be the deep lower bound of landsliding at the site. We have utilized larger search boxes in areas lacking definition but do not allow the analyses to create potential failure surfaces that go counter to the geologic data. Refer to our evaluations in Appendix E.

Item 5: *Cross Section C-C': Given that the base of landslide and rupture surface have not been defined with certainty, please utilize larger search boxes throughout to evaluate shallower or steeper failure surfaces in the stability analyses. Larger search box is also needed near toe of failure surface in the stability analyses.*

Response: See response to Item 4.

Item 6: *Cross Section E-E': Given that the base of landslide and rupture surface have not been defined with certainty, please utilize larger search boxes throughout to evaluate shallower or steeper failure surfaces in the stability analyses.*

Response: See response to Item 4.

Item 7: *Cross Sections D-D', E-E', and F-F': Landslide rupture surface does not match at intersection of D-D' and F-F'. Landslide rupture surface contacts don't match at intersection of D-D' and E-E'. Basal rupture surface on F-F' doesn't match or show on D-D'. Please revise cross sections to reconcile differences at intersection locations.*

Response: Cross sections have been reviewed and made consistent at intersections.

Item 8: *Cross Section F-F': Please include stability analysis with translational failure and anisotropic soil properties.*

Response: Refer to Appendix E. Static and pseudostatic/deformation criteria are satisfactory for the requested analyses.

Item 9: *Cross Section G-G': For temporary backcut analysis, please include stability analysis with translational failure and anisotropic soil properties.*

Response: Refer to Appendix E. Static and pseudostatic/deformation criteria are satisfactory for the requested analyses.

Item 10: *Please show geologic structure in the Capistrano Formation located behind and below the landslide on all cross sections, and clarify corresponding bedding ranges and anisotropic properties used for each slope stability analysis.*

Response: The interpreted structure of the Capistrano Formation has been added to the Geologic Cross Sections, Plates 3 through 5. The bedding appears to strike north-south and dip at 8 degrees to the west on the upper portion of the site and then gently flatten to near horizontal on the eastern side of the site.

Plots of the anisotropic properties used for the analyses are included with the stability evaluations in Appendix E. We typically used slide plane or along bedding strength for planes within 8 degrees below and 5 degrees above horizontal. For analyses made with larger search areas, we reduce the weaker soil angle to 3 degrees above and below horizontal so that potential failure planes would not go counter to the geologic data.

Item 11: *Please justify pseudo-static strength for Capistrano Formation across bedding.*

Response: A review of the historic strength testing of Capistrano Formation materials is provided in Appendix C. The existing guidelines for landslide evaluation (Blake, et al., 2002) indicate that pseudostatic strengths are 10 to 40 percent above strengths determined by typical laboratory testing for static load conditions. Our evaluations indicate that the strengths used for across bedding strengths in Capistrano Formation are consistent with the strength testing and the existing practice guidelines.

Item 12: *Cross Section 7-7': Please show storm capture module on cross section.*

Response: The storm capture module has been added to Cross Section 7-7'.

Item 13: *Cross Section 10-10': Plan shows Verdura Wall 24-ft high and section shows wall 34-ft high. Please revise.*

Response: We have reviewed Cross Section 10-10' and it appears to be consistent with the plan showing a 24-feet high Verdura Wall.

Item 14: *Cross Section 13-13': Please verify stability and analyze failure surfaces through adjacent housing and properties to the north.*

Response: See Appendix E, Figures E-44 and E-45.

Item 15: *Cross Section 15-15': Please verify stability and analyze failure surfaces through adjacent housing and properties to the north.*

Response: See Appendix E, Figures E-46 through E-49.

Item 16: *Northern property line: Please discuss potential settlement induced by the proposed grading on the adjacent property and residences located to the north (i.e., near Cross Sections 13-13' and 15-15').*

Response: Based on our review of the plans and sections along the northern property line, it appears that the planned horsetrail will result in a 10 foot setback of the proposed fill slope from the northern property line. This setback coupled with the relatively shallow fill soil conditions along this boundary should result in no unusual surcharge or settlement of the properties and residences located north of the site. If grading is performed with a reasonable degree of care, we would not expect any unusual settlement effects from the required grading. The residences and occupants will, however, experience a certain amount of low level ground vibrations from the planned grading and construction.

Item 17: *Temporary shoring: Please clarify feasibility and constructability of the planned shoring, and provide stability analyses to support your conclusion.*

Response: Grading along the western boundary is constrained by the western property line and the temporary slope ratios needed to maintain slope stability. Long-term groundwater mitigation in this area also dictates a deeper key excavation to install the chimney drain and subdrains in the southern portion of this key. Temporary slope stability is improved by using temporary shoring as demonstrated in Appendix E, Figure E-20, of the referenced report and Figure E-43 of this report. The temporary shoring will be slower than conventional grading work and will require that smaller equipment be used during removals and fill placement adjacent the shoring. Additional investigation, analysis, and cost evaluations should be planned during development of grading plans to define the most cost effective means to safely install the planned drainage system in this area.

Item 18: *MSE Walls: Please clarify feasibility and stability of MSE walls and lime-treated soil backfill. Also provide representative stability analysis to substantiate conclusion on stability/feasibility.*

Response: A recent example of a Verdura walls with lime-treated soils performed in similar soil conditions in San Clemente, California, is provided in Appendix D. Verdura walls up to 26 feet high were installed using backfill of expansive clay soil mixed with 6 percent lime. The added lime modified the expansion potential of the soil to very low. The added lime will also increase the strength of the clayey soil as indicated in Appendix D. It appears possible to conservatively achieve an undrained strength of 12,000 psf (or 80 psi). An evaluation of stability for this condition was provided in Appendix E, Figure E-13, of the referenced report. Additional analyses using lime-treated soil are provided in Figures E-27, E-32, E-44, and E-45.

Additional investigation, analysis, and cost evaluations should be planned during development of grading plans to define the most cost effective means to construct the Verdura walls.

Item 19: *Please provide additional discussion of the future groundwater monitoring and maintenance program, such as the specific requirements, methods, monitoring wells, frequency, durations, responsible party, etc.*

Response: Since maintenance of site groundwater levels is part of the overall gross site stability, it is proposed that all existing water wells and hydraugers be maintained throughout the process of grading and development.

Long-term monitoring of the water wells and hydraugers is proposed on a biannual basis most likely at the start and end of the rainy season. Electronic piezometers will be maintained in each well and data offloaded at each reading. Manual readings of each well will also be made for each reading. Manual measurements are also to be made of flow rates from the hydraugers. Reports should be made after each reading with comments, conclusions and recommendations provided as warranted. Monitoring should also include verification of domestic water usage to determine if any usual change occurs in water quantities. The specifics of the tracking and monitoring of water usage should be defined as part of site development conditions.

Maintenance of the wells and hydraugers may be required to maintain proper performance. The electronic piezometers will corrode with time and will need to

be replaced at 18- to 24-month intervals. The hydraugers have and will continue to be subject to salt build-up on the annulus. Inspection of the hydrauger system should be planned on a yearly basis.

We envision that the responsible entity for site monitoring and maintenance will change over time from the developer to the local homeowners association.

LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and engineering geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

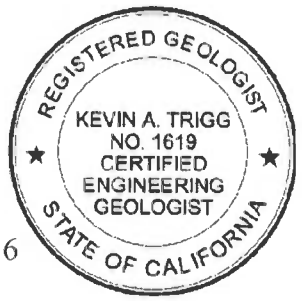
Thank you for this opportunity to be of service. If you have any questions, please contact this office.

Sincerely,

STONEY-MILLER CONSULTANTS, INC.

Russell C. Lamb, G.E. 2207
Chief Geotechnical Engineer
Registration Expires 3-31-17
Date Signed: ____/____/____

Kevin A. Trigg, E.G. 1619
Chief Engineering Geologist
Registration Expires 12-31-16



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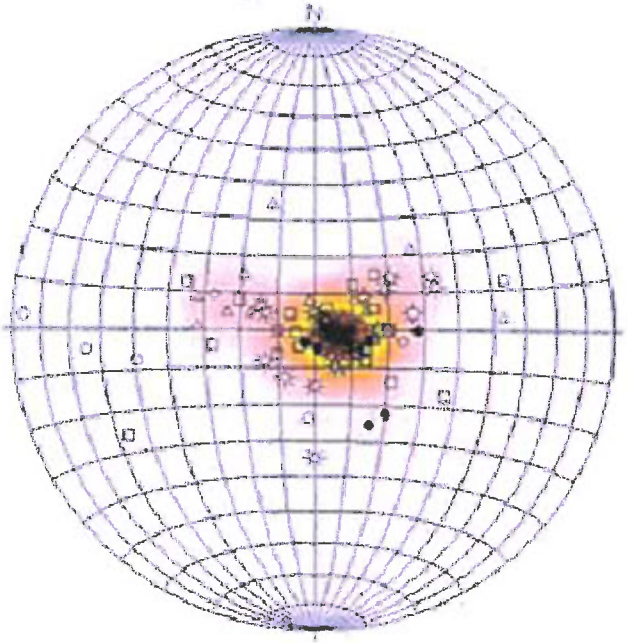
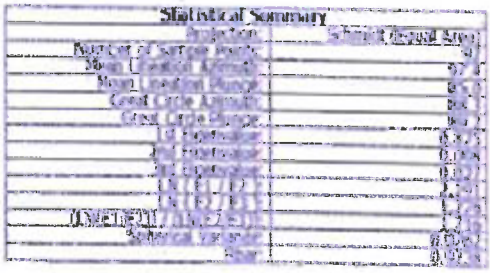
Distribution - Addressee (5)

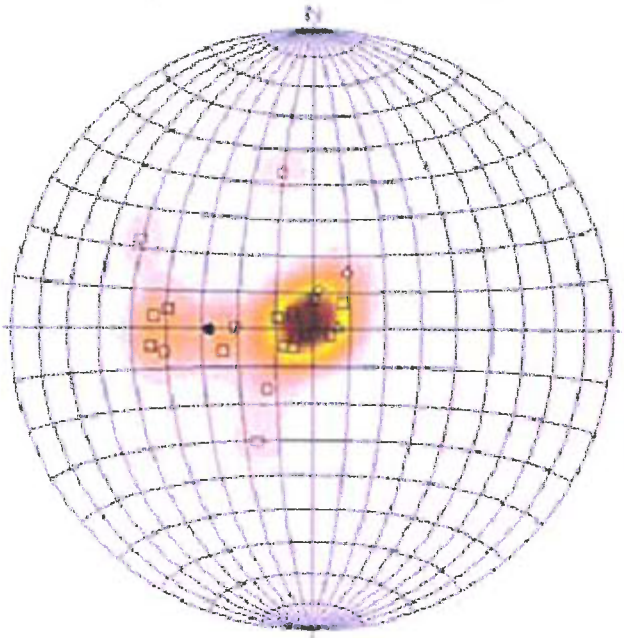
Attachments:
Figure 1 – Bedding and Clay Seams Stereonet Plots
Figure 2 – Rupture/Shear and Joint Stereonet Plots
Figure 3 – Geotechnical Cross-Sections 1 through 5
Figure 4 – Geotechnical Cross-Sections 6 through 10
Figure 5 – Geotechnical Cross-Sections 11 through 14
Figure 6 – Geotechnical Cross-Sections 15 through 16
Appendix A – City of Laguna Niguel Review Sheet dated March 20, 2015
Appendix B – Exploration Data
Appendix C – Strength Properties
Appendix D – Soil Improvement
Appendix E – Slope Stability Analyses
Plates 1 and 2 – Geologic and Geotechnical Maps
Plates 3 to 5 – Geotechnical Cross-Sections

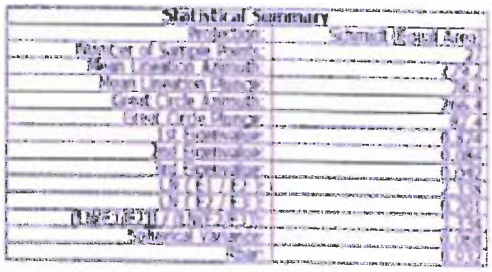
Bedding Stereonet Plot





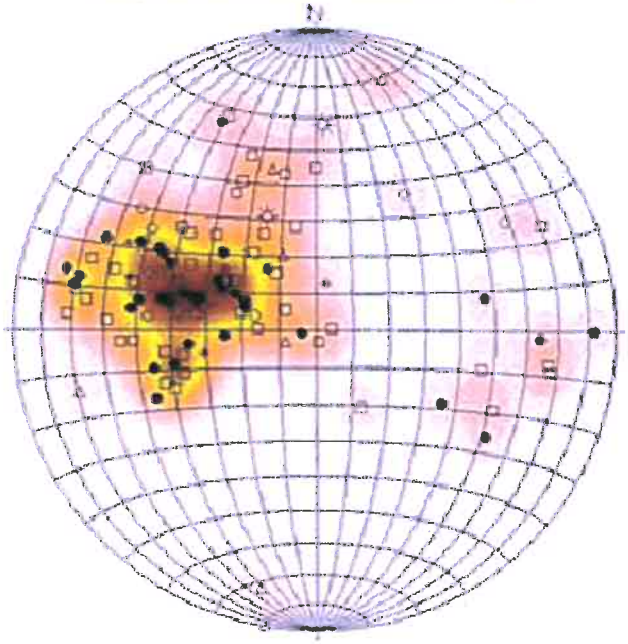
Clay Seams Stereonet Plot

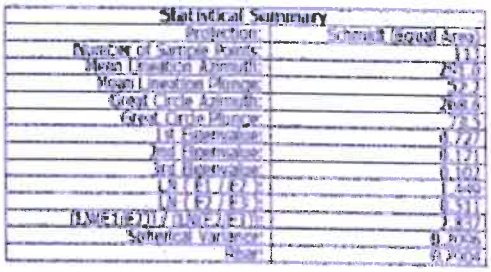




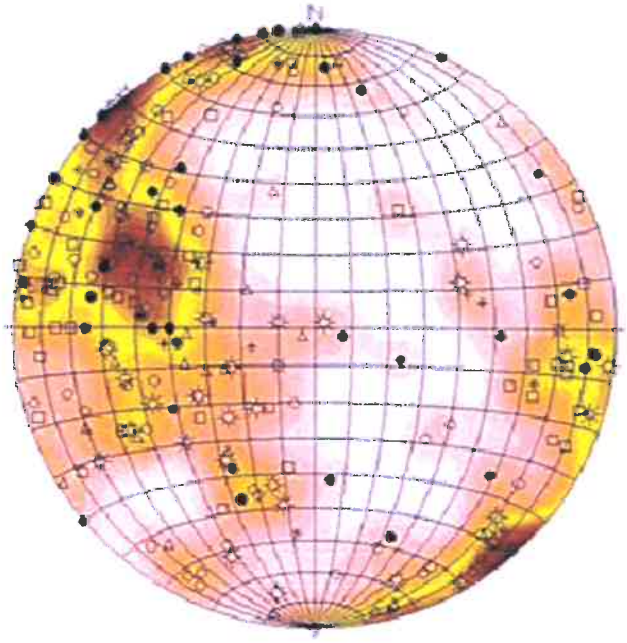
SMC	BEDDING AND CLAY SEAMS STEREONET PLOTS			
JOB NO.:	13662-05	DATE:	APRIL 2015	FIGURE NO.: 1

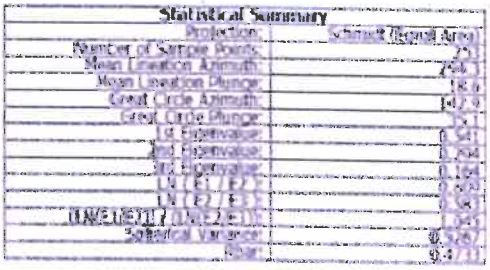
Rupture/Shear Stereonet Plot





Joint Stereonet Plot





SMC	RUPTURE/SHEAR AND JOINT STEREONET PLOTS			
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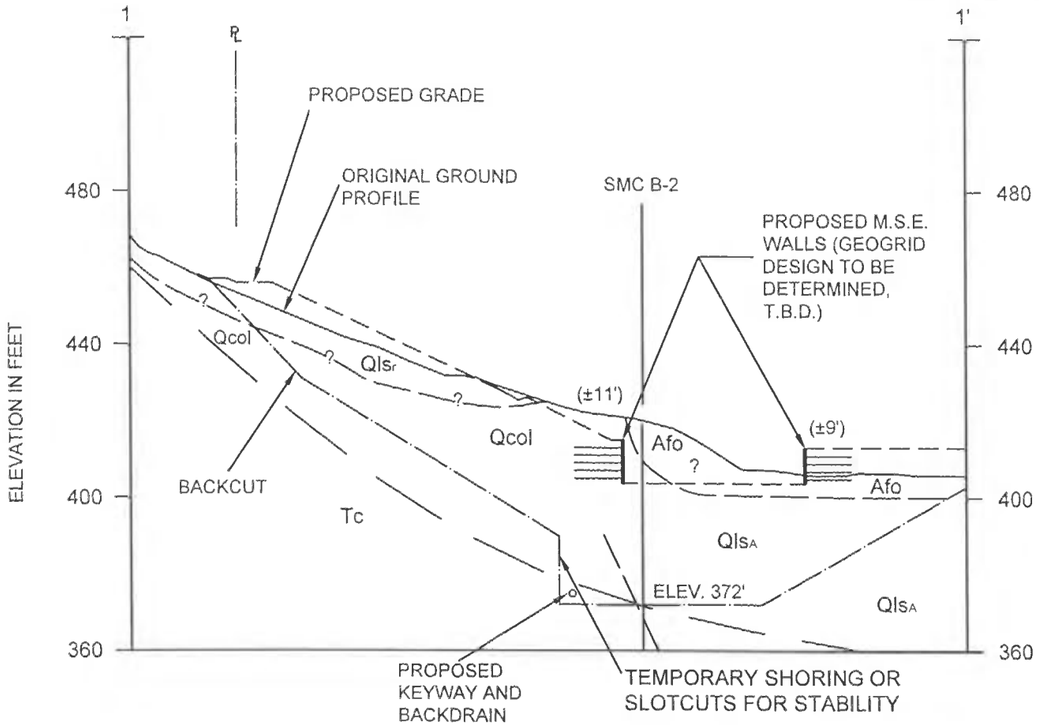

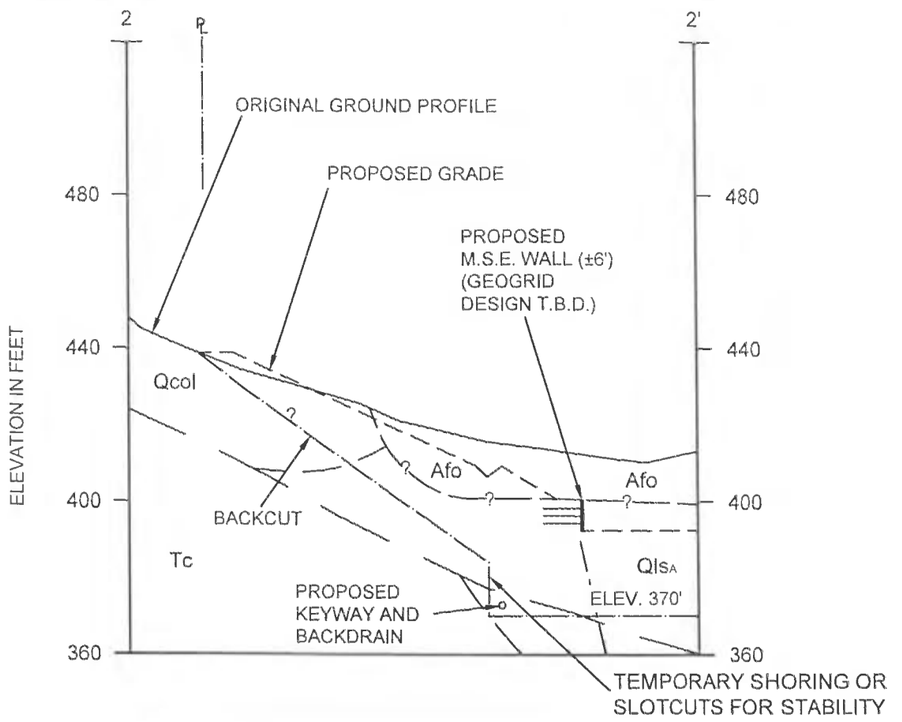

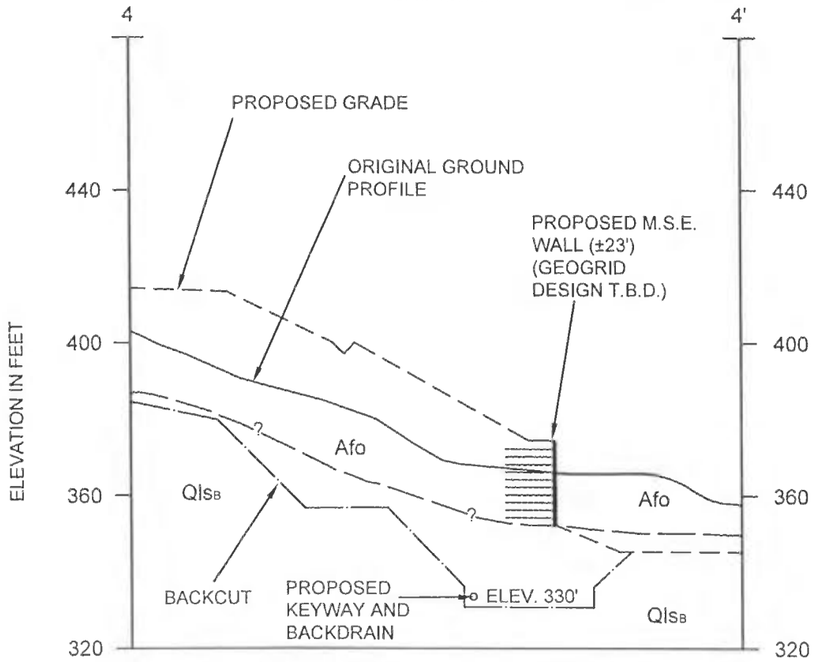

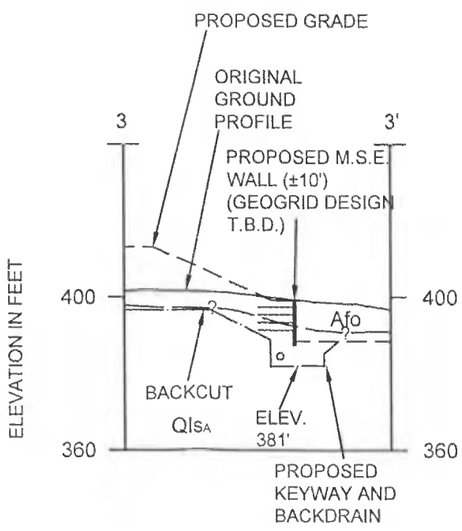

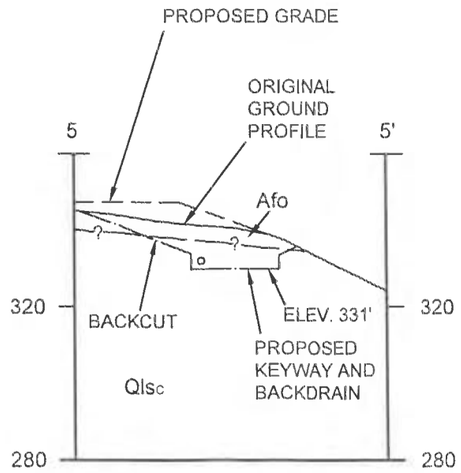

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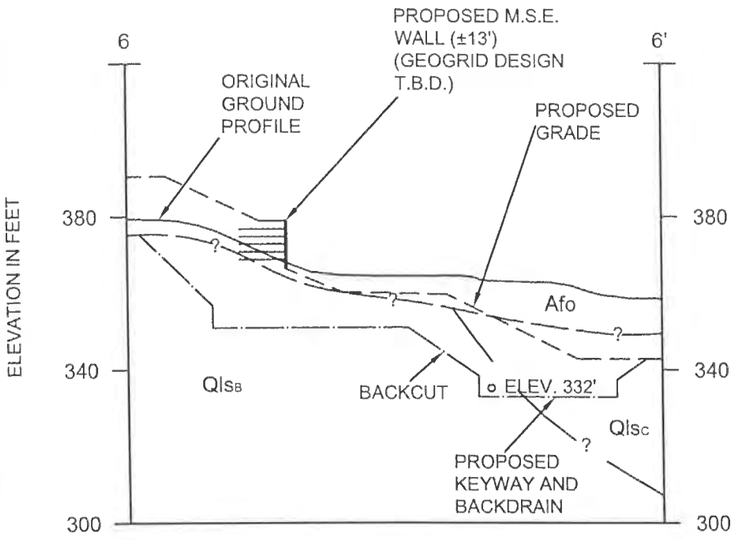
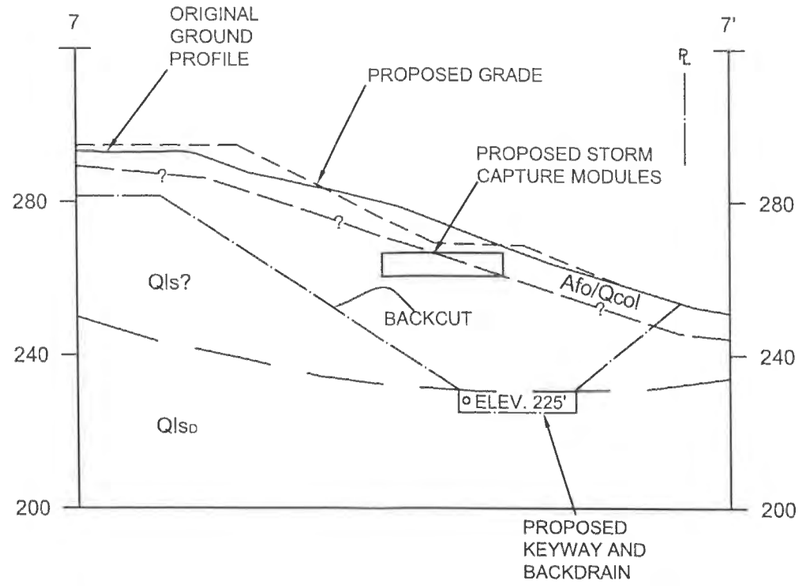
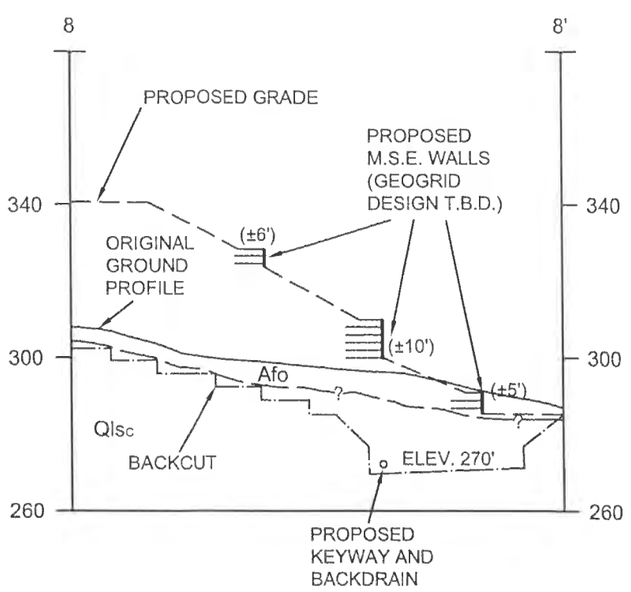
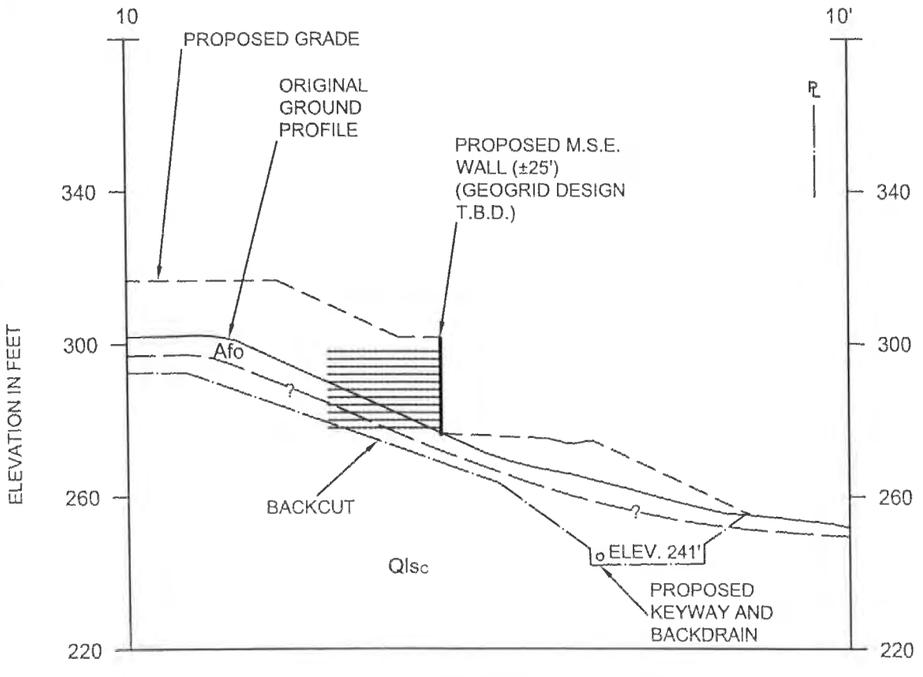
GEOTECHNICAL CROSS SECTIONS 1-5
TENTATIVE TRACT 17433,
LAGUNA NIGUEL, CALIFORNIA

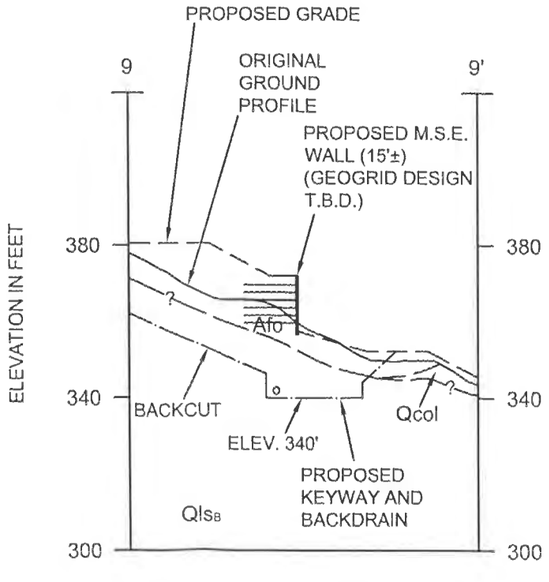
JOB NO.:	DATE:	FIGURE NO.:
13662-05	APRIL 2015	3











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GEOTECHNICAL CROSS SECTIONS 6-10
TENTATIVE TRACT 17433,
LAGUNA NIGUEL, CALIFORNIA

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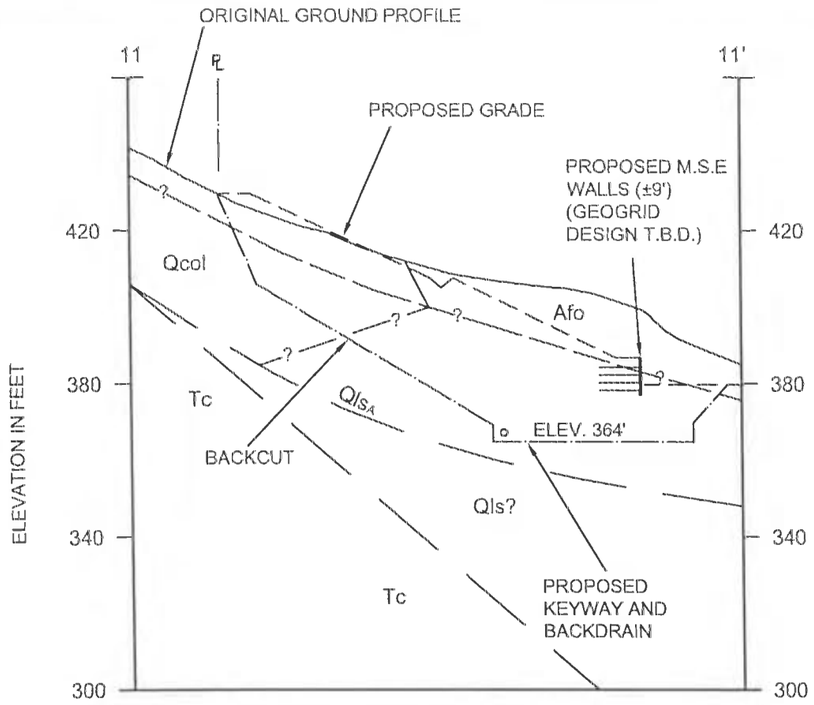

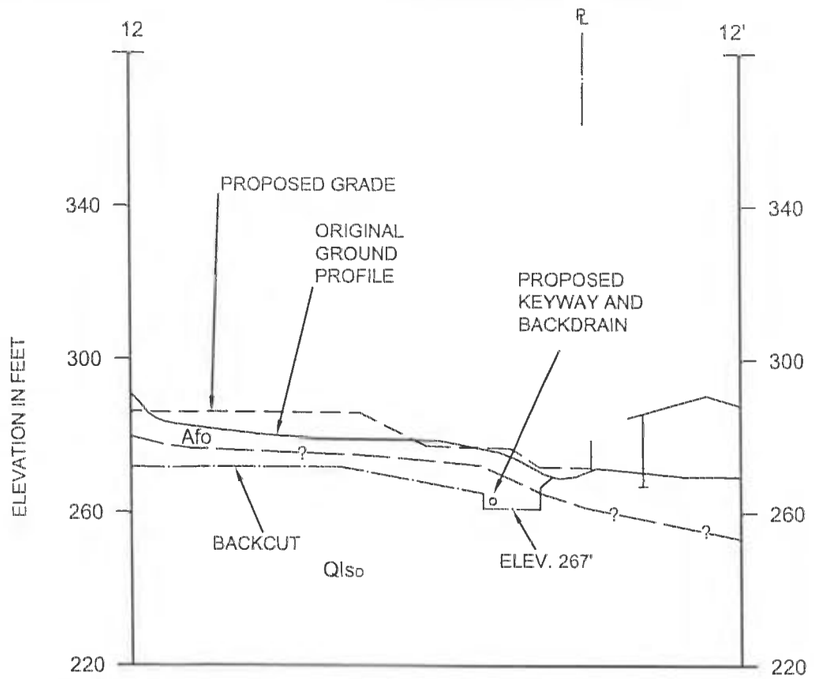

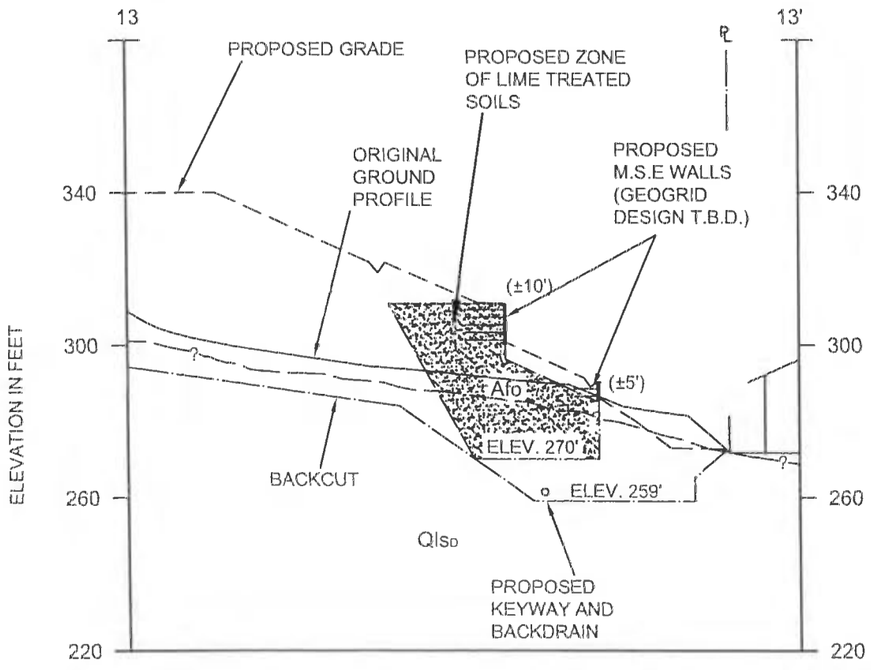

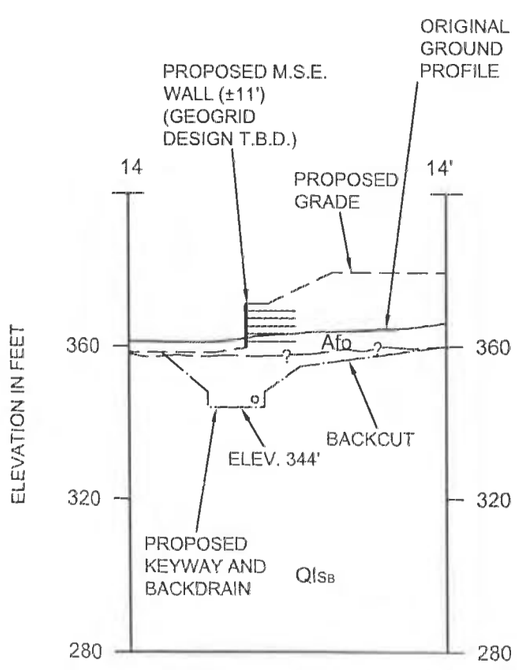

GEOTECHNICAL CROSS SECTIONS 11-14
TENTATIVE TRACT 17433,
LAGUNA NIGUEL, CALIFORNIA

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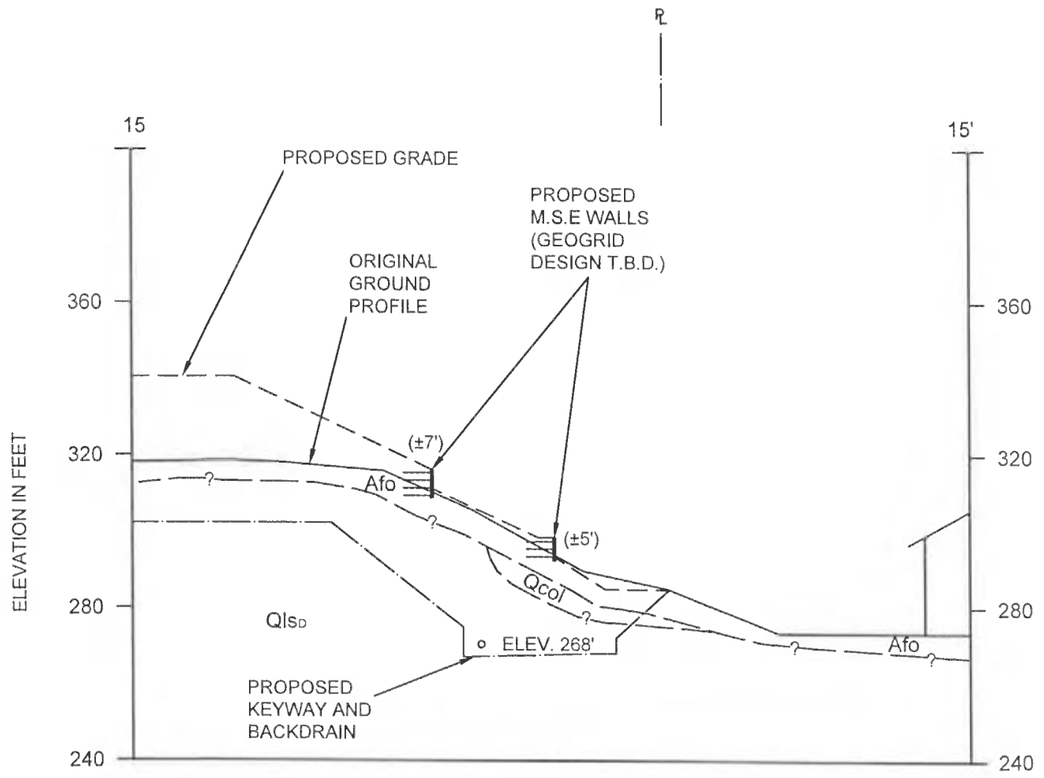
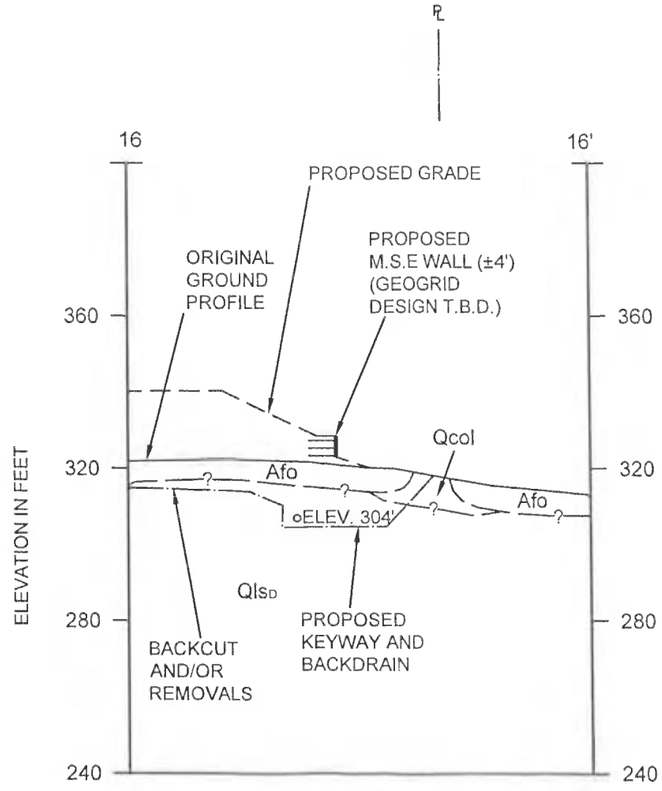
13662-05	APRIL 2015	5





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GEOTECHNICAL CROSS SECTIONS 15-16
TENTATIVE TRACT 17433,
LAGUNA NIGUEL, CALIFORNIA

JOB NO.:	DATE.	FIGURE NO.:
13662-05	APRIL 2015	6

APPENDIX A

CITY OF LAGUNA NIGUEL GEOTECHNICAL REVIEW SHEET DATED MARCH 20, 2015

CITY OF LAGUNA NIGUEL
30111 Crown Valley Parkway
Laguna Niguel, California 92677
Phone (949) 362-4300 | Fax (949) 362-4340

GEOTECHNICAL REVIEW SHEET

Reviewed by:

GMU GEOTECHNICAL, INC.
23241 Arroyo Vista
Rancho Santa Margarita, CA 92688
(949) 888-6513 · Fax: (949) 888-1380 · email: info@gmugeo.com

REFERENCE NO.: SP12-007 DATE: March 20, 2015

COMMENTS

1. Scope of Review: The report clearly indicates that this is a feasibility geotechnical investigation only, and that final design will be conducted at a later date. As a result, review comments are only focused on feasibility. Additional investigation, analysis, and review will be needed if final site design is pursued.
2. Due to the limited level of study and analysis, it cannot be definitively shown if the site can be constructed as currently planned while staying within the property boundaries.
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    b. Borings missing from map: SMC CPT-3, ICG BH-11
    c. Explanation states that the logs for "GB" borings are unavailable. If no useful data is available, shouldn't the borings be deleted from the map?
    d. Numerous borings are shown on map and missing in the Appendix. Please check and include missing boring logs, or delete borings from map if the data is unavailable.
4. Cross Section B-B': Given that the base of landslide and rupture surface have not been defined with certainty, please utilize larger search boxes throughout to evaluate shallower or steeper failure surfaces in the stability analyses. Larger search box is also needed near toe of failure surface in the stability analyses.
5. Cross Section C-C': Given that the base of landslide and rupture surface have not been defined with certainty, please utilize larger search boxes throughout to evaluate shallower or steeper failure surfaces in the stability analyses. Larger search box is also needed near toe of failure surface in the stability analyses.
6. Cross Section E-E': Given that the base of landslide and rupture surface have not been defined with certainty, please utilize larger search boxes to evaluate shallower or steeper failure surfaces in the stability analyses.
7. Cross sections D-D', E-E', and F-F': Landslide rupture surface does not match at intersection of D-D' and F-F'. Landslide rupture surface contacts don't match at intersection of D-D' and E-E'. Basal rupture surface on F-F' doesn't match or show on D-D'. Please revise cross sections to reconcile differences at intersection locations.

CITY OF LAGUNA NIGUEL
30111 Crown Valley Parkway
Laguna Niguel, California 92677
Phone (949) 362-4300 | Fax (949) 362-4340

GEOTECHNICAL REVIEW SHEET

Reviewed by:

GMU GEOTECHNICAL, INC.
23241 Arroyo Vista
Rancho Santa Margarita, CA 92688
(949) 888-6513 · Fax: (949) 888-1380 · email: info@gmugeo.com

REFERENCE NO.: SP12-007 DATE: March 20, 2015

8. Cross Section F-F': Please include stability analysis with translational failure and anisotropic soil properties.
9. Cross Section G-G': For temporary backcut analysis, please include stability analysis with translational failure and anisotropic soil properties.
10. Please show geologic structure in the Capistrano Formation located behind and below the landslide on all cross sections, and clarify corresponding bedding ranges and anisotropic properties used for each slope stability analysis.
11. Please justify pseudo-static strength for Capistrano Formation across bedding.
12. Cross Section 7-7': Please show storm capture module on cross section.
13. Cross Section 10-10': Plan shows Verdura Wall 24-ft high and section shows wall 34-ft high. Please revise.
14. Cross Section 13-13': Please verify stability and analyze failure surfaces through adjacent housing and properties to the north.
15. Cross Section 15-15': Please verify stability and analyze failure surfaces through adjacent housing and properties to the north.
16. Northern property line: Please discuss potential settlement induced by the proposed grading on the adjacent property and residences located to the north (i.e., near Cross Sections 13-13' and 15-15').
17. Temporary shoring: Please clarify feasibility and constructability of the planned shoring, and provide stability analyses to support your conclusion.
18. MSE Walls: Please clarify feasibility and stability of MSE walls and lime-treated soil backfill. Also provide representative stability analysis to substantiate conclusion on stability/feasibility.
19. Please provide additional discussion of the future groundwater monitoring and maintenance program, such as the specific requirements, methods, monitoring wells, frequency, durations, responsible party, etc.

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REFERENCE NO.: SP12-007 DATE: March 20, 2015

REVIEWED BY:

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Aron R. Taylor, CEG 2455
Principal Geologist

DISTRIBUTION: Mr. Jonathan Orduna, City of Laguna Niguel
Mr. Jeff Gibson, City of Laguna Niguel
Mr. Russell Lamb, Stoney-Miller Consultants, Inc.
Mr. David Shieh, Euland Capital Enterprises, LLC

APPENDIX B

EXPLORATION DATA

CONE PENETRATION TEST

SOUNDING : CPT-3
PROJECT : SM/HOME DEPOT
LOCATION : LAGUNA NIGUEL
DATE : 12-12-1990

PROJECT NO : 9110-05302
INSTRUMENT : F15CKE096
SYSTEM : T1/S3
OPERATOR : MS/MR

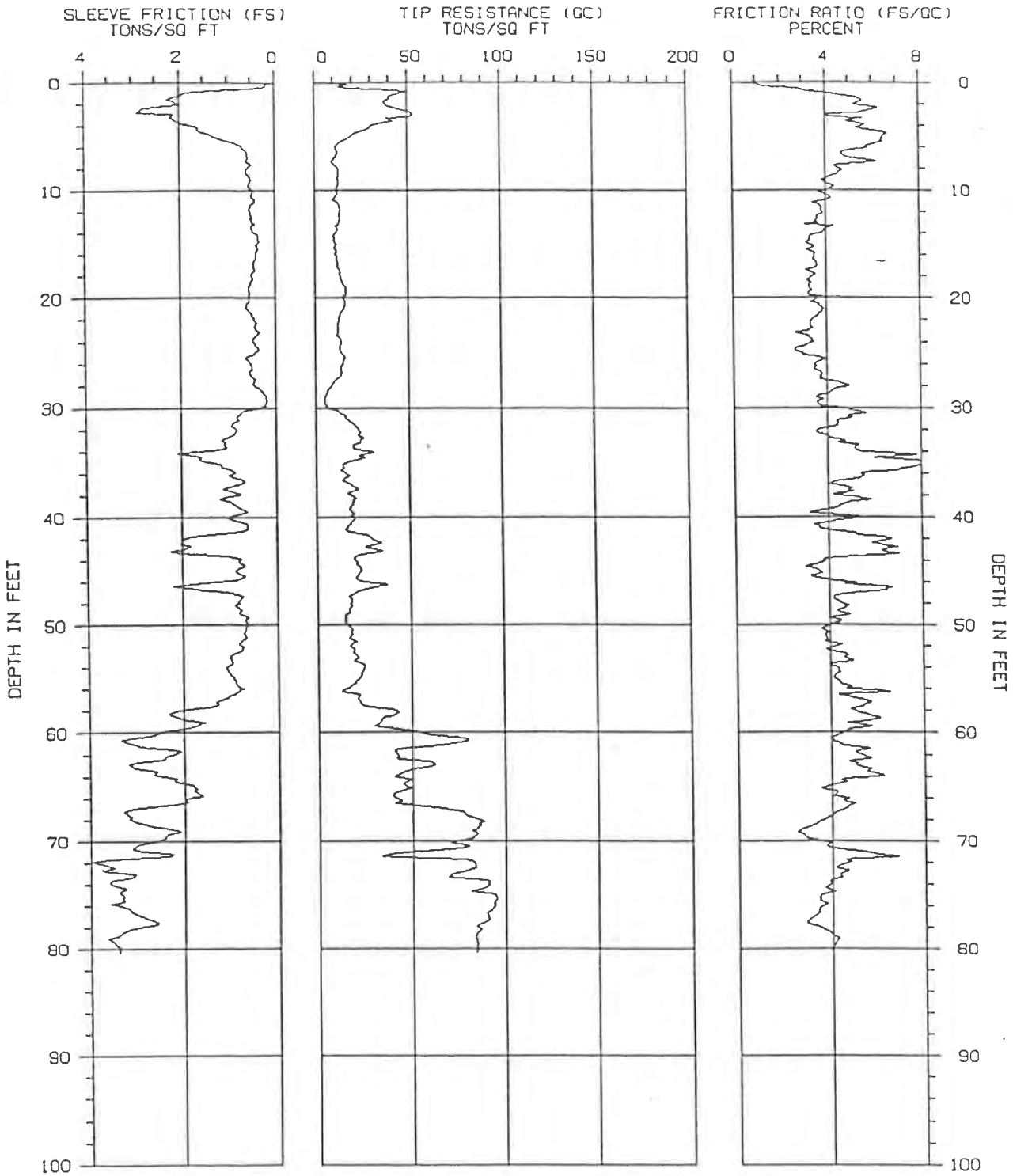
DEPTH (ft)	TIP RESISTANCE (tsf)	SLEEVE FRICTION (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)
.0	.0	.00	.00	NA
1.0	49.0	1.84	3.76	NA
2.0	38.6	2.03	5.26	NA
3.0	52.7	2.12	4.02	NA
4.0	31.1	1.76	5.67	NA
5.0	19.8	1.28	6.47	NA
6.0	11.8	.68	5.75	NA
7.0	11.0	.56	5.09	NA
8.0	12.8	.58	4.55	NA
9.0	12.8	.49	3.84	NA
10.0	11.6	.46	3.99	NA
11.0	11.2	.42	3.73	NA
12.0	13.5	.52	3.83	NA
13.0	13.1	.48	3.63	NA
14.0	11.3	.43	3.82	NA
15.0	11.6	.38	3.23	NA
16.0	11.5	.40	3.48	NA
17.0	12.5	.45	3.59	NA
18.0	13.8	.48	3.45	NA
19.0	16.9	.55	3.27	NA
20.0	15.3	.55	3.56	NA
21.0	15.7	.60	3.85	NA
22.0	12.9	.43	3.37	NA
23.0	12.5	.40	3.20	NA
24.0	13.9	.47	3.41	NA
25.0	14.2	.41	2.92	NA
26.0	15.0	.52	3.46	NA
27.0	14.1	.53	3.77	NA
28.0	9.0	.44	4.94	NA
29.0	5.7	.20	3.56	NA
30.0	6.5	.31	4.76	NA
31.0	16.4	.81	4.92	NA
32.0	23.0	.82	3.56	NA
33.0	24.2	1.13	4.66	NA
34.0	29.7	1.65	5.56	NA
35.0	17.4	1.45	8.29	NA
36.0	16.4	.89	5.43	NA
37.0	18.3	.75	4.10	NA
38.0	18.5	.79	4.25	NA
39.0	19.0	.86	4.50	NA
40.0	20.4	1.01	4.94	NA

NA = NOT APPLICABLE

SOUNDING : CPT-3

DEPTH (ft)	TIP RESISTANCE (tsf)	SLEEVE FRICTION (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)
41.0	16.4	.59	3.60	NA
42.0	29.4	1.96	6.66	NA
43.0	33.4	2.10	6.29	NA
44.0	20.7	.79	3.83	NA
45.0	23.8	.86	3.61	NA
46.0	26.0	1.29	4.98	NA
47.0	20.1	.98	4.88	NA
48.0	17.8	.80	4.50	NA
49.0	16.0	.78	4.87	NA
50.0	15.7	.62	3.97	NA
51.0	17.7	.68	3.84	NA
52.0	17.5	.75	4.30	NA
53.0	21.9	1.01	4.60	NA
54.0	25.1	1.09	4.32	NA
55.0	22.5	.94	4.17	NA
56.0	15.6	.73	4.66	NA
57.0	21.8	1.20	5.51	NA
58.0	41.6	2.08	5.01	NA
59.0	33.3	1.71	5.12	NA
60.0	54.7	2.49	4.55	NA
61.0	71.4	3.14	4.39	NA
62.0	42.3	2.26	5.34	NA
63.0	62.3	3.12	5.01	NA
64.0	40.8	2.41	5.90	NA
65.0	47.9	1.80	3.75	NA
66.0	41.2	1.94	4.72	NA
67.0	66.5	3.05	4.58	NA
68.0	86.1	3.13	3.63	NA
69.0	83.1	2.20	2.65	NA
70.0	74.5	2.54	3.41	NA
71.0	55.3	2.89	5.23	NA
72.0	83.2	3.91	4.70	NA
73.0	74.5	3.31	4.44	NA
74.0	90.6	3.54	3.91	NA
75.0	93.4	3.32	3.56	NA
76.0	93.7	3.37	3.60	NA
77.0	90.7	2.89	3.19	NA
78.0	85.2	2.96	3.47	NA
79.0	84.2	3.60	4.28	NA
80.0	85.0	3.37	3.97	NA

NA = NOT APPLICABLE



CONE PENETRATION TEST — SOUNDING NUMBER: CPT-3

PROJECT NAME	: SM/HOME DEPOT	LOCATION : LAGUNA NIGUEL	THE EARTH TECHNOLOGY CORPORATION
PROJECT NUMBER	: 9110-05302	DATE : 12-12-1990	

FIGURE B-69

CPT INTERPRETATIONS

SOUNDING : CPT-3
PROJECT : SM/HOME DEPOT
LOCATION : LAGUNA NIGUEL
DATE : 12-12-1990

PROJECT NO : 9110-05302
INSTRUMENT : F15CKE096
SYSTEM : T1/S3
OPERATOR : MS/MR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00					
.5	35.8	1.91	SILTY SAND to SANDY SILT	10-15	40-50		31-35
1.0	109.8	3.76	*CLAYEY SAND to SANDY CLAY	>40			
1.5	83.8	5.44	*SANDY CLAY to SILTY CLAY	>40		1.35	
2.0	74.8	5.26	*SANDY CLAY to SILTY CLAY	>40		1.28	
2.5	82.6	6.18	*SANDY CLAY to SILTY CLAY	>40		1.49	
3.0	93.0	4.02	*CLAYEY SAND to SANDY CLAY	>40			
3.5	68.5	5.22	*SANDY CLAY to SILTY CLAY	>40		1.34	
4.0	51.0	5.67	*SANDY CLAY to SILTY CLAY	>40		1.03	
4.5	42.4	6.05	*SANDY CLAY to SILTY CLAY	>40		.88	
5.0	30.5	6.47	*SANDY CLAY to SILTY CLAY	25-40		.65	
5.5	21.8	6.45	*SANDY CLAY to SILTY CLAY	20-25		.47	
6.0	17.2	5.75	SILTY CLAY to CLAY	15-20		.76	
6.5	17.6	4.70	CLAYEY SILT to SILTY CLAY	10-15		.80	
7.0	15.4	5.09	CLAYEY SILT to SILTY CLAY	10-15		.71	
7.5	13.6	5.41	SILTY CLAY to CLAY	10-15		.63	
8.0	17.1	4.55	CLAYEY SILT to SILTY CLAY	10-15		.82	
8.5	16.9	4.55	CLAYEY SILT to SILTY CLAY	10-15		.83	
9.0	16.5	3.84	CLAYEY SILT to SILTY CLAY	5-10		.82	
9.5	16.3	4.25	CLAYEY SILT to SILTY CLAY	10-15		.83	
10.0	14.4	3.99	CLAYEY SILT to SILTY CLAY	5-10		.73	
10.5	14.5	4.06	CLAYEY SILT to SILTY CLAY	5-10		.76	
11.0	13.5	3.73	CLAYEY SILT to SILTY CLAY	5-10		.71	
11.5	15.9	3.76	CLAYEY SILT to SILTY CLAY	5-10		.85	
12.0	15.7	3.83	CLAYEY SILT to SILTY CLAY	5-10		.86	
12.5	15.6	3.62	CLAYEY SILT to SILTY CLAY	5-10		.86	
13.0	14.8	3.63	CLAYEY SILT to SILTY CLAY	5-10		.83	
13.5	13.2	4.17	CLAYEY SILT to SILTY CLAY	5-10		.74	
14.0	12.4	3.82	CLAYEY SILT to SILTY CLAY	5-10		.70	
14.5	11.3	3.27	SILTY CLAY to CLAY	1-5		.64	
15.0	12.4	3.23	CLAYEY SILT to SILTY CLAY	5-10		.72	
15.5	12.0	3.18	CLAYEY SILT to SILTY CLAY	5-10		.70	
16.0	12.0	3.48	CLAYEY SILT to SILTY CLAY	5-10		.71	
16.5	12.3	3.50	CLAYEY SILT to SILTY CLAY	5-10		.74	
17.0	12.6	3.59	CLAYEY SILT to SILTY CLAY	5-10		.77	
17.5	13.5	3.18	CLAYEY SILT to SILTY CLAY	5-10		.84	
18.0	13.6	3.45	CLAYEY SILT to SILTY CLAY	5-10		.85	
18.5	14.7	3.33	CLAYEY SILT to SILTY CLAY	5-10		.93	
19.0	16.5	3.27	CLAYEY SILT to SILTY CLAY	5-10		1.05	
19.5	16.2	3.20	SANDY SILT to CLAYEY SILT	5-10	50-60		
20.0	14.8	3.56	CLAYEY SILT to SILTY CLAY	5-10		.95	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-3

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	15.5	3.67	CLAYEY SILT to SILTY CLAY	5-10		1.00	
21.0	14.9	3.85	CLAYEY SILT to SILTY CLAY	5-10		.96	
21.5	13.0	3.64	CLAYEY SILT to SILTY CLAY	5-10		.83	
22.0	12.2	3.37	CLAYEY SILT to SILTY CLAY	5-10		.78	
22.5	11.8	3.28	CLAYEY SILT to SILTY CLAY	5-10		.75	
23.0	11.6	3.20	SILTY CLAY to CLAY	1-5		.74	
23.5	11.3	3.27	SILTY CLAY to CLAY	1-5		.72	
24.0	12.8	3.41	CLAYEY SILT to SILTY CLAY	5-10		.83	
24.5	12.6	2.67	SANDY SILT to CLAYEY SILT	1-5	30-40		
25.0	12.9	2.92	SANDY SILT to CLAYEY SILT	5-10	40-50		
25.5	14.7	3.80	CLAYEY SILT to SILTY CLAY	5-10		.98	
26.0	13.6	3.46	CLAYEY SILT to SILTY CLAY	5-10		.90	
26.5	12.5	3.44	CLAYEY SILT to SILTY CLAY	5-10		.82	
27.0	12.6	3.77	CLAYEY SILT to SILTY CLAY	5-10		.84	
27.5	10.3	3.71	CLAYEY SILT to SILTY CLAY	1-5		.66	
28.0	7.9	4.94	SILTY CLAY to CLAY	5-10		.49	
28.5	6.0	4.16	SILTY CLAY to CLAY	1-5		.35	
29.0	5.0	3.56	SILTY CLAY to CLAY	1-5		.27	
29.5	4.4	3.58	SILTY CLAY to CLAY	1-5		.23	
30.0	5.7	4.76	SILTY CLAY to CLAY	1-5		.32	
30.5	11.3	5.65	SILTY CLAY to CLAY	5-10		.75	
31.0	14.2	4.92	CLAYEY SILT to SILTY CLAY	10-15		.98	
31.5	17.4	4.43	CLAYEY SILT to SILTY CLAY	10-15		1.23	
32.0	19.6	3.56	CLAYEY SILT to SILTY CLAY	10-15		1.41	
32.5	19.3	3.87	CLAYEY SILT to SILTY CLAY	10-15		1.39	
33.0	20.4	4.66	CLAYEY SILT to SILTY CLAY	15-20		1.49	
33.5	17.2	5.22	SILTY CLAY to CLAY	10-15		1.23	
34.0	24.8	5.56	SILTY CLAY to CLAY	25-40		1.85	
34.5	21.0	6.29	SILTY CLAY to CLAY	20-25		1.55	
35.0	14.5	8.29	CLAY to ORGANIC CLAY	15-20		1.03	
35.5	12.6	7.14	SILTY CLAY to CLAY	10-15		.88	
36.0	13.5	5.43	SILTY CLAY to CLAY	10-15		.96	
36.5	12.4	5.30	SILTY CLAY to CLAY	5-10		.87	
37.0	14.9	4.10	CLAYEY SILT to SILTY CLAY	5-10		1.08	
37.5	18.0	4.84	CLAYEY SILT to SILTY CLAY	10-15		1.34	
38.0	14.9	4.25	CLAYEY SILT to SILTY CLAY	5-10		1.09	
38.5	16.0	5.63	SILTY CLAY to CLAY	10-15		1.18	
39.0	15.2	4.50	CLAYEY SILT to SILTY CLAY	10-15		1.12	
39.5	15.1	3.25	CLAYEY SILT to SILTY CLAY	5-10		1.12	
40.0	16.2	4.94	CLAYEY SILT to SILTY CLAY	10-15		1.21	
40.5	14.5	4.01	CLAYEY SILT to SILTY CLAY	5-10		1.07	
41.0	12.9	3.60	CLAYEY SILT to SILTY CLAY	5-10		.94	
41.5	17.6	5.15	CLAYEY SILT to SILTY CLAY	10-15		1.35	
42.0	22.9	6.66	*SANDY CLAY to SILTY CLAY	25-40		.90	
42.5	25.5	6.14	*SANDY CLAY to SILTY CLAY	25-40		1.01	
43.0	25.8	6.29	*SANDY CLAY to SILTY CLAY	25-40		1.03	
43.5	17.1	6.02	SILTY CLAY to CLAY	15-20		1.31	
44.0	15.8	3.83	CLAYEY SILT to SILTY CLAY	5-10		1.21	
44.5	16.7	3.15	SANDY SILT to CLAYEY SILT	5-10	50-60		
45.0	18.0	3.61	CLAYEY SILT to SILTY CLAY	5-10		1.41	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-3

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	16.0	3.27	CLAYEY SILT to SILTY CLAY	5-10		1.24	
46.0	19.5	4.98	CLAYEY SILT to SILTY CLAY	15-20		1.55	
46.5	23.3	6.67	*SANDY CLAY to SILTY CLAY	25-40		.95	
47.0	15.0	4.88	CLAYEY SILT to SILTY CLAY	10-15		1.16	
47.5	13.2	4.19	CLAYEY SILT to SILTY CLAY	5-10		1.00	
48.0	13.2	4.50	CLAYEY SILT to SILTY CLAY	5-10		1.00	
48.5	12.7	4.57	CLAYEY SILT to SILTY CLAY	5-10		.97	
49.0	11.7	4.87	CLAYEY SILT to SILTY CLAY	5-10		.88	
49.5	11.2	4.40	CLAYEY SILT to SILTY CLAY	5-10		.83	
50.0	11.4	3.97	CLAYEY SILT to SILTY CLAY	5-10		.86	
50.5	13.2	3.78	CLAYEY SILT to SILTY CLAY	5-10		1.02	
51.0	12.8	3.84	CLAYEY SILT to SILTY CLAY	5-10		.99	
51.5	14.3	3.79	CLAYEY SILT to SILTY CLAY	5-10		1.13	
52.0	12.5	4.30	CLAYEY SILT to SILTY CLAY	5-10		.97	
52.5	13.7	4.42	CLAYEY SILT to SILTY CLAY	5-10		1.08	
53.0	15.5	4.60	CLAYEY SILT to SILTY CLAY	10-15		1.25	
53.5	14.9	4.50	CLAYEY SILT to SILTY CLAY	10-15		1.20	
54.0	17.7	4.32	CLAYEY SILT to SILTY CLAY	10-15		1.47	
54.5	16.6	4.31	CLAYEY SILT to SILTY CLAY	10-15		1.37	
55.0	15.7	4.17	CLAYEY SILT to SILTY CLAY	5-10		1.29	
55.5	14.0	4.40	CLAYEY SILT to SILTY CLAY	5-10		1.13	
56.0	10.8	4.66	CLAYEY SILT to SILTY CLAY	5-10		.82	
56.5	15.3	4.34	CLAYEY SILT to SILTY CLAY	5-10		1.26	
57.0	14.9	5.51	SILTY CLAY to CLAY	10-15		1.23	
57.5	15.9	5.42	SILTY CLAY to CLAY	10-15		1.33	
58.0	28.3	5.01	CLAYEY SILT to SILTY CLAY	25-40		2.55	
58.5	25.2	5.85	*SANDY CLAY to SILTY CLAY	25-40		1.13	
59.0	22.5	5.12	CLAYEY SILT to SILTY CLAY	20-25		2.00	
59.5	21.9	5.59	SILTY CLAY to CLAY	20-25		1.94	
60.0	36.6	4.55	*SANDY CLAY to SILTY CLAY	25-40		1.71	
60.5	51.9	3.97	*CLAYEY SAND to SANDY CLAY	>40	90-100		27-31
61.0	47.5	4.39	*SANDY CLAY to SILTY CLAY	>40		2.26	
61.5	28.7	5.64	*SANDY CLAY to SILTY CLAY	25-40		1.33	
62.0	27.9	5.34	*SANDY CLAY to SILTY CLAY	25-40		1.29	
62.5	33.0	4.99	*SANDY CLAY to SILTY CLAY	25-40		1.55	
63.0	40.8	5.01	*SANDY CLAY to SILTY CLAY	>40		1.96	
63.5	31.3	5.57	*SANDY CLAY to SILTY CLAY	25-40		1.48	
64.0	26.5	5.90	*SANDY CLAY to SILTY CLAY	25-40		1.24	
64.5	30.3	4.61	CLAYEY SILT to SILTY CLAY	25-40		2.88	
65.0	30.8	3.75	CLAYEY SILT to SILTY CLAY	20-25		2.95	
65.5	26.7	4.23	CLAYEY SILT to SILTY CLAY	20-25		2.53	
66.0	26.3	4.72	CLAYEY SILT to SILTY CLAY	20-25		2.49	
66.5	25.8	4.98	CLAYEY SILT to SILTY CLAY	20-25		2.45	
67.0	42.2	4.58	*SANDY CLAY to SILTY CLAY	25-40		2.09	
67.5	49.5	4.07	*SANDY CLAY to SILTY CLAY	>40	90-100	2.48	27-31
68.0	54.2	3.63	SANDY SILT to CLAYEY SILT	>40	90-100		27-31
68.5	54.1	3.19	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
69.0	51.8	2.65	SANDY SILT to CLAYEY SILT	25-40	60-70		31-35
69.5	52.2	2.83	SANDY SILT to CLAYEY SILT	25-40	70-80		31-35
70.0	46.2	3.41	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-3

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	49.6	3.75	SANDY SILT to CLAYEY SILT	25-40	90-100	-	27-31
71.0	34.0	5.23	*SANDY CLAY to SILTY CLAY	25-40		1.71	
71.5	25.1	6.57	*SANDY CLAY to SILTY CLAY	25-40		1.23	
72.0	50.7	4.70	*SANDY CLAY to SILTY CLAY	>40		2.63	
72.5	51.0	4.15	*SANDY CLAY to SILTY CLAY	>40		2.66	
73.0	45.1	4.44	*SANDY CLAY to SILTY CLAY	>40		2.34	
73.5	49.6	4.10	*SANDY CLAY to SILTY CLAY	>40		2.60	27-31
74.0	54.4	3.91	*CLAYEY SAND to SANDY CLAY	>40	90-100		27-31
74.5	51.4	3.76	SANDY SILT to CLAYEY SILT	>40	90-100		27-31
75.0	55.7	3.56	SANDY SILT to CLAYEY SILT	>40	90-100		27-31
75.5	56.0	3.45	SANDY SILT to CLAYEY SILT	>40	80-90		27-31
76.0	55.4	3.60	SANDY SILT to CLAYEY SILT	>40	90-100		27-31
76.5	54.4	3.40	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
77.0	53.3	3.19	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
77.5	52.1	2.90	SANDY SILT to CLAYEY SILT	25-40	70-80		31-35
78.0	49.6	3.47	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
78.5	49.5	3.87	SANDY SILT to CLAYEY SILT	25-40	90-100		27-31
79.0	48.7	4.28	*SANDY CLAY to SILTY CLAY	>40		2.65	
79.5	49.0	4.07	*SANDY CLAY to SILTY CLAY	>40	90-100	2.68	27-31
80.0	48.8	3.97	SANDY SILT to CLAYEY SILT	>40	90-100		27-31

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Date(s) Logged: 10/21/2004
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-Inches
Weight(s): 400 lbs.

BORING NO.: SMC RW-1

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
0			NO SAMPLES UNTIL 150 FEET				**ENGINEERED FILL** - Clayey SILT/Silty CLAY; medium stiff, damp to moist, olive-gray and mottled by abundant bedrock fragments.		0
1									1
2									2
3									3
4									4
5									5
6									6
7									7
8									8
9									9
10									10
11									11
12									12
13									13
14									14
15									15
16									16
17									17
18									18
19									19
20									20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30
31									31
32									32
33									33
34									34
35									35
36									36
37									37
38									38
39									39
40									40

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.1

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	BORING NO.: SMC RW-1 Continued Description	Geologic Attitudes	Depth (feet)
40							LANDSLIDE DEBRIS - Clayey SILTSTONE/SILTSTONE; moderately hard, damp to very moist, dark gray to olive-gray, massive to slightly fissile.		40
41									41
42									42
43									43
44									44
45									45
46									46
47									47
48									48
49									49
50									50
51									51
52									52
53									53
54									54
55									55
56									56
57									57
58									58
59									59
60									60
61									61
62									62
63									63
64									64
65									65
66									66
67									67
68									68
69									69
70									70
71									71
72									72
73									73
74									74
75									75
76									76
77									77
78									78
79									79
80									80

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.2

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	BORING NO.: SMC RW-1 Continued Description	Geologic Attitudes	Depth (feet)
80							LANDSLIDE DEBRIS continued		80
81									81
82									82
83									83
84									84
85									85
86									86
87									87
88									88
89									89
90									90
91									91
92									92
93									93
94									94
95									95
96									96
97									97
98									98
99									99
100									100
101									101
102									102
103									103
104									104
105									105
106									106
107									107
108									108
109									109
110									110
111									111
112									112
113									113
114									114
115									115
116									116
117									117
118									118
119									119
120									120

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.3

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	BORING NO.: SMC RW-1 Continued Description	Geologic Attitudes	Depth (feet)
120							LANDSLIDE DEBRIS continued		120
121									121
122									122
123									123
124									124
125									125
126									126
127									127
128									128
129									129
130									130
131									131
132									132
133									133
134									134
135									135
136									136
137									137
138									138
139									139
140									140
141									141
142									142
143									143
144									144
145									145
146									146
147									147
148									148
149									149
150		75-10"	X	/	31.2	87.6	@150': Clayey SILTSTONE; moderately hard to hard, very moist, dark olive-gray and unoxidized, diatomaceous, slightly to weakly fissile.		150
151									151
152									152
153									153
154									154
155									155
156									156
157									157
158									158
159									159
160									160

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.4

Date(s) Logged: 10/21/04
Logged By: JPH
LOCATION: Lot 3, Tract 5241
Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

BORING NO.: SMC RW-1 Continued

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
160							**LANDSLIDE DEBRIS continued**		160
161		35	X	X	25.2	95.8	**@160':** Clayey SILTSTONE; moderately hard, very moist, dark olive-gray, massive, slightly micaceous, possible remolded shear zone, highly plastic clay.		161
162									162
163									163
164									164
165									165
166									166
167									167
168									168
169									169
170									170
171		40	X	X	31.9	89.9	**@170':** Clayey SILTSTONE; moderately hard, very moist, dark olive-gray and unoxidized, diatomaceous, massive to slightly fissile.		171
172									172
173									173
174									174
175									175
176									176
177									177
178									178
179									179
180									180
181		60	X	X	25.6	94.7	**@180':** Clayey SILTSTONE; hard, moist, dark olive-gray and unoxidized, massive to slightly fissile, diatomaceous.		181
182									182
183									183
184									184
185									185
186							**@185-186.5':** Concretionary zone.		186
187									187
188									188
189									189
190									190
191		45	X	X	21.6	105.3	**@190':** Clayey SILTSTONE; moderately hard, very moist, dark olive-gray and unoxidized, massive, slightly diatomaceous.		191
192									192
193									193
194									194
195									195
196							**@195-200':** Drill chatter on concretionary fragments.		196
197									197
198									198
199									199
200									200

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.5

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

BORING NO.: SMC RW-1
Continued

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
200							**LANDSLIDE DEBRIS continued**		200
201		50	X		27.1	93.9	**@200':** SILTSTONE/Clayey SILTSTONE; moderately hard, moist, dark olive-gray, massive, slightly diatomaceous.		201
202									202
203									203
204									204
205									205
206									206
207									207
208									208
209									209
210									210
211		70	X		28.0	93.0	**@210':** Clayey SILTSTONE; moderately hard to hard, moist, dark olive-gray and unoxidized, massive, diatomaceous, fossiliferous (fish and clam shells).		211
212									212
213									213
214									214
215									215
216									216
217									217
218									218
219									219
220	?								220
221		60	X		22.9	98.8	**@220':** **BEDROCK: Capistrano Formation** - SILTSTONE/ Clayey SILTSTONE; moderately hard to hard, moist, dark olive-gray, massive to slightly fissile, slightly diatomaceous.		221
222									222
223									223
224									224
225									225
226									226
227							**@226-231':** Concretionary lense, very hard.		227
228									228
229									229
230									230
231									231
232		75-8"	X		17.4	105.1	**@231':** SILTSTONE with concretionary fragments; hard, moist, dark olive-gray, massive.		232
233									233
234									234
235									235
236									236
237									237
238									238
239									239
240									240

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.6

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	BORING NO.: SMC RW-1 Continued Description	Geologic Attitudes	Depth (feet)
240							**BEDROCK: Capistrano Formation continued**		240
241									241
242									242
243									243
244									244
245									245
246									246
247									247
248									248
249									249
250									250
251		75-9"	X	X	33.9	85.4	@250': Clayey SILTSTONE; hard, moist, dark olive-gray, massive to slightly fissile.		251
252							**TOTAL DEPTH 250.8'**		252
253							Boring backfilled with cement-bentonite plug.		253
254									254
255									255
256									256
257									257
258									258
259									259
260									260
261									261
262									262
263									263
264									264
265									265
266									266
267									267
268									268
269									269
270									270
271									271
272									272
273									273
274									274
275									275
276									276
277									277
278									278
279									279
280									280

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.7

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 7 Elevation: 417± Drill Date: 11/17/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
		FILL: Silty Clay; mottled dark brown and light brown; dry to 1.0 foot; moist below; stiff.							
5		SLIDE DEBRIS: Silty Clay; dark brown to brown; damp to moist; stiff. (Infill)							
10									
15									
20									
		Weathered Siltstone; light brown with iron oxide staining; highly fractured. (Capistrano Formation)							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 7 Cont'd. Elevation: 417± Drill Date: 11/17/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	Sample: CORE	Sample: BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
		SLIDE DEBRIS - Cont'd.							
30									
		0.5" to 1.0" discontinuous sand layer: N20E 12NW.							
35									
40									
45		Fractured Siliceous Zone; irregular; striking approximately N60E 12NW. Sand layer; fine grained; white; iron oxide staining: N15W 55W.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 7 Cont'd. Elevation: 417± Drill Date: 11/17/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SILTY SANDSTONE: Moist to wet; light gray.							
55		Seepage; becomes very highly disturbed with siliceous nodule on south side. SLIDE PLANE: N70W 72NW; grooves with slickensides that trenc N30E.							
60		Highly fractured.							
65		Gypsum filled fracture: N20E 25NW. Grades to darker gray (unoxidized); many gypsum filled fractures.							
70		6" sand layer; fine grained: N15E 8NW.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 7 Cont'd. Elevation: 417± Drill Date: 11/17/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.							
80									
		SILTSTONE: Dark gray; moist; dense; unfractured.							
85									
90									
95		Sand layer; fine grained; N10E 7NW.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 7 Cont'd. Elevation: 417± Drill Date: 11/17/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	Sample CORE	Sample BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
		SLIDE DEBRIS - Cont'd.							
105									
110									
115									
120									

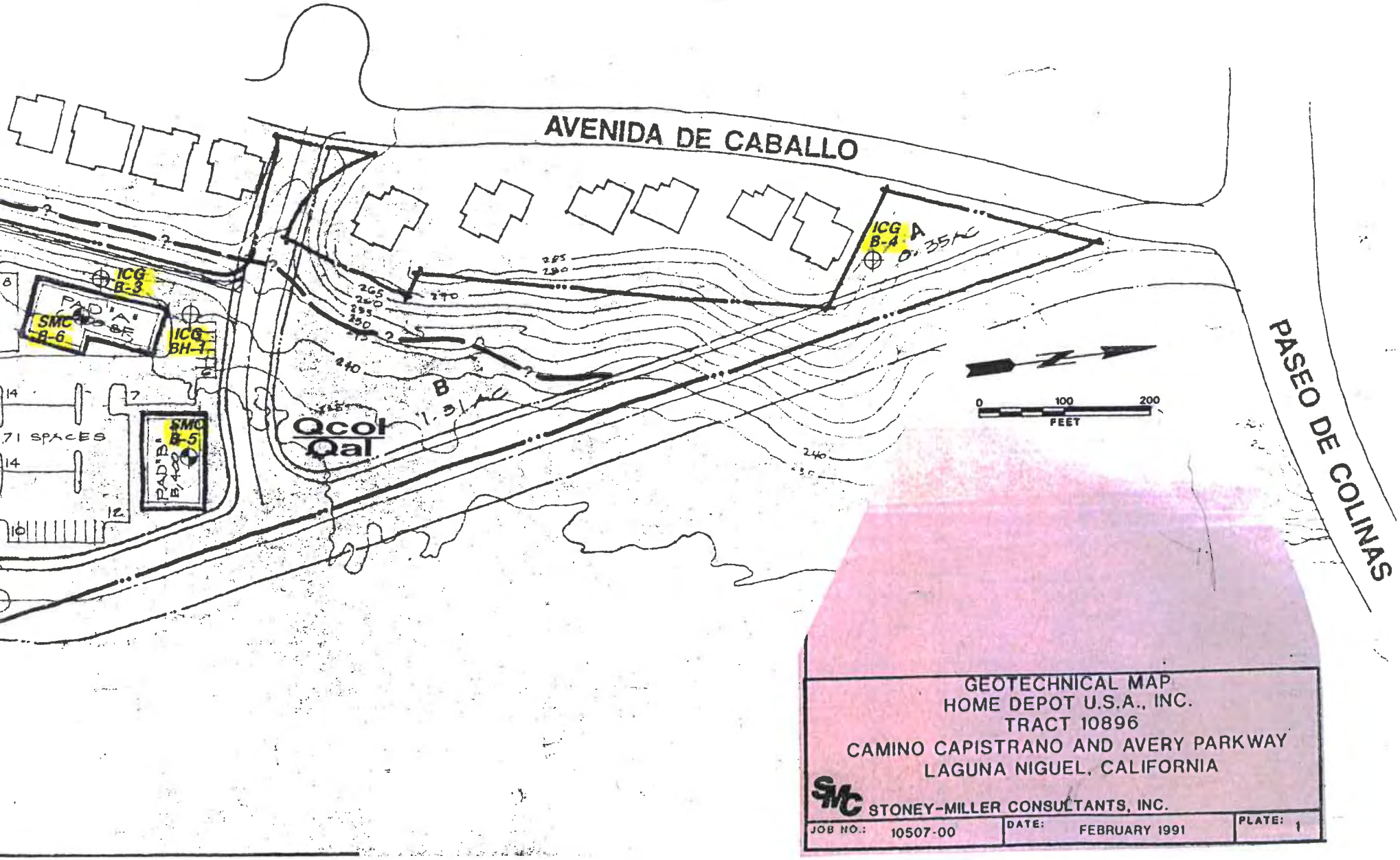
BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 7 Cont'd. Elevation: 417± Drill Date: 11/17/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	Dry Density Lbs/Cu.ft.	Moisture %	Relative Comp. — %
		SLIDE PLANE: N-S 50E; grooves and slicks down-dip. (Attitude of top of plane dips 47°E).					
130		SLIDE PLANE: N10E 48SE; grooves and slicks downdip. (Attitude of top of plane dips 45°E). At 130.0 feet: Slide Plane: N10E 48SE.					
		BEDROCK: Siltstone; dark gray.					
		2-inch sand layer; seepage: N5E 7NW. Below sand layer is siltstone; dark gray; unfractured; dense.					
135		Total Depth of Hole - 134.0 feet No Caving Water Level at 131.0 feet - 11/18/88					
140							



GEOTECHNICAL MAP
HOME DEPOT U.S.A., INC.
TRACT 10896
CAMINO CAPISTRANO AND AVERY PARKWAY
LAGUNA NIGUEL, CALIFORNIA

SMC STONEY-MILLER CONSULTANTS, INC.

JOB NO.:	DATE:	PLATE:
10507-00	FEBRUARY 1991	1

APPENDIX C

STRENGTH PROPERTIES

APPENDIX C

STRENGTH PROPERTIES

We have reviewed the historic laboratory testing of bedrock materials from the site and found very few tests that were identified from the Capistrano Formation bedrock materials. The next best material would be that identified as block landslide materials comprised of Capistrano Formation materials from the site. This information is compiled in Table C-1 and Figure C-1, which appear to be consistent with each other.

The Atterberg limits testing and grain-size data in Table C-1 indicates an average ball-mill adjusted liquid limit and clay fraction of 80 and 11, respectively. Using Figure C-2 (Stark, et al., 2005) indicates a fully softened friction angle of 27.5 to 31 degrees (average 29 degrees) for the Capistrano material.

Shear strengths used for cross-bedding in Capistrano materials are:

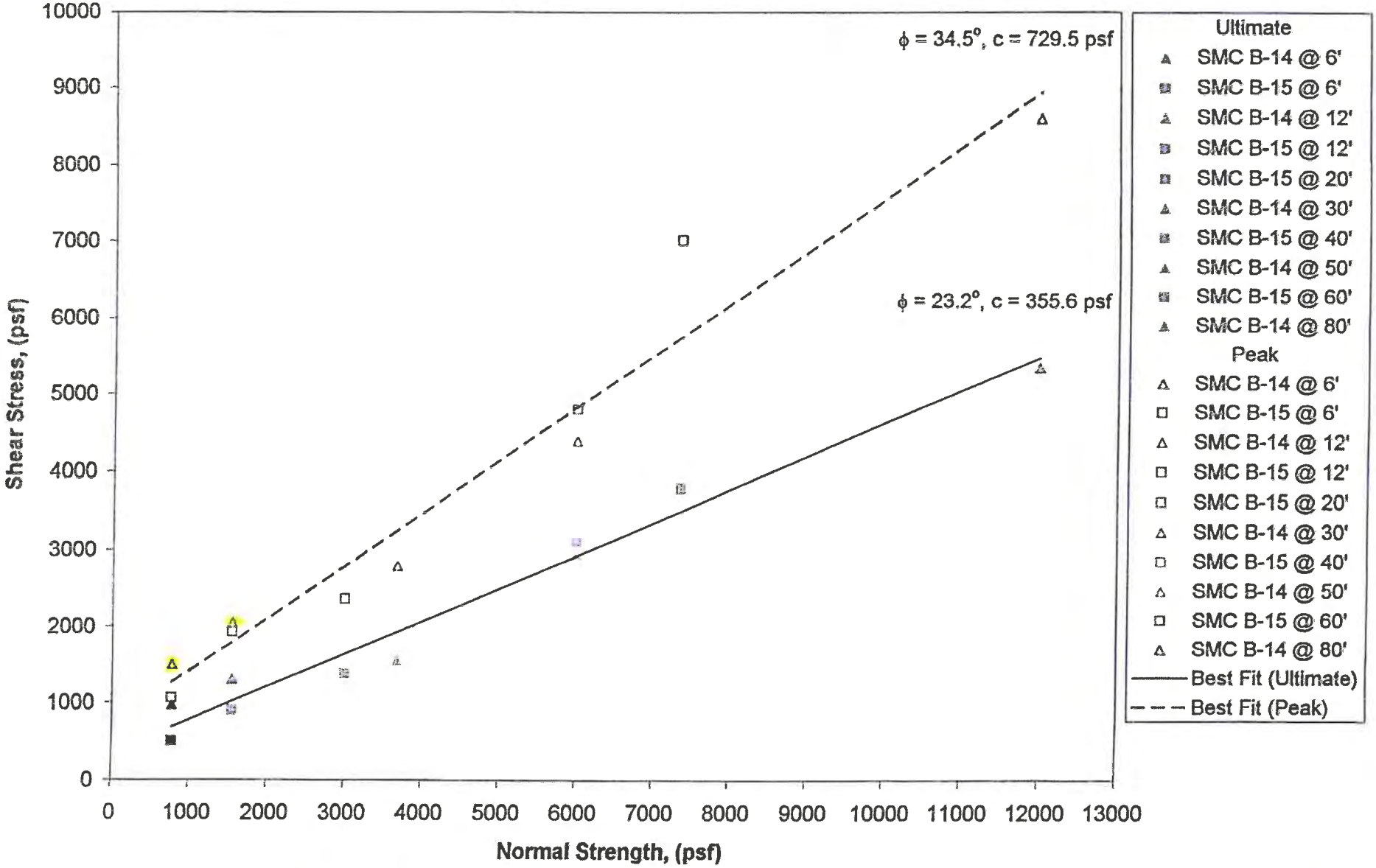
Load Condition	Cohesion (psf)	Friction Angle (degrees)
Static	750	29
Pseudostatic	1125	31

The friction angle used for both the static and pseudostatic material strengths are consistent with the fully softened friction angle correlation of Stark, et al. The static strength for the Capistrano was selected to be consistent with but below the average of the peak strengths from Table C-1 and Figure C-1; a cohesion of 900 psf and friction angle of 31.5 degrees. The pseudostatic strengths for the site materials are typically derived by taking a 50 percent increase in cohesion and a 2 degree increase in friction angle above the static strengths. An increase in the pseudostatic strength is justified in the recommended procedures for mitigating landslide hazards in California (Blake, et al., 2002). They comment that an increase of 10 to 40 percent over the static strength is justified for rate effects during seismic loading. A 10 percent increase in the average static peak strength (cohesion of 900 psf and friction angle of 31.5 degrees) provides a cohesion of 990 psf and friction angle of 34 degrees. It is concluded that the pseudostatic strength values used for the Capistrano cross bedding strengths is consistent with the material strength and standards of practice.

TABLE C-1
HISTORIC LABORATORY TESTING
LANDSLIDE MATERIALS

CONSULTANT	REPORT DATE	BORING ID	SAMPLE	GROUND	SAMPLE	GEO	USCS	LL	PI	CF	LLbm	CFbm	PHIr	PHIs	COHESIONp	FRICTIONp	COHESIONu	FRICTIONu	COHESIONr	FRICTIONr	SOIL DESCRIPTION FROM LOGS OR LAB	TEST	SAMPLE	SHEAR	STRESS
			DEPTH (FT)	ELEV (FEET)	ELEV (FT)	STRATA		(%)	(%)	(%)	(%)	(%)	(DEGREES)	(DEGREES)	(PSF)	(DEGREES)	(PSF)	(DEGREES)	(PSF)	(DEGREES)		TYPE	TYPE	RATE	RANGE
																								(IN/MIN)	(KSF)
ELEVATION SORT																									
LANDSLIDE																									
MAWA	11/12/1981	MB-1A	10	420	410	Qlso									2050	30	370	30			CLAYEY SILT	DS	UND	NK	NK
MAWA	11/12/1981	MB-2A	15	410	395	Qlso									450	19					SANDY CLAY	DS	UND	NK	NK
MAWA	11/12/1981	MB-3A	15	400	385	Qlso									950	28	280	28			CLAYEY SILTSTONE	DS	UND	NK	NK
L&A	2/2/1988	LB-10	20	402	382	Qls	CH	56	31	19	78	32									SILTY CLAY				
L&A	2/2/1988	LB-10	30	402	372	Qls	CH								800	17.5						DS	UND	0.05	0.5-2.25
MAWA	11/12/1981	MB-3A	30	400	370	Qlso									750	30	190	25			CLAYEY SILTSTONE	DS	UND	NK	NK
MAWA	11/12/1981	MB-4A	5	350	345	Qls									1310	24	370	25			SILTY CLAY	DS	UND	NK	NK
L&A	2/2/1988	LB-5	25	356	331	Qls	CL-CH								850	25						DS	UND	0.05	0.5-2.25
MAWA	11/12/1981	MB-5A	32	355	323	Qlso									1820	11	800	9			CLAYEY SILTSTONE	DS	UND	NK	NK
MAWA	11/12/1981	MB-4A	32	350	318	Qlso											300	32			SILTY CLAY	DS	UND	NK	NK
SMC	6/13/1989	SMB-4	25	340	315	Qls	ML	49	14		67														
MAWA	11/12/1981	MB-8A	10	310	300	Qlso									1500	26	320	26			SILTY CLAY	DS	UND	NK	NK
MAWA	11/12/1981	MB-6A	5	297	292	Qlso									710	27	250	27			SILT	DS	UND	NK	NK
L&A	2/2/1988	LB-8	20	305	285	Qls	ML	43	7	17	58	29									CLAYEY SANDY SILT				
L&A	2/2/1988	LB-6	30	314	284	Qls	CH	56	30		78				900	44					SANDY SILTY CLAY	DS	UND	0.05	1-4
MAWA	11/12/1981	MB-6A	18	297	279	Qlso									1300	30	310	28			CLAYEY SILT	DS	UND	NK	NK
SMC	6/13/1989	TP-4	4	276	272	Qls	CH	54	27		75														
L&A	2/2/1988	LB-5	85	356	271	Qls	CL-CH	50	31		69				2600	32					SANDY SILTY CLAY	DS	UND	0.05	1-4
L&A	2/2/1988	LB-9	10	277	267	Qls	MH								1150	17						DS	UND	0.05	0.4-2.25
SMC	6/13/1989	SMB-5	40	277	237	Qls	MH	59	22		83				1800	39						DS	UND	NK	1-4
L&A	2/2/1988	LB-9	45	277	232	Qls	MH	60	22		85										CLAYEY SANDY SILT				
SMC	10/25/2004	RW-2	160	355.6	195.6	Qls	CH	72	38	6	104	12													
SMC	10/25/2004	RW-2	180	355.6	175.6	Qls	MH	64	23	1	91	2													
SMC	6/13/1989	SMB-5	105	277	172	Qls	MH	59	28		83				100	41						DS	UND	NK	1-4
L&A	2/2/1988	LB-9	108	277	169	Qls	MH								450	41						DS	UND	0.05	2.25-9
SMC	10/25/2004	RW-2	200	355.6	155.6	Qls	MH	63	31	2	89	4													
SMC	10/25/2004	RW-2	210	355.6	145.6	Qls	MH	66	30	1	94	2													
SMC	10/21/2004	RW-1	180	299	119	Qls	CH	54	27	1	75	2													
SMC	10/21/2004	RW-1	200	299	99	Qls	MH	54	24	3	75	6													
	MINIMUM							43	7	1	58	2			100	11	190	9							
	MAXIMUM							72	38	19	104	32			2600	44	800	32							
	AVERAGE							57	26	6	80	11			1146	28	354	26							
	STND DEV							7	7	7	11	11													

Shear Tests in Block Landslide Material



Project No: 12374-00

Reference : SMC 14-13813R
10/19/14 Rev 2-17-15
Fig. C-7

Figure No. C-1

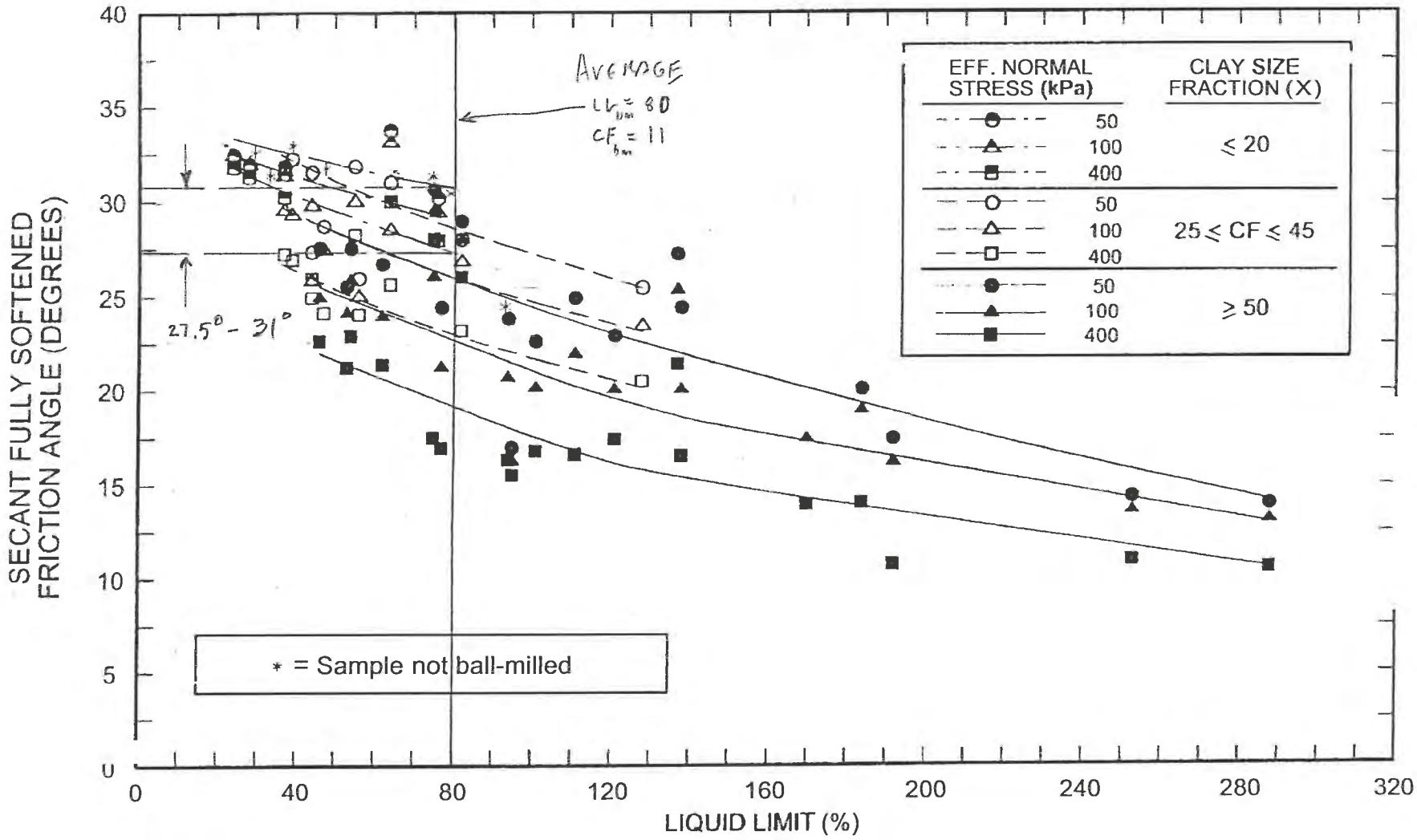


Fig. 5. Secant fully softened friction angle relationships with liquid limit, clay-size fraction, and effective normal stress

from approximately 26° at an effective normal stress of 50 kPa to between 80 and 140%. In these soils, a large shear displacement

Figure C-2

APPENDIX D

SOIL IMPROVEMENT

TENCATE
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REINFORCEMENT

Case Study

application	MSE Retaining Walls in Lime Treated Soil	job owner	Target
location	San Clemente, CA	engineer	NMG Geotechnical
product	Verdura Wall 40,000 SF wall face with Miragrid® 8XT (50,000 SY)	contractor	Soil Retention Systems
		date of installation	January 2011

TenCate™ develops and produces materials that function to increase performance, reduce costs and deliver measurable results by working with our customers to provide advanced solutions.

THE CHALLENGE

Target has constructed a new store in the beachside community of San Clemente, California. The store is located at the corner of Avenida Vista Hermosa and Avenida La Pata. The city of San Clemente is located in southern California on a narrow strip of land between landslide prone hillsides and ocean-front cliffs. In order to prepare the site, mass grading of a steep hillside was required. The hillside was composed of highly expansive soil with an Expansion Index (ASTM D4829) of 120. Large MSE retaining walls up to 26 feet in height, were needed to support the parking area. A parking structure was considered but more costly compared to MSE retaining walls. The design solution of using lime treatment of the MSE wall backfill was used to reduce the expansion potential of the soils. Lime treatment also improved the soil strength parameters.

THE DESIGN

Verdura MSE Retaining Walls by Soil Retention Systems are typically used to support large building pads in southern California. The cost of the near vertical MSE retaining wall, compared to a fill slope, is justified by the high real estate value provided by the additional usable land. This project was no different. However, the use of lime treated MSE structural backfill raised questions in designing the MSE retaining walls. The lime treatment design called for 6 percent lime added to the native fill resulting in a soil pH of 12. TenCate Geosynthetics was able to provide the necessary test reports and documentation to allow the use of Miragrid® 8XT coated polyester geogrid in the design of the MSE retaining walls. In order to compensate for the high pH soil (pH = 12) the typical Miragrid® Reduction Factor for Durability of 1.1 was increased to 1.25 based on test reports. This increase in durability provided the necessary design life for the structure.

THE CONSTRUCTION

The native soil was cut from the hillside and spread in rows one equipment width wide over a prepared staging area. Then, pure powder lime imported from Nevada was spread from a truck onto the native soil. While spraying with water, the soil was processed with two passes of a soil mixing machine. The soil was cured for 24 – 48 hours and then mixed again. The result was a six percent lime treated structural backfill with a pH of 12 and reduced soil expansion potential of EI=20 in accordance with ASTM D4829. TenCate had the soil pH tested at GMU, an independent lab. Miragrid® 8XT was installed in the lime treated soil in the construction of the Verdura MSE Walls. In the hardscape areas, the upper two feet of fill did not receive lime treatment.

Lime treatment soil mixer.

Scraper bringing lime treated soil to MSE Wall.

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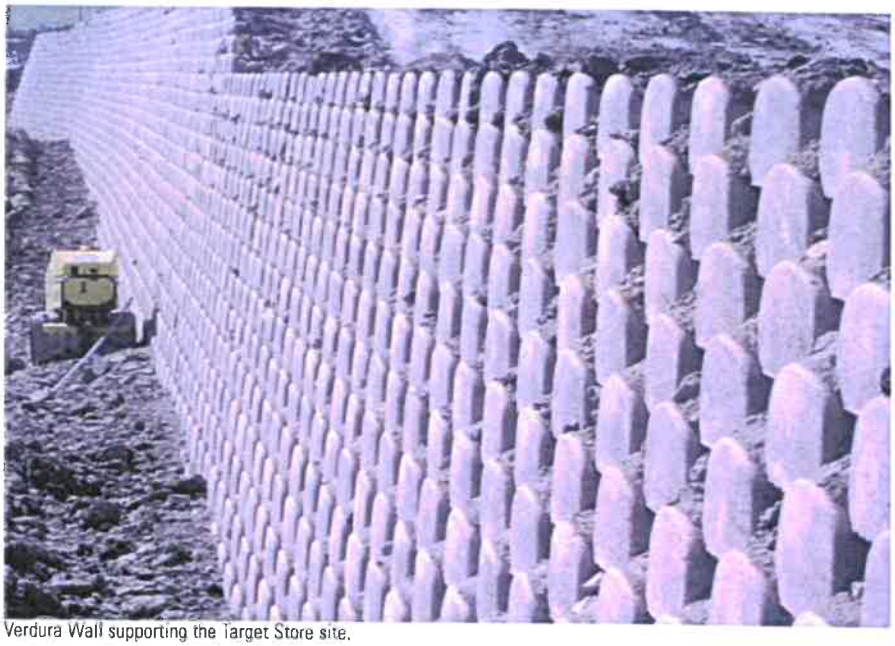
THE PERFORMANCE

The use of Verdura MSE Retaining Walls constructed with Miragrid® 8XT provided a cost effective, large building pad for a new Target store. The existing onsite soils were not favorable for use in construction of the MSE retaining walls due to the high expansion potential. The solution of lime treating the native soil and installing Miragrid® 8XT soil reinforcement in the construction of the MSE retaining walls was beneficial to completing the project without excessive design requirements or cost overruns to the owner. A guaranteed store opening date is important to Target. The use of Verdura MSE Retaining Walls with Miragrid® geogrid allowed scrapers to be used in the backfill operation, increasing time savings. Soil Retention Systems constructed 20,000 SF of wall in just 12 days, keeping the project on its fast paced schedule.

Miragrid® 8XT in lime treated soil.

Verdura Wall positive connection



Verdura Wall supporting the Target Store site.

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Head of the Geotechnical Department, Public Works Ministry, Mexico

Hermillo del Castillo

Civil Engineer, Geotechnical Department, Public Works Ministry, Mexico

George F. Sowers

Law Engineering Testing Company, USA

1988

TRANS TECH PUBLICATIONS

Thickness Design

Current thickness design methods for soil-cement layers pay special attention to fatigue, which has already been mentioned. For this, knowledge of traffic distribution is essential; including the single and double axle loads of different weights likely to occur during the design period.

The fatigue that is caused by each individual axle passing over the layer is evaluated by means of the fatigue factor, a parameter which expresses the overall traffic effect during the design life of the pavement. Table 16-14 [27,28] shows the *Basic Fatigue Factors*, which represent the equivalencies of the effects produced by different axle loads in relation to those caused by a single 8.2 t axle (18000 lb) or a double axle of 13.6 t (30,000 lbs).

The Basic Fatigue Factors in the Table are multiplied by the number of axles of each type (in thousands), according to the prevailing traffic distribution, and the total value of the sum of these products gives the design value for fatigue.

Table 16-14
Basic fatigue factors for the thickness design of soil-cement pavements [27,28]

Axle load		Soil-cement with granular matrix	Soil-cement with fine matrix
t	Kips	—	—
Single axle			
13.6	30	12500000	3530
12.7	28	1270000	1130
11.8	26	113000	337
10.9	24	8650	93
10.0	22	544	23.3
9.1	20	27	5.2
8.2	18	1	1.0
7.3	16	.12	0.16
6.4	14	.012	0.02
5.4	12	.001	0.002
Tandem axle			
22.7	50	12500000	3530
21.8	48	3210000	1790
20.9	46	792000	890
20.0	44	186000	431
19.1	42	41400	203
18.2	40	8650	93
17.3	38	1690	41.1
16.3	36	305	17.5
15.4	34	50.4	7.1
14.5	32	7.5	2.7
13.6	30	1.0	1.0
12.7	28	0.12	0.34
11.8	26	0.012	0.11
10.9	24	0.0010	0.03
10.0	22	—	0.008
9.1	20		0.002

With this value it is now possible to employ the graphs in Fig 16-25 [27,28], in which the thickness of the cement-treated layer can be obtained for both granular and fine soils, as a function of the modulus of subgrade reaction (Chapter 9).

16.5 Soil Stabilization With Lime

Soil stabilization with lime seems to be the most ancient method of improving soils. There is evidence that the Appine Way, the access route to ancient Rome, was constructed using these techniques [11]. In general terms, stabilization techniques with hydrated lime are pretty similar to those with cement, but there are two differences which should be emphasized [1]. First, lime has a range of effectiveness which includes more clayey materials than cement, but which is less effective in more granular materials of a frictional nature. Second, the use of lime stabilization as a pre-treatment is becoming more and more widespread. This is especially significant for it is not essential for all the usual stabilization requirements to be met in these cases.

For stabilization purposes lime is usually employed hydrated, in the form of calcium hydroxides. Calcium carbonates have little stabilizing properties. Quicklime or calcium oxide is often used for pre-treating moist soils. The basic effect of lime appears to be the formation of calcium silicates due to a chemical reaction between lime and clay minerals, resulting in cementing compounds.

Lime is generally prepared by heating calcium carbonates, usually in the form of natural limestones, until they lose their carbon dioxide and become calcium oxides. The resulting material is quicklime, which is very unstable and eager for water. This makes it very difficult to handle and store, which is why it is usually hydrated immediately.

In order to produce a stabilizing lime, it is not essential to start with pure limestones, and a certain amount of impurities including magnesium carbonate and clay minerals, are tolerated. Table 16-15 [1] shows the properties usually required of the raw material to be used for obtaining a stabilizing lime.

Two types of chemical reaction may take place between a lime and a soil. The first is instantaneous and involves the capture of numerous calcium ions by the soil particles. This depresses their *double layer* (Chapter 1) because of the increase in the concentration of bivalent cations in the water. At the same time another effect takes place which tends to expand the double layer owing to the high *pH* of lime. This second reaction takes place over long periods of time and is in fact the true cementing reaction. Although knowledge of this reaction is by no means complete, it is attributed to an interrelation between

Table 16-15
Requirements that must be met by limestones and natural calcium carbonates in order to provide stabilizing lime [1]

Property	Quicklime (CaO)	Hydrated lime ($Ca(OH)_2$)
Calcium magnesium oxides	Not less than 92%	Not less than 95%
Carbon dioxide In the oven Out of the oven	 No more than 3% No more than 5%	 No more than 5% No more than 7%
		Not more than 12%

the calcium ions of lime and the aluminic and siliceous components of soils. The reaction can be enhanced by adding volcanic or fly ash, rich in silica, to the soil. The formation of calcium silicates is attributed chiefly to kaolinites and that of calcium aluminates to montmorillonites. The cementing effect is largely due to the formation of calcium silicates and depends on the type of soil involved. From this point of view, lime stabilization is very different from cement stabilization.

Reference [29] presents some data about the effect of the addition of different amounts of various sodium silicates on the strength of the soil-lime obtained. Tests were conducted on a silty material and the results are shown in Table 16-16.

Table 16-16

Effect of the use of sodium silicates as an additive on the strength of lime-stabilized soils after curing for 7-days and one day of immersion. Silty soils [29]

Lime	Type of silicate	Quantity of silicate	Unconfined compressive strength of the mixture	
%	—	%	kg/cm²	lb/in²
2	$Na_3HSiO_4.5H_2O$	0	8.9	126
2	$Na_3HSiO_4.5H_2O$	2	8.4	119
2	$Na_3HSiO_4.5H_2O$	4	7.0	100
4	$Na_3HSiO_4.5H_2O$	0	9.0	128
4	$Na_3HSiO_4.5H_2O$	2	14.4	204
4	$Na_3HSiO_4.5H_2O$	4	16.2	230
6	$Na_3HSiO_4.5H_2O$	0	7.4	105
6	$Na_3HSiO_4.5H_2O$	2	16.9	240
6	$Na_3HSiO_4.5H_2O$	4	20.0	284
6	$Na_3HSiO_4.5H_2O$	5.3	16.7	238
6	$Na_2Si_2O_5.9H_2O$	8	16.1	229
6	Na_2SiO_3	3.4	15.7	223
6	$Na_2SiO_3.5H_2O$	6.0	16.8	238
6	Na_4SiO_4	3.8	11.7	166

It is observed that for very low lime contents the influence of the additive is not appreciable. With somewhat greater contents of hydrated lime, significant advantages can be obtained by using small amounts of an additive which is very easy to handle and mix.

Lime has little effect on highly organic soils or soils without clay. Its maximum effect is on clayey gravels, where it may result in mixtures that are sometimes even stronger than those that would be obtained with cement. It has been most frequently used with plastic clays, which become more workable and easy to compact. This is why it is often employed as a pretreatment, prior to a cement stabilization, (apart from the many cases where it is used as an actual stabilizer). The effect of lime is more dramatic in montmorillonite than in kaolin clays. With the former, a far more spectacular increase in strength and reduction in plasticity are achieved. Lime also provides clays with volumetric stability in the presence of changing water.

In lime stabilization the use of acid waters should be avoided. Sea water has frequently been used to compact soil-lime, but should be avoided where an asphaltic sealer coat is to be used on top of the treated layer; crystallization of the salts will detach the sealer coat. The amount of water to be employed is determined by compaction procedures. However if quicklime is used extra quantities may prove necessary to hydrate the lime in soils with less than 50% natural water content [1].

16.5.1 Properties of Soil-Lime Mixtures

A brief review follows of the most significant soil-lime properties and the factors that influence them.

.1 Plasticity

Lime greatly reduces the plasticity index of high plasticity soils such as montmorillonites and bentonites, but has little influence on the plasticity index of medium plasticity soils. It may even increase the plasticity index of low plasticity fine soils.

.2 Strength

Figure 16-26 [1] shows the variation in the unconfined compressive strength of various soils with the lime content. The general increase in strength up to lime contents of about 8% by weight can be readily appreciated. Beyond this limit strength is often relatively unaffected by an increase in the proportion of lime, except in the case of the more clayey materials where strength may continue to increase for lime contents of more than 10% [11]. In this aspect lime differs from cement, the strength of which continues to increase for contents as high as 20%.

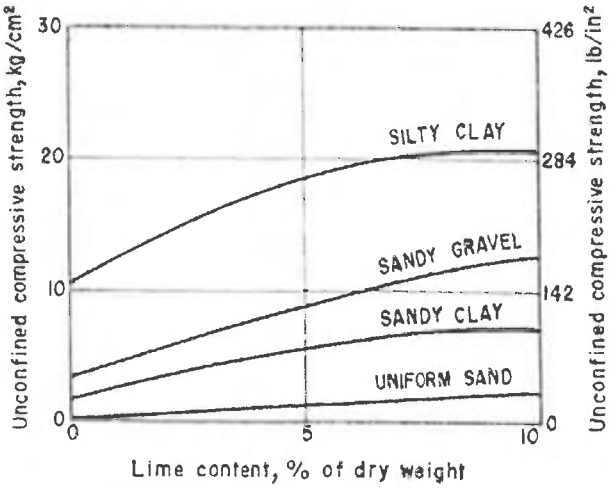

Fig. 16-26 Effect of the lime content on the unconfined compressive strength of various types of soil cured for seven days with hydrated lime [1]

Figure 16-27 [1] shows the effect of the age of the soil-lime mixture on the unconfined compressive strength of different soils. As in the case of cement, strength increases

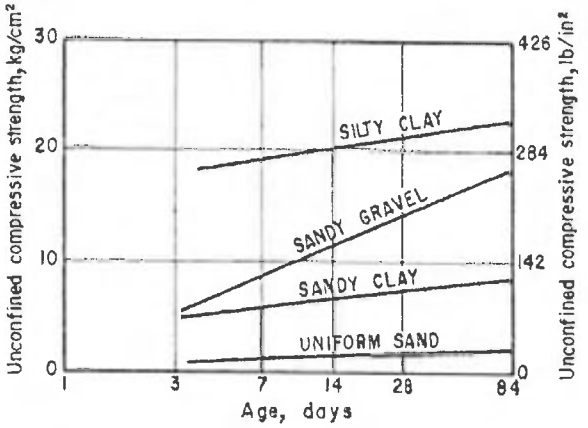

Fig. 16-27 Effect of the age of a mixture of 5% lime, by weight, with different types of soils [1]

Figure 16-28 [11] shows the influence of curing time on the unconfined compressive strength of soil-lime specimens. In all cases a silt was stabilized with 10% hydrated lime by weight, and the curves that are presented correspond to different additives, with the lime. The control curve contains none of these additives. The additives were used in proportions of 1 to 2% of the dry soil.

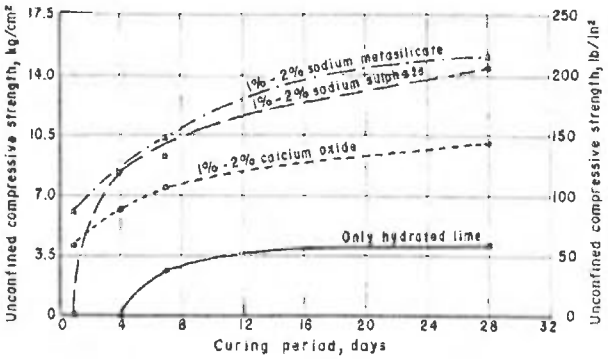

Fig. 16-28 Effect of curing time on the unconfined compressive strength obtained for specimens. Silt treated with 10% hydrated lime and the proportions of additive that are shown [11]

Figure 16-29 [1] shows the change in the strength of soil-cement and soil-lime mixtures during the first hours after stabilization. In this case, strength refers to vane tests conducted in the laboratory. By way of reference, the figure gives the strength of the unstabilized soil, which was a fat clay. It can be observed how the effect of the lime is initially a little greater, but how the cement has a greater effect once hydration commences.

The effect of organic matter on the strength can be seen in Fig. 16-30 [30]. The figure shows the variation in the unconfined compressive strength of a silty clay with variable contents of organic matter. The specimens were prepared with 12% hydrated lime, by weight, and with the optimum water content. In one case they were cured for 7 days and in the other 28.

Figure 16-31 [30] presents another interesting study on the effect of organic matter. In Part *a* of the figure quick strength envelopes are shown for specimens of a high plasticity clay, totally devoid of organic matter and with variable contents of

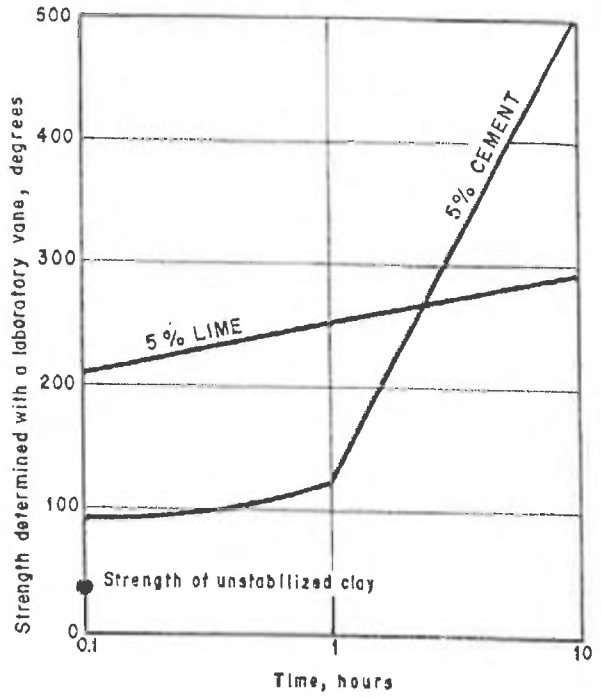

Fig. 16-29 Change in the strength of a stabilized clay during the first few hours after stabilization [1]

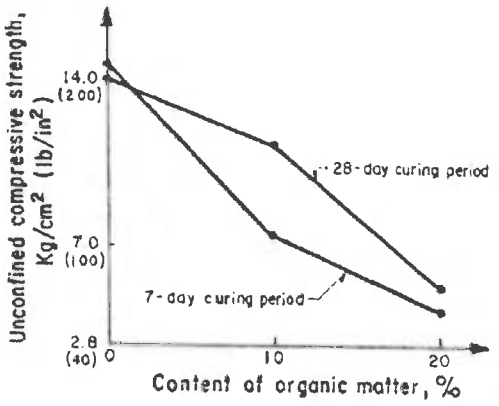

Fig. 16-30 Effect of the percentage of organic matter on the unconfined compressive strength of a silty clay treated with 12% hydrated lime [30]

hydrated lime. This curve, corresponding to the soil alone, is for comparison. The curing time was 28 days in all cases. Part *b* shows similar envelopes for a silty but far less active clay, with 20% organic matter. The specimens were also cured for 28 days and were compacted with the optimum water content corresponding to the same dynamic test that was employed to prepare the specimens in Part *a*. It can be seen that with organic matter a soil that is initially stronger will exhibit lower strengths than a high compressibility clay. It can also be seen how, under comparable conditions, the addition of lime causes an increase in the apparent cohesion of the material by cementation. Although Part *a* is an exception, in which the *CH* material with 4% lime shows greater apparent cohesion than the same material with 12% lime which cannot be easily explained

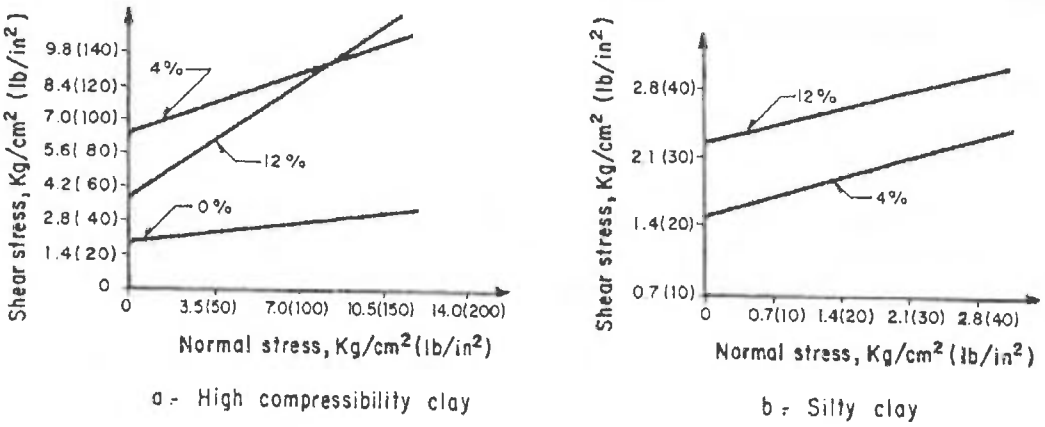

Fig. 16-31 Quick strength envelopes for a highly compressible clay without organic matter, and one with low plasticity and with 20% organic matter, both stabilized with lime [30]

.3 Other Properties

Figure 16-32 [1] shows the effect of the time that is allowed to elapse between the preparation and compaction of stabilized mixtures on the dry unit weight. A comparison is made between a mixture of active clay with 10% cement and another of the same clay with 10% lime. It can be seen that the effect of this time has far less importance in the case of the lime on account of the differences already discussed between the initial chemical reactions of the two stabilizers. From the information given in the figure, a rule can be deduced, according to which cement mixtures must be compacted immediately after preparation, while lime mixtures can be handled less rapidly, which leads to a more convenient and flexible construction process. However, it has been observed that after a few hours, lime mixtures require more water for compaction. Thus if too much time is allowed to elapse, the extra water that becomes necessary may lead to further costs.

Table 16-17 [1] shows the influence of lime on soil pulverization and handling. Data for a clay with $W_L = 73\%$, $W_p = 27\%$ and I_p of 46 are given. After treatment with 5% lime, the clay exhibited the same liquid limit, but its plastic limit increased to 40% and its I_p dropped to 33. The table reports the percentages of different sized lumps for both cases.

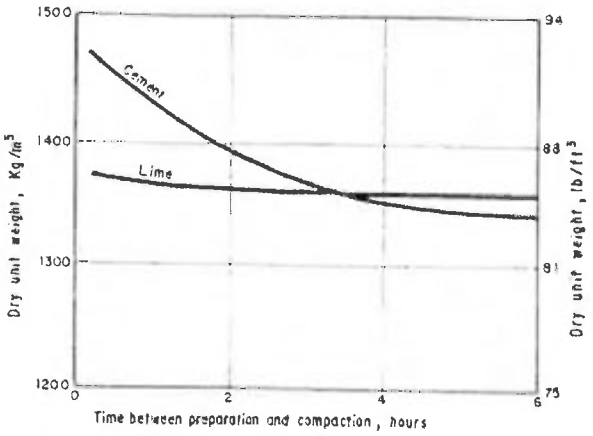

Fig. 16-32 Effect of the time between the preparation and compaction of mixtures of an active clay with 10% lime and cement, by weight, on the unit weight obtained [1]

Table 16-17
Effect of lime on the workability of a clay [1]

Sieve	Percentage of soil lumps passing sieve	
	Untreated clay	Treated with 5% lime
2 in	80	83
1 in	40	50
1/2 in	17	28
1/4 in	7	19
1/8 in	4	15

Soil-lime construction methods are similar to those for soil-cement, as are the laboratory tests that are currently employed to determine the quality of the soils obtained. A good guide for preparing mixtures for laboratory study purposes is to add 1% lime for every 10% of the fine fraction of the soil.

16.5.2 Construction Procedures

Table 16-18 [1] gives the typical lime contents for different types of soils. Again this information must be regarded as a guide, not as a substitute for the corresponding laboratory determinations.

The steps to follow for stabilizing pavement layers with lime are:

- Scarify the bearing material
- Pulverize the soil
- Sprinkle lime from bags or using a mechanical sprinkler
- Mix (by hand, with mixing equipment or machines)
- Add water, if necessary, to give the mixture its optimum compaction water content
- Compact
- Shape surface
- Minimum curing period of 5 days
- Lay a protective surface

Thickness design

The most common practice in pavement technology is for a soil-lime layer to be given the same thickness that would be

Table 16-18
Usual contents of hydrated lime in different soils (percentage by weight of dry soil) [1]

Type of soil	Pretreatments	Stabilization
Crushed rock[1]	2–4	Not recommended
Well-graded clayey gravels	1–3	3
Sands[2]	Not recommended	Not recommended
Sandy clay	Not recommended	5
Silty clay	1–3	2–4
Plastic clay	1–3	3–8
Highly plastic clay	1–3	3–8
Organic soils	Not recommended	Not recommended

1) Only recommended if there are plastic fines

2) Lime is helpful for asphalt stabilization, because it improves adhesion. For loess soils quicklime is recommended

required by the soil alone. When *CBR* design methods are employed, specimens are prepared with different lime contents and different water contents, obtaining the *CBR* for each until the minimum design value is reached. This criterion should, however, be adjusted according to the strength of the soil-lime and other properties that may be considered of interest.

16.6 Stabilization With Asphalt

The improvement of soil properties by the addition of asphalt and asphalt products is a much used and often effective technique. Three types of product are employed for this purpose [11]:

— Bituminous products, which are anhydrous systems of hydrocarbons totally soluble in carbon bisulphide.
— Asphalt products derived from the distillation and refinement of oil (or natural asphalts, more rarely).
— Residual products of the destructive distillation of organic materials, such as coal, certain oils, lignites, peats and wood (tars).

The nature of these products is not very well defined and the detailed analysis of their respective compositions is beyond the objectives of this book (and probably beyond the interests of most civil engineers).

Asphaltic and bituminous products are normally too viscous to mix directly into soils. Because of this, they have to be heated, emulsified in water (emulsions) or diluted with a volatile solvent, such as gasoline.

Emulsions and cutback asphalts are the products most widely used for soil stabilization, but heated or diluted tars are also used. The usual types of cutback products are slow- and medium-curing, but for sands, rapid curing products have also been successfully used.

Table 16-19 [1] gives the most usual characteristics of some types of bituminous products used for stabilizations. The flowing oil most widely used is diesel fuel with a viscosity of between 0.03 and 0.07 degrees STOKES at 50°C (122°F). The solvents usually employed in diluted stabilizers are gasoline, kerosene and a mixture of kerosene and diesel fuel, which result in fast, medium and slow-curing cutbacks respectively. Table 16-20 [1] indicates some requirements frequently made of cutback asphalts.

Medium and slow-curing emulsified asphalts are used. Emulsions are very fine suspensions of asphalt particles in water and the asphalt binds with the soil when the suspension sets. The moment that this setting takes place determines the effectiveness of the asphalt-soil bond. If curing (demulsification) takes place rapidly, penetration will be inadequate. For this reason quick-setting emulsions are avoided. Anionic emulsions should have an asphalt content of at least 55%. The emulsifier and the stabilizing agents should leave a maximum residue of 0.2%, by weight, retained on the No 100 sieve after dilution in an equal volume of distilled water and a rest period of 10 minutes. The viscosity of these suspensions should be between 4 and 25 degrees ENGLER. The maximum temperature for field use should be 49°C (120°F).

The specifications for cationic emulsions are not so well known. A minimum asphalt content of 58% is usually required and a viscosity of between 3 and 24 degrees ENGLER.

Practically all types of soil respond to asphalt stabilization, including highly compressible and active clays, but the best results are obtained with sands and sandy gravels, to which asphalt gives cohesion and impermeability. The grain-size distribution of the soils is not critical, but there are usually certain requirements such as the following:

— Maximum particle size should be less than one third of the thickness of the compacted layer.
— More than 50% of the material should be smaller than No 4 sieve (or sometimes finer than the 3/16 in sieve).
— 35% of the material should be finer than No 40 sieve
— The amount retained on No 200 sieve should be from 10 to 50%
— The liquid limit of the fine fraction should be below 40.
— The plasticity index of the fine fraction should be below 18.

In very clean sands there may be problems of adhesion between the asphalt and the siliceous materials, which leads to detachment (stripping) of the stabilizing material and loss of its beneficial effects. Moist soils may have the disadvantage that when more liquid is added to them during the stabilization process, they become so soft that it is very hard to compact them. In the case of very clean sands, with no more than 3% moist material passing the No 200 sieve, pre-stabilization with 1 or 2% lime may successfully improve the adhesion between the asphalt and the particles of sand.

Any type of fresh water is acceptable for compaction moisture both for stabilization and for the subsequent compaction process. A heavy concentration of salts and organic matter is not recommended, for these are highly detrimental to the adhesion between the soil and the asphalt.

The stabilizing effects of asphalt are due to two mechanisms. The first is a bond that is established between the particles of soil through the asphalt. This provides the whole with *cohesion*. The second is protection of the soil against softening and swelling by water. The first mechanism is especially important in granular soils, whereas the second is rather more useful in cohesive soils.

APPENDIX E

SLOPE STABILITY ANALYSIS

APPENDIX E

SLOPE STABILITY ANALYSIS

GENERAL

Engineering stability analyses were performed during this feasibility investigation to assess the minimum Factors of Safety (FS) against future gross movement of slopes. The "GSTABL" slope stability program (developed by Garry H. Gregory) in conjunction with the "STEDwin" editor program (developed by Harald W. Van Aller, P.E.) were utilized for the stability analyses of the slopes. The computer program utilizes the limit equilibrium theory for the calculation of the minimum Factor of Safety (FS).

SLOPE STABILITY DESIGN

Onsite material shear strength parameters for the analyses were determined from laboratory shear strength tests done by our office and by prior consultants during previous investigations (see list of references), as well as local experience in similar soils and engineering judgment. The onsite material shear strength parameters utilized in our stability analyses are presented in Table E-1. These values are considered reasonable and representative of the onsite materials.

ANALYSES

Slope stability analyses for static and pseudostatic conditions were performed for the design slope profiles. Searches were performed to determine the minimum calculated factors of safety for the critical sections using block and circular modes. The following analyses were performed:

- Analyses of landslides using Cross Sections A-A' through E-E'. Searches were made for potential surfaces throughout the landslide mass as well as within the bedrock material beyond the slide. For potential backscarps, we conservatively used lower shear strengths than for block landslide materials and similar to that of alluvium, while using the shear values listed for Oxidized and Unoxidized zones of the landslide mass for the passive portion of the surfaces.
- Analyses for the natural slope to the south side of the property using Cross section F-F'. We recommend that reinforced concrete piers with a minimum diameter of 2.5 feet and minimum depth of 35 feet, at 10 feet on center be constructed along the south side. The approximate locations of the proposed piers are shown on the Geotechnical Map, Plate 2R. It is recommended that the tops of the piers be placed at least one foot above the base elevation of the Verdura walls where planned along the south side of the site.
- Analyses of the natural slope to the west side of the property using Cross Section G-G' for static, pseudostatic and temporary conditions.

- Analyses for a 26-foot high Verdura wall proposed at the toe of slope. Our analyses indicated that as a minimum the following layers of geogrid will be needed:

    1. 14 lower geogrids 26' long, Mirafi 20XT
    2. 5 upper geogrids 26' long, Mirafi 8XT.
    3. Select lime-treated fill with cohesion of 12,000 psf, minimum.

    In addition, a fill shear key (minimum 24 feet wide and deep) consisting of lime-treated onsite soil is required to achieve stability. The approximated extent of the key and lime-treated zone is shown on Cross Section D-D'. The internal stability of the wall should be verified by the wall designer.

The required Factors of Safety were achieved for the cross sections evaluated for the static condition and with the inclusion of the recommended remedial grading, reinforced concrete piers, geogrids, lime-treated fill, as specified. The approximate locations of the proposed keys, concrete piers, Verdura geogrid walls, and lime-treated zone are shown on the Cross Sections 1 through 16 (Figures 3 through 6), Cross Section A-A' to G-G' (Plate 3 through 5) and on the Geotechnical Map, Plate 2. Once grading plans are finalized for the project, all slopes will require final evaluation to determine the specific remedial grading needed to achieve mandatory factors of safety.

When the required factors of safety were not achieved for pseudo-static analyses, slope and ground deformations for seismic loading condition were estimated using the procedure by Rathje and Antonakos (2011). This model uses empirical predictive models for the sliding displacement of rigid slopes, one considering the Peak Ground Acceleration and Magnitude (PGA,M), and the other using the peak ground acceleration and Peak Ground Velocity (PGA,PGV). Rathje and Antonakos recommend use of the PGA,PGV model for deformation estimates due to significant frequency content information provided for the evaluation.

When factors of safety were at or below 1.1, pseudo-static stability analyses were made to determine the yield acceleration (ky) for the various cross sections and surfaces analyzed under static conditions. The seismicity for slope deformation analyses is characterized by a 475-year return period; a seismic event of magnitude 6.95 with a peak acceleration of 0.2763g. The estimated displacements are provided in Table E-2 for the specific sections analyzed for this study. The results indicate seismic slope deformations up to 1.2 inches when using the PGV-model and 2.6 inches with the M-model.

The analyses were performed with the inclusion of such structural elements and remedial grading as was considered necessary, such as buttress fills (site soils or lime-treated soils), soil removals, geogrid, and reinforced concrete piers.

The Factor of Safety (FS) criteria adopted to assess the stability of the landslides and slopes that were analyzed are as follows:

Static Conditions	-	$FS \geq 1.5$
Pseudostatic	-	$FS \geq 1.1$
Temporary Conditions (Construction)	-	$FS \geq 1.25$
Surficial Stability	-	$FS \geq 1.5$

Designs should be reviewed during rough and precise grading plan development and should be revised as appropriate; similarly designs should be reviewed for the observed actual site conditions observed in the field and modified as needed. Any revisions to the Site Study Layout Plan should be reviewed by the Project Geotechnical Consultant and may require additional analyses and revisions to the recommendations presented herein.

TABLE E-1

SUMMARY OF STRENGTH PARAMETERS

Material Type	Bulk Density γ_m (pcf)	Bulk Density γ_s (pcf)	Static Condition		Pseudostatic Condition	
			Cohesion c (psf)	Friction Angle ϕ (deg)	Cohesion c (psf)	Friction Angle ϕ (deg)
Engineered Fill	119	125	300	26	450	28
Rupture Surface	119	125	250	12.5	375	14.5
Capistrano Bedrock – Across Bedding	119	125	750	29	1125	31
Capistrano Bedrock/ Landslide Block – Along Bedding	---	---	300	15	450	17
Landslide Block (Oxidized zone)	119	125	350	23	525	25
Landslide Block (Unoxidized zone)	119	125	500	29	750	31
Alluvium/Colluvium	119	125	300	20	450	22
Lime-treated Fill (for geogrids and specific buttresses)	119	125	12,000	0	12,000	0

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
A-A'	1.5	0.9	120	0.1232	1.11	2.59	E-1.1, 1.2	a-41a, a-41as	Shallow Qls. This Figure presents graphs of the anisotropic values used.
A-A'	1.6	0.9	117	0.1288	0.97	2.27	E-2.1, 2.2	a-41b, a-41bs	Shallow Qls. See Figure E-1 for anisotropic values used.
A-A'	1.8	1.1					E-3.1, 3.2	a-41c, a-41cs	Deep Qls. See Figure E-1 for anisotropic values used.
A-A'	1.6	1.0	167	0.1465	0.38	0.85	E-4.1, 4.2	a-41d, a-41ds	Deep Qls. See Figure E-1 for anisotropic values used.
A-A'	1.7	1.0	160	0.1357	0.59	1.32	E-5.1, 5.2	a-41e, a-41es	Block mode along a band/zone above rupture surface shown on cross section. This Figure presents graphs of the anisotropic values used.
A-A'	2.2	1.4					E-6.1, 6.2	a-41f, a-41fs	Shallow Qls. This Figure presents graphs of the anisotropic values used.
A-A'	2.0	1.7					E-7.1, 7.2	a-41g, a-41gs	Shallow Qls at the back of larger one. See Figure E-1 for anisotropic values used.

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES (CONT.)

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
B-B'	1.7	0.9	187	0.1307	0.54	1.21	E-8.1, 8.2	b-37c1, b-37c1s	Deep Qls. This Figure presents graphs of the anisotropic values used.
B-B'	1.9	1.1					E-9.1, 9.2	b-37b, b-37bs	Deep Qls. See Figure E-8 for anisotropic values used.
B-B'	1.5	1.1					E-10.1, 10.2	b-37a4, b-37a4s	Shallow Qls with a 30' wide shear key at elevation 215'. See Figure E-8 for anisotropic values used.
B-B'	3.8	2.0					E-11.1, 11.2	b-37d, b-37ds	Shallow Qls at the back of larger slide. This Figure presents graphs of the anisotropic values used. The angles were conservatively opened for possible lower RS shear strength.
B-B'	2.2	1.4					E-12.1, 12.2	b-37f, b-37fs	Shallow Qls at the back of larger slide. See Figure E-11 for anisotropic values used. The angles were conservatively opened for possible lower RS shear strength.
B-B'	1.6	0.9	155	0.1316	0.70	1.58	E-13.1, 13.2	b-37g, b-37gs	Block mode along a band/zone above rupture surface shown on cross section. See Figure E-8 for anisotropic values used.
B-B'	1.7	0.9	145	0.1329	0.72	1.65	E-14.1, 14.2	b-37k b-37ks	Block mode along a band/zone above rupture surface shown on cross section. This Figure presents graphs of the anisotropic values used.

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES (CONT.)

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
C-C'	1.7	1.0	175	0.1391	0.45	1.01	E-15.1, 15.2	c-103a, c-103as	Deep Qls. This Figure presents graphs of the anisotropic values used.
C-C'	2.0	1.2					E-16.1, 16.2	c-103d, c-103ds	Deep Qls. See Figure E-15 for anisotropic values used.
C-C'	1.9	1.3					E-17.1, 17.2	c-103e, c-103es	Shallow Qls. See Figure E-15 for anisotropic values used.
C-C'	3.3	1.7					E-18.1, 18.2	c-103f, c-103fs	Shallow Qls. See Figure E-15 for anisotropic values used.
C-C'	1.9	1.1					E-19.1, 19.2	c-103g, c-103gs	Shallow Qls. See Figure E-15 for anisotropic values used
C-C'	1.6	1.2					E-20.1, 20.2	c-103h, c-103hs	Shallow Qls. This Figure presents graphs of the anisotropic values used. The angles were conservatively opened for possible lower RS shear strength.
C-C'	1.7	1.0	160	0.1447	0.43	0.98	E-21.1, 21.2	c-103i, c-103is	Block mode along a band/zone above rupture surface shown on cross section. This Figure presents graphs of the anisotropic values used.
C-C'	1.7	1.0	190	0.1387	0.39	0.86	E-22.1, 22.2	c-103ja, c-103jas	Block mode along a band/zone above rupture surface shown on cross section. This Figure presents graphs of the anisotropic values used.

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES (CONT.)

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
D-D'	1.6	1.2					E-23.1, 23.2	d-14a, d-14aas	Deep Qls. This Figure presents graphs of the anisotropic values used for the section.
D-D'	1.9	1.5					E-24.1, 24.2	d-14b, d-14bs	Shallower Qls at the back of larger one. See Figure E-23 for anisotropic values used.
D-D'	1.7	1.5					E-25.1, 25.2	d-14c1, d-14c1s	Shallower Qls at the back of larger one. See Figure E-23 for anisotropic values used.
D-D'	1.6	1.1					E-26.1, 26.2	d-14f, d-14fs	Block mode along a band/zone above rupture surface shown on cross section. See Figure E-23 for anisotropic values used.
D-D'	1.5	1.3					E-27.1, 27.2	d-ver4, d-ver4s	26' high Verdura Wall mid slope. Circular mode. Recommend a buttress key with lime treated soils as shown on section D-D': 19 geogrids 26 long, Mirafi 8XT (5 upper ones) & Mirafi 20XT (14 lowers ones) for wall internal stability to be verified by wall designer. This Figure presents graphs of the anisotropic values used .

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES (CONT.)

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
E-E'	1.5	1.0	150	0.1634	0.25	0.56	E-28.1, 28.2	e-8a, e-8as	Deep Qls. This Figure presents graphs of the anisotropic values used for the section.
E-E'	1.9	1.2					E-29.1, 29.2	e-8b, e-8bs	Deep Qls. See Figure E-28 for anisotropic values used.
E-E'	1.9	1.2					E-30.1, 30.2	e-8d, e-8ds	Shallow Qls. See Figure E-28 for anisotropic values used.
E-E'	1.6	1.1					E-31.1, 30.2	e-8h, e-8hs	Block mode along a band/zone above rupture surface shown on cross section. This Figure presents graphs of the anisotropic values used for the section.
E-E'	1.5	1.3					E-32.1, 31.2	e-8ga, e-8gas	Shallower Qls at the back of larger one. Provide key as shown of Cross section. Key bottom should be backfilled with at least 11 feet of lime treated cement. The lime treated fill should extend up to with a minimum width of 15 feet against the proposed chimney drain to an elevation of 406'. See Figure E-28 for anisotropic values used.
E-E'	2.0	1.7					E-33.1, 33.2	e-8gb, e-8gbs	Same as Figure E-32 above.
E-E'	1.6	1.1					E-34.1, 34.2	e-8j, e-8js	Block mode along a band/zone above-below rupture surface shown on cross section. This Figure presents graphs of the anisotropic values used for the section.
E-E'	1.8	1.1					E-35.1, 35.2	e-8i, e-8is	Block mode along a band/zone above-below rupture surface shown on cross section. See Figure E-34 for anisotropic values used.

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES (CONT.)

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
F-F'	1.5	1.4					E-36.1, 36.2	f-6a, f-6as	Natural slope - south side. Circular mode. Piers 35'L @ 10' o.c., 2.5' diameter below wall. Surfaces exiting at toe.
F-F'	1.9	1.2					E-37.1, 37.2	f-6e, f-6es	Shallower Qls. Piers 35'L @ 10' o.c., 2.5' diameter below wall. This Figure presents graphs of the anisotropic values used for the section.
F-F'	1.5	1.1					E-38.1, 38.2	f-6c, f-6cs	Shallower Qls. Piers 35'L @ 10' o.c., 2.5' diameter below wall. See Figure E-37 for anisotropic values used.
F-F'	1.9	1.2					E-39.1, 39.2	f-6b, f-6bs	Deeper Qls. Piers 35'L @ 10' o.c., 2.5' diameter below wall. This Figure presents graphs of the anisotropic values used for the section.
F-F'	1.6	1.2					E-40.1, 40.2	f-6f, f-6fs	Deeper Qls. Piers 35'L @ 10' o.c., 2.5' diameter below wall. See Figure E-39 for anisotropic values used.
G-G'	1.6	1.3					E-41.1, 41.2	g-2, g-2s	Natural Slope - west side. Circular mode. Surfaces exiting at toe. Key at 372.5'. This Figure presents graphs of the anisotropic values used for the section.
G-G'	1.7	1.4					E-42.1, 19.2	g-2a, g-2as	Natural Slope - west side. Circular mode. Surfaces exiting at toe. Key at 372.5'. This Figure presents graphs of the anisotropic values used for the section.
G-G'	1.3	---					E-43	g-4	Natural Slope - west side. Circular mode. Temporary condition during key construction. Key at 372.5'. Analysis done with a shoring system providing at least 5 kips/ft minimum. See Figure E-41 for anisotropic values used.

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES (CONT.)

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
13-13'	1.5	1.3					E-44.1, 44.2	13-6, 13-6s	Circular mode. Provide key as shown of Cross section. Portion of the key should be backfilled with lime treated soil as show on section to bottom elevation of 270'. This Figure presents graphs of the anisotropic values used for the section.
13-13'	1.5	1.2					E-45.1, 45.2	13-3, 13-3s	Block mode. Provide key as shown of Cross section. Portion of the key should be backfilled with lime treated soil as show on section to bottom elevation of 270'. See Figure E-44 For anisotropic values used.
15-15'	1.5	1.3					E-46.1, 46.2	15-1, 15-1s	Circular mode. Provide key as shown of Cross section. This Figure presents graphs of the anisotropic values used for the section.
15-15'	1.5	1.3					E-47.1, 47.2	15-1a, 15-1as	Circular mode. Provide key as shown of Cross section. See Figure E-46 For anisotropic values used.
15-15'	1.5	1.3					E-48.1, 48.2	15-4, 15-4s	Block mode. Provide key as shown of Cross section. See Figure E-46 For anisotropic values used.
15-15'	1.6	1.2					E-49.1, 49.2	15-3, 15-3s	Block mode. Provide key as shown of Cross section. See Figure E-46 For anisotropic values used.

13662-00, Section A-A',- Static, - Shallow .Qls, 2015 design

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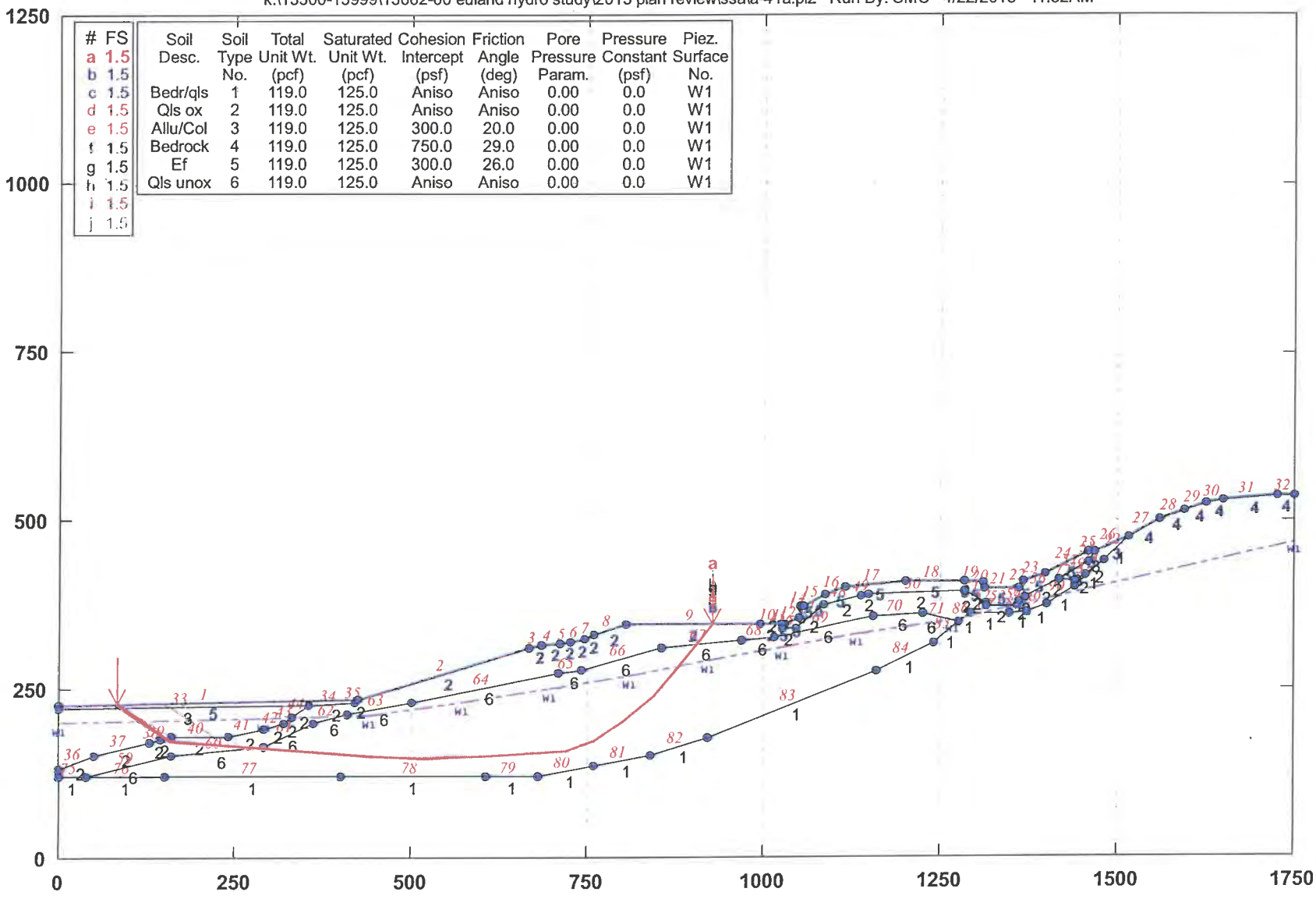
#	FS
a	1.5
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.5
h	1.5
i	1.5
j	1.5

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bedr/qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Allu/Col	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1



GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-1.1

13662-00, Section A-A',- Static, - Shallow .Qls, 2015 design

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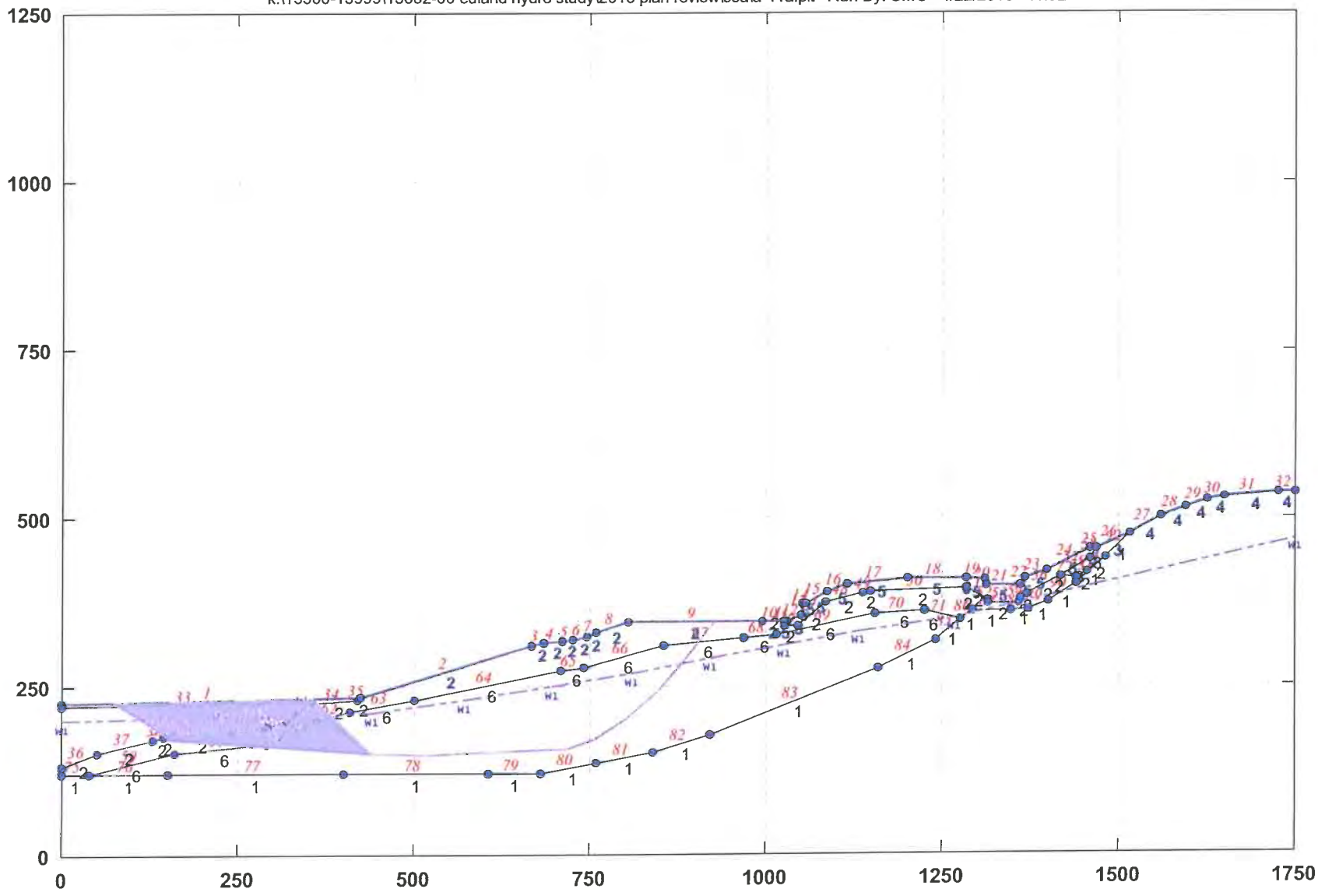

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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.

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Analysis Run Date: 4/22/2015
Time of Run: 11:32AM
Run By: SMC
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Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41a.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Static,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES

32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2

40	160.00	180.00	240.00	180.00	2
41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	250.0	12.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 11 Coordinate Points

Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Janbus Empirical Coef is being used for the case of c & phi both > 0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.

3000 Trial Surfaces Have Been Generated.

11 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	173.00	440.00	150.00	3.00
2	440.50	150.00	440.50	150.00	3.00
3	520.00	148.00	520.00	148.00	3.00
4	560.00	150.00	560.00	150.00	3.00
5	614.00	152.00	614.00	152.00	3.00
6	720.00	157.00	720.00	157.00	3.00
7	760.00	173.00	760.00	173.00	3.00
8	800.00	200.00	800.00	200.00	3.00
9	844.00	240.00	844.00	240.00	3.00
10	880.00	282.00	880.00	282.00	3.00
11	928.00	346.00	928.00	346.00	0.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.319	1.617	0.176
15.00	1.510	1.777	0.268
69.87	5.293	-0.001	2.728
18.50	-0.036	1.926	0.335
19.90	-0.053	1.999	0.362
0.00	0.479	0.001	0.000
0.00	0.479	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000
0.00	0.038	-0.036	0.000

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.55	227.84
2	129.58	222.20
3	157.08	202.94
4	189.84	180.00
5	200.46	169.38
6	440.50	150.87
7	520.00	148.97
8	560.00	150.96
9	614.00	152.38
10	720.00	158.00
11	760.00	173.87
12	800.00	200.25
13	844.00	238.68
14	880.00	282.95
15	928.00	346.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.35	227.41
2	111.19	221.88
3	138.24	202.94
4	171.01	180.00
5	180.92	170.08
6	440.50	150.84
7	520.00	148.07
8	560.00	149.01
9	614.00	150.69
10	720.00	156.38
11	760.00	173.63
12	800.00	201.21
13	844.00	239.15
14	880.00	282.74
15	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 1.537
Theta (ki = 1.0) = 6.64 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	100.14	227.36
2	108.96	221.85
3	135.96	202.94
4	168.72	180.00
5	177.38	171.34
6	440.50	148.62
7	520.00	147.43
8	560.00	150.98
9	614.00	152.55
10	720.00	157.68
11	760.00	173.13
12	800.00	199.95
13	844.00	240.41
14	880.00	283.04
15	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 1.532
Theta (ki = 1.0) = 6.68 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.301	1.608	0.176
15.00	1.464	1.747	0.268
89.94	0.000	0.000	*****
89.68	0.000	0.000	*****
89.17	0.000	0.000	*****
69.03	-0.032	-0.020	2.609
88.27	0.000	-0.001	*****
85.99	0.000	0.000	*****
84.41	0.000	0.000	*****
89.94	0.000	0.000	*****
79.33	0.000	0.001	5.310
80.74	0.000	10.477	6.133
79.33	0.000	-0.022	5.310
78.87	0.001	-0.014	5.083
77.18	0.071	0.000	4.393
80.06	0.000	0.000	5.708
80.07	0.000	0.000	5.710
80.07	0.000	0.000	5.710
80.07	0.000	0.000	5.710
80.07	0.000	0.000	5.710

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.18	226.96
2	91.82	221.56
3	121.25	200.95
4	154.02	178.01
5	159.12	172.91
6	440.50	151.07
7	520.00	147.25
8	560.00	151.44
9	614.00	153.19
10	720.00	157.27
11	760.00	172.71
12	800.00	199.80
13	844.00	240.06
14	880.00	281.28
15	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.315	1.611	0.176
15.00	1.502	1.763	0.268
65.59	4.047	-0.001	2.204

19.09	-0.012	1.932	0.346
23.70	-0.004	2.208	0.439
0.00	-0.058	-0.049	0.000
0.00	-0.058	-0.049	0.000
89.94	2.094	-0.002	*****
0.53	-0.087	-0.045	0.009
0.00	-0.095	-0.049	0.000
9.32	-0.004	-0.053	0.164
6.05	-0.002	-0.053	0.106
89.94	2.094	-0.053	*****
3.32	-0.008	-0.009	0.058
0.00	-0.095	-0.049	0.000
3.23	-0.005	-0.007	0.056
3.03	0.000	-0.004	0.053
3.62	-0.015	-0.013	0.063
3.32	-0.008	-0.009	0.058
3.34	-0.008	-0.009	0.058

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.76	227.61
2	119.69	222.03
3	146.95	202.94
4	179.71	180.00
5	188.29	171.43
6	440.50	148.50
7	520.00	147.84
8	560.00	151.27
9	614.00	152.80
10	720.00	155.73
11	760.00	173.59
12	800.00	199.15
13	844.00	241.45
14	880.00	280.77
15	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.305	1.613	0.176
15.00	1.449	1.761	0.268
0.00	-0.065	-0.049	0.000
0.00	-0.065	-0.049	0.000
9.79	1.321	1.608	0.173
0.00	-0.060	-0.046	0.000
0.00	-0.060	-0.046	0.000
89.94	2.754	-0.053	*****
0.61	-0.055	-0.043	0.011
0.00	-0.060	-0.046	0.000
4.43	-0.004	-0.053	0.078
1.34	-0.069	-0.055	0.023
1.26	-0.065	-0.052	0.022
0.00	-0.060	-0.046	0.000
33.89	0.000	-0.007	0.672
18.71	-0.010	-0.023	0.339
64.90	0.000	0.001	2.135
59.64	-0.012	-0.012	1.707
58.45	-0.007	-0.007	1.629
58.86	-0.008	-0.008	1.655

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.87	227.26
2	104.64	221.77
3	131.53	202.94
4	164.30	180.00
5	172.57	171.73

6	440.50	149.92
7	520.00	149.08
8	560.00	150.55
9	614.00	152.09
10	720.00	157.75
11	760.00	172.81
12	800.00	199.79
13	844.00	239.48
14	880.00	281.90
15	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.320	1.624	0.176
15.00	1.473	1.791	0.268
0.00	-0.042	-0.041	0.000
0.00	-0.042	-0.041	0.000
9.90	1.327	1.621	0.175
0.00	-0.049	-0.038	0.000
0.00	-0.049	-0.038	0.000
89.94	2.584	-0.005	*****
0.51	-0.038	-0.031	0.009
0.00	-0.049	-0.038	0.000
1.96	-0.042	-0.036	0.034
5.87	0.339	0.001	0.103
2.06	-0.056	-0.046	0.036
0.94	-0.054	-0.043	0.016
14.02	-0.004	-0.011	0.250
7.92	-0.001	-0.005	0.139
0.00	0.000	0.001	0.000
0.00	-0.049	-0.038	0.000
80.09	-0.001	0.001	5.722
89.94	2.584	0.001	*****

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.07	227.97
2	135.15	222.29
3	162.78	202.94
4	195.55	180.00
5	207.83	167.72
6	440.50	148.53
7	520.00	148.74
8	560.00	150.21
9	614.00	151.49
10	720.00	157.35
11	760.00	173.82
12	800.00	201.19
13	844.00	240.99
14	880.00	280.99
15	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.319	1.617	0.176
15.00	1.510	1.777	0.268
69.87	5.293	-0.001	2.727
18.50	-0.036	1.926	0.335
19.90	-0.053	1.999	0.362
0.00	0.479	0.001	0.000
0.00	0.479	-0.434	0.000
89.94	0.474	0.334	*****
89.94	0.474	0.788	*****
0.00	-0.048	-0.029	0.000
0.00	-0.048	-0.029	0.000

6.53	0.002	-0.001	0.114
5.39	0.000	0.005	0.094
5.91	0.000	0.001	0.104
6.03	0.001	0.000	0.106
5.96	0.002	0.000	0.104
6.07	0.002	0.000	0.106
6.45	0.002	-0.001	0.113
5.26	0.002	0.001	0.092
3.90	0.002	0.005	0.068

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.55	227.84
2	129.58	222.20
3	157.08	202.94
4	189.84	180.00
5	200.46	169.38
6	440.50	150.87
7	520.00	148.97
8	560.00	150.96
9	614.00	152.38
10	720.00	158.00
11	760.00	173.87
12	800.00	200.25
13	844.00	238.68
14	880.00	282.95
15	928.00	346.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.35	227.41
2	111.19	221.88
3	138.24	202.94
4	171.01	180.00
5	180.92	170.08
6	440.50	150.84
7	520.00	148.07
8	560.00	149.01
9	614.00	150.69
10	720.00	156.38
11	760.00	173.63
12	800.00	201.21
13	844.00	239.15
14	880.00	282.74
15	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 1.537
Theta (ki = 1.0) = 6.64 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.14	227.36
2	108.96	221.85
3	135.96	202.94
4	168.72	180.00
5	177.38	171.34
6	440.50	148.62

###################### SOME LINES SKIPPED ######################
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)

on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 6
Number of Trial Surfaces with Misleading FS = 4
Number of Trial Surfaces With Valid FS = 2990
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.3 %
Statistical Data On All Valid FS Values:
FS Max = 1.839 FS Min = 1.518 FS Ave = 1.620
Standard Deviation = 0.093 Coefficient of Variation = 5.76 %
((Simplified Janbu FS for Critical Surface = 1.471))
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.335	226.961
2	91.980	221.559
3	121.362	200.986
4	154.128	178.043
5	158.408	173.763
6	440.500	150.028
7	520.000	146.520
8	560.000	149.439
9	614.000	150.564
10	720.000	156.928
11	760.000	173.811
12	800.000	200.745
13	844.000	238.512
14	880.000	283.141
15	928.000	346.000

*** FOS = 1.518 Theta (ki=1.0) = 6.63 ***
Lambda = 0.116
Individual data on the 46 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.6	2883.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	27.9	52003.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	1.5	4774.9	0.0	63.4	0.	0.	0.0	0.0	0.0
4	32.8	153527.6	0.0	32055.3	0.	0.	0.0	0.0	0.0
5	4.3	27565.6	0.0	10110.4	0.	0.	0.0	0.0	0.0
6	1.6	10709.2	0.0	2894.4	0.	0.	0.0	0.0	0.0
7	80.0	581810.1	0.0	*******	0.	0.	0.0	0.0	0.0
8	38.4	309988.5	0.0	94208.0	0.	0.	0.0	0.0	0.0
9	11.6	97258.0	0.0	30211.9	0.	0.	0.0	0.0	0.0
10	2.0	16987.7	0.0	5306.5	0.	0.	0.0	0.0	0.0
11	28.0	243500.3	0.0	77329.8	0.	0.	0.0	0.0	0.0
12	7.8	69361.4	0.0	22455.8	0.	0.	0.0	0.0	0.0
13	2.2	20171.7	0.0	6564.2	0.	0.	0.0	0.0	0.0
14	24.0	220395.6	0.0	72659.2	0.	0.	0.0	0.0	0.0
15	6.0	56315.7	0.0	18829.0	0.	0.	0.0	0.0	0.0
16	35.4	342036.9	0.0	*******	0.	0.	0.0	0.0	0.0
17	14.6	146187.9	0.0	50787.2	0.	0.	0.0	0.0	0.0
18	10.0	101700.9	0.0	35662.2	0.	0.	0.0	0.0	0.0
19	5.0	51357.4	0.0	18107.9	0.	0.	0.0	0.0	0.0
20	15.0	159934.3	0.0	55430.6	0.	0.	0.0	0.0	0.0
21	0.5	5513.7	0.0	1856.6	0.	0.	0.0	0.0	0.0
22	59.5	733503.0	0.0	*******	0.	0.	0.0	0.0	0.0
23	20.0	280982.5	0.0	91135.7	0.	0.	0.0	0.0	0.0
24	40.0	602228.6	0.0	*******	0.	0.	0.0	0.0	0.0
25	10.0	158052.0	0.0	49161.0	0.	0.	0.0	0.0	0.0
26	44.0	737245.2	0.0	*******	0.	0.	0.0	0.0	0.0
27	53.0	971694.2	0.0	*******	0.	0.	0.0	0.0	0.0
28	18.0	347693.8	0.0	*******	0.	0.	0.0	0.0	0.0
29	11.0	214915.2	0.0	63823.1	0.	0.	0.0	0.0	0.0
30	12.0	235507.5	0.0	70351.8	0.	0.	0.0	0.0	0.0
31	2.0	39360.7	0.0	11824.8	0.	0.	0.0	0.0	0.0

32	10.0	197608.5	0.0	59550.3	0.	0.	0.0	0.0	0.0
33	7.0	138083.0	0.0	45031.3	0.	0.	0.0	0.0	0.0
34	15.0	291441.5	0.0	93780.4	0.	0.	0.0	0.0	0.0
35	3.0	57606.8	0.0	18311.8	0.	0.	0.0	0.0	0.0
36	13.0	249410.8	0.0	77639.6	0.	0.	0.0	0.0	0.0
37	2.0	38390.6	0.0	11697.7	0.	0.	0.0	0.0	0.0
38	40.0	733316.7	0.0	*******	0.	0.	0.0	0.0	0.0
39	5.0	86587.7	0.0	26648.1	0.	0.	0.0	0.0	0.0
40	5.0	84439.6	0.0	25265.1	0.	0.	0.0	0.0	0.0
41	34.0	503805.7	0.0	*******	0.	0.	0.0	0.0	0.0
42	12.0	145090.9	0.0	36759.8	0.	0.	0.0	0.0	0.0
43	23.6	220817.0	0.0	28833.2	0.	0.	0.0	0.0	0.0
44	0.4	2936.4	0.0	0.0	0.	0.	0.0	0.0	0.0
45	24.1	134832.3	0.0	0.0	0.	0.	0.0	0.0	0.0
46	23.9	44693.3	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.335	226.961
2	91.980	221.559
3	121.362	200.986
4	154.128	178.043
5	158.408	173.763
6	440.500	150.028
7	520.000	146.520
8	560.000	149.439
9	614.000	150.564
10	720.000	156.928
11	760.000	173.811
12	800.000	200.745
13	844.000	238.512
14	880.000	283.141
15	928.000	346.000

*** FOS = 1.518 Theta (ki=1.0) = 6.63 ***
Lambda = 0.116

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.533	226.824
2	86.118	221.460
3	117.294	199.630
4	150.061	176.687
5	152.602	174.146
6	440.500	151.063
7	520.000	148.951
8	560.000	149.795
9	614.000	150.627
10	720.000	157.729
11	760.000	172.632
12	800.000	200.117
13	844.000	240.215
14	880.000	282.208
15	928.000	346.000

*** FOS = 1.519 Theta (ki=1.0) = 6.65 ***
Lambda = 0.117

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.533	226.824
2	86.118	221.460
3	117.294	199.630
4	150.061	176.687
5	152.602	174.146
6	440.500	151.063
7	520.000	148.951
8	560.000	149.795
9	614.000	150.627
10	720.000	157.729
11	760.000	172.632
12	800.000	200.117

13	844.000	240.215
14	880.000	282.208
15	928.000	346.000

*** FOS = 1.519 Theta (ki=1.0) = 6.65 ***
Lambda = 0.117
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.266	226.936
2	90.900	221.541
3	120.612	200.736
4	153.378	177.793
5	157.416	173.755
6	440.500	149.765
7	520.000	147.301
8	560.000	150.231
9	614.000	151.087
10	720.000	157.650
11	760.000	172.951
12	800.000	200.272
13	844.000	241.144
14	880.000	283.347
15	928.000	346.000

*** FOS = 1.520 Theta (ki=1.0) = 6.66 ***
Lambda = 0.117
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.464	226.799
2	85.039	221.441
3	116.545	199.380
4	149.311	176.437
5	151.611	174.138
6	440.500	150.801
7	520.000	146.731
8	560.000	150.587
9	614.000	151.150
10	720.000	158.451
11	760.000	171.772
12	800.000	199.644
13	844.000	239.847
14	880.000	282.414
15	928.000	346.000

*** FOS = 1.520 Theta (ki=1.0) = 6.67 ***
Lambda = 0.117
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.655	226.921
2	90.283	221.530
3	120.184	200.593
4	152.950	177.650
5	157.275	173.325
6	440.500	150.157
7	520.000	146.555
8	560.000	148.630
9	614.000	151.162
10	720.000	158.182
11	760.000	171.971
12	800.000	201.062
13	844.000	240.234
14	880.000	282.520
15	928.000	346.000

*** FOS = 1.521 Theta (ki=1.0) = 6.64 ***
Lambda = 0.116
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.242	228.512
2	158.563	222.688

3	186.761	202.943
4	219.527	180.000
5	231.616	167.911
6	440.500	148.822
7	520.000	147.998
8	560.000	149.194
9	614.000	150.941
10	720.000	158.019
11	760.000	173.461
12	800.000	200.548
13	844.000	240.810
14	880.000	282.029
15	928.000	346.000

*** FOS = 1.521 Theta (ki=1.0) = 6.82 ***
Lambda = 0.120

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.068	227.072
2	96.761	221.640
3	124.680	202.092
4	157.446	179.149
5	163.222	173.372
6	440.500	148.730
7	520.000	147.871
8	560.000	149.875
9	614.000	151.024
10	720.000	156.849
11	760.000	174.131
12	800.000	200.901
13	844.000	239.440
14	880.000	281.281
15	928.000	346.000

*** FOS = 1.521 Theta (ki=1.0) = 6.64 ***
Lambda = 0.116

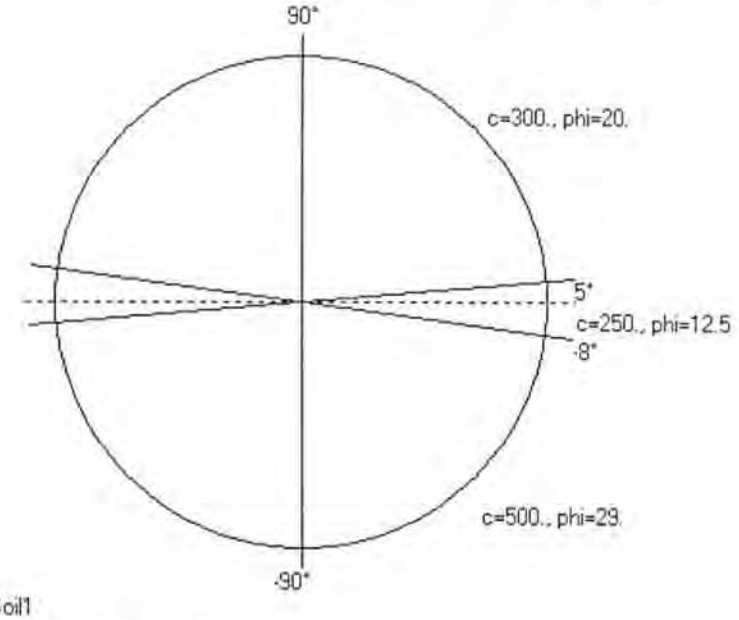
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	169.699	228.993
2	179.229	223.038
3	207.773	203.051
4	240.539	180.108
5	254.697	165.950
6	440.500	151.071
7	520.000	146.532
8	560.000	149.169
9	614.000	150.763
10	720.000	158.346
11	760.000	174.198
12	800.000	200.851
13	844.000	239.086
14	880.000	281.934
15	928.000	346.000

*** FOS = 1.522 Theta (ki=1.0) = 6.91 ***
Lambda = 0.121

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

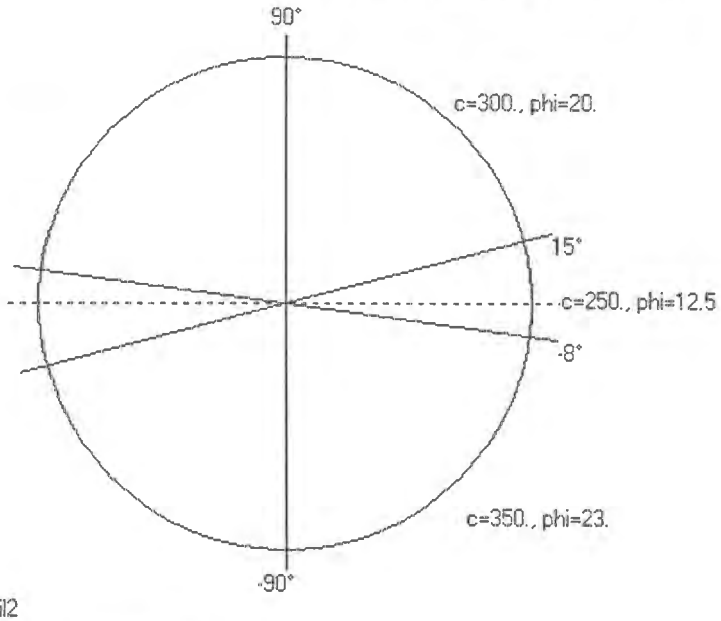
Anisotropic Soil Definition



Soil1

13662-00, Section A-A',- Static,

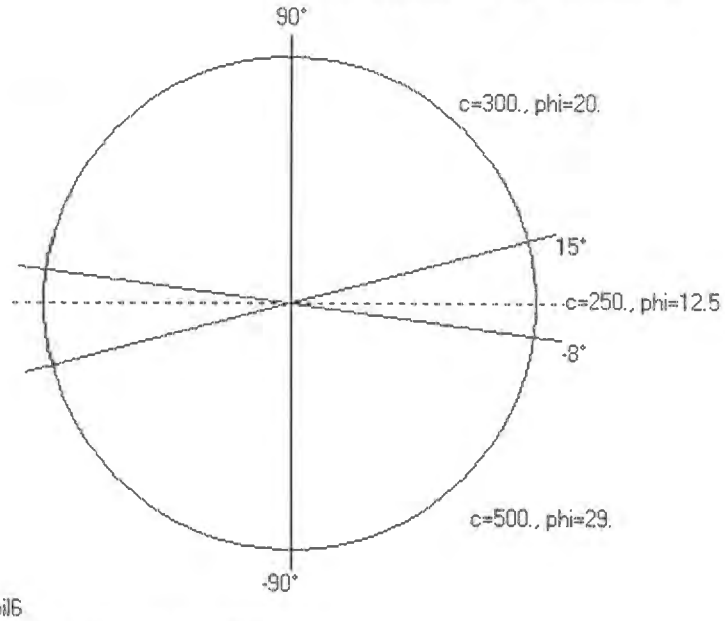
Anisotropic Soil Definition



Soil2

13662-00, Section A-A',- Static,

Anisotropic Soil Definition

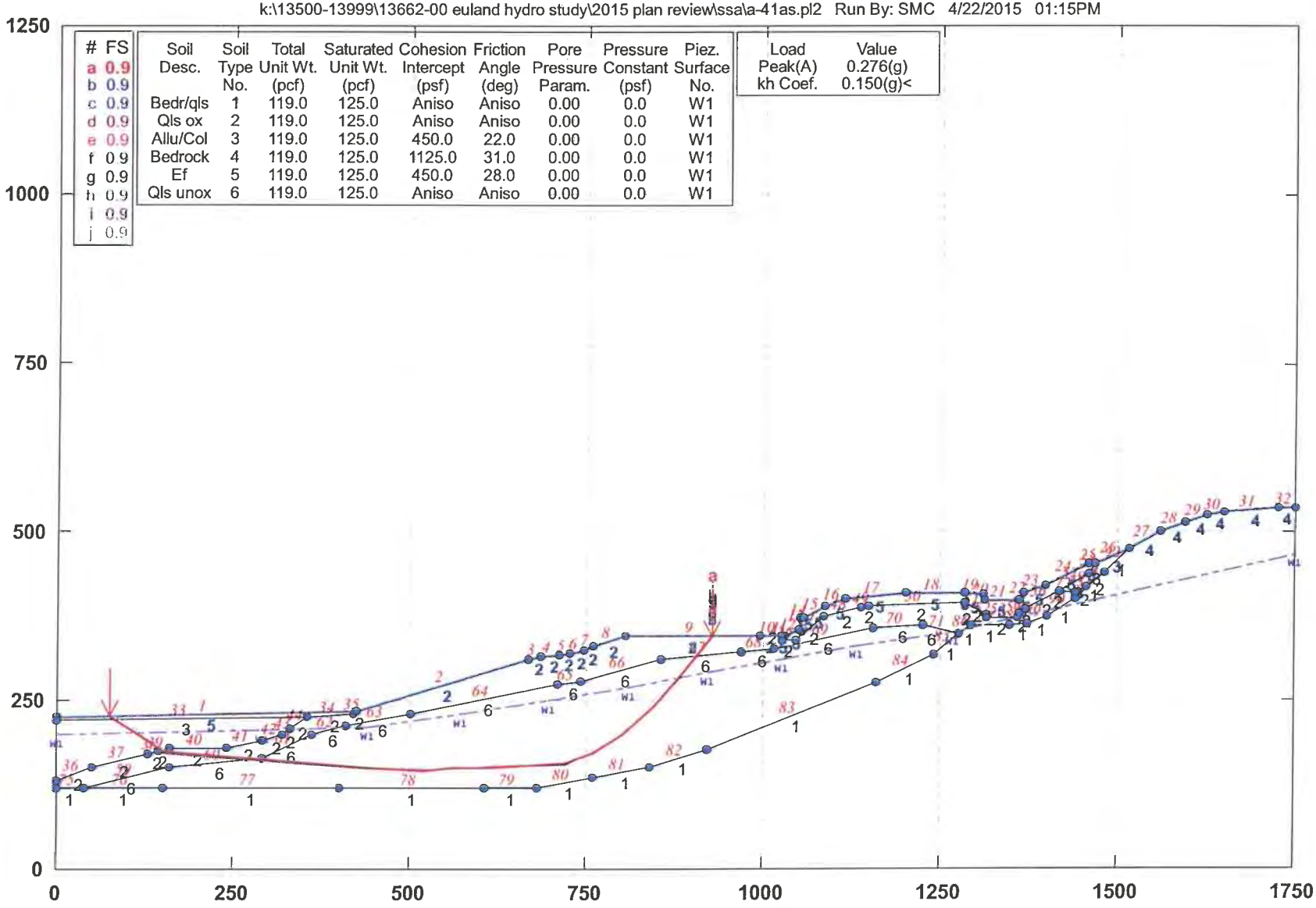


Soil6

13662-00, Section A-A',- Static,

13662-00, Section A-A',- Seismic, - Shallow .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41as.pl2 Run By: SMC 4/22/2015 01:15PM



#	FS
a	0.9
b	0.9
c	0.9
d	0.9
e	0.9
f	0.9
g	0.9
h	0.9
i	0.9
j	0.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bedr/qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Allu/Col	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Ef	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=0.9

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-1.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 01:15PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41as.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41as.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41as.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	173.00	440.00	150.00	3.00
2	440.50	150.00	440.50	150.00	3.00
3	520.00	148.00	520.00	148.00	3.00
4	560.00	150.00	560.00	150.00	3.00
5	614.00	152.00	614.00	152.00	3.00
6	720.00	157.00	720.00	157.00	3.00
7	760.00	173.00	760.00	173.00	3.00
8	800.00	200.00	800.00	200.00	3.00

9	844.00	240.00	844.00	240.00	3.00
10	880.00	282.00	880.00	282.00	3.00
11	928.00	346.00	928.00	346.00	0.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.06	230.01
2	223.42	223.79
3	244.12	209.82
4	277.28	187.46
5	296.49	168.25
6	303.55	161.19
7	440.50	151.14
8	520.00	148.77
9	560.00	149.54
10	614.00	151.99
11	720.00	157.90
12	760.00	173.29
13	800.00	201.46
14	844.00	240.92
15	880.00	282.47
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 1.019
Theta (ki = 1.0) = 4.76 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.01	229.56
2	204.17	223.46
3	228.90	206.78
4	262.06	184.41
5	282.36	164.12
6	284.15	162.33
7	440.50	150.72
8	520.00	148.62
9	560.00	149.19
10	614.00	153.22
11	720.00	155.74
12	760.00	174.03
13	800.00	198.62
14	844.00	239.30
15	880.00	283.08
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.986
Theta (ki = 1.0) = 4.73 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.11	229.28
2	192.14	223.26
3	219.39	204.88
4	252.55	182.51
5	272.12	162.94
6	272.40	162.66
7	440.50	150.18
8	520.00	146.73
9	560.00	151.30
10	614.00	153.43
11	720.00	157.88
12	760.00	173.70
13	800.00	201.16
14	844.00	238.79
15	880.00	283.39
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.971
Theta (ki = 1.0) = 4.68 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	201.15	229.73
2	211.39	223.58
3	234.61	207.92
4	267.77	185.55
5	288.50	164.83
6	291.80	161.53
7	440.50	150.60
8	520.00	146.88
9	560.00	148.65
10	614.00	152.19
11	720.00	157.03
12	760.00	172.95
13	800.00	200.99
14	844.00	240.42
15	880.00	282.77
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.995
Theta (ki = 1.0) = 4.71 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	197.29	229.64
2	207.48	223.52
3	231.52	207.30
4	264.68	184.94
5	285.17	164.44
6	286.42	163.20
7	440.50	150.46
8	520.00	148.55
9	560.00	150.81
10	614.00	152.03
11	720.00	156.24
12	760.00	171.71
13	800.00	200.99
14	844.00	238.85
15	880.00	281.32
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.980
Theta (ki = 1.0) = 4.71 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	189.99	229.47
2	200.11	223.39
3	225.69	206.14
4	258.85	183.77
5	278.90	163.72
6	279.48	163.15
7	440.50	148.63
8	520.00	148.01
9	560.00	150.36
10	614.00	152.69
11	720.00	158.29
12	760.00	171.69
13	800.00	200.68
14	844.00	239.28
15	880.00	282.77
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.972

Theta (ki = 1.0) = 4.71 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	197.43	229.65
2	207.63	223.52
3	231.64	207.33
4	264.80	184.96
5	285.30	164.46
6	288.68	161.08
7	440.50	150.20
8	520.00	148.48
9	560.00	149.43
10	614.00	150.83
11	720.00	156.73
12	760.00	172.39
13	800.00	200.36
14	844.00	241.41
15	880.00	282.57
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.997
Theta (ki = 1.0) = 4.71 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.48	229.51
2	201.61	223.42
3	226.88	206.38
4	260.04	184.01
5	280.18	163.87
6	281.32	162.73
7	440.50	149.54
8	520.00	148.71
9	560.00	150.17
10	614.00	151.72
11	720.00	157.38
12	760.00	172.43
13	800.00	199.42
14	844.00	239.10
15	880.00	281.53
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.977
Theta (ki = 1.0) = 4.68 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	200.71	229.72
2	210.94	223.58
3	234.25	207.85
4	267.41	185.48
5	288.11	164.78
6	290.95	161.95
7	440.50	149.95
8	520.00	148.41
9	560.00	151.04
10	614.00	152.64
11	720.00	157.22
12	760.00	173.07
13	800.00	199.73
14	844.00	240.96
15	880.00	280.81
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.993
Theta (ki = 1.0) = 4.74 Deg Lambda =

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	206.06	229.85
2	216.35	223.67
3	238.53	208.71
4	271.69	186.34
5	292.02	166.01
6	298.17	159.86
7	440.50	151.00
8	520.00	147.43
9	560.00	148.70
10	614.00	151.83
11	720.00	157.10
12	760.00	172.05
13	800.00	201.46
14	844.00	239.35
15	880.00	281.02
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 1.017
Theta (ki = 1.0) = 4.70 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	0.878	1.048	0.176
15.00	1.082	1.171	0.268
22.26	0.001	1.484	0.409
14.38	0.000	1.153	0.256
0.00	0.002	0.003	0.000
0.00	0.001	0.002	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000
0.00	0.001	0.001	0.000

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.04	229.33
2	194.10	223.29
3	220.93	205.19
4	254.10	182.82
5	272.11	164.80
6	440.50	150.96
7	520.00	148.24
8	560.00	151.10
9	614.00	150.57
10	720.00	155.94
11	760.00	171.74
12	800.00	199.74
13	844.00	239.97
14	880.00	281.73
15	928.00	346.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	203.98	229.80
2	214.25	223.63
3	236.87	208.37
4	270.03	186.01
5	290.69	165.35
6	293.21	162.83
7	440.50	149.69
8	520.00	148.34
9	560.00	149.66
10	614.00	151.44
11	720.00	157.71
12	760.00	173.75
13	800.00	199.09
14	844.00	240.52
15	880.00	282.05
16	928.00	346.00

Factor Of Safety For The Preceding Specified Surface = 0.986
Theta (ki = 1.0) = 4.71 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	193.27	229.55
2	203.42	223.45

##################### SOME LINES SKIPPED #####################
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 153
Number of Trial Surfaces with Misleading FS = 383
Number of Trial Surfaces With Valid FS = 2464
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 17.9 %
Statistical Data On All Valid FS Values:
FS Max = 1.257 FS Min = 0.911 FS Ave = 1.051
Standard Deviation = 0.113 Coefficient of Variation = 10.75 %
((Simplified Janbu FS for Critical Surface = 0.939))
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.771	226.736
2	82.650	221.401
3	82.988	221.173
4	116.150	198.805
5	149.311	176.437
6	151.611	174.138
7	440.500	150.801
8	520.000	146.731
9	560.000	150.587
10	614.000	151.150
11	720.000	158.451
12	760.000	171.772
13	800.000	199.644
14	844.000	239.847
15	880.000	282.414
16	928.000	346.000

*** FOS = 0.911 Theta (ki=1.0) = 4.61 ***

Lambda = 0.081

Individual data on the 47 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.9	2928.8	0.0	0.0	0.	0.	439.3	0.0	0.0
2	0.3	228.0	0.0	0.0	0.	0.	34.2	0.0	0.0
3	28.6	53515.5	0.0	0.0	0.	0.	8027.3	0.0	0.0
4	4.6	15011.6	0.0	551.6	0.	0.	2251.7	0.0	0.0
5	33.2	162745.0	0.0	36565.5	0.	0.	24411.7	0.0	0.0
6	2.3	14948.0	0.0	5536.6	0.	0.	2242.2	0.0	0.0
7	8.4	56228.2	0.0	15159.7	0.	0.	8434.2	0.0	0.0
8	80.0	582153.6	0.0	*******	0.	0.	87323.0	0.0	0.0
9	39.6	318894.8	0.0	96778.0	0.	0.	47834.2	0.0	0.0
10	10.4	87201.9	0.0	27031.9	0.	0.	13080.3	0.0	0.0
11	2.0	16919.9	0.0	5271.1	0.	0.	2538.0	0.0	0.0
12	28.0	242374.4	0.0	76745.0	0.	0.	36356.2	0.0	0.0
13	7.8	68991.1	0.0	22264.3	0.	0.	10348.7	0.0	0.0
14	2.2	20060.2	0.0	6506.6	0.	0.	3009.0	0.0	0.0
15	24.0	219067.8	0.0	71974.6	0.	0.	32860.2	0.0	0.0
16	6.0	55945.9	0.0	18638.8	0.	0.	8391.9	0.0	0.0
17	35.4	339549.0	0.0	*******	0.	0.	50932.4	0.0	0.0
18	14.6	145007.0	0.0	50182.2	0.	0.	21751.1	0.0	0.0
19	10.0	100841.2	0.0	35222.1	0.	0.	15126.2	0.0	0.0
20	5.0	50911.8	0.0	17879.8	0.	0.	7636.8	0.0	0.0
21	15.0	158534.5	0.0	54714.7	0.	0.	23780.2	0.0	0.0
22	0.5	5465.4	0.0	1832.2	0.	0.	819.8	0.0	0.0
23	59.5	729318.4	0.0	*******	0.	0.	*******	0.0	0.0
24	20.0	280278.6	0.0	90818.5	0.	0.	42041.8	0.0	0.0
25	40.0	598832.0	0.0	*******	0.	0.	89824.8	0.0	0.0
26	10.0	156682.4	0.0	48476.7	0.	0.	23502.4	0.0	0.0
27	44.0	732764.9	0.0	*******	0.	0.	*******	0.0	0.0
28	53.0	966262.9	0.0	*******	0.	0.	*******	0.0	0.0
29	18.0	345143.1	0.0	*******	0.	0.	51771.5	0.0	0.0
30	11.0	213180.3	0.0	63001.4	0.	0.	31977.0	0.0	0.0
31	12.0	233462.6	0.0	69383.0	0.	0.	35019.4	0.0	0.0
32	2.0	39004.4	0.0	11655.8	0.	0.	5850.7	0.0	0.0
33	10.0	195760.9	0.0	58672.7	0.	0.	29364.1	0.0	0.0
34	7.0	137023.5	0.0	43177.6	0.	0.	20553.5	0.0	0.0
35	15.0	291006.8	0.0	90839.0	0.	0.	43651.0	0.0	0.0
36	3.0	57820.2	0.0	17892.1	0.	0.	8673.0	0.0	0.0
37	13.0	251492.6	0.0	76470.9	0.	0.	37723.9	0.0	0.0
38	2.0	38877.8	0.0	11611.6	0.	0.	5831.7	0.0	0.0
39	40.0	741162.6	0.0	*******	0.	0.	*******	0.0	0.0
40	5.0	87189.1	0.0	27791.8	0.	0.	13078.4	0.0	0.0
41	5.0	84868.1	0.0	26255.0	0.	0.	12730.2	0.0	0.0
42	34.0	502131.8	0.0	*******	0.	0.	75319.8	0.0	0.0
43	12.0	143603.8	0.0	34608.1	0.	0.	21540.6	0.0	0.0
44	24.0	223870.0	0.0	28114.9	0.	0.	33580.5	0.0	0.0
45	0.3	2066.1	0.0	4.4	0.	0.	309.9	0.0	0.0
46	24.1	135432.2	0.0	0.0	0.	0.	20314.8	0.0	0.0
47	23.7	44102.5	0.0	0.0	0.	0.	6615.4	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.852	226.761
2	83.742	221.419
3	116.899	199.055
4	150.061	176.687
5	152.602	174.146
6	440.500	151.063
7	520.000	148.951
8	560.000	149.795
9	614.000	150.627
10	720.000	157.729
11	760.000	172.632
12	800.000	200.117
13	844.000	240.215
14	880.000	282.208

15	928.000	346.000

*** FOS = 0.912 Theta (ki=1.0) = 4.63 ***
Lambda = 0.081
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.852	226.761
2	83.742	221.419
3	116.899	199.055
4	150.061	176.687
5	152.602	174.146
6	440.500	151.063
7	520.000	148.951
8	560.000	149.795
9	614.000	150.627
10	720.000	157.729
11	760.000	172.632
12	800.000	200.117
13	844.000	240.215
14	880.000	282.208
15	928.000	346.000

*** FOS = 0.912 Theta (ki=1.0) = 4.63 ***
Lambda = 0.081
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.690	226.710
2	81.558	221.382
3	82.239	220.923
4	115.401	198.555
5	148.562	176.187
6	150.620	174.130
7	440.500	150.539
8	520.000	147.512
9	560.000	151.380
10	614.000	151.673
11	720.000	156.174
12	760.000	173.912
13	800.000	199.171
14	844.000	239.480
15	880.000	282.621
16	928.000	346.000

*** FOS = 0.912 Theta (ki=1.0) = 4.62 ***
Lambda = 0.081
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.690	226.710
2	81.558	221.382
3	82.239	220.923
4	115.401	198.555
5	148.562	176.187
6	150.620	174.130
7	440.500	150.539
8	520.000	147.512
9	560.000	151.380
10	614.000	151.673
11	720.000	156.174
12	760.000	173.912
13	800.000	199.171
14	844.000	239.480
15	880.000	282.621
16	928.000	346.000

*** FOS = 0.912 Theta (ki=1.0) = 4.63 ***
Lambda = 0.081
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.395	226.798
2	85.302	221.446

3	117.969	199.411
4	151.131	177.044
5	154.443	173.731
6	440.500	148.979
7	520.000	146.643
8	560.000	149.609
9	614.000	152.656
10	720.000	156.817
11	760.000	173.372
12	800.000	198.853
13	844.000	240.041
14	880.000	280.967
15	928.000	346.000

*** FOS = 0.913 Theta (ki=1.0) = 4.54 ***
Lambda = 0.079

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.153	226.721
2	82.025	221.390
3	82.560	221.030
4	115.721	198.662
5	148.883	176.294
6	151.469	173.708
7	440.500	151.192
8	520.000	148.986
9	560.000	148.986
10	614.000	151.225
11	720.000	155.983
12	760.000	173.792
13	800.000	200.433
14	844.000	238.938
15	880.000	281.587
16	928.000	346.000

*** FOS = 0.913 Theta (ki=1.0) = 4.60 ***
Lambda = 0.081

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.932	226.787
2	84.834	221.438
3	117.648	199.304
4	150.810	176.937
5	153.593	174.153
6	440.500	151.326
7	520.000	148.170
8	560.000	149.002
9	614.000	153.104
10	720.000	157.007
11	760.000	173.492
12	800.000	200.590
13	844.000	240.583
14	880.000	282.001
15	928.000	346.000

*** FOS = 0.913 Theta (ki=1.0) = 4.59 ***
Lambda = 0.080

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.932	226.787
2	84.834	221.438
3	117.648	199.304
4	150.810	176.937
5	153.593	174.153
6	440.500	151.326
7	520.000	148.170
8	560.000	149.002
9	614.000	153.104
10	720.000	157.007
11	760.000	173.492

12	800.000	200.590
13	844.000	240.583
14	880.000	282.001
15	928.000	346.000

*** FOS = 0.913 Theta (ki=1.0) = 4.59 ***
Lambda = 0.080

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.717	226.899
2	89.670	221.520
3	120.966	200.410
4	154.128	178.043
5	158.408	173.763
6	440.500	150.028
7	520.000	146.520
8	560.000	149.439
9	614.000	150.564
10	720.000	156.928
11	760.000	173.811
12	800.000	200.745
13	844.000	238.512
14	880.000	283.141
15	928.000	346.000

*** FOS = 0.914 Theta (ki=1.0) = 4.54 ***
Lambda = 0.079

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

12	800.000	200.590
13	844.000	240.583
14	880.000	282.001
15	928.000	346.000

*** FOS = 0.913 Theta (ki=1.0) = 4.59 ***
Lambda = 0.080

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.717	226.899
2	89.670	221.520
3	120.966	200.410
4	154.128	178.043
5	158.408	173.763
6	440.500	150.028
7	520.000	146.520
8	560.000	149.439
9	614.000	150.564
10	720.000	156.928
11	760.000	173.811
12	800.000	200.745
13	844.000	238.512
14	880.000	283.141
15	928.000	346.000

*** FOS = 0.914 Theta (ki=1.0) = 4.54 ***
Lambda = 0.079

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

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 01:17PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41as Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41as Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41as Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2

40	160.00	180.00	240.00	180.00	2
41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points

Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

Trial Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.771	226.736
2	82.650	221.401
3	82.988	221.173
4	116.150	198.805
5	149.311	176.437
6	151.611	174.138
7	440.500	150.801
8	520.000	146.731
9	560.000	150.587
10	614.000	151.150
11	720.000	158.451
12	760.000	171.772
13	800.000	199.644
14	844.000	239.847
15	880.000	282.414
16	928.000	346.000

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	0.781	0.960	0.176
15.00	0.001	1.025	0.268
8.58	0.821	0.946	0.151
5.26	0.898	0.917	0.092
3.37	0.933	0.902	0.059
4.32	0.916	0.909	0.076
4.59	0.911	0.911	0.080

((Simplified Janbu FS for Specified Surface = 0.939))
Factor Of Safety For The Preceding Specified Surface = 0.911
Theta (ki = 1.0) = 4.59 Deg Lambda = 0.080
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 12.718(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	82.65	224.43	0.546	16561.	1.000	4.59	1330.7
2	82.99	224.31	0.543	17337.	1.000	4.59	1393.1
3	111.55	214.41	0.486	139978.	1.000	4.59	11247.7
4	116.15	212.28	0.466	169875.	1.000	4.59	13650.1
5	149.31	198.82	0.430	447429.	1.000	4.59	35952.4
6	151.61	196.42	0.409	502471.	1.000	4.59	40375.3
7	160.00	196.55	0.418	514554.	1.000	4.59	41346.2
8	240.00	197.42	0.478	633859.	1.000	4.59	50932.8
9	279.59	197.62	0.499	695636.	1.000	4.59	55896.7
10	290.00	197.65	0.504	712172.	1.000	4.59	57225.4
11	292.00	197.65	0.505	715364.	1.000	4.59	57482.0
12	320.00	197.70	0.516	760438.	1.000	4.59	61103.8
13	327.76	197.71	0.519	773050.	1.000	4.59	62117.2
14	330.00	197.71	0.520	776700.	1.000	4.59	62410.5
15	354.00	197.71	0.529	816080.	1.000	4.59	65574.8
16	360.00	197.71	0.531	826002.	1.000	4.59	66372.1
17	395.39	197.66	0.541	885155.	1.000	4.59	71125.2
18	410.00	197.63	0.545	909898.	1.000	4.59	73113.4
19	420.00	197.60	0.548	926936.	1.000	4.59	74482.5
20	425.00	197.59	0.549	935488.	1.000	4.59	75169.6
21	440.00	197.50	0.525	962156.	1.000	4.59	77312.5
22	440.50	197.49	0.525	963084.	1.000	4.59	77387.1
23	500.00	197.64	0.451	1060181.	1.000	4.59	85189.1
24	520.00	197.54	0.432	1096705.	1.000	4.59	88124.0
25	560.00	201.58	0.404	1079182.	1.000	4.59	86716.0
26	570.00	201.92	0.396	1089014.	1.000	4.59	87506.0
27	614.00	203.33	0.366	1134640.	1.000	4.59	91172.2
28	667.00	207.61	0.340	1134262.	1.000	4.59	91141.9
29	685.00	209.06	0.336	1134177.	1.000	4.59	91135.0
30	696.00	209.95	0.335	1134014.	1.000	4.59	91121.9
31	708.00	210.93	0.335	1133704.	1.000	4.59	91097.0
32	710.00	211.09	0.335	1133632.	1.000	4.59	91091.2
33	720.00	211.91	0.333	1133207.	1.000	4.59	91057.0
34	727.00	213.51	0.331	1111350.	1.000	4.59	89300.7
35	742.00	216.91	0.325	1065349.	1.000	4.59	85604.4
36	745.00	217.59	0.323	1056283.	1.000	4.59	84875.9
37	758.00	220.51	0.311	1017312.	0.995	4.57	80937.1
38	760.00	220.96	0.310	1011213.	0.983	4.52	78570.0
39	800.00	241.09	0.286	686690.	0.749	3.45	30972.5
40	805.00	244.44	0.284	637088.	0.720	3.31	26534.2
41	810.00	247.81	0.284	589178.	0.691	3.18	22584.3
42	844.00	270.69	0.291	314837.	0.492	2.26	6115.6
43	856.00	281.51	0.299	219697.	0.421	1.94	3135.3
44	880.00	303.41	0.330	86099.	0.281	1.29	546.1
45	880.27	303.71	0.331	84894.	0.279	1.29	532.3

46	904.35	339.56	0.795	10974.	0.138	0.64		16.9
47	928.00	824.32	0.000	208.	0.000	0.00		0.0

Table 1 - Individual data on the 47 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.9	2928.9	0.0	0.0	0.0	0.0	439.3	0.0	0.0
2	0.3	227.6	0.0	0.0	0.0	0.0	34.1	0.0	0.0
3	28.6	53516.1	0.0	0.0	0.0	0.0	8027.4	0.0	0.0
4	4.6	15010.7	0.0	551.5	0.0	0.0	2251.6	0.0	0.0
5	33.2	162742.4	0.0	36565.2	0.0	0.0	24411.4	0.0	0.0
6	2.3	14951.8	0.0	5536.8	0.0	0.0	2242.8	0.0	0.0
7	8.4	56225.9	0.0	15159.0	0.0	0.0	8433.9	0.0	0.0
8	80.0	582151.0	0.0	*******	0.0	0.0	87322.7	0.0	0.0
9	39.6	318900.2	0.0	96779.5	0.0	0.0	47835.0	0.0	0.0
10	10.4	87195.4	0.0	27029.8	0.0	0.0	13079.3	0.0	0.0
11	2.0	16919.8	0.0	5271.0	0.0	0.0	2538.0	0.0	0.0
12	28.0	242374.1	0.0	76744.8	0.0	0.0	36356.1	0.0	0.0
13	7.8	68991.0	0.0	22264.2	0.0	0.0	10348.7	0.0	0.0
14	2.2	20060.1	0.0	6506.6	0.0	0.0	3009.0	0.0	0.0
15	24.0	219067.6	0.0	71974.5	0.0	0.0	32860.1	0.0	0.0
16	6.0	55945.9	0.0	18638.8	0.0	0.0	8391.9	0.0	0.0
17	35.4	339548.9	0.0	*******	0.0	0.0	50932.3	0.0	0.0
18	14.6	145007.1	0.0	50182.2	0.0	0.0	21751.1	0.0	0.0
19	10.0	100841.2	0.0	35222.1	0.0	0.0	15126.2	0.0	0.0
20	5.0	50911.9	0.0	17879.8	0.0	0.0	7636.8	0.0	0.0
21	15.0	158534.6	0.0	54714.8	0.0	0.0	23780.2	0.0	0.0
22	0.5	5465.4	0.0	1832.2	0.0	0.0	819.8	0.0	0.0
23	59.5	729319.6	0.0	*******	0.0	0.0	*******	0.0	0.0
24	20.0	280279.2	0.0	90818.8	0.0	0.0	42041.9	0.0	0.0
25	40.0	598833.2	0.0	*******	0.0	0.0	89825.0	0.0	0.0
26	10.0	156682.7	0.0	48476.9	0.0	0.0	23502.4	0.0	0.0
27	44.0	732766.0	0.0	*******	0.0	0.0	*******	0.0	0.0
28	53.0	966264.7	0.0	*******	0.0	0.0	*******	0.0	0.0
29	18.0	345143.9	0.0	*******	0.0	0.0	51771.6	0.0	0.0
30	11.0	213180.8	0.0	63001.6	0.0	0.0	31977.1	0.0	0.0
31	12.0	233463.2	0.0	69383.4	0.0	0.0	35019.5	0.0	0.0
32	2.0	39004.5	0.0	11655.8	0.0	0.0	5850.7	0.0	0.0
33	10.0	195761.4	0.0	58673.0	0.0	0.0	29364.2	0.0	0.0
34	7.0	137023.9	0.0	43177.9	0.0	0.0	20553.6	0.0	0.0
35	15.0	291007.5	0.0	90839.5	0.0	0.0	43651.1	0.0	0.0
36	3.0	57820.4	0.0	17892.2	0.0	0.0	8673.1	0.0	0.0
37	13.0	251493.2	0.0	76471.3	0.0	0.0	37724.0	0.0	0.0
38	2.0	38877.9	0.0	11611.7	0.0	0.0	5831.7	0.0	0.0
39	40.0	741162.9	0.0	*******	0.0	0.0	*******	0.0	0.0
40	5.0	87189.1	0.0	27791.6	0.0	0.0	13078.4	0.0	0.0
41	5.0	84868.1	0.0	26254.8	0.0	0.0	12730.2	0.0	0.0
42	34.0	502132.8	0.0	*******	0.0	0.0	75319.9	0.0	0.0
43	12.0	143604.5	0.0	34608.7	0.0	0.0	21540.7	0.0	0.0
44	24.0	223871.1	0.0	28115.9	0.0	0.0	33580.7	0.0	0.0
45	0.3	2068.4	0.0	4.4	0.0	0.0	310.3	0.0	0.0
46	24.1	135431.4	0.0	0.0	0.0	0.0	20314.7	0.0	0.0
47	23.7	44101.9	0.0	0.0	0.0	0.0	6615.3	0.0	0.0

- TABLE 2 - Base Stress Data on the 47 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-31.00	78.21	10.36	1194.71	282.75	1190.79
2	-34.00	82.82	0.41	1698.97	558.57	1246.95
3	-34.00	97.27	34.45	3639.08	1553.54	2107.05
4	-34.00	113.85	5.55	5826.61	2703.31	3032.80
5	-34.00	132.73	40.00	8042.79	4068.59	3654.05
6	-44.99	150.46	3.25	16625.53	4597.76	8211.54
7	-4.62	155.81	8.42	6969.42	6680.58	1878.07
8	-4.62	200.00	80.26	7555.29	7253.26	1967.72
9	-4.62	259.80	39.72	8347.99	8028.12	2089.02
10	-4.62	284.80	10.44	8679.41	8352.07	2139.73
11	-4.62	291.00	2.01	8761.64	8432.45	2152.31
12	-4.62	306.00	28.09	8961.19	8628.11	2179.13

13	-4.62	323.88	7.79	9199.18	8861.58	2210.42
14	-4.62	328.88	2.25	9265.73	8926.87	2219.16
15	-4.62	342.00	24.08	9440.36	9098.18	2242.12
16	-4.62	357.00	6.02	9640.02	9294.04	2268.36
17	-4.62	377.69	35.50	9915.46	9564.25	2304.57
18	-4.62	402.69	14.66	10248.22	9890.68	2348.31
19	-4.62	415.00	10.03	10412.03	10051.38	2369.84
20	-4.62	422.50	5.02	10511.86	10149.31	2382.96
21	-4.62	432.50	15.05	10911.40	10534.66	2476.07
22	-4.62	440.25	0.50	11287.86	10895.40	2578.18
23	-2.93	470.25	59.58	12532.73	12241.44	2823.64
24	-2.93	510.00	20.03	14323.50	13995.63	3189.16
25	5.51	540.00	40.19	14625.45	14901.75	3218.84
26	0.60	565.00	10.00	15710.59	15667.41	3494.11
27	0.60	592.00	44.00	16698.19	16652.87	3705.77
28	3.94	640.50	53.13	17957.78	18188.32	3964.50
29	3.94	676.00	18.04	18886.90	19129.34	4172.37
30	3.94	690.50	11.03	19089.12	19334.27	4206.96
31	3.94	702.00	12.03	19163.06	19409.28	4212.51
32	3.94	709.00	2.00	19209.23	19456.16	4212.60
33	3.94	715.00	10.02	19281.93	19529.87	4222.08
34	18.42	723.50	7.38	17448.32	18572.05	5634.53
35	18.42	734.50	15.81	17286.58	18406.63	5610.07
36	18.42	743.50	3.16	17167.79	18286.09	5596.05
37	18.42	751.50	13.70	17195.53	18354.57	5642.71
38	18.42	759.00	2.11	16881.28	18443.09	5535.60
39	34.87	780.00	48.75	14306.55	15202.43	4682.61
40	42.42	802.50	6.77	12636.12	12873.33	4276.51
41	42.42	807.50	6.77	12286.65	12530.65	4222.17
42	42.42	827.00	46.06	10630.06	10902.81	3878.56
43	49.78	850.00	18.58	7835.86	7727.73	3141.93
44	49.78	868.00	37.17	5846.93	6023.55	2750.46
45	52.95	880.14	0.45	4257.90	4546.43	2377.12
46	52.95	892.31	39.95	3085.82	3389.73	1861.77
47	52.95	916.17	39.26	759.28	1123.31	830.37

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1232(g)
Calculated Newmark Seismic Displacement = 0.135(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: A-A'

File: a-41as

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1232
T_m (s)	0.517
T_s (s)	0.23
M	6.95
T_s/T_m	0.440103

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.260	0.202	0.334
k-velmax (cm/s)	25.86	20.14	33.20

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.89	0.847	6.59	2.83	15.37
[kmax, k-velmax]	1.04	0.535	2.82	1.65	4.82
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.89	0.847	2.59	1.11	6.05
[kmax, k-velmax]	1.04	0.535	1.11	0.65	1.90

PGA	Peak Ground Acceleration (g)
PGV	Peak Ground Velocity (cm/s)
k_y	Critical or Yield Acceleration (g)
T_m	Mean Period of an Earthquake Motion (s)
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M	Earthquake Magnitude
kmax	maximum seismic coefficient (g)
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)
D	Predicted Sliding Displacment (cm)

H_{avr} = 120 ft

V_s = 2110 ft/s

$T_s = 4\ H_{avr}/V_s$ = 0.23 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

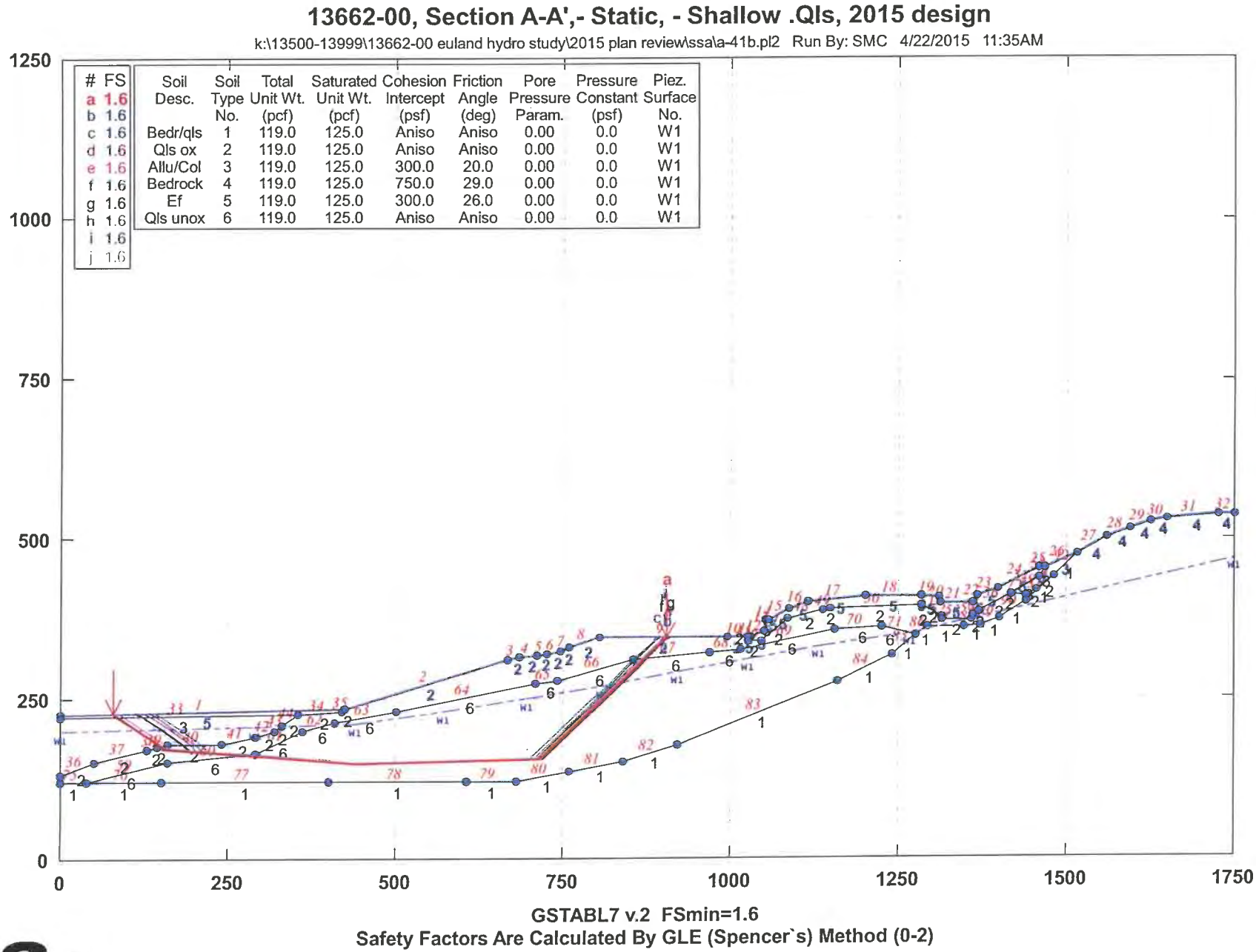
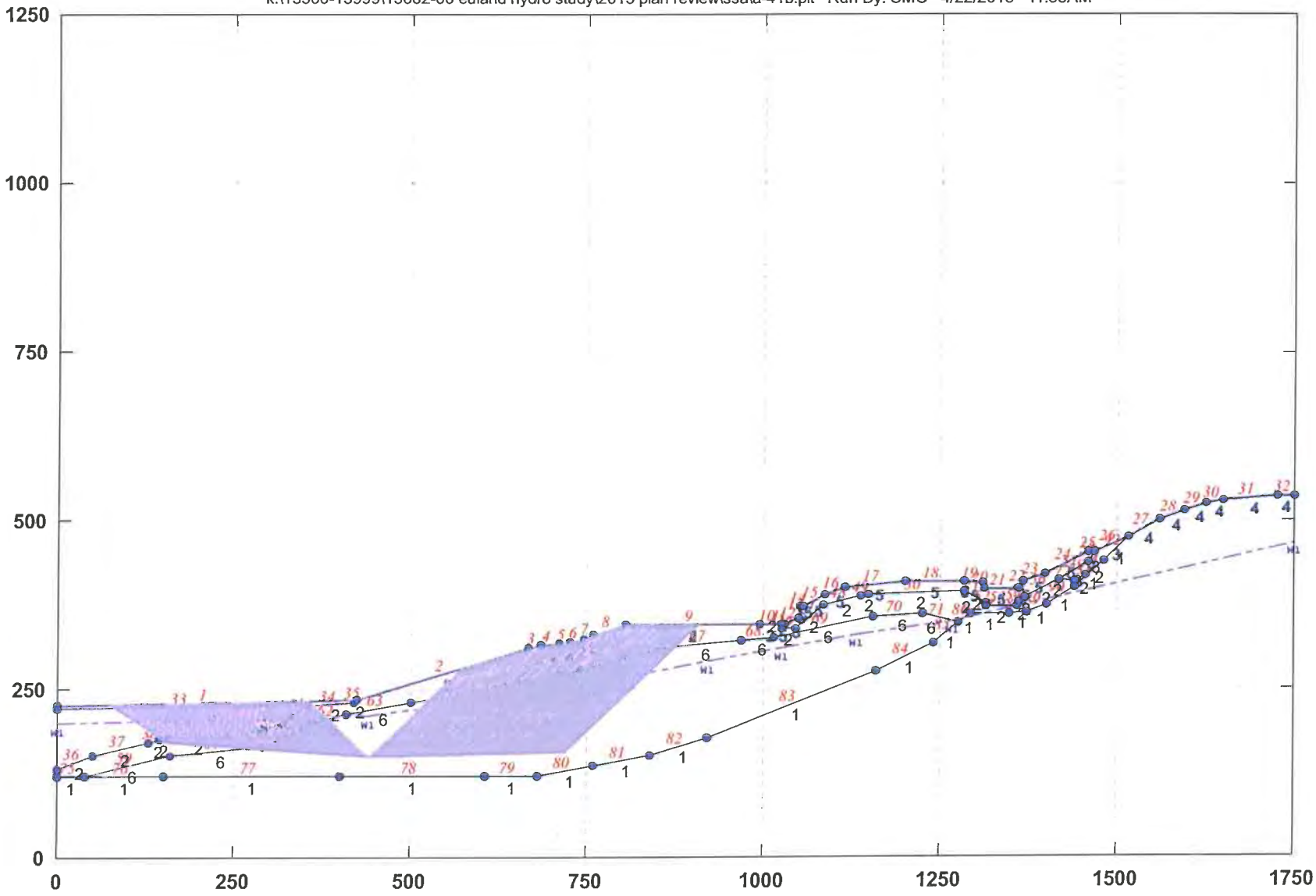

13662-00, Section A-A',- Static, - Shallow .Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41b.pl2 Run By: SMC 4/22/2015 11:35AM
FS
a 1.6
b 1.6
c 1.6
d 1.6
e 1.6
f 1.6
g 1.6
h 1.6
i 1.6
j 1.6
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.6
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-2.1

13662-00, Section A-A',- Static, - Shallow .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41b.plt Run By: SMC 4/22/2015 11:35AM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 11:35AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41b.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41b.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41b.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Static,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	250.0	12.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	173.00	440.00	150.00	3.00
2	440.50	150.00	440.50	150.00	3.00
3	441.00	150.00	720.00	157.00	3.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	2.516	4.919	0.176
15.00	0.000	7.644	0.268
6.94	3.141	4.054	0.122
2.80	3.947	3.280	0.049

3.75	3.770	3.430	0.066
5.07	3.515	3.662	0.089
4.54	3.619	3.565	0.079
4.55	3.616	3.567	0.080
8.49	-0.070	4.448	0.149
4.61	3.605	3.577	0.081
3.35	3.846	3.364	0.058
5.13	3.503	3.674	0.090
4.51	3.625	3.559	0.079
4.53	3.620	3.563	0.079
0.00	-0.403	-0.205	0.000
3.17	3.878	3.338	0.055
1.14	4.240	3.048	0.020
6.11	3.309	3.869	0.107
3.99	3.725	3.470	0.070
4.17	3.691	3.500	0.073

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	140.00	228.29
2	149.23	222.53
3	177.20	202.94
4	209.96	180.00
5	222.55	167.41
6	440.50	149.85
7	450.59	150.52
8	478.87	178.80
9	507.16	207.09
10	535.44	235.37
11	538.13	238.07
12	566.42	266.35
13	584.50	284.43

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	8.684	8.392	0.176
15.00	12.595	25.260	0.268
10.15	8.783	8.615	0.179
8.62	7.827	6.774	0.152
11.05	9.407	10.243	0.195
9.61	8.434	7.869	0.169
9.91	8.623	8.261	0.175
10.61	9.094	9.372	0.187
10.20	8.818	8.696	0.180
10.23	8.839	8.743	0.181
2.77	5.238	3.713	0.048
13.38	11.231	20.016	0.238
4.87	6.002	4.435	0.085
3.75	5.574	4.017	0.065
0.00	-0.197	-0.076	0.000
0.00	-0.197	0.000	0.000
1.14	4.738	3.290	0.020
0.18	0.001	0.001	0.003
0.00	0.000	0.000	0.000
0.18	0.000	0.000	0.003

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	345.45	233.13
2	356.60	226.16
3	378.35	204.40
4	403.41	179.34
5	431.70	151.06
6	440.50	151.18
7	453.45	150.85
8	481.73	179.14

9	510.02	207.42
10	538.30	235.70
11	541.34	238.75
12	569.63	267.03
13	588.16	285.57

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	2.453	5.223	0.176
15.00	0.277	8.006	0.268
6.28	3.328	4.164	0.110
1.96	4.373	3.377	0.034
3.65	3.965	3.647	0.064
4.71	3.708	3.839	0.082
4.30	3.808	3.762	0.075
4.30	3.807	3.763	0.075
8.27	0.000	4.668	0.145
4.35	3.795	3.772	0.076
3.07	4.105	3.550	0.054
4.85	3.673	3.866	0.085
4.24	3.822	3.751	0.074
4.25	3.818	3.754	0.074
11.06	-0.018	5.633	0.195
4.35	3.793	3.773	0.076
2.15	4.326	3.406	0.038
5.16	3.599	3.927	0.090
4.10	3.854	3.727	0.072
4.15	3.844	3.735	0.072

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.24	227.48
2	114.11	221.93
3	141.24	202.94
4	174.00	180.00
5	183.90	170.11
6	440.50	148.63
7	446.09	150.86
8	474.38	179.14
9	502.66	207.43
10	530.94	235.71
11	532.00	236.77
12	560.29	265.05
13	577.50	282.26

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	10.596	10.247	0.176
15.00	16.428	29.996	0.268
10.17	10.752	10.608	0.179
8.62	9.413	8.002	0.152
10.92	11.488	12.592	0.193
9.57	10.210	9.430	0.169
9.87	10.475	9.979	0.174
10.55	11.119	11.532	0.186
10.14	10.723	10.538	0.179
10.17	10.753	10.610	0.179
5.36	7.245	5.252	0.094
12.27	12.964	18.981	0.217
7.65	8.681	6.926	0.134
7.50	8.576	6.786	0.132
17.67	19.586	32.675	0.318
9.13	9.830	8.709	0.161
7.19	8.358	6.506	0.126
13.76	14.795	23.753	0.245

8.69	9.463	8.084	0.153
7.90	8.860	7.172	0.139

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	341.63	233.04
2	352.92	225.98
3	353.37	225.53
4	375.25	203.66
5	398.74	180.16
6	427.03	151.88
7	440.50	149.09
8	446.77	150.08
9	475.06	178.36
10	503.34	206.65
11	531.63	234.93
12	533.86	237.16
13	562.14	265.45
14	579.61	282.92

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	8.089	8.584	0.176
15.00	9.952	25.208	0.268
9.78	7.994	8.270	0.172
7.91	7.223	6.332	0.139
9.19	7.747	7.544	0.162
9.69	7.959	8.159	0.171
9.36	7.819	7.742	0.165
9.37	7.824	7.757	0.165
3.37	5.609	4.023	0.059
11.73	8.812	12.125	0.208
6.98	6.859	5.669	0.122
7.07	6.894	5.728	0.124
13.02	9.321	17.509	0.231
8.06	7.284	6.454	0.142
7.01	6.872	5.692	0.123
11.70	8.801	12.043	0.207
8.68	7.537	7.013	0.153
8.23	7.355	6.604	0.145
10.20	8.174	8.887	0.180
8.92	7.638	7.259	0.157

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	331.00	232.79
2	342.18	225.80
3	348.15	221.62
4	367.88	201.89
5	390.53	179.24
6	418.81	150.96
7	440.50	150.77
8	451.95	148.96
9	480.23	177.25
10	508.52	205.53
11	536.80	233.82
12	541.84	238.85
13	570.12	267.13
14	588.73	285.74

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	6.937	6.911	0.176
15.00	8.846	21.210	0.268

10.01	6.943	6.925	0.177
8.36	6.335	5.605	0.147
10.62	7.176	7.578	0.188
9.55	6.768	6.497	0.168
9.77	6.850	6.692	0.172
10.18	7.005	7.089	0.180
9.99	6.933	6.900	0.176
10.00	6.936	6.908	0.176
4.77	5.192	3.955	0.083
11.90	7.679	9.457	0.211
8.67	6.445	5.813	0.153
8.73	6.464	5.850	0.153
8.46	6.370	5.670	0.149
11.33	7.452	8.511	0.200
9.98	6.930	6.893	0.176
9.59	6.784	6.535	0.169
10.20	7.014	7.115	0.180
9.97	6.926	6.881	0.176

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	344.73	233.11
2	355.93	226.12
3	377.78	204.27
4	403.98	178.06
5	432.27	149.78
6	440.50	149.61
7	462.71	151.07
8	491.00	179.35
9	519.28	207.63
10	547.56	235.92
11	552.82	241.17
12	581.10	269.46
13	601.28	289.63

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	6.139	7.068	0.176
15.00	6.627	21.400	0.268
9.55	6.060	6.648	0.168
7.44	5.653	5.185	0.131
7.98	5.761	5.497	0.140
8.93	5.944	6.136	0.157
8.40	5.843	5.761	0.148
8.43	5.850	5.784	0.148
10.57	6.234	7.687	0.187
8.55	5.873	5.868	0.150
7.89	5.744	5.444	0.139
8.79	5.919	6.036	0.155
8.45	5.854	5.800	0.149
8.48	5.860	5.820	0.149
8.52	5.867	5.847	0.150
8.07	5.780	5.554	0.142
8.73	5.908	5.994	0.154
8.49	5.861	5.824	0.149
8.51	5.864	5.835	0.150
10.54	6.228	7.646	0.186

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	323.98	232.62
2	335.09	225.68
3	344.65	218.99
4	362.93	200.70
5	382.32	181.32
6	410.60	153.04

7	440.50	149.45
8	457.13	150.85
9	485.41	179.13
10	513.69	207.42
11	541.98	235.70
12	546.01	239.73
13	574.30	268.02
14	593.50	287.22

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.324	5.509	0.176
15.00	3.965	11.729	0.268
8.80	4.334	4.886	0.155
6.10	4.269	3.895	0.107
6.65	4.291	4.065	0.117
7.79	4.323	4.462	0.137
7.21	4.309	4.251	0.127
7.25	4.310	4.263	0.127
3.64	4.130	3.286	0.064
8.73	4.334	4.857	0.154
6.13	4.271	3.905	0.107
6.69	4.293	4.077	0.117
7.76	4.322	4.452	0.136
7.23	4.310	4.256	0.127
7.26	4.310	4.267	0.127
6.74	4.294	4.091	0.118
7.62	4.319	4.399	0.134
7.29	4.311	4.278	0.128
7.31	4.312	4.285	0.128
10.93	4.297	6.114	0.193

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	291.64	231.86
2	302.42	225.13
3	328.54	206.84
4	343.59	191.79
5	353.00	182.38
6	381.29	154.09
7	440.50	149.42
8	465.98	149.73
9	494.27	178.01
10	522.55	206.30
11	550.83	234.58
12	558.66	242.41
13	586.94	270.69
14	607.95	291.70

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	6.466	6.296	0.176
15.00	8.175	17.782	0.268
10.12	6.505	6.392	0.178
8.56	5.992	5.305	0.151
11.04	6.824	7.278	0.195
9.73	6.374	6.081	0.171
9.98	6.458	6.277	0.176
10.51	6.641	6.744	0.186
10.25	6.552	6.509	0.181
10.27	6.557	6.522	0.181
2.96	4.464	3.273	0.052
13.00	7.512	10.286	0.231
6.98	5.507	4.517	0.122
7.08	5.537	4.561	0.124

16.77 8.638 22.386 0.301

##################### SOME LINES SKIPPED #####################

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 29
Number of Trial Surfaces With Valid FS = 2971
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 1.0 %
Statistical Data On All Valid FS Values:
FS Max = 13.312 FS Min = 1.551 FS Ave = 2.185
Standard Deviation = 0.877 Coefficient of Variation = 40.16 %
((Simplified Janbu FS for Critical Surface = 1.471))
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.991	226.835
2	86.581	221.467
3	117.615	199.737
4	150.381	176.794
5	153.452	173.724
6	440.500	148.717
7	715.419	156.309
8	743.703	184.593
9	771.988	212.878
10	800.272	241.162
11	828.556	269.446
12	856.840	297.731
13	870.510	311.400
14	898.794	339.684
15	905.110	346.000

*** FOS = 1.551 Theta (ki=1.0) = 6.73 ***
Lambda = 0.118
Individual data on the 45 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.6	2846.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	27.9	51890.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	3.2	10176.5	0.0	275.3	0.	0.	0.0	0.0	0.0
4	32.8	158285.9	0.0	35011.7	0.	0.	0.0	0.0	0.0
5	3.1	19982.5	0.0	7406.9	0.	0.	0.0	0.0	0.0
6	6.5	44202.8	0.0	11993.8	0.	0.	0.0	0.0	0.0
7	80.0	587757.1	0.0	*******	0.	0.	0.0	0.0	0.0
8	34.3	279331.7	0.0	85400.7	0.	0.	0.0	0.0	0.0
9	15.7	132841.6	0.0	41519.2	0.	0.	0.0	0.0	0.0
10	2.0	17204.1	0.0	5416.3	0.	0.	0.0	0.0	0.0
11	28.0	246686.7	0.0	78945.2	0.	0.	0.0	0.0	0.0
12	7.8	70296.2	0.0	22929.6	0.	0.	0.0	0.0	0.0
13	2.2	20445.7	0.0	6703.1	0.	0.	0.0	0.0	0.0
14	24.0	223448.4	0.0	74206.5	0.	0.	0.0	0.0	0.0
15	6.0	57112.4	0.0	19232.8	0.	0.	0.0	0.0	0.0
16	35.4	347008.5	0.0	*******	0.	0.	0.0	0.0	0.0
17	14.6	148376.9	0.0	51896.4	0.	0.	0.0	0.0	0.0
18	10.0	103244.7	0.0	36444.4	0.	0.	0.0	0.0	0.0
19	5.0	52143.3	0.0	18506.0	0.	0.	0.0	0.0	0.0
20	15.0	162347.7	0.0	56653.3	0.	0.	0.0	0.0	0.0
21	0.5	5595.6	0.0	1897.6	0.	0.	0.0	0.0	0.0
22	59.5	727384.8	0.0	*******	0.	0.	0.0	0.0	0.0

23	70.0	1011403.2	0.0	*******	0.	0.	0.0	0.0	0.0
24	97.0	1679771.8	0.0	*******	0.	0.	0.0	0.0	0.0
25	18.0	345593.4	0.0	*******	0.	0.	0.0	0.0	0.0
26	11.0	214277.6	0.0	63418.0	0.	0.	0.0	0.0	0.0
27	12.0	235370.8	0.0	70184.8	0.	0.	0.0	0.0	0.0
28	2.0	39394.6	0.0	11824.7	0.	0.	0.0	0.0	0.0
29	5.4	107081.8	0.0	32223.3	0.	0.	0.0	0.0	0.0
30	11.6	222515.1	0.0	92942.5	0.	0.	0.0	0.0	0.0
31	15.0	268317.4	0.0	*******	0.	0.	0.0	0.0	0.0
32	1.7	29085.6	0.0	11029.0	0.	0.	0.0	0.0	0.0
33	1.3	21947.3	0.0	8254.6	0.	0.	0.0	0.0	0.0
34	13.0	213416.3	0.0	76107.5	0.	0.	0.0	0.0	0.0
35	14.0	215207.2	0.0	68360.8	0.	0.	0.0	0.0	0.0
36	28.3	385329.5	0.0	95380.0	0.	0.	0.0	0.0	0.0
37	4.7	57906.4	0.0	10349.9	0.	0.	0.0	0.0	0.0
38	5.0	58703.6	0.0	9202.1	0.	0.	0.0	0.0	0.0
39	18.6	190794.9	0.0	18560.5	0.	0.	0.0	0.0	0.0
40	4.8	42415.3	0.0	818.6	0.	0.	0.0	0.0	0.0
41	22.6	162837.1	0.0	0.0	0.	0.	0.0	0.0	0.0
42	0.8	4869.7	0.0	0.0	0.	0.	0.0	0.0	0.0
43	13.7	67400.6	0.0	0.0	0.	0.	0.0	0.0	0.0
44	28.3	68857.1	0.0	0.0	0.	0.	0.0	0.0	0.0
45	6.3	2373.3	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.991	226.835
2	86.581	221.467
3	117.615	199.737
4	150.381	176.794
5	153.452	173.724
6	440.500	148.717
7	715.419	156.309
8	743.703	184.593
9	771.988	212.878
10	800.272	241.162
11	828.556	269.446
12	856.840	297.731
13	870.510	311.400
14	898.794	339.684
15	905.110	346.000

*** FOS = 1.553 Theta (ki=1.0) = 6.83 ***
Lambda = 0.120

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	139.174	228.275
2	148.391	222.515
3	176.343	202.943
4	209.109	180.000
5	220.854	168.255
6	440.500	148.547
7	701.796	156.876
8	730.080	185.160
9	758.365	213.444
10	786.649	241.728
11	814.933	270.013
12	843.217	298.297
13	854.481	309.560
14	882.765	337.844
15	890.920	346.000

*** FOS = 1.553 Theta (ki=1.0) = 6.58 ***
Lambda = 0.115

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	132.554	228.119
2	141.703	222.402
3	169.493	202.943
4	202.259	180.000

5	213.207	169.052
6	440.500	148.667
7	716.237	155.975
8	744.521	184.259
9	772.805	212.544
10	801.089	240.828
11	829.374	269.112
12	857.658	297.397
13	871.784	311.523
14	900.069	339.807
15	906.261	346.000

*** FOS = 1.560 Theta (ki=1.0) = 7.00 ***
Lambda = 0.123

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.999	227.047
2	95.682	221.622
3	123.930	201.842
4	156.696	178.899
5	162.231	173.364
6	440.500	151.468
7	719.506	157.639
8	747.790	185.924
9	776.075	214.208
10	804.359	242.492
11	832.643	270.776
12	860.927	299.061
13	873.561	311.694
14	901.845	339.979
15	907.867	346.000

*** FOS = 1.560 Theta (ki=1.0) = 6.80 ***
Lambda = 0.119

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.546	226.778
2	84.111	221.426
3	115.901	199.166
4	148.668	176.223
5	152.885	172.005
6	440.500	150.281
7	706.156	156.094
8	734.440	184.379
9	762.724	212.663
10	791.008	240.947
11	819.293	269.231
12	847.577	297.516
13	860.495	310.434
14	888.779	338.718
15	896.061	346.000

*** FOS = 1.560 Theta (ki=1.0) = 6.26 ***
Lambda = 0.110

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.073	227.684
2	123.033	222.085
3	150.371	202.943
4	183.137	180.000
5	192.109	171.028
6	440.500	149.943
7	719.915	155.972
8	748.199	184.257
9	776.483	212.541
10	804.768	240.825
11	833.052	269.109
12	861.336	297.394
13	875.859	311.916
14	904.143	340.200

15	909.942	346.000

*** FOS = 1.561 Theta (ki=1.0) = 6.96 ***
Lambda = 0.122
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	111.865	227.632
2	120.802	222.047
3	148.086	202.943
4	180.852	180.000
5	191.542	169.310
6	440.500	148.507
7	710.651	155.757
8	738.935	184.042
9	767.220	212.326
10	795.504	240.610
11	823.788	268.895
12	852.072	297.179
13	865.843	310.950
14	894.128	339.234
15	900.894	346.000

*** FOS = 1.563 Theta (ki=1.0) = 6.58 ***
Lambda = 0.115
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.416	227.927
2	133.482	222.262
3	161.073	202.943
4	193.839	180.000
5	204.428	169.411
6	440.500	148.916
7	712.150	157.645
8	740.434	185.929
9	768.718	214.214
10	797.002	242.498
11	825.287	270.782
12	853.571	299.066
13	865.413	310.908
14	893.697	339.193
15	900.504	346.000

*** FOS = 1.563 Theta (ki=1.0) = 7.01 ***
Lambda = 0.123
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.936	227.493
2	114.812	221.946
3	141.951	202.943
4	174.717	180.000
5	183.329	171.388
6	440.500	150.192
7	715.828	157.642
8	744.112	185.926
9	772.396	214.211
10	800.681	242.495
11	828.965	270.779
12	857.249	299.064
13	869.487	311.301
14	897.771	339.586
15	904.186	346.000

*** FOS = 1.563 Theta (ki=1.0) = 6.93 ***
Lambda = 0.122
**** END OF GSTABL7 OUTPUT ****

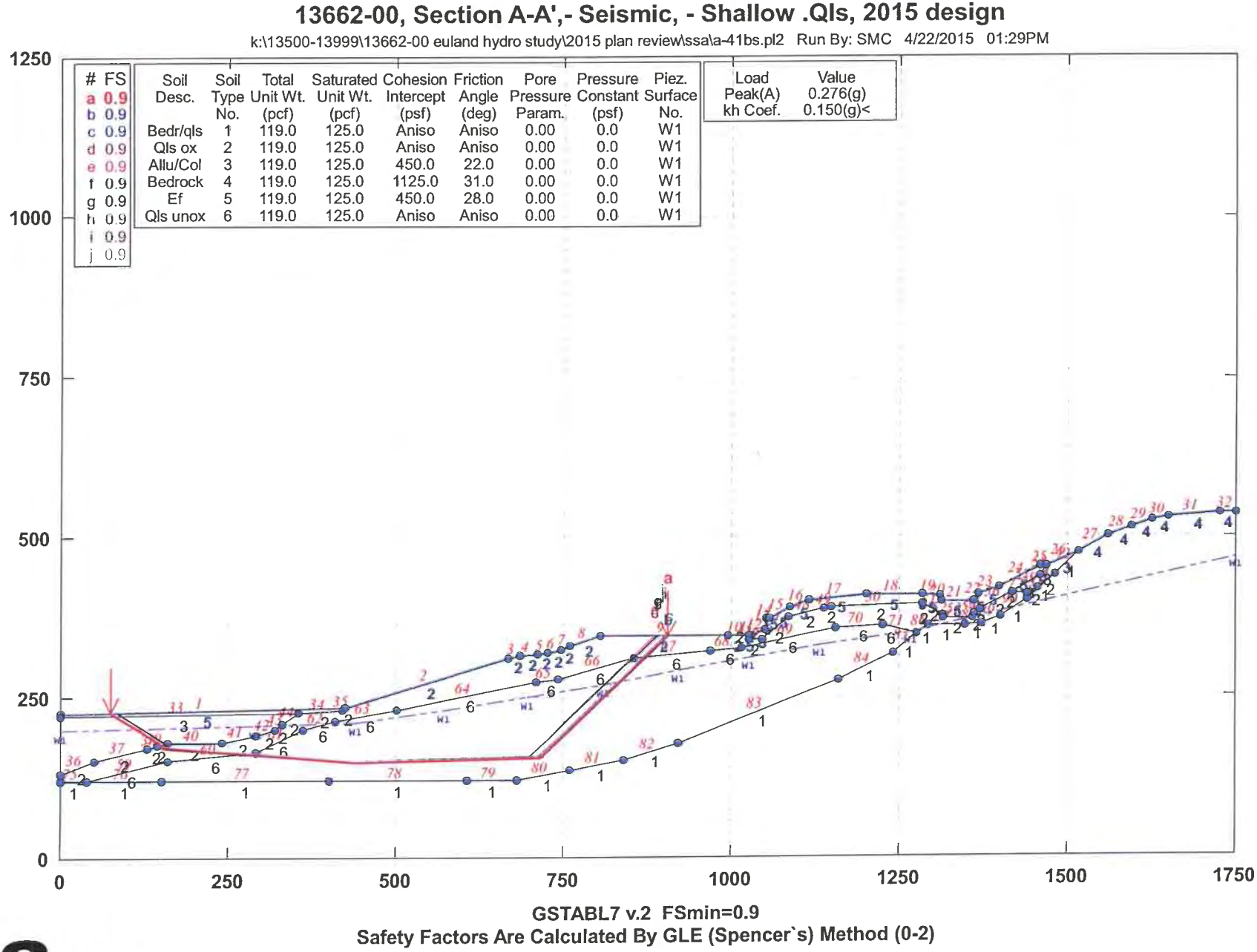
13662-00, Section A-A',- Seismic, - Shallow .Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41bs.pl2 Run By: SMC 4/22/2015 01:29PM
FS
a 0.9
b 0.9
c 0.9
d 0.9
e 0.9
f 0.9
g 0.9
h 0.9
i 0.9
j 0.9
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=0.9
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-2.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****
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: 4/22/2015
Time of Run: 01:29PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41bs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41bs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41bs.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	173.00	440.00	150.00	3.00
2	440.50	150.00	440.50	150.00	3.00
3	441.00	150.00	720.00	157.00	3.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda

6.00	1.397	1.676	0.105
9.00	1.253	1.786	0.158
1.61	1.552	1.542	0.028
0.00	1.596	1.500	0.000
2.39	1.529	1.564	0.042
1.53	1.555	1.540	0.027
1.57	1.553	1.542	0.027
0.00	0.002	0.001	0.000
0.00	0.002	0.001	0.000
0.00	0.001	0.000	0.000
0.00	0.536	0.532	0.000
0.00	0.002	0.001	0.000
0.00	0.001	0.000	0.000
0.00	0.536	0.532	0.000
0.00	0.002	0.001	0.000
0.00	0.001	0.000	0.000
0.00	0.536	0.532	0.000
0.00	0.002	0.001	0.000
0.00	0.001	0.000	0.000
0.00	0.536	0.532	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.57	227.23
2	103.67	221.76
3	132.42	202.37
4	165.58	180.00
5	175.12	170.47
6	440.50	148.88
7	442.00	149.53
8	470.29	177.81
9	498.57	206.10
10	526.86	234.38
11	528.51	236.03
12	556.79	264.31
13	573.50	281.02

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
6.00	3.743	3.331	0.105
9.00	4.310	4.121	0.158
12.38	5.100	5.597	0.219
10.24	4.580	4.565	0.181
9.61	4.440	4.328	0.169
10.58	4.658	4.703	0.187
10.21	4.572	4.551	0.180
10.24	4.579	4.564	0.181
0.00	-0.034	-0.028	0.000
0.60	2.968	2.462	0.010
0.01	-0.031	-0.021	0.000
0.00	1.638	-0.021	0.000
0.00	-0.033	-0.021	0.000
0.00	-0.033	-0.021	0.000
0.00	-0.071	-0.026	0.000
0.00	-0.033	-0.021	0.000
0.00	-0.033	-0.021	0.000
0.00	-0.071	-0.026	0.000
0.00	-0.033	-0.021	0.000
0.00	-0.033	-0.021	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.14	233.26
2	362.38	226.51
3	383.30	205.59
4	383.34	205.55

5	411.63	177.27
6	439.91	148.98
7	440.50	149.49
8	448.27	148.97
9	476.56	177.25
10	504.84	205.53
11	533.12	233.82
12	537.17	237.86
13	565.45	266.15
14	583.39	284.09

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
6.00	4.075	3.603	0.105
9.00	4.750	4.530	0.158
12.48	5.753	6.421	0.221
10.15	5.052	5.020	0.179
9.51	4.881	4.737	0.168
10.60	5.178	5.241	0.187
10.15	5.054	5.023	0.179
10.20	5.066	5.044	0.180
0.00	-0.068	-0.045	0.000
3.50	3.618	3.072	0.061
0.18	-0.061	-0.035	0.003
0.00	-0.060	-0.035	0.000
0.00	-0.060	-0.035	0.000
0.00	-0.060	-0.035	0.000
0.00	-0.060	-0.035	0.000
0.00	-0.060	-0.035	0.000
0.00	-0.060	-0.035	0.000
0.00	-0.060	-0.035	0.000
0.00	-0.060	-0.035	0.000

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.30	233.17
2	358.75	226.29
3	380.19	204.85
4	406.95	178.09
5	435.24	149.80
6	440.50	150.40
7	441.60	151.19
8	469.88	179.48
9	498.16	207.76
10	525.88	235.47
11	554.16	263.76
12	570.49	280.09

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
6.00	1.397	1.676	0.105
9.00	1.253	1.786	0.158
1.60	1.552	1.542	0.028
0.00	1.596	1.500	0.000
2.39	1.529	1.564	0.042
1.53	1.555	1.540	0.027
1.57	1.553	1.542	0.027
13.21	0.001	-0.002	0.235
18.01	0.000	-0.004	0.325
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000

0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.57	227.23
2	103.67	221.76
3	132.42	202.37
4	165.58	180.00
5	175.12	170.47
6	440.50	148.88
7	442.00	149.53
8	470.29	177.81
9	498.57	206.10
10	526.86	234.38
11	528.51	236.03
12	556.79	264.31
13	573.50	281.02

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 4
Number of Trial Surfaces With Valid FS = 2996
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.1 %
Statistical Data On All Valid FS Values:
FS Max = 4.177 FS Min = 0.930 FS Ave = 1.277
Standard Deviation = 0.379 Coefficient of Variation = 29.71 %
((Simplified Janbu FS for Critical Surface = 0.952))
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.314	226.772
2	84.210	221.427
3	117.220	199.162
4	150.381	176.794
5	153.452	173.724
6	440.500	148.717
7	715.419	156.309
8	743.703	184.593
9	771.988	212.878
10	800.272	241.162
11	828.556	269.446
12	856.840	297.731
13	870.510	311.400
14	898.794	339.684
15	905.110	346.000

*** FOS = 0.930 Theta (ki=1.0) = 4.70 ***
Lambda = 0.082
Individual data on the 45 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.9	2939.6	0.0	0.0	0.	0.	440.9	0.0	0.0

2	28.9	53777.7	0.0	0.0	0.	0.	8066.6	0.0	0.0
3	4.1	13333.4	0.0	440.6	0.	0.	2000.0	0.0	0.0
4	33.2	161369.5	0.0	35721.1	0.	0.	24205.4	0.0	0.0
5	3.1	19982.5	0.0	7406.9	0.	0.	2997.4	0.0	0.0
6	6.5	44202.8	0.0	11993.8	0.	0.	6630.4	0.0	0.0
7	80.0	587757.1	0.0	*******	0.	0.	88163.6	0.0	0.0
8	34.3	279331.7	0.0	85400.7	0.	0.	41899.8	0.0	0.0
9	15.7	132841.6	0.0	41519.2	0.	0.	19926.2	0.0	0.0
10	2.0	17204.1	0.0	5416.3	0.	0.	2580.6	0.0	0.0
11	28.0	246686.7	0.0	78945.2	0.	0.	37003.0	0.0	0.0
12	7.8	70296.2	0.0	22929.6	0.	0.	10544.4	0.0	0.0
13	2.2	20445.7	0.0	6703.1	0.	0.	3066.9	0.0	0.0
14	24.0	223448.4	0.0	74206.5	0.	0.	33517.3	0.0	0.0
15	6.0	57112.4	0.0	19232.8	0.	0.	8566.9	0.0	0.0
16	35.4	347008.5	0.0	*******	0.	0.	52051.3	0.0	0.0
17	14.6	148376.9	0.0	51896.4	0.	0.	22256.5	0.0	0.0
18	10.0	103244.7	0.0	36444.4	0.	0.	15486.7	0.0	0.0
19	5.0	52143.3	0.0	18506.0	0.	0.	7821.5	0.0	0.0
20	15.0	162347.7	0.0	56653.3	0.	0.	24352.2	0.0	0.0
21	0.5	5595.6	0.0	1897.6	0.	0.	839.3	0.0	0.0
22	59.5	727384.8	0.0	*******	0.	0.	*******	0.0	0.0
23	70.0	1011403.2	0.0	*******	0.	0.	*******	0.0	0.0
24	97.0	1679771.8	0.0	*******	0.	0.	*******	0.0	0.0
25	18.0	345593.4	0.0	*******	0.	0.	51839.0	0.0	0.0
26	11.0	214277.6	0.0	63418.0	0.	0.	32141.6	0.0	0.0
27	12.0	235370.8	0.0	70184.8	0.	0.	35305.6	0.0	0.0
28	2.0	39394.6	0.0	11824.7	0.	0.	5909.2	0.0	0.0
29	5.4	107081.8	0.0	32223.3	0.	0.	16062.3	0.0	0.0
30	11.6	222515.1	0.0	92942.5	0.	0.	33377.3	0.0	0.0
31	15.0	268317.4	0.0	*******	0.	0.	40247.6	0.0	0.0
32	1.7	29085.6	0.0	11029.0	0.	0.	4362.8	0.0	0.0
33	1.3	21947.3	0.0	8254.6	0.	0.	3292.1	0.0	0.0
34	13.0	213416.3	0.0	76107.5	0.	0.	32012.4	0.0	0.0
35	14.0	215207.2	0.0	68360.8	0.	0.	32281.1	0.0	0.0
36	28.3	385329.5	0.0	95380.0	0.	0.	57799.4	0.0	0.0
37	4.7	57906.4	0.0	10349.9	0.	0.	8686.0	0.0	0.0
38	5.0	58703.6	0.0	9202.1	0.	0.	8805.5	0.0	0.0
39	18.6	190794.9	0.0	18560.5	0.	0.	28619.2	0.0	0.0
40	4.8	42415.3	0.0	818.6	0.	0.	6362.3	0.0	0.0
41	22.6	162837.1	0.0	0.0	0.	0.	24425.6	0.0	0.0
42	0.8	4869.7	0.0	0.0	0.	0.	730.4	0.0	0.0
43	13.7	67400.6	0.0	0.0	0.	0.	10110.1	0.0	0.0
44	28.3	68857.1	0.0	0.0	0.	0.	10328.6	0.0	0.0
45	6.3	2373.3	0.0	0.0	0.	0.	356.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.314	226.772
2	84.210	221.427
3	117.220	199.162
4	150.381	176.794
5	153.452	173.724
6	440.500	148.717
7	715.419	156.309
8	743.703	184.593
9	771.988	212.878
10	800.272	241.162
11	828.556	269.446
12	856.840	297.731
13	870.510	311.400
14	898.794	339.684
15	905.110	346.000

*** FOS = 0.932 Theta (ki=1.0) = 4.85 ***
Lambda = 0.085

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	84.422	226.986
2	93.414	221.583
3	123.535	201.266

4	156.696	178.899
5	162.231	173.364
6	440.500	151.468
7	719.506	157.639
8	747.790	185.924
9	776.075	214.208
10	804.359	242.492
11	832.643	270.776
12	860.927	299.061
13	873.561	311.694
14	901.845	339.979
15	907.867	346.000

*** FOS = 0.939 Theta (ki=1.0) = 4.61 ***
Lambda = 0.081

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.616	226.732
2	82.493	221.398
3	82.881	221.137
4	116.042	198.769
5	149.204	176.401
6	152.319	173.286
7	440.500	148.846
8	696.892	155.880
9	725.176	184.164
10	753.460	212.448
11	781.745	240.732
12	810.029	269.017
13	838.313	297.301
14	848.980	307.968
15	877.264	336.252
16	887.012	346.000

*** FOS = 0.939 Theta (ki=1.0) = 4.54 ***
Lambda = 0.079

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.616	226.732
2	82.493	221.398
3	82.881	221.137
4	116.042	198.769
5	149.204	176.401
6	152.319	173.286
7	440.500	148.846
8	696.892	155.880
9	725.176	184.164
10	753.460	212.448
11	781.745	240.732
12	810.029	269.017
13	838.313	297.301
14	848.980	307.968
15	877.264	336.252
16	887.012	346.000

*** FOS = 0.940 Theta (ki=1.0) = 4.69 ***
Lambda = 0.082

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.723	226.946
2	91.697	221.554
3	122.357	200.874
4	155.519	178.506
5	161.098	172.927
6	440.500	148.596
7	700.979	157.210
8	729.263	185.494
9	757.547	213.778
10	785.832	242.062
11	814.116	270.347

12	842.400	298.631
13	852.860	309.091
14	881.144	337.375
15	889.769	346.000

*** FOS = 0.944 Theta (ki=1.0) = 4.66 ***
Lambda = 0.082

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.723	226.946
2	91.697	221.554
3	122.357	200.874
4	155.519	178.506
5	161.098	172.927
6	440.500	148.596
7	700.979	157.210
8	729.263	185.494
9	757.547	213.778
10	785.832	242.062
11	814.116	270.347
12	842.400	298.631
13	852.860	309.091
14	881.144	337.375
15	889.769	346.000

*** FOS = 0.944 Theta (ki=1.0) = 4.67 ***
Lambda = 0.082

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.010	226.812
2	85.923	221.456
3	118.395	199.553
4	151.557	177.186
5	157.558	171.185
6	440.500	149.374
7	712.831	156.867
8	741.115	185.151
9	769.399	213.435
10	797.684	241.720
11	825.968	270.004
12	854.252	298.288
13	867.028	311.064
14	895.312	339.348
15	901.964	346.000

*** FOS = 0.945 Theta (ki=1.0) = 4.68 ***
Lambda = 0.082

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.010	226.812
2	85.923	221.456
3	118.395	199.553
4	151.557	177.186
5	157.558	171.185
6	440.500	149.374
7	712.831	156.867
8	741.115	185.151
9	769.399	213.435
10	797.684	241.720
11	825.968	270.004
12	854.252	298.288
13	867.028	311.064
14	895.312	339.348
15	901.964	346.000

*** FOS = 0.945 Theta (ki=1.0) = 4.68 ***
Lambda = 0.082

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.843	226.714

2	81.711	221.385
3	82.345	220.958
4	115.506	198.590
5	148.668	176.223
6	152.885	172.005
7	440.500	150.281
8	706.156	156.094
9	734.440	184.379
10	762.724	212.663
11	791.008	240.947
12	819.293	269.231
13	847.577	297.516
14	860.495	310.434
15	888.779	338.718
16	896.061	346.000

*** FOS = 0.945 Theta (ki=1.0) = 4.80 ***

Lambda = 0.084

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

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 01:35PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41bs Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41bs Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41bs Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2

40	160.00	180.00	240.00	180.00	2
41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points

Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

Trial Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.314	226.772
2	84.210	221.427
3	117.220	199.162
4	150.381	176.794
5	153.452	173.724
6	440.500	148.717
7	715.419	156.309
8	743.703	184.593
9	771.988	212.878
10	800.272	241.162
11	828.556	269.446
12	856.840	297.731
13	870.510	311.400
14	898.794	339.684
15	905.110	346.000

Theta	FOS	FOS

(deg) (ki=1.0)	(Moment) (Equil.)	(Force) (Equil.)	Lambda
6.00	0.908	0.943	0.105
9.00	0.849	0.976	0.158
4.47	0.933	0.928	0.078
3.17	0.951	0.916	0.055
4.66	0.930	0.930	0.082

((Simplified Janbu FS for Specified Surface = 0.952))
Factor Of Safety For The Preceding Specified Surface = 0.930
Theta (ki = 1.0) = 4.66 Deg Lambda = 0.082
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 3.158(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	84.21	224.46	0.546	16135.	1.000	4.66	1315.7
2	113.11	214.50	0.489	137038.	1.000	4.66	11175.0
3	117.22	212.58	0.469	163139.	1.000	4.66	13303.4
4	150.38	199.08	0.431	434104.	1.000	4.66	35399.6
5	153.45	195.96	0.405	505366.	1.000	4.66	41210.7
6	160.00	196.07	0.412	514898.	1.000	4.66	41988.0
7	240.00	196.95	0.477	635754.	1.000	4.66	51843.4
8	274.34	197.10	0.497	690119.	1.000	4.66	56276.6
9	290.00	197.13	0.504	715414.	1.000	4.66	58339.3
10	292.00	197.14	0.505	718666.	1.000	4.66	58604.5
11	320.00	197.14	0.517	764629.	1.000	4.66	62352.6
12	327.76	197.14	0.520	777504.	1.000	4.66	63402.6
13	330.00	197.14	0.521	781232.	1.000	4.66	63706.5
14	354.00	197.09	0.530	821479.	1.000	4.66	66988.5
15	360.00	197.08	0.532	831629.	1.000	4.66	67816.2
16	395.39	196.95	0.543	892214.	1.000	4.66	72756.7
17	410.00	196.89	0.547	917593.	1.000	4.66	74826.3
18	420.00	196.83	0.549	935081.	1.000	4.66	76252.4
19	425.00	196.81	0.550	943862.	1.000	4.66	76968.4
20	440.00	196.68	0.527	971243.	1.000	4.66	79201.2
21	440.50	196.67	0.526	972195.	1.000	4.66	79278.9
22	500.00	200.03	0.460	1002464.	1.000	4.66	81747.2
23	570.00	203.69	0.403	1043812.	1.000	4.66	85119.0
24	667.00	208.33	0.344	1111076.	1.000	4.66	90604.1
25	685.00	209.15	0.339	1124614.	1.000	4.66	91708.1
26	696.00	209.66	0.338	1132834.	1.000	4.66	92378.4
27	708.00	210.22	0.337	1141681.	1.000	4.66	93099.8
28	710.00	210.31	0.337	1143136.	1.000	4.66	93218.5
29	715.42	210.57	0.336	1147062.	1.000	4.66	93538.6
30	727.00	218.81	0.335	998245.	1.000	4.66	81403.1
31	742.00	229.43	0.331	822316.	0.983	4.58	64774.1
32	743.70	230.63	0.331	803656.	0.973	4.53	61989.2
33	745.00	231.54	0.331	789597.	0.965	4.50	59929.9
34	758.00	240.67	0.319	654706.	0.886	4.13	41950.0
35	771.99	250.55	0.309	522323.	0.802	3.74	27405.6
36	800.27	270.64	0.286	297547.	0.632	2.95	9682.7
37	805.00	274.15	0.282	265609.	0.603	2.82	7881.3
38	810.00	277.90	0.284	233870.	0.573	2.68	6263.7
39	828.56	291.58	0.289	136733.	0.461	2.15	2372.5
40	833.36	295.12	0.291	116917.	0.432	2.02	1782.2
41	856.00	311.84	0.304	44720.	0.296	1.38	319.3
42	856.84	312.56	0.307	42663.	0.291	1.36	294.3
43	870.51	327.14	0.455	15495.	0.208	0.97	54.9
44	898.79	315.37	3.849	-2786.	0.038	0.18	-0.3
45	905.11	765.07	0.000	181.	0.000	0.00	0.0

Table 1 - Individual data on the 45 slices

	Water Force	Water Force	Tie Force	Tie Force	Earthquake Force	Surcharge

Slice No.	Width (ft)	Weight (lbs)	Top (lbs)	Bot (lbs)	Norm (lbs)	Tan (lbs)	Hor (lbs)	Ver (lbs)	Load (lbs)
1	8.9	2940.0	0.0	0.0	0.0	0.0	441.0	0.0	0.0
2	28.9	53778.7	0.0	0.0	0.0	0.0	8066.8	0.0	0.0
3	4.1	13331.3	0.0	440.4	0.0	0.0	1999.7	0.0	0.0
4	33.2	161367.7	0.0	35720.7	0.0	0.0	24205.2	0.0	0.0
5	3.1	19985.7	0.0	7406.9	0.0	0.0	2997.9	0.0	0.0
6	6.5	44199.4	0.0	11992.8	0.0	0.0	6629.9	0.0	0.0
7	80.0	587753.1	0.0	*******	0.0	0.0	88163.0	0.0	0.0
8	34.3	279346.4	0.0	85404.9	0.0	0.0	41902.0	0.0	0.0
9	15.7	132824.5	0.0	41513.7	0.0	0.0	19923.7	0.0	0.0
10	2.0	17204.0	0.0	5416.2	0.0	0.0	2580.6	0.0	0.0
11	28.0	246685.3	0.0	78944.5	0.0	0.0	37002.8	0.0	0.0
12	7.8	70295.8	0.0	22929.4	0.0	0.0	10544.4	0.0	0.0
13	2.2	20445.6	0.0	6703.1	0.0	0.0	3066.8	0.0	0.0
14	24.0	223447.3	0.0	74205.9	0.0	0.0	33517.1	0.0	0.0
15	6.0	57112.1	0.0	19232.7	0.0	0.0	8566.8	0.0	0.0
16	35.4	347006.8	0.0	*******	0.0	0.0	52051.0	0.0	0.0
17	14.6	148376.2	0.0	51896.1	0.0	0.0	22256.4	0.0	0.0
18	10.0	103244.2	0.0	36444.2	0.0	0.0	15486.6	0.0	0.0
19	5.0	52143.1	0.0	18505.9	0.0	0.0	7821.5	0.0	0.0
20	15.0	162347.0	0.0	56653.0	0.0	0.0	24352.1	0.0	0.0
21	0.5	5595.5	0.0	1897.6	0.0	0.0	839.3	0.0	0.0
22	59.5	727382.4	0.0	*******	0.0	0.0	*******	0.0	0.0
23	70.0	1011401.6	0.0	*******	0.0	0.0	*******	0.0	0.0
24	97.0	1679771.8	0.0	*******	0.0	0.0	*******	0.0	0.0
25	18.0	345593.6	0.0	*******	0.0	0.0	51839.0	0.0	0.0
26	11.0	214277.8	0.0	63418.1	0.0	0.0	32141.7	0.0	0.0
27	12.0	235371.0	0.0	70184.9	0.0	0.0	35305.7	0.0	0.0
28	2.0	39394.6	0.0	11824.7	0.0	0.0	5909.2	0.0	0.0
29	5.4	107077.1	0.0	32221.9	0.0	0.0	16061.6	0.0	0.0
30	11.6	222519.9	0.0	92944.5	0.0	0.0	33378.0	0.0	0.0
31	15.0	268317.3	0.0	*******	0.0	0.0	40247.6	0.0	0.0
32	1.7	29077.3	0.0	11025.8	0.0	0.0	4361.6	0.0	0.0
33	1.3	21955.6	0.0	8257.7	0.0	0.0	3293.3	0.0	0.0
34	13.0	213416.3	0.0	76107.4	0.0	0.0	32012.5	0.0	0.0
35	14.0	215211.9	0.0	68362.2	0.0	0.0	32281.8	0.0	0.0
36	28.3	385326.1	0.0	95379.1	0.0	0.0	57798.9	0.0	0.0
37	4.7	57905.7	0.0	10349.8	0.0	0.0	8685.9	0.0	0.0
38	5.0	58703.6	0.0	9202.1	0.0	0.0	8805.5	0.0	0.0
39	18.6	190792.8	0.0	18560.6	0.0	0.0	28618.9	0.0	0.0
40	4.8	42415.9	0.0	818.6	0.0	0.0	6362.4	0.0	0.0
41	22.6	162837.2	0.0	0.0	0.0	0.0	24425.6	0.0	0.0
42	0.8	4866.8	0.0	0.0	0.0	0.0	730.0	0.0	0.0
43	13.7	67403.5	0.0	0.0	0.0	0.0	10110.5	0.0	0.0
44	28.3	68857.1	0.0	0.0	0.0	0.0	10328.6	0.0	0.0
45	6.3	2373.5	0.0	0.0	0.0	0.0	356.0	0.0	0.0

- TABLE 2 - Base Stress Data on the 45 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-31.00	79.76	10.38	1171.08	283.29	1153.67
2	-34.00	98.66	34.85	3575.57	1542.93	2037.69
3	-34.00	115.16	4.96	5738.66	2686.61	2939.06
4	-34.00	133.80	40.00	7914.86	4034.18	3535.22
5	-44.99	151.92	4.34	16252.05	4603.01	7859.81
6	-4.98	156.73	6.57	7029.64	6724.59	1851.08
7	-4.98	200.00	80.30	7638.90	7319.19	1942.26
8	-4.98	257.17	34.47	8443.79	8104.71	2062.72
9	-4.98	282.17	15.72	8795.76	8448.22	2115.39
10	-4.98	291.00	2.01	8920.10	8569.56	2134.00
11	-4.98	306.00	28.11	9131.96	8776.95	2162.08
12	-4.98	323.88	7.79	9384.64	9024.40	2194.86
13	-4.98	328.88	2.25	9455.30	9093.60	2204.03
14	-4.98	342.00	24.09	9640.71	9275.17	2228.08
15	-4.98	357.00	6.02	9852.68	9482.77	2255.59
16	-4.98	377.69	35.52	10145.12	9769.15	2293.53
17	-4.98	402.69	14.67	10498.41	10115.14	2339.36
18	-4.98	415.00	10.04	10672.32	10285.46	2361.93
19	-4.98	422.50	5.02	10778.31	10389.26	2375.68

20	-4.98	432.50	15.06	11186.52	10782.29	2468.25
21	-4.98	440.25	0.50	11569.81	11148.83	2569.78
22	1.58	470.25	59.52	12192.32	12220.25	2677.47
23	1.58	535.00	70.03	14409.51	14443.09	3153.95
24	1.58	618.50	97.04	17269.61	17310.63	3765.65
25	1.58	676.00	18.01	19145.94	19192.33	4158.30
26	1.58	690.50	11.00	19424.46	19472.38	4203.18
27	1.58	702.00	12.00	19557.72	19606.78	4217.03
28	1.58	709.00	2.00	19639.87	19689.82	4222.19
29	1.58	712.71	5.42	19701.62	19752.02	4229.99
30	45.00	721.21	16.38	14047.63	13586.51	4122.20
31	45.00	734.50	21.21	12929.51	12648.60	3929.05
32	45.00	742.85	2.41	12068.70	12073.24	3738.93
33	45.00	744.35	1.83	11961.35	11969.91	3725.32
34	45.00	751.50	18.38	11570.81	11608.32	3713.06
35	45.00	764.99	19.78	10781.15	10879.14	3667.12
36	45.00	786.13	40.00	9418.71	9633.25	3540.59
37	45.00	802.64	6.69	8336.20	8660.26	3433.73
38	45.00	807.50	7.07	7943.92	8301.93	3370.40
39	45.00	819.28	26.24	6827.29	7270.48	3143.34
40	45.00	830.96	6.79	5710.35	6247.80	2912.93
41	45.00	844.68	32.02	4581.94	5084.93	2474.99
42	45.00	856.42	1.19	3645.73	4096.89	2068.18
43	45.00	863.68	19.33	3061.71	3486.67	1814.40
44	45.00	884.65	40.00	1352.98	1721.45	1071.90
45	45.00	901.95	8.93	0.00	265.73	451.63

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1288(g)
Calculated Newmark Seismic Displacement = 0.123(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: A-A'

File: a-41bs

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1288
T_m (s)	0.517
T_s (s)	0.22
M	6.95
T_s/T_m	0.429101

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.262	0.204	0.336
k-velmax (cm/s)	25.84	20.12	33.18

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.75	0.852	5.75	2.45	13.49
[kmax, k-velmax]	0.90	0.540	2.46	1.43	4.22
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.75	0.852	2.27	0.97	5.31
[kmax, k-velmax]	0.90	0.540	0.97	0.56	1.66

PGA Peak Ground Acceleration (g)
PGV Peak Ground Velocity (cm/s)
k_y Critical or Yield Acceleration (g)
T_m Mean Period of an Earthquake Motion (s)
T_s Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M Earthquake Magnitude
kmax maximum seismic coefficient (g)
k-velmax the maximum velocity of the seismic coefficient-time history (cm/s)
D Predicted Sliding Displacment (cm)

H_{avr} = 117 ft
V_s = 2110 ft/s
$T_s = 4\ H_{avr}/V_s$ = 0.22 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

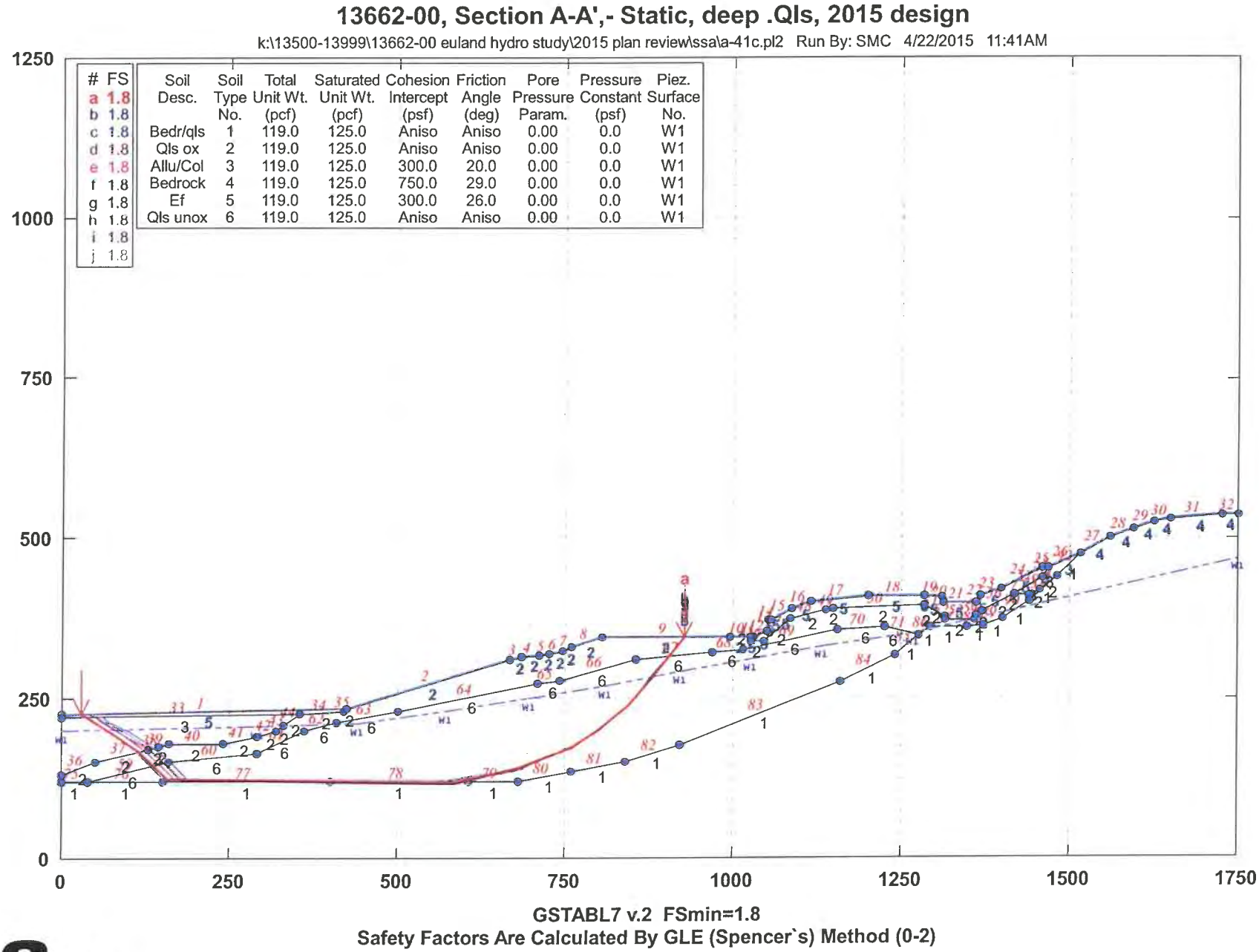
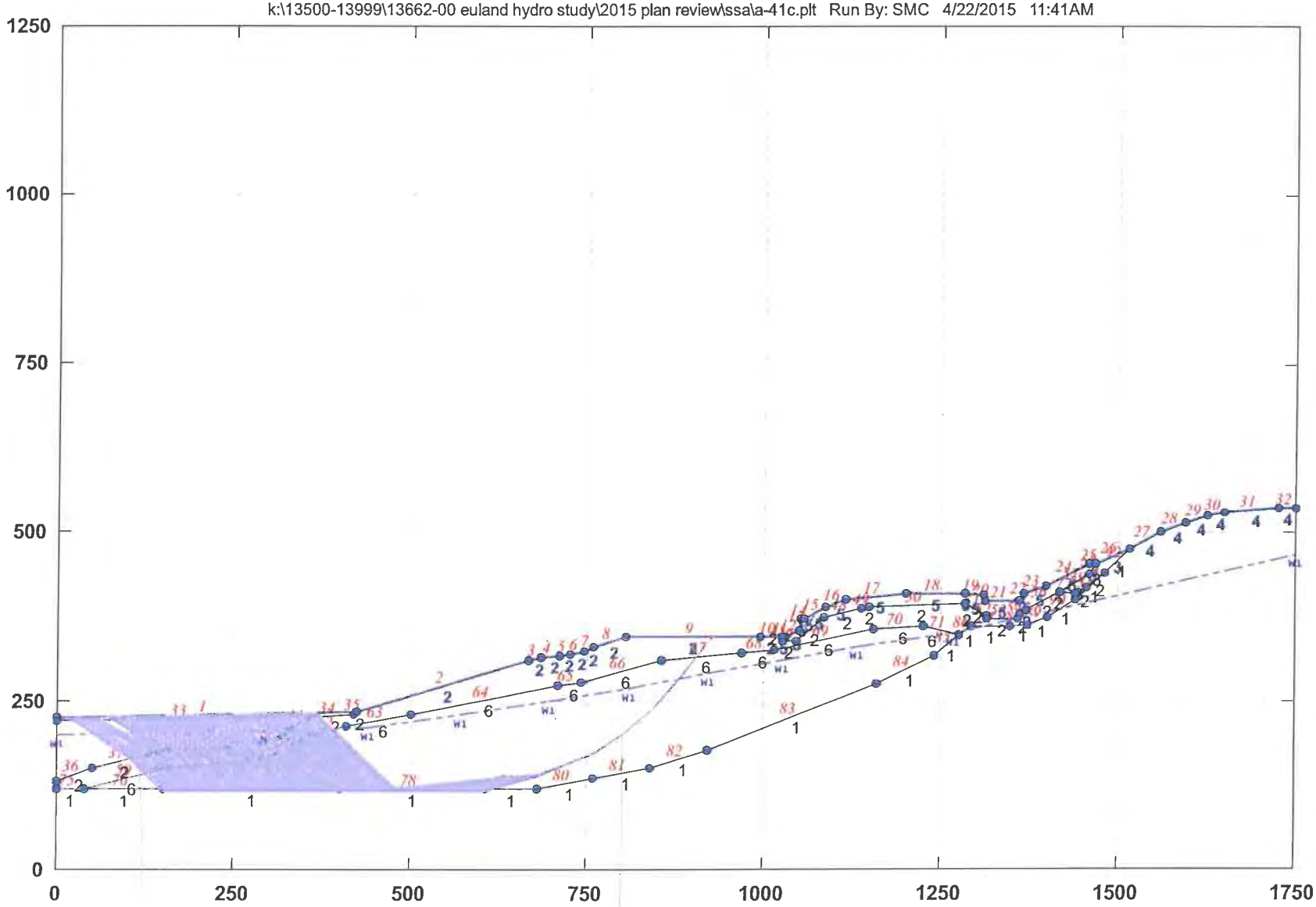

13662-00, Section A-A',- Static, deep .Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41c.pl2 Run By: SMC 4/22/2015 11:41AM
FS
a 1.8
b 1.8
c 1.8
d 1.8
e 1.8
f 1.8
g 1.8
h 1.8
i 1.8
j 1.8
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.8
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-3.1

13662-00, Section A-A',- Static, deep .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41c.plt Run By: SMC 4/22/2015 11:41AM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 11:41AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41c.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41c.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41c.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Static, deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	250.0	12.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	120.00	479.00	120.00	10.00
2	480.00	120.00	606.00	120.00	10.00
3	680.00	141.00	680.00	141.00	5.00
4	720.00	157.00	720.00	157.00	3.00
5	760.00	173.00	760.00	173.00	3.00
6	800.00	200.00	800.00	200.00	3.00
7	844.00	240.00	844.00	240.00	3.00
8	880.00	282.00	880.00	282.00	3.00
9	928.00	346.00	928.00	346.00	0.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 2.271 FS Min = 1.832 FS Ave = 1.955
Standard Deviation = 0.075 Coefficient of Variation = 3.82 %
((Simplified Janbu FS for Critical Surface = 1.669))
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.482	225.694
2	37.575	220.637
3	49.650	212.182
4	82.416	189.239
5	115.182	166.296
6	137.182	144.296
7	157.289	124.189
8	585.105	118.344
9	680.000	141.136
10	720.000	158.024
11	760.000	172.610
12	800.000	201.372
13	844.000	239.092
14	880.000	281.799
15	928.000	346.000

*** FOS = 1.832 Theta (ki=1.0) = 5.77 ***
Lambda = 0.101
Individual data on the 49 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.1	2526.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	12.1	13818.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	15.8	37037.9	0.0	0.0	0.	0.	0.0	0.0	0.0
4	17.0	64349.8	0.0	7866.3	0.	0.	0.0	0.0	0.0
5	32.8	197935.8	0.0	59707.1	0.	0.	0.0	0.0	0.0
6	14.8	125503.8	0.0	56496.2	0.	0.	0.0	0.0	0.0
7	7.2	70940.3	0.0	34475.7	0.	0.	0.0	0.0	0.0
8	7.8	84711.9	0.0	42785.9	0.	0.	0.0	0.0	0.0
9	12.3	148970.1	0.0	78347.8	0.	0.	0.0	0.0	0.0
10	2.7	35007.1	0.0	13285.5	0.	0.	0.0	0.0	0.0
11	80.0	1048384.9	0.0	*******	0.	0.	0.0	0.0	0.0
12	50.0	670224.4	0.0	*******	0.	0.	0.0	0.0	0.0
13	2.0	27048.7	0.0	10310.5	0.	0.	0.0	0.0	0.0
14	28.0	380651.7	0.0	*******	0.	0.	0.0	0.0	0.0
15	7.8	106150.3	0.0	40735.5	0.	0.	0.0	0.0	0.0
16	2.2	30691.7	0.0	11791.0	0.	0.	0.0	0.0	0.0
17	24.0	330342.6	0.0	*******	0.	0.	0.0	0.0	0.0
18	6.0	83009.6	0.0	32084.1	0.	0.	0.0	0.0	0.0
19	35.4	493020.6	0.0	*******	0.	0.	0.0	0.0	0.0
20	14.6	205320.2	0.0	80118.7	0.	0.	0.0	0.0	0.0
21	10.0	141081.2	0.0	55189.8	0.	0.	0.0	0.0	0.0
22	5.0	70717.2	0.0	27705.9	0.	0.	0.0	0.0	0.0
23	15.0	216692.3	0.0	83561.5	0.	0.	0.0	0.0	0.0
24	23.9	363348.9	0.0	*******	0.	0.	0.0	0.0	0.0
25	36.1	591620.1	0.0	*******	0.	0.	0.0	0.0	0.0
26	70.0	1293852.4	0.0	*******	0.	0.	0.0	0.0	0.0
27	15.1	304581.3	0.0	*******	0.	0.	0.0	0.0	0.0
28	6.9	141260.0	0.0	49718.4	0.	0.	0.0	0.0	0.0
29	75.0	1560736.1	0.0	*******	0.	0.	0.0	0.0	0.0
30	13.0	274113.9	0.0	88049.2	0.	0.	0.0	0.0	0.0
31	5.0	105026.3	0.0	35345.5	0.	0.	0.0	0.0	0.0
32	11.0	228090.5	0.0	76209.0	0.	0.	0.0	0.0	0.0

33	12.0	243636.1	0.0	80569.2	0.	0.	0.0	0.0	0.0
34	2.0	40082.2	0.0	13197.7	0.	0.	0.0	0.0	0.0
35	10.0	198501.7	0.0	65000.8	0.	0.	0.0	0.0	0.0
36	7.0	137300.7	0.0	43749.7	0.	0.	0.0	0.0	0.0
37	15.0	290948.6	0.0	91706.6	0.	0.	0.0	0.0	0.0
38	3.0	57701.9	0.0	18007.1	0.	0.	0.0	0.0	0.0
39	13.0	250568.8	0.0	76743.0	0.	0.	0.0	0.0	0.0
40	2.0	38676.4	0.0	11620.9	0.	0.	0.0	0.0	0.0
41	40.0	734751.2	0.0	*******	0.	0.	0.0	0.0	0.0
42	5.0	86197.8	0.0	26381.3	0.	0.	0.0	0.0	0.0
43	5.0	84053.1	0.0	25001.3	0.	0.	0.0	0.0	0.0
44	34.0	501265.4	0.0	*******	0.	0.	0.0	0.0	0.0
45	12.0	144701.6	0.0	35512.2	0.	0.	0.0	0.0	0.0
46	24.0	225854.8	0.0	29683.0	0.	0.	0.0	0.0	0.0
47	0.8	6086.5	0.0	38.2	0.	0.	0.0	0.0	0.0
48	23.8	133659.5	0.0	0.0	0.	0.	0.0	0.0	0.0
49	23.4	43614.0	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.502	221.042
2	70.756	215.260
3	104.678	194.063
4	138.600	172.867
5	138.600	172.867
6	161.315	150.152
7	186.848	124.619
8	576.738	118.461
9	680.000	139.789
10	720.000	155.621
11	760.000	173.864
12	800.000	199.533
13	844.000	239.408
14	880.000	280.522
15	928.000	346.000

*** FOS = 1.835 Theta (ki=1.0) = 5.87 ***
Lambda = 0.103

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.365	225.997
2	50.589	220.857
3	59.473	214.637
4	92.239	191.694
5	125.005	168.751
6	147.005	146.751
7	169.338	124.418
8	573.477	120.566
9	680.000	139.337
10	720.000	158.104
11	760.000	173.007
12	800.000	200.492
13	844.000	240.590
14	880.000	282.583
15	928.000	346.000

*** FOS = 1.836 Theta (ki=1.0) = 5.80 ***
Lambda = 0.102

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.365	225.997
2	50.589	220.857
3	59.473	214.637
4	92.239	191.694
5	125.005	168.751
6	147.005	146.751
7	169.338	124.418
8	573.477	120.566
9	680.000	139.337
10	720.000	158.104

11	760.000	173.007
12	800.000	200.492
13	844.000	240.590
14	880.000	282.583
15	928.000	346.000

*** FOS = 1.836 Theta (ki=1.0) = 5.80 ***
Lambda = 0.102

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.965	225.729
2	39.072	220.662
3	50.780	212.464
4	83.546	189.521
5	116.313	166.578
6	138.313	144.578
7	158.414	124.477
8	543.700	119.218
9	680.000	139.835
10	720.000	157.231
11	760.000	172.087
12	800.000	200.650
13	844.000	239.951
14	880.000	282.272
15	928.000	346.000

*** FOS = 1.837 Theta (ki=1.0) = 5.81 ***
Lambda = 0.102

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.965	225.729
2	39.072	220.662
3	50.780	212.464
4	83.546	189.521
5	116.313	166.578
6	138.313	144.578
7	158.414	124.477
8	543.700	119.218
9	680.000	139.835
10	720.000	157.231
11	760.000	172.087
12	800.000	200.650
13	844.000	239.951
14	880.000	282.272
15	928.000	346.000

*** FOS = 1.837 Theta (ki=1.0) = 5.81 ***
Lambda = 0.102

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.036	225.589
2	33.083	220.561
3	46.260	211.334
4	79.026	188.391
5	111.792	165.448
6	133.792	143.448
7	153.916	123.325
8	583.321	115.722
9	680.000	140.040
10	720.000	157.401
11	760.000	174.179
12	800.000	200.539
13	844.000	239.512
14	880.000	283.380
15	928.000	346.000

*** FOS = 1.837 Theta (ki=1.0) = 5.73 ***
Lambda = 0.100

Failure Surface Specified By 15 Coordinate Points

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

1	53.838	220.913
2	65.622	213.549
3	99.544	192.352
4	133.466	171.155
5	133.466	171.155
6	155.697	148.924
7	180.261	124.360
8	603.255	121.913
9	680.000	138.839
10	720.000	155.977
11	760.000	173.927
12	800.000	200.334
13	844.000	241.229
14	880.000	282.893
15	928.000	346.000

*** FOS = 1.837 Theta (ki=1.0) = 5.87 ***
Lambda = 0.103
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.336	220.836
2	62.607	212.544
3	96.529	191.347
4	130.451	170.150
5	130.451	170.150
6	152.481	148.120
7	175.924	124.677
8	546.961	117.114
9	680.000	140.287
10	720.000	157.748
11	760.000	172.944
12	800.000	199.691
13	844.000	238.769
14	880.000	283.211
15	928.000	346.000

*** FOS = 1.840 Theta (ki=1.0) = 5.88 ***
Lambda = 0.103
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.782	225.560
2	31.817	220.539
3	45.304	211.095
4	78.070	188.152
5	110.836	165.209
6	132.836	143.209
7	151.827	124.218
8	570.216	122.670
9	680.000	138.885
10	720.000	157.587
11	760.000	172.150
12	800.000	201.451
13	844.000	238.772
14	880.000	281.644
15	928.000	346.000

*** FOS = 1.840 Theta (ki=1.0) = 5.78 ***
Lambda = 0.101
**** END OF GSTABL7 OUTPUT ****

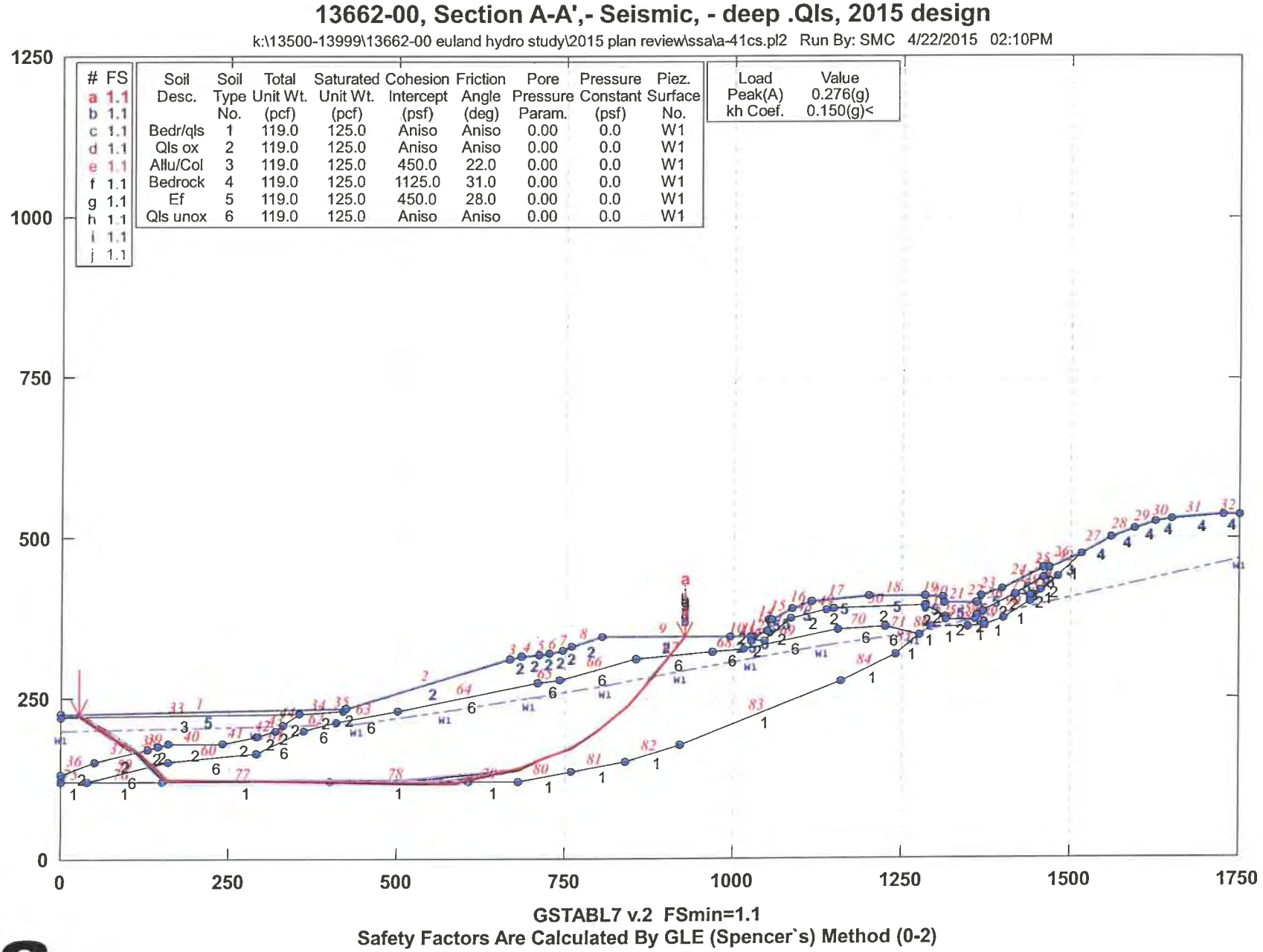
13662-00, Section A-A',- Seismic, - deep .Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41cs.pl2 Run By: SMC 4/22/2015 02:10PM
FS
a 1.1
b 1.1
c 1.1
d 1.1
e 1.1
f 1.1
g 1.1
h 1.1
i 1.1
j 1.1
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.1
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-3.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 02:10PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41cs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41cs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41cs.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- deep .Qls, 2015 design

BOUNDARY COORDINATES

32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	120.00	479.00	120.00	10.00
2	480.00	120.00	606.00	120.00	10.00
3	680.00	141.00	680.00	141.00	5.00
4	720.00	157.00	720.00	157.00	3.00
5	760.00	173.00	760.00	173.00	3.00
6	800.00	200.00	800.00	200.00	3.00
7	844.00	240.00	844.00	240.00	3.00
8	880.00	282.00	880.00	282.00	3.00

9	928.00	346.00	928.00	346.00	0.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.131	1.378	0.176
15.00	1.368	1.621	0.268
0.00	1.353	0.003	0.000
11.85	-0.088	1.457	0.210
7.37	0.662	0.675	0.129
5.82	0.633	0.641	0.102
1.36	0.552	0.554	0.024
0.00	0.528	0.530	0.000
0.00	0.000	0.000	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000
0.00	0.006	0.009	0.000

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.90	226.67
2	79.74	221.35
3	81.00	220.51
4	114.16	198.14
5	147.32	175.77
6	171.74	151.35
7	173.50	149.59
8	201.79	121.30
9	602.64	117.22
10	680.00	140.36
11	720.00	157.52
12	760.00	172.92
13	800.00	201.08
14	844.00	240.55
15	880.00	282.09
16	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.095	1.332	0.176
15.00	1.502	1.562	0.268
17.26	0.004	1.701	0.311
14.89	0.006	1.556	0.266
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.000	0.001	0.000

0.00 0.000 0.001 0.000

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.65	220.82
2	63.51	211.90
3	97.79	191.29
4	132.08	170.69
5	132.08	170.69
6	154.22	148.55
7	181.06	121.71
8	501.68	115.39
9	680.00	140.05
10	720.00	157.98
11	760.00	173.55
12	800.00	200.68
13	844.00	240.13
14	880.00	281.95
15	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.088	1.323	0.176
15.00	1.350	1.554	0.268
58.29	0.000	-0.001	1.619
57.82	0.000	-0.001	1.589
52.20	0.000	0.000	1.289
48.05	0.000	0.002	1.113
51.32	0.000	0.000	1.249
50.83	0.000	0.000	1.228
50.01	0.000	0.001	1.192
50.41	0.000	0.000	1.209
50.47	0.000	0.000	1.212
50.46	0.000	0.000	1.211
50.46	0.000	0.000	1.211
50.45	0.000	0.000	1.211
50.45	0.000	0.000	1.211
50.45	0.000	0.000	1.211
50.45	0.000	0.000	1.211
50.45	0.000	0.000	1.211
50.45	0.000	0.000	1.211

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.25	220.85
2	64.57	212.25
3	98.85	191.65
4	133.14	171.05
5	133.14	171.05
6	155.35	148.84
7	182.19	122.00
8	586.27	116.27
9	680.00	138.75
10	720.00	157.19
11	760.00	173.03
12	800.00	199.95
13	844.00	240.99
14	880.00	282.42
15	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.158	1.415	0.176

15.00	1.440	1.669	0.268
70.56	36.213	0.000	2.833
15.47	-23.152	1.699	0.277
27.00	1.151	0.000	0.509
26.32	0.066	0.060	0.495
26.09	0.063	0.058	0.490
23.90	0.046	0.043	0.443
18.33	0.069	0.059	0.331
29.03	0.052	0.045	0.555
65.87	-0.001	0.008	2.233
51.07	-0.001	0.022	1.238
83.37	-0.001	0.106	8.605
38.90	-0.001	-0.001	0.807
24.30	-0.005	0.014	0.452
38.50	-0.001	-0.001	0.796
38.15	-0.001	-0.001	0.785
27.60	0.002	0.001	0.523
46.98	-0.003	0.001	1.072
33.35	-0.001	0.022	0.658

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.61	226.90
2	89.56	221.52
3	120.89	200.39
4	154.05	178.02
5	179.79	152.28
6	183.79	148.28
7	212.07	120.00
8	216.57	116.52
9	598.46	117.27
10	680.00	139.68
11	720.00	157.82
12	760.00	172.04
13	800.00	200.16
14	844.00	240.70
15	880.00	281.45
16	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.093	1.326	0.176
15.00	1.536	1.557	0.268
15.66	0.004	1.595	0.280
14.99	0.004	1.557	0.268
0.00	0.007	0.009	0.000
0.00	0.001	0.009	0.000
7.58	1.112	1.241	0.133
0.00	0.046	0.001	0.000
0.07	0.004	0.403	0.001
0.01	0.003	0.001	0.000
0.00	-0.001	0.663	0.000
60.74	0.392	0.097	1.785
35.81	0.000	0.000	0.722
27.53	0.001	0.001	0.521
29.82	-0.005	0.000	0.573
27.65	0.001	0.001	0.524
26.96	0.003	0.004	0.509
27.62	0.001	0.004	0.523
26.27	0.001	0.036	0.493
28.22	0.000	0.002	0.537

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	58.26	220.99
2	69.86	214.02

3	104.15	193.41
4	138.44	172.81
5	138.44	172.81
6	161.12	150.13
7	187.81	123.44
8	505.25	120.64
9	680.00	142.24
10	720.00	156.23
11	760.00	173.42
12	800.00	199.34
13	844.00	239.29
14	880.00	281.78
15	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.088	1.321	0.176
15.00	1.366	1.553	0.268
41.89	2.088	0.002	0.897
17.95	-0.001	1.740	0.324
24.50	1.007	0.762	0.456
23.42	1.065	0.739	0.433
29.20	1.261	0.884	0.559
0.00	1.153	1.161	0.000
0.00	1.157	1.043	0.000
0.01	0.003	0.001	0.000
0.01	-0.001	0.663	0.000
60.74	0.000	-0.001	1.785
60.70	0.000	-0.002	1.782
27.53	0.001	0.001	0.521
22.92	0.000	-0.002	0.423
27.00	0.003	0.000	0.509
0.00	0.003	0.004	0.000
1.58	0.000	0.000	0.028
1.71	0.004	0.000	0.030
1.59	0.000	0.002	0.028

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.86	221.01
2	70.92	214.37
3	105.21	193.77
4	139.50	173.17
5	139.50	173.17
6	162.39	150.28
7	188.94	123.72
8	589.84	121.51
9	680.00	140.94
10	720.00	158.44
11	760.00	172.89
12	800.00	198.62
13	844.00	240.15
14	880.00	282.26
15	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.068	1.425	0.176
15.00	1.129	1.695	0.268
0.00	1.028	1.099	0.000
0.00	1.028	1.099	0.000
6.53	1.048	1.288	0.115
0.00	1.028	1.099	0.000
0.00	1.028	1.099	0.000
0.00	-0.247	0.003	0.000

0.88	1.030	1.120	0.015
1.55	-0.402	1.137	0.027
0.83	1.030	1.119	0.014
0.53	1.029	1.112	0.009
0.00	1.028	1.099	0.000
0.00	1.028	1.099	0.000
43.15	-0.057	0.000	0.938
89.94	-0.057	0.964	*****
39.46	0.442	-0.006	0.823
43.15	0.000	0.000	0.937
43.15	0.004	0.000	0.938
0.00	-0.025	0.001	0.000

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	140.21	228.30
2	149.79	222.54
3	179.70	202.37
4	212.86	180.00
5	234.29	158.57
6	244.58	148.28
7	272.86	120.00
8	274.72	118.56
9	527.21	115.33
10	680.00	139.53
11	720.00	158.41
12	760.00	172.00
13	800.00	199.67
14	844.00	241.46
15	880.00	280.64
16	928.00	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	0.991	1.296	0.176
15.00	-0.148	1.515	0.268
8.50	-0.099	1.245	0.150
0.00	-0.053	0.003	0.000
0.00	-0.053	0.003	0.000
0.00	1.016	1.034	0.000
0.00	1.016	1.034	0.000
0.00	-0.053	0.004	0.000
0.88	1.011	1.051	0.015
3.61	-0.235	0.002	0.063
0.16	1.015	1.037	0.003
0.00	1.016	1.034	0.000
0.00	1.016	1.034	0.000
0.00	1.016	1.034	0.000
43.15	-0.022	-0.014	0.938
86.21	0.540	-0.592	*****
43.54	-0.051	-0.046	0.950
29.58	-0.215	0.003	0.568
48.65	-0.043	0.001	1.136
54.98	-0.025	-0.001	1.427

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.11	225.47
2	28.41	220.48
3	44.16	209.86
4	77.33	187.49
5	110.49	165.12
6	132.49	143.12
7	153.76	121.85
8	553.24	117.03
9	680.00	138.80

10	720.00	155.80
11	760.00	174.25
12	800.00	201.07
13	844.00	238.53
14	880.00	281.17
15	928.00	346.00

##################### SOME LINES SKIPPED ####################

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 40
Number of Trial Surfaces with Misleading FS = 8
Number of Trial Surfaces With Valid FS = 2952
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 1.6 %
Statistical Data On All Valid FS Values:
FS Max = 1.501 FS Min = 1.104 FS Ave = 1.256
Standard Deviation = 0.087 Coefficient of Variation = 6.92 %
((Simplified Janbu FS for Critical Surface = 1.096))
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.317	225.619
2	34.691	220.588
3	48.859	211.031
4	82.021	188.663
5	115.182	166.296
6	137.182	144.296
7	157.289	124.189
8	585.105	118.344
9	680.000	141.136
10	720.000	158.024
11	760.000	172.610
12	800.000	201.372
13	844.000	239.092
14	880.000	281.799
15	928.000	346.000

*** FOS = 1.104 Theta (ki=1.0) = 3.84 ***
Lambda = 0.067
Individual data on the 49 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.4	2604.8	0.0	0.0	0.	0.	390.7	0.0	0.0
2	14.2	17153.1	0.0	0.0	0.	0.	2573.0	0.0	0.0
3	14.7	35541.7	0.0	0.0	0.	0.	5331.3	0.0	0.0
4	18.4	70497.0	0.0	8832.0	0.	0.	10574.6	0.0	0.0
5	33.2	201497.9	0.0	60416.6	0.	0.	30224.7	0.0	0.0
6	14.8	125503.8	0.0	56496.2	0.	0.	18825.6	0.0	0.0
7	7.2	70940.3	0.0	34475.7	0.	0.	10641.0	0.0	0.0
8	7.8	84711.9	0.0	42785.9	0.	0.	12706.8	0.0	0.0
9	12.3	148970.1	0.0	78347.8	0.	0.	22345.5	0.0	0.0
10	2.7	35007.1	0.0	13285.5	0.	0.	5251.1	0.0	0.0
11	80.0	1048384.9	0.0	*******	0.	0.	*******	0.0	0.0
12	50.0	670224.4	0.0	*******	0.	0.	*******	0.0	0.0
13	2.0	27048.7	0.0	10310.5	0.	0.	4057.3	0.0	0.0
14	28.0	380651.7	0.0	*******	0.	0.	57097.8	0.0	0.0
15	7.8	106150.3	0.0	40735.5	0.	0.	15922.5	0.0	0.0
16	2.2	30691.7	0.0	11791.0	0.	0.	4603.8	0.0	0.0

17	24.0	330342.6	0.0	*******	0.	0.	49551.4	0.0	0.0
18	6.0	83009.6	0.0	32084.1	0.	0.	12451.4	0.0	0.0
19	35.4	493020.6	0.0	*******	0.	0.	73953.1	0.0	0.0
20	14.6	205320.2	0.0	80118.7	0.	0.	30798.0	0.0	0.0
21	10.0	141081.2	0.0	55189.8	0.	0.	21162.2	0.0	0.0
22	5.0	70717.2	0.0	27705.9	0.	0.	10607.6	0.0	0.0
23	15.0	216692.3	0.0	83561.5	0.	0.	32503.8	0.0	0.0
24	23.9	363348.9	0.0	*******	0.	0.	54502.3	0.0	0.0
25	36.1	591620.1	0.0	*******	0.	0.	88743.0	0.0	0.0
26	70.0	1293852.4	0.0	*******	0.	0.	*******	0.0	0.0
27	15.1	304581.3	0.0	*******	0.	0.	45687.2	0.0	0.0
28	6.9	141260.0	0.0	49718.4	0.	0.	21189.0	0.0	0.0
29	75.0	1560736.1	0.0	*******	0.	0.	*******	0.0	0.0
30	13.0	274113.9	0.0	88049.2	0.	0.	41117.1	0.0	0.0
31	5.0	105026.3	0.0	35345.5	0.	0.	15753.9	0.0	0.0
32	11.0	228090.5	0.0	76209.0	0.	0.	34213.6	0.0	0.0
33	12.0	243636.1	0.0	80569.2	0.	0.	36545.4	0.0	0.0
34	2.0	40082.2	0.0	13197.7	0.	0.	6012.3	0.0	0.0
35	10.0	198501.7	0.0	65000.8	0.	0.	29775.3	0.0	0.0
36	7.0	137300.7	0.0	43749.7	0.	0.	20595.1	0.0	0.0
37	15.0	290948.6	0.0	91706.6	0.	0.	43642.3	0.0	0.0
38	3.0	57701.9	0.0	18007.1	0.	0.	8655.3	0.0	0.0
39	13.0	250568.8	0.0	76743.0	0.	0.	37585.3	0.0	0.0
40	2.0	38676.4	0.0	11620.9	0.	0.	5801.5	0.0	0.0
41	40.0	734751.2	0.0	*******	0.	0.	*******	0.0	0.0
42	5.0	86197.8	0.0	26381.3	0.	0.	12929.7	0.0	0.0
43	5.0	84053.1	0.0	25001.3	0.	0.	12608.0	0.0	0.0
44	34.0	501265.4	0.0	*******	0.	0.	75189.8	0.0	0.0
45	12.0	144701.6	0.0	35512.2	0.	0.	21705.2	0.0	0.0
46	24.0	225854.8	0.0	29683.0	0.	0.	33878.2	0.0	0.0
47	0.8	6086.5	0.0	38.2	0.	0.	913.0	0.0	0.0
48	23.8	133659.5	0.0	0.0	0.	0.	20048.9	0.0	0.0
49	23.4	43614.0	0.0	0.0	0.	0.	6542.1	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.568	225.484
2	28.880	220.489
3	44.513	209.945
4	77.675	187.577
5	110.836	165.209
6	132.836	143.209
7	151.827	124.218
8	570.216	122.670
9	680.000	138.885
10	720.000	157.587
11	760.000	172.150
12	800.000	201.451
13	844.000	238.772
14	880.000	281.644
15	928.000	346.000

*** FOS = 1.105 Theta (ki=1.0) = 3.90 ***
Lambda = 0.068

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.832	225.514
2	30.158	220.511
3	45.469	210.184
4	78.631	187.816
5	111.792	165.448
6	133.792	143.448
7	153.916	123.325
8	583.321	115.722
9	680.000	140.040
10	720.000	157.401
11	760.000	174.179
12	800.000	200.539
13	844.000	239.512
14	880.000	283.380

15	928.000	346.000

*** FOS = 1.106 Theta (ki=1.0) = 3.84 ***
Lambda = 0.067
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.812	225.654
2	36.202	220.614
3	49.990	211.314
4	83.151	188.946
5	116.313	166.578
6	138.313	144.578
7	158.414	124.477
8	543.700	119.218
9	680.000	139.835
10	720.000	157.231
11	760.000	172.087
12	800.000	200.650
13	844.000	239.951
14	880.000	282.272
15	928.000	346.000

*** FOS = 1.107 Theta (ki=1.0) = 3.88 ***
Lambda = 0.068
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.812	225.654
2	36.202	220.614
3	49.990	211.314
4	83.151	188.946
5	116.313	166.578
6	138.313	144.578
7	158.414	124.477
8	543.700	119.218
9	680.000	139.835
10	720.000	157.231
11	760.000	172.087
12	800.000	200.650
13	844.000	239.951
14	880.000	282.272
15	928.000	346.000

*** FOS = 1.107 Theta (ki=1.0) = 3.88 ***
Lambda = 0.068
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.307	225.690
2	37.713	220.639
3	51.120	211.596
4	84.281	189.228
5	117.443	166.861
6	139.443	144.861
7	159.538	124.765
8	502.295	120.092
9	680.000	138.534
10	720.000	156.439
11	760.000	171.564
12	800.000	199.928
13	844.000	240.811
14	880.000	282.745
15	928.000	346.000

*** FOS = 1.108 Theta (ki=1.0) = 3.90 ***
Lambda = 0.068
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.327	225.549
2	31.669	220.537
3	46.599	210.466
4	79.761	188.098

5	112.922	165.731
6	134.922	143.731
7	155.040	123.613
8	541.916	116.596
9	680.000	138.739
10	720.000	156.609
11	760.000	173.656
12	800.000	199.817
13	844.000	240.372
14	880.000	280.853
15	928.000	346.000

*** FOS = 1.110 Theta (ki=1.0) = 3.89 ***
Lambda = 0.068

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	22.063	225.519
2	30.391	220.515
3	45.643	210.227
4	78.805	187.859
5	111.966	165.492
6	133.966	143.492
7	152.952	124.506
8	528.811	123.544
9	680.000	142.584
10	720.000	156.795
11	760.000	171.627
12	800.000	200.729
13	844.000	239.632
14	880.000	282.117
15	928.000	346.000

*** FOS = 1.110 Theta (ki=1.0) = 3.96 ***
Lambda = 0.069

Failure Surface Specified By 15 Coordinate Points

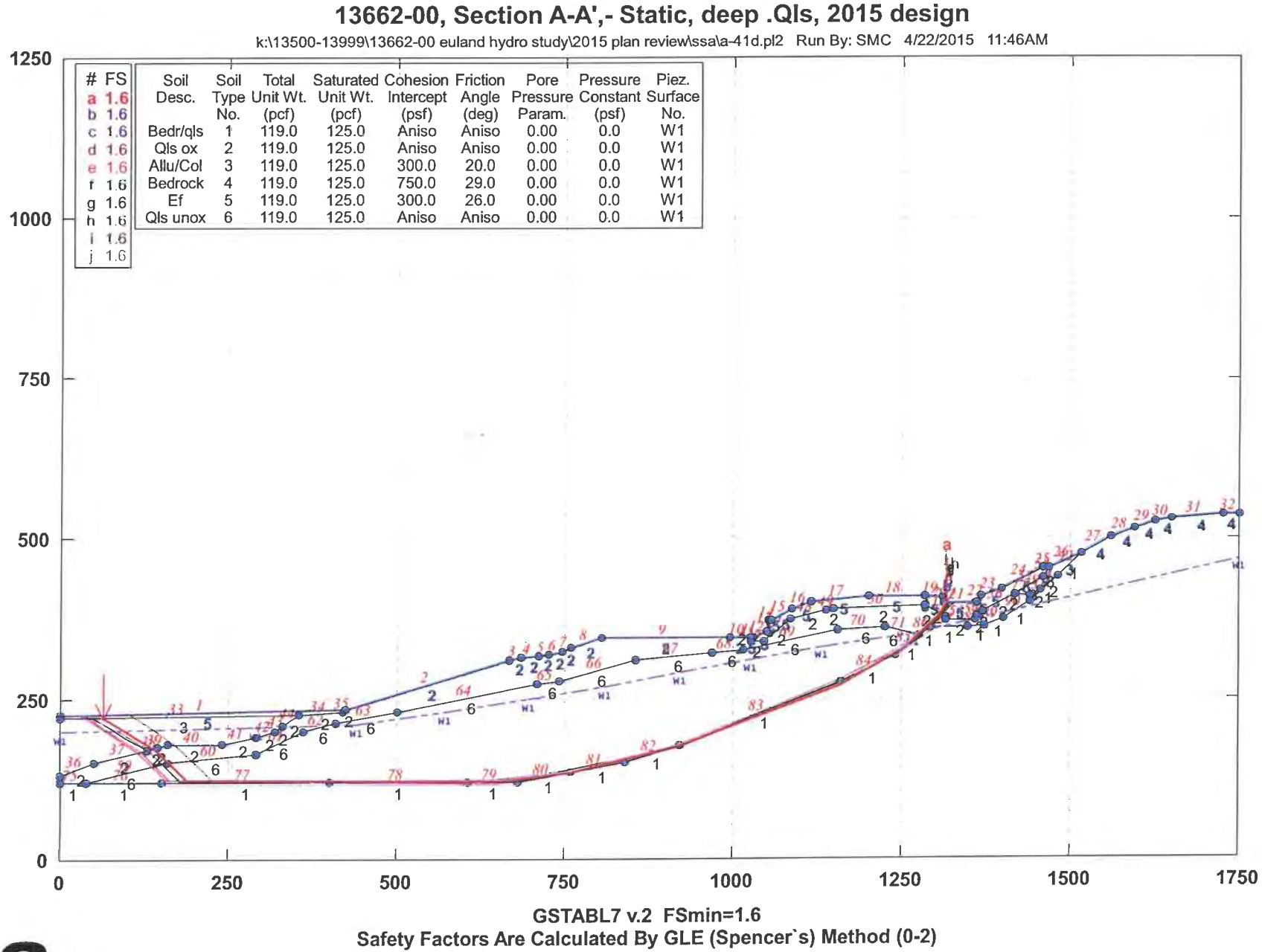
Point No.	X-Surf (ft)	Y-Surf (ft)
1	19.073	225.449
2	27.369	220.464
3	43.383	209.662
4	76.545	187.294
5	109.706	164.927
6	131.706	142.927
7	150.703	123.930
8	485.622	121.796
9	680.000	140.187
10	720.000	158.380
11	760.000	172.673
12	800.000	199.174
13	844.000	240.912
14	880.000	281.171
15	928.000	346.000

*** FOS = 1.111 Theta (ki=1.0) = 3.98 ***
Lambda = 0.070

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.347	225.408
2	25.625	220.434
3	42.079	209.336
4	75.241	186.968
5	108.402	164.600
6	130.402	142.600
7	150.542	122.460
8	581.537	123.100
9	680.000	138.944
10	720.000	156.779
11	760.000	172.748
12	800.000	199.705
13	844.000	239.932
14	880.000	281.960

```
    15        928.000      346.000
 ***  FOS =     1.112   Theta (ki=1.0) =     3.89  ***
                     Lambda =   0.068
          **** END OF GSTABL7 OUTPUT ****
```


13662-00, Section A-A',- Static, deep .Qls, 2015 design
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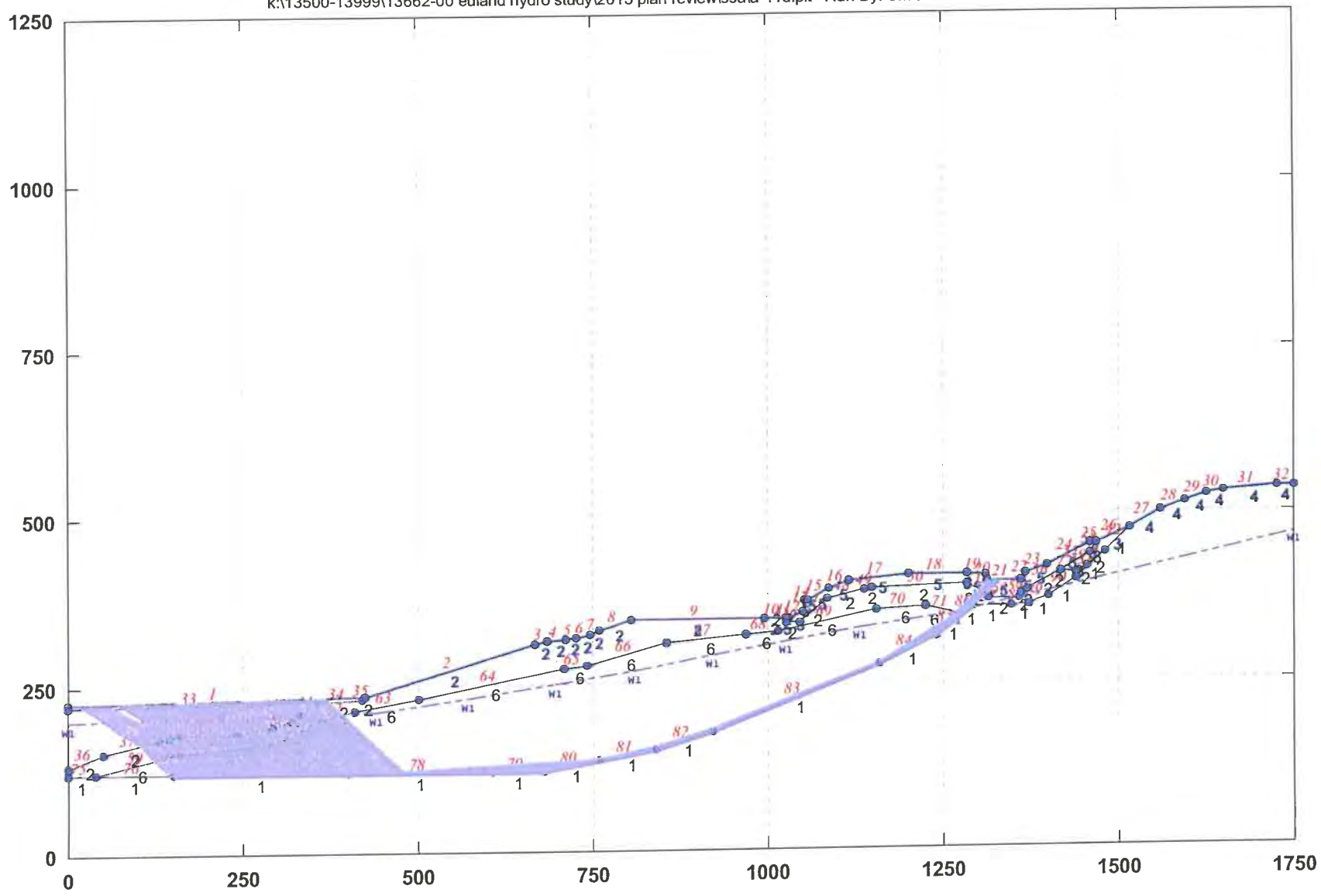
FS
a 1.6
b 1.6
c 1.6
d 1.6
e 1.6
f 1.6
g 1.6
h 1.6
i 1.6
j 1.6
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.6
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-4.1

13662-00, Section A-A',- Static, deep .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41d.plt Run By: SMC 4/22/2015 11:46AM



*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 11:46AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41d.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41d.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41d.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Static, deep .Qls, 2015 design

BOUNDARY COORDINATES

32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	250.0	12.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	120.00	479.00	120.00	10.00
2	480.00	120.00	680.00	120.00	10.00
3	760.00	136.00	760.00	136.00	10.00
4	840.00	152.00	840.00	152.00	10.00
5	920.00	178.00	920.00	178.00	10.00
6	1160.00	276.00	1160.00	276.00	10.00
7	1240.00	318.00	1292.00	360.00	10.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear

Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.915 FS Min = 1.588 FS Ave = 1.659
Standard Deviation = 0.088 Coefficient of Variation = 5.28 %
((Simplified Janbu FS for Critical Surface = 1.511))
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.840	221.065
2	71.652	215.559
3	105.574	194.362
4	139.496	173.165
5	139.496	173.165
6	162.386	150.275
7	188.936	123.725
8	654.353	121.513
9	760.000	135.887
10	840.000	156.785
11	920.000	177.643
12	1160.000	271.400
13	1254.736	330.395
14	1255.343	331.152
15	1272.771	348.579
16	1301.056	376.864
17	1305.370	381.178
18	1315.881	398.000

*** FOS = 1.588 Theta (ki=1.0) = 6.48 ***
Lambda = 0.114
Individual data on the 77 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.8	8672.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	22.3	48786.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	11.6	40782.6	0.0	3176.5	0.	0.	0.0	0.0	0.0
4	33.9	181828.6	0.0	45756.3	0.	0.	0.0	0.0	0.0
5	5.5	39003.3	0.0	15551.7	0.	0.	0.0	0.0	0.0
6	15.0	125962.2	0.0	56183.1	0.	0.	0.0	0.0	0.0
7	2.4	22688.2	0.0	10797.8	0.	0.	0.0	0.0	0.0
8	26.6	301606.9	0.0	*******	0.	0.	0.0	0.0	0.0
9	51.1	671336.6	0.0	*******	0.	0.	0.0	0.0	0.0
10	50.0	666186.0	0.0	*******	0.	0.	0.0	0.0	0.0
11	2.0	26829.3	0.0	10200.1	0.	0.	0.0	0.0	0.0
12	28.0	377111.8	0.0	*******	0.	0.	0.0	0.0	0.0
13	7.8	105014.7	0.0	40165.6	0.	0.	0.0	0.0	0.0
14	2.2	30351.5	0.0	11620.2	0.	0.	0.0	0.0	0.0
15	24.0	326346.2	0.0	*******	0.	0.	0.0	0.0	0.0
16	6.0	81910.2	0.0	31532.9	0.	0.	0.0	0.0	0.0
17	35.4	485721.6	0.0	*******	0.	0.	0.0	0.0	0.0
18	14.6	201899.1	0.0	78405.2	0.	0.	0.0	0.0	0.0
19	10.0	138603.1	0.0	53948.8	0.	0.	0.0	0.0	0.0
20	5.0	69436.4	0.0	27064.5	0.	0.	0.0	0.0	0.0
21	15.0	212682.8	0.0	81554.1	0.	0.	0.0	0.0	0.0
22	60.0	936435.1	0.0	*******	0.	0.	0.0	0.0	0.0
23	70.0	1267165.2	0.0	*******	0.	0.	0.0	0.0	0.0
24	84.4	1776947.2	0.0	*******	0.	0.	0.0	0.0	0.0
25	12.6	288572.0	0.0	95987.4	0.	0.	0.0	0.0	0.0
26	18.0	414767.6	0.0	*******	0.	0.	0.0	0.0	0.0
27	11.0	254390.0	0.0	83950.0	0.	0.	0.0	0.0	0.0
28	12.0	277255.0	0.0	91605.6	0.	0.	0.0	0.0	0.0
29	2.0	46185.7	0.0	15301.8	0.	0.	0.0	0.0	0.0
30	17.0	393278.2	0.0	*******	0.	0.	0.0	0.0	0.0
31	15.0	348832.8	0.0	*******	0.	0.	0.0	0.0	0.0

32	3.0	70049.7	0.0	23205.5	0.	0.	0.0	0.0	0.0
33	13.0	307045.7	0.0	*******	0.	0.	0.0	0.0	0.0
34	0.2	5589.9	0.0	1819.4	0.	0.	0.0	0.0	0.0
35	1.8	42203.6	0.0	13726.7	0.	0.	0.0	0.0	0.0
36	1.8	44137.5	0.0	14678.4	0.	0.	0.0	0.0	0.0
37	43.2	1041350.1	0.0	*******	0.	0.	0.0	0.0	0.0
38	5.0	121218.2	0.0	38520.8	0.	0.	0.0	0.0	0.0
39	30.0	710717.2	0.0	*******	0.	0.	0.0	0.0	0.0
40	16.0	367445.2	0.0	*******	0.	0.	0.0	0.0	0.0
41	58.4	1273685.6	0.0	*******	0.	0.	0.0	0.0	0.0
42	5.6	115473.8	0.0	39685.7	0.	0.	0.0	0.0	0.0
43	50.0	975253.7	0.0	*******	0.	0.	0.0	0.0	0.0
44	25.0	442928.0	0.0	*******	0.	0.	0.0	0.0	0.0
45	20.0	332887.0	0.0	*******	0.	0.	0.0	0.0	0.0
46	10.0	159291.7	0.0	60678.8	0.	0.	0.0	0.0	0.0
47	1.0	15666.9	0.0	5994.7	0.	0.	0.0	0.0	0.0
48	4.0	62190.9	0.0	23846.0	0.	0.	0.0	0.0	0.0
49	15.0	232446.2	0.0	87527.4	0.	0.	0.0	0.0	0.0
50	5.0	77775.6	0.0	28510.9	0.	0.	0.0	0.0	0.0
51	3.0	49529.4	0.0	16947.0	0.	0.	0.0	0.0	0.0
52	3.0	52134.7	0.0	16827.3	0.	0.	0.0	0.0	0.0
53	30.0	527868.4	0.0	*******	0.	0.	0.0	0.0	0.0
54	2.0	35807.5	0.0	10353.8	0.	0.	0.0	0.0	0.0
55	28.0	499814.2	0.0	*******	0.	0.	0.0	0.0	0.0
56	16.0	280158.6	0.0	74957.9	0.	0.	0.0	0.0	0.0
57	6.0	102859.0	0.0	27358.9	0.	0.	0.0	0.0	0.0
58	10.0	168731.5	0.0	44318.4	0.	0.	0.0	0.0	0.0
59	7.0	116103.7	0.0	30071.2	0.	0.	0.0	0.0	0.0
60	5.0	81918.6	0.0	20999.5	0.	0.	0.0	0.0	0.0
61	40.0	601774.8	0.0	*******	0.	0.	0.0	0.0	0.0
62	7.1	95577.8	0.0	21677.8	0.	0.	0.0	0.0	0.0
63	17.9	225121.4	0.0	47253.7	0.	0.	0.0	0.0	0.0
64	28.7	309169.4	0.0	52643.3	0.	0.	0.0	0.0	0.0
65	1.0	9689.8	0.0	1330.4	0.	0.	0.0	0.0	0.0
66	0.6	5789.0	0.0	1053.5	0.	0.	0.0	0.0	0.0
67	10.7	94038.5	0.0	11836.3	0.	0.	0.0	0.0	0.0
68	0.7	5548.2	0.0	465.4	0.	0.	0.0	0.0	0.0
69	6.1	46894.0	0.0	2797.7	0.	0.	0.0	0.0	0.0
70	4.0	28138.3	0.0	517.0	0.	0.	0.0	0.0	0.0
71	7.3	46465.6	0.0	0.0	0.	0.	0.0	0.0	0.0
72	1.0	5913.3	0.0	0.0	0.	0.	0.0	0.0	0.0
73	16.1	76195.0	0.0	0.0	0.	0.	0.0	0.0	0.0
74	4.3	14408.7	0.0	0.0	0.	0.	0.0	0.0	0.0
75	4.6	11839.0	0.0	0.0	0.	0.	0.0	0.0	0.0
76	3.0	3931.2	0.0	0.0	0.	0.	0.0	0.0	0.0
77	2.9	790.6	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.840	221.065
2	71.652	215.559
3	105.574	194.362
4	139.496	173.165
5	139.496	173.165
6	162.386	150.275
7	188.936	123.725
8	654.353	121.513
9	760.000	135.887
10	840.000	156.785
11	920.000	177.643
12	1160.000	271.400
13	1254.736	330.395
14	1255.343	331.152
15	1272.771	348.579
16	1301.056	376.864
17	1305.370	381.178
18	1315.881	398.000

*** FOS = 1.588 Theta (ki=1.0) = 6.49 ***

Lambda = 0.114

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.182	225.828
2	43.334	220.734
3	53.996	213.268
4	86.762	190.325
5	119.529	167.382
6	141.529	145.382
7	162.751	124.160
8	670.466	124.018
9	760.000	140.775
10	840.000	156.868
11	920.000	178.234
12	1160.000	280.311
13	1266.441	337.393
14	1274.854	347.875
15	1274.983	348.004
16	1303.268	376.289
17	1307.112	380.133
18	1318.277	398.000

*** FOS = 1.592 Theta (ki=1.0) = 6.33 ***
Lambda = 0.111
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.182	225.828
2	43.334	220.734
3	53.996	213.268
4	86.762	190.325
5	119.529	167.382
6	141.529	145.382
7	162.751	124.160
8	670.466	124.018
9	760.000	140.775
10	840.000	156.868
11	920.000	178.234
12	1160.000	280.311
13	1266.441	337.393
14	1274.854	347.875
15	1274.983	348.004
16	1303.268	376.289
17	1307.112	380.133
18	1318.277	398.000

*** FOS = 1.592 Theta (ki=1.0) = 6.33 ***
Lambda = 0.111
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.482	225.694
2	37.575	220.637
3	49.650	212.182
4	82.416	189.239
5	115.182	166.296
6	137.182	144.296
7	157.289	124.189
8	646.833	118.344
9	760.000	136.273
10	840.000	155.412
11	920.000	176.701
12	1160.000	280.575
13	1263.140	333.662
14	1273.871	347.032
15	1274.872	348.033
16	1303.156	376.318
17	1307.024	380.185
18	1318.156	398.000

*** FOS = 1.596 Theta (ki=1.0) = 6.32 ***
Lambda = 0.111
Failure Surface Specified By 16 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	49.093	220.832
2	62.444	212.489
3	96.366	191.293
4	130.288	170.096
5	130.288	170.096
6	152.307	148.077
7	176.888	123.495
8	672.810	119.291
9	760.000	139.486
10	840.000	156.516
11	920.000	176.320
12	1160.000	274.334
13	1271.926	339.283
14	1284.046	354.386
15	1308.788	379.127
16	1320.581	398.000

*** FOS = 1.600 Theta (ki=1.0) = 6.40 ***
Lambda = 0.112
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.093	220.832
2	62.444	212.489
3	96.366	191.293
4	130.288	170.096
5	130.288	170.096
6	152.307	148.077
7	176.888	123.495
8	672.810	119.291
9	760.000	139.486
10	840.000	156.516
11	920.000	176.320
12	1160.000	274.334
13	1271.926	339.283
14	1284.046	354.386
15	1308.788	379.127
16	1320.581	398.000

*** FOS = 1.601 Theta (ki=1.0) = 6.41 ***
Lambda = 0.112
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.043	227.401
2	110.880	221.879
3	137.923	202.943
4	170.690	180.000
5	196.480	154.209
6	198.885	151.804
7	227.170	123.520
8	619.783	121.230
9	760.000	137.401
10	840.000	156.970
11	920.000	178.375
12	1160.000	279.554
13	1277.842	346.508
14	1284.318	354.577
15	1308.838	379.097
16	1327.740	398.000

*** FOS = 1.601 Theta (ki=1.0) = 6.41 ***
Lambda = 0.112
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.674	220.859
2	63.503	212.843
3	97.425	191.646
4	131.347	170.449
5	131.347	170.449
6	153.437	148.359

7	178.012	123.784
8	607.087	120.165
9	760.000	136.883
10	840.000	153.874
11	920.000	174.577
12	1160.000	271.927
13	1248.135	322.934
14	1253.377	329.466
15	1272.548	348.637
16	1300.833	376.922
17	1305.194	381.283
18	1315.640	398.000

*** FOS = 1.613 Theta (ki=1.0) = 6.54 ***
Lambda = 0.115

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.817	228.572
2	161.163	222.732
3	189.424	202.943
4	222.190	180.000
5	242.654	159.537
6	251.255	150.935
7	279.540	122.651
8	587.556	116.220
9	760.000	137.625
10	840.000	156.804
11	920.000	177.194
12	1160.000	271.732
13	1254.431	332.512
14	1270.968	349.048
15	1299.252	377.333
16	1303.950	382.030
17	1313.929	398.000

*** FOS = 1.613 Theta (ki=1.0) = 6.81 ***
Lambda = 0.119

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

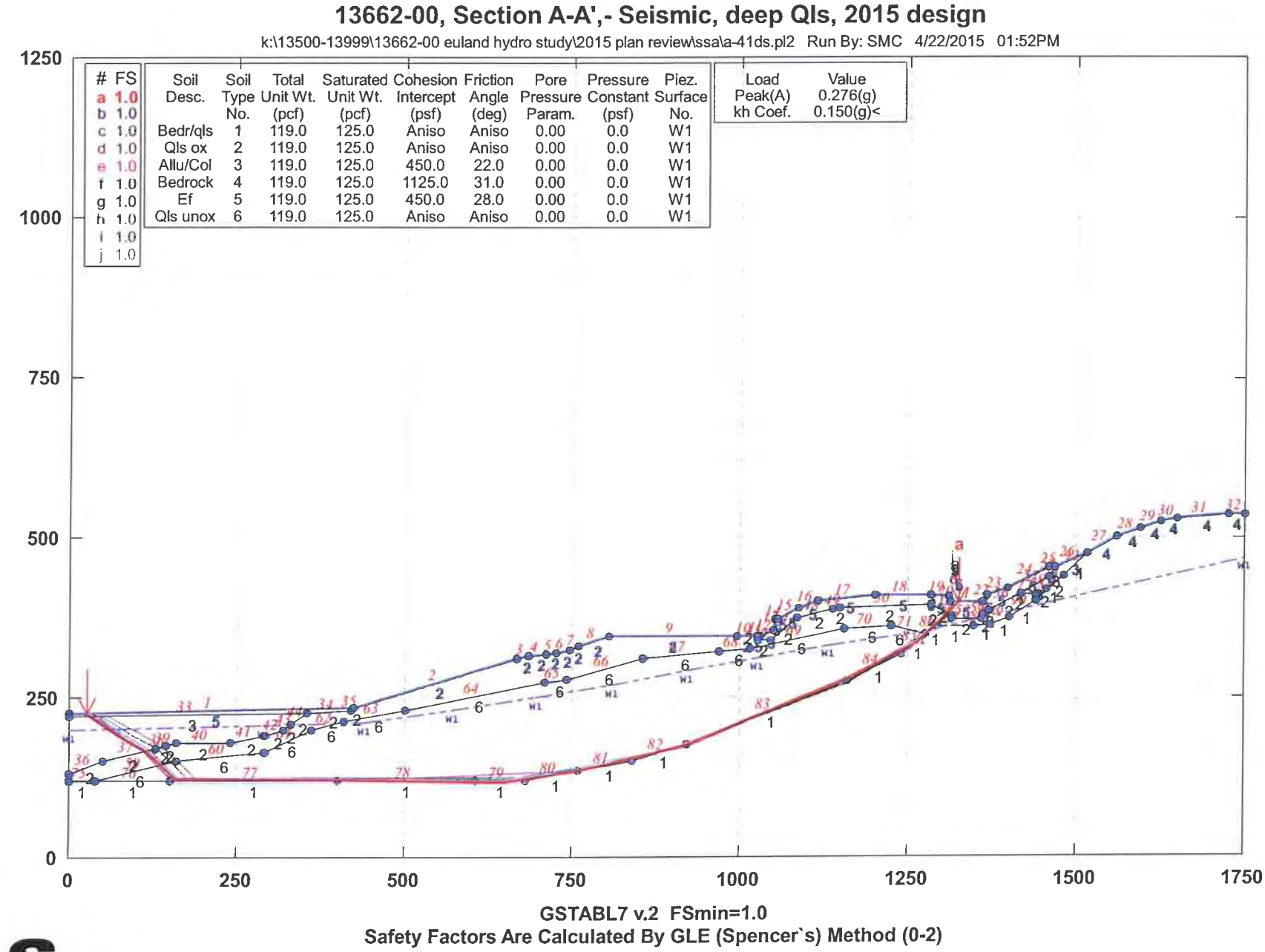
13662-00, Section A-A',- Seismic, deep Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41ds.pl2 Run By: SMC 4/22/2015 01:52PM
FS
a 1.0
b 1.0
c 1.0
d 1.0
e 1.0
f 1.0
g 1.0
h 1.0
i 1.0
j 1.0
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.0
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-4.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 01:52PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41ds.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41ds.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41ds.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic, deep Qls, 2015 design

BOUNDARY COORDINATES

32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	120.00	479.00	120.00	10.00
2	480.00	120.00	680.00	120.00	10.00
3	760.00	136.00	760.00	136.00	10.00
4	840.00	152.00	840.00	152.00	10.00
5	920.00	178.00	920.00	178.00	10.00
6	1160.00	276.00	1160.00	276.00	10.00
7	1240.00	318.00	1292.00	360.00	10.00

Following Are Displayed The Ten Most Critical Of The Trial

Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.273 FS Min = 0.991 FS Ave = 1.050
Standard Deviation = 0.087 Coefficient of Variation = 8.28 %
((Simplified Janbu FS for Critical Surface = 0.969))
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.317	225.619
2	34.691	220.588
3	48.859	211.031
4	82.021	188.663
5	115.182	166.296
6	137.182	144.296
7	157.289	124.189
8	646.833	118.344
9	760.000	136.273
10	840.000	155.412
11	920.000	176.701
12	1160.000	280.575
13	1263.140	333.662
14	1272.745	346.068
15	1274.744	348.066
16	1303.029	376.351
17	1306.924	380.246
18	1324.678	398.000

*** FOS = 0.991 Theta (ki=1.0) = 4.57 ***
Lambda = 0.080
Individual data on the 80 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.4	2604.8	0.0	0.0	0.	0.	390.7	0.0	0.0
2	14.2	17153.1	0.0	0.0	0.	0.	2573.0	0.0	0.0
3	14.7	35541.7	0.0	0.0	0.	0.	5331.3	0.0	0.0
4	18.4	70497.0	0.0	8832.0	0.	0.	10574.6	0.0	0.0
5	33.2	201497.9	0.0	60416.6	0.	0.	30224.7	0.0	0.0
6	14.8	125503.8	0.0	56496.2	0.	0.	18825.6	0.0	0.0
7	7.2	70940.3	0.0	34475.7	0.	0.	10641.0	0.0	0.0
8	7.8	84711.9	0.0	42785.9	0.	0.	12706.8	0.0	0.0
9	12.3	148970.1	0.0	78347.8	0.	0.	22345.5	0.0	0.0
10	2.7	35006.3	0.0	13284.8	0.	0.	5250.9	0.0	0.0
11	80.0	1047649.1	0.0	*******	0.	0.	*******	0.0	0.0
12	50.0	669064.8	0.0	*******	0.	0.	*******	0.0	0.0
13	2.0	26991.1	0.0	10281.6	0.	0.	4048.7	0.0	0.0
14	28.0	379755.1	0.0	*******	0.	0.	56963.3	0.0	0.0
15	7.8	105871.9	0.0	40595.8	0.	0.	15880.8	0.0	0.0
16	2.2	30609.0	0.0	11749.4	0.	0.	4591.3	0.0	0.0
17	24.0	329388.0	0.0	*******	0.	0.	49408.2	0.0	0.0
18	6.0	82751.5	0.0	31954.6	0.	0.	12412.7	0.0	0.0
19	35.4	491341.2	0.0	*******	0.	0.	73701.2	0.0	0.0
20	14.6	204548.0	0.0	79731.6	0.	0.	30682.2	0.0	0.0
21	10.0	140526.3	0.0	54911.7	0.	0.	21078.9	0.0	0.0
22	5.0	70431.7	0.0	27562.8	0.	0.	10564.8	0.0	0.0
23	15.0	215803.4	0.0	83116.1	0.	0.	32370.5	0.0	0.0
24	60.0	950930.9	0.0	*******	0.	0.	*******	0.0	0.0
25	8.1	139896.1	0.0	50110.8	0.	0.	20984.4	0.0	0.0
26	61.9	1148266.2	0.0	*******	0.	0.	*******	0.0	0.0
27	36.0	737438.5	0.0	*******	0.	0.	*******	0.0	0.0

28	40.8	898118.6	0.0	*******	0.	0.	*******	0.0	0.0
29	10.5	239261.2	0.0	80779.9	0.	0.	35889.2	0.0	0.0
30	9.7	224146.4	0.0	75082.4	0.	0.	33622.0	0.0	0.0
31	18.0	418125.8	0.0	*******	0.	0.	62718.9	0.0	0.0
32	11.0	255996.5	0.0	85023.5	0.	0.	38399.5	0.0	0.0
33	12.0	278621.6	0.0	92582.2	0.	0.	41793.2	0.0	0.0
34	2.0	46374.3	0.0	15445.2	0.	0.	6956.1	0.0	0.0
35	17.0	394430.5	0.0	*******	0.	0.	59164.6	0.0	0.0
36	15.0	349178.8	0.0	*******	0.	0.	52376.8	0.0	0.0
37	3.0	70043.5	0.0	23277.4	0.	0.	10506.5	0.0	0.0
38	13.0	306728.1	0.0	*******	0.	0.	46009.2	0.0	0.0
39	2.0	47702.7	0.0	15551.1	0.	0.	7155.4	0.0	0.0
40	45.0	1086098.2	0.0	*******	0.	0.	*******	0.0	0.0
41	5.0	121629.1	0.0	38530.0	0.	0.	18244.4	0.0	0.0
42	30.0	714623.5	0.0	*******	0.	0.	*******	0.0	0.0
43	16.0	370101.3	0.0	*******	0.	0.	55515.2	0.0	0.0
44	41.9	931002.1	0.0	*******	0.	0.	*******	0.0	0.0
45	22.1	467064.5	0.0	*******	0.	0.	70059.7	0.0	0.0
46	50.0	974557.5	0.0	*******	0.	0.	*******	0.0	0.0
47	3.1	55926.1	0.0	20812.1	0.	0.	8388.9	0.0	0.0
48	21.9	381717.8	0.0	*******	0.	0.	57257.7	0.0	0.0
49	20.0	326290.4	0.0	*******	0.	0.	48943.6	0.0	0.0
50	10.0	155203.7	0.0	59398.5	0.	0.	23280.5	0.0	0.0
51	1.0	15229.2	0.0	5850.1	0.	0.	2284.4	0.0	0.0
52	4.0	60387.3	0.0	23237.3	0.	0.	9058.1	0.0	0.0
53	15.0	224932.1	0.0	84815.3	0.	0.	33739.8	0.0	0.0
54	5.0	75007.7	0.0	27456.1	0.	0.	11251.2	0.0	0.0
55	3.0	47805.4	0.0	16277.9	0.	0.	7170.8	0.0	0.0
56	3.0	50363.4	0.0	16131.0	0.	0.	7554.5	0.0	0.0
57	30.0	507548.8	0.0	*******	0.	0.	76132.3	0.0	0.0
58	2.0	34284.4	0.0	9693.6	0.	0.	5142.7	0.0	0.0
59	28.0	476279.2	0.0	*******	0.	0.	71441.9	0.0	0.0
60	16.0	264856.8	0.0	67891.2	0.	0.	39728.5	0.0	0.0
61	6.0	96771.5	0.0	24490.9	0.	0.	14515.7	0.0	0.0
62	10.0	158164.3	0.0	39292.5	0.	0.	23724.6	0.0	0.0
63	7.0	108393.3	0.0	26370.1	0.	0.	16259.0	0.0	0.0
64	5.0	76253.2	0.0	18263.7	0.	0.	11438.0	0.0	0.0
65	40.0	566720.7	0.0	*******	0.	0.	85008.1	0.0	0.0
66	25.0	309755.2	0.0	59728.8	0.	0.	46463.3	0.0	0.0
67	26.0	279660.8	0.0	45236.4	0.	0.	41949.1	0.0	0.0
68	12.2	116542.7	0.0	15340.3	0.	0.	17481.4	0.0	0.0
69	2.9	25591.2	0.0	4116.1	0.	0.	3838.7	0.0	0.0
70	0.7	5919.4	0.0	832.6	0.	0.	887.9	0.0	0.0
71	6.1	49254.6	0.0	5249.9	0.	0.	7388.2	0.0	0.0
72	2.0	15025.5	0.0	819.5	0.	0.	2253.8	0.0	0.0
73	5.3	37191.2	0.0	906.3	0.	0.	5578.7	0.0	0.0
74	4.0	25988.0	0.0	0.0	0.	0.	3898.2	0.0	0.0
75	1.0	6209.2	0.0	0.0	0.	0.	931.4	0.0	0.0
76	18.0	88436.6	0.0	0.0	0.	0.	13265.5	0.0	0.0
77	3.9	13212.5	0.0	0.0	0.	0.	1981.9	0.0	0.0
78	3.1	8955.1	0.0	0.0	0.	0.	1343.3	0.0	0.0
79	3.0	6132.5	0.0	0.0	0.	0.	919.9	0.0	0.0
80	11.7	8114.3	0.0	0.0	0.	0.	1217.1	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	32.067	225.755
2	40.502	220.686
3	53.206	212.118
4	86.367	189.750
5	119.529	167.382
6	141.529	145.382
7	162.751	124.160
8	670.466	124.018
9	760.000	140.775
10	840.000	156.868
11	920.000	178.234
12	1160.000	280.311
13	1266.441	337.393
14	1273.972	347.118

15	1274.883	348.030
16	1303.168	376.315
17	1307.033	380.180
18	1324.853	398.000

*** FOS = 0.995 Theta (ki=1.0) = 4.67 ***
Lambda = 0.082

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	32.067	225.755
2	40.502	220.686
3	53.206	212.118
4	86.367	189.750
5	119.529	167.382
6	141.529	145.382
7	162.751	124.160
8	670.466	124.018
9	760.000	140.775
10	840.000	156.868
11	920.000	178.234
12	1160.000	280.311
13	1266.441	337.393
14	1273.972	347.118
15	1274.883	348.030
16	1303.168	376.315
17	1307.033	380.180
18	1324.853	398.000

*** FOS = 0.995 Theta (ki=1.0) = 4.67 ***
Lambda = 0.082

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.582	225.649
2	35.969	220.610
3	49.815	211.270
4	82.977	188.902
5	116.138	166.535
6	138.138	144.535
7	159.378	123.295
8	667.634	121.396
9	760.000	138.582
10	840.000	154.792
11	920.000	173.463
12	1160.000	277.533
13	1285.814	354.442
14	1287.849	357.070
15	1306.152	380.709
16	1316.542	398.000

*** FOS = 1.003 Theta (ki=1.0) = 4.70 ***
Lambda = 0.082

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	45.937	220.779
2	61.714	211.299
3	96.001	190.697
4	130.288	170.096
5	130.288	170.096
6	152.307	148.077
7	176.888	123.495
8	672.810	119.291
9	760.000	139.486
10	840.000	156.516
11	920.000	176.320
12	1160.000	274.334
13	1271.926	339.283
14	1283.104	353.720
15	1308.615	379.231
16	1319.892	398.000

*** FOS = 1.004 Theta (ki=1.0) = 4.70 ***

Lambda = 0.082
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	45.937	220.779
2	61.714	211.299
3	96.001	190.697
4	130.288	170.096
5	130.288	170.096
6	152.307	148.077
7	176.888	123.495
8	672.810	119.291
9	760.000	139.486
10	840.000	156.516
11	920.000	176.320
12	1160.000	274.334
13	1271.926	339.283
14	1283.104	353.720
15	1308.615	379.231
16	1319.892	398.000

*** FOS = 1.004 Theta (ki=1.0) = 4.71 ***

Lambda = 0.082
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.861	221.015
2	70.923	214.368
3	105.209	193.767
4	139.496	173.165
5	139.496	173.165
6	162.386	150.275
7	188.936	123.725
8	654.353	121.513
9	760.000	135.887
10	840.000	156.785
11	920.000	177.643
12	1160.000	271.400
13	1254.736	330.395
14	1255.280	331.097
15	1269.479	349.435
16	1297.763	377.720
17	1302.777	382.734
18	1318.044	398.000

*** FOS = 1.009 Theta (ki=1.0) = 4.82 ***

Lambda = 0.084
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.861	221.015
2	70.923	214.368
3	105.209	193.767
4	139.496	173.165
5	139.496	173.165
6	162.386	150.275
7	188.936	123.725
8	654.353	121.513
9	760.000	135.887
10	840.000	156.785
11	920.000	177.643
12	1160.000	271.400
13	1254.736	330.395
14	1255.280	331.097
15	1269.479	349.435
16	1297.763	377.720
17	1302.777	382.734
18	1318.044	398.000

*** FOS = 1.009 Theta (ki=1.0) = 4.82 ***

Lambda = 0.084
Failure Surface Specified By 18 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	20.337	225.479
2	28.647	220.486
3	44.339	209.901
4	77.501	187.533
5	110.662	165.166
6	132.662	143.166
7	152.791	123.036
8	509.724	124.848
9	760.000	136.683
10	840.000	155.979
11	920.000	173.673
12	1160.000	280.203
13	1254.304	325.061
14	1266.276	340.522
15	1272.558	348.635
16	1300.842	376.919
17	1305.202	381.279
18	1315.249	398.000

*** FOS = 1.009 Theta (ki=1.0) = 4.82 ***
Lambda = 0.084

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.097	225.543
2	31.436	220.533
3	46.425	210.422
4	79.587	188.055
5	112.748	165.687
6	134.748	143.687
7	156.004	122.431
8	664.802	118.774
9	760.000	136.390
10	840.000	152.717
11	920.000	178.693
12	1160.000	274.754
13	1253.187	329.490
14	1272.378	348.682
15	1300.663	376.966
16	1305.061	381.364
17	1315.057	398.000

*** FOS = 1.011 Theta (ki=1.0) = 4.78 ***
Lambda = 0.084

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

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 01:52PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41ds Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41ds Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41ds Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic, deep Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2

40	160.00	180.00	240.00	180.00	2
41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points

Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

Trial Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.317	225.619
2	34.691	220.588
3	48.859	211.031
4	82.021	188.663
5	115.182	166.296
6	137.182	144.296
7	157.289	124.189
8	646.833	118.344
9	760.000	136.273
10	840.000	155.412
11	920.000	176.701
12	1160.000	280.575
13	1263.140	333.662
14	1272.745	346.068
15	1274.744	348.066
16	1303.029	376.351

17	1306.924	380.246
18	1324.678	398.000

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	0.974	1.054	0.132
11.25	0.965	1.160	0.199
3.99	0.995	0.980	0.070
2.24	1.003	0.950	0.039
5.45	0.987	1.009	0.095
4.20	0.994	0.984	0.074
4.29	0.993	0.986	0.075
4.60	0.992	0.992	0.080

((Simplified Janbu FS for Specified Surface = 0.969))
Factor Of Safety For The Preceding Specified Surface = 0.992
Theta (ki = 1.0) = 4.60 Deg Lambda = 0.080
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 5.839(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	34.69	223.44	0.546	13465.	1.000	4.60	1083.4
2	48.86	218.41	0.488	54421.	1.000	4.60	4378.6
3	63.60	212.33	0.442	124104.	1.000	4.60	9985.2
4	82.02	204.86	0.423	244274.	1.000	4.60	19653.8
5	115.18	191.80	0.415	540317.	1.000	4.60	43472.9
6	130.00	179.32	0.364	912596.	1.000	4.60	73425.7
7	137.18	174.12	0.355	1115820.	1.000	4.60	89776.7
8	145.00	165.73	0.318	1518165.	1.000	4.60	122148.6
9	157.29	155.51	0.300	2207245.	1.000	4.60	177590.7
10	160.00	155.70	0.302	2209173.	1.000	4.60	177745.8
11	240.00	161.25	0.354	2266315.	1.000	4.60	182343.3
12	290.00	164.64	0.385	2302258.	1.000	4.60	185235.2
13	292.00	164.78	0.386	2303699.	1.000	4.60	185351.2
14	320.00	166.65	0.403	2323820.	1.000	4.60	186970.0
15	327.76	167.17	0.407	2329369.	1.000	4.60	187416.5
16	330.00	167.32	0.408	2330968.	1.000	4.60	187545.2
17	354.00	168.91	0.422	2348046.	1.000	4.60	188919.2
18	360.00	169.31	0.426	2352298.	1.000	4.60	189261.3
19	395.39	171.64	0.445	2377230.	1.000	4.60	191267.3
20	410.00	172.60	0.453	2387455.	1.000	4.60	192090.0
21	420.00	173.25	0.459	2394428.	1.000	4.60	192651.0
22	425.00	173.58	0.461	2397906.	1.000	4.60	192930.9
23	440.00	174.55	0.452	2408800.	1.000	4.60	193807.4
24	500.00	178.22	0.421	2459200.	1.000	4.60	197862.5
25	508.14	178.69	0.417	2466654.	1.000	4.60	198462.2
26	570.00	182.17	0.392	2528176.	1.000	4.60	203412.2
27	606.00	184.07	0.379	2567914.	1.000	4.60	206609.4
28	646.83	186.11	0.366	2616378.	1.000	4.60	210508.8
29	657.29	187.13	0.359	2609574.	1.000	4.60	209961.3
30	667.00	188.62	0.356	2582266.	1.000	4.60	207764.1
31	685.00	191.40	0.353	2531518.	1.000	4.60	203681.0
32	696.00	193.11	0.354	2500479.	1.000	4.60	201183.7
33	708.00	194.98	0.355	2466697.	1.000	4.60	198465.7
34	710.00	195.30	0.355	2461066.	1.000	4.60	198012.6
35	727.00	197.98	0.354	2413146.	1.000	4.60	194157.0
36	742.00	200.37	0.353	2370738.	1.000	4.60	190745.0
37	745.00	200.86	0.352	2362238.	1.000	4.60	190061.1
38	758.00	202.96	0.345	2325210.	1.000	4.60	187082.0
39	760.00	203.29	0.345	2319483.	1.000	4.60	186621.1
40	805.00	213.34	0.333	2105854.	1.000	4.60	169433.0
41	810.00	214.50	0.335	2082122.	1.000	4.60	167523.5
42	840.00	221.51	0.347	1942254.	1.000	4.60	156270.0

43	856.00	225.65	0.354	1860108.	1.000	4.60	149660.7
44	897.94	236.83	0.377	1652497.	1.000	4.60	132956.7
45	920.00	241.12	0.380	1589929.	1.000	4.60	127922.6
46	970.00	257.02	0.397	1310055.	1.000	4.60	105404.5
47	973.07	257.99	0.399	1294092.	1.000	4.60	104120.1
48	995.00	264.79	0.407	1184426.	1.000	4.60	95296.6
49	1015.00	270.87	0.414	1090791.	1.000	4.60	87762.9
50	1025.00	273.86	0.418	1046263.	1.000	4.60	84180.3
51	1026.00	274.16	0.418	1041894.	1.000	4.60	83828.8
52	1030.00	275.34	0.419	1024571.	1.000	4.60	82435.0
53	1045.00	279.76	0.401	960750.	1.000	4.60	77300.1
54	1050.00	281.24	0.396	939779.	1.000	4.60	75612.8
55	1053.00	282.15	0.348	926790.	1.000	4.60	74567.7
56	1056.00	283.08	0.348	913416.	1.000	4.60	73491.7
57	1086.00	292.48	0.313	781781.	0.919	4.23	53140.8
58	1088.00	293.12	0.311	773123.	0.911	4.19	51675.3
59	1116.00	301.98	0.292	655215.	0.804	3.70	34045.2
60	1132.00	307.01	0.289	591324.	0.742	3.42	26194.4
61	1138.00	308.89	0.288	568178.	0.719	3.31	23625.9
62	1148.00	311.98	0.285	530724.	0.680	3.13	19767.5
63	1155.00	314.13	0.283	505341.	0.653	3.01	17360.2
64	1160.00	315.64	0.281	487630.	0.634	2.92	15779.0
65	1200.00	330.52	0.270	323374.	0.480	2.21	5998.0
66	1225.00	339.64	0.267	239015.	0.384	1.77	2833.6
67	1250.96	348.55	0.256	167700.	0.284	1.31	1087.5
68	1263.14	352.41	0.246	139943.	0.237	1.09	632.4
69	1266.00	354.95	0.242	122007.	0.226	1.04	501.3
70	1266.68	355.55	0.241	117926.	0.223	1.03	473.3
71	1272.74	360.88	0.232	84966.	0.200	0.92	273.5
72	1272.74	360.88	0.232	84956.	0.200	0.92	273.4
73	1274.74	362.26	0.229	77402.	0.192	0.89	230.3
74	1280.01	365.86	0.221	59343.	0.172	0.79	141.3
75	1284.00	368.64	0.215	47174.	0.157	0.72	93.1
76	1285.00	369.36	0.214	44294.	0.153	0.70	83.2
77	1303.03	384.18	0.254	5634.	0.083	0.38	3.2
78	1306.92	432.21	1.980	616.	0.068	0.32	0.2
79	1310.00	362.50	-0.918	-1610.	0.057	0.26	-0.4
80	1313.00	371.05	-1.308	-2608.	0.045	0.21	-0.4
81	1324.68	480.50	0.000	622.	0.000	0.00	0.0

Table 1 - Individual data on the 81 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.4	2605.0	0.0	0.0	0.0	0.0	390.8	0.0	0.0
2	14.2	17152.3	0.0	0.0	0.0	0.0	2572.8	0.0	0.0
3	14.7	35541.7	0.0	0.0	0.0	0.0	5331.3	0.0	0.0
4	18.4	70499.4	0.0	8832.4	0.0	0.0	10574.9	0.0	0.0
5	33.2	201498.7	0.0	60416.7	0.0	0.0	30224.8	0.0	0.0
6	14.8	125503.6	0.0	56496.1	0.0	0.0	18825.5	0.0	0.0
7	7.2	70939.8	0.0	34475.5	0.0	0.0	10641.0	0.0	0.0
8	7.8	84712.6	0.0	42786.3	0.0	0.0	12706.9	0.0	0.0
9	12.3	148967.1	0.0	78346.2	0.0	0.0	22345.1	0.0	0.0
10	2.7	35009.4	0.0	13285.9	0.0	0.0	5251.4	0.0	0.0
11	80.0	1047647.8	0.0	*******	0.0	0.0	*******	0.0	0.0
12	50.0	669064.1	0.0	*******	0.0	0.0	*******	0.0	0.0
13	2.0	26991.1	0.0	10281.5	0.0	0.0	4048.7	0.0	0.0
14	28.0	379754.9	0.0	*******	0.0	0.0	56963.2	0.0	0.0
15	7.8	105871.8	0.0	40595.7	0.0	0.0	15880.8	0.0	0.0
16	2.2	30609.0	0.0	11749.4	0.0	0.0	4591.3	0.0	0.0
17	24.0	329387.8	0.0	*******	0.0	0.0	49408.2	0.0	0.0
18	6.0	82751.5	0.0	31954.6	0.0	0.0	12412.7	0.0	0.0
19	35.4	491341.1	0.0	*******	0.0	0.0	73701.2	0.0	0.0
20	14.6	204547.9	0.0	79731.6	0.0	0.0	30682.2	0.0	0.0
21	10.0	140526.3	0.0	54911.7	0.0	0.0	21078.9	0.0	0.0
22	5.0	70431.7	0.0	27562.8	0.0	0.0	10564.8	0.0	0.0
23	15.0	215803.4	0.0	83116.1	0.0	0.0	32370.5	0.0	0.0
24	60.0	950931.1	0.0	*******	0.0	0.0	*******	0.0	0.0
25	8.1	139835.2	0.0	50089.1	0.0	0.0	20975.3	0.0	0.0
26	61.9	1148327.4	0.0	*******	0.0	0.0	*******	0.0	0.0

27	36.0	737438.9	0.0	*******	0.0	0.0	*******	0.0	0.0
28	40.8	898108.1	0.0	*******	0.0	0.0	*******	0.0	0.0
29	10.5	239275.2	0.0	80784.6	0.0	0.0	35891.3	0.0	0.0
30	9.7	224143.7	0.0	75081.5	0.0	0.0	33621.6	0.0	0.0
31	18.0	418125.7	0.0	*******	0.0	0.0	62718.9	0.0	0.0
32	11.0	255996.4	0.0	85023.5	0.0	0.0	38399.5	0.0	0.0
33	12.0	278621.5	0.0	92582.2	0.0	0.0	41793.2	0.0	0.0
34	2.0	46374.3	0.0	15445.2	0.0	0.0	6956.1	0.0	0.0
35	17.0	394430.3	0.0	*******	0.0	0.0	59164.5	0.0	0.0
36	15.0	349178.6	0.0	*******	0.0	0.0	52376.8	0.0	0.0
37	3.0	70043.4	0.0	23277.3	0.0	0.0	10506.5	0.0	0.0
38	13.0	306727.8	0.0	*******	0.0	0.0	46009.2	0.0	0.0
39	2.0	47702.6	0.0	15551.0	0.0	0.0	7155.4	0.0	0.0
40	45.0	1086098.2	0.0	*******	0.0	0.0	*******	0.0	0.0
41	5.0	121629.2	0.0	38530.0	0.0	0.0	18244.4	0.0	0.0
42	30.0	714624.9	0.0	*******	0.0	0.0	*******	0.0	0.0
43	16.0	370102.2	0.0	*******	0.0	0.0	55515.3	0.0	0.0
44	41.9	931070.8	0.0	*******	0.0	0.0	*******	0.0	0.0
45	22.1	466995.3	0.0	*******	0.0	0.0	70049.3	0.0	0.0
46	50.0	974554.8	0.0	*******	0.0	0.0	*******	0.0	0.0
47	3.1	55602.9	0.0	20691.7	0.0	0.0	8340.4	0.0	0.0
48	21.9	382039.7	0.0	*******	0.0	0.0	57306.0	0.0	0.0
49	20.0	326289.4	0.0	*******	0.0	0.0	48943.4	0.0	0.0
50	10.0	155203.1	0.0	59398.2	0.0	0.0	23280.5	0.0	0.0
51	1.0	15229.1	0.0	5850.1	0.0	0.0	2284.4	0.0	0.0
52	4.0	60387.0	0.0	23237.2	0.0	0.0	9058.1	0.0	0.0
53	15.0	224931.3	0.0	84814.9	0.0	0.0	33739.7	0.0	0.0
54	5.0	75007.4	0.0	27455.9	0.0	0.0	11251.1	0.0	0.0
55	3.0	47805.2	0.0	16277.8	0.0	0.0	7170.8	0.0	0.0
56	3.0	50363.2	0.0	16131.0	0.0	0.0	7554.5	0.0	0.0
57	30.0	507547.2	0.0	*******	0.0	0.0	76132.1	0.0	0.0
58	2.0	34284.3	0.0	9693.6	0.0	0.0	5142.6	0.0	0.0
59	28.0	476277.8	0.0	*******	0.0	0.0	71441.7	0.0	0.0
60	16.0	264855.9	0.0	67890.7	0.0	0.0	39728.4	0.0	0.0
61	6.0	96771.2	0.0	24490.7	0.0	0.0	14515.7	0.0	0.0
62	10.0	158163.7	0.0	39292.2	0.0	0.0	23724.6	0.0	0.0
63	7.0	108392.9	0.0	26369.9	0.0	0.0	16258.9	0.0	0.0
64	5.0	76252.9	0.0	18263.5	0.0	0.0	11437.9	0.0	0.0
65	40.0	566719.2	0.0	*******	0.0	0.0	85007.9	0.0	0.0
66	25.0	309754.8	0.0	59728.4	0.0	0.0	46463.2	0.0	0.0
67	26.0	279658.4	0.0	45235.9	0.0	0.0	41948.8	0.0	0.0
68	12.2	116542.0	0.0	15340.3	0.0	0.0	17481.3	0.0	0.0
69	2.9	25594.4	0.0	4116.8	0.0	0.0	3839.2	0.0	0.0
70	0.7	5919.4	0.0	832.6	0.0	0.0	887.9	0.0	0.0
71	6.1	49235.4	0.0	5248.4	0.0	0.0	7385.3	0.0	0.0
72	0.0	14.9	0.0	1.1	0.0	0.0	2.2	0.0	0.0
73	2.0	15030.1	0.0	819.5	0.0	0.0	2254.5	0.0	0.0
74	5.3	37191.1	0.0	906.3	0.0	0.0	5578.7	0.0	0.0
75	4.0	25987.2	0.0	0.0	0.0	0.0	3898.1	0.0	0.0
76	1.0	6209.2	0.0	0.0	0.0	0.0	931.4	0.0	0.0
77	18.0	88438.3	0.0	0.0	0.0	0.0	13265.7	0.0	0.0
78	3.9	13212.4	0.0	0.0	0.0	0.0	1981.9	0.0	0.0
79	3.1	8954.0	0.0	0.0	0.0	0.0	1343.1	0.0	0.0
80	3.0	6132.5	0.0	0.0	0.0	0.0	919.9	0.0	0.0
81	11.7	8114.4	0.0	0.0	0.0	0.0	1217.2	0.0	0.0

- TABLE 2 - Base Stress Data on the 81 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-31.00	30.50	9.77	1051.47	266.65	1017.68
2	-34.00	41.78	17.09	2411.40	1003.65	1436.41
3	-34.00	56.23	17.78	4270.19	1999.06	2193.81
4	-34.00	72.81	22.22	6270.15	3172.60	2846.78
5	-34.00	98.60	40.00	9216.18	5037.49	3593.70
6	-45.00	122.59	20.96	18399.39	5989.18	7914.48
7	-45.00	133.59	10.16	20915.64	6984.01	8769.55
8	-45.00	141.09	11.06	33944.97	7662.31	18981.27
9	-45.00	151.14	17.38	37164.77	8571.54	20545.81
10	-0.68	158.64	2.71	13000.62	12912.91	2490.91
11	-0.68	200.00	80.01	13182.96	13094.66	2518.91

12	-0.68	265.00	50.00	13469.53	13380.33	2562.92
13	-0.68	291.00	2.00	13584.16	13494.60	2580.52
14	-0.68	306.00	28.00	13651.20	13561.71	2587.68
15	-0.68	323.88	7.76	13731.38	13642.07	2595.30
16	-0.68	328.88	2.24	13753.80	13664.54	2597.43
17	-0.68	342.00	24.00	13812.64	13723.52	2603.02
18	-0.68	357.00	6.00	13879.91	13790.93	2609.40
19	-0.68	377.69	35.39	13972.70	13883.95	2618.22
20	-0.68	402.69	14.61	14084.81	13996.31	2628.87
21	-0.68	415.00	10.00	14140.00	14051.63	2634.11
22	-0.68	422.50	5.00	14173.63	14085.34	2637.30
23	-0.68	432.50	15.00	14477.49	14385.87	2709.11
24	-0.68	470.00	60.00	15952.32	15847.72	3024.15
25	-0.68	504.07	8.14	17299.88	17185.96	3284.76
26	-0.68	539.07	61.87	18684.30	18560.81	3552.50
27	-0.68	588.00	36.00	20619.83	20482.96	3926.76
28	-0.68	626.42	40.84	22140.21	21993.09	4217.91
29	9.00	652.06	10.58	21849.67	22609.52	6246.51
30	9.00	662.14	9.84	22186.58	22789.07	4173.92
31	9.00	676.00	18.22	22335.67	22943.05	4212.74
32	9.00	690.50	11.14	22376.99	22985.72	4223.44
33	9.00	702.00	12.15	22325.12	22932.44	4213.58
34	9.00	709.00	2.02	22295.34	22901.52	4203.90
35	9.00	718.50	17.21	22309.52	22915.97	4205.01
36	9.00	734.50	15.19	22383.28	22991.81	4219.89
37	9.00	743.50	3.04	22449.67	23060.19	4234.75
38	9.00	751.50	13.16	22685.70	23303.80	4294.13
39	9.00	759.00	2.02	22931.49	23557.50	4356.19
40	13.45	782.50	46.27	22720.36	23473.13	4323.86
41	13.45	807.50	5.14	22893.81	23658.24	4394.68
42	13.45	825.00	30.85	22420.66	23167.08	4289.74
43	14.90	848.00	16.56	21626.64	22353.43	4107.24
44	14.90	876.97	43.40	20759.36	21452.94	3920.14
45	14.90	908.97	22.83	19471.23	20458.27	5529.86
46	23.40	945.00	54.48	17006.01	17887.59	4704.55
47	23.40	971.54	3.35	15779.71	16598.19	4366.77
48	23.40	984.04	23.89	15202.08	15990.84	4207.65
49	23.40	1005.00	21.79	14233.38	14972.30	3940.82
50	23.40	1020.00	10.90	13540.22	14243.47	3749.89
51	23.40	1025.50	1.09	13286.05	13976.24	3679.88
52	23.40	1028.00	4.36	13170.54	13854.77	3648.06
53	23.40	1037.50	16.34	13068.24	13761.76	3664.33
54	23.40	1047.50	5.45	13055.09	13767.33	3719.98
55	23.40	1051.50	3.27	13830.49	14624.12	4060.33
56	23.40	1054.50	3.27	14539.87	15406.64	4367.69
57	23.40	1071.00	32.69	14475.71	15526.40	4442.20
58	23.40	1087.00	2.18	14598.69	15731.88	4589.92
59	23.40	1102.00	30.51	14492.87	15610.54	4638.31
60	23.40	1124.00	17.43	14114.77	15191.66	4618.46
61	23.40	1135.00	6.54	13760.88	14801.66	4534.61
62	23.40	1143.00	10.90	13495.86	14515.18	4483.67
63	23.40	1151.50	7.63	13213.57	14210.79	4429.26
64	23.40	1157.50	5.45	13013.82	13995.94	4390.66
65	27.24	1180.00	44.99	11758.43	12597.25	4080.77
66	27.24	1212.50	28.12	10248.53	11016.55	3764.23
67	27.24	1237.98	29.19	8869.00	9579.90	3436.28
68	27.24	1257.05	13.70	7828.90	8504.58	3187.74
69	52.25	1264.57	4.67	5680.02	5478.56	2409.21
70	52.25	1266.34	1.12	5454.52	5303.91	2372.40
71	52.25	1269.71	9.90	5040.78	4973.96	2291.76
72	52.25	1272.74	0.00	4669.57	4677.35	2219.56
73	44.99	1273.74	2.83	5042.80	5316.57	2390.51
74	45.00	1277.38	7.44	4684.33	4998.36	2312.93
75	45.00	1282.00	5.65	4259.93	4600.68	2189.63
76	45.00	1284.50	1.41	4053.61	4390.56	2105.56
77	45.00	1294.01	25.50	3142.79	3468.59	1734.43
78	45.00	1304.98	5.51	2081.35	2398.58	1301.93
79	45.00	1308.46	4.35	1597.19	2058.37	1310.31
80	45.00	1311.50	4.24	1034.76	1445.45	1008.72
81	45.00	1318.84	16.52	157.41	491.33	538.24

```
      *** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) =  0.1465(g)
Calculated Newmark Seismic Displacement =   0.095(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
            **** END OF GSTABL7 OUTPUT ****
```

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: A-A'

File: a-41ds

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1465
T_m (s)	0.517
T_s (s)	0.32
M	6.95
T_s/T_m	0.612477

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.226	0.176	0.291
k-velmax (cm/s)	25.66	19.98	32.94

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.77	0.902	2.15	0.87	5.30
[kmax, k-velmax]	-0.04	0.584	0.96	0.53	1.71
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.77	0.902	0.85	0.34	2.09
[kmax, k-velmax]	-0.04	0.584	0.38	0.21	0.68

PGA	Peak Ground Acceleration (g)
PGV	Peak Ground Velocity (cm/s)
k_y	Critical or Yield Acceleration (g)
T_m	Mean Period of an Earthquake Motion (s)
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M	Earthquake Magnitude
kmax	maximum seismic coefficient (g)
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)
D	Predicted Sliding Displacment (cm)

H_{avr} = 167 ft

V_s = 2110 ft/s

$T_s = 4\ H_{avr}/V_s$ = 0.32 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

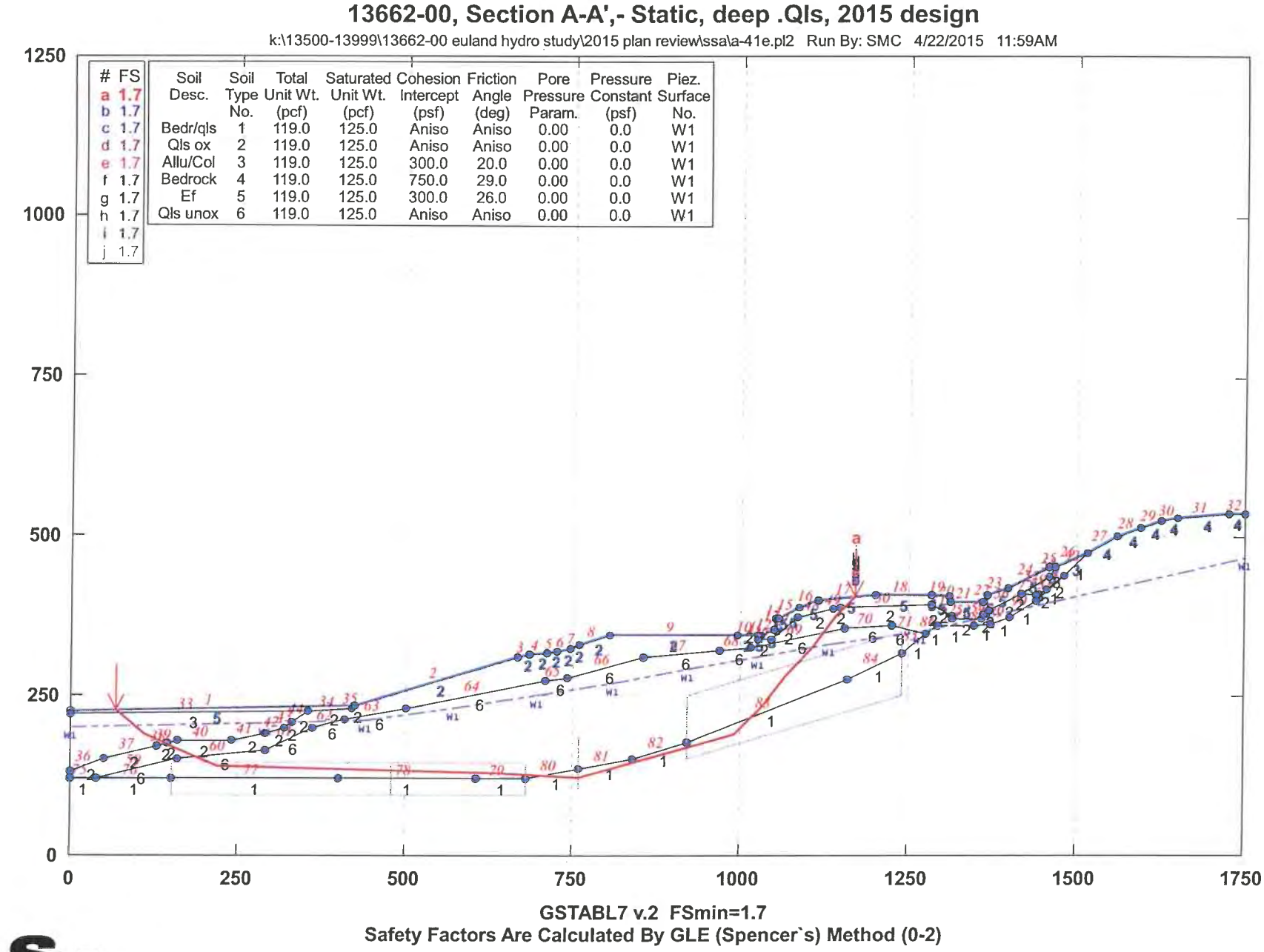
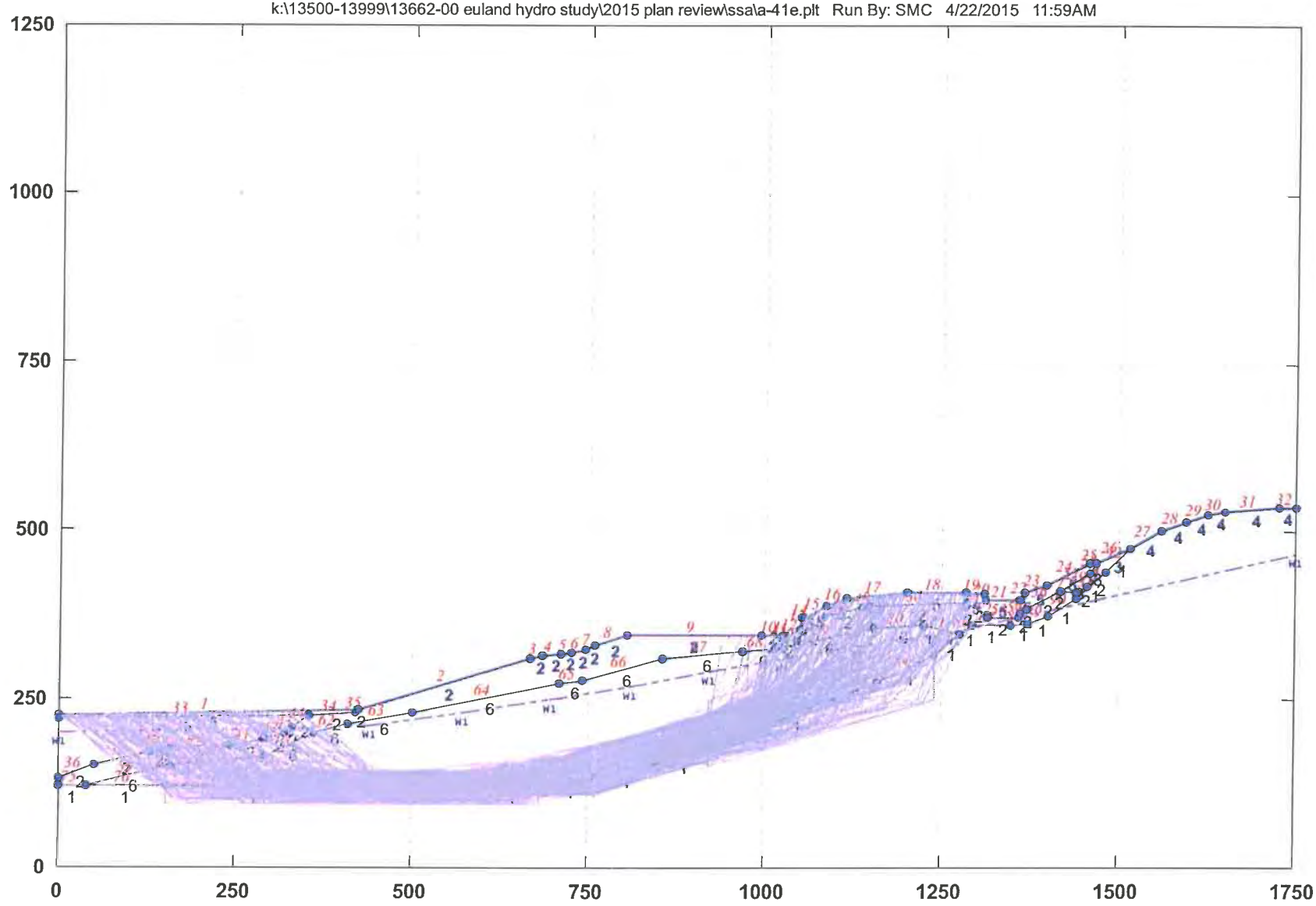

13662-00, Section A-A',- Static, deep .Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41e.pl2 Run By: SMC 4/22/2015 11:59AM
FS
a 1.7
b 1.7
c 1.7
d 1.7
e 1.7
f 1.7
g 1.7
h 1.7
i 1.7
j 1.7
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.7
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-5.1

13662-00, Section A-A',- Static, deep .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41e.plt Run By: SMC 4/22/2015 11:59AM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/22/2015
Time of Run: 11:59AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41e.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41e.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41e.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Static, deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	250.0	12.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	120.00	479.00	120.00	50.00
2	480.00	120.00	680.00	120.00	50.00
3	760.00	145.00	760.00	145.00	80.00
4	920.00	200.00	1240.00	300.00	100.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Specified Tension Crack Water Force Factor = 0.000

Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 3.525 FS Min = 1.664 FS Ave = 2.177
Standard Deviation = 0.304 Coefficient of Variation = 13.97 %
((Simplified Janbu FS for Critical Surface = 1.600))
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.700	226.593
2	109.554	191.053
3	163.614	165.024
4	218.495	140.773
5	641.072	128.151
6	760.000	122.534
7	991.152	190.002
8	1032.716	233.274
9	1068.272	281.605
10	1107.875	326.677
11	1141.029	376.685
12	1170.021	406.431

*** FOS = 1.664 Theta (ki=1.0) = 7.41 ***
Lambda = 0.130
Individual data on the 66 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.3	2052.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	23.1	42707.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	12.5	46603.5	0.0	5533.6	0.	0.	0.0	0.0	0.0
4	34.2	187777.3	0.0	45826.6	0.	0.	0.0	0.0	0.0
5	1.2	8218.7	0.0	2427.4	0.	0.	0.0	0.0	0.0
6	15.0	106810.6	0.0	33483.1	0.	0.	0.0	0.0	0.0
7	3.6	27856.9	0.0	9228.8	0.	0.	0.0	0.0	0.0
8	26.2	225000.5	0.0	78299.9	0.	0.	0.0	0.0	0.0
9	28.7	291821.8	0.0	*******	0.	0.	0.0	0.0	0.0
10	21.5	238360.7	0.0	85201.9	0.	0.	0.0	0.0	0.0
11	50.0	566057.0	0.0	*******	0.	0.	0.0	0.0	0.0
12	2.0	22987.4	0.0	8286.1	0.	0.	0.0	0.0	0.0
13	28.0	324644.8	0.0	*******	0.	0.	0.0	0.0	0.0
14	7.8	90909.2	0.0	33142.3	0.	0.	0.0	0.0	0.0
15	2.2	26315.3	0.0	9610.6	0.	0.	0.0	0.0	0.0
16	24.0	284087.0	0.0	*******	0.	0.	0.0	0.0	0.0
17	6.0	71628.0	0.0	26414.3	0.	0.	0.0	0.0	0.0
18	35.4	427378.2	0.0	*******	0.	0.	0.0	0.0	0.0
19	14.6	178952.4	0.0	66985.4	0.	0.	0.0	0.0	0.0
20	10.0	123287.0	0.0	46327.2	0.	0.	0.0	0.0	0.0
21	5.0	61896.1	0.0	23312.5	0.	0.	0.0	0.0	0.0
22	15.0	190532.7	0.0	70533.3	0.	0.	0.0	0.0	0.0
23	60.0	854941.6	0.0	*******	0.	0.	0.0	0.0	0.0
24	70.0	1186366.8	0.0	*******	0.	0.	0.0	0.0	0.0
25	71.1	1412736.8	0.0	*******	0.	0.	0.0	0.0	0.0
26	25.9	568372.9	0.0	*******	0.	0.	0.0	0.0	0.0
27	18.0	410173.0	0.0	*******	0.	0.	0.0	0.0	0.0
28	11.0	255234.3	0.0	83693.3	0.	0.	0.0	0.0	0.0
29	9.5	223257.1	0.0	73627.8	0.	0.	0.0	0.0	0.0
30	2.5	58078.3	0.0	19252.8	0.	0.	0.0	0.0	0.0
31	2.0	47186.3	0.0	15671.9	0.	0.	0.0	0.0	0.0
32	17.0	405480.7	0.0	*******	0.	0.	0.0	0.0	0.0
33	15.0	365094.3	0.0	*******	0.	0.	0.0	0.0	0.0
34	3.0	73920.2	0.0	24926.1	0.	0.	0.0	0.0	0.0
35	13.0	326198.8	0.0	*******	0.	0.	0.0	0.0	0.0
36	2.0	51083.5	0.0	17042.2	0.	0.	0.0	0.0	0.0
37	45.0	1156666.4	0.0	*******	0.	0.	0.0	0.0	0.0
38	5.0	128648.2	0.0	42634.3	0.	0.	0.0	0.0	0.0
39	30.0	753284.6	0.0	*******	0.	0.	0.0	0.0	0.0
40	16.0	388730.7	0.0	*******	0.	0.	0.0	0.0	0.0
41	64.0	1464341.8	0.0	*******	0.	0.	0.0	0.0	0.0
42	50.0	1043183.2	0.0	*******	0.	0.	0.0	0.0	0.0

43	21.2	414719.8	0.0	*******	0.	0.	0.0	0.0	0.0
44	3.8	73046.0	0.0	38076.9	0.	0.	0.0	0.0	0.0
45	20.0	348947.1	0.0	*******	0.	0.	0.0	0.0	0.0
46	3.1	49472.5	0.0	25187.3	0.	0.	0.0	0.0	0.0
47	6.9	105663.6	0.0	53456.1	0.	0.	0.0	0.0	0.0
48	1.0	14804.6	0.0	7449.3	0.	0.	0.0	0.0	0.0
49	4.0	57929.1	0.0	29042.5	0.	0.	0.0	0.0	0.0
50	2.7	38358.2	0.0	19032.9	0.	0.	0.0	0.0	0.0
51	12.3	163531.2	0.0	90009.0	0.	0.	0.0	0.0	0.0
52	5.0	61589.9	0.0	31402.6	0.	0.	0.0	0.0	0.0
53	3.0	38366.2	0.0	17387.8	0.	0.	0.0	0.0	0.0
54	3.0	39882.7	0.0	16297.4	0.	0.	0.0	0.0	0.0
55	12.3	152378.0	0.0	55313.4	0.	0.	0.0	0.0	0.0
56	17.7	197426.9	0.0	46047.6	0.	0.	0.0	0.0	0.0
57	2.0	20810.7	0.0	3454.5	0.	0.	0.0	0.0	0.0
58	18.6	174956.0	0.0	15227.7	0.	0.	0.0	0.0	0.0
59	1.3	10925.4	0.0	0.0	0.	0.	0.0	0.0	0.0
60	8.1	63563.1	0.0	0.0	0.	0.	0.0	0.0	0.0
61	7.5	49878.4	0.0	0.0	0.	0.	0.0	0.0	0.0
62	14.5	69988.2	0.0	0.0	0.	0.	0.0	0.0	0.0
63	3.0	10237.3	0.0	0.0	0.	0.	0.0	0.0	0.0
64	7.0	19189.3	0.0	0.0	0.	0.	0.0	0.0	0.0
65	6.2	12633.0	0.0	0.0	0.	0.	0.0	0.0	0.0
66	15.8	13535.1	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.700	226.593
2	109.554	191.053
3	163.614	165.024
4	218.495	140.773
5	641.072	128.151
6	760.000	122.534
7	991.152	190.002
8	1032.716	233.274
9	1068.272	281.605
10	1107.875	326.677
11	1141.029	376.685
12	1170.021	406.431

*** FOS = 1.665 Theta (ki=1.0) = 7.48 ***
Lambda = 0.131

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Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.700	226.593
2	109.554	191.053
3	163.614	165.024
4	218.495	140.773
5	641.072	128.151
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4	218.495	140.773
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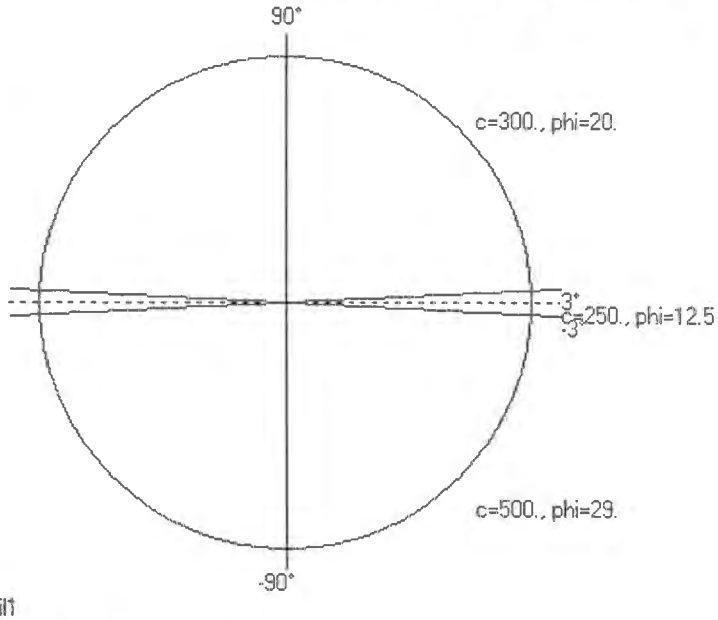
3	163.614	165.024
4	218.495	140.773
5	641.072	128.151
6	760.000	122.534
7	991.152	190.002
8	1032.716	233.274
9	1068.272	281.605
10	1107.875	326.677
11	1141.029	376.685
12	1170.021	406.431

*** FOS = 1.665 Theta (ki=1.0) = 7.49 ***
Lambda = 0.131

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

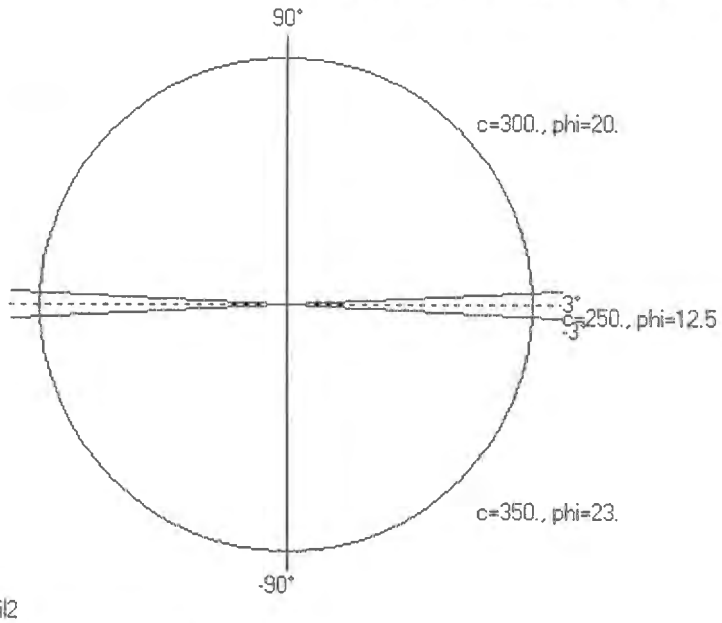
Anisotropic Soil Definition



Soil1

13662-00, Section A-A',- Static,

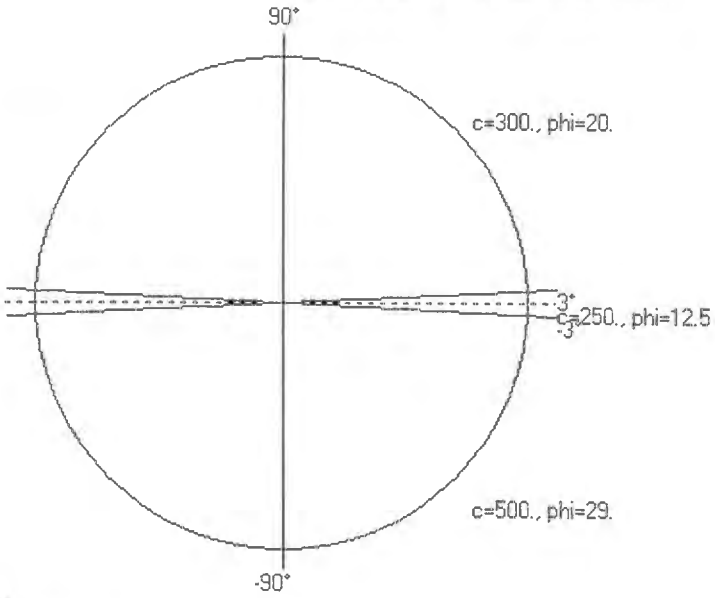
Anisotropic Soil Definition



Soil2

13662-00, Section A-A',- Static,

Anisotropic Soil Definition



Soil6

13662-00, Section A-A',- Static,

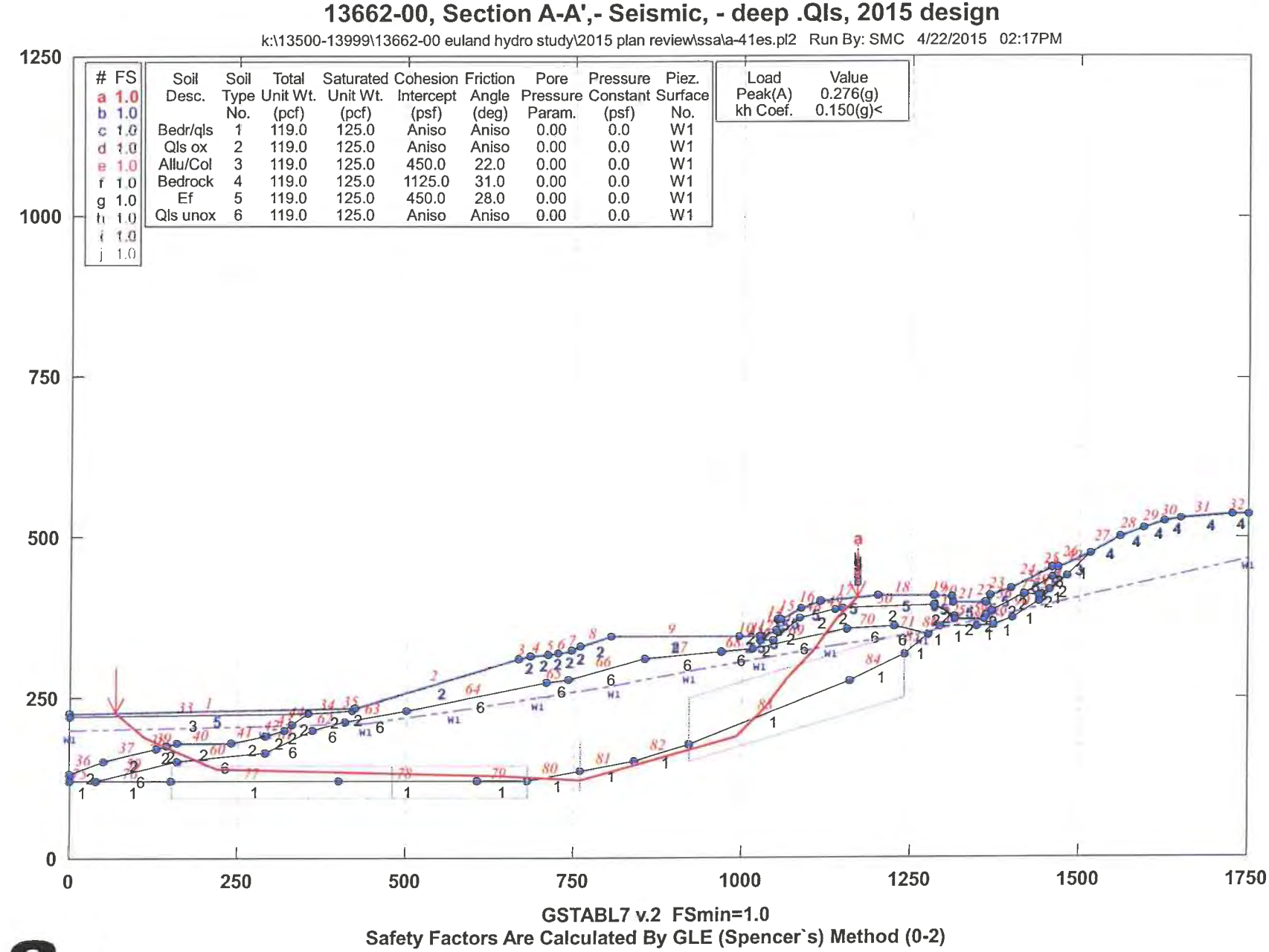

13662-00, Section A-A',- Seismic, - deep .Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41es.pl2 Run By: SMC 4/22/2015 02:17PM
FS
a 1.0
b 1.0
c 1.0
d 1.0
e 1.0
f 1.0
g 1.0
h 1.0
i 1.0
j 1.0
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.0
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-5.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/22/2015
Time of Run: 02:17PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41es.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41es.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41es.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	120.00	479.00	120.00	50.00
2	480.00	120.00	680.00	120.00	50.00
3	760.00	145.00	760.00	145.00	80.00
4	920.00	200.00	1240.00	300.00	100.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00

Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.719 FS Min = 0.951 FS Ave = 1.268
Standard Deviation = 0.138 Coefficient of Variation = 10.87 %
((Simplified Janbu FS for Critical Surface = 0.972))
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.700	226.593
2	109.554	191.053
3	163.614	165.024
4	218.495	140.773
5	641.072	128.151
6	760.000	122.534
7	991.152	190.002
8	1032.716	233.274
9	1068.272	281.605
10	1107.875	326.677
11	1141.029	376.685
12	1170.021	406.431

*** FOS = 0.951 Theta (ki=1.0) = 5.41 ***
Lambda = 0.095
Individual data on the 66 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.3	2052.7	0.0	0.0	0.	0.	307.9	0.0	0.0
2	23.1	42707.7	0.0	0.0	0.	0.	6406.2	0.0	0.0
3	12.5	46603.5	0.0	5533.6	0.	0.	6990.5	0.0	0.0
4	34.2	187777.3	0.0	45826.6	0.	0.	28166.6	0.0	0.0
5	1.2	8218.7	0.0	2427.4	0.	0.	1232.8	0.0	0.0
6	15.0	106810.6	0.0	33483.1	0.	0.	16021.6	0.0	0.0
7	3.6	27856.9	0.0	9228.8	0.	0.	4178.5	0.0	0.0
8	26.2	225000.5	0.0	78299.9	0.	0.	33750.1	0.0	0.0
9	28.7	291821.8	0.0	*******	0.	0.	43773.3	0.0	0.0
10	21.5	238360.7	0.0	85201.9	0.	0.	35754.1	0.0	0.0
11	50.0	566057.0	0.0	*******	0.	0.	84908.6	0.0	0.0
12	2.0	22987.4	0.0	8286.1	0.	0.	3448.1	0.0	0.0
13	28.0	324644.8	0.0	*******	0.	0.	48696.7	0.0	0.0
14	7.8	90909.2	0.0	33142.3	0.	0.	13636.4	0.0	0.0
15	2.2	26315.3	0.0	9610.6	0.	0.	3947.3	0.0	0.0
16	24.0	284087.0	0.0	*******	0.	0.	42613.1	0.0	0.0
17	6.0	71628.0	0.0	26414.3	0.	0.	10744.2	0.0	0.0
18	35.4	427378.2	0.0	*******	0.	0.	64106.7	0.0	0.0
19	14.6	178952.4	0.0	66985.4	0.	0.	26842.9	0.0	0.0
20	10.0	123287.0	0.0	46327.2	0.	0.	18493.0	0.0	0.0
21	5.0	61896.1	0.0	23312.5	0.	0.	9284.4	0.0	0.0
22	15.0	190532.7	0.0	70533.3	0.	0.	28579.9	0.0	0.0
23	60.0	854941.6	0.0	*******	0.	0.	*******	0.0	0.0
24	70.0	1186366.8	0.0	*******	0.	0.	*******	0.0	0.0
25	71.1	1412736.8	0.0	*******	0.	0.	*******	0.0	0.0
26	25.9	568372.9	0.0	*******	0.	0.	85255.9	0.0	0.0
27	18.0	410173.0	0.0	*******	0.	0.	61525.9	0.0	0.0
28	11.0	255234.3	0.0	83693.3	0.	0.	38285.2	0.0	0.0
29	9.5	223257.1	0.0	73627.8	0.	0.	33488.6	0.0	0.0
30	2.5	58078.3	0.0	19252.8	0.	0.	8711.7	0.0	0.0
31	2.0	47186.3	0.0	15671.9	0.	0.	7077.9	0.0	0.0
32	17.0	405480.7	0.0	*******	0.	0.	60822.1	0.0	0.0
33	15.0	365094.3	0.0	*******	0.	0.	54764.2	0.0	0.0
34	3.0	73920.2	0.0	24926.1	0.	0.	11088.0	0.0	0.0
35	13.0	326198.8	0.0	*******	0.	0.	48929.8	0.0	0.0
36	2.0	51083.5	0.0	17042.2	0.	0.	7662.5	0.0	0.0
37	45.0	1156666.4	0.0	*******	0.	0.	*******	0.0	0.0
38	5.0	128648.2	0.0	42634.3	0.	0.	19297.2	0.0	0.0

39	30.0	753284.6	0.0	*******	0.	0.	*******	0.0	0.0
40	16.0	388730.7	0.0	*******	0.	0.	58309.6	0.0	0.0
41	64.0	1464341.8	0.0	*******	0.	0.	*******	0.0	0.0
42	50.0	1043183.2	0.0	*******	0.	0.	*******	0.0	0.0
43	21.2	414719.8	0.0	*******	0.	0.	62208.0	0.0	0.0
44	3.8	73046.0	0.0	38076.9	0.	0.	10956.9	0.0	0.0
45	20.0	348947.1	0.0	*******	0.	0.	52342.1	0.0	0.0
46	3.1	49472.5	0.0	25187.3	0.	0.	7420.9	0.0	0.0
47	6.9	105663.6	0.0	53456.1	0.	0.	15849.5	0.0	0.0
48	1.0	14804.6	0.0	7449.3	0.	0.	2220.7	0.0	0.0
49	4.0	57929.1	0.0	29042.5	0.	0.	8689.4	0.0	0.0
50	2.7	38358.2	0.0	19032.9	0.	0.	5753.7	0.0	0.0
51	12.3	163531.2	0.0	90009.0	0.	0.	24529.7	0.0	0.0
52	5.0	61589.9	0.0	31402.6	0.	0.	9238.5	0.0	0.0
53	3.0	38366.2	0.0	17387.8	0.	0.	5754.9	0.0	0.0
54	3.0	39882.7	0.0	16297.4	0.	0.	5982.4	0.0	0.0
55	12.3	152378.0	0.0	55313.4	0.	0.	22856.7	0.0	0.0
56	17.7	197426.9	0.0	46047.6	0.	0.	29614.0	0.0	0.0
57	2.0	20810.7	0.0	3454.5	0.	0.	3121.6	0.0	0.0
58	18.6	174956.0	0.0	15227.7	0.	0.	26243.4	0.0	0.0
59	1.3	10925.4	0.0	0.0	0.	0.	1638.8	0.0	0.0
60	8.1	63563.1	0.0	0.0	0.	0.	9534.5	0.0	0.0
61	7.5	49878.4	0.0	0.0	0.	0.	7481.8	0.0	0.0
62	14.5	69988.2	0.0	0.0	0.	0.	10498.2	0.0	0.0
63	3.0	10237.3	0.0	0.0	0.	0.	1535.6	0.0	0.0
64	7.0	19189.3	0.0	0.0	0.	0.	2878.4	0.0	0.0
65	6.2	12633.0	0.0	0.0	0.	0.	1894.9	0.0	0.0
66	15.8	13535.1	0.0	0.0	0.	0.	2030.3	0.0	0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.700	226.593
2	109.554	191.053
3	163.614	165.024
4	218.495	140.773
5	641.072	128.151
6	760.000	122.534
7	991.152	190.002
8	1032.716	233.274
9	1068.272	281.605
10	1107.875	326.677
11	1141.029	376.685
12	1170.021	406.431

*** FOS = 0.952 Theta (ki=1.0) = 5.49 ***
Lambda = 0.096

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.700	226.593
2	109.554	191.053
3	163.614	165.024
4	218.495	140.773
5	641.072	128.151
6	760.000	122.534
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Lambda = 0.097

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

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 02:18PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41es Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41es Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41es Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2

40	160.00	180.00	240.00	180.00	2
41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points

Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

Trial Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.700	226.593
2	109.554	191.053
3	163.614	165.024
4	218.495	140.773
5	641.072	128.151
6	760.000	122.534
7	991.152	190.002
8	1032.716	233.274
9	1068.272	281.605
10	1107.875	326.677
11	1141.029	376.685
12	1170.021	406.431

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	0.915	0.970	0.132

11.25	0.828	1.010	0.199
5.32	0.953	0.951	0.093
3.42	0.980	0.935	0.060
5.40	0.951	0.951	0.095

((Simplified Janbu FS for Specified Surface = 0.973))
Factor Of Safety For The Preceding Specified Surface = 0.951
Theta (ki = 1.0) = 5.40 Deg Lambda = 0.095
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 7.182(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	73.99	224.22	0.541	20098.	1.000	5.40	1900.8
2	97.06	214.36	0.496	153850.	1.000	5.40	14550.7
3	109.55	207.39	0.447	273847.	1.000	5.40	25899.7
4	143.76	199.36	0.461	480579.	1.000	5.40	45451.9
5	145.00	198.98	0.459	490400.	1.000	5.40	46380.7
6	160.00	194.45	0.446	615235.	1.000	5.40	58187.3
7	163.61	193.38	0.444	647086.	1.000	5.40	61199.7
8	189.83	186.60	0.436	876236.	1.000	5.40	82872.0
9	218.49	177.02	0.406	1253458.	1.000	5.40	118548.7
10	240.00	178.38	0.423	1276156.	1.000	5.40	120695.4
11	290.00	181.46	0.460	1329336.	1.000	5.40	125725.0
12	292.00	181.58	0.461	1331475.	1.000	5.40	125927.3
13	320.00	183.24	0.480	1361419.	1.000	5.40	128759.4
14	327.76	183.70	0.485	1369711.	1.000	5.40	129543.6
15	330.00	183.83	0.487	1372104.	1.000	5.40	129769.9
16	354.00	185.22	0.502	1397726.	1.000	5.40	132193.2
17	360.00	185.57	0.506	1404127.	1.000	5.40	132798.5
18	395.39	187.57	0.527	1441839.	1.000	5.40	136365.3
19	410.00	188.39	0.536	1457394.	1.000	5.40	137836.4
20	420.00	188.94	0.541	1468032.	1.000	5.40	138842.5
21	425.00	189.22	0.544	1473348.	1.000	5.40	139345.3
22	440.00	190.02	0.530	1489903.	1.000	5.40	140911.0
23	500.00	192.82	0.480	1565514.	1.000	5.40	148062.2
24	570.00	195.41	0.435	1669232.	1.000	5.40	157871.5
25	641.07	197.39	0.398	1791507.	1.000	5.40	169436.0
26	667.00	197.54	0.386	1851363.	1.000	5.40	175096.9
27	685.00	197.61	0.381	1894280.	1.000	5.40	179156.0
28	696.00	197.66	0.380	1920750.	1.000	5.40	181659.4
29	705.53	197.70	0.379	1943744.	1.000	5.40	183834.1
30	708.00	197.71	0.379	1949694.	1.000	5.40	184396.9
31	710.00	197.72	0.379	1954517.	1.000	5.40	184853.0
32	727.00	197.80	0.376	1995667.	1.000	5.40	188744.8
33	742.00	197.87	0.373	2032349.	1.000	5.40	192214.2
34	745.00	197.88	0.372	2039742.	1.000	5.40	192913.3
35	758.00	197.92	0.363	2072425.	1.000	5.40	196004.4
36	760.00	197.92	0.362	2077556.	1.000	5.40	196489.6
37	805.00	208.64	0.347	1904274.	1.000	5.40	180101.2
38	810.00	209.83	0.348	1885390.	1.000	5.40	178315.1
39	840.00	217.04	0.356	1774282.	1.000	5.40	167806.8
40	856.00	220.90	0.360	1716481.	1.000	5.40	162340.2
41	920.00	236.41	0.380	1495411.	1.000	5.40	141432.0
42	970.00	248.53	0.399	1331502.	0.907	4.90	103658.2
43	991.15	253.55	0.407	1263861.	0.811	4.39	78682.9
44	995.00	256.56	0.412	1210410.	0.794	4.29	72147.8
45	1015.00	271.98	0.436	956428.	0.703	3.80	44724.4
46	1018.10	274.34	0.440	920650.	0.689	3.73	41346.7
47	1025.00	279.54	0.450	844491.	0.658	3.56	34559.5
48	1026.00	280.28	0.451	833852.	0.653	3.54	33655.1
49	1030.00	283.25	0.457	792303.	0.635	3.44	30226.5
50	1032.72	285.25	0.456	764902.	0.623	3.37	28060.2
51	1045.00	296.24	0.450	619620.	0.567	3.07	18845.3

52	1050.00	300.56	0.446	566163.	0.544	2.95	15869.6
53	1053.00	303.26	0.382	533655.	0.531	2.87	14220.0
54	1056.00	306.09	0.384	500491.	0.517	2.80	12661.2
55	1068.27	317.47	0.369	377197.	0.462	2.50	7598.7
56	1086.00	331.63	0.343	249043.	0.381	2.06	3421.1
57	1088.00	333.26	0.340	236183.	0.372	2.02	3091.8
58	1106.58	348.06	0.320	134932.	0.288	1.56	1056.7
59	1107.88	349.10	0.318	129094.	0.282	1.53	970.2
60	1116.00	357.47	0.304	86177.	0.245	1.33	489.4
61	1123.50	365.57	0.302	53441.	0.211	1.14	225.0
62	1138.00	383.28	0.366	10999.	0.145	0.79	21.9
63	1141.03	391.86	0.577	5616.	0.132	0.71	9.2
64	1148.00	262.30	-6.085	-554.	0.100	0.54	-0.5
65	1154.18	367.57	-1.574	-3550.	0.072	0.39	-1.7
66	1170.02	1044.22	0.000	169.	0.000	0.00	0.0

Table 1 - Individual data on the 66 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Force Ver (lbs)	Surcharge Load (lbs)
1	6.3	2052.7	0.0	0.0	0.0	0.0	307.9	0.0	0.0
2	23.1	42706.9	0.0	0.0	0.0	0.0	6406.0	0.0	0.0
3	12.5	46604.1	0.0	5533.8	0.0	0.0	6990.6	0.0	0.0
4	34.2	187776.8	0.0	45826.7	0.0	0.0	28166.5	0.0	0.0
5	1.2	8221.0	0.0	2428.1	0.0	0.0	1233.1	0.0	0.0
6	15.0	106811.1	0.0	33483.4	0.0	0.0	16021.7	0.0	0.0
7	3.6	27856.3	0.0	9228.6	0.0	0.0	4178.4	0.0	0.0
8	26.2	224998.1	0.0	78299.2	0.0	0.0	33749.7	0.0	0.0
9	28.7	291828.4	0.0	*******	0.0	0.0	43774.3	0.0	0.0
10	21.5	238359.5	0.0	85201.5	0.0	0.0	35753.9	0.0	0.0
11	50.0	566058.8	0.0	*******	0.0	0.0	84908.8	0.0	0.0
12	2.0	22987.4	0.0	8286.1	0.0	0.0	3448.1	0.0	0.0
13	28.0	324645.8	0.0	*******	0.0	0.0	48696.9	0.0	0.0
14	7.8	90909.4	0.0	33142.4	0.0	0.0	13636.4	0.0	0.0
15	2.2	26315.4	0.0	9610.6	0.0	0.0	3947.3	0.0	0.0
16	24.0	284087.8	0.0	*******	0.0	0.0	42613.2	0.0	0.0
17	6.0	71628.2	0.0	26414.4	0.0	0.0	10744.2	0.0	0.0
18	35.4	427379.5	0.0	*******	0.0	0.0	64106.9	0.0	0.0
19	14.6	178952.9	0.0	66985.7	0.0	0.0	26842.9	0.0	0.0
20	10.0	123287.3	0.0	46327.4	0.0	0.0	18493.1	0.0	0.0
21	5.0	61896.3	0.0	23312.6	0.0	0.0	9284.4	0.0	0.0
22	15.0	190533.2	0.0	70533.6	0.0	0.0	28580.0	0.0	0.0
23	60.0	854943.4	0.0	*******	0.0	0.0	*******	0.0	0.0
24	70.0	1186369.0	0.0	*******	0.0	0.0	*******	0.0	0.0
25	71.1	1412743.9	0.0	*******	0.0	0.0	*******	0.0	0.0
26	25.9	568368.4	0.0	*******	0.0	0.0	85255.3	0.0	0.0
27	18.0	410173.4	0.0	*******	0.0	0.0	61526.0	0.0	0.0
28	11.0	255234.6	0.0	83693.4	0.0	0.0	38285.2	0.0	0.0
29	9.5	223238.7	0.0	73621.8	0.0	0.0	33485.8	0.0	0.0
30	2.5	58097.0	0.0	19259.0	0.0	0.0	8714.5	0.0	0.0
31	2.0	47186.3	0.0	15672.0	0.0	0.0	7077.9	0.0	0.0
32	17.0	405481.1	0.0	*******	0.0	0.0	60822.2	0.0	0.0
33	15.0	365094.7	0.0	*******	0.0	0.0	54764.2	0.0	0.0
34	3.0	73920.2	0.0	24926.1	0.0	0.0	11088.0	0.0	0.0
35	13.0	326199.1	0.0	*******	0.0	0.0	48929.9	0.0	0.0
36	2.0	51083.5	0.0	17042.2	0.0	0.0	7662.5	0.0	0.0
37	45.0	1156667.4	0.0	*******	0.0	0.0	*******	0.0	0.0
38	5.0	128648.3	0.0	42634.3	0.0	0.0	19297.3	0.0	0.0
39	30.0	753285.4	0.0	*******	0.0	0.0	*******	0.0	0.0
40	16.0	388731.2	0.0	*******	0.0	0.0	58309.7	0.0	0.0
41	64.0	1464343.9	0.0	*******	0.0	0.0	*******	0.0	0.0
42	50.0	1043185.2	0.0	*******	0.0	0.0	*******	0.0	0.0
43	21.2	414713.7	0.0	*******	0.0	0.0	62207.1	0.0	0.0
44	3.8	73053.0	0.0	38080.6	0.0	0.0	10958.0	0.0	0.0
45	20.0	348947.2	0.0	*******	0.0	0.0	52342.1	0.0	0.0
46	3.1	49472.5	0.0	25187.3	0.0	0.0	7420.9	0.0	0.0
47	6.9	105663.6	0.0	53456.1	0.0	0.0	15849.5	0.0	0.0
48	1.0	14804.6	0.0	7449.3	0.0	0.0	2220.7	0.0	0.0
49	4.0	57929.1	0.0	29042.5	0.0	0.0	8689.4	0.0	0.0
50	2.7	38354.8	0.0	19031.2	0.0	0.0	5753.2	0.0	0.0

51	12.3	163534.6	0.0	90011.1	0.0	0.0	24530.2	0.0	0.0
52	5.0	61589.8	0.0	31402.5	0.0	0.0	9238.5	0.0	0.0
53	3.0	38366.1	0.0	17387.7	0.0	0.0	5754.9	0.0	0.0
54	3.0	39882.7	0.0	16297.4	0.0	0.0	5982.4	0.0	0.0
55	12.3	152380.5	0.0	55314.0	0.0	0.0	22857.1	0.0	0.0
56	17.7	197423.2	0.0	46046.2	0.0	0.0	29613.5	0.0	0.0
57	2.0	20810.6	0.0	3454.5	0.0	0.0	3121.6	0.0	0.0
58	18.6	174952.2	0.0	15227.1	0.0	0.0	26242.8	0.0	0.0
59	1.3	10924.3	0.0	0.0	0.0	0.0	1638.7	0.0	0.0
60	8.1	63566.6	0.0	0.0	0.0	0.0	9535.0	0.0	0.0
61	7.5	49876.6	0.0	0.0	0.0	0.0	7481.5	0.0	0.0
62	14.5	69989.3	0.0	0.0	0.0	0.0	10498.4	0.0	0.0
63	3.0	10236.6	0.0	0.0	0.0	0.0	1535.5	0.0	0.0
64	7.0	19190.2	0.0	0.0	0.0	0.0	2878.5	0.0	0.0
65	6.2	12633.3	0.0	0.0	0.0	0.0	1895.0	0.0	0.0
66	15.8	13535.4	0.0	0.0	0.0	0.0	2030.3	0.0	0.0

- TABLE 2 - Base Stress Data on the 66 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-40.34	70.84	8.25	1958.86	248.86	1567.95
2	-40.34	85.52	30.27	4377.07	1410.92	2332.10
3	-40.34	103.31	16.39	7686.62	2843.38	3594.35
4	-25.71	126.65	37.96	7593.01	4946.71	3185.24
5	-25.71	144.38	1.38	9427.35	5954.12	4311.10
6	-25.71	152.50	16.65	10072.77	6415.79	4503.63
7	-25.71	161.81	4.01	10812.38	6944.82	4724.25
8	-23.84	176.72	28.66	11563.85	7851.46	4881.09
9	-23.84	204.16	31.34	14960.03	9310.67	8015.60
10	-1.71	229.25	21.51	11254.30	11078.97	2377.24
11	-1.71	265.00	50.02	11493.42	11316.13	2413.75
12	-1.71	291.00	2.00	11667.30	11488.60	2440.30
13	-1.71	306.00	28.01	11768.44	11589.33	2452.36
14	-1.71	323.88	7.76	11889.20	11709.71	2465.90
15	-1.71	328.88	2.24	11922.97	11743.38	2469.68
16	-1.71	342.00	24.01	12011.58	11831.72	2479.61
17	-1.71	357.00	6.00	12112.88	11932.71	2490.97
18	-1.71	377.69	35.40	12252.65	12072.04	2506.63
19	-1.71	402.69	14.62	12421.49	12240.37	2525.55
20	-1.71	415.00	10.00	12504.61	12323.24	2534.87
21	-1.71	422.50	5.00	12555.26	12373.73	2540.54
22	-1.71	432.50	15.01	12884.36	12696.55	2619.22
23	-1.71	470.00	60.03	14456.13	14242.71	2960.16
24	-1.71	535.00	70.03	17192.29	16940.57	3503.79
25	-1.71	605.54	71.10	20161.86	19868.78	4092.23
26	-2.70	654.04	25.96	22352.40	21896.64	4530.72
27	-2.70	676.00	18.02	23233.64	22762.04	4694.50
28	-2.70	690.50	11.01	23654.48	23177.31	4758.88
29	-2.70	700.77	9.54	23871.67	23392.39	4786.78
30	-2.70	706.77	2.47	23999.49	23519.55	4799.21
31	-2.70	709.00	2.00	24047.08	23566.88	4803.83
32	-2.70	718.50	17.02	24308.31	23825.27	4839.50
33	-2.70	734.50	15.02	24802.01	24312.54	4914.18
34	-2.70	743.50	3.00	25106.53	24612.63	4963.48
35	-2.70	751.50	13.01	25567.90	25064.29	5059.15
36	-2.70	759.00	2.00	26026.84	25513.33	5156.01
37	16.27	782.50	46.88	23345.85	24674.17	6836.09
38	16.27	807.50	5.21	23355.37	24699.08	6916.13
39	16.27	825.00	31.25	22795.64	24103.77	6732.82
40	16.27	848.00	16.67	22062.06	23322.55	6487.27
41	16.27	888.00	66.67	20786.29	21963.91	6060.23
42	16.27	945.00	52.09	18759.23	20028.02	5362.14
43	16.27	980.58	22.03	17374.76	18821.06	4869.75
44	46.15	993.08	5.55	13830.34	13151.18	3435.50
45	46.15	1005.00	28.87	12725.54	12086.31	3231.01
46	46.15	1016.55	4.48	11646.51	11054.83	3029.16
47	46.15	1021.55	9.96	11175.08	10608.31	2939.95
48	46.15	1025.50	1.44	10801.43	10255.57	2868.96
49	46.15	1028.00	5.77	10564.05	10032.30	2823.64
50	46.15	1031.36	3.92	10293.23	9782.80	2783.18

51	53.66	1038.86	20.73	9013.11	7889.00	2456.90
52	53.66	1047.50	8.44	8247.59	7299.50	2395.28
53	53.66	1051.50	5.06	8459.47	7578.45	2607.23
54	53.66	1054.50	5.06	8711.95	7878.02	2805.94
55	53.66	1062.14	20.71	8028.76	7358.23	2748.61
56	48.70	1077.14	26.86	7418.66	7350.55	2895.78
57	48.70	1087.00	3.03	6798.86	6868.13	2876.47
58	48.70	1097.29	28.15	5992.74	6215.02	2788.57
59	48.70	1107.23	1.96	5206.95	5571.11	2684.57
60	56.46	1111.94	14.70	4225.41	4323.06	2267.69
61	56.46	1119.75	13.58	3540.85	3672.78	1976.94
62	56.46	1130.75	26.23	2469.47	2667.88	1521.89
63	56.46	1139.51	5.48	1608.59	1867.38	1156.26
64	45.74	1144.51	9.99	1571.81	1921.43	1140.64
65	45.74	1151.09	8.86	1082.76	1425.96	932.93
66	45.74	1162.10	22.69	235.67	596.52	604.78

*** SEISMIC SLOPE DISPLACEMENT DATA ***

(Note: kv is set = zero for displacement calculations)

Seismic Yield Coefficient (ky) = 0.1357(g)

Calculated Newmark Seismic Displacement = 0.111(ft)

Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: A-A'

File: a-41es

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1357
T_m (s)	0.517
T_s (s)	0.30
M	6.95
T_s/T_m	0.586804

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.231	0.180	0.297
k-velmax (cm/s)	25.73	20.03	33.03

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.21	0.883	3.36	1.39	8.14
[kmax, k-velmax]	0.40	0.567	1.49	0.85	2.63
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.21	0.883	1.32	0.55	3.20
[kmax, k-velmax]	0.40	0.567	0.59	0.33	1.03

PGA	Peak Ground Acceleration (g)	
PGV	Peak Ground Velocity (cm/s)	
k_y	Critical or Yield Acceleration (g)	
T_m	Mean Period of an Earthquake Motion (s)	
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s	
M	Earthquake Magnitude	
kmax	maximum seismic coefficient (g)	
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)	
D	Predicted Sliding Displacment (cm)	

H_{avr} =	160	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.30	s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

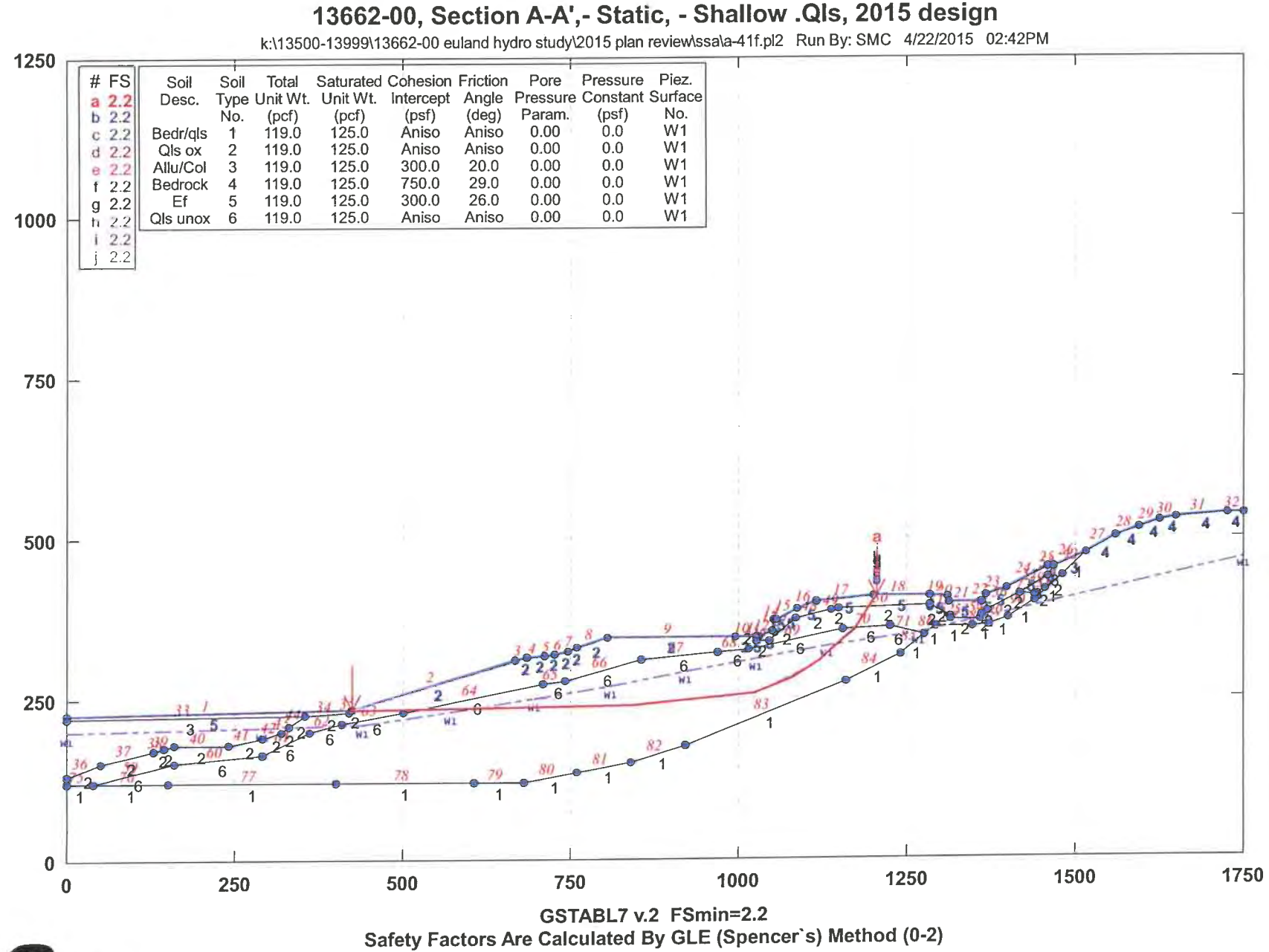
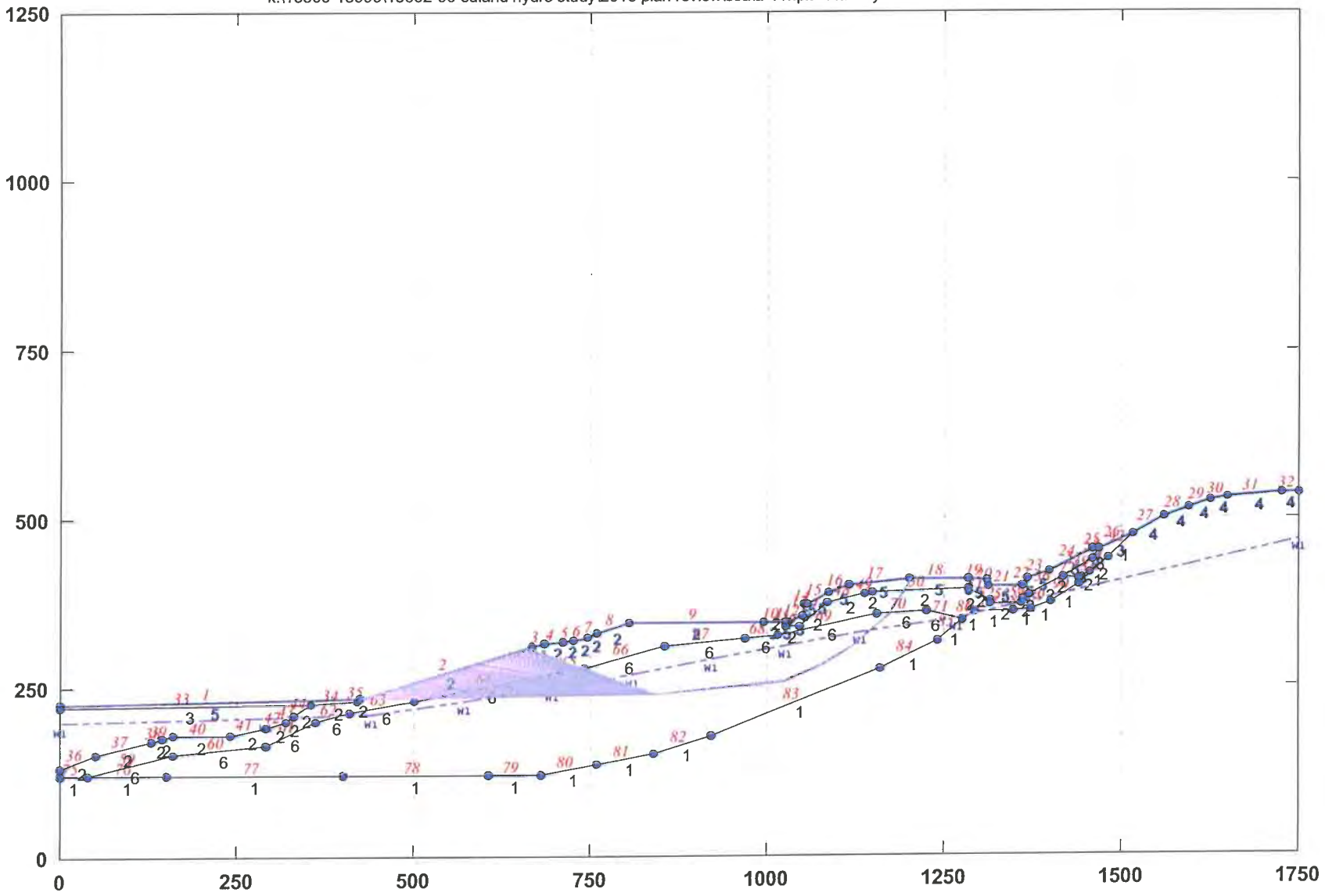

13662-00, Section A-A',- Static, - Shallow .Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41f.pl2 Run By: SMC 4/22/2015 02:42PM
FS
a 2.2
b 2.2
c 2.2
d 2.2
e 2.2
f 2.2
g 2.2
h 2.2
i 2.2
j 2.2
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=2.2
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-6.1

13662-00, Section A-A',- Static, - Shallow .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41f.plt Run By: SMC 4/22/2015 02:42PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 02:42PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41f.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41f.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41f.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Static,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	250.0	12.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	1.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	1.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	425.00	234.00	667.00	309.00	1.00
2	844.00	240.00	844.00	240.00	3.00
3	1024.00	258.00	1024.00	258.00	3.00
4	1080.00	284.00	1080.00	284.00	3.00
5	1120.00	310.00	1120.00	310.00	3.00
6	1160.00	344.00	1160.00	344.00	3.00
7	1172.00	356.00	1172.00	356.00	3.00
8	1196.00	396.00	1196.00	396.00	3.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *

Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 1000
Number of Trial Surfaces With Valid FS = 1000
Statistical Data On All Valid FS Values:
FS Max = 2.690 FS Min = 2.212 FS Ave = 2.389
Standard Deviation = 0.128 Coefficient of Variation = 5.38 %
((Simplified Janbu FS for Critical Surface = 2.181))
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	424.591	234.990
2	424.837	234.837
3	425.753	233.920
4	844.000	239.757
5	1024.000	259.003
6	1080.000	282.582
7	1120.000	309.524
8	1160.000	345.110
9	1172.000	355.872
10	1196.000	396.592
11	1204.379	410.000

*** FOS = 2.212 Theta (ki=1.0) = 10.31 ***
Lambda = 0.182
Individual data on the 47 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.2	2.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.2	4.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.8	73.5	0.0	0.0	0.	0.	0.0	0.0	0.0
4	99.3	189274.2	0.0	0.0	0.	0.	0.0	0.0	0.0
5	85.9	443856.3	0.0	0.0	0.	0.	0.0	0.0	0.0
6	56.0	430801.7	0.0	14001.5	0.	0.	0.0	0.0	0.0
7	18.0	160770.8	0.0	10443.8	0.	0.	0.0	0.0	0.0
8	11.0	101602.8	0.0	7805.7	0.	0.	0.0	0.0	0.0
9	12.0	112703.9	0.0	9794.7	0.	0.	0.0	0.0	0.0
10	2.0	18974.0	0.0	1771.4	0.	0.	0.0	0.0	0.0
11	17.0	164442.3	0.0	16660.4	0.	0.	0.0	0.0	0.0
12	15.0	150579.2	0.0	17082.8	0.	0.	0.0	0.0	0.0
13	3.0	30810.8	0.0	3684.6	0.	0.	0.0	0.0	0.0
14	13.0	138596.6	0.0	16999.0	0.	0.	0.0	0.0	0.0
15	47.0	561607.5	0.0	75455.3	0.	0.	0.0	0.0	0.0
16	5.0	64413.7	0.0	9317.7	0.	0.	0.0	0.0	0.0
17	34.0	437559.4	0.0	70092.5	0.	0.	0.0	0.0	0.0
18	12.0	153411.8	0.0	27324.7	0.	0.	0.0	0.0	0.0
19	64.0	788326.7	0.0	*******	0.	0.	0.0	0.0	0.0
20	50.0	580911.6	0.0	*******	0.	0.	0.0	0.0	0.0
21	25.0	278978.9	0.0	72820.0	0.	0.	0.0	0.0	0.0
22	20.0	217674.2	0.0	60525.0	0.	0.	0.0	0.0	0.0
23	9.0	96355.8	0.0	27894.3	0.	0.	0.0	0.0	0.0
24	1.0	10625.4	0.0	3360.6	0.	0.	0.0	0.0	0.0
25	1.0	10573.9	0.0	3345.1	0.	0.	0.0	0.0	0.0
26	4.0	41780.9	0.0	13225.8	0.	0.	0.0	0.0	0.0
27	15.0	155367.4	0.0	47393.5	0.	0.	0.0	0.0	0.0
28	5.0	51892.9	0.0	15024.8	0.	0.	0.0	0.0	0.0
29	3.0	33954.2	0.0	8829.3	0.	0.	0.0	0.0	0.0
30	3.0	36525.4	0.0	8690.1	0.	0.	0.0	0.0	0.0
31	24.0	294803.2	0.0	64511.4	0.	0.	0.0	0.0	0.0
32	6.0	74524.8	0.0	16038.9	0.	0.	0.0	0.0	0.0
33	2.0	24713.0	0.0	5059.5	0.	0.	0.0	0.0	0.0
34	28.0	329651.6	0.0	55774.9	0.	0.	0.0	0.0	0.0
35	4.0	44273.7	0.0	5673.3	0.	0.	0.0	0.0	0.0
36	12.0	124268.6	0.0	13796.4	0.	0.	0.0	0.0	0.0
37	6.0	56956.7	0.0	3756.7	0.	0.	0.0	0.0	0.0

38	7.2	64091.7	0.0	1601.5	0.	0.	0.0	0.0	0.0
39	2.8	23165.1	0.0	0.0	0.	0.	0.0	0.0	0.0
40	7.0	55542.9	0.0	0.0	0.	0.	0.0	0.0	0.0
41	5.0	36922.4	0.0	0.0	0.	0.	0.0	0.0	0.0
42	12.0	79198.5	0.0	0.0	0.	0.	0.0	0.0	0.0
43	1.3	7584.8	0.0	0.0	0.	0.	0.0	0.0	0.0
44	19.6	77729.7	0.0	0.0	0.	0.	0.0	0.0	0.0
45	3.1	5687.2	0.0	0.0	0.	0.	0.0	0.0	0.0
46	4.0	4745.5	0.0	0.0	0.	0.	0.0	0.0	0.0
47	4.4	1825.6	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	424.591	234.990
2	424.837	234.837
3	425.753	233.920
4	844.000	239.757
5	1024.000	259.003
6	1080.000	282.582
7	1120.000	309.524
8	1160.000	345.110
9	1172.000	355.872
10	1196.000	396.592
11	1204.379	410.000

*** FOS = 2.212 Theta (ki=1.0) = 10.31 ***
Lambda = 0.182

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	424.591	234.990
2	424.837	234.837
3	425.753	233.920
4	844.000	239.757
5	1024.000	259.003
6	1080.000	282.582
7	1120.000	309.524
8	1160.000	345.110
9	1172.000	355.872
10	1196.000	396.592
11	1204.379	410.000

*** FOS = 2.212 Theta (ki=1.0) = 10.31 ***
Lambda = 0.182

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	424.591	234.990
2	424.837	234.837
3	425.753	233.920
4	844.000	239.757
5	1024.000	259.003
6	1080.000	282.582
7	1120.000	309.524
8	1160.000	345.110
9	1172.000	355.872
10	1196.000	396.592
11	1204.379	410.000

*** FOS = 2.212 Theta (ki=1.0) = 10.31 ***
Lambda = 0.182

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	425.830	235.257
2	426.699	234.389
3	844.000	239.628
4	1024.000	258.968
5	1080.000	283.390
6	1120.000	308.926
7	1160.000	343.856
8	1172.000	354.712
9	1196.000	396.275

10	1204.576	410.000

*** FOS = 2.216 Theta (ki=1.0) = 10.31 ***
Lambda = 0.182
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	425.830	235.257
2	426.699	234.389
3	844.000	239.628
4	1024.000	258.968
5	1080.000	283.390
6	1120.000	308.926
7	1160.000	343.856
8	1172.000	354.712
9	1196.000	396.275
10	1204.576	410.000

*** FOS = 2.216 Theta (ki=1.0) = 10.31 ***
Lambda = 0.182
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	425.830	235.257
2	426.699	234.389
3	844.000	239.628
4	1024.000	258.968
5	1080.000	283.390
6	1120.000	308.926
7	1160.000	343.856
8	1172.000	354.712
9	1196.000	396.275
10	1204.576	410.000

*** FOS = 2.216 Theta (ki=1.0) = 10.31 ***
Lambda = 0.182
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	425.830	235.257
2	426.699	234.389
3	844.000	239.628
4	1024.000	258.968
5	1080.000	283.390
6	1120.000	308.926
7	1160.000	343.856
8	1172.000	354.712
9	1196.000	396.275
10	1204.576	410.000

*** FOS = 2.216 Theta (ki=1.0) = 10.31 ***
Lambda = 0.182
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	429.069	236.261
2	429.535	235.795
3	844.000	239.241
4	1024.000	258.863
5	1080.000	282.816
6	1120.000	310.133
7	1160.000	343.095
8	1172.000	357.232
9	1196.000	395.326
10	1205.169	410.000

*** FOS = 2.217 Theta (ki=1.0) = 10.28 ***
Lambda = 0.181
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	429.069	236.261
2	429.535	235.795
3	844.000	239.241
4	1024.000	258.863

```
    5       1080.000      282.816
    6       1120.000      310.133
    7       1160.000      343.095
    8       1172.000      357.232
    9       1196.000      395.326
   10       1205.169      410.000
***  FOS =      2.217   Theta (ki=1.0) =    10.28  ***
                    Lambda =   0.181
          **** END OF GSTABL7 OUTPUT ****
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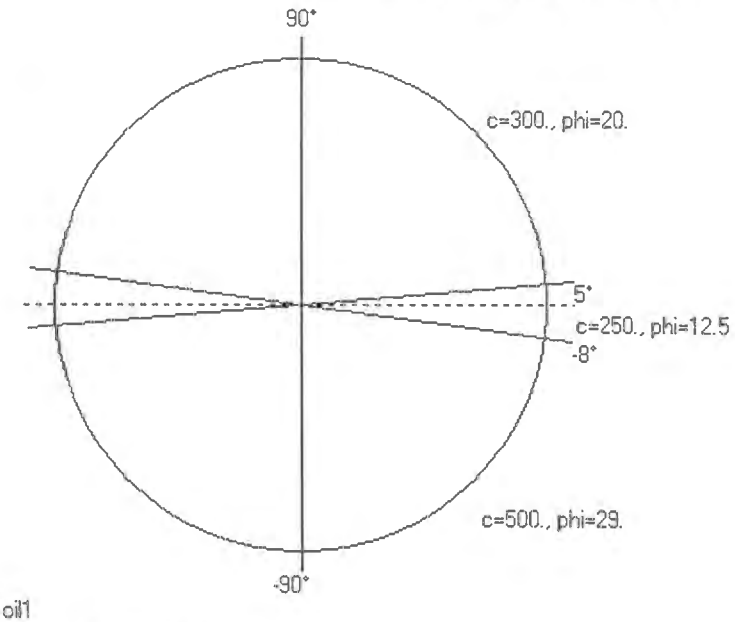
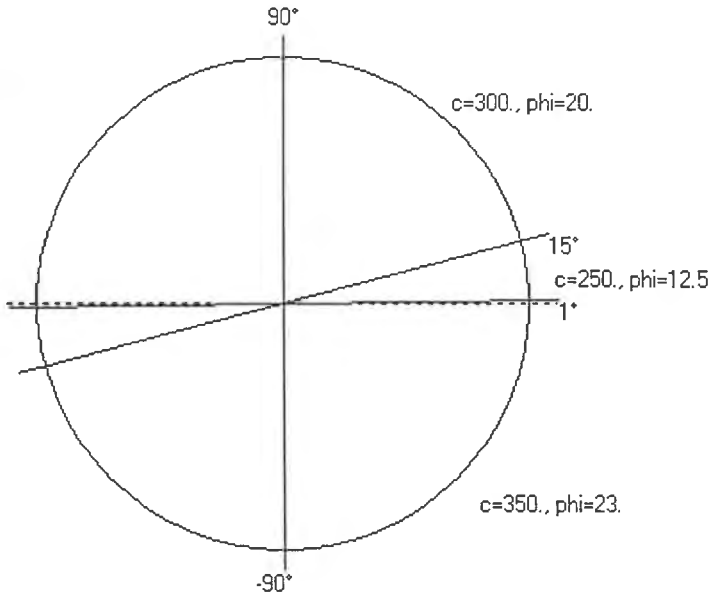
Anisotropic Soil Definition



Soil1

13662-00, Section A-A',- Static,

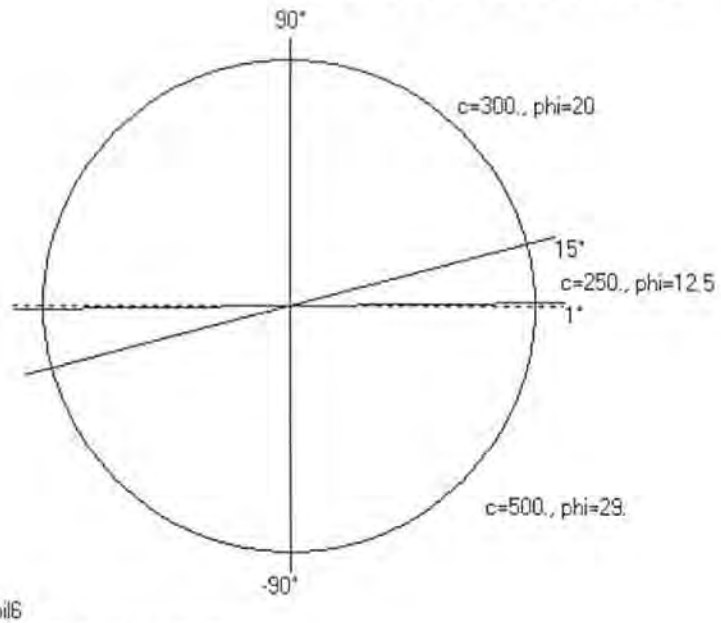
Anisotropic Soil Definition



Soil2

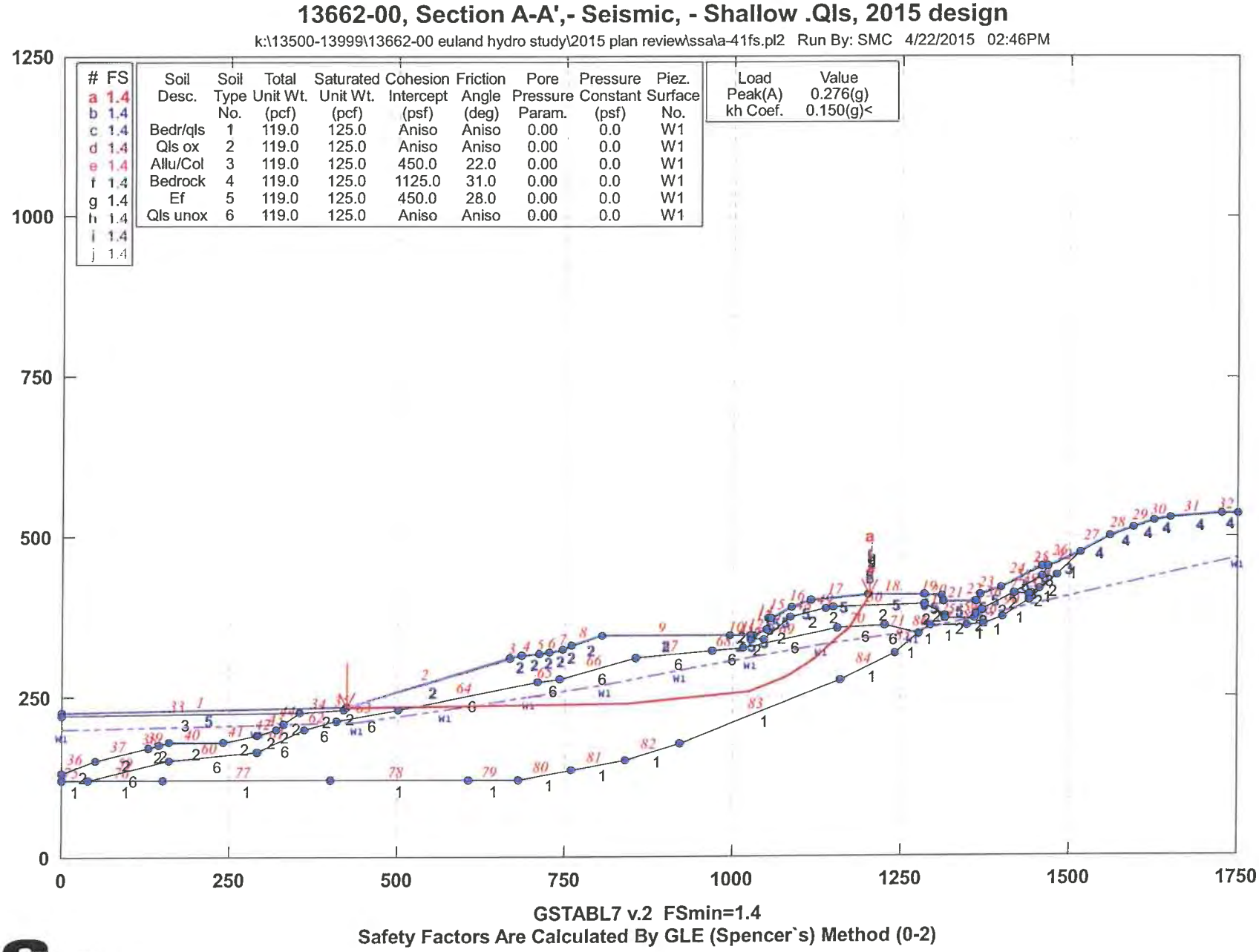
13662-00, Section A-A',- Static,

Anisotropic Soil Definition



Soil6

13662-00, Section A-A',- Static,


13662-00, Section A-A',- Seismic, - Shallow .Qls, 2015 design
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FS
a 1.4
b 1.4
c 1.4
d 1.4
e 1.4
f 1.4
g 1.4
h 1.4
i 1.4
j 1.4
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.4
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-6.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/22/2015
Time of Run: 02:46PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41fs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41fs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41fs.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	1.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	1.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	425.00	234.00	667.00	309.00	1.00
2	844.00	240.00	844.00	240.00	3.00
3	1024.00	258.00	1024.00	258.00	3.00
4	1080.00	284.00	1080.00	284.00	3.00
5	1120.00	310.00	1120.00	310.00	3.00
6	1160.00	344.00	1160.00	344.00	3.00
7	1172.00	356.00	1172.00	356.00	3.00
8	1196.00	396.00	1196.00	396.00	3.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 1000
Number of Trial Surfaces With Valid FS = 1000
Statistical Data On All Valid FS Values:
FS Max = 1.575 FS Min = 1.399 FS Ave = 1.456
Standard Deviation = 0.046 Coefficient of Variation = 3.14 %
((Simplified Janbu FS for Critical Surface = 1.418))
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	424.582	234.990
2	424.837	234.837
3	425.753	233.920
4	844.000	239.757
5	1024.000	259.003
6	1080.000	282.582
7	1120.000	309.524
8	1160.000	345.110
9	1172.000	355.872
10	1196.000	396.592
11	1204.057	410.000

*** FOS = 1.399 Theta (ki=1.0) = 8.89 ***
Lambda = 0.156
Individual data on the 47 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.3	2.4	0.0	0.0	0.	0.	0.4	0.0	0.0
2	0.2	4.7	0.0	0.0	0.	0.	0.7	0.0	0.0
3	0.8	73.5	0.0	0.0	0.	0.	11.0	0.0	0.0
4	99.3	189274.2	0.0	0.0	0.	0.	28391.1	0.0	0.0
5	85.9	443856.3	0.0	0.0	0.	0.	66578.5	0.0	0.0
6	56.0	430801.7	0.0	14001.5	0.	0.	64620.3	0.0	0.0
7	18.0	160770.8	0.0	10443.8	0.	0.	24115.6	0.0	0.0
8	11.0	101602.8	0.0	7805.7	0.	0.	15240.4	0.0	0.0
9	12.0	112703.9	0.0	9794.7	0.	0.	16905.6	0.0	0.0
10	2.0	18974.0	0.0	1771.4	0.	0.	2846.1	0.0	0.0
11	17.0	164442.3	0.0	16660.4	0.	0.	24666.4	0.0	0.0
12	15.0	150579.2	0.0	17082.8	0.	0.	22586.9	0.0	0.0
13	3.0	30810.8	0.0	3684.6	0.	0.	4621.6	0.0	0.0
14	13.0	138596.6	0.0	16999.0	0.	0.	20789.5	0.0	0.0
15	47.0	561607.5	0.0	75455.3	0.	0.	84241.1	0.0	0.0
16	5.0	64413.7	0.0	9317.7	0.	0.	9662.1	0.0	0.0
17	34.0	437559.4	0.0	70092.5	0.	0.	65633.9	0.0	0.0
18	12.0	153411.8	0.0	27324.7	0.	0.	23011.8	0.0	0.0
19	64.0	788326.7	0.0	*******	0.	0.	*******	0.0	0.0
20	50.0	580911.6	0.0	*******	0.	0.	87136.8	0.0	0.0
21	25.0	278978.9	0.0	72820.0	0.	0.	41846.8	0.0	0.0
22	20.0	217674.2	0.0	60525.0	0.	0.	32651.1	0.0	0.0
23	9.0	96355.8	0.0	27894.3	0.	0.	14453.4	0.0	0.0
24	1.0	10625.4	0.0	3360.6	0.	0.	1593.8	0.0	0.0
25	1.0	10573.9	0.0	3345.1	0.	0.	1586.1	0.0	0.0
26	4.0	41780.9	0.0	13225.8	0.	0.	6267.1	0.0	0.0
27	15.0	155367.4	0.0	47393.5	0.	0.	23305.1	0.0	0.0
28	5.0	51892.9	0.0	15024.8	0.	0.	7783.9	0.0	0.0
29	3.0	33954.2	0.0	8829.3	0.	0.	5093.1	0.0	0.0
30	3.0	36525.4	0.0	8690.1	0.	0.	5478.8	0.0	0.0
31	24.0	294803.2	0.0	64511.4	0.	0.	44220.5	0.0	0.0
32	6.0	74524.8	0.0	16038.9	0.	0.	11178.7	0.0	0.0
33	2.0	24713.0	0.0	5059.5	0.	0.	3707.0	0.0	0.0

34	28.0	329651.6	0.0	55774.9	0.	0.	49447.7	0.0	0.0
35	4.0	44273.7	0.0	5673.3	0.	0.	6641.1	0.0	0.0
36	12.0	124268.6	0.0	13796.4	0.	0.	18640.3	0.0	0.0
37	6.0	56956.7	0.0	3756.7	0.	0.	8543.5	0.0	0.0
38	7.2	64091.7	0.0	1601.5	0.	0.	9613.8	0.0	0.0
39	2.8	23165.1	0.0	0.0	0.	0.	3474.8	0.0	0.0
40	7.0	55542.9	0.0	0.0	0.	0.	8331.4	0.0	0.0
41	5.0	36922.4	0.0	0.0	0.	0.	5538.4	0.0	0.0
42	12.0	79198.5	0.0	0.0	0.	0.	11879.8	0.0	0.0
43	1.3	7584.8	0.0	0.0	0.	0.	1137.7	0.0	0.0
44	19.6	77729.7	0.0	0.0	0.	0.	11659.5	0.0	0.0
45	3.1	5687.2	0.0	0.0	0.	0.	853.1	0.0	0.0
46	4.0	4684.7	0.0	0.0	0.	0.	702.7	0.0	0.0
47	4.1	1629.6	0.0	0.0	0.	0.	244.4	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	424.582	234.990
2	424.837	234.837
3	425.753	233.920
4	844.000	239.757
5	1024.000	259.003
6	1080.000	282.582
7	1120.000	309.524
8	1160.000	345.110
9	1172.000	355.872
10	1196.000	396.592
11	1204.057	410.000

*** FOS = 1.399 Theta (ki=1.0) = 8.89 ***
Lambda = 0.156

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	424.582	234.990
2	424.837	234.837
3	425.753	233.920
4	844.000	239.757
5	1024.000	259.003
6	1080.000	282.582
7	1120.000	309.524
8	1160.000	345.110
9	1172.000	355.872
10	1196.000	396.592
11	1204.057	410.000

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Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	424.582	234.990
2	424.837	234.837
3	425.753	233.920
4	844.000	239.757
5	1024.000	259.003
6	1080.000	282.582
7	1120.000	309.524
8	1160.000	345.110
9	1172.000	355.872
10	1196.000	396.592
11	1204.057	410.000

*** FOS = 1.399 Theta (ki=1.0) = 8.89 ***
Lambda = 0.156

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	429.069	236.261
2	429.535	235.795
3	844.000	239.241
4	1024.000	258.863
5	1080.000	282.816

6	1120.000	310.133
7	1160.000	343.095
8	1172.000	357.232
9	1196.000	395.326
10	1204.817	410.000

*** FOS = 1.400 Theta (ki=1.0) = 8.86 ***
Lambda = 0.156
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	429.069	236.261
2	429.535	235.795
3	844.000	239.241
4	1024.000	258.863
5	1080.000	282.816
6	1120.000	310.133
7	1160.000	343.095
8	1172.000	357.232
9	1196.000	395.326
10	1204.817	410.000

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Lambda = 0.156
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	429.069	236.261
2	429.535	235.795
3	844.000	239.241
4	1024.000	258.863
5	1080.000	282.816
6	1120.000	310.133
7	1160.000	343.095
8	1172.000	357.232
9	1196.000	395.326
10	1204.817	410.000

*** FOS = 1.400 Theta (ki=1.0) = 8.86 ***
Lambda = 0.156
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	429.069	236.261
2	429.535	235.795
3	844.000	239.241
4	1024.000	258.863
5	1080.000	282.816
6	1120.000	310.133
7	1160.000	343.095
8	1172.000	357.232
9	1196.000	395.326
10	1204.817	410.000

*** FOS = 1.400 Theta (ki=1.0) = 8.86 ***
Lambda = 0.156
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	425.830	235.257
2	426.699	234.389
3	844.000	239.628
4	1024.000	258.968
5	1080.000	283.390
6	1120.000	308.926
7	1160.000	343.856
8	1172.000	354.712
9	1196.000	396.275
10	1204.247	410.000

*** FOS = 1.400 Theta (ki=1.0) = 8.88 ***
Lambda = 0.156
Failure Surface Specified By 10 Coordinate Points

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

1	425.830	235.257
2	426.699	234.389
3	844.000	239.628
4	1024.000	258.968
5	1080.000	283.390
6	1120.000	308.926
7	1160.000	343.856
8	1172.000	354.712
9	1196.000	396.275
10	1204.247	410.000

*** FOS = 1.400 Theta (ki=1.0) = 8.88 ***
Lambda = 0.156
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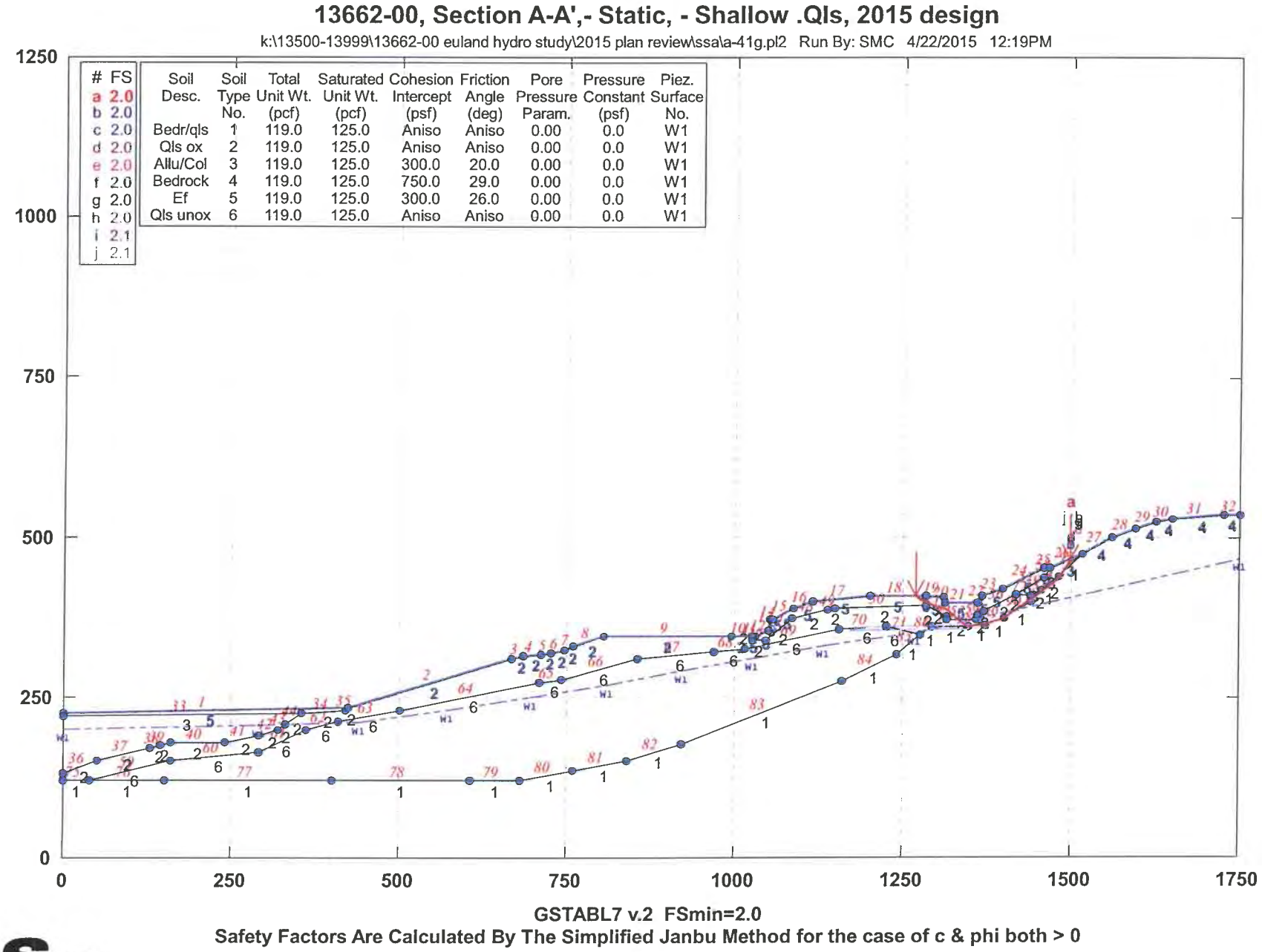
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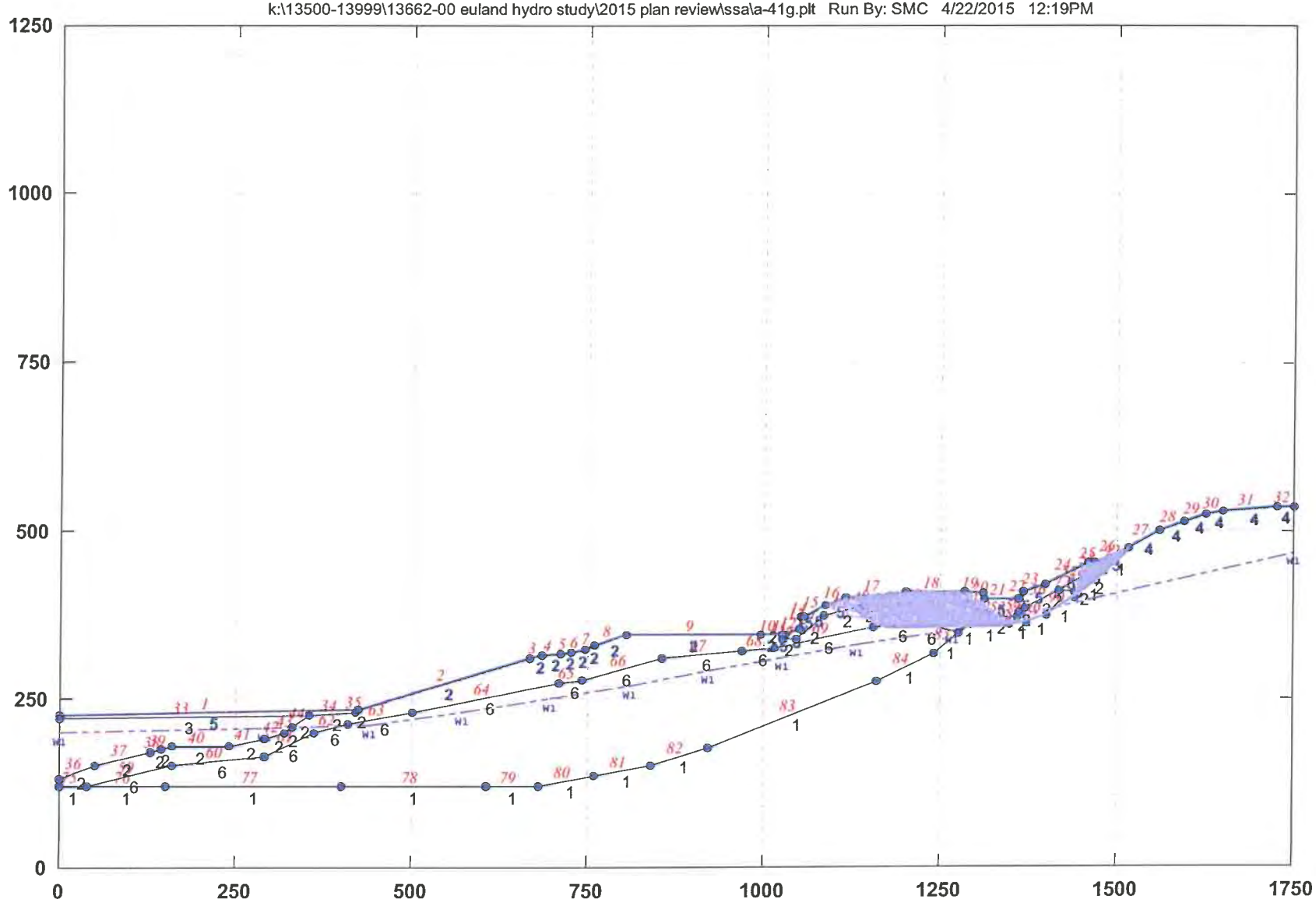
FS
a 2.0
b 2.0
c 2.0
d 2.0
e 2.0
f 2.0
g 2.0
h 2.0
i 2.1
j 2.1
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=2.0
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-7.1

13662-00, Section A-A',- Static, - Shallow .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41g.plt Run By: SMC 4/22/2015 12:19PM



*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 12:19PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41g.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41g.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41g.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Static,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES

32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	250.0	12.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1172.00	356.00	1348.00	360.00	5.00
2	1372.00	365.00	1372.00	365.00	3.00
3	1400.00	375.00	1400.00	375.00	3.00
4	1440.00	402.00	1488.00	442.00	3.00

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 = 1000
Number of Trial Surfaces With Valid FS = 1000
Statistical Data On All Valid FS Values:
FS Max = 5.720 FS Min = 2.006 FS Ave = 3.185
Standard Deviation = 0.526 Coefficient of Variation = 16.52 %
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1268.893	410.000
2	1279.229	402.835
3	1296.804	393.289
4	1316.000	387.674
5	1331.030	374.479
6	1345.282	360.448
7	1372.000	364.619
8	1400.000	374.670
9	1471.813	429.252
10	1485.934	443.416
11	1495.467	460.998
12	1497.950	466.830

Factor of Safety

*** 2.006 ***

Individual data on the 33 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.3	4406.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	5.8	5996.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	11.8	17644.4	0.0	0.0	0.	0.	0.0	0.0	0.0
4	13.2	24647.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	3.0	4644.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	3.0	3529.6	0.0	0.0	0.	0.	0.0	0.0	0.0
7	15.0	30268.7	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.5	10623.7	0.0	0.0	0.	0.	0.0	0.0	0.0
9	3.9	13249.9	0.0	0.0	0.	0.	0.0	0.0	0.0
10	6.9	28084.9	0.0	2454.2	0.	0.	0.0	0.0	0.0
11	9.1	40362.7	0.0	4900.4	0.	0.	0.0	0.0	0.0
12	3.6	15628.0	0.0	2063.2	0.	0.	0.0	0.0	0.0
13	0.3	1128.8	0.0	152.8	0.	0.	0.0	0.0	0.0
14	1.7	7409.9	0.0	1016.0	0.	0.	0.0	0.0	0.0
15	7.0	33480.4	0.0	4248.7	0.	0.	0.0	0.0	0.0
16	3.0	16076.4	0.0	1896.0	0.	0.	0.0	0.0	0.0
17	2.0	10865.1	0.0	1289.0	0.	0.	0.0	0.0	0.0
18	25.0	137855.4	0.0	14599.0	0.	0.	0.0	0.0	0.0
19	3.0	16784.7	0.0	1423.0	0.	0.	0.0	0.0	0.0
20	13.7	74234.6	0.0	3751.7	0.	0.	0.0	0.0	0.0
21	4.3	21980.7	0.0	0.0	0.	0.	0.0	0.0	0.0
22	22.0	104916.7	0.0	0.0	0.	0.	0.0	0.0	0.0
23	15.0	63758.5	0.0	0.0	0.	0.	0.0	0.0	0.0
24	3.0	11995.2	0.0	0.0	0.	0.	0.0	0.0	0.0
25	2.0	7731.8	0.0	0.0	0.	0.	0.0	0.0	0.0
26	1.1	4243.1	0.0	0.0	0.	0.	0.0	0.0	0.0
27	5.9	19969.3	0.0	0.0	0.	0.	0.0	0.0	0.0
28	4.8	14738.4	0.0	0.0	0.	0.	0.0	0.0	0.0
29	8.2	22318.5	0.0	0.0	0.	0.	0.0	0.0	0.0
30	5.9	13564.8	0.0	0.0	0.	0.	0.0	0.0	0.0
31	3.0	5542.4	0.0	0.0	0.	0.	0.0	0.0	0.0
32	6.6	7105.5	0.0	0.0	0.	0.	0.0	0.0	0.0
33	2.5	685.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1268.893	410.000
2	1279.229	402.835
3	1296.804	393.289
4	1316.000	387.674
5	1331.030	374.479
6	1345.282	360.448
7	1372.000	364.619
8	1400.000	374.670
9	1471.813	429.252
10	1485.934	443.416
11	1495.467	460.998
12	1497.950	466.830

Factor of Safety

*** 2.006 ***
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1268.893	410.000
2	1279.229	402.835
3	1296.804	393.289
4	1316.000	387.674
5	1331.030	374.479
6	1345.282	360.448
7	1372.000	364.619
8	1400.000	374.670
9	1471.813	429.252
10	1485.934	443.416
11	1495.467	460.998
12	1497.950	466.830

Factor of Safety
*** 2.006 ***
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1268.893	410.000
2	1279.229	402.835
3	1296.804	393.289
4	1316.000	387.674
5	1331.030	374.479
6	1345.282	360.448
7	1372.000	364.619
8	1400.000	374.670
9	1471.813	429.252
10	1485.934	443.416
11	1495.467	460.998
12	1497.950	466.830

Factor of Safety
*** 2.006 ***
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1266.037	410.000
2	1278.547	399.391
3	1297.225	392.242
4	1315.375	383.841
5	1332.926	374.251
6	1347.646	360.711
7	1372.000	365.863
8	1400.000	374.174
9	1483.802	439.772
10	1494.541	456.644
11	1508.669	470.800
12	1508.742	472.001

Factor of Safety
*** 2.039 ***
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1266.037	410.000
2	1278.547	399.391
3	1297.225	392.242
4	1315.375	383.841
5	1332.926	374.251
6	1347.646	360.711
7	1372.000	365.863
8	1400.000	374.174
9	1483.802	439.772
10	1494.541	456.644
11	1508.669	470.800
12	1508.742	472.001

Factor of Safety
*** 2.039 ***
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1266.037	410.000
2	1278.547	399.391
3	1297.225	392.242
4	1315.375	383.841
5	1332.926	374.251
6	1347.646	360.711
7	1372.000	365.863
8	1400.000	374.174
9	1483.802	439.772
10	1494.541	456.644
11	1508.669	470.800
12	1508.742	472.001

Factor of Safety
*** 2.039 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1266.037	410.000
2	1278.547	399.391
3	1297.225	392.242
4	1315.375	383.841
5	1332.926	374.251
6	1347.646	360.711
7	1372.000	365.863
8	1400.000	374.174
9	1483.802	439.772
10	1494.541	456.644
11	1508.669	470.800
12	1508.742	472.001

Factor of Safety
*** 2.039 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1283.919	410.000
2	1298.448	397.114
3	1315.806	387.180
4	1330.061	373.151
5	1345.927	360.974
6	1372.000	364.686
7	1400.000	374.262
8	1475.083	430.485
9	1487.846	445.883
10	1487.990	462.058

Factor of Safety
*** 2.050 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1283.919	410.000
2	1298.448	397.114
3	1315.806	387.180
4	1330.061	373.151
5	1345.927	360.974
6	1372.000	364.686
7	1400.000	374.262
8	1475.083	430.485
9	1487.846	445.883
10	1487.990	462.058

Factor of Safety
*** 2.050 ***

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

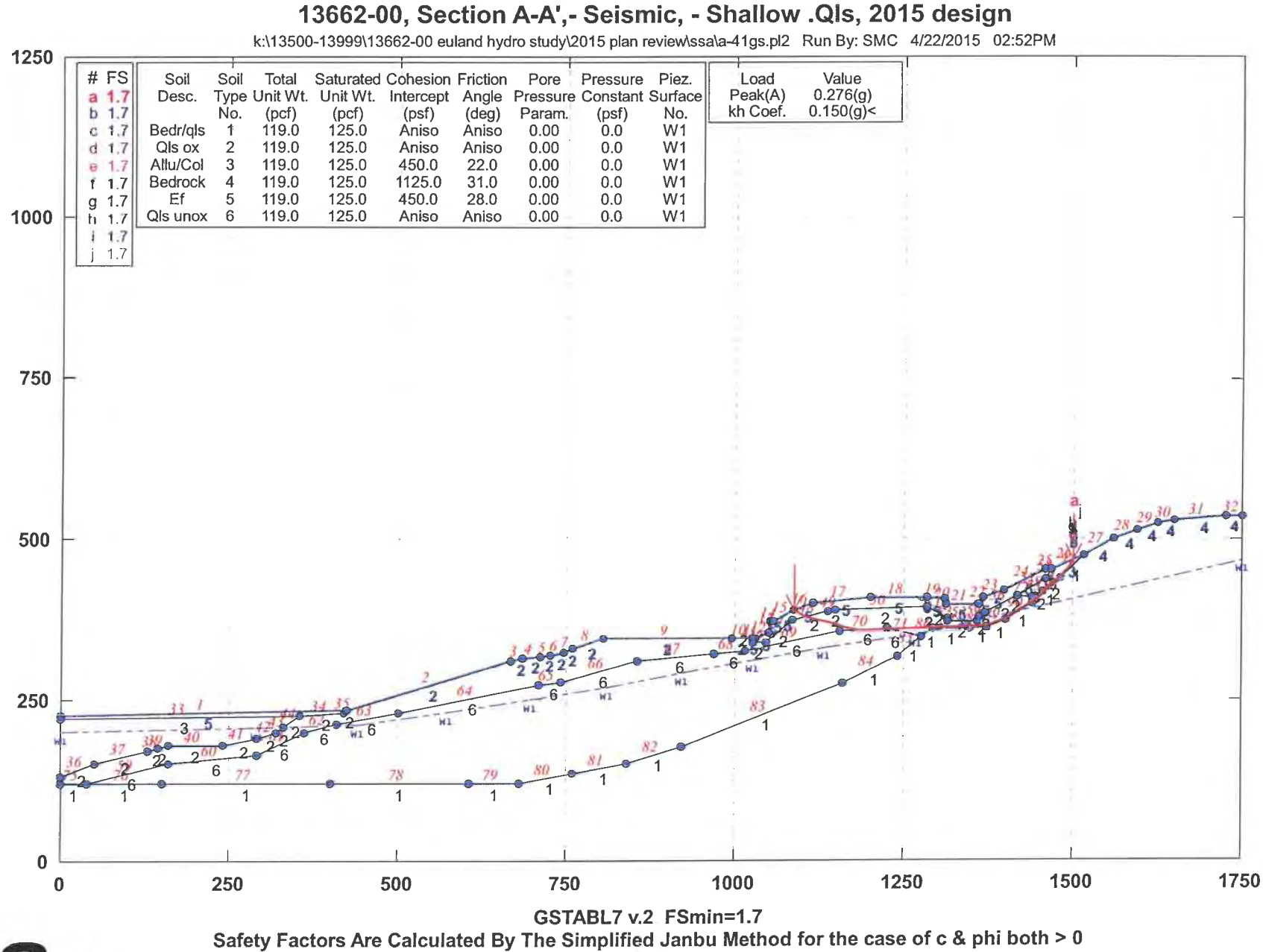
13662-00, Section A-A',- Seismic, - Shallow .Qls, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-41gs.pl2 Run By: SMC 4/22/2015 02:52PM
FS
a 1.7
b 1.7
c 1.7
d 1.7
e 1.7
f 1.7
g 1.7
h 1.7
i 1.7
j 1.7
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedr/qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Allu/Col | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load Peak(A) 0.276(g)
kh Coef. 0.150(g)<
1250
1000
750
500
250
0
0
250
500
750
1000
1250
1500
1750
GSTABL7 v.2 FSmin=1.7
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-7.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/22/2015
Time of Run: 02:52PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41gs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41gs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-41gs.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',- Seismic,
- Shallow .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
92 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	200.00	2
43	320.00	200.00	330.00	208.00	2
44	330.00	208.00	354.00	226.00	2
45	1025.00	346.00	1026.00	340.00	2
46	1026.00	340.00	1045.00	340.00	2
47	1045.00	340.00	1086.00	373.00	2
48	1086.00	373.00	1138.00	388.00	2
49	1138.00	388.00	1148.00	390.00	2
50	1148.00	390.00	1284.00	394.00	2
51	1284.00	394.00	1314.00	376.00	2
52	1314.00	376.00	1315.00	371.00	2
53	1315.00	371.00	1358.00	371.00	2
54	1358.00	371.00	1360.00	378.00	2
55	1360.00	378.00	1370.00	385.00	2
56	1370.00	385.00	1418.00	411.00	2
57	1418.00	411.00	1460.00	438.00	3
58	1460.00	438.00	1467.00	452.00	3
59	40.00	120.00	160.00	150.00	6
60	160.00	150.00	290.00	165.00	6
61	290.00	165.00	360.00	200.00	6
62	360.00	200.00	410.00	212.00	6
63	410.00	212.00	500.00	230.00	6
64	500.00	230.00	708.00	274.00	6
65	708.00	274.00	742.00	277.00	6
66	742.00	277.00	856.00	310.00	6
67	856.00	310.00	970.00	321.00	6
68	970.00	321.00	1015.00	327.00	6
69	1015.00	327.00	1155.00	357.00	6
70	1155.00	357.00	1225.00	361.00	6
71	1225.00	361.00	1275.00	348.00	6
72	1418.00	411.00	1440.00	410.00	2
73	1440.00	410.00	1455.00	418.00	2
74	1455.00	418.00	1480.00	440.00	2
75	0.00	120.00	40.00	120.00	1
76	40.00	119.90	150.00	120.00	1
77	150.00	120.00	400.00	120.00	1
78	400.00	120.00	606.00	120.00	1
79	606.00	120.00	680.00	120.00	1
80	680.00	120.00	760.00	136.00	1
81	760.00	136.00	840.00	152.00	1
82	840.00	152.00	920.00	178.00	1
83	920.00	178.00	1160.00	276.00	1
84	1160.00	276.00	1240.00	318.00	1
85	1240.00	318.00	1275.00	348.00	1
86	1275.00	348.00	1292.00	360.00	1
87	1292.00	360.00	1348.00	360.00	1
88	1348.00	360.00	1372.00	363.00	1
89	1372.00	363.00	1400.00	373.00	1
90	1400.00	373.00	1440.00	400.00	1
91	1440.00	400.00	1480.00	440.00	1
92	1480.00	440.00	1515.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	375.0	14.5	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 11 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	570.00	230.00
5	696.00	250.00
6	810.00	270.00
7	920.00	290.00
8	1026.00	310.00
9	1132.00	330.00
10	1266.00	350.00
11	1750.00	465.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1172.00	356.00	1348.00	360.00	5.00
2	1372.00	365.00	1372.00	365.00	3.00
3	1400.00	375.00	1400.00	375.00	3.00
4	1440.00	402.00	1488.00	442.00	3.00

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 = 1000
Number of Trial Surfaces With Valid FS = 1000

Statistical Data On All Valid FS Values:
FS Max = 2.796 FS Min = 1.660 FS Ave = 2.047
Standard Deviation = 0.169 Coefficient of Variation = 8.23 %

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1087.740	389.854
2	1104.539	379.247
3	1123.732	373.626
4	1143.380	369.891
5	1161.824	362.155
6	1181.648	359.514
7	1201.638	358.860
8	1372.000	364.365
9	1400.000	376.391
10	1453.544	412.332
11	1466.190	427.826
12	1480.199	442.101
13	1493.757	456.804
14	1500.220	467.918

Factor of Safety
*** 1.660 ***

Individual data on the 46 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.3	4.8	0.0	0.0	0.	0.	0.7	0.0	0.0
2	16.5	16698.9	0.0	0.0	0.	0.	2504.8	0.0	0.0
3	1.5	3160.7	0.0	0.0	0.	0.	474.1	0.0	0.0
4	9.9	24641.7	0.0	0.0	0.	0.	3696.3	0.0	0.0
5	7.7	23649.5	0.0	0.0	0.	0.	3547.4	0.0	0.0
6	14.3	50086.4	0.0	0.0	0.	0.	7513.0	0.0	0.0
7	5.4	20832.6	0.0	0.0	0.	0.	3124.9	0.0	0.0
8	4.6	19027.1	0.0	0.0	0.	0.	2854.1	0.0	0.0
9	13.8	65106.6	0.0	0.0	0.	0.	9766.0	0.0	0.0
10	19.8	108051.3	0.0	0.0	0.	0.	16207.7	0.0	0.0
11	11.0	64486.1	0.0	0.0	0.	0.	9672.9	0.0	0.0
12	7.3	44037.5	0.0	0.0	0.	0.	6605.6	0.0	0.0
13	1.6	9961.3	0.0	0.0	0.	0.	1494.2	0.0	0.0
14	23.4	141126.9	0.0	0.0	0.	0.	21169.0	0.0	0.0
15	4.7	28375.7	0.0	0.0	0.	0.	4256.4	0.0	0.0
16	54.3	318687.8	0.0	0.0	0.	0.	47803.2	0.0	0.0
17	1.0	5767.1	0.0	0.0	0.	0.	865.1	0.0	0.0
18	25.0	136976.9	0.0	0.0	0.	0.	20546.5	0.0	0.0
19	3.0	14133.7	0.0	0.0	0.	0.	2120.1	0.0	0.0
20	1.0	4227.5	0.0	0.0	0.	0.	634.1	0.0	0.0
21	1.0	4223.7	0.0	0.0	0.	0.	633.6	0.0	0.0
22	4.3	18068.0	0.0	0.0	0.	0.	2710.2	0.0	0.0
23	35.1	145952.7	0.0	7681.8	0.	0.	21892.9	0.0	0.0
24	3.6	14859.0	0.0	1665.2	0.	0.	2228.9	0.0	0.0
25	0.3	1080.7	0.0	127.6	0.	0.	162.1	0.0	0.0
26	1.7	7119.7	0.0	863.1	0.	0.	1067.9	0.0	0.0
27	7.0	32782.9	0.0	3860.6	0.	0.	4917.4	0.0	0.0
28	3.0	16009.3	0.0	1841.6	0.	0.	2401.4	0.0	0.0
29	2.0	10897.7	0.0	1290.1	0.	0.	1634.6	0.0	0.0
30	25.0	135897.5	0.0	13917.7	0.	0.	20384.6	0.0	0.0
31	3.0	16179.9	0.0	1137.4	0.	0.	2427.0	0.0	0.0
32	12.6	66374.3	0.0	2503.4	0.	0.	9956.1	0.0	0.0
33	5.4	27780.5	0.0	0.0	0.	0.	4167.1	0.0	0.0
34	22.0	107154.6	0.0	0.0	0.	0.	16073.2	0.0	0.0
35	9.9	45272.9	0.0	0.0	0.	0.	6790.9	0.0	0.0
36	3.7	16494.2	0.0	0.0	0.	0.	2474.1	0.0	0.0
37	1.5	6379.9	0.0	0.0	0.	0.	957.0	0.0	0.0
38	3.0	12587.6	0.0	0.0	0.	0.	1888.1	0.0	0.0
39	0.9	3706.7	0.0	0.0	0.	0.	556.0	0.0	0.0
40	1.1	4143.4	0.0	0.0	0.	0.	621.5	0.0	0.0
41	6.2	20601.5	0.0	0.0	0.	0.	3090.2	0.0	0.0
42	0.2	441.4	0.0	0.0	0.	0.	66.2	0.0	0.0
43	0.7	1847.8	0.0	0.0	0.	0.	277.2	0.0	0.0

44	13.2	31076.7	0.0	0.0	0.	0.	4661.5	0.0	0.0
45	13.6	19555.8	0.0	0.0	0.	0.	2933.4	0.0	0.0
46	6.5	3083.2	0.0	0.0	0.	0.	462.5	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1087.740	389.854
2	1104.539	379.247
3	1123.732	373.626
4	1143.380	369.891
5	1161.824	362.155
6	1181.648	359.514
7	1201.638	358.860
8	1372.000	364.365
9	1400.000	376.391
10	1453.544	412.332
11	1466.190	427.826
12	1480.199	442.101
13	1493.757	456.804
14	1500.220	467.918

Factor of Safety
*** 1.660 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1087.740	389.854
2	1104.539	379.247
3	1123.732	373.626
4	1143.380	369.891
5	1161.824	362.155
6	1181.648	359.514
7	1201.638	358.860
8	1372.000	364.365
9	1400.000	376.391
10	1453.544	412.332
11	1466.190	427.826
12	1480.199	442.101
13	1493.757	456.804
14	1500.220	467.918

Factor of Safety
*** 1.660 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1087.740	389.854
2	1104.539	379.247
3	1123.732	373.626
4	1143.380	369.891
5	1161.824	362.155
6	1181.648	359.514
7	1201.638	358.860
8	1372.000	364.365
9	1400.000	376.391
10	1453.544	412.332
11	1466.190	427.826
12	1480.199	442.101
13	1493.757	456.804
14	1500.220	467.918

Factor of Safety
*** 1.660 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1268.893	410.000
2	1279.229	402.835
3	1296.804	393.289
4	1316.000	387.674
5	1331.030	374.479
6	1345.282	360.448
7	1372.000	364.619

8	1400.000	374.670
9	1471.813	429.252
10	1485.934	443.416
11	1495.467	460.998
12	1497.950	466.830

Factor of Safety
*** 1.676 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1268.893	410.000
2	1279.229	402.835
3	1296.804	393.289
4	1316.000	387.674
5	1331.030	374.479
6	1345.282	360.448
7	1372.000	364.619
8	1400.000	374.670
9	1471.813	429.252
10	1485.934	443.416
11	1495.467	460.998
12	1497.950	466.830

Factor of Safety
*** 1.676 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1268.893	410.000
2	1279.229	402.835
3	1296.804	393.289
4	1316.000	387.674
5	1331.030	374.479
6	1345.282	360.448
7	1372.000	364.619
8	1400.000	374.670
9	1471.813	429.252
10	1485.934	443.416
11	1495.467	460.998
12	1497.950	466.830

Factor of Safety
*** 1.676 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1268.893	410.000
2	1279.229	402.835
3	1296.804	393.289
4	1316.000	387.674
5	1331.030	374.479
6	1345.282	360.448
7	1372.000	364.619
8	1400.000	374.670
9	1471.813	429.252
10	1485.934	443.416
11	1495.467	460.998
12	1497.950	466.830

Factor of Safety
*** 1.676 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1266.037	410.000
2	1278.547	399.391
3	1297.225	392.242
4	1315.375	383.841
5	1332.926	374.251
6	1347.646	360.711
7	1372.000	365.863
8	1400.000	374.174
9	1483.802	439.772

10	1494.541	456.644
11	1508.669	470.800
12	1508.742	472.001

Factor of Safety
*** 1.681 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1266.037	410.000
2	1278.547	399.391
3	1297.225	392.242
4	1315.375	383.841
5	1332.926	374.251
6	1347.646	360.711
7	1372.000	365.863
8	1400.000	374.174
9	1483.802	439.772
10	1494.541	456.644
11	1508.669	470.800
12	1508.742	472.001

Factor of Safety
*** 1.681 ***

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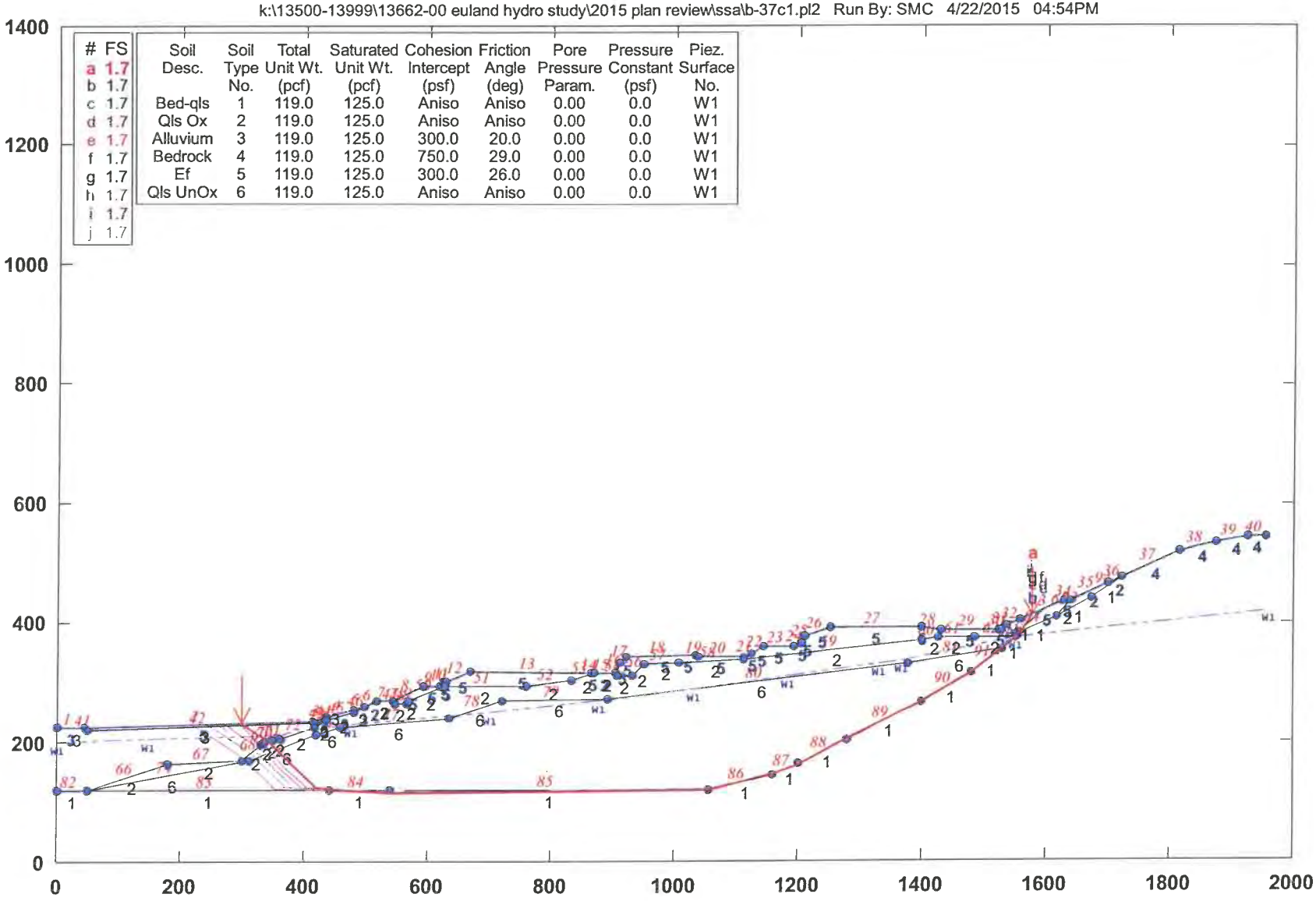
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FS
a 1.7
b 1.7
c 1.7
d 1.7
e 1.7
f 1.7
g 1.7
h 1.7
i 1.7
j 1.7
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.7
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-8.1

13662-00, Euland Capital , B-B', Static, 2015 design

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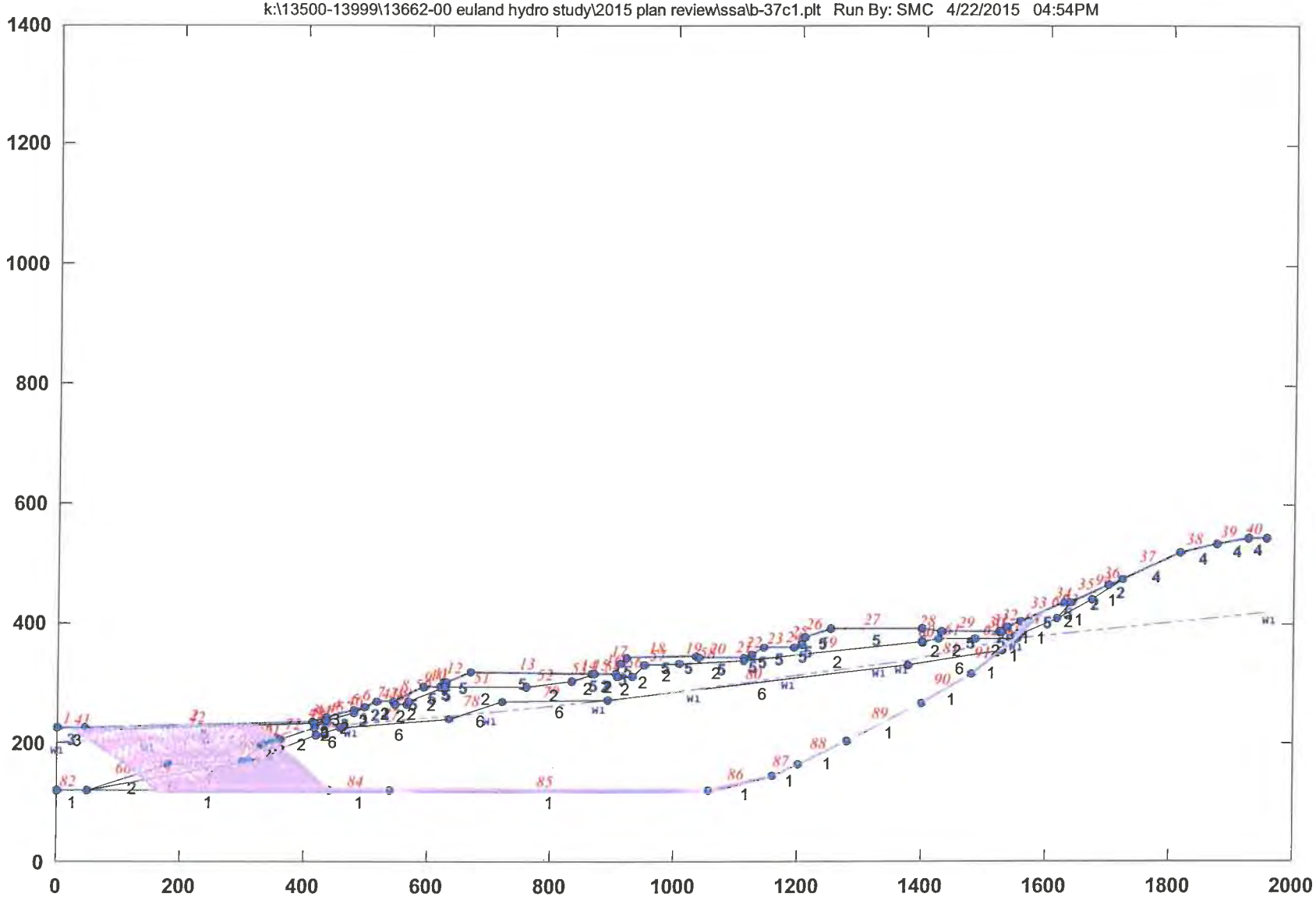

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 04:54PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
Static, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	440.00	120.00	10.00
2	539.00	120.00	539.00	120.00	10.00
3	1057.00	120.00	1057.00	120.00	10.00
4	1160.00	145.00	1160.00	145.00	5.00
5	1200.00	163.00	1200.00	163.00	5.00
6	1280.00	204.00	1280.00	204.00	5.00
7	1400.00	266.00	1400.00	266.00	5.00
8	1480.00	317.00	1480.00	317.00	5.00
9	1528.00	357.00	1550.00	375.00	5.00

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 = 2000

Number of Trial Surfaces With Valid FS = 2000

Statistical Data On All Valid FS Values:

FS Max = 1.840 FS Min = 1.687 FS Ave = 1.386

Standard Deviation = 0.337 Coefficient of Variation = 24.31 %

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	298.528	231.889
2	304.251	228.313
3	342.138	201.785
4	356.260	187.663
5	383.915	160.008
6	419.270	124.653
7	539.000	115.175
8	1057.000	120.659
9	1160.000	146.020
10	1200.000	161.879
11	1280.000	205.875
12	1400.000	267.726
13	1480.000	315.901
14	1541.067	365.310
15	1559.613	383.857
16	1577.690	412.786

Factor of Safety

*** 1.687 ***

Individual data on the 90 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	5.7	1270.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	26.3	41478.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	2.5	7071.2	0.0	172.9	0.	0.	0.0	0.0	0.0
4	9.1	30718.9	0.0	3898.9	0.	0.	0.0	0.0	0.0
5	4.9	19902.0	0.0	5211.5	0.	0.	0.0	0.0	0.0
6	9.3	46340.2	0.0	16439.5	0.	0.	0.0	0.0	0.0
7	3.7	21853.5	0.0	9062.0	0.	0.	0.0	0.0	0.0
8	23.9	182392.3	0.0	90886.5	0.	0.	0.0	0.0	0.0
9	14.6	147645.2	0.0	83509.8	0.	0.	0.0	0.0	0.0
10	14.5	173616.4	0.0	*******	0.	0.	0.0	0.0	0.0
11	4.0	52970.2	0.0	32354.2	0.	0.	0.0	0.0	0.0
12	2.3	31202.9	0.0	19070.1	0.	0.	0.0	0.0	0.0
13	0.7	10179.1	0.0	4412.0	0.	0.	0.0	0.0	0.0
14	15.0	214525.6	0.0	92262.6	0.	0.	0.0	0.0	0.0
15	2.0	29375.7	0.0	12532.5	0.	0.	0.0	0.0	0.0
16	20.0	303451.8	0.0	*******	0.	0.	0.0	0.0	0.0
17	19.0	304555.5	0.0	*******	0.	0.	0.0	0.0	0.0
18	2.0	33778.8	0.0	14045.8	0.	0.	0.0	0.0	0.0
19	2.0	32371.5	0.0	13430.8	0.	0.	0.0	0.0	0.0
20	17.0	290197.8	0.0	*******	0.	0.	0.0	0.0	0.0
21	21.0	382631.8	0.0	*******	0.	0.	0.0	0.0	0.0
22	21.0	399724.9	0.0	*******	0.	0.	0.0	0.0	0.0
23	6.0	114849.8	0.0	45008.7	0.	0.	0.0	0.0	0.0
24	1.0	19169.9	0.0	7518.6	0.	0.	0.0	0.0	0.0
25	21.0	416701.8	0.0	*******	0.	0.	0.0	0.0	0.0
26	1.0	20516.0	0.0	7626.2	0.	0.	0.0	0.0	0.0
27	25.0	532787.4	0.0	*******	0.	0.	0.0	0.0	0.0
28	27.0	595774.2	0.0	*******	0.	0.	0.0	0.0	0.0
29	4.0	89879.9	0.0	31571.1	0.	0.	0.0	0.0	0.0
30	3.0	68651.1	0.0	23729.7	0.	0.	0.0	0.0	0.0
31	3.0	68644.0	0.0	23773.7	0.	0.	0.0	0.0	0.0
32	5.0	115001.2	0.0	39720.7	0.	0.	0.0	0.0	0.0
33	15.9	374074.2	0.0	*******	0.	0.	0.0	0.0	0.0
34	18.1	439778.6	0.0	*******	0.	0.	0.0	0.0	0.0
35	31.0	766392.0	0.0	*******	0.	0.	0.0	0.0	0.0

36	20.0	493415.5	0.0	*******	0.	0.	0.0	0.0	0.0
37	40.0	984590.4	0.0	*******	0.	0.	0.0	0.0	0.0
38	72.0	1764734.2	0.0	*******	0.	0.	0.0	0.0	0.0
39	33.0	805601.8	0.0	*******	0.	0.	0.0	0.0	0.0
40	5.0	121601.2	0.0	46562.9	0.	0.	0.0	0.0	0.0
41	8.0	194051.9	0.0	74828.8	0.	0.	0.0	0.0	0.0
42	14.0	339473.4	0.0	*******	0.	0.	0.0	0.0	0.0
43	13.0	315129.6	0.0	*******	0.	0.	0.0	0.0	0.0
44	1.0	24389.9	0.0	9562.8	0.	0.	0.0	0.0	0.0
45	0.9	23109.6	0.0	8959.0	0.	0.	0.0	0.0	0.0
46	5.1	129644.5	0.0	48574.0	0.	0.	0.0	0.0	0.0
47	8.0	216221.6	0.0	77127.0	0.	0.	0.0	0.0	0.0
48	11.0	304511.0	0.0	*******	0.	0.	0.0	0.0	0.0
49	19.0	526118.4	0.0	*******	0.	0.	0.0	0.0	0.0
50	44.8	1240895.6	0.0	*******	0.	0.	0.0	0.0	0.0
51	11.2	310836.2	0.0	*******	0.	0.	0.0	0.0	0.0
52	25.0	693251.9	0.0	*******	0.	0.	0.0	0.0	0.0
53	2.0	55473.7	0.0	21004.2	0.	0.	0.0	0.0	0.0
54	5.0	137787.5	0.0	52641.5	0.	0.	0.0	0.0	0.0
55	19.0	520077.8	0.0	*******	0.	0.	0.0	0.0	0.0
56	56.0	1485559.6	0.0	*******	0.	0.	0.0	0.0	0.0
57	11.0	284684.5	0.0	*******	0.	0.	0.0	0.0	0.0
58	20.0	529733.3	0.0	*******	0.	0.	0.0	0.0	0.0
59	16.0	426575.4	0.0	*******	0.	0.	0.0	0.0	0.0
60	19.1	494712.8	0.0	*******	0.	0.	0.0	0.0	0.0
61	3.9	100076.5	0.0	40752.0	0.	0.	0.0	0.0	0.0
62	10.0	250555.3	0.0	*******	0.	0.	0.0	0.0	0.0
63	7.0	173704.2	0.0	70467.6	0.	0.	0.0	0.0	0.0
64	5.0	123860.4	0.0	52712.9	0.	0.	0.0	0.0	0.0
65	5.0	126650.0	0.0	51982.7	0.	0.	0.0	0.0	0.0
66	19.9	510640.5	0.0	*******	0.	0.	0.0	0.0	0.0
67	23.1	574993.6	0.0	*******	0.	0.	0.0	0.0	0.0
68	27.0	638392.2	0.0	*******	0.	0.	0.0	0.0	0.0
69	50.0	1056883.5	0.0	*******	0.	0.	0.0	0.0	0.0
70	38.0	696936.6	0.0	*******	0.	0.	0.0	0.0	0.0
71	10.0	168143.0	0.0	57167.9	0.	0.	0.0	0.0	0.0
72	22.0	347702.4	0.0	*******	0.	0.	0.0	0.0	0.0
73	27.0	376696.6	0.0	*******	0.	0.	0.0	0.0	0.0
74	3.0	37992.5	0.0	13694.7	0.	0.	0.0	0.0	0.0
75	18.9	223228.5	0.0	80463.1	0.	0.	0.0	0.0	0.0
76	31.1	309555.0	0.0	*******	0.	0.	0.0	0.0	0.0
77	5.0	42616.8	0.0	16726.2	0.	0.	0.0	0.0	0.0
78	32.8	216747.0	0.0	80711.0	0.	0.	0.0	0.0	0.0
79	7.2	33263.8	0.0	11072.6	0.	0.	0.0	0.0	0.0
80	4.4	17803.3	0.0	5583.1	0.	0.	0.0	0.0	0.0
81	0.6	2098.2	0.0	636.5	0.	0.	0.0	0.0	0.0
82	2.5	9546.8	0.0	2700.1	0.	0.	0.0	0.0	0.0
83	4.5	17456.9	0.0	4046.1	0.	0.	0.0	0.0	0.0
84	4.1	15820.7	0.0	2868.4	0.	0.	0.0	0.0	0.0
85	8.9	31120.2	0.0	3289.3	0.	0.	0.0	0.0	0.0
86	0.8	2668.3	0.0	28.2	0.	0.	0.0	0.0	0.0
87	0.2	467.1	0.0	0.0	0.	0.	0.0	0.0	0.0
88	6.0	17426.2	0.0	0.0	0.	0.	0.0	0.0	0.0
89	2.6	6842.1	0.0	0.0	0.	0.	0.0	0.0	0.0
90	18.1	22859.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	298.528	231.889
2	304.251	228.313
3	342.138	201.785
4	356.260	187.663
5	383.915	160.008
6	419.270	124.653
7	539.000	115.175
8	1057.000	120.659
9	1160.000	146.020
10	1200.000	161.879
11	1280.000	205.875
12	1400.000	267.726

13	1480.000	315.901
14	1541.067	365.310
15	1559.613	383.857
16	1577.690	412.786

Factor of Safety
*** 1.687 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	269.829	231.109
2	275.792	227.383
3	285.408	220.650
4	326.366	191.971
5	337.744	180.593
6	358.758	159.578
7	394.114	124.223
8	539.000	115.058
9	1057.000	123.354
10	1160.000	145.024
11	1200.000	164.789
12	1280.000	203.941
13	1400.000	267.198
14	1480.000	318.030
15	1544.590	369.228
16	1558.899	383.537
17	1594.254	418.892
18	1595.867	420.505

Factor of Safety
*** 1.689 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	269.829	231.109
2	275.792	227.383
3	285.408	220.650
4	326.366	191.971
5	337.744	180.593
6	358.758	159.578
7	394.114	124.223
8	539.000	115.058
9	1057.000	123.354
10	1160.000	145.024
11	1200.000	164.789
12	1280.000	203.941
13	1400.000	267.198
14	1480.000	318.030
15	1544.590	369.228
16	1558.899	383.537
17	1594.254	418.892
18	1595.867	420.505

Factor of Safety
*** 1.689 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	220.131	229.759
2	226.512	225.771
3	261.856	201.023
4	302.813	172.345
5	305.939	169.219
6	316.786	158.372
7	352.141	123.017
8	539.000	115.297
9	1057.000	120.351
10	1160.000	145.808
11	1200.000	163.014
12	1280.000	206.014
13	1400.000	265.775
14	1480.000	317.017
15	1544.730	368.896

16	1559.754	383.919
17	1577.828	412.845

Factor of Safety

*** 1.692 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	243.246	230.387
2	249.433	226.521
3	272.810	210.152
4	313.768	181.473
5	321.030	174.211
6	335.516	159.725
7	370.872	124.370
8	539.000	116.689
9	1057.000	120.844
10	1160.000	146.386
11	1200.000	160.956
12	1280.000	204.600
13	1400.000	264.537
14	1480.000	316.736
15	1546.889	373.370
16	1555.562	382.043
17	1590.917	417.398
18	1592.664	419.145

Factor of Safety

*** 1.694 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	257.347	230.770
2	263.415	226.978
3	279.493	215.721
4	320.450	187.042
5	329.896	177.596
6	349.325	158.167
7	384.680	122.812
8	539.000	115.014
9	1057.000	121.865
10	1160.000	145.901
11	1200.000	163.381
12	1280.000	205.091
13	1400.000	264.501
14	1480.000	318.828
15	1545.911	370.697
16	1558.631	383.417
17	1576.727	412.377

Factor of Safety

*** 1.695 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	257.347	230.770
2	263.415	226.978
3	279.493	215.721
4	320.450	187.042
5	329.896	177.596
6	349.325	158.167
7	384.680	122.812
8	539.000	115.014
9	1057.000	121.865
10	1160.000	145.901
11	1200.000	163.381
12	1280.000	205.091
13	1400.000	264.501
14	1480.000	318.828
15	1545.911	370.697
16	1558.631	383.417
17	1576.727	412.377

Factor of Safety

*** 1.695 ***
Failure Surface Specified By 16 Coordinate Points

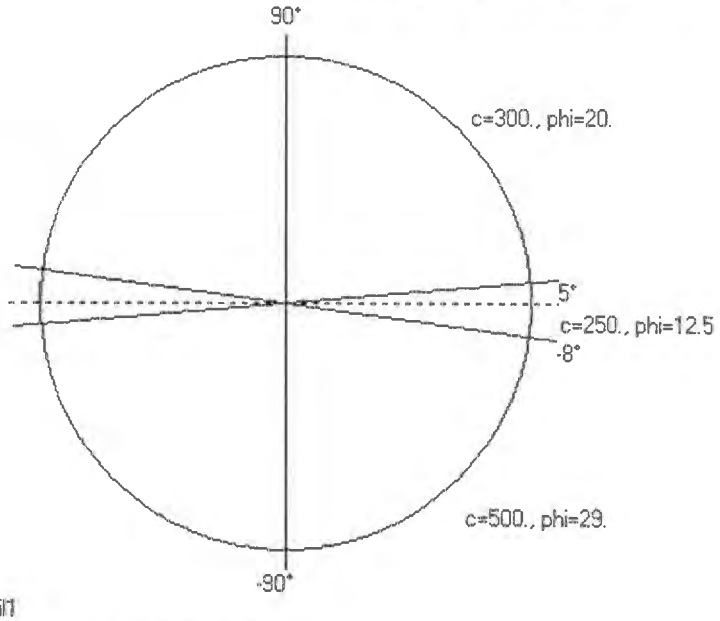
Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.656	231.757
2	299.420	228.155
3	331.288	196.288
4	344.429	183.146
5	368.055	159.520
6	403.411	124.164
7	539.000	116.406
8	1057.000	122.358
9	1160.000	146.479
10	1200.000	161.322
11	1280.000	203.677
12	1400.000	268.263
13	1480.000	318.548
14	1548.070	375.171
15	1551.122	380.055
16	1569.366	409.251

Factor of Safety
*** 1.696 ***
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	256.745	230.754
2	262.819	226.959
3	279.208	215.483
4	320.165	186.804
5	329.517	177.452
6	346.727	160.242
7	382.083	124.887
8	539.000	119.785
9	1057.000	124.643
10	1160.000	145.200
11	1200.000	160.746
12	1280.000	201.929
13	1400.000	268.468
14	1480.000	318.831
15	1549.145	374.537
16	1557.533	382.925
17	1575.651	411.921

Factor of Safety
*** 1.697 ***
**** END OF GSTABL7 OUTPUT ****

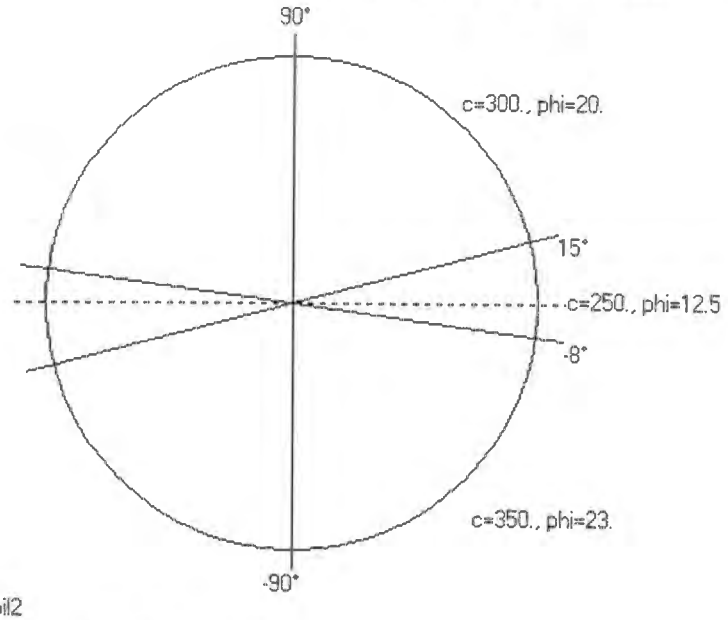
Anisotropic Soil Definition



Soil1

13662-00, Euland Capital , B-B',

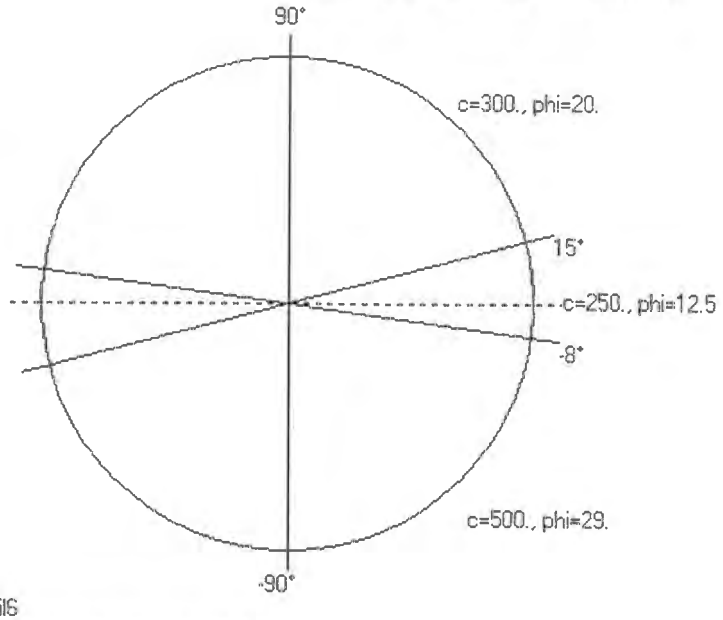
Anisotropic Soil Definition



Soil2

13662-00, Euland Capital , B-B',

Anisotropic Soil Definition



Soil6

13662-00, Euland Capital , B-B',

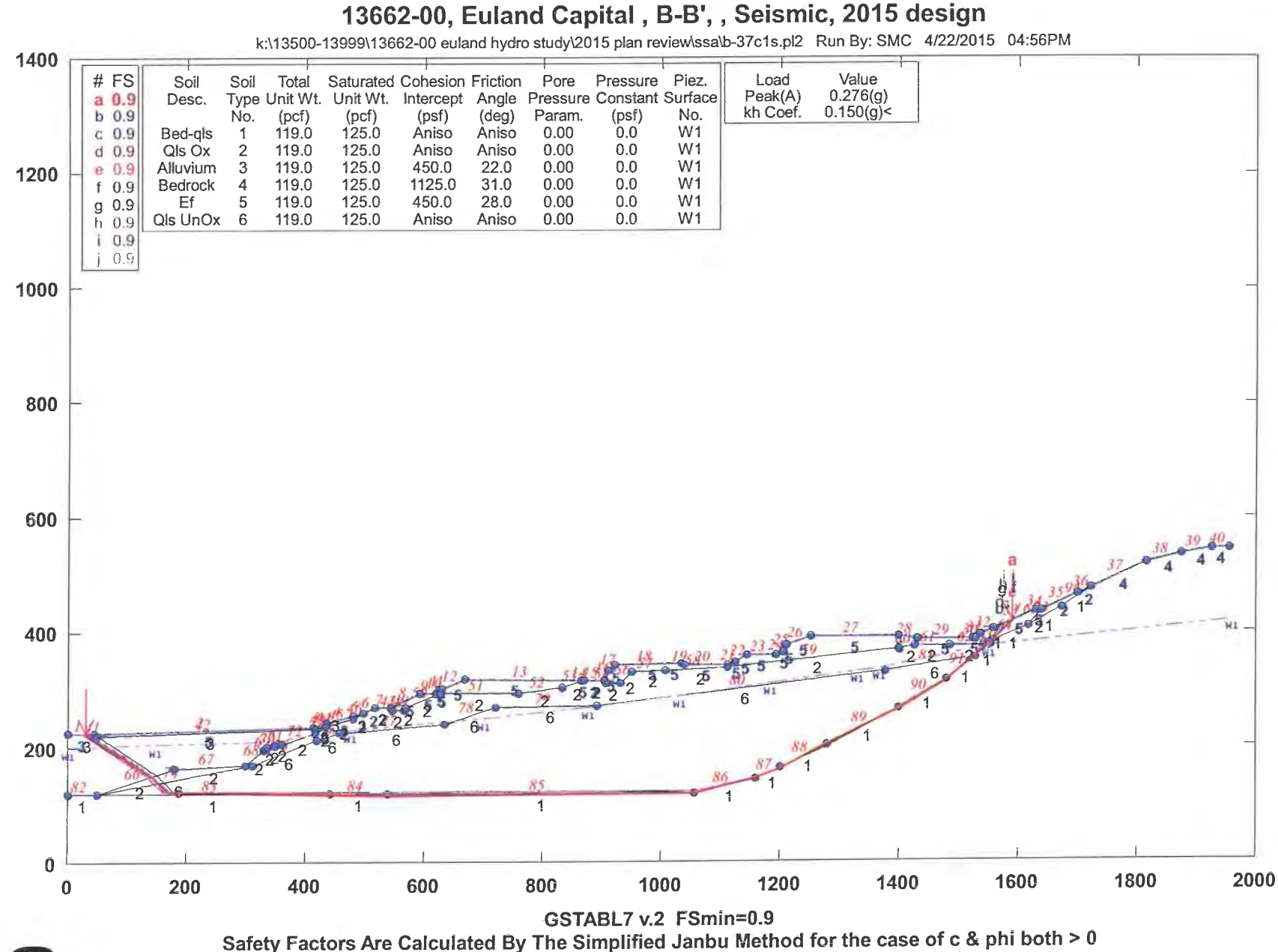

13662-00, Euland Capital , B-B', , Seismic, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37c1s.pl2 Run By: SMC 4/22/2015 04:56PM
FS
a 0.9
b 0.9
c 0.9
d 0.9
e 0.9
f 0.9
g 0.9
h 0.9
i 0.9
j 0.9
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=0.9
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-8.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/22/2015
Time of Run: 04:56PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, Seismic, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	440.00	120.00	10.00
2	539.00	120.00	539.00	120.00	10.00
3	1057.00	120.00	1057.00	120.00	10.00
4	1160.00	145.00	1160.00	145.00	5.00
5	1200.00	163.00	1200.00	163.00	5.00

6	1280.00	204.00	1280.00	204.00	5.00
7	1400.00	266.00	1400.00	266.00	5.00
8	1480.00	317.00	1480.00	317.00	5.00
9	1528.00	357.00	1550.00	375.00	5.00

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 = 2000

Number of Trial Surfaces With Valid FS = 2000

Statistical Data On All Valid FS Values:

FS Max = 1.092 FS Min = 0.936 FS Ave = 0.792

Standard Deviation = 0.195 Coefficient of Variation = 24.68 %

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.663	225.000
2	56.531	206.877
3	97.983	178.918
4	139.434	150.958
5	150.974	139.418
6	166.204	124.189
7	539.000	118.344
8	1057.000	120.273
9	1160.000	146.706
10	1200.000	162.350
11	1280.000	206.287
12	1400.000	264.486
13	1480.000	316.665
14	1541.120	369.028
15	1552.977	380.885
16	1588.333	416.241
17	1590.183	418.092

Factor of Safety

*** 0.936 ***

Individual data on the 100 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Ver (lbs)	Surcharge Load (lbs)
1	15.3	9440.7	0.0	0.0	0.	0.	1416.1	0.0	0.0
2	5.0	7199.1	0.0	0.0	0.	0.	1079.9	0.0	0.0
3	6.5	12546.8	0.0	0.0	0.	0.	1882.0	0.0	0.0
4	6.2	15162.2	0.0	0.0	0.	0.	2274.3	0.0	0.0
5	35.3	150133.4	0.0	32836.3	0.	0.	22520.0	0.0	0.0
6	41.5	315921.8	0.0	*******	0.	0.	47388.3	0.0	0.0
7	7.6	75088.4	0.0	38523.2	0.	0.	11263.3	0.0	0.0
8	4.0	42389.2	0.0	22314.7	0.	0.	6358.4	0.0	0.0
9	15.2	181207.0	0.0	98754.6	0.	0.	27181.1	0.0	0.0
10	13.8	178155.3	0.0	70250.3	0.	0.	26723.3	0.0	0.0
11	120.0	1592568.8	0.0	*******	0.	0.	*******	0.0	0.0
12	10.0	136194.6	0.0	54421.4	0.	0.	20429.2	0.0	0.0
13	20.0	273995.6	0.0	*******	0.	0.	41099.3	0.0	0.0
14	3.0	41284.1	0.0	16537.5	0.	0.	6192.6	0.0	0.0
15	2.0	27541.0	0.0	10950.3	0.	0.	4131.2	0.0	0.0
16	12.0	165752.2	0.0	66509.4	0.	0.	24862.8	0.0	0.0
17	13.0	180543.7	0.0	73614.0	0.	0.	27081.6	0.0	0.0
18	38.5	540895.6	0.0	*******	0.	0.	81134.3	0.0	0.0
19	14.5	205702.5	0.0	89289.5	0.	0.	30855.4	0.0	0.0
20	4.0	57285.5	0.0	25015.4	0.	0.	8592.8	0.0	0.0
21	3.0	43357.9	0.0	18862.5	0.	0.	6503.7	0.0	0.0
22	13.4	197517.4	0.0	85194.1	0.	0.	29627.6	0.0	0.0
23	1.6	24334.2	0.0	10416.3	0.	0.	3650.1	0.0	0.0
24	2.0	30217.7	0.0	12911.5	0.	0.	4532.7	0.0	0.0
25	3.0	45601.0	0.0	19439.3	0.	0.	6840.2	0.0	0.0
26	17.0	264525.7	0.0	*******	0.	0.	39678.9	0.0	0.0
27	19.0	307958.1	0.0	*******	0.	0.	46193.7	0.0	0.0
28	4.0	66501.9	0.0	27569.1	0.	0.	9975.3	0.0	0.0
29	17.0	290276.0	0.0	*******	0.	0.	43541.4	0.0	0.0
30	21.0	379562.9	0.0	*******	0.	0.	56934.4	0.0	0.0

31	21.0	393157.3	0.0	*******	0.	0.	58973.6	0.0	0.0
32	6.0	112488.9	0.0	43832.3	0.	0.	16873.3	0.0	0.0
33	1.0	18779.4	0.0	7324.0	0.	0.	2816.9	0.0	0.0
34	21.0	408700.1	0.0	*******	0.	0.	61305.0	0.0	0.0
35	1.0	20144.4	0.0	7441.0	0.	0.	3021.7	0.0	0.0
36	25.0	523776.2	0.0	*******	0.	0.	78566.4	0.0	0.0
37	27.0	586644.1	0.0	*******	0.	0.	87996.6	0.0	0.0
38	4.0	88580.5	0.0	30923.3	0.	0.	13287.1	0.0	0.0
39	3.0	67685.6	0.0	23248.3	0.	0.	10152.8	0.0	0.0
40	3.0	67686.2	0.0	23296.2	0.	0.	10152.9	0.0	0.0
41	5.0	113421.9	0.0	38933.4	0.	0.	17013.3	0.0	0.0
42	15.9	369189.8	0.0	*******	0.	0.	55378.5	0.0	0.0
43	18.1	434492.6	0.0	*******	0.	0.	65173.9	0.0	0.0
44	31.0	757982.9	0.0	*******	0.	0.	*******	0.0	0.0
45	20.0	488428.2	0.0	*******	0.	0.	73264.2	0.0	0.0
46	40.0	975644.9	0.0	*******	0.	0.	*******	0.0	0.0
47	72.0	1752090.0	0.0	*******	0.	0.	*******	0.0	0.0
48	33.0	801292.1	0.0	*******	0.	0.	*******	0.0	0.0
49	5.0	121029.7	0.0	46277.0	0.	0.	18154.4	0.0	0.0
50	8.0	193182.1	0.0	74393.5	0.	0.	28977.3	0.0	0.0
51	14.0	338083.4	0.0	*******	0.	0.	50712.5	0.0	0.0
52	13.0	313989.4	0.0	*******	0.	0.	47098.4	0.0	0.0
53	1.0	24308.2	0.0	9521.9	0.	0.	3646.2	0.0	0.0
54	0.9	23033.9	0.0	8921.1	0.	0.	3455.1	0.0	0.0
55	5.1	129248.0	0.0	48375.3	0.	0.	19387.2	0.0	0.0
56	8.0	215640.0	0.0	76835.2	0.	0.	32346.0	0.0	0.0
57	11.0	303800.9	0.0	*******	0.	0.	45570.1	0.0	0.0
58	19.0	525136.2	0.0	*******	0.	0.	78770.4	0.0	0.0
59	33.7	933357.2	0.0	*******	0.	0.	*******	0.0	0.0
60	22.3	617280.4	0.0	*******	0.	0.	92592.1	0.0	0.0
61	25.0	693631.5	0.0	*******	0.	0.	*******	0.0	0.0
62	2.0	55527.2	0.0	21029.7	0.	0.	8329.1	0.0	0.0
63	5.0	137936.3	0.0	52712.6	0.	0.	20690.4	0.0	0.0
64	19.0	520838.8	0.0	*******	0.	0.	78125.8	0.0	0.0
65	56.0	1486220.0	0.0	*******	0.	0.	*******	0.0	0.0
66	11.0	284335.1	0.0	*******	0.	0.	42650.3	0.0	0.0
67	20.0	528695.1	0.0	*******	0.	0.	79304.3	0.0	0.0
68	16.0	425370.4	0.0	*******	0.	0.	63805.6	0.0	0.0
69	23.0	592995.2	0.0	*******	0.	0.	88949.3	0.0	0.0
70	6.0	149732.0	0.0	60846.2	0.	0.	22459.8	0.0	0.0
71	4.0	100154.1	0.0	40751.7	0.	0.	15023.1	0.0	0.0
72	7.0	173275.6	0.0	70110.9	0.	0.	25991.3	0.0	0.0
73	5.0	123567.1	0.0	52531.0	0.	0.	18535.1	0.0	0.0
74	5.0	126359.1	0.0	51802.4	0.	0.	18953.9	0.0	0.0
75	7.7	198232.9	0.0	78324.3	0.	0.	29734.9	0.0	0.0
76	35.3	884993.8	0.0	*******	0.	0.	*******	0.0	0.0
77	27.0	636967.0	0.0	*******	0.	0.	95545.1	0.0	0.0
78	50.0	1059059.5	0.0	*******	0.	0.	*******	0.0	0.0
79	22.2	422413.1	0.0	*******	0.	0.	63362.0	0.0	0.0
80	15.8	282534.5	0.0	96965.6	0.	0.	42380.2	0.0	0.0
81	10.0	171162.3	0.0	58116.1	0.	0.	25674.3	0.0	0.0
82	22.0	355682.6	0.0	*******	0.	0.	53352.4	0.0	0.0
83	27.0	385341.2	0.0	*******	0.	0.	57801.2	0.0	0.0
84	3.0	38671.8	0.0	14403.0	0.	0.	5800.8	0.0	0.0
85	50.0	535824.5	0.0	*******	0.	0.	80373.7	0.0	0.0
86	4.4	36858.2	0.0	14704.5	0.	0.	5528.7	0.0	0.0
87	0.6	5207.2	0.0	2063.1	0.	0.	781.1	0.0	0.0
88	39.9	239834.6	0.0	87550.4	0.	0.	35975.2	0.0	0.0
89	0.1	412.7	0.0	123.8	0.	0.	61.9	0.0	0.0
90	5.0	18012.2	0.0	5151.0	0.	0.	2701.8	0.0	0.0
91	7.0	24108.8	0.0	5042.9	0.	0.	3616.3	0.0	0.0
92	4.1	14184.4	0.0	1785.5	0.	0.	2127.7	0.0	0.0
93	5.2	16331.5	0.0	909.3	0.	0.	2449.7	0.0	0.0
94	0.8	2337.1	0.0	0.0	0.	0.	350.6	0.0	0.0
95	3.6	10183.7	0.0	0.0	0.	0.	1527.6	0.0	0.0
96	0.3	729.7	0.0	0.0	0.	0.	109.5	0.0	0.0
97	2.0	5140.5	0.0	0.0	0.	0.	771.1	0.0	0.0
98	4.0	9669.2	0.0	0.0	0.	0.	1450.4	0.0	0.0
99	31.3	37578.1	0.0	0.0	0.	0.	5636.7	0.0	0.0
100	1.9	117.3	0.0	0.0	0.	0.	17.6	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.859	225.000
2	50.713	204.863
3	92.164	176.904
4	133.616	148.944
5	144.406	138.155
6	161.282	121.279
7	539.000	115.278
8	1057.000	120.800
9	1160.000	145.642
10	1200.000	161.833
11	1280.000	203.192
12	1400.000	265.687
13	1480.000	319.038
14	1537.984	366.882
15	1551.184	380.082
16	1568.486	408.878

Factor of Safety
*** 0.939 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	37.248	225.000
2	61.543	208.613
3	102.995	180.653
4	144.447	152.693
5	156.634	140.507
6	173.586	123.554
7	539.000	117.944
8	1057.000	124.482
9	1160.000	145.803
10	1200.000	160.627
11	1280.000	203.431
12	1400.000	267.684
13	1480.000	315.606
14	1545.825	369.748
15	1560.194	384.117
16	1577.328	412.632

Factor of Safety
*** 0.939 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	33.049	225.000
2	58.769	207.652
3	100.221	179.692
4	141.672	151.733
5	153.501	139.904
6	170.715	122.690
7	539.000	115.322
8	1057.000	122.289
9	1160.000	144.765
10	1200.000	163.241
11	1280.000	202.042
12	1400.000	268.385
13	1480.000	318.240
14	1536.662	365.413
15	1551.452	380.202
16	1568.749	408.989

Factor of Safety
*** 0.941 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.870	225.000
2	54.024	206.010
3	95.476	178.050
4	136.928	150.090

5	148.144	138.874
6	162.512	124.506
7	539.000	123.544
8	1057.000	123.168
9	1160.000	144.658
10	1200.000	160.712
11	1280.000	205.216
12	1400.000	265.387
13	1480.000	317.195
14	1538.768	366.169
15	1553.896	381.297
16	1589.251	416.652
17	1591.065	418.466

Factor of Safety
*** 0.942 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.656	225.000
2	57.187	207.105
3	98.639	179.145
4	140.091	151.185
5	151.716	139.561
6	167.981	123.295
7	539.000	121.396
8	1057.000	122.582
9	1160.000	146.396
10	1200.000	160.732
11	1280.000	204.766
12	1400.000	265.719
13	1480.000	314.558
14	1544.697	371.665
15	1554.681	381.648
16	1590.036	417.004
17	1591.819	418.786

Factor of Safety
*** 0.943 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.718	221.282
2	50.808	220.026
3	65.631	210.028
4	107.083	182.068
5	148.535	154.108
6	161.249	141.394
7	180.012	122.631
8	539.000	116.669
9	1057.000	121.293
10	1160.000	146.220
11	1200.000	164.775
12	1280.000	201.778
13	1400.000	264.449
14	1480.000	318.758
15	1540.143	366.356
16	1556.046	382.259
17	1573.257	410.904

Factor of Safety
*** 0.944 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.255	225.000
2	60.887	208.385
3	102.339	180.426
4	143.791	152.466
5	155.893	140.364
6	171.809	124.448
7	539.000	124.892
8	1057.000	122.172

9	1160.000	146.113
10	1200.000	162.245
11	1280.000	204.952
12	1400.000	266.451
13	1480.000	317.713
14	1542.248	367.112
15	1558.490	383.354
16	1575.656	411.922

Factor of Safety

*** 0.944 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.855	225.000
2	59.962	208.065
3	101.414	180.105
4	142.866	152.146
5	154.848	140.163
6	170.852	124.160
7	539.000	124.018
8	1057.000	124.775
9	1160.000	147.434
10	1200.000	163.117
11	1280.000	206.155
12	1400.000	265.018
13	1480.000	316.924
14	1531.860	358.000
15	1556.180	382.319
16	1591.535	417.675
17	1593.257	419.397

Factor of Safety

*** 0.944 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.064	225.000
2	52.831	205.597
3	94.283	177.637
4	135.735	149.677
5	146.797	138.615
6	162.375	123.036
7	539.000	124.848
8	1057.000	120.683
9	1160.000	146.989
10	1200.000	160.837
11	1280.000	206.102
12	1400.000	263.754
13	1480.000	318.511
14	1543.569	368.581
15	1549.767	374.779
16	1558.222	383.234
17	1575.393	411.811

Factor of Safety

*** 0.945 ***

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

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 04:57PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37c1s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B', , Seismic, 2015 design

BOUNDARY COORDINATES

40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.663	225.000
2	56.531	206.877
3	97.983	178.918
4	139.434	150.958
5	150.974	139.418
6	166.204	124.189
7	539.000	118.344
8	1057.000	120.273
9	1160.000	146.706
10	1200.000	162.350
11	1280.000	206.287
12	1400.000	264.486
13	1480.000	316.665

14	1541.120	369.028
15	1552.977	380.885
16	1588.333	416.241
17	1590.183	418.091

Janbu's Empirical Coefficient (fo) = 1.058

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

Factor Of Safety For The Preceding Specified Surface = 0.936

Table 1 - Individual Data on the 100 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	15.3	9440.4	0.0	0.0	0.0	0.0	1416.1	0.0	0.0
2	5.0	7199.1	0.0	0.0	0.0	0.0	1079.9	0.0	0.0
3	6.5	12547.7	0.0	0.0	0.0	0.0	1882.2	0.0	0.0
4	6.2	15161.6	0.0	0.0	0.0	0.0	2274.2	0.0	0.0
5	35.3	150134.7	0.0	32836.1	0.0	0.0	22520.2	0.0	0.0
6	41.5	315915.1	0.0	*******	0.0	0.0	47387.3	0.0	0.0
7	7.6	75091.8	0.0	38525.1	0.0	0.0	11263.8	0.0	0.0
8	4.0	42386.0	0.0	22313.0	0.0	0.0	6357.9	0.0	0.0
9	15.2	181215.4	0.0	98755.9	0.0	0.0	27182.3	0.0	0.0
10	13.8	178150.2	0.0	70248.2	0.0	0.0	26722.5	0.0	0.0
11	120.0	1592567.1	0.0	*******	0.0	0.0	*******	0.0	0.0
12	10.0	136194.5	0.0	54421.3	0.0	0.0	20429.2	0.0	0.0
13	20.0	273995.4	0.0	*******	0.0	0.0	41099.3	0.0	0.0
14	3.0	41284.1	0.0	16537.5	0.0	0.0	6192.6	0.0	0.0
15	2.0	27541.0	0.0	10950.3	0.0	0.0	4131.2	0.0	0.0
16	12.0	165752.1	0.0	66509.3	0.0	0.0	24862.8	0.0	0.0
17	13.0	180543.6	0.0	73614.0	0.0	0.0	27081.5	0.0	0.0
18	38.5	540895.6	0.0	*******	0.0	0.0	81134.3	0.0	0.0
19	14.5	205702.6	0.0	89289.6	0.0	0.0	30855.4	0.0	0.0
20	4.0	57285.5	0.0	25015.4	0.0	0.0	8592.8	0.0	0.0
21	3.0	43357.9	0.0	18862.5	0.0	0.0	6503.7	0.0	0.0
22	13.4	197484.0	0.0	85179.8	0.0	0.0	29622.6	0.0	0.0
23	1.6	24367.7	0.0	10430.7	0.0	0.0	3655.2	0.0	0.0
24	2.0	30217.7	0.0	12911.5	0.0	0.0	4532.7	0.0	0.0
25	3.0	45601.0	0.0	19439.3	0.0	0.0	6840.2	0.0	0.0
26	17.0	264525.8	0.0	*******	0.0	0.0	39678.9	0.0	0.0
27	19.0	307958.2	0.0	*******	0.0	0.0	46193.7	0.0	0.0
28	4.0	66501.9	0.0	27569.1	0.0	0.0	9975.3	0.0	0.0
29	17.0	290276.1	0.0	*******	0.0	0.0	43541.4	0.0	0.0
30	21.0	379563.2	0.0	*******	0.0	0.0	56934.5	0.0	0.0
31	21.0	393157.6	0.0	*******	0.0	0.0	58973.6	0.0	0.0
32	6.0	112489.0	0.0	43832.4	0.0	0.0	16873.4	0.0	0.0
33	1.0	18779.4	0.0	7324.0	0.0	0.0	2816.9	0.0	0.0
34	21.0	408700.4	0.0	*******	0.0	0.0	61305.1	0.0	0.0
35	1.0	20144.4	0.0	7441.0	0.0	0.0	3021.7	0.0	0.0
36	25.0	523776.5	0.0	*******	0.0	0.0	78566.5	0.0	0.0
37	27.0	586644.4	0.0	*******	0.0	0.0	87996.7	0.0	0.0
38	4.0	88580.5	0.0	30923.4	0.0	0.0	13287.1	0.0	0.0
39	3.0	67685.6	0.0	23248.3	0.0	0.0	10152.8	0.0	0.0
40	3.0	67686.2	0.0	23296.2	0.0	0.0	10152.9	0.0	0.0
41	5.0	113422.0	0.0	38933.4	0.0	0.0	17013.3	0.0	0.0
42	15.9	369189.9	0.0	*******	0.0	0.0	55378.5	0.0	0.0
43	18.1	434492.8	0.0	*******	0.0	0.0	65173.9	0.0	0.0
44	31.0	757983.0	0.0	*******	0.0	0.0	*******	0.0	0.0
45	20.0	488428.3	0.0	*******	0.0	0.0	73264.2	0.0	0.0
46	40.0	975644.9	0.0	*******	0.0	0.0	*******	0.0	0.0
47	72.0	1752089.9	0.0	*******	0.0	0.0	*******	0.0	0.0
48	33.0	801291.9	0.0	*******	0.0	0.0	*******	0.0	0.0
49	5.0	121029.6	0.0	46276.9	0.0	0.0	18154.4	0.0	0.0
50	8.0	193182.0	0.0	74393.4	0.0	0.0	28977.3	0.0	0.0
51	14.0	338083.3	0.0	*******	0.0	0.0	50712.5	0.0	0.0
52	13.0	313989.3	0.0	*******	0.0	0.0	47098.4	0.0	0.0
53	1.0	24308.2	0.0	9521.9	0.0	0.0	3646.2	0.0	0.0
54	0.9	23033.9	0.0	8921.1	0.0	0.0	3455.1	0.0	0.0
55	5.1	129247.9	0.0	48375.2	0.0	0.0	19387.2	0.0	0.0
56	8.0	215639.9	0.0	76835.2	0.0	0.0	32346.0	0.0	0.0
57	11.0	303800.8	0.0	*******	0.0	0.0	45570.1	0.0	0.0
58	19.0	525135.9	0.0	*******	0.0	0.0	78770.4	0.0	0.0

59	33.7	932404.8	0.0	*******	0.0	0.0	*******	0.0	0.0
60	22.3	618231.8	0.0	*******	0.0	0.0	92734.8	0.0	0.0
61	25.0	693631.1	0.0	*******	0.0	0.0	*******	0.0	0.0
62	2.0	55527.1	0.0	21029.6	0.0	0.0	8329.1	0.0	0.0
63	5.0	137936.2	0.0	52712.5	0.0	0.0	20690.4	0.0	0.0
64	19.0	520838.4	0.0	*******	0.0	0.0	78125.8	0.0	0.0
65	56.0	1486219.8	0.0	*******	0.0	0.0	*******	0.0	0.0
66	11.0	284335.2	0.0	*******	0.0	0.0	42650.3	0.0	0.0
67	20.0	528695.4	0.0	*******	0.0	0.0	79304.3	0.0	0.0
68	16.0	425370.8	0.0	*******	0.0	0.0	63805.6	0.0	0.0
69	23.0	592996.0	0.0	*******	0.0	0.0	88949.4	0.0	0.0
70	6.0	149619.5	0.0	60800.4	0.0	0.0	22442.9	0.0	0.0
71	4.0	100266.9	0.0	40797.5	0.0	0.0	15040.0	0.0	0.0
72	7.0	173275.9	0.0	70111.0	0.0	0.0	25991.4	0.0	0.0
73	5.0	123567.3	0.0	52531.1	0.0	0.0	18535.1	0.0	0.0
74	5.0	126359.3	0.0	51802.5	0.0	0.0	18953.9	0.0	0.0
75	7.7	198427.1	0.0	78400.6	0.0	0.0	29764.1	0.0	0.0
76	35.3	884800.9	0.0	*******	0.0	0.0	*******	0.0	0.0
77	27.0	636967.9	0.0	*******	0.0	0.0	95545.2	0.0	0.0
78	50.0	1059061.0	0.0	*******	0.0	0.0	*******	0.0	0.0
79	22.2	422335.0	0.0	*******	0.0	0.0	63350.3	0.0	0.0
80	15.8	282613.2	0.0	96992.8	0.0	0.0	42392.0	0.0	0.0
81	10.0	171162.4	0.0	58116.2	0.0	0.0	25674.4	0.0	0.0
82	22.0	355682.8	0.0	*******	0.0	0.0	53352.4	0.0	0.0
83	27.0	385341.5	0.0	*******	0.0	0.0	57801.2	0.0	0.0
84	3.0	38671.8	0.0	14403.0	0.0	0.0	5800.8	0.0	0.0
85	50.0	535825.4	0.0	*******	0.0	0.0	80373.8	0.0	0.0
86	4.4	36881.4	0.0	14713.7	0.0	0.0	5532.2	0.0	0.0
87	0.6	5184.1	0.0	2054.0	0.0	0.0	777.6	0.0	0.0
88	39.9	239837.3	0.0	87551.6	0.0	0.0	35975.6	0.0	0.0
89	0.1	411.3	0.0	123.4	0.0	0.0	61.7	0.0	0.0
90	5.0	18012.3	0.0	5151.1	0.0	0.0	2701.8	0.0	0.0
91	7.0	24108.9	0.0	5043.0	0.0	0.0	3616.3	0.0	0.0
92	4.1	14183.7	0.0	1785.5	0.0	0.0	2127.6	0.0	0.0
93	5.2	16332.8	0.0	909.4	0.0	0.0	2449.9	0.0	0.0
94	0.8	2336.8	0.0	0.0	0.0	0.0	350.5	0.0	0.0
95	3.6	10183.7	0.0	0.0	0.0	0.0	1527.6	0.0	0.0
96	0.3	729.8	0.0	0.0	0.0	0.0	109.5	0.0	0.0
97	2.0	5140.8	0.0	0.0	0.0	0.0	771.1	0.0	0.0
98	4.0	9668.9	0.0	0.0	0.0	0.0	1450.3	0.0	0.0
99	31.3	37578.9	0.0	0.0	0.0	0.0	5636.8	0.0	0.0
100	1.8	117.2	0.0	0.0	0.0	0.0	17.6	0.0	0.0

Table 2 - Base Stress Data on the 100 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-34.00	37.33	18.50	1188.76	-267.66
2	-34.00	47.50	6.03	1755.38	-626.10
3	-34.00	53.27	7.88	2086.32	-835.44
4	-34.00	59.62	7.46	2451.14	-1066.22
5	-34.00	80.35	42.54	3161.17	-1851.00
6	-34.00	118.71	50.00	4319.93	-3314.18
7	-45.00	143.22	10.70	9787.09	-5965.32
8	-45.00	148.99	5.62	10274.62	-6410.59
9	-45.00	158.59	21.54	20300.88	-7151.21
10	-0.90	173.10	13.80	2408.60	1734.30
11	-0.90	240.00	120.01	2455.52	1782.41
12	-0.90	305.00	10.00	2501.11	1829.16
13	-0.90	320.00	20.00	2511.63	1839.94
14	-0.90	331.50	3.00	2519.69	1848.21
15	-0.90	334.00	2.00	2531.77	1849.44
16	-0.90	341.00	12.00	2525.25	1855.11
17	-0.90	353.50	13.00	2513.59	1865.22
18	-0.90	379.26	38.52	2489.58	1886.06
19	-0.90	405.76	14.49	2464.88	1907.50
20	-0.90	415.00	4.00	2472.61	1923.43
21	-0.90	418.50	3.00	2497.97	1941.06
22	-0.90	426.69	13.38	2557.30	1982.30
23	-0.90	434.19	1.62	2611.63	2020.07
24	-0.90	436.00	2.00	2624.74	2029.19

25	-0.90	438.50	3.00	2642.26	2041.48
26	-0.90	448.50	17.00	2710.81	2089.83
27	-0.90	466.50	19.00	2834.19	2176.85
28	-0.90	478.00	4.00	2905.33	2232.88
29	-0.90	488.50	17.00	3004.33	2293.26
30	-0.90	507.50	21.00	3231.74	2427.48
31	-0.90	528.50	21.00	3364.31	2514.42
32	0.21	542.00	6.00	3330.91	2882.02
33	0.21	545.50	1.00	3334.17	2886.82
34	0.21	556.50	21.00	3495.39	2991.74
35	0.21	567.50	1.00	3656.61	3096.66
36	0.21	580.50	25.00	3847.14	3220.66
37	0.21	606.50	27.00	4012.03	3340.02
38	0.21	622.00	4.00	4098.62	3404.21
39	0.21	625.50	3.00	4201.47	3468.27
40	0.21	628.50	3.00	4197.40	3468.31
41	0.21	632.50	5.00	4223.51	3487.11
42	0.21	642.96	15.92	4341.23	3565.71
43	0.21	659.96	18.08	4532.60	3693.47
44	0.21	684.50	31.00	4608.49	3758.69
45	0.21	710.00	20.00	4566.95	3754.13
46	0.21	740.00	40.00	4506.91	3749.47
47	0.21	796.00	72.00	4394.84	3740.78
48	0.21	848.50	33.00	4289.77	3732.63
49	0.21	867.50	5.00	4237.16	3721.00
50	0.21	874.00	8.00	4210.82	3712.06
51	0.21	885.00	14.00	4195.17	3712.22
52	0.21	898.50	13.00	4168.85	3712.87
53	0.21	905.50	1.00	4194.74	3736.73
54	0.21	906.47	0.94	4269.38	3782.31
55	0.21	909.47	5.06	4500.70	3923.57
56	0.21	916.00	8.00	4857.22	4143.60
57	0.21	925.50	11.00	5009.29	4245.56
58	0.21	940.50	19.00	4984.13	4248.71
59	0.21	966.85	33.69	4939.94	4254.24
60	0.21	994.85	22.31	4892.98	4260.11
61	0.21	1018.50	25.00	4853.30	4265.08
62	0.21	1032.00	2.00	4830.92	4267.90
63	0.21	1035.50	5.00	4778.21	4240.79
64	0.21	1047.50	19.00	4708.55	4213.94
65	14.39	1085.00	57.81	4361.66	10453.11
66	14.39	1118.50	11.36	4254.00	10180.96
67	14.39	1134.00	20.65	4430.03	10411.81
68	14.39	1152.00	16.52	4502.38	10471.24
69	21.36	1171.50	24.70	6371.54	12992.56
70	21.36	1185.98	6.40	6200.95	12641.41
71	21.36	1190.98	4.33	6141.03	12520.32
72	21.36	1196.50	7.52	6139.32	12474.15
73	28.78	1202.50	5.70	6192.76	15146.01
74	28.78	1207.50	5.70	6448.44	15488.23
75	28.78	1213.85	8.79	6688.28	15783.22
76	28.78	1235.35	40.27	6637.89	15363.73
77	28.78	1266.50	30.80	6383.90	14458.34
78	25.87	1305.00	55.57	5794.79	12101.73
79	25.87	1341.10	24.68	5283.67	10868.34
80	25.87	1360.10	17.56	5005.06	10220.78
81	25.87	1373.00	11.11	4827.64	9779.23
82	25.87	1389.00	24.45	4573.46	9237.12
83	33.11	1413.50	32.24	4127.01	9589.91
84	33.11	1428.50	3.58	3757.97	8661.76
85	33.11	1455.00	59.70	3206.20	7200.88
86	40.59	1482.18	5.75	2719.68	6457.90
87	40.59	1484.68	0.83	2653.88	6253.45
88	40.59	1504.95	52.53	2120.49	4596.21
89	40.59	1524.95	0.14	1594.05	2960.56
90	40.59	1527.50	6.58	1528.06	2754.15
91	40.59	1533.50	9.22	1557.94	2633.11
92	40.59	1539.06	5.43	1642.04	2631.97
93	45.00	1543.71	7.32	1653.84	2564.55
94	45.00	1546.70	1.12	1620.63	2395.93

95	45.00	1548.91	5.14	1749.52	2278.09
96	45.00	1550.86	0.39	1511.74	2174.08
97	45.00	1551.99	2.80	1482.35	2114.20
98	45.00	1554.99	5.69	1558.69	1954.53
99	45.00	1572.67	44.31	981.12	975.26
100	45.01	1589.26	2.62	436.31	51.53

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 6957183.00 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 4140.15(psf)
Sum of the Driving Forces = 7862168.00 (lbs)
Average Mobilized Shear Stress = 4678.69(psf)
Total length of the failure surface = 1680.42(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1307(g)
Calculated Newmark Seismic Displacement = 0.120(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: B-B'

File: b-37c1s

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1307
T_m (s)	0.517
T_s (s)	0.35
M	6.95
T_s/T_m	0.685828

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.214	0.166	0.274
k-velmax (cm/s)	25.41	19.79	32.63

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.12	0.891	3.07	1.26	7.47
[kmax, k-velmax]	0.32	0.574	1.37	0.77	2.44
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.12	0.891	1.21	0.50	2.94
[kmax, k-velmax]	0.32	0.574	0.54	0.30	0.96

PGA	Peak Ground Acceleration (g)	
PGV	Peak Ground Velocity (cm/s)	
k_y	Critical or Yield Acceleration (g)	
T_m	Mean Period of an Earthquake Motion (s)	
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s	
M	Earthquake Magnitude	
kmax	maximum seismic coefficient (g)	
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)	
D	Predicted Sliding Displacment (cm)	

H_{avr} =	187	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.35	s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

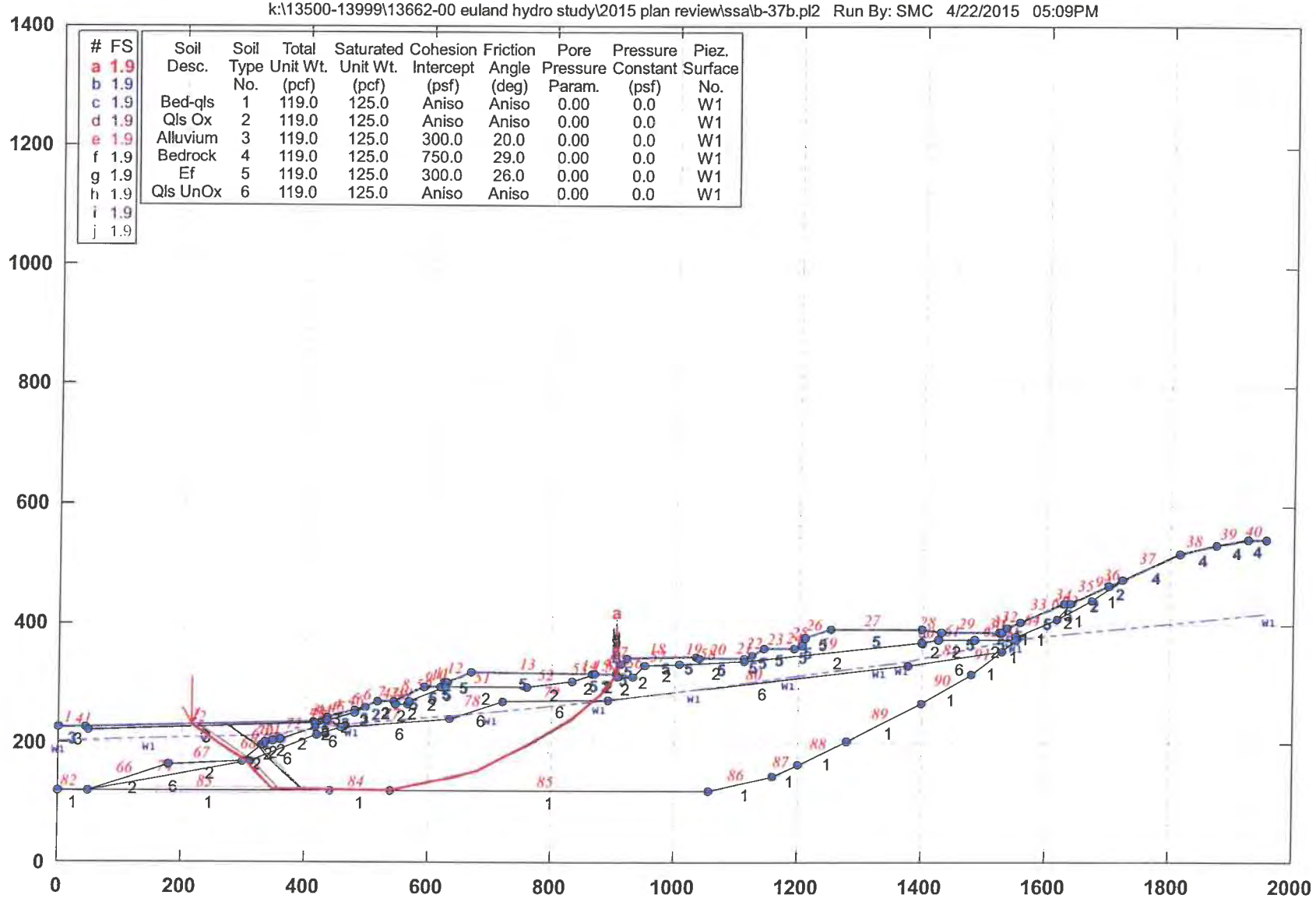
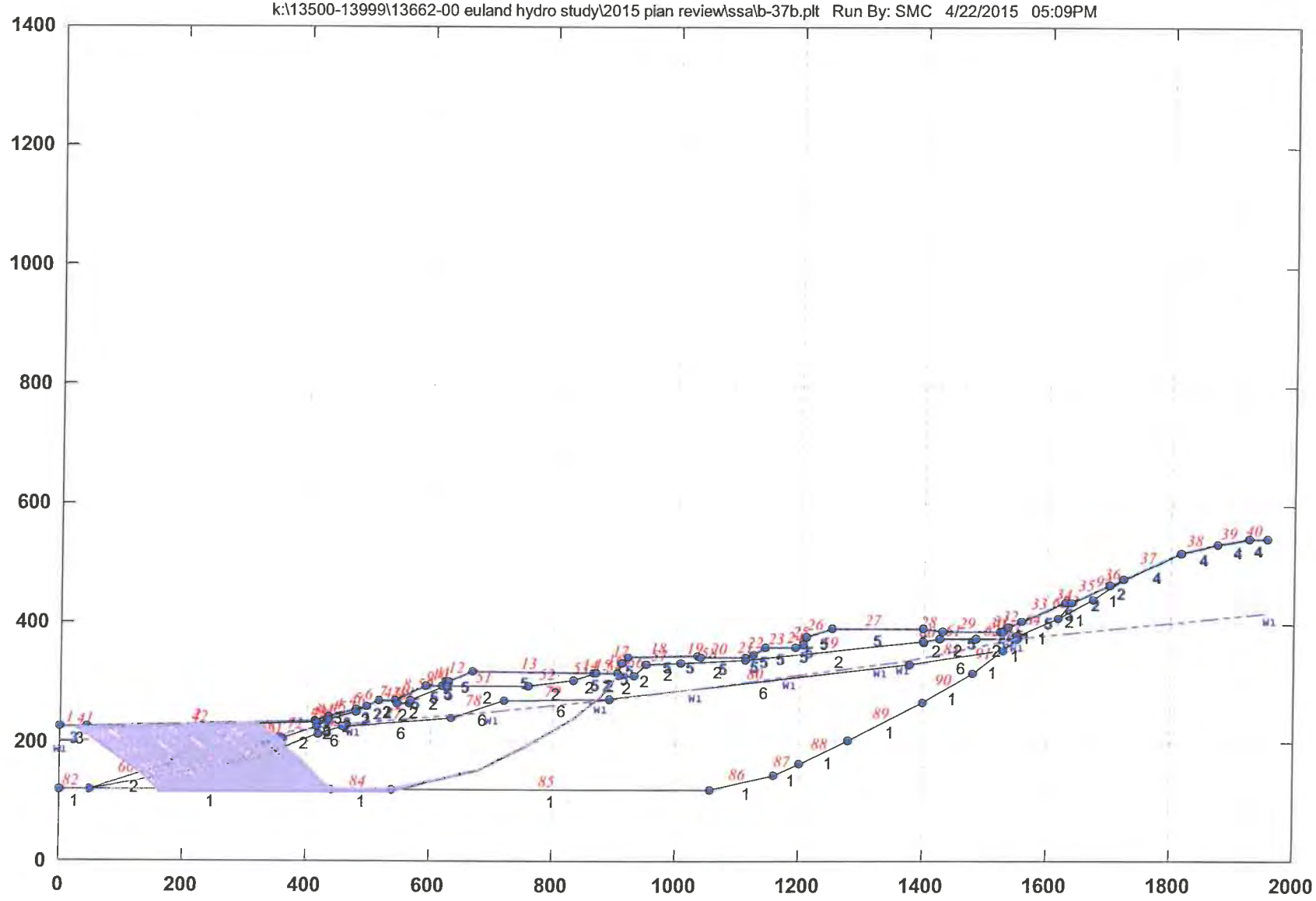

13662-00, Euland Capital , B-B', , , Static, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37b.pl2 Run By: SMC 4/22/2015 05:09PM
FS
a 1.9
b 1.9
c 1.9
d 1.9
e 1.9
f 1.9
g 1.9
h 1.9
i 1.9
j 1.9
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.9
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-9.1

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37b.plt Run By: SMC 4/22/2015 05:09PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 05:09PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37b.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37b.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37b.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Static, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
10 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	440.00	120.00	10.00
2	539.00	120.00	539.00	120.00	10.00
3	600.00	134.00	600.00	134.00	5.00
4	640.00	144.00	640.00	144.00	5.00
5	680.00	155.00	680.00	155.00	5.00
6	760.00	195.00	760.00	195.00	5.00
7	832.00	240.00	832.00	240.00	5.00
8	880.00	280.00	880.00	280.00	5.00
9	896.00	302.00	896.00	302.00	5.00

10 905.00 315.00 905.00 315.00 0.00

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 = 2000

Number of Trial Surfaces With Valid FS = 2000

Statistical Data On All Valid FS Values:

FS Max = 2.175 FS Min = 1.926 FS Ave = 2.036

Standard Deviation = 0.045 Coefficient of Variation = 2.20 %

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	216.247	229.653
2	222.661	225.646
3	260.016	199.490
4	300.973	170.811
5	303.109	168.675
6	313.094	158.690
7	348.450	123.334
8	539.000	120.497
9	600.000	135.623
10	640.000	142.759
11	680.000	153.376
12	760.000	195.942
13	832.000	240.676
14	880.000	280.547
15	896.000	304.273
16	905.000	315.000

Factor of Safety

*** 1.926 ***

Individual data on the 51 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.4	1596.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	25.6	41097.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	11.8	38184.3	0.0	3826.5	0.	0.	0.0	0.0	0.0
4	41.0	231173.2	0.0	73100.9	0.	0.	0.0	0.0	0.0
5	2.1	16326.6	0.0	7429.0	0.	0.	0.0	0.0	0.0
6	6.9	56661.4	0.0	26782.7	0.	0.	0.0	0.0	0.0
7	3.1	27427.7	0.0	13426.4	0.	0.	0.0	0.0	0.0
8	16.9	171553.1	0.0	88667.5	0.	0.	0.0	0.0	0.0
9	3.0	34276.7	0.0	18439.3	0.	0.	0.0	0.0	0.0
10	2.0	23486.4	0.0	12647.8	0.	0.	0.0	0.0	0.0
11	12.0	151755.1	0.0	84255.5	0.	0.	0.0	0.0	0.0
12	1.4	19591.1	0.0	11150.1	0.	0.	0.0	0.0	0.0
13	11.6	157563.8	0.0	64051.5	0.	0.	0.0	0.0	0.0
14	38.5	531140.3	0.0	*******	0.	0.	0.0	0.0	0.0
15	14.5	201996.4	0.0	87455.1	0.	0.	0.0	0.0	0.0
16	4.0	56258.3	0.0	24507.0	0.	0.	0.0	0.0	0.0
17	3.0	42586.4	0.0	18480.7	0.	0.	0.0	0.0	0.0
18	15.0	217981.1	0.0	93694.5	0.	0.	0.0	0.0	0.0
19	2.0	29699.9	0.0	12655.2	0.	0.	0.0	0.0	0.0
20	20.0	304927.5	0.0	*******	0.	0.	0.0	0.0	0.0
21	19.0	302982.3	0.0	*******	0.	0.	0.0	0.0	0.0
22	4.0	65449.5	0.0	27045.4	0.	0.	0.0	0.0	0.0
23	17.0	285785.8	0.0	*******	0.	0.	0.0	0.0	0.0
24	21.0	373976.8	0.0	*******	0.	0.	0.0	0.0	0.0
25	21.0	387527.7	0.0	*******	0.	0.	0.0	0.0	0.0
26	6.0	110324.8	0.0	44050.6	0.	0.	0.0	0.0	0.0
27	1.0	18311.9	0.0	7306.2	0.	0.	0.0	0.0	0.0
28	21.0	391831.0	0.0	*******	0.	0.	0.0	0.0	0.0
29	1.0	19005.4	0.0	7082.7	0.	0.	0.0	0.0	0.0
30	25.0	485379.4	0.0	*******	0.	0.	0.0	0.0	0.0
31	7.0	137918.3	0.0	47516.0	0.	0.	0.0	0.0	0.0
32	20.0	387567.9	0.0	*******	0.	0.	0.0	0.0	0.0
33	4.0	78135.0	0.0	26134.6	0.	0.	0.0	0.0	0.0
34	3.0	59622.2	0.0	19541.9	0.	0.	0.0	0.0	0.0

35	3.0	59426.3	0.0	19491.2	0.	0.	0.0	0.0	0.0
36	5.0	99218.9	0.0	32372.8	0.	0.	0.0	0.0	0.0
37	5.0	99895.3	0.0	32232.2	0.	0.	0.0	0.0	0.0
38	10.9	219800.6	0.0	70844.9	0.	0.	0.0	0.0	0.0
39	18.1	368359.1	0.0	*******	0.	0.	0.0	0.0	0.0
40	11.0	223628.2	0.0	67769.7	0.	0.	0.0	0.0	0.0
41	20.0	389437.7	0.0	*******	0.	0.	0.0	0.0	0.0
42	20.0	362572.0	0.0	*******	0.	0.	0.0	0.0	0.0
43	40.0	644703.6	0.0	*******	0.	0.	0.0	0.0	0.0
44	72.0	861284.6	0.0	*******	0.	0.	0.0	0.0	0.0
45	33.0	245058.1	0.0	32731.4	0.	0.	0.0	0.0	0.0
46	0.6	3566.9	0.0	11.5	0.	0.	0.0	0.0	0.0
47	3.8	20305.1	0.0	0.0	0.	0.	0.0	0.0	0.0
48	0.6	3104.0	0.0	0.0	0.	0.	0.0	0.0	0.0
49	10.0	45941.9	0.0	0.0	0.	0.	0.0	0.0	0.0
50	16.0	43012.1	0.0	0.0	0.	0.	0.0	0.0	0.0
51	9.0	5744.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	216.247	229.653
2	222.661	225.646
3	260.016	199.490
4	300.973	170.811
5	303.109	168.675
6	313.094	158.690
7	348.450	123.334
8	539.000	120.497
9	600.000	135.623
10	640.000	142.759
11	680.000	153.376
12	760.000	195.942
13	832.000	240.676
14	880.000	280.547
15	896.000	304.273
16	905.000	315.000

Factor of Safety

*** 1.926 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	226.880	229.942
2	233.205	225.990
3	265.055	203.689
4	306.012	175.010
5	310.740	170.282
6	322.391	158.631
7	357.747	123.276
8	539.000	121.845
9	600.000	135.125
10	640.000	144.215
11	680.000	154.909
12	760.000	195.678
13	832.000	241.740
14	880.000	281.064
15	896.000	302.368
16	905.000	315.000

Factor of Safety

*** 1.927 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	226.880	229.942
2	233.205	225.990
3	265.055	203.689
4	306.012	175.010
5	310.740	170.282
6	322.391	158.631
7	357.747	123.276
8	539.000	121.845

9	600.000	135.125
10	640.000	144.215
11	680.000	154.909
12	760.000	195.678
13	832.000	241.740
14	880.000	281.064
15	896.000	302.368
16	905.000	315.000

Factor of Safety
*** 1.927 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	267.378	231.043
2	273.363	227.303
3	284.247	219.682
4	325.204	191.004
5	336.203	180.005
6	356.024	160.184
7	391.379	124.828
8	539.000	121.132
9	600.000	135.823
10	640.000	145.655
11	680.000	154.279
12	760.000	192.666
13	832.000	238.532
14	880.000	282.348
15	896.000	300.332
16	905.000	315.000

Factor of Safety
*** 1.930 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	267.378	231.043
2	273.363	227.303
3	284.247	219.682
4	325.204	191.004
5	336.203	180.005
6	356.024	160.184
7	391.379	124.828
8	539.000	121.132
9	600.000	135.823
10	640.000	145.655
11	680.000	154.279
12	760.000	192.666
13	832.000	238.532
14	880.000	282.348
15	896.000	300.332
16	905.000	315.000

Factor of Safety
*** 1.930 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.863	231.165
2	277.810	227.449
3	286.372	221.454
4	327.330	192.775
5	339.023	181.081
6	362.313	157.791
7	397.668	122.436
8	539.000	121.161
9	600.000	132.987
10	640.000	143.404
11	680.000	153.552
12	760.000	196.899
13	832.000	238.664
14	880.000	281.816
15	896.000	300.073

16	905.000	315.000

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.863	231.165
2	277.810	227.449
3	286.372	221.454
4	327.330	192.775
5	339.023	181.081
6	362.313	157.791
7	397.668	122.436
8	539.000	121.161
9	600.000	132.987
10	640.000	143.404
11	680.000	153.552
12	760.000	196.899
13	832.000	238.664
14	880.000	281.816
15	896.000	300.073
16	905.000	315.000

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.769	229.532
2	218.221	225.500
3	256.668	198.580
4	297.625	169.901
5	299.538	167.988
6	307.626	159.901
7	342.981	124.545
8	539.000	122.646
9	600.000	135.916
10	640.000	146.021
11	680.000	153.357
12	760.000	196.391
13	832.000	240.344
14	880.000	278.183
15	896.000	303.628
16	905.000	315.000

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.769	229.532
2	218.221	225.500
3	256.668	198.580
4	297.625	169.901
5	299.538	167.988
6	307.626	159.901
7	342.981	124.545
8	539.000	122.646
9	600.000	135.916
10	640.000	146.021
11	680.000	153.357
12	760.000	196.391
13	832.000	240.344
14	880.000	278.183
15	896.000	303.628
16	905.000	315.000

Factor of Safety
*** 1.932 ***

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

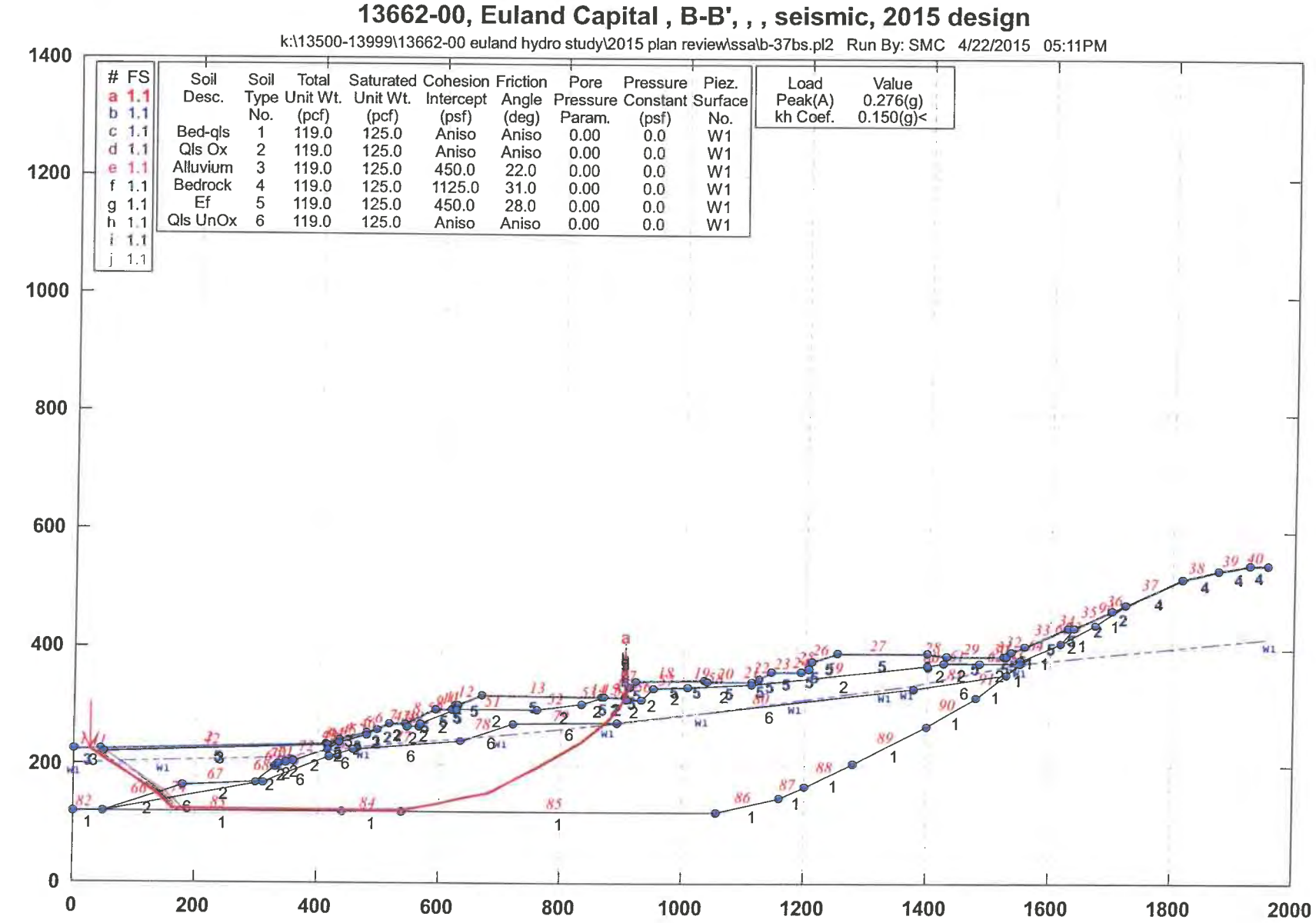
13662-00, Euland Capital , B-B', , , seismic, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37bs.pl2 Run By: SMC 4/22/2015 05:11PM
FS
a 1.1
b 1.1
c 1.1
d 1.1
e 1.1
f 1.1
g 1.1
h 1.1
i 1.1
j 1.1
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.1
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-9.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

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: 4/22/2015
Time of Run: 05:11PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37bs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37bs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37bs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , seismic, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
10 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	440.00	120.00	10.00
2	539.00	120.00	539.00	120.00	10.00
3	600.00	134.00	600.00	134.00	5.00
4	640.00	144.00	640.00	144.00	5.00
5	680.00	155.00	680.00	155.00	5.00

6	760.00	195.00	760.00	195.00	5.00
7	832.00	240.00	832.00	240.00	5.00
8	880.00	280.00	880.00	280.00	5.00
9	896.00	302.00	896.00	302.00	5.00
10	905.00	315.00	905.00	315.00	0.00

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 = 2000

Number of Trial Surfaces With Valid FS = 2000

Statistical Data On All Valid FS Values:

FS Max = 1.419 FS Min = 1.120 FS Ave = 1.265

Standard Deviation = 0.062 Coefficient of Variation = 4.91 %

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.870	225.000
2	54.024	206.010
3	95.476	178.050
4	136.928	150.090
5	148.144	138.874
6	162.512	124.506
7	539.000	123.544
8	600.000	135.584
9	640.000	143.658
10	680.000	152.712
11	760.000	196.216
12	832.000	239.387
13	880.000	280.195
14	896.000	302.359
15	905.000	315.000

Factor of Safety

*** 1.120 ***

Individual data on the 55 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	19.1	14687.0	0.0	0.0	0.	0.	2203.1	0.0	0.0
2	5.0	8721.2	0.0	0.0	0.	0.	1308.2	0.0	0.0
3	4.0	8535.4	0.0	0.0	0.	0.	1280.3	0.0	0.0
4	5.0	12608.9	0.0	0.0	0.	0.	1891.3	0.0	0.0
5	36.4	156802.3	0.0	34991.8	0.	0.	23520.3	0.0	0.0
6	41.5	320064.2	0.0	*******	0.	0.	48009.6	0.0	0.0
7	10.1	102591.5	0.0	53139.6	0.	0.	15388.7	0.0	0.0
8	1.1	12481.6	0.0	6619.9	0.	0.	1872.2	0.0	0.0
9	14.4	171000.2	0.0	93200.4	0.	0.	25650.0	0.0	0.0
10	17.5	224832.2	0.0	88542.1	0.	0.	33724.8	0.0	0.0
11	120.0	1573423.1	0.0	*******	0.	0.	*******	0.0	0.0
12	10.0	133532.9	0.0	53086.6	0.	0.	20029.9	0.0	0.0
13	20.0	268180.1	0.0	*******	0.	0.	40227.0	0.0	0.0
14	3.0	40355.1	0.0	16072.0	0.	0.	6053.3	0.0	0.0
15	2.0	26913.8	0.0	10638.8	0.	0.	4037.1	0.0	0.0
16	12.0	161851.2	0.0	64571.8	0.	0.	24277.7	0.0	0.0
17	13.0	176051.2	0.0	71383.0	0.	0.	26407.7	0.0	0.0
18	38.5	525958.5	0.0	*******	0.	0.	78893.8	0.0	0.0
19	14.5	199456.5	0.0	86189.3	0.	0.	29918.5	0.0	0.0
20	4.0	55499.9	0.0	24129.2	0.	0.	8325.0	0.0	0.0
21	3.0	42001.4	0.0	18189.3	0.	0.	6300.2	0.0	0.0
22	15.0	214848.0	0.0	92134.7	0.	0.	32227.2	0.0	0.0
23	2.0	29256.0	0.0	12434.3	0.	0.	4388.4	0.0	0.0
24	20.0	300149.1	0.0	*******	0.	0.	45022.4	0.0	0.0
25	19.0	297871.9	0.0	*******	0.	0.	44680.8	0.0	0.0
26	4.0	64302.4	0.0	26472.0	0.	0.	9645.4	0.0	0.0
27	17.0	280635.7	0.0	*******	0.	0.	42095.4	0.0	0.0
28	21.0	366999.9	0.0	*******	0.	0.	55050.0	0.0	0.0
29	21.0	379871.0	0.0	*******	0.	0.	56980.7	0.0	0.0
30	6.0	108153.9	0.0	42480.2	0.	0.	16223.1	0.0	0.0
31	1.0	17972.2	0.0	7056.1	0.	0.	2695.8	0.0	0.0

32	21.0	386158.0	0.0	*******	0.	0.	57923.7	0.0	0.0
33	1.0	18804.8	0.0	6905.4	0.	0.	2820.7	0.0	0.0
34	25.0	482419.2	0.0	*******	0.	0.	72362.9	0.0	0.0
35	7.0	137797.6	0.0	46947.8	0.	0.	20669.6	0.0	0.0
36	20.0	387079.7	0.0	*******	0.	0.	58062.0	0.0	0.0
37	4.0	77896.7	0.0	26126.3	0.	0.	11684.5	0.0	0.0
38	3.0	59412.8	0.0	19519.8	0.	0.	8911.9	0.0	0.0
39	3.0	59190.5	0.0	19455.6	0.	0.	8878.6	0.0	0.0
40	5.0	98767.3	0.0	32283.2	0.	0.	14815.1	0.0	0.0
41	5.0	99370.5	0.0	32104.8	0.	0.	14905.6	0.0	0.0
42	10.9	218865.8	0.0	69729.7	0.	0.	32829.9	0.0	0.0
43	18.1	368090.6	0.0	*******	0.	0.	55213.6	0.0	0.0
44	11.0	224245.8	0.0	67473.7	0.	0.	33636.9	0.0	0.0
45	20.0	390804.6	0.0	*******	0.	0.	58620.7	0.0	0.0
46	20.0	363353.0	0.0	*******	0.	0.	54503.0	0.0	0.0
47	40.0	644508.3	0.0	*******	0.	0.	96676.2	0.0	0.0
48	72.0	865853.6	0.0	*******	0.	0.	*******	0.0	0.0
49	33.0	249044.9	0.0	35644.5	0.	0.	37356.7	0.0	0.0
50	1.5	8457.1	0.0	66.4	0.	0.	1268.6	0.0	0.0
51	3.5	18877.4	0.0	0.0	0.	0.	2831.6	0.0	0.0
52	0.1	312.5	0.0	0.0	0.	0.	46.9	0.0	0.0
53	9.9	46164.0	0.0	0.0	0.	0.	6924.6	0.0	0.0
54	16.0	45169.0	0.0	0.0	0.	0.	6775.3	0.0	0.0
55	9.0	6769.5	0.0	0.0	0.	0.	1015.4	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.870	225.000
2	54.024	206.010
3	95.476	178.050
4	136.928	150.090
5	148.144	138.874
6	162.512	124.506
7	539.000	123.544
8	600.000	135.584
9	640.000	143.658
10	680.000	152.712
11	760.000	196.216
12	832.000	239.387
13	880.000	280.195
14	896.000	302.359
15	905.000	315.000

Factor of Safety

*** 1.120 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.488	222.512
2	51.582	220.052
3	66.168	210.213
4	107.620	182.254
5	149.072	154.294
6	161.855	141.511
7	178.372	124.995
8	539.000	122.314
9	600.000	134.735
10	640.000	143.199
11	680.000	153.269
12	760.000	193.413
13	832.000	238.850
14	880.000	277.549
15	896.000	303.228
16	905.000	315.000

Factor of Safety

*** 1.129 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.488	222.512
2	51.582	220.052

3	66.168	210.213
4	107.620	182.254
5	149.072	154.294
6	161.855	141.511
7	178.372	124.995
8	539.000	122.314
9	600.000	134.735
10	640.000	143.199
11	680.000	153.269
12	760.000	193.413
13	832.000	238.850
14	880.000	277.549
15	896.000	303.228
16	905.000	315.000

Factor of Safety
*** 1.129 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.255	225.000
2	60.887	208.385
3	102.339	180.426
4	143.791	152.466
5	155.893	140.364
6	171.809	124.448
7	539.000	124.892
8	600.000	135.086
9	640.000	145.113
10	680.000	154.245
11	760.000	195.952
12	832.000	240.451
13	880.000	280.713
14	896.000	300.454
15	905.000	315.000

Factor of Safety
*** 1.130 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.255	225.000
2	60.887	208.385
3	102.339	180.426
4	143.791	152.466
5	155.893	140.364
6	171.809	124.448
7	539.000	124.892
8	600.000	135.086
9	640.000	145.113
10	680.000	154.245
11	760.000	195.952
12	832.000	240.451
13	880.000	280.713
14	896.000	300.454
15	905.000	315.000

Factor of Safety
*** 1.130 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.656	225.000
2	57.187	207.105
3	98.639	179.145
4	140.091	151.185
5	151.716	139.561
6	167.981	123.295
7	539.000	121.396
8	600.000	135.291
9	640.000	145.396
10	680.000	152.732
11	760.000	195.766

12	832.000	239.719
13	880.000	277.558
14	896.000	303.003
15	905.000	315.000

Factor of Safety
*** 1.130 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.656	225.000
2	57.187	207.105
3	98.639	179.145
4	140.091	151.185
5	151.716	139.561
6	167.981	123.295
7	539.000	121.396
8	600.000	135.291
9	640.000	145.396
10	680.000	152.732
11	760.000	195.766
12	832.000	239.719
13	880.000	277.558
14	896.000	303.003
15	905.000	315.000

Factor of Safety
*** 1.130 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.442	225.000
2	60.350	208.199
3	101.802	180.240
4	143.254	152.280
5	155.287	140.247
6	173.450	122.084
7	539.000	119.247
8	600.000	134.998
9	640.000	142.134
10	680.000	152.751
11	760.000	195.317
12	832.000	240.051
13	880.000	279.922
14	896.000	303.648
15	905.000	315.000

Factor of Safety
*** 1.137 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.442	225.000
2	60.350	208.199
3	101.802	180.240
4	143.254	152.280
5	155.287	140.247
6	173.450	122.084
7	539.000	119.247
8	600.000	134.998
9	640.000	142.134
10	680.000	152.751
11	760.000	195.317
12	832.000	240.051
13	880.000	279.922
14	896.000	303.648
15	905.000	315.000

Factor of Safety
*** 1.137 ***

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

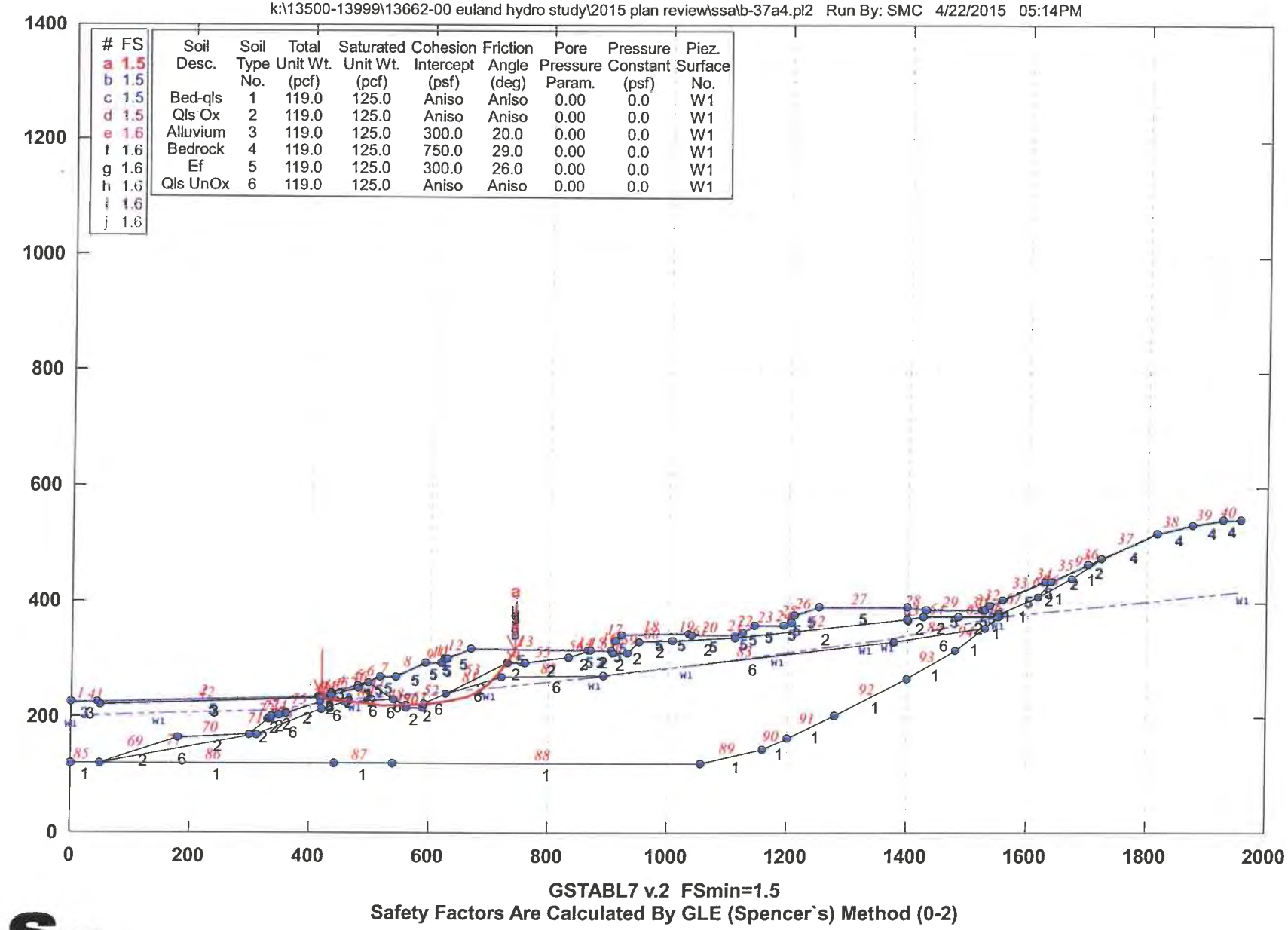
13662-00, Euland Capital , B-B', , , Static, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37a4.pl2 Run By: SMC 4/22/2015 05:14PM
FS
a 1.5
b 1.5
c 1.5
d 1.5
e 1.6
f 1.6
g 1.6
h 1.6
i 1.6
j 1.6
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.5
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-10.1

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 05:14PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37a4.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37a4.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37a4.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Static, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
97 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	5
7	518.00	270.00	545.00	270.00	5
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	497.00	260.00	540.00	231.00	2
48	540.00	231.00	560.00	220.00	6
49	560.00	220.00	561.00	215.00	6
50	561.00	215.00	589.00	215.00	2
51	589.00	215.00	590.00	222.00	2
52	590.00	222.00	627.00	240.00	6
53	627.00	240.00	730.00	295.00	2
54	730.00	295.00	760.00	295.00	2
55	760.00	295.00	832.00	305.00	2
56	832.00	305.00	870.00	315.00	2
57	905.00	315.00	906.00	310.00	2
58	906.00	310.00	931.00	310.00	2
59	931.00	310.00	950.00	330.00	2
60	950.00	330.00	1006.00	333.00	2
61	1006.00	333.00	1113.00	337.00	2
62	1113.00	337.00	1400.00	370.00	2
63	1400.00	370.00	1427.00	374.00	2
64	1427.00	374.00	1485.00	375.00	2
65	1485.00	375.00	1550.00	375.00	2
66	1550.00	375.00	1551.00	380.00	1
67	1551.00	380.00	1618.00	410.00	1
68	1618.00	410.00	1638.00	437.00	2
69	50.00	120.00	180.00	165.00	2
70	180.00	165.00	300.00	170.00	2
71	300.00	170.00	330.00	195.00	2
72	330.00	195.00	335.00	200.00	2
73	335.00	200.00	347.00	203.00	2
74	347.00	203.00	360.00	207.00	2
75	360.00	207.00	417.00	225.00	2
76	417.00	225.00	435.00	237.00	2
77	50.00	120.00	310.00	170.00	6
78	310.00	170.00	420.00	212.00	6
79	420.00	212.00	457.00	225.00	6
80	457.00	225.00	540.00	231.00	6
81	627.00	240.00	720.00	270.00	6
82	720.00	270.00	892.00	272.00	6
83	892.00	272.00	1378.00	330.00	6
84	1378.00	330.00	1530.00	356.00	6
85	0.00	120.00	50.00	120.00	1
86	50.00	120.00	440.00	120.00	1
87	440.00	120.00	539.00	120.00	1
88	539.00	120.00	1057.00	120.00	1
89	1057.00	120.00	1160.00	145.00	1
90	1160.00	145.00	1200.00	163.00	1
91	1200.00	163.00	1280.00	204.00	1
92	1280.00	204.00	1400.00	266.00	1
93	1400.00	266.00	1480.00	317.00	1
94	1480.00	317.00	1530.00	356.00	1
95	1530.00	356.00	1550.00	375.00	1
96	1618.00	410.00	1673.00	440.00	1
97	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1

6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
12 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	427.00	231.00	427.00	231.00	3.00
2	480.00	223.00	480.00	223.00	3.00
3	520.00	220.00	520.00	220.00	3.00
4	560.00	222.00	560.00	222.00	3.00
5	590.00	224.00	590.00	224.00	3.00
6	600.00	222.00	600.00	222.00	3.00

7	640.00	229.00	640.00	229.00	3.00
8	662.00	237.00	662.00	237.00	3.00
9	680.00	245.00	680.00	245.00	3.00
10	698.00	257.00	698.00	257.00	3.00
11	718.00	280.00	718.00	280.00	3.00
12	730.00	295.00	730.00	295.00	3.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 2000
Number of Trial Surfaces With Valid FS = 2000
Statistical Data On All Valid FS Values:
FS Max = 1.998 FS Min = 1.543 FS Ave = 1.748
Standard Deviation = 0.072 Coefficient of Variation = 4.10 %
((Simplified Janbu FS for Critical Surface = 1.521))
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.545	236.617
2	423.185	233.718
3	426.546	231.364
4	427.000	230.910
5	480.000	224.216
6	520.000	220.447
7	560.000	221.385
8	590.000	223.061
9	600.000	221.757
10	640.000	230.003
11	662.000	235.582
12	680.000	244.524
13	698.000	258.110
14	718.000	279.872
15	730.000	295.592
16	743.527	317.240

*** FOS = 1.543 Theta (ki=1.0) = 11.98 ***
Lambda = 0.212
Individual data on the 38 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.6	1174.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.4	2368.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.5	425.5	0.0	0.0	0.	0.	0.0	0.0	0.0
4	8.0	9372.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	2.0	2840.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	19.2	37036.3	0.0	0.0	0.	0.	0.0	0.0	0.0
7	11.5	30868.4	0.0	1098.7	0.	0.	0.0	0.0	0.0
8	8.3	26422.7	0.0	2162.3	0.	0.	0.0	0.0	0.0
9	4.0	13927.9	0.0	1430.9	0.	0.	0.0	0.0	0.0
10	17.0	68725.5	0.0	8173.3	0.	0.	0.0	0.0	0.0
11	21.0	109799.7	0.0	14667.6	0.	0.	0.0	0.0	0.0
12	2.0	11930.2	0.0	1660.4	0.	0.	0.0	0.0	0.0
13	13.8	82421.3	0.0	11980.8	0.	0.	0.0	0.0	0.0
14	6.2	36647.9	0.0	5601.3	0.	0.	0.0	0.0	0.0
15	5.0	29617.5	0.0	4651.4	0.	0.	0.0	0.0	0.0
16	12.6	79193.5	0.0	12160.9	0.	0.	0.0	0.0	0.0
17	2.4	16272.0	0.0	2407.1	0.	0.	0.0	0.0	0.0
18	30.0	229325.3	0.0	31031.5	0.	0.	0.0	0.0	0.0
19	1.7	14693.8	0.0	1865.4	0.	0.	0.0	0.0	0.0
20	1.3	11092.2	0.0	1415.4	0.	0.	0.0	0.0	0.0
21	7.0	61407.3	0.0	8137.1	0.	0.	0.0	0.0	0.0
22	20.0	171581.4	0.0	23031.0	0.	0.	0.0	0.0	0.0

23	4.0	34771.1	0.0	4250.2	0.	0.	0.0	0.0	0.0
24	3.0	27062.9	0.0	3109.8	0.	0.	0.0	0.0	0.0
25	3.0	26835.8	0.0	3043.0	0.	0.	0.0	0.0	0.0
26	4.8	43301.5	0.0	4759.3	0.	0.	0.0	0.0	0.0
27	5.2	46952.2	0.0	4901.9	0.	0.	0.0	0.0	0.0
28	1.9	17641.9	0.0	1788.3	0.	0.	0.0	0.0	0.0
29	20.1	187785.5	0.0	16313.8	0.	0.	0.0	0.0	0.0
30	7.0	66411.5	0.0	4663.2	0.	0.	0.0	0.0	0.0
31	11.0	100073.4	0.0	4528.3	0.	0.	0.0	0.0	0.0
32	5.5	47074.6	0.0	796.8	0.	0.	0.0	0.0	0.0
33	12.5	95384.5	0.0	0.0	0.	0.	0.0	0.0	0.0
34	6.3	41839.9	0.0	0.0	0.	0.	0.0	0.0	0.0
35	13.7	73853.7	0.0	0.0	0.	0.	0.0	0.0	0.0
36	11.2	40398.9	0.0	0.0	0.	0.	0.0	0.0	0.0
37	0.8	2022.3	0.0	0.0	0.	0.	0.0	0.0	0.0
38	13.5	17534.6	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.545	236.617
2	423.185	233.718
3	426.546	231.364
4	427.000	230.910
5	480.000	224.216
6	520.000	220.447
7	560.000	221.385
8	590.000	223.061
9	600.000	221.757
10	640.000	230.003
11	662.000	235.582
12	680.000	244.524
13	698.000	258.110
14	718.000	279.872
15	730.000	295.592
16	743.527	317.240

*** FOS = 1.543 Theta (ki=1.0) = 11.98 ***
Lambda = 0.212

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.545	236.617
2	423.185	233.718
3	426.546	231.364
4	427.000	230.910
5	480.000	224.216
6	520.000	220.447
7	560.000	221.385
8	590.000	223.061
9	600.000	221.757
10	640.000	230.003
11	662.000	235.582
12	680.000	244.524
13	698.000	258.110
14	718.000	279.872
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13	698.000	258.110
14	718.000	279.872
15	730.000	295.592
16	743.527	317.240

*** FOS = 1.543 Theta (ki=1.0) = 11.98 ***
Lambda = 0.212

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	417.824	236.407
2	422.453	233.515
3	426.022	231.015
4	427.000	230.037
5	480.000	223.296
6	520.000	220.605
7	560.000	220.746
8	590.000	222.750
9	600.000	222.899
10	640.000	227.724
11	662.000	237.006
12	680.000	244.776
13	698.000	258.315
14	718.000	281.156
15	730.000	296.078
16	743.225	317.243

*** FOS = 1.583 Theta (ki=1.0) = 12.22 ***
Lambda = 0.217

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	417.824	236.407
2	422.453	233.515
3	426.022	231.015
4	427.000	230.037
5	480.000	223.296
6	520.000	220.605
7	560.000	220.746
8	590.000	222.750
9	600.000	222.899
10	640.000	227.724
11	662.000	237.006
12	680.000	244.776
13	698.000	258.315
14	718.000	281.156
15	730.000	296.078
16	743.225	317.243

*** FOS = 1.583 Theta (ki=1.0) = 12.23 ***
Lambda = 0.217

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	417.824	236.407
2	422.453	233.515
3	426.022	231.015
4	427.000	230.037
5	480.000	223.296
6	520.000	220.605
7	560.000	220.746
8	590.000	222.750
9	600.000	222.899
10	640.000	227.724
11	662.000	237.006
12	680.000	244.776
13	698.000	258.315
14	718.000	281.156
15	730.000	296.078
16	743.225	317.243

*** FOS = 1.583 Theta (ki=1.0) = 12.23 ***
Lambda = 0.217
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	417.824	236.407
2	422.453	233.515
3	426.022	231.015
4	427.000	230.037
5	480.000	223.296
6	520.000	220.605
7	560.000	220.746
8	590.000	222.750
9	600.000	222.899
10	640.000	227.724
11	662.000	237.006
12	680.000	244.776
13	698.000	258.315
14	718.000	281.156
15	730.000	296.078
16	743.225	317.243

*** FOS = 1.583 Theta (ki=1.0) = 12.23 ***
Lambda = 0.217
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.356	236.562
2	422.993	233.665
3	426.409	231.273
4	427.000	230.682
5	480.000	223.471
6	520.000	219.562
7	560.000	220.734
8	590.000	223.020
9	600.000	222.700
10	640.000	229.306
11	662.000	236.619
12	680.000	244.670
13	698.000	257.741
14	718.000	279.363
15	730.000	295.316
16	743.698	317.238

*** FOS = 1.584 Theta (ki=1.0) = 12.23 ***
Lambda = 0.217
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.356	236.562
2	422.993	233.665
3	426.409	231.273
4	427.000	230.682
5	480.000	223.471
6	520.000	219.562
7	560.000	220.734
8	590.000	223.020
9	600.000	222.700
10	640.000	229.306
11	662.000	236.619
12	680.000	244.670
13	698.000	257.741
14	718.000	279.363
15	730.000	295.316
16	743.698	317.238

*** FOS = 1.584 Theta (ki=1.0) = 12.24 ***
Lambda = 0.217
**** END OF GSTABL7 OUTPUT ****

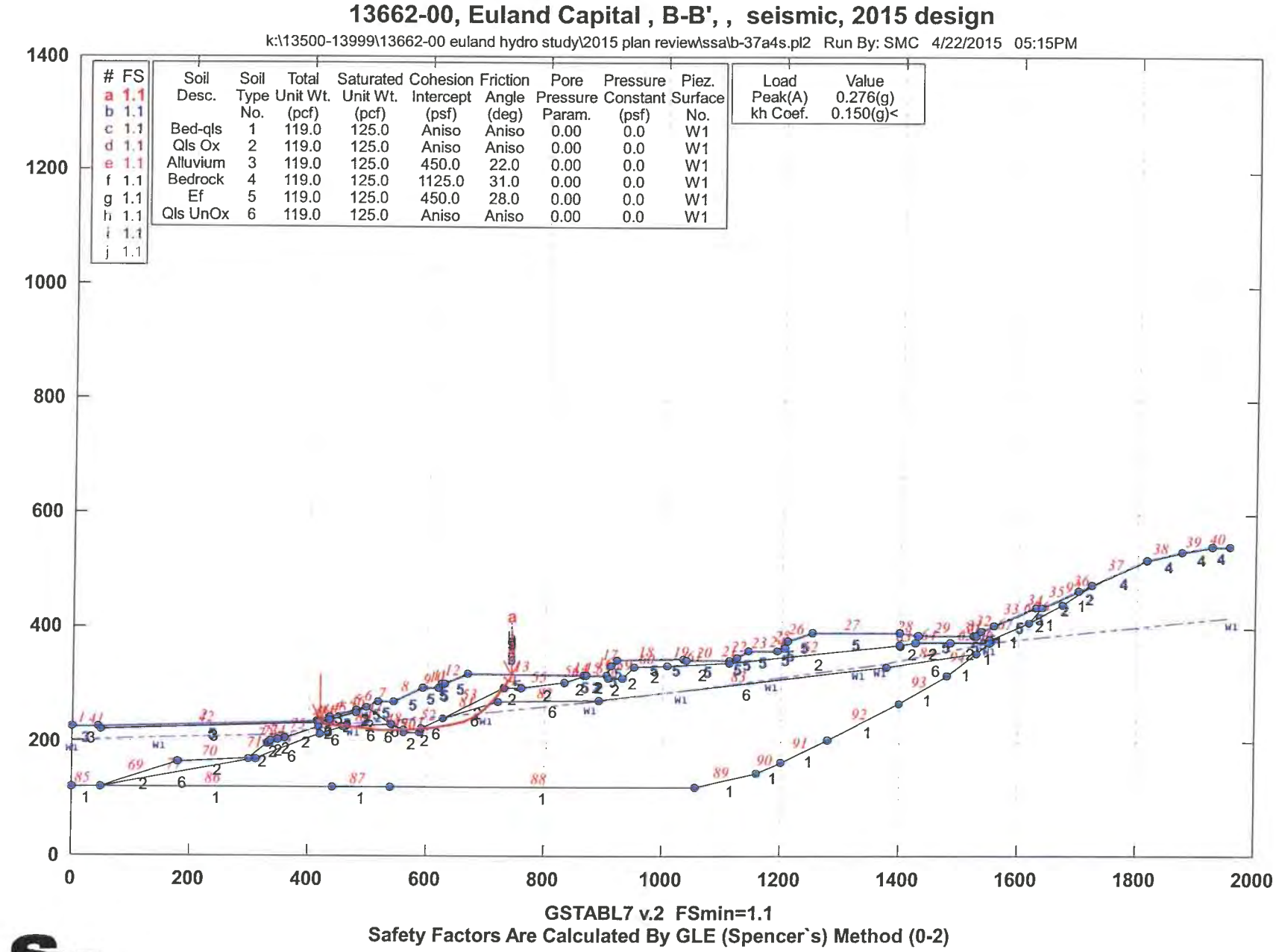

13662-00, Euland Capital , B-B', , seismic, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37a4s.pl2 Run By: SMC 4/22/2015 05:15PM
FS
a 1.1
b 1.1
c 1.1
d 1.1
e 1.1
f 1.1
g 1.1
h 1.1
i 1.1
j 1.1
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.1
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-10.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/22/2015
Time of Run: 05:15PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37a4s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37a4s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37a4s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, seismic, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
97 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	5
7	518.00	270.00	545.00	270.00	5
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	497.00	260.00	540.00	231.00	2
48	540.00	231.00	560.00	220.00	6
49	560.00	220.00	561.00	215.00	6
50	561.00	215.00	589.00	215.00	2
51	589.00	215.00	590.00	222.00	2
52	590.00	222.00	627.00	240.00	6
53	627.00	240.00	730.00	295.00	2
54	730.00	295.00	760.00	295.00	2
55	760.00	295.00	832.00	305.00	2
56	832.00	305.00	870.00	315.00	2
57	905.00	315.00	906.00	310.00	2
58	906.00	310.00	931.00	310.00	2
59	931.00	310.00	950.00	330.00	2
60	950.00	330.00	1006.00	333.00	2
61	1006.00	333.00	1113.00	337.00	2
62	1113.00	337.00	1400.00	370.00	2
63	1400.00	370.00	1427.00	374.00	2
64	1427.00	374.00	1485.00	375.00	2
65	1485.00	375.00	1550.00	375.00	2
66	1550.00	375.00	1551.00	380.00	1
67	1551.00	380.00	1618.00	410.00	1
68	1618.00	410.00	1638.00	437.00	2
69	50.00	120.00	180.00	165.00	2
70	180.00	165.00	300.00	170.00	2
71	300.00	170.00	330.00	195.00	2
72	330.00	195.00	335.00	200.00	2
73	335.00	200.00	347.00	203.00	2
74	347.00	203.00	360.00	207.00	2
75	360.00	207.00	417.00	225.00	2
76	417.00	225.00	435.00	237.00	2
77	50.00	120.00	310.00	170.00	6
78	310.00	170.00	420.00	212.00	6
79	420.00	212.00	457.00	225.00	6
80	457.00	225.00	540.00	231.00	6
81	627.00	240.00	720.00	270.00	6
82	720.00	270.00	892.00	272.00	6
83	892.00	272.00	1378.00	330.00	6
84	1378.00	330.00	1530.00	356.00	6
85	0.00	120.00	50.00	120.00	1
86	50.00	120.00	440.00	120.00	1
87	440.00	120.00	539.00	120.00	1
88	539.00	120.00	1057.00	120.00	1
89	1057.00	120.00	1160.00	145.00	1
90	1160.00	145.00	1200.00	163.00	1
91	1200.00	163.00	1280.00	204.00	1
92	1280.00	204.00	1400.00	266.00	1
93	1400.00	266.00	1480.00	317.00	1
94	1480.00	317.00	1530.00	356.00	1
95	1530.00	356.00	1550.00	375.00	1
96	1618.00	410.00	1673.00	440.00	1
97	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1

6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
12 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	427.00	231.00	427.00	231.00	3.00
2	480.00	223.00	480.00	223.00	3.00

3	520.00	220.00	520.00	220.00	3.00
4	560.00	222.00	560.00	222.00	3.00
5	590.00	224.00	590.00	224.00	3.00
6	600.00	222.00	600.00	222.00	3.00
7	640.00	229.00	640.00	229.00	3.00
8	662.00	237.00	662.00	237.00	3.00
9	680.00	245.00	680.00	245.00	3.00
10	698.00	257.00	698.00	257.00	3.00
11	718.00	280.00	718.00	280.00	3.00
12	730.00	295.00	730.00	295.00	3.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 2000
Number of Trial Surfaces With Valid FS = 2000
Statistical Data On All Valid FS Values:
FS Max = 1.377 FS Min = 1.071 FS Ave = 1.208
Standard Deviation = 0.049 Coefficient of Variation = 4.04 %
((Simplified Janbu FS for Critical Surface = 1.094))
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.331	236.555
2	423.094	233.693
3	426.546	231.364
4	427.000	230.910
5	480.000	224.216
6	520.000	220.447
7	560.000	221.385
8	590.000	223.061
9	600.000	221.757
10	640.000	230.003
11	662.000	235.582
12	680.000	244.524
13	698.000	258.110
14	718.000	279.872
15	730.000	295.592
16	743.011	317.245

*** FOS = 1.071 Theta (ki=1.0) = 10.10 ***
Lambda = 0.178
Individual data on the 38 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Force Ver (lbs)	Surcharge Load (lbs)
1	4.8	1204.9	0.0	0.0	0.	0.	180.7	0.0	0.0
2	3.5	2431.7	0.0	0.0	0.	0.	364.7	0.0	0.0
3	0.5	425.5	0.0	0.0	0.	0.	63.8	0.0	0.0
4	8.0	9372.3	0.0	0.0	0.	0.	1405.8	0.0	0.0
5	2.0	2840.5	0.0	0.0	0.	0.	426.1	0.0	0.0
6	19.2	37036.3	0.0	0.0	0.	0.	5555.4	0.0	0.0
7	11.5	30868.4	0.0	1098.7	0.	0.	4630.3	0.0	0.0
8	8.3	26422.7	0.0	2162.3	0.	0.	3963.4	0.0	0.0
9	4.0	13927.9	0.0	1430.9	0.	0.	2089.2	0.0	0.0
10	17.0	68725.5	0.0	8173.3	0.	0.	10308.8	0.0	0.0
11	21.0	109799.7	0.0	14667.6	0.	0.	16470.0	0.0	0.0
12	2.0	11930.2	0.0	1660.4	0.	0.	1789.5	0.0	0.0
13	13.8	82421.3	0.0	11980.8	0.	0.	12363.2	0.0	0.0
14	6.2	36647.9	0.0	5601.3	0.	0.	5497.2	0.0	0.0
15	5.0	29617.5	0.0	4651.4	0.	0.	4442.6	0.0	0.0
16	12.6	79193.5	0.0	12160.9	0.	0.	11879.0	0.0	0.0
17	2.4	16272.0	0.0	2407.1	0.	0.	2440.8	0.0	0.0
18	30.0	229325.3	0.0	31031.5	0.	0.	34398.8	0.0	0.0

19	1.7	14693.8	0.0	1865.4	0.	0.	2204.1	0.0	0.0
20	1.3	11092.2	0.0	1415.4	0.	0.	1663.8	0.0	0.0
21	7.0	61407.3	0.0	8137.1	0.	0.	9211.1	0.0	0.0
22	20.0	171581.4	0.0	23031.0	0.	0.	25737.2	0.0	0.0
23	4.0	34771.1	0.0	4250.2	0.	0.	5215.7	0.0	0.0
24	3.0	27062.9	0.0	3109.8	0.	0.	4059.4	0.0	0.0
25	3.0	26835.8	0.0	3043.0	0.	0.	4025.4	0.0	0.0
26	4.8	43301.5	0.0	4759.3	0.	0.	6495.2	0.0	0.0
27	5.2	46952.2	0.0	4901.9	0.	0.	7042.8	0.0	0.0
28	1.9	17641.9	0.0	1788.3	0.	0.	2646.3	0.0	0.0
29	20.1	187785.5	0.0	16313.8	0.	0.	28167.8	0.0	0.0
30	7.0	66411.5	0.0	4663.2	0.	0.	9961.7	0.0	0.0
31	11.0	100073.4	0.0	4528.3	0.	0.	15011.0	0.0	0.0
32	5.5	47074.6	0.0	796.8	0.	0.	7061.2	0.0	0.0
33	12.5	95384.5	0.0	0.0	0.	0.	14307.7	0.0	0.0
34	6.3	41839.9	0.0	0.0	0.	0.	6276.0	0.0	0.0
35	13.7	73853.7	0.0	0.0	0.	0.	11078.0	0.0	0.0
36	11.2	40398.9	0.0	0.0	0.	0.	6059.8	0.0	0.0
37	0.8	2022.3	0.0	0.0	0.	0.	303.4	0.0	0.0
38	13.0	16865.2	0.0	0.0	0.	0.	2529.8	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.331	236.555
2	423.094	233.693
3	426.546	231.364
4	427.000	230.910
5	480.000	224.216
6	520.000	220.447
7	560.000	221.385
8	590.000	223.061
9	600.000	221.757
10	640.000	230.003
11	662.000	235.582
12	680.000	244.524
13	698.000	258.110
14	718.000	279.872
15	730.000	295.592
16	743.011	317.245

*** FOS = 1.071 Theta (ki=1.0) = 10.10 ***
Lambda = 0.178

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.331	236.555
2	423.094	233.693
3	426.546	231.364
4	427.000	230.910
5	480.000	224.216
6	520.000	220.447
7	560.000	221.385
8	590.000	223.061
9	600.000	221.757
10	640.000	230.003
11	662.000	235.582
12	680.000	244.524
13	698.000	258.110
14	718.000	279.872
15	730.000	295.592
16	743.011	317.245

*** FOS = 1.071 Theta (ki=1.0) = 10.10 ***
Lambda = 0.178

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.331	236.555
2	423.094	233.693
3	426.546	231.364
4	427.000	230.910
5	480.000	224.216

6	520.000	220.447
7	560.000	221.385
8	590.000	223.061
9	600.000	221.757
10	640.000	230.003
11	662.000	235.582
12	680.000	244.524
13	698.000	258.110
14	718.000	279.872
15	730.000	295.592
16	743.011	317.245

*** FOS = 1.071 Theta (ki=1.0) = 10.10 ***
Lambda = 0.178
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.141	236.499
2	422.901	233.639
3	426.409	231.273
4	427.000	230.682
5	480.000	223.471
6	520.000	219.562
7	560.000	220.734
8	590.000	223.020
9	600.000	222.700
10	640.000	229.306
11	662.000	236.619
12	680.000	244.670
13	698.000	257.741
14	718.000	279.363
15	730.000	295.316
16	743.175	317.243

*** FOS = 1.096 Theta (ki=1.0) = 10.38 ***
Lambda = 0.183
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.141	236.499
2	422.901	233.639
3	426.409	231.273
4	427.000	230.682
5	480.000	223.471
6	520.000	219.562
7	560.000	220.734
8	590.000	223.020
9	600.000	222.700
10	640.000	229.306
11	662.000	236.619
12	680.000	244.670
13	698.000	257.741
14	718.000	279.363
15	730.000	295.316
16	743.175	317.243

*** FOS = 1.096 Theta (ki=1.0) = 10.41 ***
Lambda = 0.184
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.141	236.499
2	422.901	233.639
3	426.409	231.273
4	427.000	230.682
5	480.000	223.471
6	520.000	219.562
7	560.000	220.734
8	590.000	223.020
9	600.000	222.700
10	640.000	229.306
11	662.000	236.619
12	680.000	244.670

13	698.000	257.741
14	718.000	279.363
15	730.000	295.316
16	743.175	317.243

*** FOS = 1.096 Theta (ki=1.0) = 10.41 ***
Lambda = 0.184

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	418.141	236.499
2	422.901	233.639
3	426.409	231.273
4	427.000	230.682
5	480.000	223.471
6	520.000	219.562
7	560.000	220.734
8	590.000	223.020
9	600.000	222.700
10	640.000	229.306
11	662.000	236.619
12	680.000	244.670
13	698.000	257.741
14	718.000	279.363
15	730.000	295.316
16	743.175	317.243

*** FOS = 1.096 Theta (ki=1.0) = 10.41 ***
Lambda = 0.184

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	417.605	236.343
2	422.356	233.488
3	426.022	231.015
4	427.000	230.037
5	480.000	223.296
6	520.000	220.605
7	560.000	220.746
8	590.000	222.750
9	600.000	222.899
10	640.000	227.724
11	662.000	237.006
12	680.000	244.776
13	698.000	258.315
14	718.000	281.156
15	730.000	296.078
16	742.720	317.248

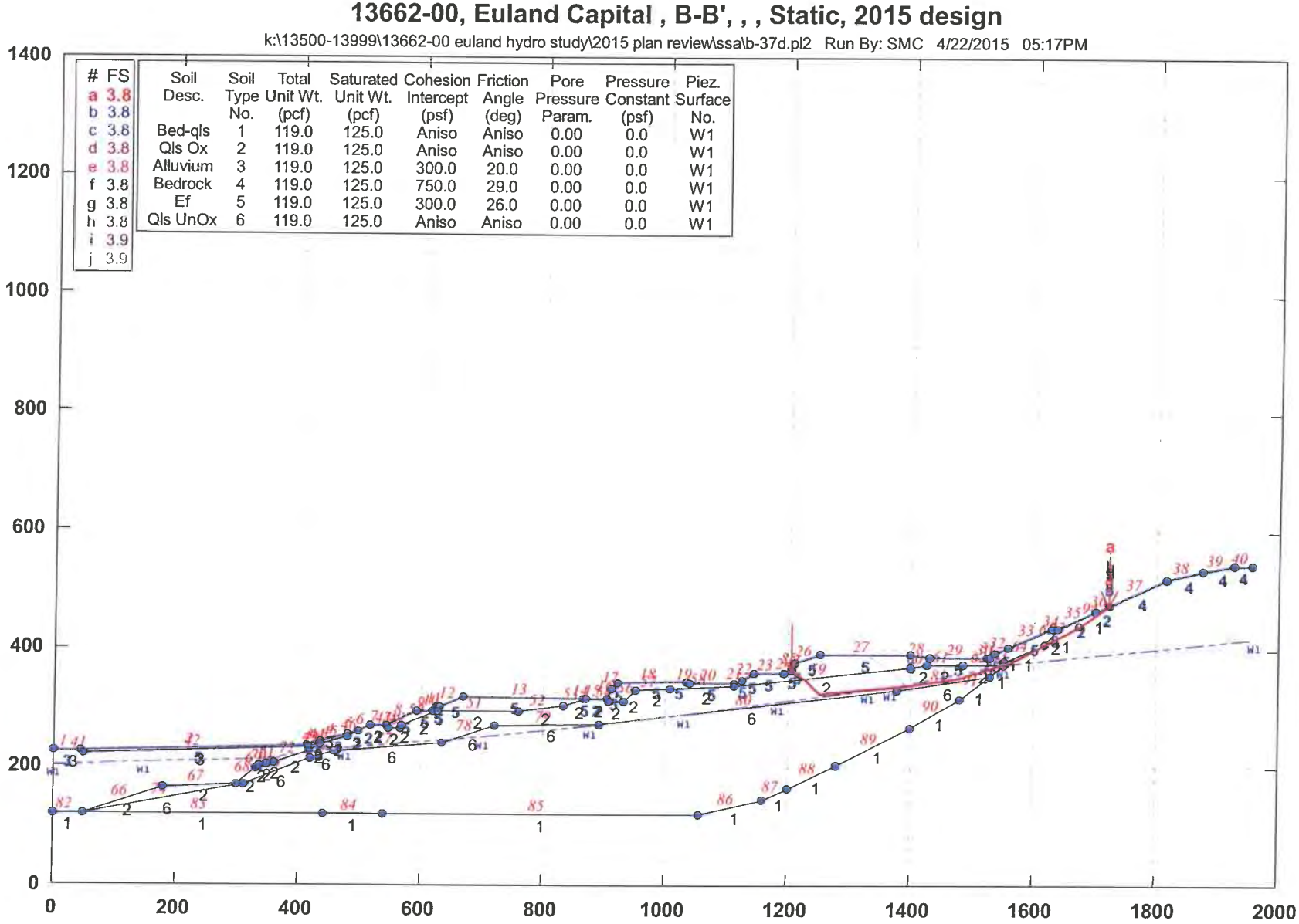
*** FOS = 1.097 Theta (ki=1.0) = 10.32 ***
Lambda = 0.182

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	417.605	236.343
2	422.356	233.488
3	426.022	231.015
4	427.000	230.037
5	480.000	223.296
6	520.000	220.605
7	560.000	220.746
8	590.000	222.750
9	600.000	222.899
10	640.000	227.724
11	662.000	237.006
12	680.000	244.776
13	698.000	258.315
14	718.000	281.156
15	730.000	296.078
16	742.720	317.248

*** FOS = 1.097 Theta (ki=1.0) = 10.35 ***
Lambda = 0.183

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


13662-00, Euland Capital , B-B', , , Static, 2015 design
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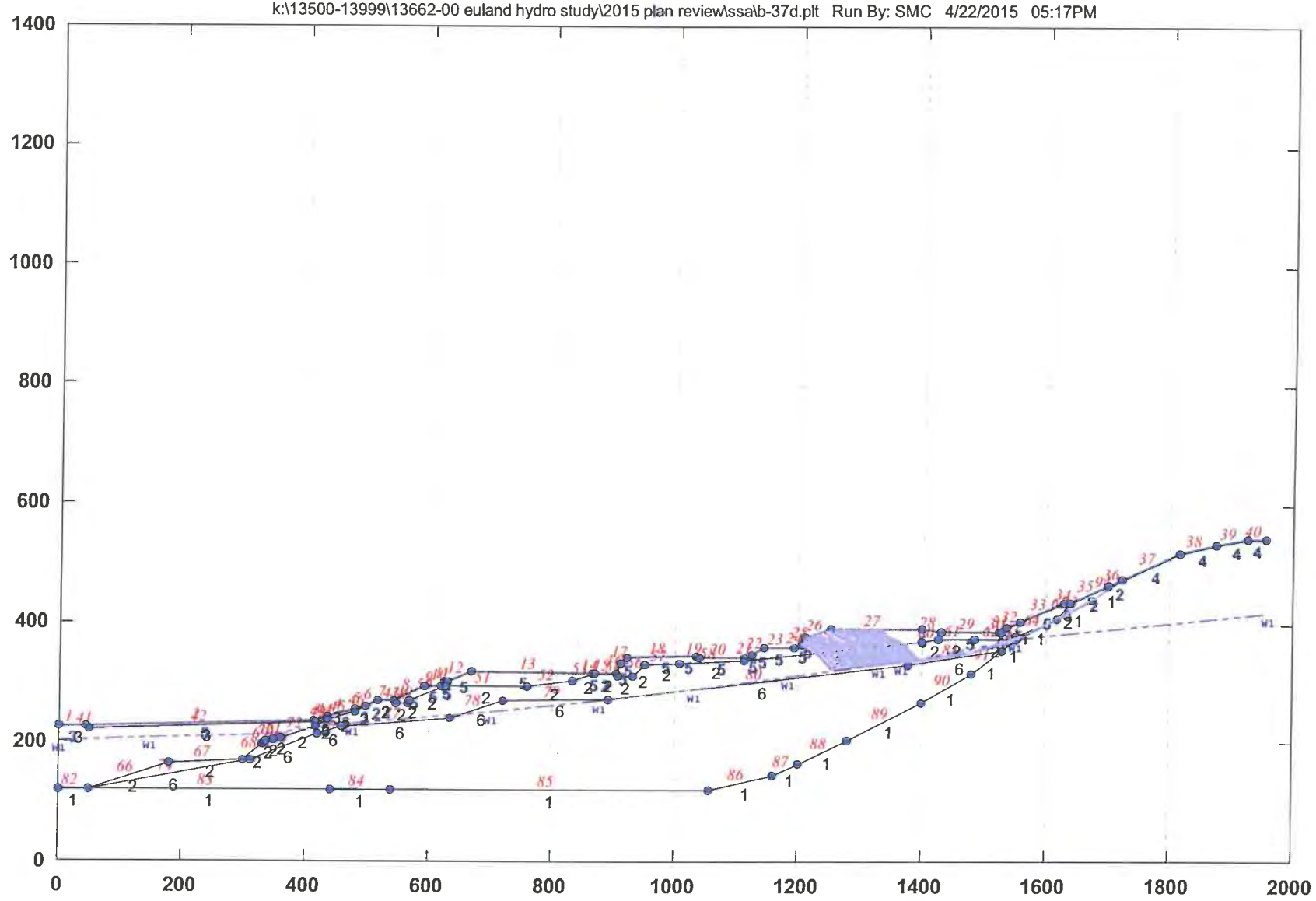
FS
a 3.8
b 3.8
c 3.8
d 3.8
e 3.8
f 3.8
g 3.8
h 3.8
i 3.9
j 3.9
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=3.8
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-11.1

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37d.plt Run By: SMC 4/22/2015 05:17PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 05:17PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37d.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37d.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37d.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Static, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	20.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	20.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	20.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1252.00	326.00	1400.00	340.00	5.00
2	1401.00	340.00	1401.00	340.00	5.00
3	1480.00	352.00	1480.00	352.00	5.00
4	1545.00	375.00	1550.00	375.00	5.00
5	1560.00	380.00	1560.00	380.00	5.00
6	1618.00	410.00	1618.00	410.00	5.00
7	1673.00	440.00	1673.00	440.00	5.00
8	1722.00	475.00	1722.00	475.00	0.00

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 = 2000
Number of Trial Surfaces With Valid FS = 2000
Statistical Data On All Valid FS Values:
FS Max = 5.727 FS Min = 3.822 FS Ave = 4.289
Standard Deviation = 0.651 Coefficient of Variation = 15.17 %
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.756	364.898
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 3.822 ***
Individual data on the 29 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.2	3.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	5.0	4948.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	18.2	53762.4	0.0	0.0	0.	0.	0.0	0.0	0.0
4	3.6	15348.0	0.0	0.0	0.	0.	0.0	0.0	0.0
5	21.2	130426.1	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.0	302.9	0.0	0.0	0.	0.	0.0	0.0	0.0
7	117.2	837372.6	0.0	0.0	0.	0.	0.0	0.0	0.0
8	29.8	188658.4	0.0	3262.0	0.	0.	0.0	0.0	0.0
9	1.0	6163.8	0.0	222.6	0.	0.	0.0	0.0	0.0
10	26.0	148765.9	0.0	6667.4	0.	0.	0.0	0.0	0.0
11	3.0	15723.7	0.0	861.3	0.	0.	0.0	0.0	0.0
12	50.0	231459.0	0.0	17158.4	0.	0.	0.0	0.0	0.0
13	5.0	19876.1	0.0	1968.1	0.	0.	0.0	0.0	0.0
14	40.0	126028.2	0.0	11209.3	0.	0.	0.0	0.0	0.0
15	5.0	11646.6	0.0	834.3	0.	0.	0.0	0.0	0.0
16	7.0	18150.7	0.0	956.3	0.	0.	0.0	0.0	0.0
17	11.7	35761.7	0.0	1048.3	0.	0.	0.0	0.0	0.0
18	0.7	2162.2	0.0	39.8	0.	0.	0.0	0.0	0.0
19	0.6	1894.1	0.0	32.7	0.	0.	0.0	0.0	0.0
20	1.0	3175.5	0.0	42.3	0.	0.	0.0	0.0	0.0
21	1.7	5379.5	0.0	27.6	0.	0.	0.0	0.0	0.0
22	4.3	13781.5	0.0	0.0	0.	0.	0.0	0.0	0.0
23	3.0	9647.9	0.0	0.0	0.	0.	0.0	0.0	0.0
24	58.0	162913.2	0.0	0.0	0.	0.	0.0	0.0	0.0
25	12.0	28027.2	0.0	0.0	0.	0.	0.0	0.0	0.0
26	8.0	17199.8	0.0	0.0	0.	0.	0.0	0.0	0.0
27	35.0	66591.2	0.0	0.0	0.	0.	0.0	0.0	0.0
28	27.0	34749.7	0.0	0.0	0.	0.	0.0	0.0	0.0
29	22.0	8741.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.756	364.898
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760

10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 3.822 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.756	364.898
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 3.822 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.756	364.898
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 3.822 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.756	364.898
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 3.822 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.756	364.898
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 3.822 ***

Failure Surface Specified By 11 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	1204.756	364.898
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 3.822 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.756	364.898
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 3.822 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1327.975	391.000
2	1342.111	382.167
3	1367.553	366.269
4	1373.466	360.356
5	1394.679	339.142
6	1401.000	341.743
7	1480.000	354.258
8	1548.407	374.160
9	1560.000	379.167
10	1618.000	407.749
11	1673.000	439.123
12	1722.000	475.000

Factor of Safety
*** 3.871 ***

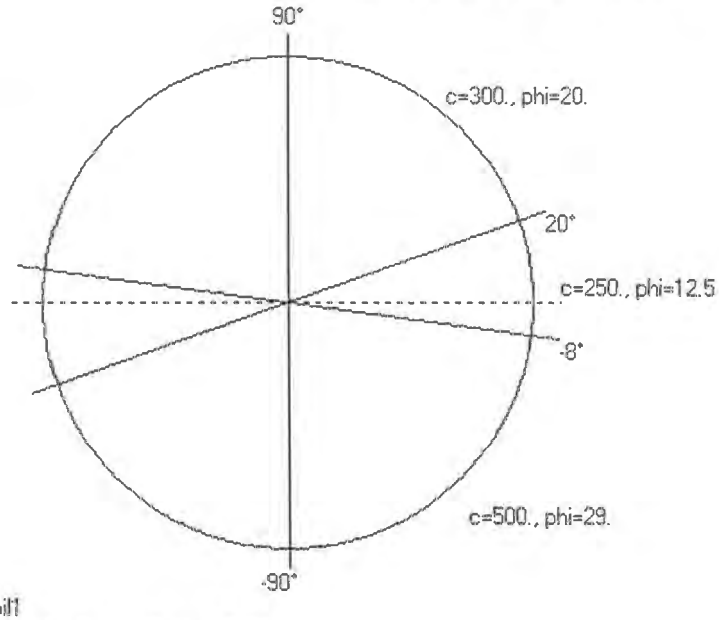
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1327.975	391.000
2	1342.111	382.167
3	1367.553	366.269
4	1373.466	360.356
5	1394.679	339.142
6	1401.000	341.743
7	1480.000	354.258
8	1548.407	374.160
9	1560.000	379.167
10	1618.000	407.749
11	1673.000	439.123
12	1722.000	475.000

Factor of Safety
*** 3.871 ***

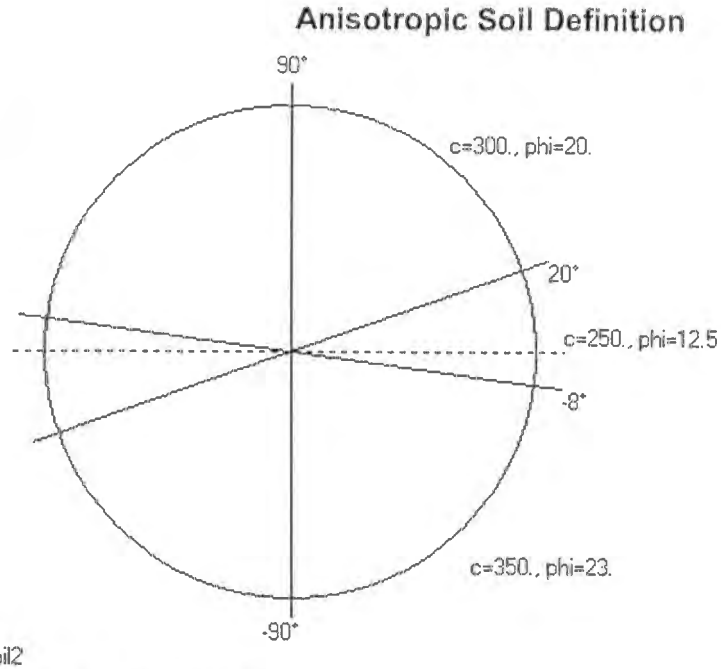
**** END OF GSTABL7 OUTPUT ****

Anisotropic Soil Definition



Soil1

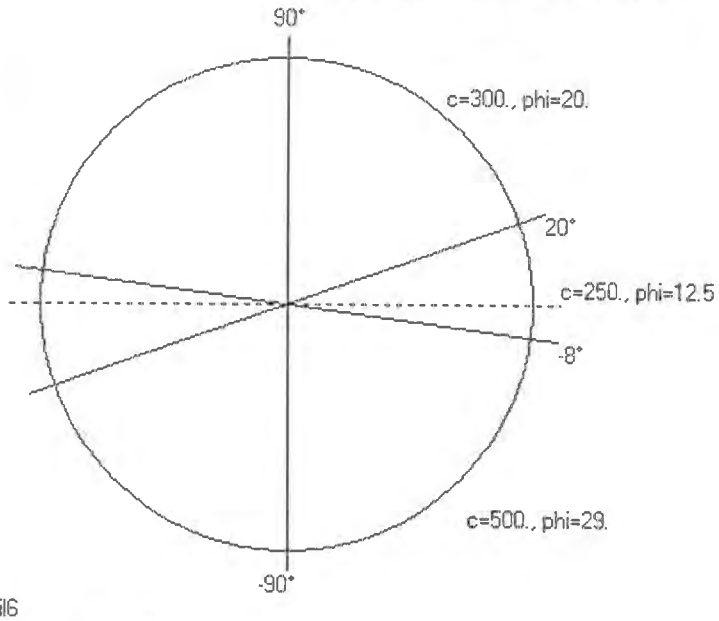
13662-00, Euland Capital , B-B',



Soil2

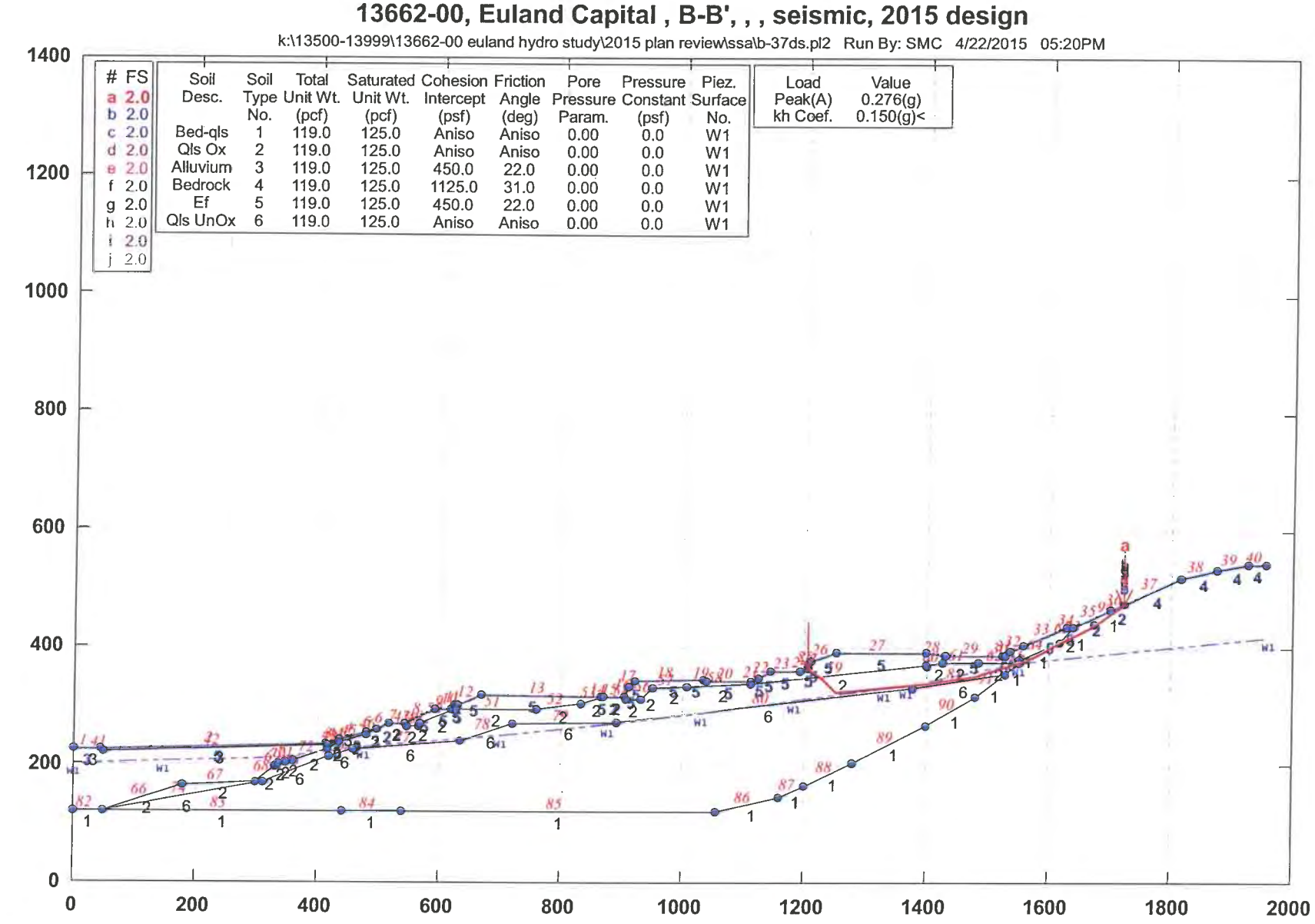
13662-00, Euland Capital , B-B',

Anisotropic Soil Definition



Soil6

13662-00, Euland Capital , B-B',


13662-00, Euland Capital , B-B', , , seismic, 2015 design
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FS
a 2.0
b 2.0
c 2.0
d 2.0
e 2.0
f 2.0
g 2.0
h 2.0
i 2.0
j 2.0
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=2.0
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-11.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/22/2015
Time of Run: 05:20PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ds.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ds.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ds.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , seismic, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	22.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	20.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	20.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	20.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1252.00	326.00	1400.00	340.00	5.00
2	1401.00	340.00	1401.00	340.00	5.00
3	1480.00	352.00	1480.00	352.00	5.00
4	1545.00	375.00	1550.00	375.00	5.00
5	1560.00	380.00	1560.00	380.00	5.00

6	1618.00	410.00	1618.00	410.00	5.00
7	1673.00	440.00	1673.00	440.00	5.00
8	1722.00	475.00	1722.00	475.00	0.00

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 = 2000

Number of Trial Surfaces With Valid FS = 2000

Statistical Data On All Valid FS Values:

FS Max = 2.529 FS Min = 1.963 FS Ave = 2.116

Standard Deviation = 0.232 Coefficient of Variation = 10.95 %

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1205.274	365.713
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety

*** 1.963 ***

Individual data on the 28 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.7	4351.2	0.0	0.0	0.	0.	652.7	0.0	0.0
2	18.2	52783.7	0.0	0.0	0.	0.	7917.5	0.0	0.0
3	3.6	15348.0	0.0	0.0	0.	0.	2302.2	0.0	0.0
4	21.2	130426.1	0.0	0.0	0.	0.	19563.9	0.0	0.0
5	0.0	302.9	0.0	0.0	0.	0.	45.4	0.0	0.0
6	117.2	837372.6	0.0	0.0	0.	0.	*******	0.0	0.0
7	29.8	188658.4	0.0	3262.0	0.	0.	28298.8	0.0	0.0
8	1.0	6163.8	0.0	222.6	0.	0.	924.6	0.0	0.0
9	26.0	148765.9	0.0	6667.4	0.	0.	22314.9	0.0	0.0
10	3.0	15723.7	0.0	861.3	0.	0.	2358.6	0.0	0.0
11	50.0	231459.0	0.0	17158.4	0.	0.	34718.8	0.0	0.0
12	5.0	19876.1	0.0	1968.1	0.	0.	2981.4	0.0	0.0
13	40.0	126028.2	0.0	11209.3	0.	0.	18904.2	0.0	0.0
14	5.0	11646.6	0.0	834.3	0.	0.	1747.0	0.0	0.0
15	7.0	18150.7	0.0	956.3	0.	0.	2722.6	0.0	0.0
16	11.7	35761.7	0.0	1048.3	0.	0.	5364.3	0.0	0.0
17	0.7	2162.2	0.0	39.8	0.	0.	324.3	0.0	0.0
18	0.6	1894.1	0.0	32.7	0.	0.	284.1	0.0	0.0
19	1.0	3175.5	0.0	42.3	0.	0.	476.3	0.0	0.0
20	1.7	5379.5	0.0	27.6	0.	0.	806.9	0.0	0.0
21	4.3	13781.5	0.0	0.0	0.	0.	2067.2	0.0	0.0
22	3.0	9647.9	0.0	0.0	0.	0.	1447.2	0.0	0.0
23	58.0	162913.2	0.0	0.0	0.	0.	24437.0	0.0	0.0
24	12.0	28027.2	0.0	0.0	0.	0.	4204.1	0.0	0.0
25	8.0	17199.8	0.0	0.0	0.	0.	2580.0	0.0	0.0
26	35.0	66591.2	0.0	0.0	0.	0.	9988.7	0.0	0.0
27	27.0	34749.7	0.0	0.0	0.	0.	5212.5	0.0	0.0
28	22.0	8741.4	0.0	0.0	0.	0.	1311.2	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1205.274	365.713
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613

7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 1.963 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1205.274	365.713
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 1.963 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1205.274	365.713
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 1.963 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1205.274	365.713
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 1.963 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1205.274	365.713
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety

*** 1.963 ***
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1205.274	365.713
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 1.963 ***
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1205.274	365.713
2	1228.204	350.246
3	1231.826	346.625
4	1253.039	325.412
5	1401.000	339.380
6	1480.000	353.613
7	1549.403	373.984
8	1560.000	378.210
9	1618.000	409.760
10	1673.000	437.854
11	1722.000	475.000

Factor of Safety
*** 1.963 ***
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.842	364.934
2	1226.848	350.091
3	1231.247	345.692
4	1252.461	324.478
5	1401.000	339.594
6	1480.000	353.672
7	1547.040	372.636
8	1560.000	379.206
9	1618.000	411.850
10	1673.000	439.787
11	1722.000	475.000

Factor of Safety
*** 1.992 ***
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.842	364.934
2	1226.848	350.091
3	1231.247	345.692
4	1252.461	324.478
5	1401.000	339.594
6	1480.000	353.672
7	1547.040	372.636
8	1560.000	379.206
9	1618.000	411.850
10	1673.000	439.787
11	1722.000	475.000

Factor of Safety
*** 1.992 ***
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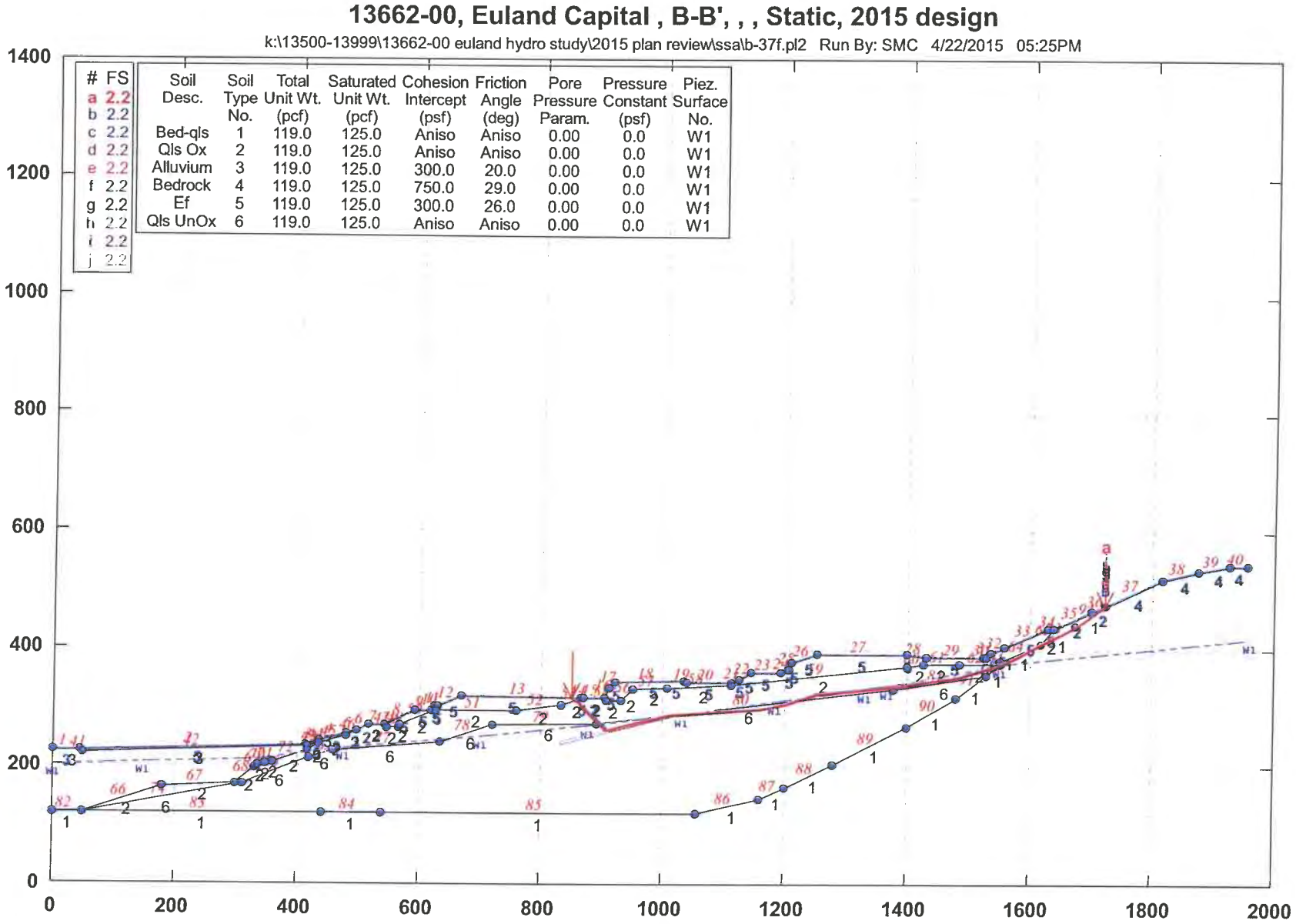
13662-00, Euland Capital , B-B', , , Static, 2015 design
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FS
a 2.2
b 2.2
c 2.2
d 2.2
e 2.2
f 2.2
g 2.2
h 2.2
i 2.2
j 2.2
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=2.2
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-12.1

13662-00, Euland Capital , B-B', , , Static, 2015 design

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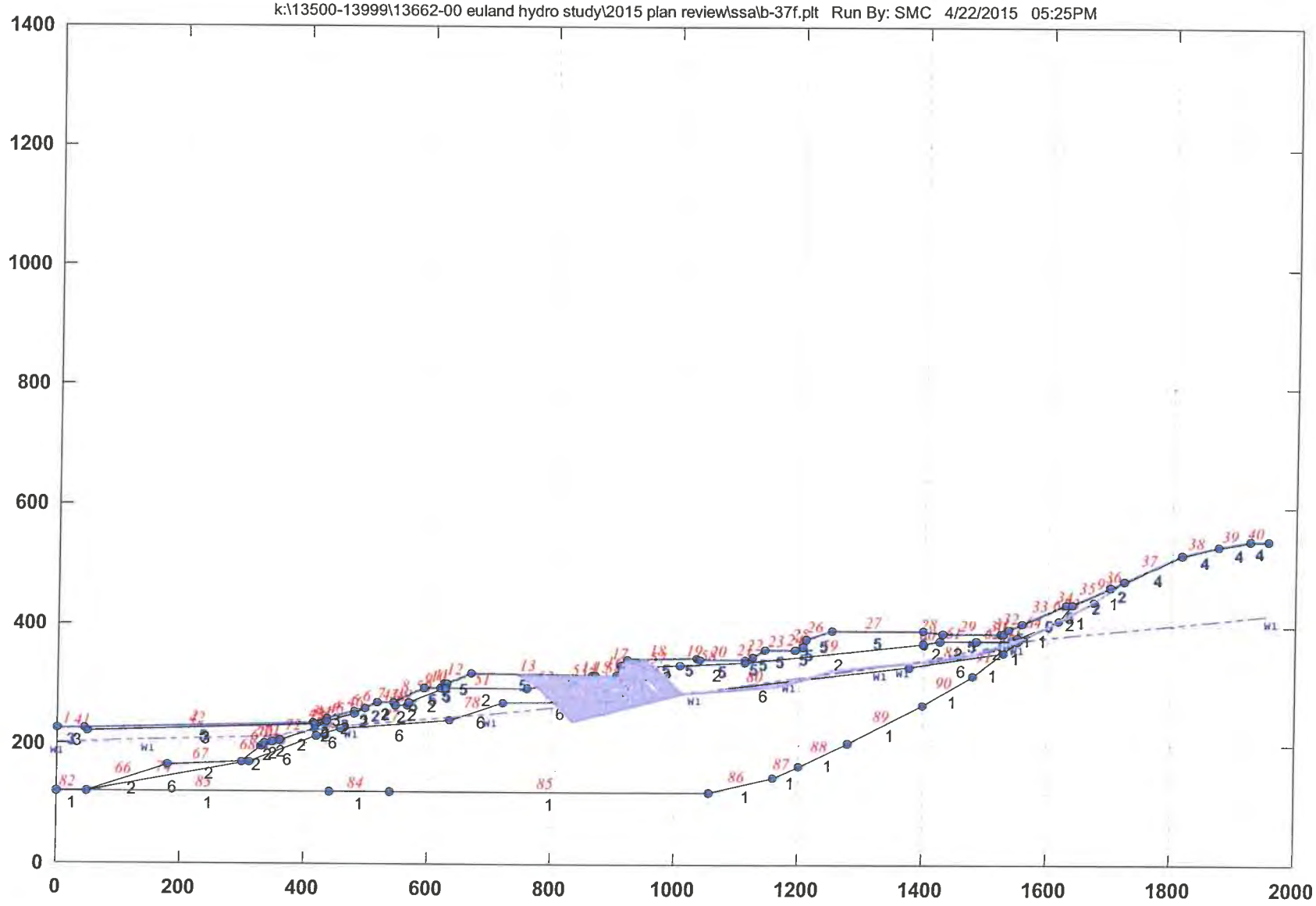

SMC

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 05:25PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37f.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37f.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37f.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Static, 2015 design

BOUNDARY COORDINATES

40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	20.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	20.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	20.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
13 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	832.00	240.00	1012.00	287.00	5.00
2	1013.00	287.00	1013.00	287.00	5.00
3	1160.00	299.00	1160.00	299.00	5.00
4	1200.00	308.00	1200.00	308.00	5.00
5	1252.00	326.00	1252.00	326.00	5.00
6	1400.00	340.00	1400.00	340.00	5.00
7	1401.00	340.00	1401.00	340.00	5.00
8	1480.00	352.00	1480.00	352.00	5.00
9	1545.00	375.00	1550.00	375.00	5.00

10	1560.00	380.00	1560.00	380.00	5.00
11	1618.00	410.00	1618.00	410.00	5.00
12	1673.00	440.00	1673.00	440.00	5.00
13	1722.00	475.00	1722.00	475.00	0.00

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 = 2000

Number of Trial Surfaces With Valid FS = 2000

Statistical Data On All Valid FS Values:

FS Max = 3.475 FS Min = 2.185 FS Ave = 2.471

Standard Deviation = 0.338 Coefficient of Variation = 13.69 %

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	850.405	316.149
2	857.506	311.712
3	861.306	307.912
4	878.984	290.234
5	896.661	272.556
6	907.707	261.511
7	1013.000	289.258
8	1160.000	298.160
9	1200.000	307.167
10	1252.000	323.749
11	1400.000	339.123
12	1401.000	341.259
13	1480.000	352.876
14	1547.474	373.442
15	1560.000	378.176
16	1618.000	408.047
17	1673.000	439.773
18	1722.000	475.000

Factor of Safety

*** 2.185 ***

Individual data on the 60 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.1	1843.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.8	2824.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	3.7	4375.9	0.0	0.0	0.	0.	0.0	0.0	0.0
4	5.0	8200.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	9.0	21674.2	0.0	0.0	0.	0.	0.0	0.0	0.0
6	17.7	70692.6	0.0	0.0	0.	0.	0.0	0.0	0.0
7	0.1	522.9	0.0	0.0	0.	0.	0.0	0.0	0.0
8	8.2	45959.9	0.0	3355.2	0.	0.	0.0	0.0	0.0
9	1.0	6314.4	0.0	864.3	0.	0.	0.0	0.0	0.0
10	0.9	6302.5	0.0	898.8	0.	0.	0.0	0.0	0.0
11	0.8	5472.1	0.0	805.0	0.	0.	0.0	0.0	0.0
12	4.3	33723.0	0.0	3320.6	0.	0.	0.0	0.0	0.0
13	8.0	71749.7	0.0	5769.8	0.	0.	0.0	0.0	0.0
14	11.0	102559.4	0.0	7045.4	0.	0.	0.0	0.0	0.0
15	19.0	168285.6	0.0	9747.4	0.	0.	0.0	0.0	0.0
16	43.5	342708.0	0.0	10761.9	0.	0.	0.0	0.0	0.0
17	7.4	52591.0	0.0	233.5	0.	0.	0.0	0.0	0.0
18	5.1	35408.8	0.0	0.0	0.	0.	0.0	0.0	0.0
19	7.0	47028.1	0.0	0.0	0.	0.	0.0	0.0	0.0
20	20.0	131014.1	0.0	0.0	0.	0.	0.0	0.0	0.0
21	2.9	18489.0	0.0	0.0	0.	0.	0.0	0.0	0.0
22	2.1	12975.2	0.0	9.7	0.	0.	0.0	0.0	0.0
23	22.9	138033.4	0.0	1369.4	0.	0.	0.0	0.0	0.0
24	52.1	300164.4	0.0	11704.8	0.	0.	0.0	0.0	0.0
25	11.0	64987.3	0.0	3999.8	0.	0.	0.0	0.0	0.0
26	20.0	137475.7	0.0	8636.9	0.	0.	0.0	0.0	0.0
27	16.0	119450.9	0.0	8177.4	0.	0.	0.0	0.0	0.0
28	23.0	163227.4	0.0	11285.9	0.	0.	0.0	0.0	0.0
29	10.0	66456.2	0.0	3939.3	0.	0.	0.0	0.0	0.0

30	7.0	46108.2	0.0	2421.4	0.	0.	0.0	0.0	0.0
31	5.0	33455.8	0.0	1521.5	0.	0.	0.0	0.0	0.0
32	3.0	21133.2	0.0	763.0	0.	0.	0.0	0.0	0.0
33	2.0	15834.1	0.0	461.9	0.	0.	0.0	0.0	0.0
34	18.1	145926.4	0.0	1953.5	0.	0.	0.0	0.0	0.0
35	23.9	190600.5	0.0	0.0	0.	0.	0.0	0.0	0.0
36	1.0	7978.7	0.0	0.0	0.	0.	0.0	0.0	0.0
37	111.3	812639.8	0.0	0.0	0.	0.	0.0	0.0	0.0
38	3.7	24531.2	0.0	23.2	0.	0.	0.0	0.0	0.0
39	32.0	204245.5	0.0	3863.0	0.	0.	0.0	0.0	0.0
40	1.0	6056.6	0.0	399.2	0.	0.	0.0	0.0	0.0
41	26.0	144060.9	0.0	4308.1	0.	0.	0.0	0.0	0.0
42	3.0	15360.7	0.0	677.5	0.	0.	0.0	0.0	0.0
43	50.0	230891.4	0.0	16787.6	0.	0.	0.0	0.0	0.0
44	5.0	20318.9	0.0	2200.4	0.	0.	0.0	0.0	0.0
45	40.0	128301.8	0.0	12405.8	0.	0.	0.0	0.0	0.0
46	5.0	11772.2	0.0	901.1	0.	0.	0.0	0.0	0.0
47	7.0	18267.4	0.0	1019.0	0.	0.	0.0	0.0	0.0
48	10.5	31888.9	0.0	996.2	0.	0.	0.0	0.0	0.0
49	1.5	4616.8	0.0	86.0	0.	0.	0.0	0.0	0.0
50	1.1	3319.2	0.0	47.4	0.	0.	0.0	0.0	0.0
51	1.0	3155.0	0.0	31.1	0.	0.	0.0	0.0	0.0
52	1.2	3952.8	0.0	13.9	0.	0.	0.0	0.0	0.0
53	4.8	15141.9	0.0	0.0	0.	0.	0.0	0.0	0.0
54	3.0	9649.0	0.0	0.0	0.	0.	0.0	0.0	0.0
55	58.0	168945.7	0.0	0.0	0.	0.	0.0	0.0	0.0
56	12.0	29908.7	0.0	0.0	0.	0.	0.0	0.0	0.0
57	8.0	17825.3	0.0	0.0	0.	0.	0.0	0.0	0.0
58	35.0	63413.2	0.0	0.0	0.	0.	0.0	0.0	0.0
59	27.0	30282.8	0.0	0.0	0.	0.	0.0	0.0	0.0
60	22.0	7613.6	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	855.751	316.094
2	861.206	312.686
3	865.481	308.410
4	883.159	290.732
5	900.837	273.055
6	911.310	262.581
7	1013.000	287.532
8	1160.000	299.110
9	1200.000	306.574
10	1252.000	323.644
11	1400.000	337.788
12	1401.000	338.225
13	1480.000	353.924
14	1547.730	375.603
15	1560.000	379.731
16	1618.000	408.528
17	1673.000	439.961
18	1722.000	475.000

Factor of Safety

*** 2.198 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	853.816	316.114
2	859.867	312.333
3	863.970	308.230
4	881.648	290.552
5	899.326	272.874
6	911.135	261.065
7	1013.000	288.836
8	1160.000	296.624
9	1200.000	306.237
10	1252.000	323.893
11	1400.000	339.560
12	1401.000	339.958
13	1480.000	351.555

14	1549.913	372.570
15	1560.000	381.972
16	1618.000	409.480
17	1673.000	440.561
18	1722.000	475.000

Factor of Safety
*** 2.199 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	847.503	316.179
2	855.497	311.183
3	859.039	307.641
4	876.717	289.963
5	894.395	272.286
6	907.443	259.237
7	1013.000	286.214
8	1160.000	299.432
9	1200.000	309.162
10	1252.000	324.122
11	1400.000	341.782
12	1401.000	341.360
13	1480.000	351.824
14	1545.748	373.894
15	1560.000	379.038
16	1618.000	409.475
17	1673.000	438.174
18	1722.000	475.000

Factor of Safety
*** 2.202 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	851.882	316.134
2	858.528	311.981
3	862.459	308.049
4	880.137	290.372
5	897.815	272.694
6	910.959	259.550
7	1013.000	285.139
8	1160.000	299.139
9	1200.000	305.900
10	1252.000	324.142
11	1400.000	341.333
12	1401.000	341.692
13	1480.000	354.187
14	1547.096	374.538
15	1560.000	379.214
16	1618.000	410.432
17	1673.000	441.162
18	1722.000	475.000

Factor of Safety
*** 2.203 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	853.646	316.116
2	859.749	312.302
3	863.838	308.214
4	881.515	290.536
5	899.193	272.858
6	910.080	261.972
7	1013.000	286.658
8	1160.000	296.712
9	1200.000	309.216
10	1252.000	325.387
11	1400.000	340.195
12	1401.000	340.359
13	1480.000	352.346
14	1548.009	374.377

15	1560.000	380.420
16	1618.000	410.193
17	1673.000	439.165
18	1722.000	475.000

Factor of Safety
*** 2.204 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	849.268	316.161
2	856.719	311.505
3	860.418	307.806
4	878.095	290.128
5	895.773	272.450
6	906.564	261.659
7	1013.000	287.732
8	1160.000	297.005
9	1200.000	307.477
10	1252.000	325.367
11	1400.000	340.644
12	1401.000	340.027
13	1480.000	349.983
14	1546.661	373.733
15	1560.000	380.244
16	1618.000	409.236
17	1673.000	441.176
18	1722.000	475.000

Factor of Safety
*** 2.205 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	851.797	316.135
2	858.469	311.965
3	862.393	308.041
4	880.071	290.364
5	897.748	272.686
6	910.431	260.003
7	1013.000	289.050
8	1160.000	296.683
9	1200.000	309.889
10	1252.000	324.889
11	1400.000	341.650
12	1401.000	341.892
13	1480.000	352.083
14	1548.644	375.442
15	1560.000	380.937
16	1618.000	408.288
17	1673.000	437.964
18	1722.000	475.000

Factor of Safety
*** 2.206 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	853.561	316.117
2	859.690	312.287
3	863.771	308.206
4	881.449	290.528
5	899.127	272.851
6	909.552	262.425
7	1013.000	285.569
8	1160.000	299.256
9	1200.000	308.205
10	1252.000	326.134
11	1400.000	340.512
12	1401.000	340.559
13	1480.000	350.242
14	1549.557	375.280
15	1560.000	382.143

16	1618.000	408.049
17	1673.000	440.966
18	1722.000	475.000

Factor of Safety

*** 2.209 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	849.438	316.159
2	856.836	311.536
3	860.550	307.821
4	878.228	290.144
5	895.906	272.466
6	907.619	260.753
7	1013.000	284.910
8	1160.000	296.917
9	1200.000	309.499
10	1252.000	323.873
11	1400.000	340.009
12	1401.000	339.626
13	1480.000	354.192
14	1548.565	376.926
15	1560.000	381.797
16	1618.000	408.523
17	1673.000	437.573
18	1722.000	475.000

Factor of Safety

*** 2.211 ***

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

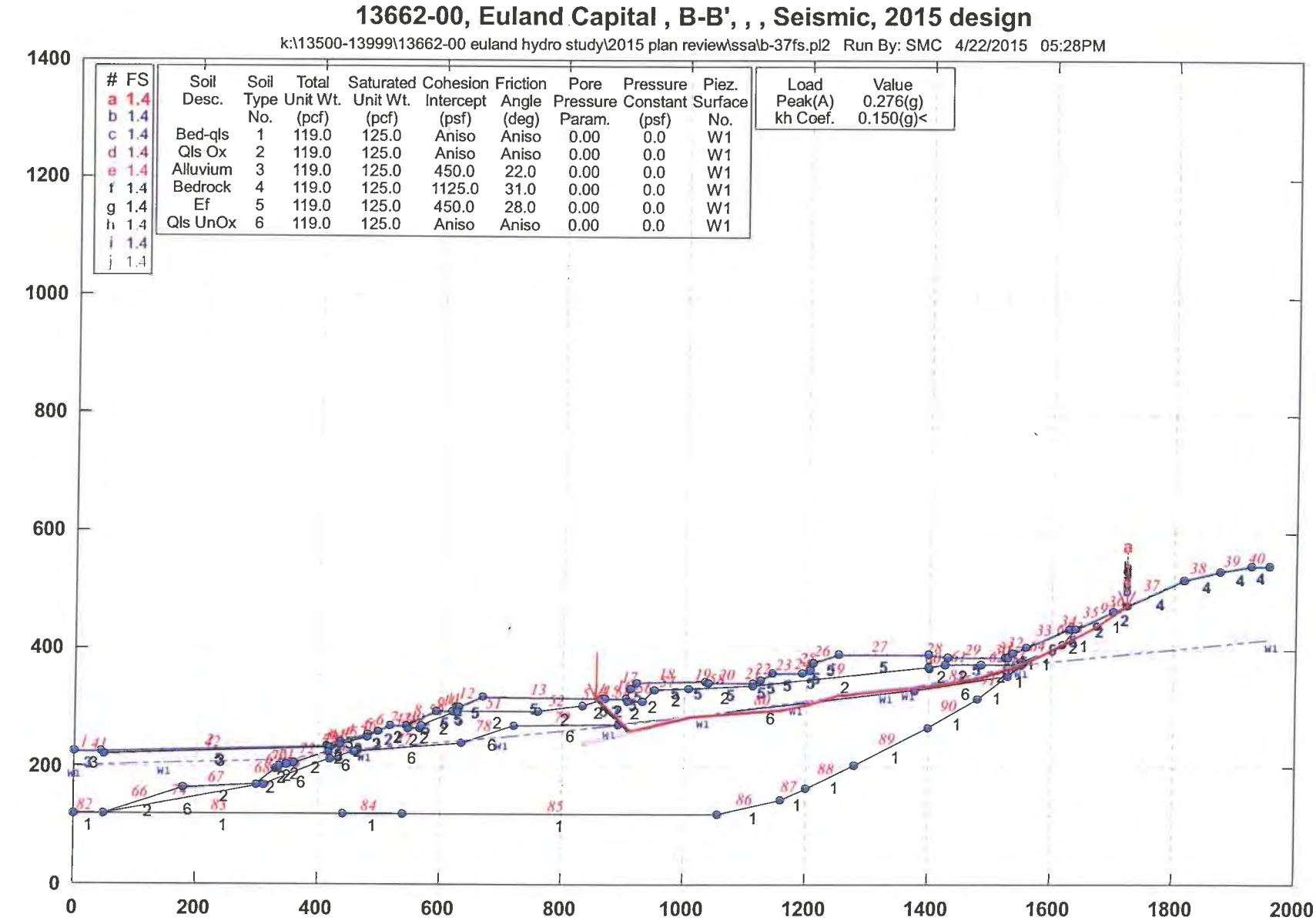

13662-00, Euland Capital , B-B', , , Seismic, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37fs.pl2 Run By: SMC 4/22/2015 05:28PM
FS
a 1.4
b 1.4
c 1.4
d 1.4
e 1.4
f 1.4
g 1.4
h 1.4
i 1.4
j 1.4
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.4
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-12.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

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: 4/22/2015
Time of Run: 05:28PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37fs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37fs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37fs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Seismic, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	20.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	20.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	20.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
13 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	832.00	240.00	1012.00	287.00	5.00
2	1013.00	287.00	1013.00	287.00	5.00
3	1160.00	299.00	1160.00	299.00	5.00
4	1200.00	308.00	1200.00	308.00	5.00
5	1252.00	326.00	1252.00	326.00	5.00

6	1400.00	340.00	1400.00	340.00	5.00
7	1401.00	340.00	1401.00	340.00	5.00
8	1480.00	352.00	1480.00	352.00	5.00
9	1545.00	375.00	1550.00	375.00	5.00
10	1560.00	380.00	1560.00	380.00	5.00
11	1618.00	410.00	1618.00	410.00	5.00
12	1673.00	440.00	1673.00	440.00	5.00
13	1722.00	475.00	1722.00	475.00	0.00

WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	905.20	313.99
2	911.85	310.00
3	926.00	295.85
4	943.68	278.17
5	950.07	271.78
6	1013.00	285.06
7	1160.00	297.13
8	1200.00	308.36
9	1252.00	323.73
10	1400.00	341.96
11	1401.00	338.51
12	1480.00	353.60
13	1546.46	374.21
14	1560.00	378.04
15	1618.00	408.58
16	1673.00	440.03
17	1722.00	475.00

Factor of Safety for the Preceding Surface is Between 1.500 and 5.859
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	907.40	321.18
2	926.02	310.00
3	938.66	297.36
4	956.34	279.68
5	961.94	274.08
6	1013.00	287.06
7	1160.00	299.89
8	1200.00	308.61
9	1252.00	326.92
10	1400.00	342.32
11	1401.00	339.01
12	1480.00	350.95
13	1549.14	373.88
14	1560.00	379.26
15	1618.00	409.31
16	1673.00	441.99
17	1722.00	475.00

Factor of Safety for the Preceding Surface is Between-3.381 and 1.534
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	789.35	316.77
2	791.84	315.27
3	813.27	302.40
4	826.55	289.12
5	844.22	271.44
6	847.05	268.62
7	864.73	250.94
8	1013.00	288.02
9	1160.00	300.49
10	1200.00	307.29
11	1252.00	324.63

12	1400.00	342.49
13	1401.00	337.58
14	1480.00	351.36
15	1546.12	377.06
16	1560.00	378.65
17	1618.00	410.85
18	1673.00	439.12
19	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.463
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	745.03	317.22
2	756.46	310.36
3	777.89	297.48
4	786.71	288.66
5	804.39	270.98
6	815.32	260.05
7	833.00	242.37
8	1013.00	288.34
9	1160.00	296.89
10	1200.00	308.98
11	1252.00	324.58
12	1400.00	342.42
13	1401.00	337.95
14	1480.00	351.41
15	1545.09	374.75
16	1560.00	380.69
17	1618.00	407.71
18	1673.00	440.02
19	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.521
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	892.75	315.00
2	895.73	312.02
3	913.41	294.34
4	931.09	276.66
5	938.73	269.02
6	1013.00	289.15
7	1160.00	296.82
8	1200.00	309.13
9	1252.00	324.80
10	1400.00	341.28
11	1401.00	337.81
12	1480.00	353.36
13	1547.24	373.63
14	1560.00	380.10
15	1618.00	409.99
16	1673.00	441.27
17	1722.00	475.00

Factor of Safety for the Preceding Surface is Between 1.336 and 1.322
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.48	316.73
2	795.14	315.73
3	816.57	302.86
4	830.26	289.17
5	847.93	271.49
6	850.04	269.38
7	867.72	251.71
8	1013.00	285.85

9	1160.00	297.74
10	1200.00	308.02
11	1252.00	325.40
12	1400.00	342.36
13	1401.00	338.11
14	1480.00	351.62
15	1549.02	373.61
16	1560.00	380.55
17	1618.00	409.66
18	1673.00	438.91
19	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.414
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	825.61	316.40
2	840.76	307.30
3	840.89	307.17
4	858.56	289.49
5	876.24	271.82
6	893.56	254.50
7	1013.00	289.21
8	1160.00	298.09
9	1200.00	307.55
10	1252.00	323.80
11	1400.00	341.81
12	1401.00	338.30
13	1480.00	349.74
14	1548.17	374.35
15	1560.00	381.09
16	1618.00	409.69
17	1673.00	440.62
18	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.349
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	825.44	316.40
2	840.64	307.27
3	840.74	307.17
4	858.42	289.49
5	876.10	271.82
6	892.50	255.41
7	1013.00	287.03
8	1160.00	298.18
9	1200.00	305.52
10	1252.00	325.29
11	1400.00	342.44
12	1401.00	338.70
13	1480.00	350.53
14	1546.27	376.15
15	1560.00	379.54
16	1618.00	410.41
17	1673.00	439.22
18	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.397
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	933.61	344.12
2	935.10	343.23
3	956.53	330.35
4	966.42	320.46
5	984.10	302.78

6	1001.78	285.10
7	1003.60	283.28
8	1013.00	288.08
9	1160.00	298.92
10	1200.00	308.45
11	1252.00	327.91
12	1400.00	342.25
13	1401.00	338.19
14	1480.00	352.21
15	1546.86	372.52
16	1560.00	378.10
17	1618.00	408.65
18	1673.00	439.65
19	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.525
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	809.47	316.57
2	829.33	304.63
3	844.63	289.33
4	862.31	271.65
5	864.54	269.42
6	882.22	251.75
7	1013.00	288.30
8	1160.00	297.78
9	1200.00	308.31
10	1252.00	324.86
11	1400.00	341.13
12	1401.00	337.60
13	1480.00	354.49
14	1548.95	373.77
15	1560.00	378.15
16	1618.00	411.11
17	1673.00	441.86
18	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.378
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	888.85	315.00
2	892.24	311.60
3	909.92	293.93
4	927.60	276.25
5	934.69	269.16
6	1013.00	289.14
7	1160.00	299.66
8	1200.00	306.38
9	1252.00	325.52
10	1400.00	342.05
11	1401.00	337.68
12	1480.00	353.89
13	1547.44	373.89
14	1560.00	381.65
15	1618.00	411.89
16	1673.00	440.08
17	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.446
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	855.61	316.10
2	861.26	312.70
3	865.55	308.42

4	883.23	290.74
5	900.90	273.06
6	911.84	262.13
7	1013.00	288.62
8	1160.00	296.57
9	1200.00	307.58
10	1252.00	327.90
11	1400.00	342.47
12	1401.00	338.02
13	1480.00	351.03
14	1546.18	374.70
15	1560.00	378.01
16	1618.00	410.67
17	1673.00	438.16
18	1722.00	475.00

Factor Of Safety For The Preceding Specified Surface = 1.358
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	749.16	317.18
2	759.75	310.82
3	781.18	297.94
4	790.42	288.70

##################### SOME LINES SKIPPED #####################

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 = 2000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 53
Number of Trial Surfaces with Misleading FS = 90
Number of Trial Surfaces With Valid FS = 1857
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 7.2 %
Statistical Data On All Valid FS Values:
FS Max = 1.998 FS Min = 1.390 FS Ave = 1.464
Standard Deviation = 0.150 Coefficient of Variation = 10.26 %
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	855.529	316.097
2	861.206	312.686
3	865.481	308.410
4	883.159	290.732
5	900.837	273.055
6	911.310	262.581
7	1013.000	287.532
8	1160.000	299.110
9	1200.000	306.574
10	1252.000	323.644
11	1400.000	337.788
12	1401.000	338.225
13	1480.000	353.924
14	1547.730	375.603
15	1560.000	379.731
16	1618.000	408.528
17	1673.000	439.961
18	1722.000	475.000

Factor of Safety
*** 1.390 ***

Individual data on the 59 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	5.7	1132.5	0.0	0.0	0.	0.	169.9	0.0	0.0

2	3.8	2361.8	0.0	0.0	0.	0.	354.3	0.0	0.0
3	0.5	418.3	0.0	0.0	0.	0.	62.7	0.0	0.0
4	4.5	5001.3	0.0	0.0	0.	0.	750.2	0.0	0.0
5	13.2	27698.6	0.0	0.0	0.	0.	4154.8	0.0	0.0
6	17.7	69644.3	0.0	0.0	0.	0.	10446.7	0.0	0.0
7	0.1	306.7	0.0	0.0	0.	0.	46.0	0.0	0.0
8	4.1	21561.8	0.0	832.4	0.	0.	3234.3	0.0	0.0
9	1.0	5730.4	0.0	455.3	0.	0.	859.6	0.0	0.0
10	0.9	5755.8	0.0	515.9	0.	0.	863.4	0.0	0.0
11	4.4	31907.8	0.0	3559.8	0.	0.	4786.2	0.0	0.0
12	0.7	5748.0	0.0	515.6	0.	0.	862.2	0.0	0.0
13	8.0	71714.2	0.0	5726.7	0.	0.	10757.1	0.0	0.0
14	11.0	102747.7	0.0	7110.9	0.	0.	15412.2	0.0	0.0
15	19.0	169257.6	0.0	10200.7	0.	0.	25388.6	0.0	0.0
16	54.3	426620.2	0.0	14619.6	0.	0.	63993.0	0.0	0.0
17	1.7	11707.2	0.0	107.3	0.	0.	1756.1	0.0	0.0
18	7.0	48434.5	0.0	230.3	0.	0.	7265.2	0.0	0.0
19	18.0	121432.2	0.0	651.1	0.	0.	18214.8	0.0	0.0
20	2.0	13332.3	0.0	136.9	0.	0.	1999.8	0.0	0.0
21	5.0	32284.9	0.0	399.7	0.	0.	4842.7	0.0	0.0
22	1.9	11859.2	0.0	173.2	0.	0.	1778.9	0.0	0.0
23	73.1	431852.7	0.0	15656.4	0.	0.	64777.9	0.0	0.0
24	11.0	64720.3	0.0	3872.2	0.	0.	9708.0	0.0	0.0
25	20.0	136285.2	0.0	8056.5	0.	0.	20442.8	0.0	0.0
26	16.0	117843.4	0.0	7389.2	0.	0.	17676.5	0.0	0.0
27	23.0	161773.0	0.0	10467.7	0.	0.	24265.9	0.0	0.0
28	10.0	66619.1	0.0	3991.5	0.	0.	9992.9	0.0	0.0
29	7.0	46509.0	0.0	2604.8	0.	0.	6976.4	0.0	0.0
30	5.0	33811.8	0.0	1711.1	0.	0.	5071.8	0.0	0.0
31	5.0	37293.9	0.0	1398.4	0.	0.	5594.1	0.0	0.0
32	0.5	3660.5	0.0	110.6	0.	0.	549.1	0.0	0.0
33	19.4	156984.4	0.0	2355.8	0.	0.	23547.7	0.0	0.0
34	22.1	177438.7	0.0	0.0	0.	0.	26615.8	0.0	0.0
35	1.0	7991.7	0.0	0.0	0.	0.	1198.8	0.0	0.0
36	94.6	706412.9	0.0	0.0	0.	0.	*******	0.0	0.0
37	20.4	138925.2	0.0	801.7	0.	0.	20838.8	0.0	0.0
38	32.0	209050.1	0.0	6218.8	0.	0.	31357.5	0.0	0.0
39	1.0	6329.4	0.0	330.2	0.	0.	949.4	0.0	0.0
40	26.0	151732.4	0.0	8168.3	0.	0.	22759.9	0.0	0.0
41	3.0	15965.2	0.0	984.6	0.	0.	2394.8	0.0	0.0
42	50.0	232417.3	0.0	17694.2	0.	0.	34862.6	0.0	0.0
43	5.0	19641.1	0.0	1862.2	0.	0.	2946.2	0.0	0.0
44	40.0	121162.1	0.0	8796.0	0.	0.	18174.3	0.0	0.0
45	5.0	10665.1	0.0	336.8	0.	0.	1599.8	0.0	0.0
46	7.0	16637.3	0.0	186.8	0.	0.	2495.6	0.0	0.0
47	0.4	1187.6	0.0	0.6	0.	0.	178.1	0.0	0.0
48	8.4	23456.0	0.0	0.0	0.	0.	3518.4	0.0	0.0
49	1.9	5401.2	0.0	0.0	0.	0.	810.2	0.0	0.0
50	2.6	7431.8	0.0	0.0	0.	0.	1114.8	0.0	0.0
51	0.7	2066.1	0.0	0.0	0.	0.	309.9	0.0	0.0
52	6.0	17805.5	0.0	0.0	0.	0.	2670.8	0.0	0.0
53	3.0	9071.6	0.0	0.0	0.	0.	1360.7	0.0	0.0
54	58.0	161919.0	0.0	0.0	0.	0.	24287.8	0.0	0.0
55	12.0	29267.5	0.0	0.0	0.	0.	4390.1	0.0	0.0
56	8.0	17448.5	0.0	0.0	0.	0.	2617.3	0.0	0.0
57	35.0	62241.9	0.0	0.0	0.	0.	9336.3	0.0	0.0
58	27.0	29845.2	0.0	0.0	0.	0.	4476.8	0.0	0.0
59	22.0	7503.1	0.0	0.0	0.	0.	1125.5	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	850.116	316.152
2	857.506	311.712
3	861.306	307.912
4	878.984	290.234
5	896.661	272.556
6	907.707	261.511
7	1013.000	289.258
8	1160.000	298.160
9	1200.000	307.167

10	1252.000	323.749
11	1400.000	339.123
12	1401.000	341.259
13	1480.000	352.876
14	1547.474	373.442
15	1560.000	378.176
16	1618.000	408.047
17	1673.000	439.773
18	1722.000	475.000

Factor of Safety
*** 1.391 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	853.312	316.119
2	859.690	312.287
3	863.771	308.206
4	881.449	290.528
5	899.127	272.851
6	909.552	262.425
7	1013.000	285.569
8	1160.000	299.256
9	1200.000	308.205
10	1252.000	326.134
11	1400.000	340.512
12	1401.000	340.559
13	1480.000	350.242
14	1549.557	375.280
15	1560.000	382.143
16	1618.000	408.049
17	1673.000	440.966
18	1722.000	475.000

Factor of Safety
*** 1.393 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	848.965	316.164
2	856.719	311.505
3	860.418	307.806
4	878.095	290.128
5	895.773	272.450
6	906.564	261.659
7	1013.000	287.732
8	1160.000	297.005
9	1200.000	307.477
10	1252.000	325.367
11	1400.000	340.644
12	1401.000	340.027
13	1480.000	349.983
14	1546.661	373.733
15	1560.000	380.244
16	1618.000	409.236
17	1673.000	441.176
18	1722.000	475.000

Factor of Safety
*** 1.393 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	855.443	316.098
2	861.147	312.670
3	865.415	308.402
4	883.093	290.724
5	900.770	273.047
6	910.783	263.034
7	1013.000	286.443
8	1160.000	296.654
9	1200.000	305.563
10	1252.000	324.391

11	1400.000	338.105
12	1401.000	338.425
13	1480.000	351.819
14	1549.278	376.506
15	1560.000	381.455
16	1618.000	411.384
17	1673.000	441.762
18	1722.000	475.000

Factor of Safety

*** 1.393 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	853.398	316.118
2	859.749	312.302
3	863.838	308.214
4	881.515	290.536
5	899.193	272.858
6	910.080	261.972
7	1013.000	286.658
8	1160.000	296.712
9	1200.000	309.216
10	1252.000	325.387
11	1400.000	340.195
12	1401.000	340.359
13	1480.000	352.346
14	1548.009	374.377
15	1560.000	380.420
16	1618.000	410.193
17	1673.000	439.165
18	1722.000	475.000

Factor of Safety

*** 1.394 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	851.096	316.142
2	858.175	311.888
3	862.061	308.002
4	879.739	290.324
5	897.417	272.646
6	907.795	262.269
7	1013.000	288.606
8	1160.000	299.403
9	1200.000	309.836
10	1252.000	323.624
11	1400.000	338.237
12	1401.000	337.893
13	1480.000	351.560
14	1546.383	374.958
15	1560.000	379.555
16	1618.000	407.570
17	1673.000	441.972
18	1722.000	475.000

Factor of Safety

*** 1.395 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	849.137	316.162
2	856.836	311.536
3	860.550	307.821
4	878.228	290.144
5	895.906	272.466
6	907.619	260.753
7	1013.000	284.910
8	1160.000	296.917
9	1200.000	309.499
10	1252.000	323.873
11	1400.000	340.009

12	1401.000	339.626
13	1480.000	354.192
14	1548.565	376.926
15	1560.000	381.797
16	1618.000	408.523
17	1673.000	437.573
18	1722.000	475.000

Factor of Safety

*** 1.397 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	853.570	316.117
2	859.867	312.333
3	863.970	308.230
4	881.648	290.552
5	899.326	272.874
6	911.135	261.065
7	1013.000	288.836
8	1160.000	296.624
9	1200.000	306.237
10	1252.000	323.893
11	1400.000	339.560
12	1401.000	339.958
13	1480.000	351.555
14	1549.913	372.570
15	1560.000	381.972
16	1618.000	409.480
17	1673.000	440.561
18	1722.000	475.000

Factor of Safety

*** 1.398 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	859.790	316.053
2	864.119	313.452
3	868.769	308.802
4	886.446	291.125
5	904.124	273.447
6	913.771	263.800
7	1013.000	289.280
8	1160.000	298.904
9	1200.000	306.291
10	1252.000	325.157
11	1400.000	337.973
12	1401.000	338.957
13	1480.000	352.078
14	1547.174	373.054
15	1560.000	378.354
16	1618.000	410.197
17	1673.000	441.552
18	1722.000	475.000

Factor of Safety

*** 1.400 ***

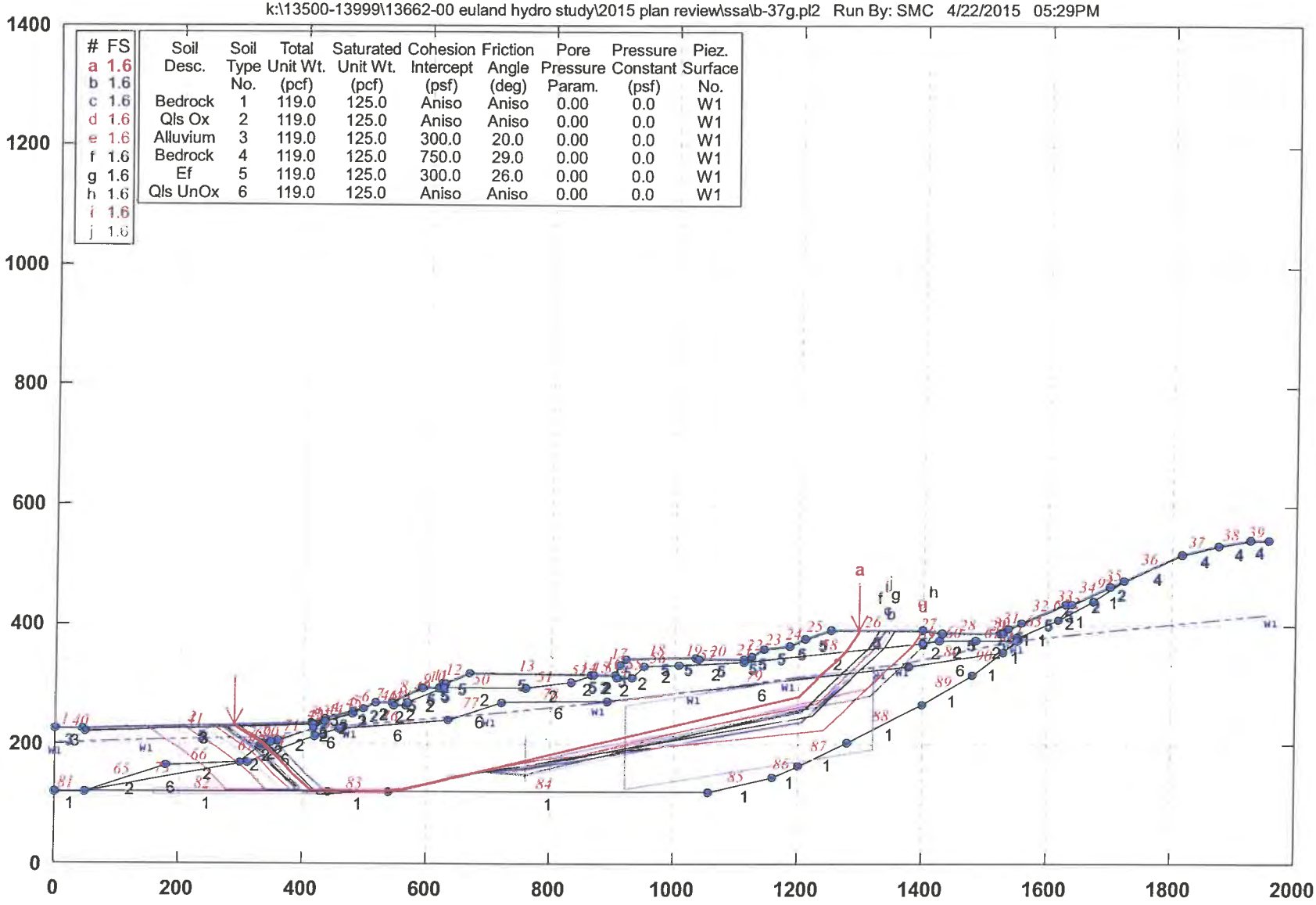
**** END OF GSTABL7 OUTPUT ****

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37g.pl2 Run By: SMC 4/22/2015 05:29PM

#	FS
a	1.6
b	1.6
c	1.6
d	1.6
e	1.6
f	1.6
g	1.6
h	1.6
i	1.6
j	1.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1



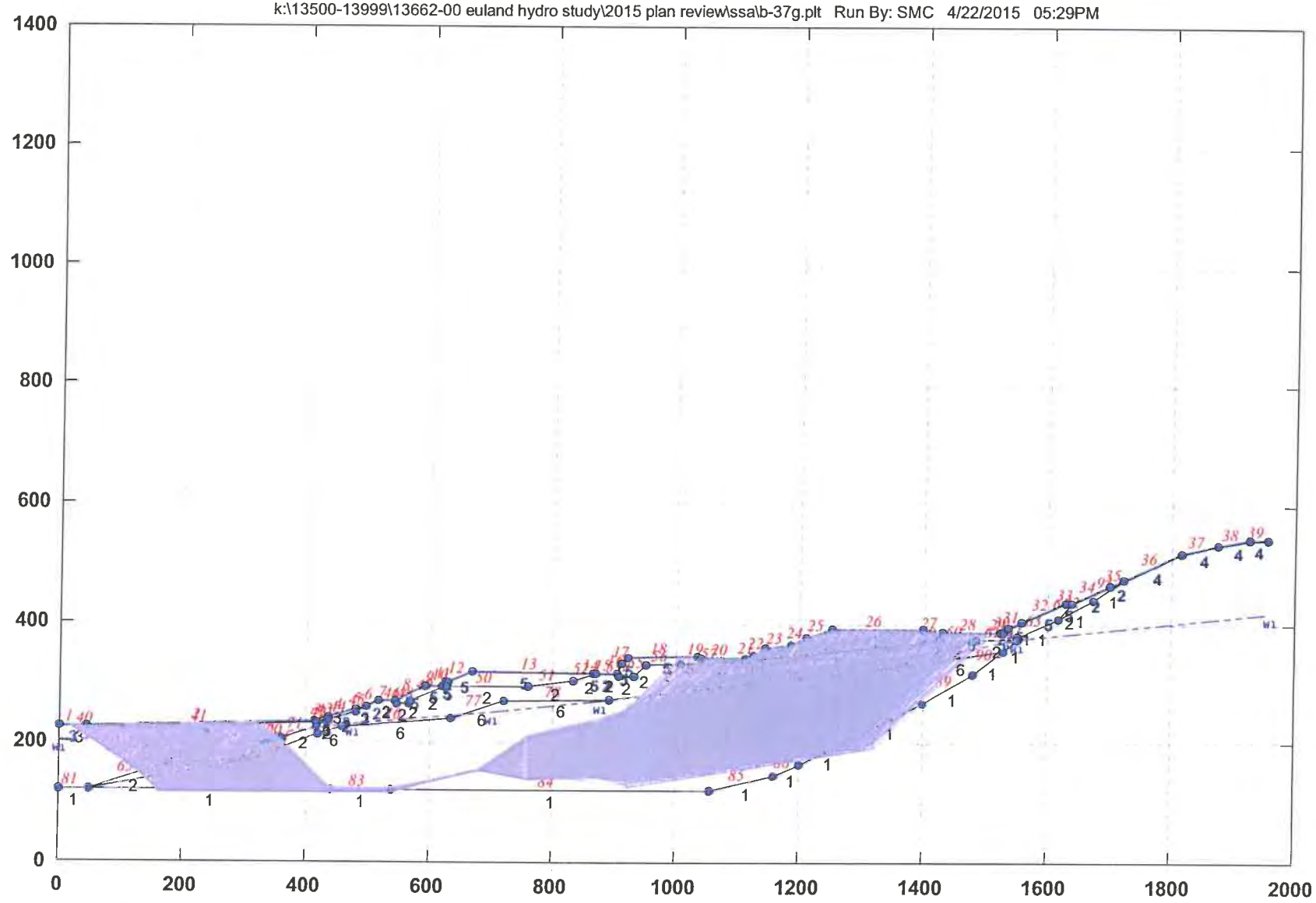
GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-13.1

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37g.plt Run By: SMC 4/22/2015 05:29PM



SMC

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 05:29PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37g.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37g.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37g.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Static, 2015 design

BOUNDARY COORDINATES

39 Top Boundaries
93 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1185.00	365.00	5
24	1185.00	365.00	1210.00	378.00	5
25	1210.00	378.00	1253.00	391.00	5
26	1253.00	391.00	1400.00	391.00	5
27	1400.00	391.00	1430.00	388.00	5
28	1430.00	388.00	1525.00	387.00	5
29	1525.00	387.00	1530.00	387.00	5
30	1530.00	387.00	1537.00	395.00	5
31	1537.00	395.00	1557.00	404.00	5
32	1557.00	404.00	1630.00	435.00	5
33	1630.00	435.00	1638.00	437.00	5
34	1638.00	437.00	1700.00	465.00	2
35	1700.00	465.00	1722.00	475.00	2
36	1722.00	475.00	1815.00	520.00	4
37	1815.00	520.00	1875.00	535.00	4
38	1875.00	535.00	1925.00	545.00	4
39	1925.00	545.00	1955.00	545.00	4
40	45.00	225.00	50.00	220.00	3

41	50.00	220.00	417.00	232.00	3
42	417.00	232.00	435.00	237.00	3
43	435.00	237.00	437.00	242.00	3
44	435.00	237.00	480.00	249.00	2
45	480.00	249.00	497.00	260.00	2
46	545.00	270.00	546.00	265.00	2
47	546.00	265.00	567.00	265.00	2
48	567.00	265.00	568.00	270.00	2
49	568.00	270.00	627.00	293.00	2
50	627.00	293.00	760.00	295.00	2
51	760.00	295.00	832.00	305.00	2
52	832.00	305.00	870.00	315.00	2
53	905.00	315.00	906.00	310.00	2
54	906.00	310.00	931.00	310.00	2
55	931.00	310.00	950.00	330.00	2
56	950.00	330.00	1006.00	333.00	2
57	1006.00	333.00	1113.00	337.00	2
58	1113.00	337.00	1400.00	370.00	2
59	1400.00	370.00	1427.00	374.00	2
60	1427.00	374.00	1485.00	375.00	2
61	1485.00	375.00	1550.00	375.00	2
62	1550.00	375.00	1551.00	380.00	1
63	1551.00	380.00	1618.00	410.00	1
64	1618.00	410.00	1638.00	437.00	2
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	310.00	170.00	6
74	310.00	170.00	420.00	212.00	6
75	420.00	212.00	457.00	225.00	6
76	457.00	225.00	635.00	240.00	6
77	635.00	240.00	720.00	270.00	6
78	720.00	270.00	892.00	272.00	6
79	892.00	272.00	1378.00	330.00	6
80	1378.00	330.00	1530.00	356.00	6
81	0.00	120.00	50.00	120.00	1
82	50.00	120.00	440.00	120.00	1
83	440.00	120.00	539.00	120.00	1
84	539.00	120.00	1057.00	120.00	1
85	1057.00	120.00	1160.00	145.00	1
86	1160.00	145.00	1200.00	163.00	1
87	1200.00	163.00	1280.00	204.00	1
88	1280.00	204.00	1400.00	266.00	1
89	1400.00	266.00	1480.00	317.00	1
90	1480.00	317.00	1530.00	356.00	1
91	1530.00	356.00	1550.00	375.00	1
92	1618.00	410.00	1673.00	440.00	1
93	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	440.00	120.00	10.00
2	539.00	120.00	539.00	120.00	10.00
3	600.00	134.00	600.00	134.00	5.00
4	640.00	144.00	640.00	144.00	5.00
5	680.00	155.00	680.00	155.00	5.00
6	760.00	175.00	760.00	175.00	75.00
7	920.00	195.00	1320.00	260.00	140.00

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 = 2000
Number of Trial Surfaces With Valid FS = 2000
Statistical Data On All Valid FS Values:
FS Max = 2.692 FS Min = 1.579 FS Ave = 1.752
Standard Deviation = 0.212 Coefficient of Variation = 12.12 %
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	289.015	231.631
2	294.817	228.005
3	302.157	222.866
4	334.923	199.923
5	349.691	185.155
6	356.823	178.023
7	385.107	149.739
8	413.391	121.454
9	539.000	121.235
10	600.000	135.894
11	640.000	145.277
12	680.000	154.233
13	760.000	174.739
14	1201.128	282.511
15	1229.412	310.795
16	1231.084	312.467
17	1259.368	340.751
18	1274.146	355.529
19	1295.343	389.451
20	1296.311	391.000

Factor of Safety
*** 1.579 ***

Individual data on the 73 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	5.8	1306.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	7.3	5635.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	18.8	35800.5	0.0	0.0	0.	0.	0.0	0.0	0.0
4	12.0	39167.2	0.0	3991.7	0.	0.	0.0	0.0	0.0
5	1.9	7489.6	0.0	1383.7	0.	0.	0.0	0.0	0.0
6	0.1	307.9	0.0	70.1	0.	0.	0.0	0.0	0.0
7	12.0	57206.3	0.0	18116.3	0.	0.	0.0	0.0	0.0
8	2.7	15377.9	0.0	6031.6	0.	0.	0.0	0.0	0.0
9	7.1	45274.8	0.0	19474.9	0.	0.	0.0	0.0	0.0
10	3.2	22284.5	0.0	10308.5	0.	0.	0.0	0.0	0.0
11	25.1	221889.6	0.0	*******	0.	0.	0.0	0.0	0.0
12	13.4	151830.5	0.0	88126.7	0.	0.	0.0	0.0	0.0
13	14.5	190042.2	0.0	*******	0.	0.	0.0	0.0	0.0
14	0.4	5509.7	0.0	3403.5	0.	0.	0.0	0.0	0.0
15	3.6	51184.9	0.0	22313.4	0.	0.	0.0	0.0	0.0
16	3.0	42903.5	0.0	18635.5	0.	0.	0.0	0.0	0.0
17	15.0	219344.8	0.0	94358.8	0.	0.	0.0	0.0	0.0
18	2.0	29853.9	0.0	12730.0	0.	0.	0.0	0.0	0.0
19	20.0	306105.6	0.0	*******	0.	0.	0.0	0.0	0.0
20	19.0	303493.3	0.0	*******	0.	0.	0.0	0.0	0.0
21	4.0	65481.6	0.0	27058.4	0.	0.	0.0	0.0	0.0
22	17.0	285629.0	0.0	*******	0.	0.	0.0	0.0	0.0
23	21.0	373128.0	0.0	*******	0.	0.	0.0	0.0	0.0
24	21.0	385954.7	0.0	*******	0.	0.	0.0	0.0	0.0
25	6.0	109789.1	0.0	43699.1	0.	0.	0.0	0.0	0.0
26	1.0	18225.9	0.0	7249.4	0.	0.	0.0	0.0	0.0
27	21.0	390247.1	0.0	*******	0.	0.	0.0	0.0	0.0
28	1.0	18940.5	0.0	7037.0	0.	0.	0.0	0.0	0.0
29	25.0	484067.0	0.0	*******	0.	0.	0.0	0.0	0.0
30	7.0	137657.9	0.0	47299.1	0.	0.	0.0	0.0	0.0
31	20.0	385487.0	0.0	*******	0.	0.	0.0	0.0	0.0
32	4.0	77381.9	0.0	26042.0	0.	0.	0.0	0.0	0.0
33	3.0	58983.8	0.0	19434.1	0.	0.	0.0	0.0	0.0
34	3.0	58724.7	0.0	19350.6	0.	0.	0.0	0.0	0.0

35	5.0	97909.2	0.0	32065.6	0.	0.	0.0	0.0	0.0
36	5.0	98410.2	0.0	31833.7	0.	0.	0.0	0.0	0.0
37	10.9	216675.6	0.0	68577.0	0.	0.	0.0	0.0	0.0
38	18.1	364542.5	0.0	*******	0.	0.	0.0	0.0	0.0
39	11.0	222136.4	0.0	66363.4	0.	0.	0.0	0.0	0.0
40	20.0	394188.2	0.0	*******	0.	0.	0.0	0.0	0.0
41	20.0	381105.3	0.0	*******	0.	0.	0.0	0.0	0.0
42	40.0	723120.2	0.0	*******	0.	0.	0.0	0.0	0.0
43	72.0	1174164.2	0.0	*******	0.	0.	0.0	0.0	0.0
44	33.0	484323.2	0.0	*******	0.	0.	0.0	0.0	0.0
45	5.0	70148.0	0.0	21645.7	0.	0.	0.0	0.0	0.0
46	8.0	110208.1	0.0	34195.2	0.	0.	0.0	0.0	0.0
47	14.0	188264.5	0.0	58531.4	0.	0.	0.0	0.0	0.0
48	13.0	169596.2	0.0	53080.8	0.	0.	0.0	0.0	0.0
49	1.0	12990.6	0.0	4032.5	0.	0.	0.0	0.0	0.0
50	0.9	12411.6	0.0	3768.5	0.	0.	0.0	0.0	0.0
51	5.1	71333.4	0.0	20274.5	0.	0.	0.0	0.0	0.0
52	8.0	122574.1	0.0	31652.2	0.	0.	0.0	0.0	0.0
53	11.0	172693.8	0.0	42765.6	0.	0.	0.0	0.0	0.0
54	19.0	290111.2	0.0	71805.9	0.	0.	0.0	0.0	0.0
55	56.0	794803.9	0.0	*******	0.	0.	0.0	0.0	0.0
56	25.0	325768.9	0.0	80372.8	0.	0.	0.0	0.0	0.0
57	2.0	25286.7	0.0	6233.9	0.	0.	0.0	0.0	0.0
58	5.0	61809.0	0.0	15459.1	0.	0.	0.0	0.0	0.0
59	75.0	824516.7	0.0	*******	0.	0.	0.0	0.0	0.0
60	11.0	110787.5	0.0	27455.0	0.	0.	0.0	0.0	0.0
61	20.0	213631.3	0.0	47692.5	0.	0.	0.0	0.0	0.0
62	39.0	421243.7	0.0	84740.2	0.	0.	0.0	0.0	0.0
63	2.0	20977.6	0.0	4049.5	0.	0.	0.0	0.0	0.0
64	16.1	173100.4	0.0	31647.7	0.	0.	0.0	0.0	0.0
65	8.9	95074.5	0.0	20266.9	0.	0.	0.0	0.0	0.0
66	19.4	186052.7	0.0	23604.2	0.	0.	0.0	0.0	0.0
67	1.7	14469.9	0.0	701.4	0.	0.	0.0	0.0	0.0
68	4.7	39497.1	0.0	840.5	0.	0.	0.0	0.0	0.0
69	17.2	128155.6	0.0	0.0	0.	0.	0.0	0.0	0.0
70	6.4	40493.8	0.0	0.0	0.	0.	0.0	0.0	0.0
71	14.8	75372.6	0.0	0.0	0.	0.	0.0	0.0	0.0
72	21.2	46690.0	0.0	0.0	0.	0.	0.0	0.0	0.0
73	1.0	89.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	262.849	230.920
2	268.871	227.157
3	290.292	212.158
4	323.058	189.215
5	333.355	178.917
6	335.704	176.569
7	363.988	148.284
8	392.272	120.000
9	392.747	119.526
10	539.000	118.095
11	600.000	133.250
12	640.000	142.340
13	680.000	153.034
14	760.000	157.051
15	1206.011	237.708
16	1234.295	265.993
17	1262.579	294.277
18	1287.502	319.200
19	1315.786	347.484
20	1330.286	361.984
21	1348.418	391.000

Factor of Safety

*** 1.586 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	310.495	232.215
2	316.117	228.701

3	318.279	227.188
4	351.045	204.245
5	364.486	190.804
6	374.733	180.557
7	403.017	152.273
8	431.301	123.989
9	539.000	120.449
10	600.000	133.685
11	640.000	144.844
12	680.000	152.922
13	760.000	158.296
14	1204.839	254.061
15	1233.123	282.345
16	1261.407	310.630
17	1267.603	316.825
18	1295.887	345.109
19	1310.485	359.707
20	1338.770	387.992
21	1341.778	391.000

Factor of Safety
*** 1.590 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	253.047	230.653
2	259.152	226.839
3	285.647	208.287
4	318.413	185.344
5	327.192	176.564
6	353.525	150.232
7	381.809	121.948
8	539.000	122.392
9	600.000	133.836
10	640.000	143.863
11	680.000	152.995
12	760.000	170.528
13	1240.386	224.701
14	1268.670	252.985
15	1296.954	281.269
16	1325.239	309.553
17	1341.306	325.621
18	1369.590	353.905
19	1383.826	368.140
20	1398.110	391.000

Factor of Safety
*** 1.592 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	146.822	227.767
2	153.819	223.395
3	168.470	213.136
4	201.236	190.193
5	234.002	167.250
6	243.953	157.299
7	249.482	151.770
8	277.766	123.486
9	539.000	124.516
10	600.000	133.160
11	640.000	143.167
12	680.000	152.749
13	760.000	161.848
14	1307.378	293.214
15	1335.662	321.498
16	1339.579	325.415
17	1367.863	353.699
18	1382.107	367.943
19	1396.515	391.000

Factor of Safety
*** 1.594 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	273.066	231.197
2	279.002	227.488
3	295.134	216.193
4	327.900	193.250
5	339.779	181.370
6	344.581	176.569
7	372.865	148.284
8	401.149	120.000
9	402.864	118.286
10	539.000	121.620
11	600.000	135.208
12	640.000	144.805
13	680.000	153.820
14	760.000	148.335
15	1214.214	263.241
16	1242.498	291.525
17	1267.825	316.852
18	1296.109	345.136
19	1310.706	359.733
20	1330.244	391.000

Factor of Safety
*** 1.595 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	295.505	231.807
2	301.253	228.215
3	307.060	224.149
4	339.826	201.206
5	354.168	186.864
6	364.464	176.569
7	392.748	148.284
8	421.032	120.000
9	425.833	115.200
10	539.000	122.597
11	600.000	133.978
12	640.000	143.106
13	680.000	152.903
14	760.000	165.034
15	1222.026	247.557
16	1250.311	275.841
17	1278.595	304.126
18	1294.505	320.036
19	1322.789	348.320
20	1337.255	362.785
21	1354.885	391.000

Factor of Safety
*** 1.598 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	268.997	231.087
2	274.968	227.356
3	293.205	214.586
4	325.971	191.643
5	337.221	180.393
6	339.186	178.428
7	367.470	150.144
8	395.754	121.860
9	539.000	119.413
10	600.000	135.589
11	640.000	146.046
12	680.000	155.295
13	760.000	164.595
14	1316.558	281.786
15	1344.842	310.070
16	1362.979	328.207

17	1391.264	356.492
18	1405.602	370.830
19	1417.135	389.286

Factor of Safety
*** 1.599 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	207.755	229.423
2	214.240	225.370
3	228.160	215.623
4	260.926	192.680
5	293.692	169.737
6	296.102	167.327
7	312.646	150.784
8	340.930	122.499
9	539.000	122.202
10	600.000	132.276
11	640.000	145.994
12	680.000	155.224
13	760.000	170.271
14	1228.862	268.834
15	1257.147	297.118
16	1278.107	318.079
17	1306.391	346.363
18	1320.938	360.909
19	1339.741	391.000

Factor of Safety
*** 1.599 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	235.063	230.165
2	241.319	226.256
3	244.358	224.128
4	277.124	201.185
5	309.890	178.242
6	315.885	172.247
7	336.025	152.107
8	364.309	123.823
9	539.000	119.267
10	600.000	134.774
11	640.000	142.300
12	680.000	153.933
13	760.000	147.090
14	1215.386	246.888
15	1243.670	275.172
16	1271.954	303.457
17	1287.724	319.226
18	1316.008	347.511
19	1330.507	362.010
20	1348.623	391.000

Factor of Safety
*** 1.599 ***

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

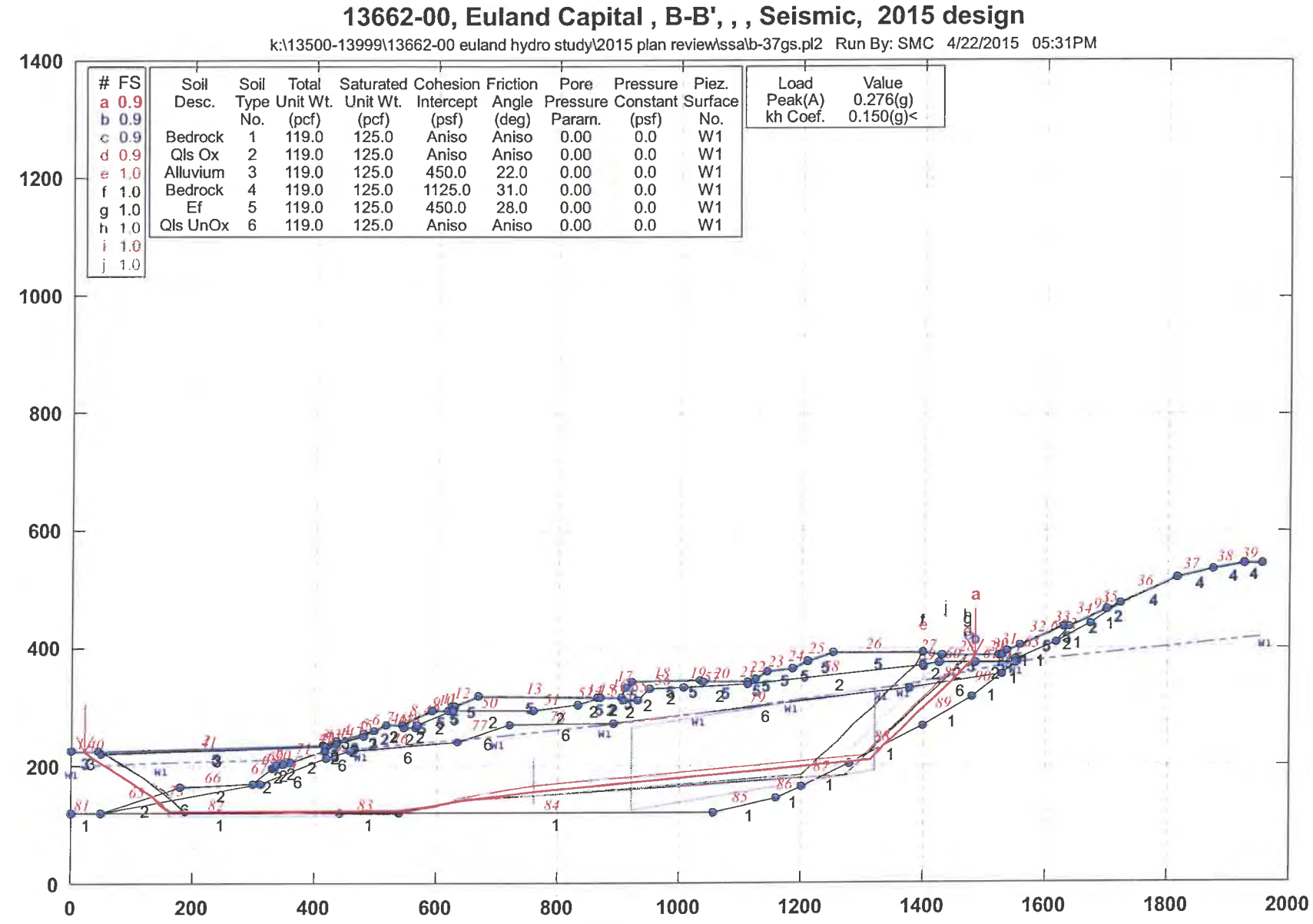
13662-00, Euland Capital , B-B', , , Seismic, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37gs.pl2 Run By: SMC 4/22/2015 05:31PM
FS
a 0.9
b 0.9
c 0.9
d 0.9
e 1.0
f 1.0
g 1.0
h 1.0
i 1.0
j 1.0
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedrock | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=0.9
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-13.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 05:31PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37gs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37gs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37gs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Seismic, 2015 design

BOUNDARY COORDINATES
39 Top Boundaries
93 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1185.00	365.00	5
24	1185.00	365.00	1210.00	378.00	5
25	1210.00	378.00	1253.00	391.00	5
26	1253.00	391.00	1400.00	391.00	5
27	1400.00	391.00	1430.00	388.00	5
28	1430.00	388.00	1525.00	387.00	5
29	1525.00	387.00	1530.00	387.00	5
30	1530.00	387.00	1537.00	395.00	5
31	1537.00	395.00	1557.00	404.00	5
32	1557.00	404.00	1630.00	435.00	5
33	1630.00	435.00	1638.00	437.00	5
34	1638.00	437.00	1700.00	465.00	2
35	1700.00	465.00	1722.00	475.00	2
36	1722.00	475.00	1815.00	520.00	4
37	1815.00	520.00	1875.00	535.00	4
38	1875.00	535.00	1925.00	545.00	4
39	1925.00	545.00	1955.00	545.00	4
40	45.00	225.00	50.00	220.00	3

41	50.00	220.00	417.00	232.00	3
42	417.00	232.00	435.00	237.00	3
43	435.00	237.00	437.00	242.00	3
44	435.00	237.00	480.00	249.00	2
45	480.00	249.00	497.00	260.00	2
46	545.00	270.00	546.00	265.00	2
47	546.00	265.00	567.00	265.00	2
48	567.00	265.00	568.00	270.00	2
49	568.00	270.00	627.00	293.00	2
50	627.00	293.00	760.00	295.00	2
51	760.00	295.00	832.00	305.00	2
52	832.00	305.00	870.00	315.00	2
53	905.00	315.00	906.00	310.00	2
54	906.00	310.00	931.00	310.00	2
55	931.00	310.00	950.00	330.00	2
56	950.00	330.00	1006.00	333.00	2
57	1006.00	333.00	1113.00	337.00	2
58	1113.00	337.00	1400.00	370.00	2
59	1400.00	370.00	1427.00	374.00	2
60	1427.00	374.00	1485.00	375.00	2
61	1485.00	375.00	1550.00	375.00	2
62	1550.00	375.00	1551.00	380.00	1
63	1551.00	380.00	1618.00	410.00	1
64	1618.00	410.00	1638.00	437.00	2
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	310.00	170.00	6
74	310.00	170.00	420.00	212.00	6
75	420.00	212.00	457.00	225.00	6
76	457.00	225.00	635.00	240.00	6
77	635.00	240.00	720.00	270.00	6
78	720.00	270.00	892.00	272.00	6
79	892.00	272.00	1378.00	330.00	6
80	1378.00	330.00	1530.00	356.00	6
81	0.00	120.00	50.00	120.00	1
82	50.00	120.00	440.00	120.00	1
83	440.00	120.00	539.00	120.00	1
84	539.00	120.00	1057.00	120.00	1
85	1057.00	120.00	1160.00	145.00	1
86	1160.00	145.00	1200.00	163.00	1
87	1200.00	163.00	1280.00	204.00	1
88	1280.00	204.00	1400.00	266.00	1
89	1400.00	266.00	1480.00	317.00	1
90	1480.00	317.00	1530.00	356.00	1
91	1530.00	356.00	1550.00	375.00	1
92	1618.00	410.00	1673.00	440.00	1
93	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
6 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	440.00	120.00	10.00
2	539.00	120.00	539.00	120.00	10.00
3	600.00	134.00	600.00	134.00	5.00
4	640.00	144.00	640.00	144.00	5.00
5	760.00	175.00	760.00	175.00	75.00
6	920.00	195.00	1320.00	260.00	140.00

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 = 2000
Number of Trial Surfaces With Valid FS = 2000
Statistical Data On All Valid FS Values:
FS Max = 1.604 FS Min = 0.942 FS Ave = 1.073
Standard Deviation = 0.108 Coefficient of Variation = 10.11 %
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	22.665	225.000
2	35.325	216.460
3	68.487	194.093
4	101.648	171.725
5	134.810	149.357
6	145.753	138.414
7	161.418	122.748
8	539.000	123.974
9	600.000	135.643
10	640.000	142.310
11	760.000	155.623
12	1313.237	211.451
13	1333.351	231.565
14	1361.635	259.849
15	1389.919	288.133
16	1418.204	316.417
17	1442.885	341.099
18	1471.169	369.383
19	1476.642	374.856
20	1484.197	387.430

Factor of Safety
*** 0.942 ***

Individual data on the 87 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.7	6432.9	0.0	0.0	0.	0.	964.9	0.0	0.0
2	9.7	13588.3	0.0	0.0	0.	0.	2038.2	0.0	0.0
3	5.0	10007.7	0.0	0.0	0.	0.	1501.1	0.0	0.0
4	6.0	14730.7	0.0	0.0	0.	0.	2209.6	0.0	0.0
5	12.5	40727.2	0.0	4124.3	0.	0.	6109.1	0.0	0.0
6	33.2	174456.4	0.0	50914.5	0.	0.	26168.5	0.0	0.0
7	33.2	270908.7	0.0	*******	0.	0.	40636.3	0.0	0.0
8	10.9	113001.2	0.0	58820.0	0.	0.	16950.2	0.0	0.0
9	1.2	13854.3	0.0	7392.3	0.	0.	2078.1	0.0	0.0
10	14.4	174671.6	0.0	95694.8	0.	0.	26200.7	0.0	0.0
11	18.6	242820.4	0.0	96039.6	0.	0.	36423.1	0.0	0.0
12	120.0	1592994.5	0.0	*******	0.	0.	*******	0.0	0.0
13	10.0	134692.5	0.0	53665.4	0.	0.	20203.9	0.0	0.0
14	20.0	270281.8	0.0	*******	0.	0.	40542.3	0.0	0.0
15	3.0	40645.4	0.0	16216.8	0.	0.	6096.8	0.0	0.0
16	2.0	27103.6	0.0	10732.6	0.	0.	4065.5	0.0	0.0
17	12.0	162929.0	0.0	65105.1	0.	0.	24439.4	0.0	0.0
18	13.0	177101.1	0.0	71902.5	0.	0.	26565.2	0.0	0.0
19	38.5	528350.0	0.0	*******	0.	0.	79252.5	0.0	0.0
20	14.5	200077.6	0.0	86496.7	0.	0.	30011.6	0.0	0.0
21	4.0	55644.6	0.0	24200.8	0.	0.	8346.7	0.0	0.0
22	3.0	42102.4	0.0	18239.3	0.	0.	6315.4	0.0	0.0
23	15.0	215254.9	0.0	92336.1	0.	0.	32288.2	0.0	0.0
24	2.0	29297.9	0.0	12455.0	0.	0.	4394.7	0.0	0.0
25	20.0	300409.0	0.0	*******	0.	0.	45061.3	0.0	0.0
26	19.0	297850.2	0.0	*******	0.	0.	44677.5	0.0	0.0
27	4.0	64264.5	0.0	26453.2	0.	0.	9639.7	0.0	0.0
28	17.0	280345.1	0.0	*******	0.	0.	42051.8	0.0	0.0
29	21.0	366351.8	0.0	*******	0.	0.	54952.8	0.0	0.0
30	21.0	378903.2	0.0	*******	0.	0.	56835.5	0.0	0.0
31	6.0	107845.4	0.0	42275.6	0.	0.	16176.8	0.0	0.0

32	1.0	17923.4	0.0	7023.3	0.	0.	2688.5	0.0	0.0
33	21.0	385309.7	0.0	*******	0.	0.	57796.5	0.0	0.0
34	1.0	18772.7	0.0	6881.3	0.	0.	2815.9	0.0	0.0
35	25.0	481865.6	0.0	*******	0.	0.	72279.8	0.0	0.0
36	7.0	137727.7	0.0	46859.0	0.	0.	20659.2	0.0	0.0
37	20.0	387812.0	0.0	*******	0.	0.	58171.8	0.0	0.0
38	4.0	78254.1	0.0	26143.4	0.	0.	11738.1	0.0	0.0
39	3.0	59726.9	0.0	19556.3	0.	0.	8959.0	0.0	0.0
40	3.0	59544.2	0.0	19512.4	0.	0.	8931.6	0.0	0.0
41	5.0	99444.7	0.0	32423.2	0.	0.	14916.7	0.0	0.0
42	5.0	100157.8	0.0	32301.3	0.	0.	15023.7	0.0	0.0
43	10.9	221563.8	0.0	69776.4	0.	0.	33234.6	0.0	0.0
44	18.1	376342.3	0.0	*******	0.	0.	56451.3	0.0	0.0
45	31.0	648104.4	0.0	*******	0.	0.	97215.7	0.0	0.0
46	20.0	410713.7	0.0	*******	0.	0.	61607.1	0.0	0.0
47	40.0	804138.4	0.0	*******	0.	0.	*******	0.0	0.0
48	72.0	1392605.6	0.0	*******	0.	0.	*******	0.0	0.0
49	33.0	615487.4	0.0	*******	0.	0.	92323.1	0.0	0.0
50	5.0	91723.7	0.0	31895.1	0.	0.	13758.5	0.0	0.0
51	8.0	145660.9	0.0	51069.3	0.	0.	21849.1	0.0	0.0
52	14.0	253059.9	0.0	89397.9	0.	0.	37959.0	0.0	0.0
53	13.0	232907.8	0.0	83337.7	0.	0.	34936.2	0.0	0.0
54	1.0	17986.2	0.0	6423.6	0.	0.	2697.9	0.0	0.0
55	0.9	17104.5	0.0	6015.1	0.	0.	2565.7	0.0	0.0
56	5.1	96990.1	0.0	32565.2	0.	0.	14548.5	0.0	0.0
57	8.0	164043.5	0.0	51544.2	0.	0.	24606.5	0.0	0.0
58	11.0	231586.7	0.0	71067.0	0.	0.	34738.0	0.0	0.0
59	19.0	396941.7	0.0	*******	0.	0.	59541.3	0.0	0.0
60	56.0	1147299.4	0.0	*******	0.	0.	*******	0.0	0.0
61	25.0	501274.4	0.0	*******	0.	0.	75191.2	0.0	0.0
62	2.0	39810.8	0.0	13314.8	0.	0.	5971.6	0.0	0.0
63	5.0	98432.8	0.0	33320.3	0.	0.	14764.9	0.0	0.0
64	75.0	1427626.9	0.0	*******	0.	0.	*******	0.0	0.0
65	11.0	207718.5	0.0	75045.7	0.	0.	31157.8	0.0	0.0
66	20.0	395424.0	0.0	*******	0.	0.	59313.6	0.0	0.0
67	39.0	796353.4	0.0	*******	0.	0.	*******	0.0	0.0
68	2.0	40948.0	0.0	13886.9	0.	0.	6142.2	0.0	0.0
69	25.0	527568.5	0.0	*******	0.	0.	79135.3	0.0	0.0
70	43.0	956687.9	0.0	*******	0.	0.	*******	0.0	0.0
71	36.9	831103.0	0.0	*******	0.	0.	*******	0.0	0.0
72	23.4	518994.2	0.0	*******	0.	0.	77849.1	0.0	0.0
73	16.8	352304.2	0.0	*******	0.	0.	52845.6	0.0	0.0
74	3.4	66236.2	0.0	29320.0	0.	0.	9935.4	0.0	0.0
75	28.3	503627.1	0.0	*******	0.	0.	75544.1	0.0	0.0
76	6.4	99659.7	0.0	40207.8	0.	0.	14949.0	0.0	0.0
77	10.0	146410.4	0.0	56841.6	0.	0.	21961.6	0.0	0.0
78	11.9	158365.2	0.0	58893.1	0.	0.	23754.8	0.0	0.0
79	10.1	120226.8	0.0	42287.7	0.	0.	18034.0	0.0	0.0
80	18.2	183314.6	0.0	58906.0	0.	0.	27497.2	0.0	0.0
81	8.8	72488.0	0.0	20411.1	0.	0.	10873.2	0.0	0.0
82	3.0	22324.5	0.0	5761.3	0.	0.	3348.7	0.0	0.0
83	12.9	82900.2	0.0	17804.9	0.	0.	12435.0	0.0	0.0
84	13.9	66317.2	0.0	6583.2	0.	0.	9947.6	0.0	0.0
85	14.4	43434.5	0.0	0.0	0.	0.	6515.2	0.0	0.0
86	5.5	10041.6	0.0	0.0	0.	0.	1506.2	0.0	0.0
87	7.6	5687.8	0.0	0.0	0.	0.	853.2	0.0	0.0

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	22.665	225.000
2	35.325	216.460
3	68.487	194.093
4	101.648	171.725
5	134.810	149.357
6	145.753	138.414
7	161.418	122.748
8	539.000	123.974
9	600.000	135.643
10	640.000	142.310
11	760.000	155.623

12	1313.237	211.451
13	1333.351	231.565
14	1361.635	259.849
15	1389.919	288.133
16	1418.204	316.417
17	1442.885	341.099
18	1471.169	369.383
19	1476.642	374.856
20	1484.197	387.430

Factor of Safety
*** 0.942 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.071	225.000
2	35.594	216.553
3	68.755	194.186
4	101.917	171.818
5	135.078	149.450
6	146.056	138.472
7	160.598	123.930
8	539.000	121.796
9	600.000	133.187
10	640.000	146.299
11	760.000	166.829
12	1302.690	218.624
13	1330.975	246.908
14	1359.259	275.193
15	1387.543	303.477
16	1415.828	331.761
17	1421.509	337.442
18	1449.793	365.727
19	1458.612	374.545
20	1471.629	387.562

Factor of Safety
*** 0.948 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.071	225.000
2	35.594	216.553
3	68.755	194.186
4	101.917	171.818
5	135.078	149.450
6	146.056	138.472
7	160.598	123.930
8	539.000	121.796
9	600.000	133.187
10	640.000	146.299
11	760.000	166.829
12	1302.690	218.624
13	1330.975	246.908
14	1359.259	275.193
15	1387.543	303.477
16	1415.828	331.761
17	1421.509	337.442
18	1449.793	365.727
19	1458.612	374.545
20	1471.629	387.562

Factor of Safety
*** 0.948 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.024	225.082
2	56.147	220.201
3	85.912	200.124
4	119.073	177.757
5	152.235	155.389
6	165.426	142.197

7	183.840	123.784
8	539.000	120.165
9	600.000	134.442
10	640.000	144.937
11	760.000	149.324
12	1201.519	183.727
13	1229.803	212.011
14	1258.087	240.295
15	1286.371	268.579
16	1314.656	296.864
17	1342.940	325.148
18	1343.699	325.906
19	1371.983	354.191
20	1386.206	368.414
21	1399.777	391.000

Factor of Safety
*** 0.952 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.024	225.082
2	56.147	220.201
3	85.912	200.124
4	119.073	177.757
5	152.235	155.389
6	165.426	142.197
7	183.840	123.784
8	539.000	120.165
9	600.000	134.442
10	640.000	144.937
11	760.000	149.324
12	1201.519	183.727
13	1229.803	212.011
14	1258.087	240.295
15	1286.371	268.579
16	1314.656	296.864
17	1342.940	325.148
18	1343.699	325.906
19	1371.983	354.191
20	1386.206	368.414
21	1399.777	391.000

Factor of Safety
*** 0.952 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	52.629	225.207
2	60.712	220.350
3	89.075	201.219
4	122.236	178.852
5	155.398	156.484
6	168.998	142.884
7	189.309	122.573
8	539.000	118.017
9	600.000	134.149
10	640.000	141.675
11	760.000	149.617
12	1271.831	182.574
13	1300.115	210.858
14	1307.428	218.171
15	1335.712	246.455
16	1363.997	274.740
17	1392.281	303.024
18	1420.565	331.308
19	1427.770	338.513
20	1456.055	366.798
21	1463.893	374.636
22	1471.660	387.561

Factor of Safety
*** 0.954 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	52.629	225.207
2	60.712	220.350
3	89.075	201.219
4	122.236	178.852
5	155.398	156.484
6	168.998	142.884
7	189.309	122.573
8	539.000	118.017
9	600.000	134.149
10	640.000	141.675
11	760.000	149.617
12	1271.831	182.574
13	1300.115	210.858
14	1307.428	218.171
15	1335.712	246.455
16	1363.997	274.740
17	1392.281	303.024
18	1420.565	331.308
19	1427.770	338.513
20	1456.055	366.798
21	1463.893	374.636
22	1471.660	387.561

Factor of Safety

*** 0.954 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.410	225.229
2	61.487	220.376
3	89.612	201.405
4	122.773	179.037
5	155.935	156.670
6	169.604	143.001
7	187.668	124.936
8	539.000	123.661
9	600.000	134.237
10	640.000	144.654
11	760.000	172.029
12	1250.737	196.920
13	1279.022	225.204
14	1307.306	253.488
15	1335.590	281.773
16	1363.875	310.057
17	1385.018	331.200
18	1413.302	359.485
19	1427.832	374.014
20	1436.196	387.935

Factor of Safety

*** 0.956 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.410	225.229
2	61.487	220.376
3	89.612	201.405
4	122.773	179.037
5	155.935	156.670
6	169.604	143.001
7	187.668	124.936
8	539.000	123.661
9	600.000	134.237
10	640.000	144.654
11	760.000	172.029
12	1250.737	196.920
13	1279.022	225.204
14	1307.306	253.488
15	1335.590	281.773

16	1363.875	310.057
17	1385.018	331.200
18	1413.302	359.485
19	1427.832	374.014
20	1436.196	387.935

Factor of Safety

*** 0.956 ***

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

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 05:32PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37gs Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37gs Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37gs Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Seismic, 2015 design

BOUNDARY COORDINATES
39 Top Boundaries
93 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1185.00	365.00	5
24	1185.00	365.00	1210.00	378.00	5
25	1210.00	378.00	1253.00	391.00	5
26	1253.00	391.00	1400.00	391.00	5
27	1400.00	391.00	1430.00	388.00	5
28	1430.00	388.00	1525.00	387.00	5
29	1525.00	387.00	1530.00	387.00	5
30	1530.00	387.00	1537.00	395.00	5
31	1537.00	395.00	1557.00	404.00	5
32	1557.00	404.00	1630.00	435.00	5
33	1630.00	435.00	1638.00	437.00	5
34	1638.00	437.00	1700.00	465.00	2
35	1700.00	465.00	1722.00	475.00	2
36	1722.00	475.00	1815.00	520.00	4
37	1815.00	520.00	1875.00	535.00	4
38	1875.00	535.00	1925.00	545.00	4
39	1925.00	545.00	1955.00	545.00	4

40	45.00	225.00	50.00	220.00	3
41	50.00	220.00	417.00	232.00	3
42	417.00	232.00	435.00	237.00	3
43	435.00	237.00	437.00	242.00	3
44	435.00	237.00	480.00	249.00	2
45	480.00	249.00	497.00	260.00	2
46	545.00	270.00	546.00	265.00	2
47	546.00	265.00	567.00	265.00	2
48	567.00	265.00	568.00	270.00	2
49	568.00	270.00	627.00	293.00	2
50	627.00	293.00	760.00	295.00	2
51	760.00	295.00	832.00	305.00	2
52	832.00	305.00	870.00	315.00	2
53	905.00	315.00	906.00	310.00	2
54	906.00	310.00	931.00	310.00	2
55	931.00	310.00	950.00	330.00	2
56	950.00	330.00	1006.00	333.00	2
57	1006.00	333.00	1113.00	337.00	2
58	1113.00	337.00	1400.00	370.00	2
59	1400.00	370.00	1427.00	374.00	2
60	1427.00	374.00	1485.00	375.00	2
61	1485.00	375.00	1550.00	375.00	2
62	1550.00	375.00	1551.00	380.00	1
63	1551.00	380.00	1618.00	410.00	1
64	1618.00	410.00	1638.00	437.00	2
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	310.00	170.00	6
74	310.00	170.00	420.00	212.00	6
75	420.00	212.00	457.00	225.00	6
76	457.00	225.00	635.00	240.00	6
77	635.00	240.00	720.00	270.00	6
78	720.00	270.00	892.00	272.00	6
79	892.00	272.00	1378.00	330.00	6
80	1378.00	330.00	1530.00	356.00	6
81	0.00	120.00	50.00	120.00	1
82	50.00	120.00	440.00	120.00	1
83	440.00	120.00	539.00	120.00	1
84	539.00	120.00	1057.00	120.00	1
85	1057.00	120.00	1160.00	145.00	1
86	1160.00	145.00	1200.00	163.00	1
87	1200.00	163.00	1280.00	204.00	1
88	1280.00	204.00	1400.00	266.00	1
89	1400.00	266.00	1480.00	317.00	1
90	1480.00	317.00	1530.00	356.00	1
91	1530.00	356.00	1550.00	375.00	1
92	1618.00	410.00	1673.00	440.00	1
93	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	22.665	225.000
2	35.325	216.460
3	68.487	194.093
4	101.648	171.725
5	134.810	149.357
6	145.753	138.414
7	161.418	122.748
8	539.000	123.974
9	600.000	135.643
10	640.000	142.310
11	760.000	155.623
12	1313.237	211.451
13	1333.351	231.565

14	1361.635	259.849
15	1389.919	288.133
16	1418.204	316.417
17	1442.885	341.099
18	1471.169	369.383
19	1476.642	374.856
20	1484.197	387.430

Janbu's Empirical Coefficient (fo) = 1.046

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

Factor Of Safety For The Preceding Specified Surface = 0.942

Table 1 - Individual Data on the 87 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)	
1	12.7	6432.9	0.0	0.0	0.0	0.0	964.9	0.0	0.0	
2	9.7	13588.8	0.0	0.0	0.0	0.0	2038.3	0.0	0.0	
3	5.0	10007.7	0.0	0.0	0.0	0.0	1501.2	0.0	0.0	
4	6.0	14731.3	0.0	0.0	0.0	0.0	2209.7	0.0	0.0	
5	12.5	40727.2	0.0	4124.1	0.0	0.0	6109.1	0.0	0.0	
6	33.2	174452.9	0.0	50913.6	0.0	0.0	26167.9	0.0	0.0	
7	33.2	270913.0	0.0	*******	0.0	0.0	40636.9	0.0	0.0	
8	10.9	112999.6	0.0	58819.2	0.0	0.0	16949.9	0.0	0.0	
9	1.2	13852.6	0.0	7391.6	0.0	0.0	2077.9	0.0	0.0	
10	14.4	174666.2	0.0	95694.9	0.0	0.0	26199.9	0.0	0.0	
11	18.6	242827.5	0.0	96042.5	0.0	0.0	36424.1	0.0	0.0	
12	120.0	1592999.4	0.0	*******	0.0	0.0	*******	0.0	0.0	
13	10.0	134692.8	0.0	53665.6	0.0	0.0	20203.9	0.0	0.0	
14	20.0	270282.4	0.0	*******	0.0	0.0	40542.4	0.0	0.0	
15	3.0	40645.5	0.0	16216.9	0.0	0.0	6096.8	0.0	0.0	
16	2.0	27103.7	0.0	10732.7	0.0	0.0	4065.5	0.0	0.0	
17	12.0	162929.3	0.0	65105.2	0.0	0.0	24439.4	0.0	0.0	
18	13.0	177101.4	0.0	71902.7	0.0	0.0	26565.2	0.0	0.0	
19	38.5	528350.9	0.0	*******	0.0	0.0	79252.6	0.0	0.0	
20	14.5	200077.9	0.0	86496.8	0.0	0.0	30011.7	0.0	0.0	
21	4.0	55644.7	0.0	24200.9	0.0	0.0	8346.7	0.0	0.0	
22	3.0	42102.4	0.0	18239.3	0.0	0.0	6315.4	0.0	0.0	
23	15.0	215255.2	0.0	92336.3	0.0	0.0	32288.3	0.0	0.0	
24	2.0	29298.0	0.0	12455.0	0.0	0.0	4394.7	0.0	0.0	
25	20.0	300409.2	0.0	*******	0.0	0.0	45061.4	0.0	0.0	
26	19.0	297850.4	0.0	*******	0.0	0.0	44677.6	0.0	0.0	
27	4.0	64264.5	0.0	26453.2	0.0	0.0	9639.7	0.0	0.0	
28	17.0	280345.2	0.0	*******	0.0	0.0	42051.8	0.0	0.0	
29	21.0	366351.8	0.0	*******	0.0	0.0	54952.8	0.0	0.0	
30	21.0	378903.2	0.0	*******	0.0	0.0	56835.5	0.0	0.0	
31	6.0	107845.4	0.0	42275.6	0.0	0.0	16176.8	0.0	0.0	
32	1.0	17923.4	0.0	7023.3	0.0	0.0	2688.5	0.0	0.0	
33	21.0	385309.5	0.0	*******	0.0	0.0	57796.4	0.0	0.0	
34	1.0	18772.7	0.0	6881.3	0.0	0.0	2815.9	0.0	0.0	
35	25.0	481865.0	0.0	*******	0.0	0.0	72279.8	0.0	0.0	
36	7.0	137727.5	0.0	46858.9	0.0	0.0	20659.1	0.0	0.0	
37	20.0	387811.7	0.0	*******	0.0	0.0	58171.8	0.0	0.0	
38	4.0	78254.1	0.0	26143.3	0.0	0.0	11738.1	0.0	0.0	
39	3.0	59726.9	0.0	19556.3	0.0	0.0	8959.0	0.0	0.0	
40	3.0	59544.3	0.0	19512.4	0.0	0.0	8931.6	0.0	0.0	
41	5.0	99444.8	0.0	32423.2	0.0	0.0	14916.7	0.0	0.0	
42	5.0	100157.9	0.0	32301.3	0.0	0.0	15023.7	0.0	0.0	
43	10.9	221564.1	0.0	69776.6	0.0	0.0	33234.6	0.0	0.0	
44	18.1	376342.7	0.0	*******	0.0	0.0	56451.4	0.0	0.0	
45	31.0	648104.8	0.0	*******	0.0	0.0	97215.7	0.0	0.0	
46	20.0	410713.7	0.0	*******	0.0	0.0	61607.1	0.0	0.0	
47	40.0	804138.0	0.0	*******	0.0	0.0	*******	0.0	0.0	
48	72.0	1392604.4	0.0	*******	0.0	0.0	*******	0.0	0.0	
49	33.0	615486.9	0.0	*******	0.0	0.0	92323.0	0.0	0.0	
50	5.0	91723.6	0.0	31895.1	0.0	0.0	13758.5	0.0	0.0	
51	8.0	145660.8	0.0	51069.2	0.0	0.0	21849.1	0.0	0.0	
52	14.0	253059.7	0.0	89397.8	0.0	0.0	37959.0	0.0	0.0	
53	13.0	232907.7	0.0	83337.6	0.0	0.0	34936.2	0.0	0.0	
54	1.0	17986.2	0.0	6423.6	0.0	0.0	2697.9	0.0	0.0	
55	0.9	17104.5	0.0	6015.1	0.0	0.0	2565.7	0.0	0.0	

56	5.1	96990.0	0.0	32565.1	0.0	0.0	14548.5	0.0	0.0
57	8.0	164043.4	0.0	51544.2	0.0	0.0	24606.5	0.0	0.0
58	11.0	231586.6	0.0	71067.0	0.0	0.0	34738.0	0.0	0.0
59	19.0	396941.5	0.0	*******	0.0	0.0	59541.2	0.0	0.0
60	56.0	1147298.9	0.0	*******	0.0	0.0	*******	0.0	0.0
61	25.0	501274.2	0.0	*******	0.0	0.0	75191.1	0.0	0.0
62	2.0	39810.8	0.0	13314.8	0.0	0.0	5971.6	0.0	0.0
63	5.0	98432.8	0.0	33320.3	0.0	0.0	14764.9	0.0	0.0
64	75.0	1427626.6	0.0	*******	0.0	0.0	*******	0.0	0.0
65	11.0	207718.5	0.0	75045.6	0.0	0.0	31157.8	0.0	0.0
66	20.0	395424.0	0.0	*******	0.0	0.0	59313.6	0.0	0.0
67	39.0	796353.4	0.0	*******	0.0	0.0	*******	0.0	0.0
68	2.0	40948.1	0.0	13886.9	0.0	0.0	6142.2	0.0	0.0
69	25.0	527568.6	0.0	*******	0.0	0.0	79135.3	0.0	0.0
70	43.0	956688.0	0.0	*******	0.0	0.0	*******	0.0	0.0
71	36.9	831100.6	0.0	*******	0.0	0.0	*******	0.0	0.0
72	23.4	518989.0	0.0	*******	0.0	0.0	77848.4	0.0	0.0
73	16.8	352312.0	0.0	*******	0.0	0.0	52846.8	0.0	0.0
74	3.4	66240.9	0.0	29322.0	0.0	0.0	9936.1	0.0	0.0
75	28.3	503619.3	0.0	*******	0.0	0.0	75542.9	0.0	0.0
76	6.4	99661.5	0.0	40208.4	0.0	0.0	14949.2	0.0	0.0
77	10.0	146410.1	0.0	56841.4	0.0	0.0	21961.5	0.0	0.0
78	11.9	158360.4	0.0	58891.3	0.0	0.0	23754.1	0.0	0.0
79	10.1	120231.3	0.0	42288.7	0.0	0.0	18034.7	0.0	0.0
80	18.2	183317.2	0.0	58906.1	0.0	0.0	27497.6	0.0	0.0
81	8.8	72486.2	0.0	20411.2	0.0	0.0	10872.9	0.0	0.0
82	3.0	22324.6	0.0	5761.5	0.0	0.0	3348.7	0.0	0.0
83	12.9	82899.4	0.0	17805.1	0.0	0.0	12434.9	0.0	0.0
84	13.9	66316.0	0.0	6583.0	0.0	0.0	9947.4	0.0	0.0
85	14.4	43434.4	0.0	0.0	0.0	0.0	6515.2	0.0	0.0
86	5.5	10041.6	0.0	0.0	0.0	0.0	1506.2	0.0	0.0
87	7.6	5687.8	0.0	0.0	0.0	0.0	853.2	0.0	0.0

Table 2 - Base Stress Data on the 87 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-34.00	28.99	15.27	1112.19	-220.97
2	-34.00	40.16	11.67	1726.70	-610.71
3	-34.00	47.50	6.03	2136.05	-870.30
4	-34.00	52.99	7.22	2450.57	-1069.76
5	-34.00	62.24	15.08	2810.24	-1416.79
6	-34.00	85.07	40.00	3498.22	-2287.65
7	-34.00	118.23	40.00	4497.22	-3552.34
8	-45.00	140.28	15.48	9990.47	-6206.47
9	-45.00	146.38	1.76	19158.00	-6677.11
10	-45.00	154.21	20.39	20340.27	-7281.61
11	0.19	170.71	18.58	2415.77	2002.60
12	0.19	240.00	120.00	2442.89	2034.34
13	0.19	305.00	10.00	2468.33	2064.12
14	0.19	320.00	20.00	2474.20	2070.99
15	0.19	331.50	3.00	2478.70	2076.25
16	0.19	334.00	2.00	2489.71	2076.77
17	0.19	341.00	12.00	2481.06	2080.69
18	0.19	353.50	13.00	2465.61	2087.70
19	0.19	379.26	38.52	2433.77	2102.15
20	0.19	405.76	14.48	2401.02	2117.00
21	0.19	415.00	4.00	2405.86	2131.83
22	0.19	418.50	3.00	2430.00	2150.68
23	0.19	427.50	15.00	2492.07	2199.14
24	0.19	436.00	2.00	2550.69	2244.90
25	0.19	447.00	20.00	2622.68	2301.83
26	0.19	466.50	19.00	2749.61	2402.34
27	0.19	478.00	4.00	2817.18	2462.07
28	0.19	488.50	17.00	2912.43	2527.17
29	0.19	507.50	21.00	3132.79	2673.43
30	0.19	528.50	21.00	3258.20	2765.02
31	10.83	542.00	6.11	3128.08	6025.26
32	10.83	545.50	1.02	3120.92	6008.23
33	10.83	556.50	21.38	3244.60	6150.58
34	10.83	567.50	1.02	3368.29	6292.94

35	10.83	580.50	25.45	3514.46	6461.17
36	10.83	596.50	7.13	3640.10	6595.51
37	9.46	610.00	20.28	3594.24	6056.95
38	9.46	622.00	4.06	3652.07	6110.97
39	9.46	625.50	3.04	3742.90	6218.88
40	9.46	628.50	3.04	3731.25	6199.86
41	9.46	632.50	5.07	3746.32	6212.63
42	9.46	637.50	5.07	3788.11	6257.18
43	6.33	645.46	10.98	3887.11	5263.93
44	6.33	659.96	18.19	4021.98	5397.39
45	6.33	684.50	31.19	4054.42	5422.14
46	6.33	710.00	20.12	3969.43	5325.94
47	6.33	740.00	40.25	3859.62	5213.84
48	5.76	796.00	72.37	3666.33	4828.54
49	5.76	848.50	33.17	3482.23	4656.13
50	5.76	867.50	5.03	3401.32	4579.64
51	5.76	874.00	8.04	3365.48	4545.41
52	5.76	885.00	14.07	3331.63	4512.48
53	5.76	898.50	13.07	3284.94	4472.61
54	5.76	905.50	1.01	3299.42	4490.13
55	5.76	906.47	0.94	3371.00	4561.22
56	5.76	909.47	5.09	3592.81	4781.54
57	5.76	916.00	8.04	3931.71	5119.05
58	5.76	925.50	11.06	4065.86	5255.83
59	5.76	940.50	19.10	4017.97	5215.47
60	5.76	978.00	56.28	3898.25	5114.57
61	5.76	1018.50	25.13	3768.95	5005.60
62	5.76	1032.00	2.01	3726.01	4969.26
63	5.76	1035.50	5.03	3668.98	4914.63
64	5.76	1075.50	75.38	3484.99	4751.97
65	5.76	1118.50	11.06	3426.04	4714.15
66	5.76	1134.00	20.10	3643.12	4935.75
67	5.76	1163.50	39.20	3792.89	5097.55
68	5.76	1184.00	2.01	3797.83	5111.21
69	5.76	1197.50	25.13	3949.43	5268.17
70	5.76	1231.50	43.22	4220.55	5554.21
71	5.76	1271.43	37.04	4275.09	5629.70
72	5.76	1301.55	23.50	6284.39	5540.98
73	45.00	1321.62	23.71	6154.10	17090.54
74	45.00	1331.68	4.74	5875.84	16074.01
75	45.00	1347.49	40.00	5419.91	14479.24
76	45.00	1364.82	9.00	4920.52	12732.46
77	45.00	1373.00	14.14	4692.92	11905.66
78	45.00	1383.96	16.86	4361.34	10804.05
79	45.00	1394.96	14.26	4028.51	9698.27
80	45.00	1409.10	25.74	3557.33	8188.69
81	45.00	1422.60	12.44	3084.69	6701.29
82	45.00	1428.50	4.24	2878.17	6051.34
83	45.00	1436.44	18.22	2627.50	5231.86
84	45.00	1449.85	19.71	2215.05	3870.23
85	45.00	1463.99	20.29	1655.74	2461.22
86	45.00	1473.91	7.74	1179.11	1492.01
87	59.00	1480.42	14.67	851.33	703.48

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 5947971.00 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 3774.85(psf)
Sum of the Driving Forces = 6600553.00 (lbs)
Average Mobilized Shear Stress = 4189.01(psf)
Total length of the failure surface = 1575.68(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1316(g)
Calculated Newmark Seismic Displacement = 0.118(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: B-B'

File: b-37gs

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1316
T_m (s)	0.517
T_s (s)	0.29
M	6.95
T_s/T_m	0.568467

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.234	0.183	0.301
k-velmax (cm/s)	25.77	20.07	33.09

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.39	0.875	4.01	1.67	9.61
[kmax, k-velmax]	0.57	0.559	1.77	1.01	3.10
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.39	0.875	1.58	0.66	3.78
[kmax, k-velmax]	0.57	0.559	0.70	0.40	1.22

H_{avr} =	155	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.29	s

PGA	Peak Ground Acceleration (g)
PGV	Peak Ground Velocity (cm/s)
k_y	Critical or Yield Acceleration (g)
T_m	Mean Period of an Earthquake Motion (s)
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s = 0 s
M	Earthquake Magnitude
kmax	maximum seismic coefficient (g)
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)
D	Predicted Sliding Displacment (cm)

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

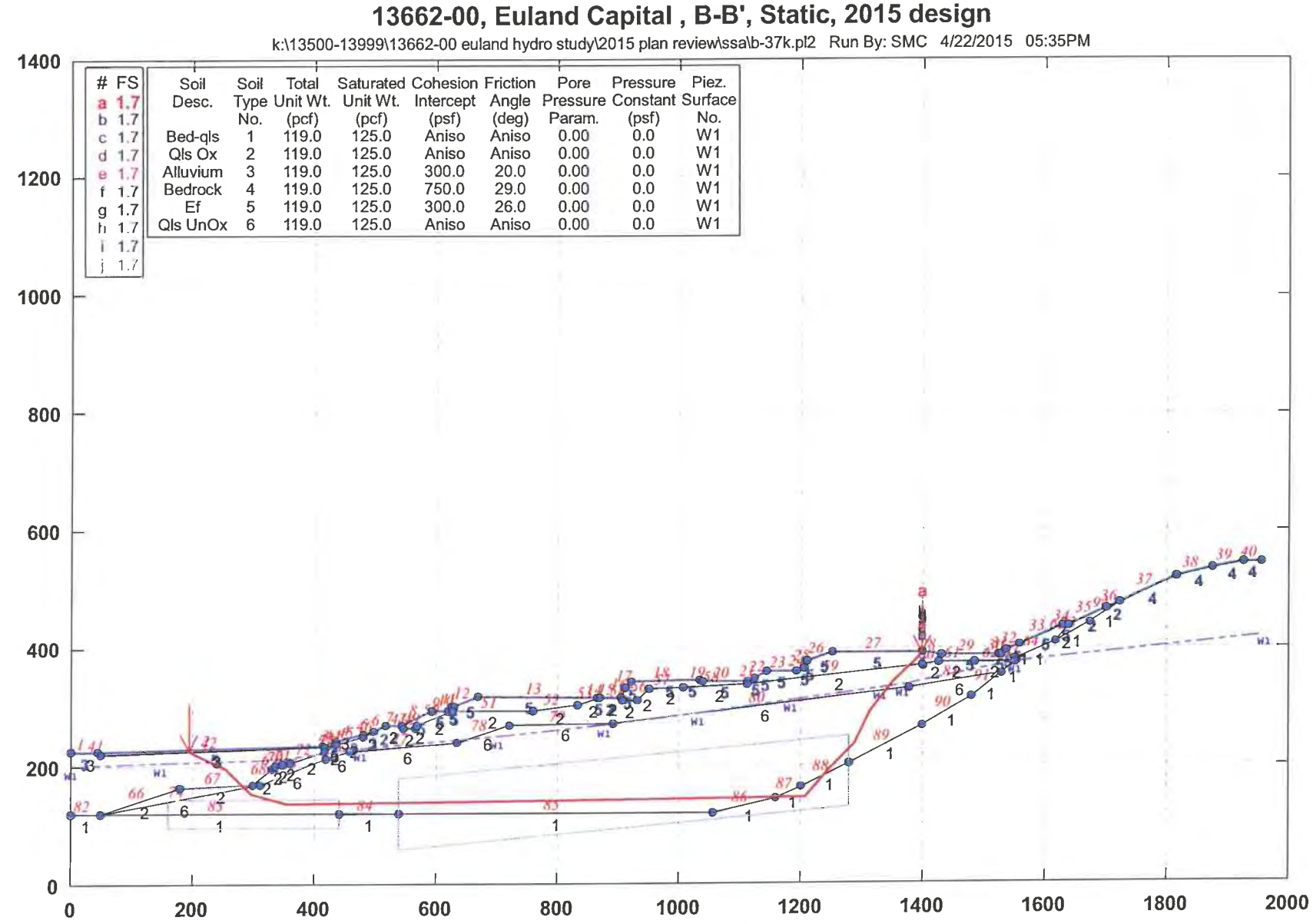
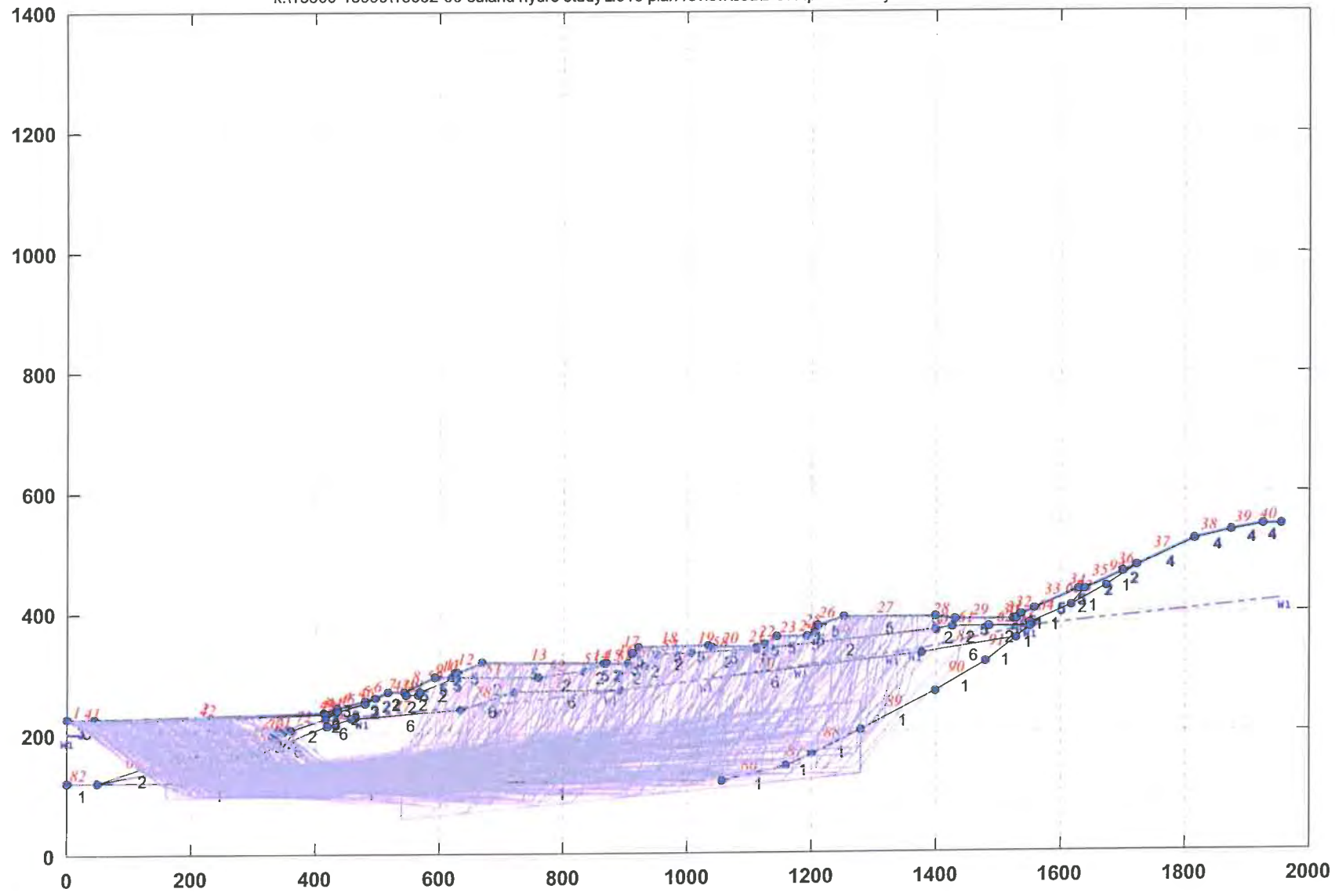

13662-00, Euland Capital , B-B', Static, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37k.pl2 Run By: SMC 4/22/2015 05:35PM
FS
a 1.7
b 1.7
c 1.7
d 1.7
e 1.7
f 1.7
g 1.7
h 1.7
i 1.7
j 1.7
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.7
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-14.1

13662-00, Euland Capital , B-B', Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-37k.plt Run By: SMC 4/22/2015 05:35PM



SMC

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/22/2015
Time of Run: 05:35PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37k.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37k.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37k.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
Static, 2015 design

BOUNDARY COORDINATES
40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
5000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	440.00	120.00	50.00
2	539.00	120.00	1280.00	190.00	120.00

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 = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 7.053 FS Min = 1.666 FS Ave = 2.606
Standard Deviation = 0.598 Coefficient of Variation = 22.95 %

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	193.784	229.043
2	200.047	222.953
3	253.733	196.161
4	296.166	153.741
5	354.055	137.966
6	1208.496	147.789
7	1246.518	194.203
8	1288.144	237.415
9	1313.024	292.014
10	1349.142	339.924
11	1391.410	382.509
12	1399.890	391.000

Factor of Safety
*** 1.666 ***

Individual data on the 79 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.3	1109.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	1.9	1223.2	0.0	0.0	0.	0.	0.0	0.0	0.0
3	31.4	54328.1	0.0	0.0	0.	0.	0.0	0.0	0.0
4	22.3	76692.5	0.0	9085.8	0.	0.	0.0	0.0	0.0
5	27.0	159363.5	0.0	60793.4	0.	0.	0.0	0.0	0.0
6	4.1	32004.9	0.0	14822.4	0.	0.	0.0	0.0	0.0
7	11.4	101434.4	0.0	49719.8	0.	0.	0.0	0.0	0.0
8	3.8	37169.4	0.0	13841.2	0.	0.	0.0	0.0	0.0
9	10.0	99543.7	0.0	37442.2	0.	0.	0.0	0.0	0.0
10	20.0	210325.0	0.0	80691.5	0.	0.	0.0	0.0	0.0
11	3.0	32841.1	0.0	12771.5	0.	0.	0.0	0.0	0.0
12	2.0	22075.3	0.0	8546.1	0.	0.	0.0	0.0	0.0
13	12.0	135653.4	0.0	53495.4	0.	0.	0.0	0.0	0.0
14	7.1	82316.9	0.0	33227.2	0.	0.	0.0	0.0	0.0
15	5.9	70207.4	0.0	27689.2	0.	0.	0.0	0.0	0.0
16	38.5	457127.1	0.0	*******	0.	0.	0.0	0.0	0.0
17	14.5	172900.3	0.0	73058.1	0.	0.	0.0	0.0	0.0
18	4.0	48100.7	0.0	20470.5	0.	0.	0.0	0.0	0.0
19	3.0	36433.6	0.0	15436.2	0.	0.	0.0	0.0	0.0
20	15.0	186771.9	0.0	78252.0	0.	0.	0.0	0.0	0.0
21	2.0	25482.7	0.0	10568.5	0.	0.	0.0	0.0	0.0
22	20.0	262029.5	0.0	*******	0.	0.	0.0	0.0	0.0
23	19.0	261007.8	0.0	*******	0.	0.	0.0	0.0	0.0
24	4.0	56458.7	0.0	22572.6	0.	0.	0.0	0.0	0.0
25	17.0	246986.3	0.0	96796.4	0.	0.	0.0	0.0	0.0
26	21.0	324732.4	0.0	*******	0.	0.	0.0	0.0	0.0
27	27.0	432992.8	0.0	*******	0.	0.	0.0	0.0	0.0
28	1.0	16055.1	0.0	5969.5	0.	0.	0.0	0.0	0.0
29	21.0	351266.0	0.0	*******	0.	0.	0.0	0.0	0.0
30	1.0	17398.8	0.0	6075.9	0.	0.	0.0	0.0	0.0
31	25.0	454819.4	0.0	*******	0.	0.	0.0	0.0	0.0
32	27.0	511488.8	0.0	*******	0.	0.	0.0	0.0	0.0
33	4.0	77386.1	0.0	25357.6	0.	0.	0.0	0.0	0.0
34	3.0	59279.6	0.0	19069.0	0.	0.	0.0	0.0	0.0
35	3.0	59271.5	0.0	19112.5	0.	0.	0.0	0.0	0.0
36	5.0	99378.0	0.0	31950.9	0.	0.	0.0	0.0	0.0
37	15.9	324322.5	0.0	*******	0.	0.	0.0	0.0	0.0
38	18.1	383217.1	0.0	*******	0.	0.	0.0	0.0	0.0
39	31.0	669344.6	0.0	*******	0.	0.	0.0	0.0	0.0
40	20.0	430753.1	0.0	*******	0.	0.	0.0	0.0	0.0
41	40.0	859129.0	0.0	*******	0.	0.	0.0	0.0	0.0
42	72.0	1538445.0	0.0	*******	0.	0.	0.0	0.0	0.0
43	33.0	701688.6	0.0	*******	0.	0.	0.0	0.0	0.0
44	5.0	105846.0	0.0	38744.5	0.	0.	0.0	0.0	0.0
45	8.0	168837.7	0.0	62316.5	0.	0.	0.0	0.0	0.0
46	14.0	295335.4	0.0	*******	0.	0.	0.0	0.0	0.0
47	13.0	274124.5	0.0	*******	0.	0.	0.0	0.0	0.0
48	1.0	21234.9	0.0	8000.4	0.	0.	0.0	0.0	0.0

49	0.9	20155.9	0.0	7496.3	0.	0.	0.0	0.0	0.0
50	5.1	113665.6	0.0	40661.1	0.	0.	0.0	0.0	0.0
51	8.0	190971.8	0.0	64623.1	0.	0.	0.0	0.0	0.0
52	11.0	269780.5	0.0	89627.7	0.	0.	0.0	0.0	0.0
53	19.0	466097.0	0.0	*******	0.	0.	0.0	0.0	0.0
54	56.0	1374587.5	0.0	*******	0.	0.	0.0	0.0	0.0
55	25.0	614054.4	0.0	*******	0.	0.	0.0	0.0	0.0
56	2.0	49134.8	0.0	17865.5	0.	0.	0.0	0.0	0.0
57	5.0	121938.4	0.0	44793.7	0.	0.	0.0	0.0	0.0
58	75.0	1813727.2	0.0	*******	0.	0.	0.0	0.0	0.0
59	11.0	269631.1	0.0	*******	0.	0.	0.0	0.0	0.0
60	20.0	511455.7	0.0	*******	0.	0.	0.0	0.0	0.0
61	21.1	554056.1	0.0	*******	0.	0.	0.0	0.0	0.0
62	17.9	470376.5	0.0	*******	0.	0.	0.0	0.0	0.0
63	10.0	262510.5	0.0	*******	0.	0.	0.0	0.0	0.0
64	7.0	184934.8	0.0	71069.4	0.	0.	0.0	0.0	0.0
65	5.0	133565.0	0.0	50994.9	0.	0.	0.0	0.0	0.0
66	3.5	95706.0	0.0	35771.0	0.	0.	0.0	0.0	0.0
67	1.5	42159.7	0.0	24192.7	0.	0.	0.0	0.0	0.0
68	26.1	695897.8	0.0	*******	0.	0.	0.0	0.0	0.0
69	10.4	254986.2	0.0	*******	0.	0.	0.0	0.0	0.0
70	6.5	153131.1	0.0	70200.1	0.	0.	0.0	0.0	0.0
71	35.1	740077.1	0.0	*******	0.	0.	0.0	0.0	0.0
72	24.9	382950.8	0.0	*******	0.	0.	0.0	0.0	0.0
73	17.0	179805.3	0.0	44591.0	0.	0.	0.0	0.0	0.0
74	8.1	68792.7	0.0	8884.0	0.	0.	0.0	0.0	0.0
75	5.2	38431.3	0.0	1598.1	0.	0.	0.0	0.0	0.0
76	5.9	38651.3	0.0	0.0	0.	0.	0.0	0.0	0.0
77	27.1	120815.2	0.0	0.0	0.	0.	0.0	0.0	0.0
78	15.1	28988.2	0.0	0.0	0.	0.	0.0	0.0	0.0
79	8.5	4284.0	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	193.784	229.043
2	200.047	222.953
3	253.733	196.161
4	296.166	153.741
5	354.055	137.966
6	1208.496	147.789
7	1246.518	194.203
8	1288.144	237.415
9	1313.024	292.014
10	1349.142	339.924
11	1391.410	382.509
12	1399.890	391.000

Factor of Safety

*** 1.666 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	193.784	229.043
2	200.047	222.953
3	253.733	196.161
4	296.166	153.741
5	354.055	137.966
6	1208.496	147.789
7	1246.518	194.203
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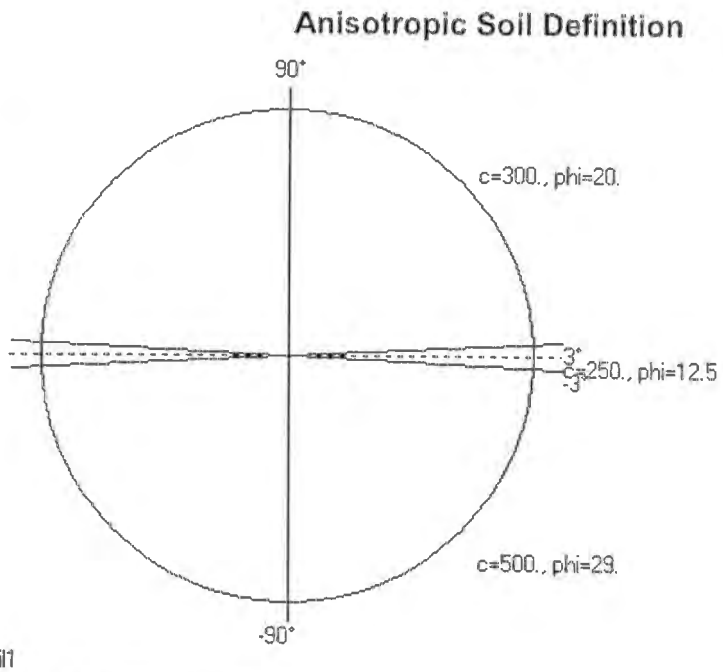
10	1349.142	339.924
11	1391.410	382.509
12	1399.890	391.000

Factor of Safety

*** 1.666 ***

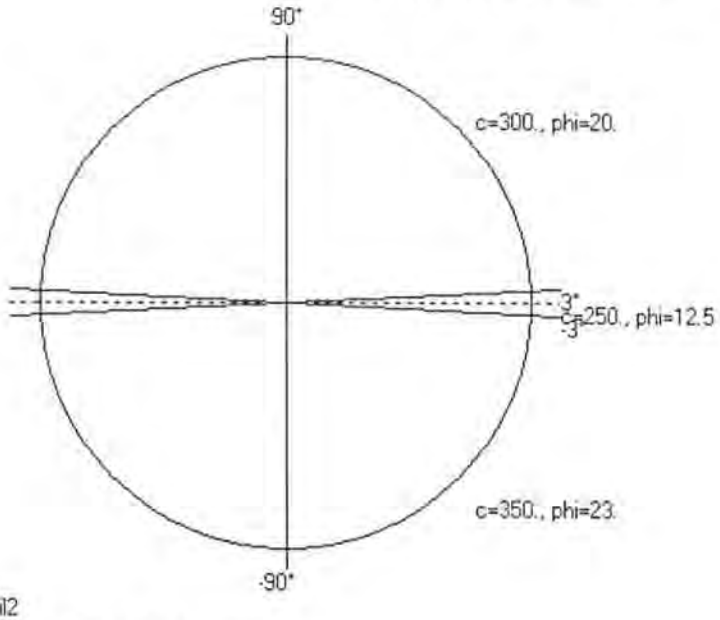
**** END OF GSTABL7 OUTPUT ****



Soil1

13662-00, Euland Capital , B-B',

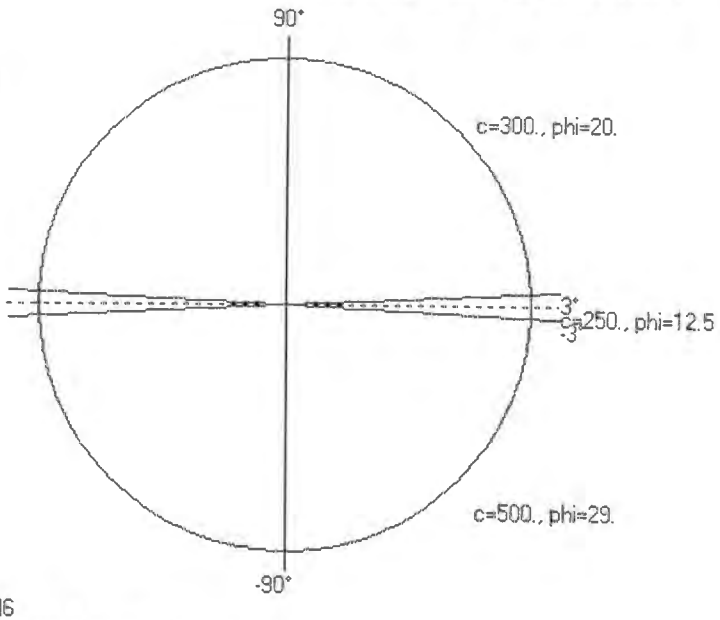
Anisotropic Soil Definition



Soil2

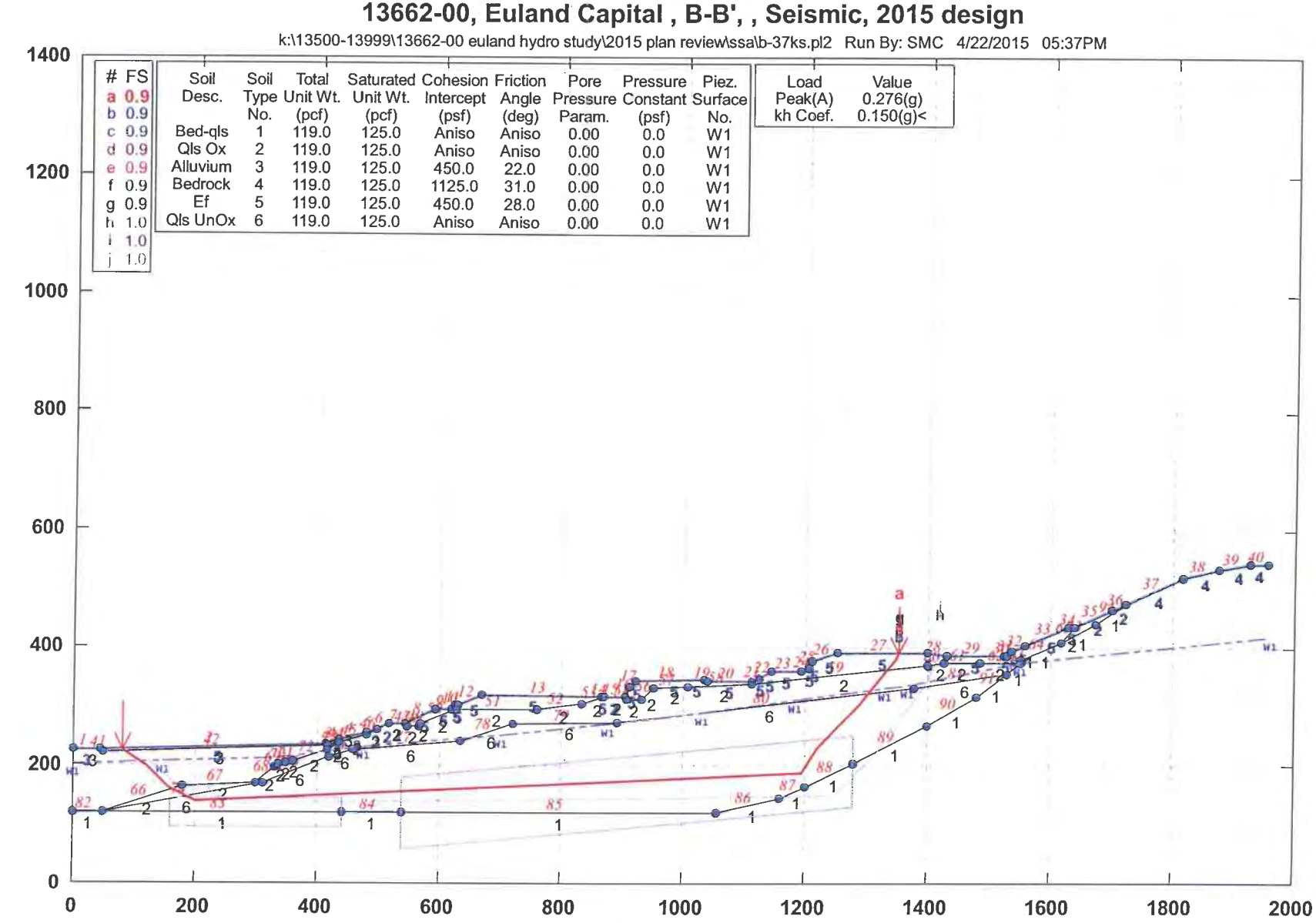
13662-00, Euland Capital , B-B'.

Anisotropic Soil Definition



Soil6

13662-00, Euland Capital , B-B',



GSTABL7 v.2 FSmin=0.9

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-14.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 05:37PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ks.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ks.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ks.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, Seismic, 2015 design

BOUNDARY COORDINATES

40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4
40	1925.00	545.00	1955.00	545.00	4

41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	440.00	120.00	50.00
2	539.00	120.00	1280.00	190.00	120.00

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 = 2000

Number of Trial Surfaces With Valid FS = 2000
Statistical Data On All Valid FS Values:
FS Max = 2.679 FS Min = 0.940 FS Ave = 1.432
Standard Deviation = 0.308 Coefficient of Variation = 21.53 %
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.976	226.005
2	120.920	197.669
3	156.307	162.346
4	200.588	139.125
5	1194.566	187.459
6	1220.058	230.472
7	1254.222	266.981
8	1289.257	302.653
9	1317.290	344.056
10	1348.416	383.186
11	1352.226	391.000

Factor of Safety
*** 0.940 ***

Individual data on the 76 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.5	1910.7	0.0	0.0	0.	0.	286.6	0.0	0.0
2	23.6	38972.2	0.0	0.0	0.	0.	5845.8	0.0	0.0
3	8.8	27402.6	0.0	2240.3	0.	0.	4110.4	0.0	0.0
4	26.1	135849.0	0.0	45954.3	0.	0.	20377.4	0.0	0.0
5	9.3	69587.1	0.0	31281.4	0.	0.	10438.1	0.0	0.0
6	6.4	52840.2	0.0	20043.3	0.	0.	7926.0	0.0	0.0
7	17.3	157785.5	0.0	62452.2	0.	0.	23667.8	0.0	0.0
8	6.9	68280.5	0.0	27984.1	0.	0.	10242.1	0.0	0.0
9	13.7	146173.4	0.0	61401.1	0.	0.	21926.0	0.0	0.0
10	99.4	1092789.9	0.0	*******	0.	0.	*******	0.0	0.0
11	10.0	108457.9	0.0	40621.2	0.	0.	16268.7	0.0	0.0
12	20.0	216110.7	0.0	80835.0	0.	0.	32416.6	0.0	0.0
13	3.0	32324.0	0.0	12078.4	0.	0.	4848.6	0.0	0.0
14	2.0	21530.1	0.0	7985.2	0.	0.	3229.5	0.0	0.0
15	12.0	129012.0	0.0	48385.1	0.	0.	19351.8	0.0	0.0
16	13.0	139436.2	0.0	53334.6	0.	0.	20915.4	0.0	0.0
17	38.5	411130.3	0.0	*******	0.	0.	61669.6	0.0	0.0
18	14.5	153823.8	0.0	63692.5	0.	0.	23073.6	0.0	0.0
19	4.0	42660.6	0.0	17799.3	0.	0.	6399.1	0.0	0.0
20	3.0	32304.8	0.0	13408.8	0.	0.	4845.7	0.0	0.0
21	15.0	165501.8	0.0	67805.9	0.	0.	24825.3	0.0	0.0
22	2.0	22567.8	0.0	9136.7	0.	0.	3385.2	0.0	0.0
23	20.0	231860.2	0.0	92609.4	0.	0.	34779.0	0.0	0.0
24	19.0	230628.2	0.0	90070.4	0.	0.	34594.2	0.0	0.0
25	4.0	49847.8	0.0	19306.1	0.	0.	7477.2	0.0	0.0
26	17.0	218061.7	0.0	82502.6	0.	0.	32709.2	0.0	0.0
27	21.0	287150.4	0.0	*******	0.	0.	43072.6	0.0	0.0
28	27.0	381666.1	0.0	*******	0.	0.	57249.9	0.0	0.0
29	1.0	14089.2	0.0	4997.3	0.	0.	2113.4	0.0	0.0
30	21.0	308909.0	0.0	*******	0.	0.	46336.4	0.0	0.0
31	1.0	15330.7	0.0	5053.0	0.	0.	2299.6	0.0	0.0
32	25.0	401610.2	0.0	*******	0.	0.	60241.5	0.0	0.0
33	27.0	450765.4	0.0	*******	0.	0.	67614.8	0.0	0.0
34	4.0	68102.4	0.0	20763.4	0.	0.	10215.4	0.0	0.0
35	3.0	52268.1	0.0	15599.1	0.	0.	7840.2	0.0	0.0
36	3.0	52218.2	0.0	15621.9	0.	0.	7832.7	0.0	0.0
37	5.0	87529.7	0.0	26087.1	0.	0.	13129.4	0.0	0.0
38	15.9	285833.7	0.0	83463.4	0.	0.	42875.1	0.0	0.0
39	18.1	338060.6	0.0	95606.5	0.	0.	50709.1	0.0	0.0
40	31.0	588404.6	0.0	*******	0.	0.	88260.7	0.0	0.0
41	20.0	376173.1	0.0	*******	0.	0.	56426.0	0.0	0.0
42	40.0	744401.2	0.0	*******	0.	0.	*******	0.0	0.0
43	72.0	1313226.8	0.0	*******	0.	0.	*******	0.0	0.0
44	33.0	590425.1	0.0	*******	0.	0.	88563.8	0.0	0.0
45	5.0	88547.0	0.0	30193.2	0.	0.	13282.1	0.0	0.0

46	8.0	140918.1	0.0	48514.9	0.	0.	21137.7	0.0	0.0
47	14.0	245766.9	0.0	85435.5	0.	0.	36865.0	0.0	0.0
48	13.0	227282.3	0.0	80225.4	0.	0.	34092.3	0.0	0.0
49	1.0	17599.2	0.0	6206.8	0.	0.	2639.9	0.0	0.0
50	0.9	16748.1	0.0	5815.1	0.	0.	2512.2	0.0	0.0
51	5.1	95161.6	0.0	31532.4	0.	0.	14274.2	0.0	0.0
52	8.0	161496.3	0.0	50081.5	0.	0.	24224.4	0.0	0.0
53	11.0	228767.0	0.0	69393.5	0.	0.	34315.0	0.0	0.0
54	19.0	393933.1	0.0	*******	0.	0.	59090.0	0.0	0.0
55	56.0	1152151.4	0.0	*******	0.	0.	*******	0.0	0.0
56	25.0	510055.2	0.0	*******	0.	0.	76508.3	0.0	0.0
57	2.0	40689.7	0.0	13698.8	0.	0.	6103.4	0.0	0.0
58	5.0	100744.3	0.0	34337.0	0.	0.	15111.6	0.0	0.0
59	75.0	1481897.6	0.0	*******	0.	0.	*******	0.0	0.0
60	11.0	218768.4	0.0	80232.5	0.	0.	32815.3	0.0	0.0
61	20.0	417539.8	0.0	*******	0.	0.	62631.0	0.0	0.0
62	39.0	835958.9	0.0	*******	0.	0.	*******	0.0	0.0
63	10.0	213048.7	0.0	76479.0	0.	0.	31957.3	0.0	0.0
64	1.6	33380.0	0.0	12026.9	0.	0.	5007.0	0.0	0.0
65	10.4	214008.3	0.0	*******	0.	0.	32101.3	0.0	0.0
66	5.0	99612.5	0.0	63095.5	0.	0.	14941.9	0.0	0.0
67	10.1	194083.0	0.0	*******	0.	0.	29112.4	0.0	0.0
68	32.9	554313.4	0.0	*******	0.	0.	83147.0	0.0	0.0
69	1.2	18513.6	0.0	5890.9	0.	0.	2777.0	0.0	0.0
70	35.0	450457.6	0.0	*******	0.	0.	67568.6	0.0	0.0
71	12.3	117366.9	0.0	18415.2	0.	0.	17605.0	0.0	0.0
72	3.9	31405.7	0.0	1135.1	0.	0.	4710.8	0.0	0.0
73	11.8	77942.3	0.0	0.0	0.	0.	11691.3	0.0	0.0
74	14.4	64892.2	0.0	0.0	0.	0.	9733.8	0.0	0.0
75	16.7	36518.2	0.0	0.0	0.	0.	5477.7	0.0	0.0
76	3.8	1771.6	0.0	0.0	0.	0.	265.7	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.976	226.005
2	120.920	197.669
3	156.307	162.346
4	200.588	139.125
5	1194.566	187.459
6	1220.058	230.472
7	1254.222	266.981
8	1289.257	302.653
9	1317.290	344.056
10	1348.416	383.186
11	1352.226	391.000

Factor of Safety

*** 0.940 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.976	226.005
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8	1289.257	302.653
9	1317.290	344.056
10	1348.416	383.186
11	1352.226	391.000

Factor of Safety
*** 0.940 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.659	225.000
2	79.847	214.121
3	128.502	202.602
4	165.229	168.674
5	215.119	165.351
6	254.456	134.487
7	1250.286	148.777
8	1283.134	186.474
9	1317.074	223.190
10	1343.295	265.763

11	1375.568	303.953
12	1401.373	346.779
13	1418.915	389.109

Factor of Safety
*** 0.951 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.659	225.000
2	79.847	214.121
3	128.502	202.602
4	165.229	168.674
5	215.119	165.351
6	254.456	134.487
7	1250.286	148.777
8	1283.134	186.474
9	1317.074	223.190
10	1343.295	265.763
11	1375.568	303.953
12	1401.373	346.779
13	1418.915	389.109

Factor of Safety
*** 0.951 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.659	225.000
2	79.847	214.121
3	128.502	202.602
4	165.229	168.674
5	215.119	165.351
6	254.456	134.487
7	1250.286	148.777
8	1283.134	186.474
9	1317.074	223.190
10	1343.295	265.763
11	1375.568	303.953
12	1401.373	346.779
13	1418.915	389.109

Factor of Safety
*** 0.951 ***

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

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/22/2015
Time of Run: 05:38PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ks Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ks Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-37ks Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, Seismic, 2015 design

BOUNDARY COORDINATES

40 Top Boundaries
94 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	905.00	315.00	2
16	905.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1124.00	348.00	5
22	1124.00	348.00	1144.00	360.00	5
23	1144.00	360.00	1193.00	360.00	5
24	1193.00	360.00	1205.00	365.00	5
25	1205.00	365.00	1210.00	378.00	5
26	1210.00	378.00	1253.00	391.00	5
27	1253.00	391.00	1400.00	391.00	5
28	1400.00	391.00	1430.00	388.00	5
29	1430.00	388.00	1525.00	387.00	5
30	1525.00	387.00	1530.00	387.00	5
31	1530.00	387.00	1537.00	395.00	5
32	1537.00	395.00	1557.00	404.00	5
33	1557.00	404.00	1630.00	435.00	5
34	1630.00	435.00	1638.00	437.00	5
35	1638.00	437.00	1700.00	465.00	2
36	1700.00	465.00	1722.00	475.00	2
37	1722.00	475.00	1815.00	520.00	4
38	1815.00	520.00	1875.00	535.00	4
39	1875.00	535.00	1925.00	545.00	4

40	1925.00	545.00	1955.00	545.00	4
41	45.00	225.00	50.00	220.00	3
42	50.00	220.00	417.00	232.00	3
43	417.00	232.00	435.00	237.00	3
44	435.00	237.00	437.00	242.00	3
45	435.00	237.00	480.00	249.00	2
46	480.00	249.00	497.00	260.00	2
47	545.00	270.00	546.00	265.00	2
48	546.00	265.00	567.00	265.00	2
49	567.00	265.00	568.00	270.00	2
50	568.00	270.00	627.00	293.00	2
51	627.00	293.00	760.00	295.00	2
52	760.00	295.00	832.00	305.00	2
53	832.00	305.00	870.00	315.00	2
54	905.00	315.00	906.00	310.00	2
55	906.00	310.00	931.00	310.00	2
56	931.00	310.00	950.00	330.00	2
57	950.00	330.00	1006.00	333.00	2
58	1006.00	333.00	1113.00	337.00	2
59	1113.00	337.00	1400.00	370.00	2
60	1400.00	370.00	1427.00	374.00	2
61	1427.00	374.00	1485.00	375.00	2
62	1485.00	375.00	1550.00	375.00	2
63	1550.00	375.00	1551.00	380.00	1
64	1551.00	380.00	1618.00	410.00	1
65	1618.00	410.00	1638.00	437.00	2
66	50.00	120.00	180.00	165.00	2
67	180.00	165.00	300.00	170.00	2
68	300.00	170.00	330.00	195.00	2
69	330.00	195.00	335.00	200.00	2
70	335.00	200.00	347.00	203.00	2
71	347.00	203.00	360.00	207.00	2
72	360.00	207.00	417.00	225.00	2
73	417.00	225.00	435.00	237.00	2
74	50.00	120.00	310.00	170.00	6
75	310.00	170.00	420.00	212.00	6
76	420.00	212.00	457.00	225.00	6
77	457.00	225.00	635.00	240.00	6
78	635.00	240.00	720.00	270.00	6
79	720.00	270.00	892.00	272.00	6
80	892.00	272.00	1378.00	330.00	6
81	1378.00	330.00	1530.00	356.00	6
82	0.00	120.00	50.00	120.00	1
83	50.00	120.00	440.00	120.00	1
84	440.00	120.00	539.00	120.00	1
85	539.00	120.00	1057.00	120.00	1
86	1057.00	120.00	1160.00	145.00	1
87	1160.00	145.00	1200.00	163.00	1
88	1200.00	163.00	1280.00	204.00	1
89	1280.00	204.00	1400.00	266.00	1
90	1400.00	266.00	1480.00	317.00	1
91	1480.00	317.00	1530.00	356.00	1
92	1530.00	356.00	1550.00	375.00	1
93	1618.00	410.00	1673.00	440.00	1
94	1673.00	440.00	1722.00	475.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.976	226.005
2	120.920	197.669
3	156.307	162.346
4	200.588	139.125
5	1194.566	187.459
6	1220.058	230.472
7	1254.222	266.981
8	1289.257	302.653
9	1317.290	344.056
10	1348.416	383.186
11	1352.226	391.000

Janbu's Empirical Coefficient (fo) = 1.057

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 0.940

Table 1 - Individual Data on the 76 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)	
1	6.5	1910.7	0.0	0.0	0.0	0.0	286.6	0.0	0.0	
2	23.6	38972.0	0.0	0.0	0.0	0.0	5845.8	0.0	0.0	
3	8.8	27402.4	0.0	2240.3	0.0	0.0	4110.4	0.0	0.0	
4	26.1	135848.7	0.0	45953.9	0.0	0.0	20377.3	0.0	0.0	
5	9.3	69585.4	0.0	31280.4	0.0	0.0	10437.8	0.0	0.0	
6	6.4	52843.8	0.0	20044.8	0.0	0.0	7926.6	0.0	0.0	
7	17.3	157783.0	0.0	62451.8	0.0	0.0	23667.4	0.0	0.0	
8	6.9	68276.9	0.0	27982.9	0.0	0.0	10241.5	0.0	0.0	
9	13.7	146173.5	0.0	61401.8	0.0	0.0	21926.0	0.0	0.0	
10	99.4	1092798.2	0.0	*******	0.0	0.0	*******	0.0	0.0	
11	10.0	108458.2	0.0	40621.4	0.0	0.0	16268.7	0.0	0.0	
12	20.0	216111.5	0.0	80835.4	0.0	0.0	32416.7	0.0	0.0	
13	3.0	32324.2	0.0	12078.5	0.0	0.0	4848.6	0.0	0.0	
14	2.0	21530.2	0.0	7985.2	0.0	0.0	3229.5	0.0	0.0	
15	12.0	129012.4	0.0	48385.4	0.0	0.0	19351.9	0.0	0.0	
16	13.0	139436.7	0.0	53334.8	0.0	0.0	20915.5	0.0	0.0	
17	38.5	411131.7	0.0	*******	0.0	0.0	61669.8	0.0	0.0	
18	14.5	153824.3	0.0	63692.8	0.0	0.0	23073.7	0.0	0.0	
19	4.0	42660.8	0.0	17799.4	0.0	0.0	6399.1	0.0	0.0	
20	3.0	32304.9	0.0	13408.8	0.0	0.0	4845.7	0.0	0.0	
21	15.0	165502.3	0.0	67806.1	0.0	0.0	24825.3	0.0	0.0	
22	2.0	22567.9	0.0	9136.8	0.0	0.0	3385.2	0.0	0.0	
23	20.0	231860.9	0.0	92609.7	0.0	0.0	34779.1	0.0	0.0	
24	19.0	230628.8	0.0	90070.7	0.0	0.0	34594.3	0.0	0.0	
25	4.0	49847.9	0.0	19306.2	0.0	0.0	7477.2	0.0	0.0	
26	17.0	218062.2	0.0	82502.9	0.0	0.0	32709.3	0.0	0.0	
27	21.0	287151.1	0.0	*******	0.0	0.0	43072.7	0.0	0.0	
28	27.0	381666.9	0.0	*******	0.0	0.0	57250.0	0.0	0.0	
29	1.0	14089.2	0.0	4997.3	0.0	0.0	2113.4	0.0	0.0	
30	21.0	308909.7	0.0	*******	0.0	0.0	46336.5	0.0	0.0	
31	1.0	15330.8	0.0	5053.0	0.0	0.0	2299.6	0.0	0.0	
32	25.0	401611.0	0.0	*******	0.0	0.0	60241.6	0.0	0.0	
33	27.0	450766.2	0.0	*******	0.0	0.0	67614.9	0.0	0.0	
34	4.0	68102.5	0.0	20763.5	0.0	0.0	10215.4	0.0	0.0	
35	3.0	52268.1	0.0	15599.2	0.0	0.0	7840.2	0.0	0.0	
36	3.0	52218.2	0.0	15622.0	0.0	0.0	7832.7	0.0	0.0	
37	5.0	87529.8	0.0	26087.2	0.0	0.0	13129.5	0.0	0.0	
38	15.9	285834.2	0.0	83463.6	0.0	0.0	42875.1	0.0	0.0	
39	18.1	338061.1	0.0	95606.8	0.0	0.0	50709.2	0.0	0.0	
40	31.0	588405.4	0.0	*******	0.0	0.0	88260.8	0.0	0.0	
41	20.0	376173.6	0.0	*******	0.0	0.0	56426.0	0.0	0.0	
42	40.0	744402.2	0.0	*******	0.0	0.0	*******	0.0	0.0	
43	72.0	1313228.5	0.0	*******	0.0	0.0	*******	0.0	0.0	
44	33.0	590425.9	0.0	*******	0.0	0.0	88563.9	0.0	0.0	
45	5.0	88547.2	0.0	30193.3	0.0	0.0	13282.1	0.0	0.0	
46	8.0	140918.3	0.0	48515.0	0.0	0.0	21137.7	0.0	0.0	
47	14.0	245767.2	0.0	85435.6	0.0	0.0	36865.1	0.0	0.0	
48	13.0	227282.6	0.0	80225.6	0.0	0.0	34092.4	0.0	0.0	
49	1.0	17599.2	0.0	6206.8	0.0	0.0	2639.9	0.0	0.0	
50	0.9	16748.1	0.0	5815.1	0.0	0.0	2512.2	0.0	0.0	
51	5.1	95161.8	0.0	31532.4	0.0	0.0	14274.3	0.0	0.0	
52	8.0	161496.5	0.0	50081.6	0.0	0.0	24224.5	0.0	0.0	
53	11.0	228767.2	0.0	69393.6	0.0	0.0	34315.1	0.0	0.0	
54	19.0	393933.5	0.0	*******	0.0	0.0	59090.0	0.0	0.0	
55	56.0	1152152.5	0.0	*******	0.0	0.0	*******	0.0	0.0	
56	25.0	510055.6	0.0	*******	0.0	0.0	76508.3	0.0	0.0	
57	2.0	40689.7	0.0	13698.8	0.0	0.0	6103.5	0.0	0.0	
58	5.0	100744.4	0.0	34337.0	0.0	0.0	15111.7	0.0	0.0	
59	75.0	1481898.8	0.0	*******	0.0	0.0	*******	0.0	0.0	
60	11.0	218768.5	0.0	80232.6	0.0	0.0	32815.3	0.0	0.0	
61	20.0	417540.1	0.0	*******	0.0	0.0	62631.0	0.0	0.0	
62	39.0	835959.4	0.0	*******	0.0	0.0	*******	0.0	0.0	
63	10.0	213048.8	0.0	76479.1	0.0	0.0	31957.3	0.0	0.0	

64	1.6	33377.4	0.0	12025.9	0.0	0.0	5006.6	0.0	0.0
65	10.4	214011.0	0.0	*******	0.0	0.0	32101.6	0.0	0.0
66	5.0	99612.5	0.0	63095.3	0.0	0.0	14941.9	0.0	0.0
67	10.1	194078.5	0.0	*******	0.0	0.0	29111.8	0.0	0.0
68	32.9	554318.4	0.0	*******	0.0	0.0	83147.8	0.0	0.0
69	1.2	18515.5	0.0	5891.5	0.0	0.0	2777.3	0.0	0.0
70	35.0	450455.2	0.0	*******	0.0	0.0	67568.3	0.0	0.0
71	12.3	117366.3	0.0	18415.7	0.0	0.0	17604.9	0.0	0.0
72	3.9	31405.7	0.0	1135.1	0.0	0.0	4710.9	0.0	0.0
73	11.8	77942.1	0.0	0.0	0.0	0.0	11691.3	0.0	0.0
74	14.4	64892.4	0.0	0.0	0.0	0.0	9733.9	0.0	0.0
75	16.7	36519.4	0.0	0.0	0.0	0.0	5477.9	0.0	0.0
76	3.8	1771.3	0.0	0.0	0.0	0.0	265.7	0.0	0.0

Table 2 - Base Stress Data on the 76 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-36.04	85.24	8.07	1272.64	-136.82
2	-36.04	100.32	29.25	2007.36	-769.67
3	-36.04	116.53	10.85	2929.99	-1458.99
4	-44.95	133.96	36.85	5072.80	-3126.94
5	-44.95	151.65	13.15	6208.29	-4488.28
6	-27.67	159.49	7.20	3898.75	-2749.67
7	-27.67	171.34	19.56	5010.79	-3020.48
8	-27.67	183.43	7.75	5308.15	-3296.95
9	-27.67	193.73	15.49	8099.29	-3532.27
10	2.78	250.29	99.53	2123.54	2180.85
11	2.78	305.00	10.01	2104.99	2151.73
12	2.78	320.00	20.02	2099.90	2143.74
13	2.78	331.50	3.00	2096.01	2137.62
14	2.78	334.00	2.00	2102.11	2135.72
15	2.78	341.00	12.01	2088.43	2132.92
16	2.78	353.50	13.02	2064.00	2127.94
17	2.78	379.26	38.56	2013.66	2117.66
18	2.78	405.76	14.50	1961.87	2107.09
19	2.78	415.00	4.00	1959.89	2115.89
20	2.78	418.50	3.00	1981.20	2136.35
21	2.78	427.50	15.02	2035.99	2188.96
22	2.78	436.00	2.00	2087.73	2238.65
23	2.78	447.00	20.02	2150.87	2299.97
24	2.78	466.50	19.02	2262.10	2408.16
25	2.78	478.00	4.00	2322.85	2472.36
26	2.78	488.50	17.02	2409.38	2544.82
27	2.78	507.50	21.02	2613.44	2712.79
28	2.78	531.50	27.03	2715.98	2804.44
29	2.78	545.50	1.00	2695.03	2795.19
30	2.78	556.50	21.02	2846.54	2918.35
31	2.78	567.50	1.00	2998.06	3041.51
32	2.78	580.50	25.03	3177.12	3187.06
33	2.78	606.50	27.03	3321.45	3312.17
34	2.78	622.00	4.00	3395.91	3377.75
35	2.78	625.50	3.00	3495.11	3456.53
36	2.78	628.50	3.00	3488.92	3453.23
37	2.78	632.50	5.01	3511.86	3473.05
38	2.78	642.96	15.94	3620.75	3562.84
39	2.78	659.96	18.11	3797.75	3708.80
40	2.78	684.50	31.04	3855.12	3765.65
41	2.78	710.00	20.02	3794.18	3731.50
42	2.78	740.00	40.05	3713.14	3692.09
43	2.78	796.00	72.09	3561.85	3618.54
44	2.78	848.50	33.04	3420.03	3549.58
45	2.78	867.50	5.01	3354.27	3513.42
46	2.78	874.00	8.01	3323.53	3494.64
47	2.78	885.00	14.02	3298.46	3482.74
48	2.78	898.50	13.02	3262.66	3468.55
49	2.78	905.50	1.00	3283.19	3491.54
50	2.78	906.47	0.94	3356.31	3549.30
51	2.78	909.47	5.07	3582.92	3728.27
52	2.78	916.00	8.01	3930.78	4004.96
53	2.78	925.50	11.01	4074.30	4125.97

54	2.78	940.50	19.02	4038.56	4113.34
55	2.78	978.00	56.07	3949.22	4081.76
56	2.78	1018.50	25.03	3852.73	4047.65
57	2.78	1032.00	2.00	3820.73	4036.26
58	2.78	1035.50	5.01	3766.07	3997.38
59	2.78	1075.50	75.09	3613.91	3919.97
60	2.78	1118.50	11.01	3590.58	3945.64
61	2.78	1134.00	20.02	3822.94	4141.84
62	2.78	1163.50	39.05	3926.80	4252.51
63	2.78	1188.00	10.01	3862.24	4226.73
64	2.78	1193.78	1.57	3856.39	4228.39
65	59.35	1199.78	20.46	6639.11	19213.54
66	59.35	1207.50	9.81	6708.81	18662.27
67	59.35	1215.03	19.73	6752.64	18075.14
68	46.90	1236.53	48.21	5536.54	14011.28
69	46.90	1253.61	1.79	5257.15	12617.05
70	45.52	1271.74	50.00	4680.23	10524.38
71	55.90	1295.43	22.01	4314.75	8673.71
72	55.90	1303.56	6.99	3953.35	7311.16
73	55.90	1311.40	21.00	3410.16	6039.20
74	51.50	1324.48	23.11	2370.01	3950.74
75	51.50	1340.05	26.89	1511.88	1911.26
76	64.01	1350.32	8.69	736.66	448.45

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 4923369.50 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 3511.66(psf)
Sum of the Driving Forces = 5532302.00 (lbs)
Average Mobilized Shear Stress = 3945.99(psf)
Total length of the failure surface = 1402.01(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1329(g)
Calculated Newmark Seismic Displacement = 0.116(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: B-B'

File: b-37ks

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1329
T_m (s)	0.517
T_s (s)	0.27
M	6.95
T_s/T_m	0.531792

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.241	0.188	0.310
k-velmax (cm/s)	25.84	20.12	33.18

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.43	0.871	4.18	1.75	10.00
[kmax, k-velmax]	0.61	0.556	1.84	1.05	3.20
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.43	0.871	1.65	0.69	3.94
[kmax, k-velmax]	0.61	0.556	0.72	0.41	1.26

PGA	Peak Ground Acceleration (g)	
PGV	Peak Ground Velocity (cm/s)	
k_y	Critical or Yield Acceleration (g)	
T_m	Mean Period of an Earthquake Motion (s)	
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s	
M	Earthquake Magnitude	
kmax	maximum seismic coefficient (g)	
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)	
D	Predicted Sliding Displacment (cm)	

H_{avr} =	145	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.27	s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

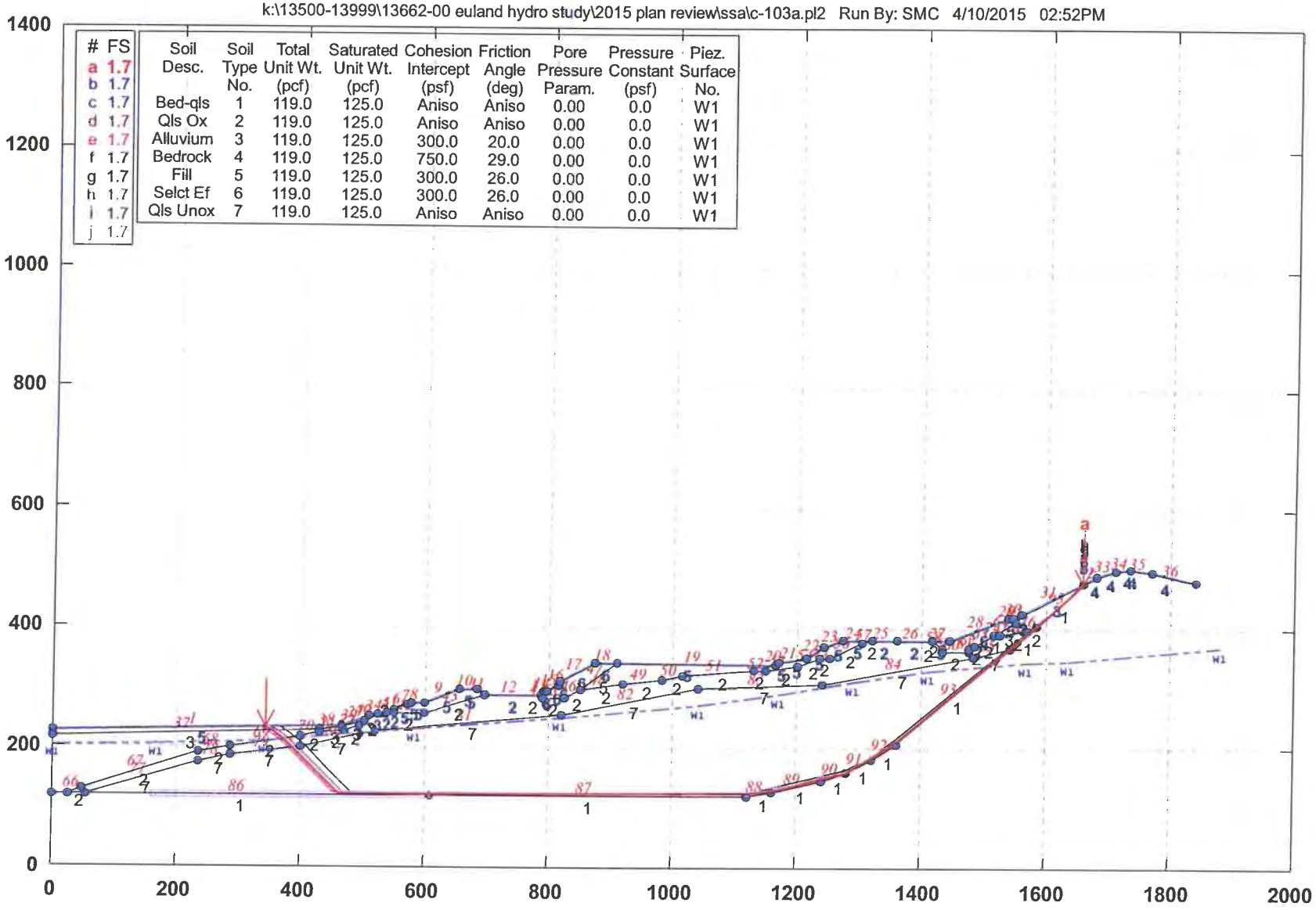
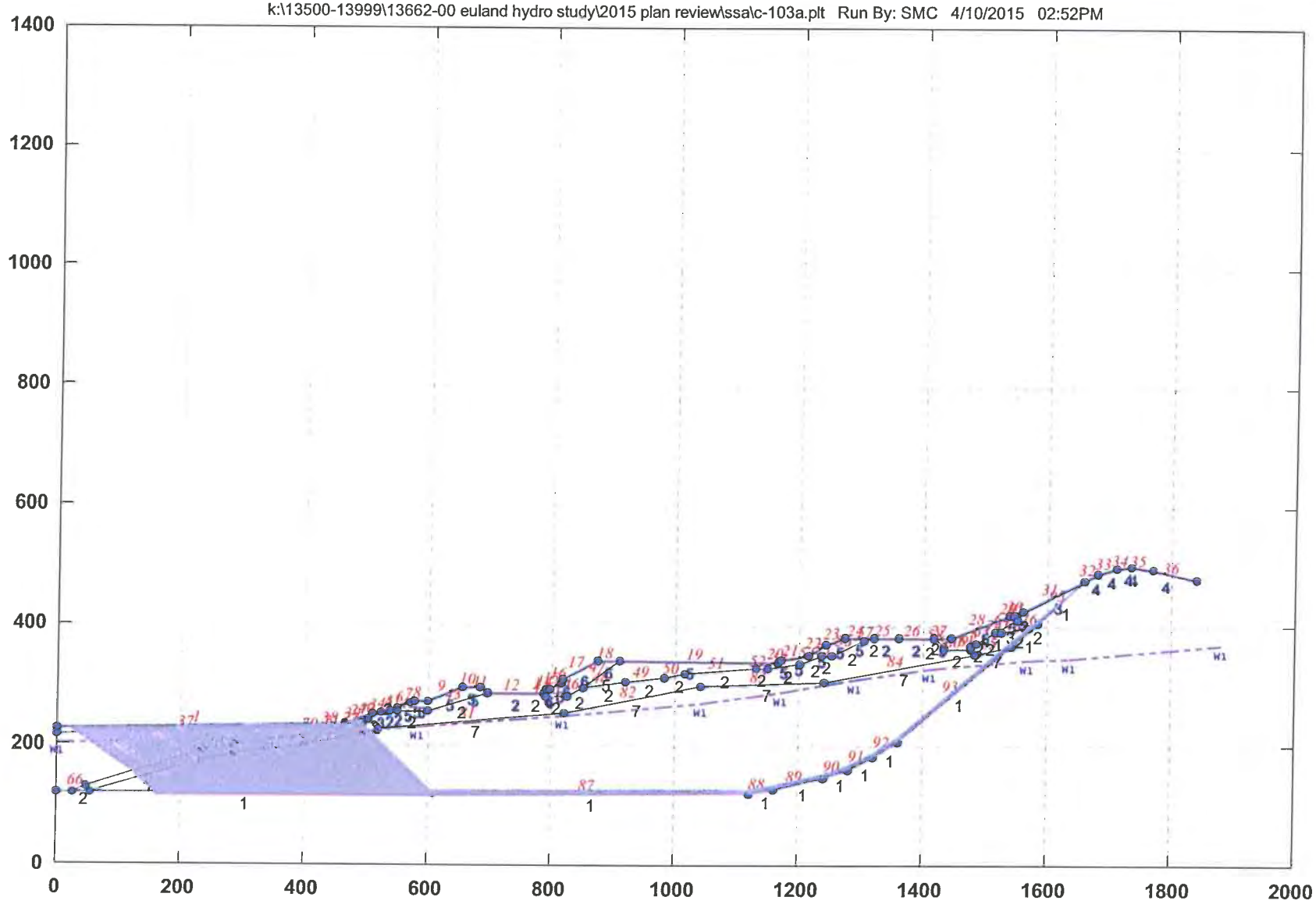

13662-00, Euland Capital, C-C', - - Static-
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103a.pl2 Run By: SMC 4/10/2015 02:52PM
FS
a 1.7
b 1.7
c 1.7
d 1.7
e 1.7
f 1.7
g 1.7
h 1.7
i 1.7
j 1.7
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Selct Ef | 6 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.7
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-15.1

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103a.plt Run By: SMC 4/10/2015 02:52PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

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: 4/10/2015
Time of Run: 02:52PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103a.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103a.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103a.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	608.00	120.00	10.00
2	1120.00	125.00	1125.00	125.00	10.00
3	1160.00	132.00	1160.00	132.00	10.00
4	1240.00	151.00	1240.00	151.00	10.00
5	1280.00	165.00	1280.00	165.00	10.00
6	1320.00	185.00	1320.00	185.00	10.00
7	1360.00	211.00	1360.00	211.00	10.00

8	1584.00	409.00	1584.00	409.00	10.00
9	1658.00	476.00	1658.00	476.00	0.00

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 = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.016 FS Min = 1.659 FS Ave = 1.764
Standard Deviation = 0.057 Coefficient of Variation = 3.22 %
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.742	232.371
2	354.160	225.236
3	372.802	212.183
4	386.731	198.254
5	420.406	164.579
6	462.832	122.153
7	1122.733	127.675
8	1160.000	130.159
9	1240.000	150.540
10	1280.000	160.258
11	1320.000	186.249
12	1360.000	211.952
13	1584.000	404.302
14	1658.000	476.000

Factor of Safety
*** 1.659 ***

Individual data on the 83 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Ver (lbs)	Surcharge Load (lbs)
1	11.4	5013.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	18.3	30350.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.4	945.7	0.0	4.4	0.	0.	0.0	0.0	0.0
4	5.3	14868.9	0.0	1465.0	0.	0.	0.0	0.0	0.0
5	8.7	32109.7	0.0	8145.2	0.	0.	0.0	0.0	0.0
6	13.3	67858.7	0.0	26346.8	0.	0.	0.0	0.0	0.0
7	20.4	148344.5	0.0	73249.5	0.	0.	0.0	0.0	0.0
8	9.6	88175.4	0.0	48151.6	0.	0.	0.0	0.0	0.0
9	32.8	390911.4	0.0	*******	0.	0.	0.0	0.0	0.0
10	2.2	30374.2	0.0	13200.8	0.	0.	0.0	0.0	0.0
11	5.0	70618.2	0.0	30528.6	0.	0.	0.0	0.0	0.0
12	23.0	339143.0	0.0	*******	0.	0.	0.0	0.0	0.0
13	9.0	139102.9	0.0	56210.2	0.	0.	0.0	0.0	0.0
14	8.0	126666.7	0.0	50281.6	0.	0.	0.0	0.0	0.0
15	8.0	128363.2	0.0	50580.0	0.	0.	0.0	0.0	0.0
16	2.0	32176.9	0.0	12691.6	0.	0.	0.0	0.0	0.0
17	3.0	48329.8	0.0	19072.4	0.	0.	0.0	0.0	0.0
18	14.0	227332.3	0.0	89559.2	0.	0.	0.0	0.0	0.0
19	13.0	216412.7	0.0	83980.3	0.	0.	0.0	0.0	0.0
20	1.0	16970.5	0.0	6492.7	0.	0.	0.0	0.0	0.0
21	19.0	333641.3	0.0	*******	0.	0.	0.0	0.0	0.0
22	8.0	145895.4	0.0	52817.6	0.	0.	0.0	0.0	0.0
23	5.0	91829.4	0.0	33162.5	0.	0.	0.0	0.0	0.0
24	17.0	313129.1	0.0	*******	0.	0.	0.0	0.0	0.0
25	56.0	1106265.0	0.0	*******	0.	0.	0.0	0.0	0.0
26	29.0	610186.2	0.0	*******	0.	0.	0.0	0.0	0.0
27	11.0	226095.8	0.0	78717.1	0.	0.	0.0	0.0	0.0
28	92.0	1844646.2	0.0	*******	0.	0.	0.0	0.0	0.0
29	1.0	20129.7	0.0	7623.7	0.	0.	0.0	0.0	0.0
30	3.0	61635.2	0.0	22899.7	0.	0.	0.0	0.0	0.0
31	5.0	104276.5	0.0	38261.6	0.	0.	0.0	0.0	0.0
32	18.0	384923.3	0.0	*******	0.	0.	0.0	0.0	0.0
33	2.0	44781.5	0.0	15509.8	0.	0.	0.0	0.0	0.0
34	1.0	22896.7	0.0	7762.1	0.	0.	0.0	0.0	0.0
35	2.0	45976.0	0.0	15533.4	0.	0.	0.0	0.0	0.0

36	5.0	116008.2	0.0	38921.5	0.	0.	0.0	0.0	0.0
37	25.0	602930.9	0.0	*******	0.	0.	0.0	0.0	0.0
38	25.0	641080.6	0.0	*******	0.	0.	0.0	0.0	0.0
39	35.0	923903.8	0.0	*******	0.	0.	0.0	0.0	0.0
40	10.0	263787.2	0.0	82495.1	0.	0.	0.0	0.0	0.0
41	63.0	1657462.4	0.0	*******	0.	0.	0.0	0.0	0.0
42	32.0	838979.0	0.0	*******	0.	0.	0.0	0.0	0.0
43	25.0	654089.8	0.0	*******	0.	0.	0.0	0.0	0.0
44	2.0	52275.6	0.0	17766.4	0.	0.	0.0	0.0	0.0
45	80.7	2104522.2	0.0	*******	0.	0.	0.0	0.0	0.0
46	8.3	214696.5	0.0	79340.0	0.	0.	0.0	0.0	0.0
47	17.0	439600.6	0.0	*******	0.	0.	0.0	0.0	0.0
48	12.0	308775.4	0.0	*******	0.	0.	0.0	0.0	0.0
49	5.0	127988.7	0.0	50274.9	0.	0.	0.0	0.0	0.0
50	5.0	128388.6	0.0	50118.2	0.	0.	0.0	0.0	0.0
51	30.0	771938.5	0.0	*******	0.	0.	0.0	0.0	0.0
52	15.0	383596.2	0.0	*******	0.	0.	0.0	0.0	0.0
53	22.0	572854.3	0.0	*******	0.	0.	0.0	0.0	0.0
54	3.0	79884.0	0.0	28837.0	0.	0.	0.0	0.0	0.0
55	4.0	107183.8	0.0	38272.1	0.	0.	0.0	0.0	0.0
56	8.0	215519.1	0.0	76316.5	0.	0.	0.0	0.0	0.0
57	21.0	569294.4	0.0	*******	0.	0.	0.0	0.0	0.0
58	7.0	189904.2	0.0	65830.9	0.	0.	0.0	0.0	0.0
59	9.0	239990.9	0.0	96480.4	0.	0.	0.0	0.0	0.0
60	16.0	410619.3	0.0	*******	0.	0.	0.0	0.0	0.0
61	15.0	366310.9	0.0	*******	0.	0.	0.0	0.0	0.0
62	40.0	889340.0	0.0	*******	0.	0.	0.0	0.0	0.0
63	50.0	899521.4	0.0	*******	0.	0.	0.0	0.0	0.0
64	8.0	119282.4	0.0	47221.1	0.	0.	0.0	0.0	0.0
65	15.0	205226.5	0.0	77560.6	0.	0.	0.0	0.0	0.0
66	1.0	12827.1	0.0	4661.5	0.	0.	0.0	0.0	0.0
67	11.0	134047.8	0.0	47076.3	0.	0.	0.0	0.0	0.0
68	30.0	321304.8	0.0	89247.6	0.	0.	0.0	0.0	0.0
69	1.0	9792.1	0.0	1988.4	0.	0.	0.0	0.0	0.0
70	7.0	66886.3	0.0	12136.8	0.	0.	0.0	0.0	0.0
71	2.0	18577.3	0.0	2894.8	0.	0.	0.0	0.0	0.0
72	21.7	186664.7	0.0	15042.7	0.	0.	0.0	0.0	0.0
73	8.3	63723.4	0.0	0.0	0.	0.	0.0	0.0	0.0
74	10.0	72179.7	0.0	0.0	0.	0.	0.0	0.0	0.0
75	15.0	97756.3	0.0	0.0	0.	0.	0.0	0.0	0.0
76	0.0	278.2	0.0	0.0	0.	0.	0.0	0.0	0.0
77	7.0	40380.1	0.0	0.0	0.	0.	0.0	0.0	0.0
78	3.0	16061.3	0.0	0.0	0.	0.	0.0	0.0	0.0
79	10.0	51060.6	0.0	0.0	0.	0.	0.0	0.0	0.0
80	10.0	47142.3	0.0	0.0	0.	0.	0.0	0.0	0.0
81	13.2	55895.2	0.0	0.0	0.	0.	0.0	0.0	0.0
82	0.8	3340.7	0.0	0.0	0.	0.	0.0	0.0	0.0
83	74.0	146125.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.742	232.371
2	354.160	225.236
3	372.802	212.183
4	386.731	198.254
5	420.406	164.579
6	462.832	122.153
7	1122.733	127.675
8	1160.000	130.159
9	1240.000	150.540
10	1280.000	160.258
11	1320.000	186.249
12	1360.000	211.952
13	1584.000	404.302
14	1658.000	476.000

Factor of Safety

*** 1.659 ***

Failure Surface Specified By 14 Coordinate Points

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

1	352.169	232.574
2	363.561	225.455
3	380.894	213.318
4	394.885	199.327
5	429.374	164.838
6	471.801	122.411
7	1121.681	124.223
8	1160.000	132.058
9	1240.000	149.354
10	1280.000	160.048
11	1320.000	183.578
12	1360.000	215.882
13	1584.000	406.397
14	1658.000	476.000

Factor of Safety

*** 1.659 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	352.169	232.574
2	363.561	225.455
3	380.894	213.318
4	394.885	199.327
5	429.374	164.838
6	471.801	122.411
7	1121.681	124.223
8	1160.000	132.058
9	1240.000	149.354
10	1280.000	160.048
11	1320.000	183.578
12	1360.000	215.882
13	1584.000	406.397
14	1658.000	476.000

Factor of Safety

*** 1.659 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	365.447	232.859
2	376.803	225.763
3	392.291	214.918
4	405.966	201.243
5	442.718	164.491
6	485.145	122.065
7	1124.505	124.697
8	1160.000	133.664
9	1240.000	154.906
10	1280.000	164.858
11	1320.000	185.458
12	1360.000	215.145
13	1584.000	405.855
14	1658.000	476.000

Factor of Safety

*** 1.662 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	365.447	232.859
2	376.803	225.763
3	392.291	214.918
4	405.966	201.243
5	442.718	164.491
6	485.145	122.065
7	1124.505	124.697
8	1160.000	133.664
9	1240.000	154.906
10	1280.000	164.858
11	1320.000	185.458
12	1360.000	215.145
13	1584.000	405.855

14	1658.000	476.000

Factor of Safety
*** 1.662 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	365.447	232.859
2	376.803	225.763
3	392.291	214.918
4	405.966	201.243
5	442.718	164.491
6	485.145	122.065
7	1124.505	124.697
8	1160.000	133.664
9	1240.000	154.906
10	1280.000	164.858
11	1320.000	185.458
12	1360.000	215.145
13	1584.000	405.855
14	1658.000	476.000

Factor of Safety
*** 1.662 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	334.906	232.202
2	346.345	225.055
3	366.076	211.239
4	379.953	197.362
5	410.343	166.972
6	452.770	124.545
7	1122.816	127.646
8	1160.000	135.832
9	1240.000	155.042
10	1280.000	161.713
11	1320.000	187.783
12	1360.000	211.688
13	1584.000	405.367
14	1658.000	476.000

Factor of Safety
*** 1.664 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	334.906	232.202
2	346.345	225.055
3	366.076	211.239
4	379.953	197.362
5	410.343	166.972
6	452.770	124.545
7	1122.816	127.646
8	1160.000	135.832
9	1240.000	155.042
10	1280.000	161.713
11	1320.000	187.783
12	1360.000	211.688
13	1584.000	405.367
14	1658.000	476.000

Factor of Safety
*** 1.664 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	346.994	232.462
2	358.400	225.335
3	376.452	212.695
4	390.409	198.738
5	426.720	162.426
6	469.147	120.000
7	471.145	118.002

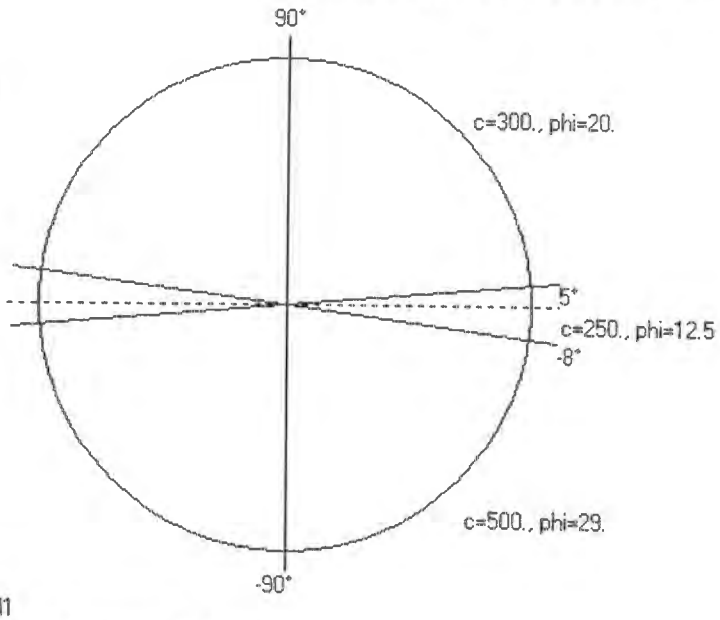
8	1123.099	128.134
9	1160.000	134.602
10	1240.000	153.343
11	1280.000	160.795
12	1320.000	188.896
13	1360.000	206.082
14	1584.000	404.292
15	1658.000	476.000

Factor of Safety

*** 1.668 ***

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

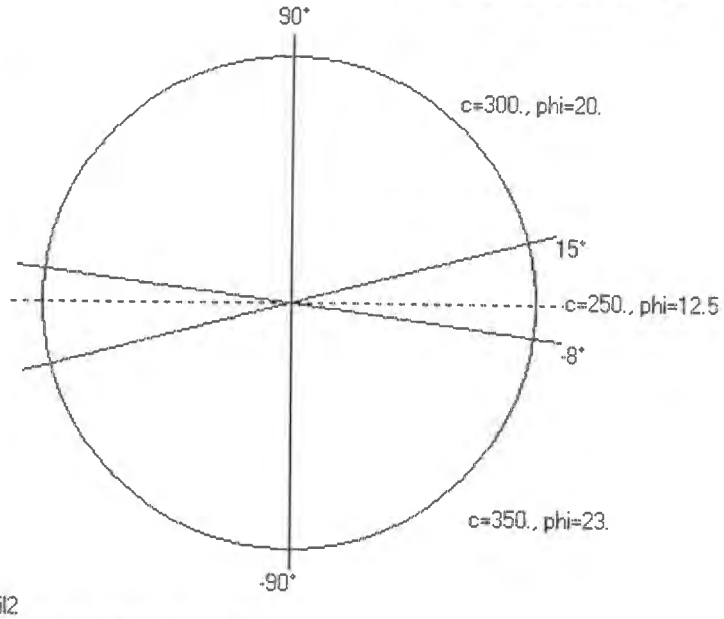
Anisotropic Soil Definition



Soil1

13662-00, Euland Capital, C-C',

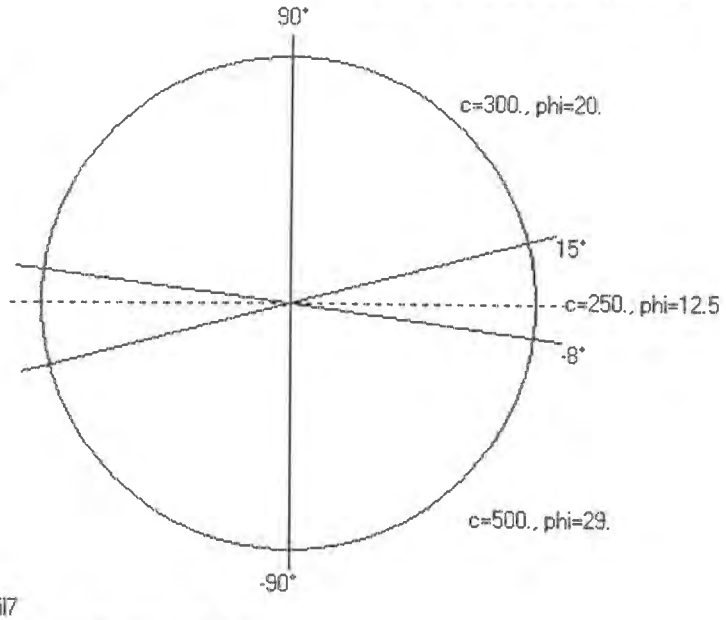
Anisotropic Soil Definition



Soil2

13662-00, Euland Capital, C-C',

Anisotropic Soil Definition



Soil7

13662-00, Euland Capital, C-C',

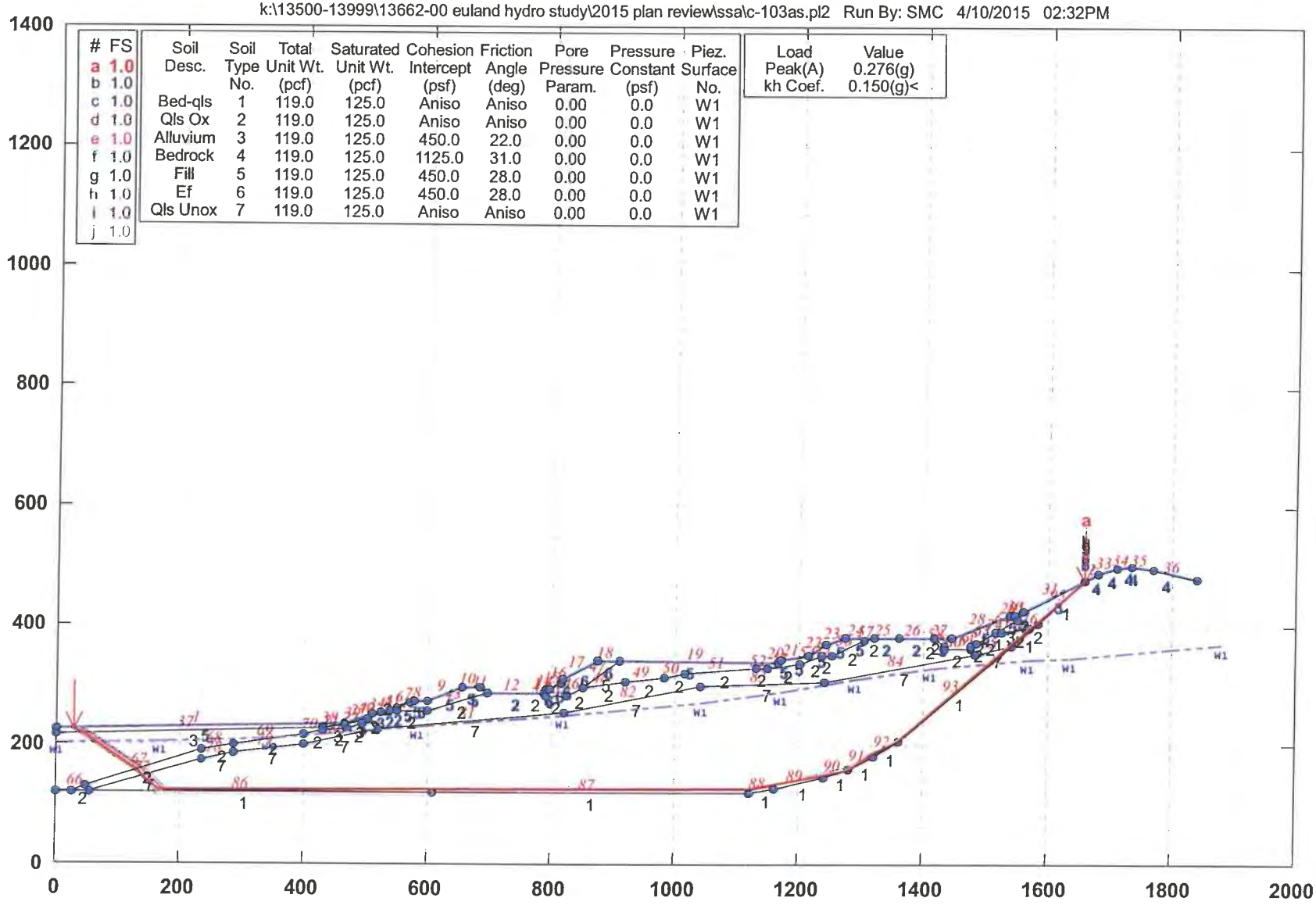

13662-00, Euland Capital, C-C', - - Seismic
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103as.pl2 Run By: SMC 4/10/2015 02:32PM
FS
a 1.0
b 1.0
c 1.0
d 1.0
e 1.0
f 1.0
g 1.0
h 1.0
i 1.0
j 1.0
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Ef | 6 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.0
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-15.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/10/2015
Time of Run: 02:32PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103as.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103as.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103as.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES

36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	608.00	120.00	10.00
2	1120.00	125.00	1125.00	125.00	10.00
3	1160.00	132.00	1160.00	132.00	10.00

4	1240.00	151.00	1240.00	151.00	10.00
5	1280.00	165.00	1280.00	165.00	10.00
6	1320.00	185.00	1320.00	185.00	10.00
7	1360.00	211.00	1360.00	211.00	10.00
8	1584.00	409.00	1584.00	409.00	10.00
9	1658.00	476.00	1658.00	476.00	0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 1.240 FS Min = 0.965 FS Ave = 1.065

Standard Deviation = 0.052 Coefficient of Variation = 4.87 %

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.395	225.611
2	41.133	217.957
3	81.826	190.509
4	131.568	156.958
5	141.842	146.683
6	164.020	124.506
7	1121.937	128.544
8	1160.000	135.168
9	1240.000	150.316
10	1280.000	160.424
11	1320.000	187.431
12	1360.000	209.774
13	1584.000	409.390
14	1658.000	476.000

Factor of Safety

*** 0.965 ***

Individual data on the 87 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.7	6009.0	0.0	0.0	0.	0.	901.3	0.0	0.0
2	22.0	40759.4	0.0	0.0	0.	0.	6113.9	0.0	0.0
3	18.7	66933.0	0.0	9117.1	0.	0.	10040.0	0.0	0.0
4	49.7	326050.2	0.0	*******	0.	0.	48907.5	0.0	0.0
5	10.3	96308.2	0.0	47701.3	0.	0.	14446.2	0.0	0.0
6	22.2	253825.4	0.0	*******	0.	0.	38073.8	0.0	0.0
7	4.0	51209.6	0.0	19979.2	0.	0.	7681.4	0.0	0.0
8	66.0	854177.4	0.0	*******	0.	0.	*******	0.0	0.0
9	52.0	679748.8	0.0	*******	0.	0.	*******	0.0	0.0
10	57.0	751954.6	0.0	*******	0.	0.	*******	0.0	0.0
11	35.1	466446.9	0.0	*******	0.	0.	69967.0	0.0	0.0
12	21.9	293110.2	0.0	*******	0.	0.	43966.5	0.0	0.0
13	30.0	403069.3	0.0	*******	0.	0.	60460.4	0.0	0.0
14	35.0	473126.0	0.0	*******	0.	0.	70968.9	0.0	0.0
15	5.0	68372.4	0.0	29410.4	0.	0.	10255.9	0.0	0.0
16	23.0	328979.8	0.0	*******	0.	0.	49347.0	0.0	0.0
17	9.0	135200.7	0.0	54267.1	0.	0.	20280.1	0.0	0.0
18	8.0	123233.4	0.0	48572.0	0.	0.	18485.0	0.0	0.0
19	8.0	124963.1	0.0	48886.9	0.	0.	18744.5	0.0	0.0
20	2.0	31332.0	0.0	12270.9	0.	0.	4699.8	0.0	0.0
21	3.0	47066.5	0.0	18443.3	0.	0.	7060.0	0.0	0.0
22	14.0	221498.4	0.0	86654.1	0.	0.	33224.8	0.0	0.0
23	13.0	211086.6	0.0	81328.0	0.	0.	31663.0	0.0	0.0
24	1.0	16564.5	0.0	6290.4	0.	0.	2484.7	0.0	0.0
25	19.0	326024.7	0.0	*******	0.	0.	48903.7	0.0	0.0
26	8.0	142744.5	0.0	51248.5	0.	0.	21411.7	0.0	0.0
27	5.0	89877.0	0.0	32190.2	0.	0.	13481.5	0.0	0.0
28	17.0	306587.8	0.0	*******	0.	0.	45988.2	0.0	0.0
29	56.0	1085778.2	0.0	*******	0.	0.	*******	0.0	0.0
30	29.0	600216.8	0.0	*******	0.	0.	90032.5	0.0	0.0
31	11.0	222428.5	0.0	76890.6	0.	0.	33364.3	0.0	0.0

32	92.0	1816433.2	0.0	*******	0.	0. *******	0.0	0.0
33	1.0	19847.1	0.0	7482.9	0.	0. 2977.1	0.0	0.0
34	3.0	60790.8	0.0	22479.0	0.	0. 9118.6	0.0	0.0
35	5.0	102879.5	0.0	37565.6	0.	0. 15431.9	0.0	0.0
36	18.0	380001.3	0.0	*******	0.	0. 57000.2	0.0	0.0
37	2.0	44245.0	0.0	15242.5	0.	0. 6636.8	0.0	0.0
38	1.0	22629.2	0.0	7628.8	0.	0. 3394.4	0.0	0.0
39	2.0	45442.6	0.0	15267.7	0.	0. 6816.4	0.0	0.0
40	5.0	114683.8	0.0	38261.8	0.	0. 17202.6	0.0	0.0
41	25.0	596503.7	0.0	*******	0.	0. 89475.6	0.0	0.0
42	25.0	634977.8	0.0	*******	0.	0. 95246.7	0.0	0.0
43	35.0	915904.8	0.0	*******	0.	0. *******	0.0	0.0
44	10.0	261618.6	0.0	81414.5	0.	0. 39242.8	0.0	0.0
45	63.0	1644993.5	0.0	*******	0.	0. *******	0.0	0.0
46	32.0	833434.5	0.0	*******	0.	0. *******	0.0	0.0
47	25.0	650128.0	0.0	*******	0.	0. 97519.2	0.0	0.0
48	2.0	51972.6	0.0	17615.3	0.	0. 7795.9	0.0	0.0
49	79.9	2073419.2	0.0	*******	0.	0. *******	0.0	0.0
50	9.1	233802.6	0.0	87270.9	0.	0. 35070.4	0.0	0.0
51	17.0	433636.4	0.0	*******	0.	0. 65045.5	0.0	0.0
52	12.0	302231.0	0.0	*******	0.	0. 45334.7	0.0	0.0
53	5.0	124961.5	0.0	48063.7	0.	0. 18744.2	0.0	0.0
54	5.0	125565.8	0.0	48011.8	0.	0. 18834.9	0.0	0.0
55	30.0	759294.2	0.0	*******	0.	0. *******	0.0	0.0
56	15.0	380032.6	0.0	*******	0.	0. 57004.9	0.0	0.0
57	22.0	570954.2	0.0	*******	0.	0. 85643.1	0.0	0.0
58	3.0	79931.4	0.0	28464.6	0.	0. 11989.7	0.0	0.0
59	4.0	107286.2	0.0	38411.5	0.	0. 16092.9	0.0	0.0
60	8.0	215665.5	0.0	76565.1	0.	0. 32349.8	0.0	0.0
61	21.0	569307.2	0.0	*******	0.	0. 85396.1	0.0	0.0
62	7.0	189788.9	0.0	65922.6	0.	0. 28468.3	0.0	0.0
63	9.0	239675.8	0.0	97427.5	0.	0. 35951.4	0.0	0.0
64	16.0	409424.8	0.0	*******	0.	0. 61413.7	0.0	0.0
65	15.0	364453.6	0.0	*******	0.	0. 54668.0	0.0	0.0
66	40.0	891828.6	0.0	*******	0.	0. *******	0.0	0.0
67	50.0	908058.6	0.0	*******	0.	0. *******	0.0	0.0
68	8.0	119708.5	0.0	48270.2	0.	0. 17956.3	0.0	0.0
69	15.0	205326.2	0.0	78883.8	0.	0. 30798.9	0.0	0.0
70	1.0	12801.3	0.0	4719.9	0.	0. 1920.2	0.0	0.0
71	11.0	133496.5	0.0	47471.7	0.	0. 20024.5	0.0	0.0
72	30.0	317308.5	0.0	88030.1	0.	0. 47596.3	0.0	0.0
73	1.0	9596.1	0.0	1890.0	0.	0. 1439.4	0.0	0.0
74	7.0	65400.5	0.0	11343.1	0.	0. 9810.1	0.0	0.0
75	2.0	18116.3	0.0	2634.5	0.	0. 2717.4	0.0	0.0
76	18.5	155963.5	0.0	11592.2	0.	0. 23394.5	0.0	0.0
77	11.5	85722.4	0.0	0.0	0.	0. 12858.4	0.0	0.0
78	10.0	68595.4	0.0	0.0	0.	0. 10289.3	0.0	0.0
79	9.2	58001.5	0.0	0.0	0.	0. 8700.2	0.0	0.0
80	5.8	33933.0	0.0	0.0	0.	0. 5090.0	0.0	0.0
81	7.0	37236.2	0.0	0.0	0.	0. 5585.4	0.0	0.0
82	3.0	14656.0	0.0	0.0	0.	0. 2198.4	0.0	0.0
83	10.0	46125.4	0.0	0.0	0.	0. 6918.8	0.0	0.0
84	10.0	41821.1	0.0	0.0	0.	0. 6273.2	0.0	0.0
85	0.2	869.9	0.0	0.0	0.	0. 130.5	0.0	0.0
86	13.8	50267.9	0.0	0.0	0.	0. 7540.2	0.0	0.0
87	74.0	123723.4	0.0	0.0	0.	0. 18558.5	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.395	225.611
2	41.133	217.957
3	81.826	190.509
4	131.568	156.958
5	141.842	146.683
6	164.020	124.506
7	1121.937	128.544
8	1160.000	135.168
9	1240.000	150.316
10	1280.000	160.424
11	1320.000	187.431

12	1360.000	209.774
13	1584.000	409.390
14	1658.000	476.000

Factor of Safety
*** 0.965 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.563	225.786
2	49.279	218.146
3	87.526	192.348
4	137.269	158.796
5	147.609	148.455
6	172.770	123.295
7	1124.691	126.396
8	1160.000	134.582
9	1240.000	153.792
10	1280.000	160.463
11	1320.000	186.533
12	1360.000	210.438
13	1584.000	404.117
14	1658.000	476.000

Factor of Safety
*** 0.971 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.563	225.786
2	49.279	218.146
3	87.526	192.348
4	137.269	158.796
5	147.609	148.455
6	172.770	123.295
7	1124.691	126.396
8	1160.000	134.582
9	1240.000	153.792
10	1280.000	160.463
11	1320.000	186.533
12	1360.000	210.438
13	1584.000	404.117
14	1658.000	476.000

Factor of Safety
*** 0.971 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.794	225.447
2	33.553	217.780
3	76.521	188.798
4	126.264	155.246
5	136.476	145.034
6	160.520	120.991
7	1122.835	129.404
8	1160.000	135.403
9	1240.000	154.925
10	1280.000	164.409
11	1320.000	185.790
12	1360.000	207.508
13	1584.000	411.499
14	1658.000	476.000

Factor of Safety
*** 0.972 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.794	225.447
2	33.553	217.780
3	76.521	188.798
4	126.264	155.246
5	136.476	145.034

6	160.520	120.991
7	1122.835	129.404
8	1160.000	135.403
9	1240.000	154.925
10	1280.000	164.409
11	1320.000	185.790
12	1360.000	207.508
13	1584.000	411.499
14	1658.000	476.000

Factor of Safety
*** 0.972 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.477	225.913
2	55.176	218.283
3	91.653	193.679
4	141.395	160.128
5	151.785	149.738
6	177.363	124.160
7	1124.762	129.018
8	1160.000	136.775
9	1240.000	155.868
10	1280.000	165.234
11	1320.000	189.311
12	1360.000	209.036
13	1584.000	408.848
14	1658.000	476.000

Factor of Safety
*** 0.974 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.477	225.913
2	55.176	218.283
3	91.653	193.679
4	141.395	160.128
5	151.785	149.738
6	177.363	124.160
7	1124.762	129.018
8	1160.000	136.775
9	1240.000	155.868
10	1280.000	165.234
11	1320.000	189.311
12	1360.000	209.036
13	1584.000	408.848
14	1658.000	476.000

Factor of Safety
*** 0.974 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.448	225.956
2	57.142	218.329
3	93.029	194.123
4	142.771	160.571
5	153.176	150.166
6	178.895	124.448
7	1123.119	129.892
8	1160.000	134.172
9	1240.000	153.226
10	1280.000	163.491
11	1320.000	186.904
12	1360.000	211.903
13	1584.000	410.425
14	1658.000	476.000

Factor of Safety
*** 0.975 ***

Failure Surface Specified By 14 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	44.448	225.956
2	57.142	218.329
3	93.029	194.123
4	142.771	160.571
5	153.176	150.166
6	178.895	124.448
7	1123.119	129.892
8	1160.000	134.172
9	1240.000	153.226
10	1280.000	163.491
11	1320.000	186.904
12	1360.000	211.903
13	1584.000	410.425
14	1658.000	476.000

Factor of Safety

*** 0.975 ***

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

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/10/2015
Time of Run: 02:33PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103as Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103as Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103as Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES

36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3

40	502.00	243.00	510.00	252.00	3
41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1

7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.395	225.611
2	41.133	217.957
3	81.826	190.509
4	131.568	156.958
5	141.842	146.683
6	164.020	124.506
7	1121.937	128.544
8	1160.000	135.168
9	1240.000	150.316
10	1280.000	160.424

11	1320.000	187.431
12	1360.000	209.774
13	1584.000	409.390
14	1658.000	476.000

Janbu's Empirical Coefficient (fo) = 1.062
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 0.965

Table 1 - Individual Data on the 87 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)	
1	12.7	6009.0	0.0	0.0	0.0	0.0	901.4	0.0	0.0	
2	22.0	40759.1	0.0	0.0	0.0	0.0	6113.9	0.0	0.0	
3	18.7	66933.0	0.0	9117.1	0.0	0.0	10039.9	0.0	0.0	
4	49.7	326052.3	0.0	*******	0.0	0.0	48907.8	0.0	0.0	
5	10.3	96302.2	0.0	47700.7	0.0	0.0	14445.3	0.0	0.0	
6	22.2	253835.7	0.0	*******	0.0	0.0	38075.4	0.0	0.0	
7	4.0	51203.7	0.0	19976.9	0.0	0.0	7680.5	0.0	0.0	
8	66.0	854179.3	0.0	*******	0.0	0.0	*******	0.0	0.0	
9	52.0	679750.4	0.0	*******	0.0	0.0	*******	0.0	0.0	
10	57.0	751956.4	0.0	*******	0.0	0.0	*******	0.0	0.0	
11	35.1	466448.0	0.0	*******	0.0	0.0	69967.2	0.0	0.0	
12	21.9	293110.9	0.0	*******	0.0	0.0	43966.6	0.0	0.0	
13	30.0	403070.2	0.0	*******	0.0	0.0	60460.5	0.0	0.0	
14	35.0	473127.2	0.0	*******	0.0	0.0	70969.1	0.0	0.0	
15	5.0	68372.6	0.0	29410.5	0.0	0.0	10255.9	0.0	0.0	
16	23.0	328980.5	0.0	*******	0.0	0.0	49347.1	0.0	0.0	
17	9.0	135201.0	0.0	54267.3	0.0	0.0	20280.1	0.0	0.0	
18	8.0	123233.7	0.0	48572.1	0.0	0.0	18485.1	0.0	0.0	
19	8.0	124963.4	0.0	48887.0	0.0	0.0	18744.5	0.0	0.0	
20	2.0	31332.1	0.0	12271.0	0.0	0.0	4699.8	0.0	0.0	
21	3.0	47066.6	0.0	18443.3	0.0	0.0	7060.0	0.0	0.0	
22	14.0	221498.9	0.0	86654.4	0.0	0.0	33224.8	0.0	0.0	
23	13.0	211087.0	0.0	81328.2	0.0	0.0	31663.1	0.0	0.0	
24	1.0	16564.5	0.0	6290.5	0.0	0.0	2484.7	0.0	0.0	
25	19.0	326025.3	0.0	*******	0.0	0.0	48903.8	0.0	0.0	
26	8.0	142744.7	0.0	51248.6	0.0	0.0	21411.7	0.0	0.0	
27	5.0	89877.1	0.0	32190.3	0.0	0.0	13481.6	0.0	0.0	
28	17.0	306588.4	0.0	*******	0.0	0.0	45988.3	0.0	0.0	
29	56.0	1085780.1	0.0	*******	0.0	0.0	*******	0.0	0.0	
30	29.0	600217.8	0.0	*******	0.0	0.0	90032.7	0.0	0.0	
31	11.0	222428.8	0.0	76890.8	0.0	0.0	33364.3	0.0	0.0	
32	92.0	1816436.5	0.0	*******	0.0	0.0	*******	0.0	0.0	
33	1.0	19847.2	0.0	7483.0	0.0	0.0	2977.1	0.0	0.0	
34	3.0	60790.9	0.0	22479.1	0.0	0.0	9118.6	0.0	0.0	
35	5.0	102879.6	0.0	37565.7	0.0	0.0	15431.9	0.0	0.0	
36	18.0	380002.0	0.0	*******	0.0	0.0	57000.3	0.0	0.0	
37	2.0	44245.1	0.0	15242.5	0.0	0.0	6636.8	0.0	0.0	
38	1.0	22629.3	0.0	7628.8	0.0	0.0	3394.4	0.0	0.0	
39	2.0	45442.7	0.0	15267.7	0.0	0.0	6816.4	0.0	0.0	
40	5.0	114684.0	0.0	38261.9	0.0	0.0	17202.6	0.0	0.0	
41	25.0	596504.6	0.0	*******	0.0	0.0	89475.7	0.0	0.0	
42	25.0	634978.6	0.0	*******	0.0	0.0	95246.8	0.0	0.0	
43	35.0	915906.1	0.0	*******	0.0	0.0	*******	0.0	0.0	
44	10.0	261619.0	0.0	81414.7	0.0	0.0	39242.8	0.0	0.0	
45	63.0	1644996.0	0.0	*******	0.0	0.0	*******	0.0	0.0	
46	32.0	833435.8	0.0	*******	0.0	0.0	*******	0.0	0.0	
47	25.0	650129.0	0.0	*******	0.0	0.0	97519.4	0.0	0.0	
48	2.0	51972.7	0.0	17615.4	0.0	0.0	7795.9	0.0	0.0	
49	79.9	2073422.5	0.0	*******	0.0	0.0	*******	0.0	0.0	
50	9.1	233803.0	0.0	87271.0	0.0	0.0	35070.4	0.0	0.0	
51	17.0	433637.1	0.0	*******	0.0	0.0	65045.6	0.0	0.0	
52	12.0	302231.5	0.0	*******	0.0	0.0	45334.7	0.0	0.0	
53	5.0	124961.7	0.0	48063.9	0.0	0.0	18744.3	0.0	0.0	
54	5.0	125566.0	0.0	48011.9	0.0	0.0	18834.9	0.0	0.0	
55	30.0	759294.9	0.0	*******	0.0	0.0	*******	0.0	0.0	
56	15.0	380032.7	0.0	*******	0.0	0.0	57004.9	0.0	0.0	
57	22.0	570953.9	0.0	*******	0.0	0.0	85643.1	0.0	0.0	
58	3.0	79931.4	0.0	28464.6	0.0	0.0	11989.7	0.0	0.0	

59	4.0	107286.1	0.0	38411.4	0.0	0.0	16092.9	0.0	0.0
60	8.0	215665.3	0.0	76564.9	0.0	0.0	32349.8	0.0	0.0
61	21.0	569307.3	0.0	*******	0.0	0.0	85396.1	0.0	0.0
62	7.0	189789.1	0.0	65922.5	0.0	0.0	28468.4	0.0	0.0
63	9.0	239676.0	0.0	97427.8	0.0	0.0	35951.4	0.0	0.0
64	16.0	409425.0	0.0	*******	0.0	0.0	61413.8	0.0	0.0
65	15.0	364453.7	0.0	*******	0.0	0.0	54668.1	0.0	0.0
66	40.0	891828.2	0.0	*******	0.0	0.0	*******	0.0	0.0
67	50.0	908057.5	0.0	*******	0.0	0.0	*******	0.0	0.0
68	8.0	119708.4	0.0	48270.1	0.0	0.0	17956.3	0.0	0.0
69	15.0	205325.9	0.0	78883.6	0.0	0.0	30798.9	0.0	0.0
70	1.0	12801.3	0.0	4719.9	0.0	0.0	1920.2	0.0	0.0
71	11.0	133496.4	0.0	47471.6	0.0	0.0	20024.5	0.0	0.0
72	30.0	317308.2	0.0	88029.8	0.0	0.0	47596.2	0.0	0.0
73	1.0	9596.1	0.0	1890.0	0.0	0.0	1439.4	0.0	0.0
74	7.0	65400.4	0.0	11343.0	0.0	0.0	9810.1	0.0	0.0
75	2.0	18116.3	0.0	2634.5	0.0	0.0	2717.4	0.0	0.0
76	18.5	155963.4	0.0	11592.0	0.0	0.0	23394.5	0.0	0.0
77	11.5	85722.4	0.0	0.0	0.0	0.0	12858.4	0.0	0.0
78	10.0	68595.4	0.0	0.0	0.0	0.0	10289.3	0.0	0.0
79	9.2	58001.4	0.0	0.0	0.0	0.0	8700.2	0.0	0.0
80	5.8	33933.0	0.0	0.0	0.0	0.0	5090.0	0.0	0.0
81	7.0	37236.2	0.0	0.0	0.0	0.0	5585.4	0.0	0.0
82	3.0	14656.0	0.0	0.0	0.0	0.0	2198.4	0.0	0.0
83	10.0	46125.4	0.0	0.0	0.0	0.0	6918.8	0.0	0.0
84	10.0	41821.1	0.0	0.0	0.0	0.0	6273.2	0.0	0.0
85	0.2	869.9	0.0	0.0	0.0	0.0	130.5	0.0	0.0
86	13.8	50268.0	0.0	0.0	0.0	0.0	7540.2	0.0	0.0
87	74.0	123723.4	0.0	0.0	0.0	0.0	18558.5	0.0	0.0

Table 2 - Base Stress Data on the 87 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-31.00	34.76	14.86	1221.97	-182.30
2	-34.00	52.13	26.52	2015.14	-806.16
3	-34.00	72.47	22.56	2911.46	-1555.85
4	-34.00	106.70	60.00	3928.87	-2850.24
5	-45.00	136.71	14.53	9206.84	-5634.47
6	-45.00	152.93	31.36	18856.19	-6878.93
7	0.24	166.01	3.98	2401.42	1984.00
8	0.24	201.00	66.00	2408.20	1995.85
9	0.24	260.00	52.00	2418.63	2015.90
10	0.24	314.50	57.00	2428.27	2034.42
11	0.24	360.54	35.08	2426.24	2050.72
12	0.24	389.04	21.92	2408.65	2061.84
13	0.24	415.00	30.00	2392.62	2071.97
14	0.24	447.50	35.00	2372.56	2084.65
15	0.24	467.50	5.00	2387.60	2108.80
16	0.24	481.50	23.00	2532.29	2205.80
17	0.24	497.50	9.00	2697.64	2316.65
18	0.24	506.00	8.00	2785.49	2375.55
19	0.24	514.00	8.00	2831.18	2408.89
20	0.24	519.00	2.00	2836.61	2415.92
21	0.24	521.50	3.00	2839.32	2419.44
22	0.24	530.00	14.00	2862.75	2439.87
23	0.24	543.50	13.00	2953.08	2504.04
24	0.24	550.50	1.00	3028.67	2554.48
25	0.24	560.50	19.00	3169.59	2646.19
26	0.24	574.00	8.00	3329.10	2751.65
27	0.24	580.50	5.00	3355.02	2772.06
28	0.24	591.50	17.00	3356.34	2781.19
29	0.24	628.00	56.00	3658.77	2990.05
30	0.24	670.50	29.00	3941.51	3191.79
31	0.24	690.50	11.00	3792.47	3118.33
32	0.24	742.00	92.00	3602.35	3044.78
33	0.24	788.50	1.00	3568.62	3060.71
34	0.24	790.50	3.00	3673.60	3124.94
35	0.24	794.50	5.00	3749.08	3173.10
36	0.24	806.00	18.00	3872.42	3255.65
37	0.24	816.00	2.00	4120.68	3411.61

38	0.24	817.50	1.00	4249.64	3489.75
39	0.24	819.00	2.00	4272.12	3503.95
40	0.24	822.50	5.00	4323.00	3537.18
41	0.24	837.50	25.00	4541.04	3679.58
42	0.24	862.50	25.00	4904.45	3916.90
43	0.24	892.50	35.00	5062.29	4035.59
44	0.24	915.00	10.00	5029.78	4034.53
45	0.24	951.50	63.00	4966.79	4026.69
46	0.24	999.00	32.00	4884.82	4016.48
47	0.24	1027.50	25.00	4835.63	4010.36
48	0.24	1041.00	2.00	4812.33	4007.46
49	0.24	1081.97	79.94	4719.94	4000.04
50	9.87	1126.47	9.20	4454.61	8235.34
51	9.87	1139.50	17.26	4385.59	8142.93
52	9.87	1154.00	12.18	4308.79	8040.10
53	10.72	1162.50	5.09	4257.96	8333.08
54	10.72	1167.50	5.09	4290.79	8373.38
55	10.72	1185.00	30.53	4350.60	8438.94
56	10.72	1207.50	15.27	4364.41	8447.50
57	10.72	1226.00	22.39	4525.03	8653.21
58	10.72	1238.50	3.05	4702.31	8883.71
59	14.18	1242.00	4.13	4737.21	10471.86
60	14.18	1248.00	8.25	4779.15	10525.20
61	14.18	1262.50	21.66	4835.92	10584.43
62	14.18	1276.50	7.22	4854.85	10585.54
63	34.03	1284.50	10.86	7135.37	18212.44
64	34.03	1297.00	19.31	6886.81	17500.10
65	34.03	1312.50	18.10	6580.63	16616.41
66	29.19	1340.00	45.82	6013.46	13792.38
67	41.71	1385.00	66.97	5320.79	14116.47
68	41.71	1414.00	10.72	4561.61	11631.01
69	41.71	1425.50	20.09	4287.01	10639.84
70	41.71	1433.50	1.34	4095.98	9950.34
71	41.71	1439.50	14.73	3952.71	9433.21
72	41.71	1460.00	40.18	3744.63	8221.34
73	41.71	1475.50	1.34	3665.34	7458.91
74	41.71	1479.50	9.38	3644.87	7262.15
75	41.71	1484.00	2.68	3621.85	7040.80
76	41.71	1494.27	24.85	3569.28	6535.39
77	41.71	1509.27	15.34	3389.93	5819.08
78	41.71	1520.00	13.39	3142.85	5331.84
79	41.71	1529.60	12.34	2921.58	4895.51
80	41.71	1537.10	7.76	2748.80	4554.79
81	41.71	1543.50	9.38	2535.79	4134.76
82	41.71	1548.50	4.02	2364.68	3797.32
83	41.71	1555.00	13.39	2257.15	3585.28
84	41.71	1565.00	13.39	2087.49	3250.71
85	41.71	1570.11	0.29	1998.63	3075.48
86	41.71	1577.11	18.46	1876.90	2835.44
87	41.99	1621.00	99.56	1099.95	1304.96

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 7110106.50 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 3988.26(psf)
Sum of the Driving Forces = 7819855.50 (lbs)
Average Mobilized Shear Stress = 4386.38(psf)
Total length of the failure surface = 1782.76(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1391(g)
Calculated Newmark Seismic Displacement = 0.106(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: C-C'

File: c-103as

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1391
T_m (s)	0.517
T_s (s)	0.33
M	6.95
T_s/T_m	0.641817

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.221	0.172	0.284
k-velmax (cm/s)	25.56	19.91	32.83

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.94	0.897	2.57	1.05	6.29
[kmax, k-velmax]	0.14	0.579	1.15	0.64	2.04
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.94	0.897	1.01	0.41	2.48
[kmax, k-velmax]	0.14	0.579	0.45	0.25	0.81

PGA	Peak Ground Acceleration (g)
PGV	Peak Ground Velocity (cm/s)
k_y	Critical or Yield Acceleration (g)
T_m	Mean Period of an Earthquake Motion (s)
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M	Earthquake Magnitude
kmax	maximum seismic coefficient (g)
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)
D	Predicted Sliding Displacment (cm)

H_{avr} = 175 ft

V_s = 2110 ft/s

$T_s = 4\ H_{avr}/V_s$ = 0.33 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

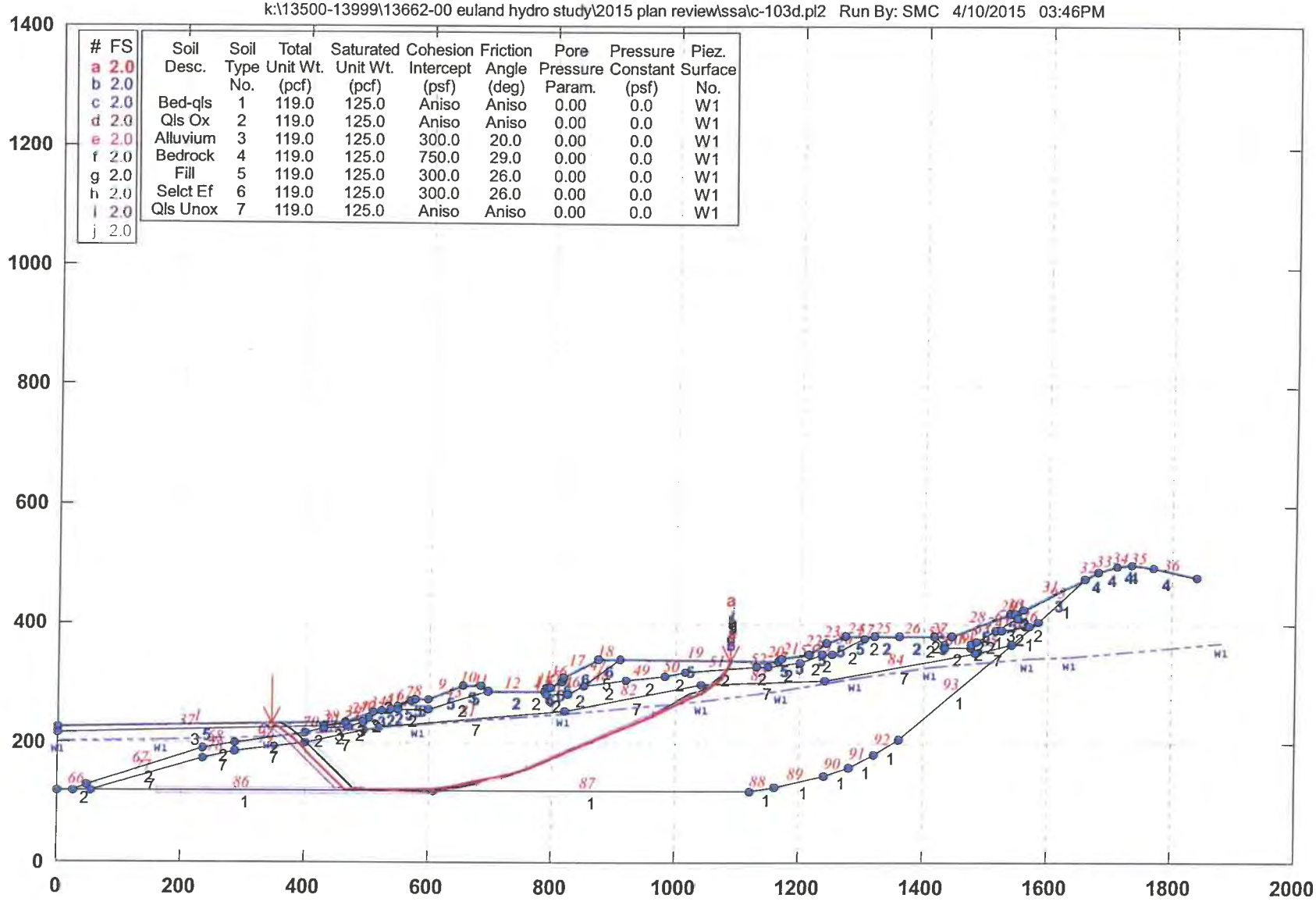
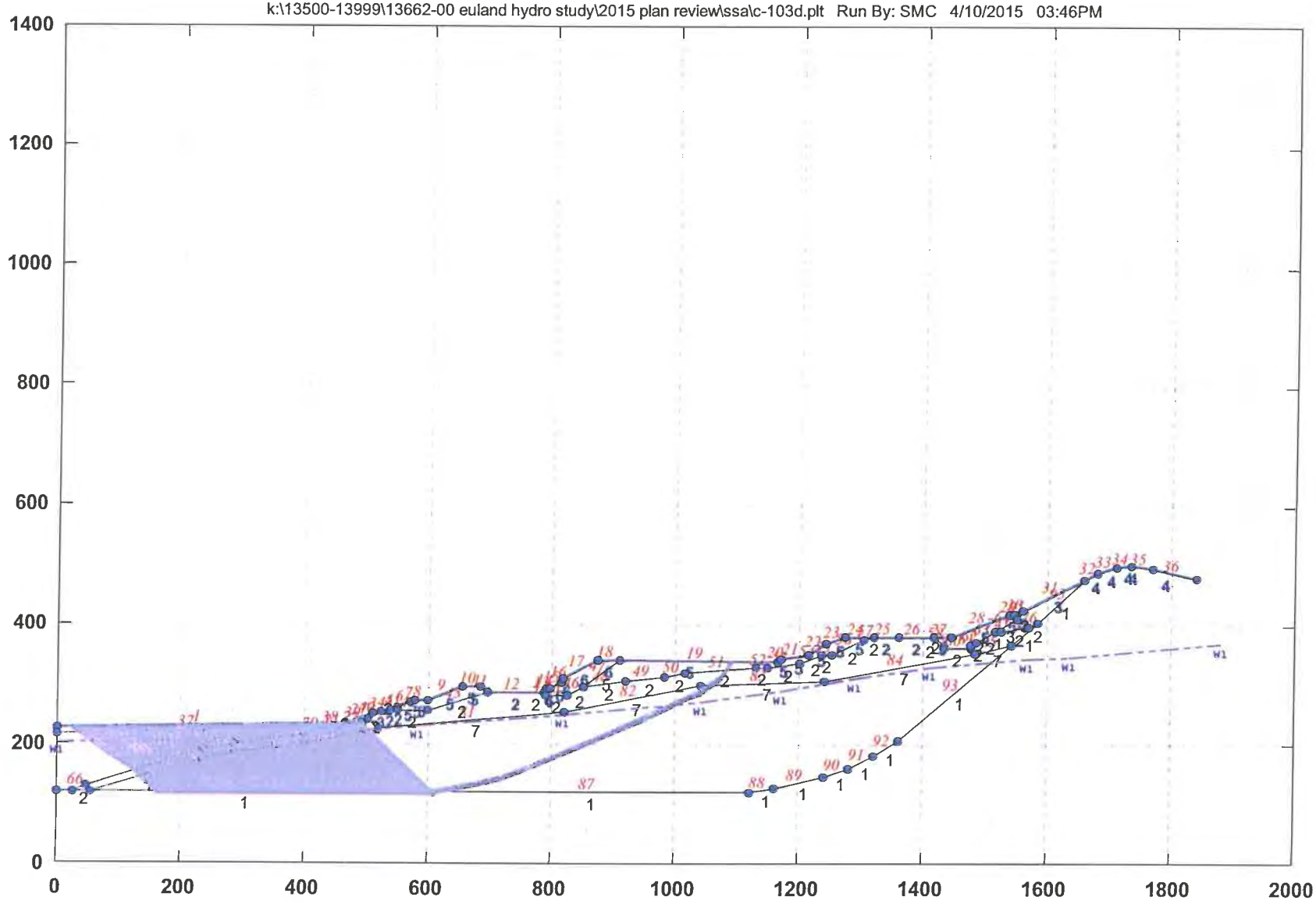

13662-00, Euland Capital, C-C', - - Static-
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103d.pl2 Run By: SMC 4/10/2015 03:46PM
FS
a 2.0
b 2.0
c 2.0
d 2.0
e 2.0
f 2.0
g 2.0
h 2.0
i 2.0
j 2.0
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Selct Ef | 6 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=2.0
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-16.1

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103d.plt Run By: SMC 4/10/2015 03:46PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 03:46PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103d.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103d.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103d.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3

40	502.00	243.00	510.00	252.00	3
41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1

7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	608.00	120.00	10.00
2	609.00	120.00	609.00	120.00	10.00
3	640.00	126.00	640.00	126.00	10.00
4	680.00	134.00	680.00	134.00	10.00
5	720.00	144.00	720.00	144.00	10.00
6	760.00	160.00	760.00	160.00	10.00

7	964.00	250.00	964.00	250.00	10.00
8	1022.00	280.00	1022.00	280.00	10.00
9	1040.00	288.00	1040.00	288.00	10.00
10	1075.00	312.00	1075.00	312.00	10.00
11	1086.00	330.00	1086.00	330.00	10.00

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 = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.926 FS Min = 1.971 FS Ave = 2.181
Standard Deviation = 0.151 Coefficient of Variation = 6.92 %
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	346.459	232.451
2	357.867	225.322
3	375.993	212.631
4	389.946	198.677
5	409.326	179.297
6	437.610	151.013
7	465.895	122.729
8	609.000	124.423
9	640.000	128.953
10	680.000	138.257
11	720.000	145.772
12	760.000	156.435
13	964.000	246.684
14	1022.000	278.456
15	1040.000	283.190
16	1075.000	309.822
17	1086.000	334.789
18	1088.568	338.899

Factor of Safety
*** 1.971 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	346.459	232.451
2	357.867	225.322
3	375.993	212.631
4	389.946	198.677
5	409.326	179.297
6	437.610	151.013
7	465.895	122.729
8	609.000	124.423
9	640.000	128.953
10	680.000	138.257
11	720.000	145.772
12	760.000	156.435
13	964.000	246.684
14	1022.000	278.456
15	1040.000	283.190
16	1075.000	309.822
17	1086.000	334.789
18	1088.568	338.899

Factor of Safety
*** 1.971 ***
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.730	232.779
2	373.096	225.677

3	389.100	214.470
4	402.955	200.616
5	425.513	178.057
6	453.798	149.773
7	482.082	121.489
8	609.000	117.949
9	640.000	122.870
10	680.000	133.189
11	720.000	147.344
12	760.000	155.273
13	964.000	248.412
14	1022.000	283.701
15	1040.000	287.575
16	1075.000	313.972
17	1086.000	334.330
18	1088.853	338.896

Factor of Safety
*** 2.011 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.730	232.779
2	373.096	225.677
3	389.100	214.470
4	402.955	200.616
5	425.513	178.057
6	453.798	149.773
7	482.082	121.489
8	609.000	117.949
9	640.000	122.870
10	680.000	133.189
11	720.000	147.344
12	760.000	155.273
13	964.000	248.412
14	1022.000	283.701
15	1040.000	287.575
16	1075.000	313.972
17	1086.000	334.330
18	1088.853	338.896

Factor of Safety
*** 2.011 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	359.604	232.733
2	370.976	225.627
3	387.276	214.214
4	401.233	200.257
5	421.357	180.132
6	449.642	151.848
7	477.926	123.564
8	609.000	122.719
9	640.000	125.648
10	680.000	131.787
11	720.000	142.076
12	760.000	158.950
13	964.000	246.347
14	1022.000	283.705
15	1040.000	289.962
16	1075.000	311.555
17	1086.000	332.421
18	1090.037	338.882

Factor of Safety
*** 2.014 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	359.604	232.733
2	370.976	225.627
3	387.276	214.214

4	401.233	200.257
5	421.357	180.132
6	449.642	151.848
7	477.926	123.564
8	609.000	122.719
9	640.000	125.648
10	680.000	131.787
11	720.000	142.076
12	760.000	158.950
13	964.000	246.347
14	1022.000	283.705
15	1040.000	289.962
16	1075.000	311.555
17	1086.000	332.421
18	1090.037	338.882

Factor of Safety
*** 2.014 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	359.604	232.733
2	370.976	225.627
3	387.276	214.214
4	401.233	200.257
5	421.357	180.132
6	449.642	151.848
7	477.926	123.564
8	609.000	122.719
9	640.000	125.648
10	680.000	131.787
11	720.000	142.076
12	760.000	158.950
13	964.000	246.347
14	1022.000	283.705
15	1040.000	289.962
16	1075.000	311.555
17	1086.000	332.421
18	1090.037	338.882

Factor of Safety
*** 2.014 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	329.330	232.082
2	340.784	224.925
3	361.290	210.567
4	375.129	196.728
5	391.607	180.250
6	419.892	151.965
7	448.176	123.681
8	609.000	120.024
9	640.000	127.640
10	680.000	135.967
11	720.000	145.943
12	760.000	160.004
13	964.000	252.089
14	1022.000	281.635
15	1040.000	287.579
16	1075.000	316.360
17	1086.000	331.913
18	1090.352	338.878

Factor of Safety
*** 2.015 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	329.330	232.082
2	340.784	224.925
3	361.290	210.567
4	375.129	196.728

5	391.607	180.250
6	419.892	151.965
7	448.176	123.681
8	609.000	120.024
9	640.000	127.640
10	680.000	135.967
11	720.000	145.943
12	760.000	160.004
13	964.000	252.089
14	1022.000	281.635
15	1040.000	287.579
16	1075.000	316.360
17	1086.000	331.913
18	1090.352	338.878

Factor of Safety

*** 2.015 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	369.164	232.939
2	380.511	225.849
3	395.482	215.366
4	408.978	201.870
5	431.638	179.210
6	459.923	150.925
7	488.207	122.641
8	609.000	121.445
9	640.000	122.459
10	680.000	132.622
11	720.000	140.371
12	760.000	155.644
13	964.000	249.877
14	1022.000	280.009
15	1040.000	292.477
16	1075.000	311.218
17	1086.000	327.670
18	1092.984	338.847

Factor of Safety

*** 2.016 ***

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

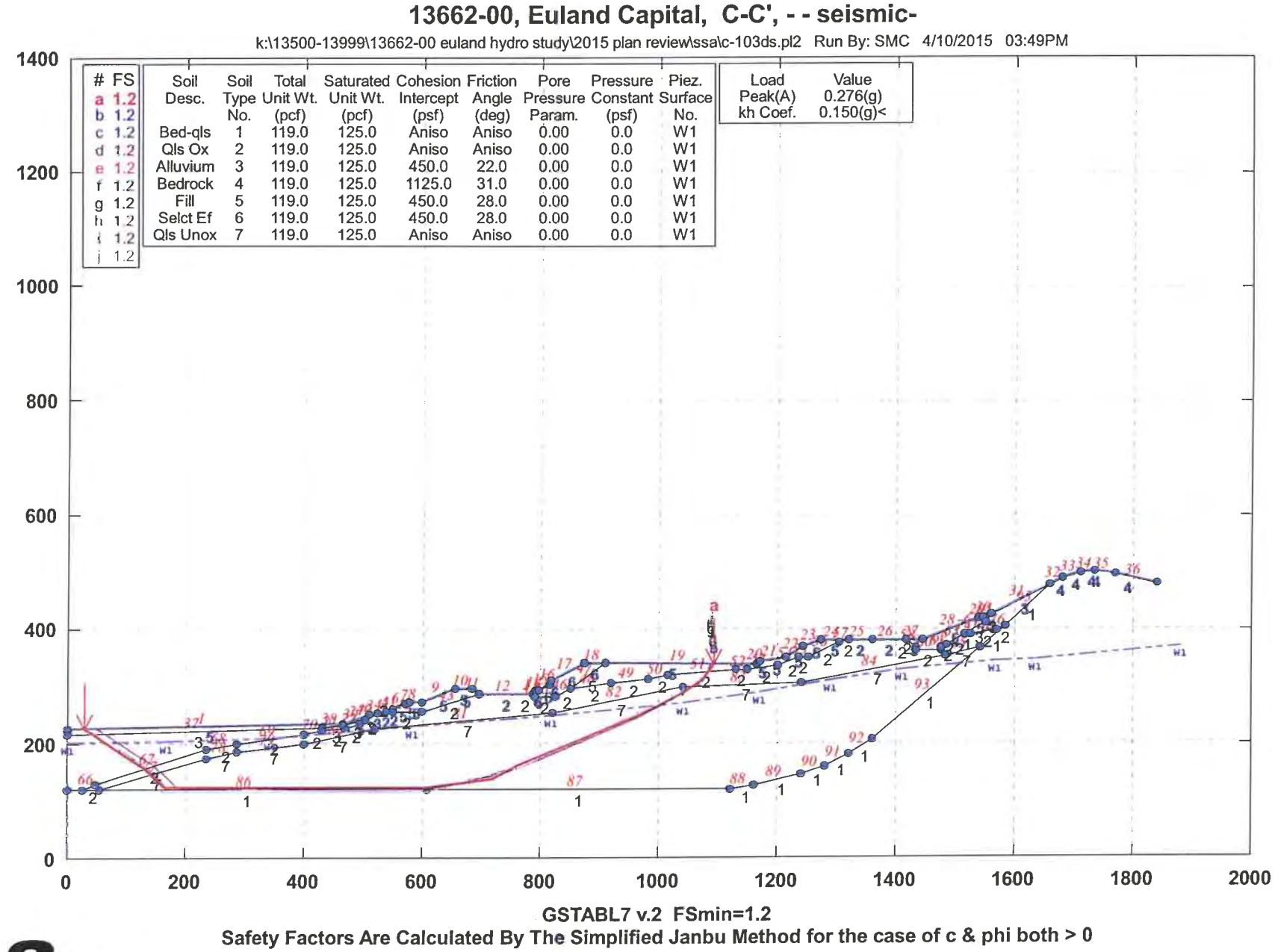
13662-00, Euland Capital, C-C', - - seismic-
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103ds.pl2 Run By: SMC 4/10/2015 03:49PM
FS
a 1.2
b 1.2
c 1.2
d 1.2
e 1.2
f 1.2
g 1.2
h 1.2
i 1.2
j 1.2
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Selct Ef | 6 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.2
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-16.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/10/2015
Time of Run: 03:49PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103ds.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103ds.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103ds.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - seismic-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	608.00	120.00	10.00
2	609.00	120.00	609.00	120.00	10.00
3	640.00	126.00	640.00	126.00	10.00

4	680.00	134.00	680.00	134.00	10.00
5	720.00	144.00	720.00	144.00	10.00
6	760.00	160.00	760.00	160.00	10.00
7	964.00	250.00	964.00	250.00	10.00
8	1022.00	280.00	1022.00	280.00	10.00
9	1040.00	288.00	1040.00	288.00	10.00
10	1075.00	312.00	1075.00	312.00	10.00
11	1086.00	330.00	1086.00	330.00	10.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 1.927 FS Min = 1.176 FS Ave = 1.357

Standard Deviation = 0.133 Coefficient of Variation = 9.82 %

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.395	225.611
2	41.133	217.957
3	65.245	201.693
4	98.407	179.325
5	131.568	156.958
6	141.842	146.683
7	164.020	124.506
8	609.000	123.544
9	640.000	129.168
10	680.000	133.316
11	720.000	139.424
12	760.000	162.431
13	964.000	248.774
14	1022.000	280.390
15	1040.000	288.717
16	1075.000	312.693
17	1086.000	328.754
18	1092.071	338.858

Factor of Safety

*** 1.176 ***

Individual data on the 61 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.7	6009.0	0.0	0.0	0.	0.	901.3	0.0	0.0
2	22.0	40759.4	0.0	0.0	0.	0.	6113.9	0.0	0.0
3	2.1	6074.4	0.0	117.8	0.	0.	911.2	0.0	0.0
4	33.2	145629.5	0.0	32323.3	0.	0.	21844.4	0.0	0.0
5	33.2	241279.3	0.0	89622.0	0.	0.	36191.9	0.0	0.0
6	10.3	96308.2	0.0	47701.3	0.	0.	14446.2	0.0	0.0
7	22.2	253825.4	0.0	*******	0.	0.	38073.8	0.0	0.0
8	4.0	51215.9	0.0	19982.2	0.	0.	7682.4	0.0	0.0
9	66.0	856122.9	0.0	*******	0.	0.	*******	0.0	0.0
10	52.0	683727.2	0.0	*******	0.	0.	*******	0.0	0.0
11	57.0	758792.0	0.0	*******	0.	0.	*******	0.0	0.0
12	35.1	471940.9	0.0	*******	0.	0.	70791.1	0.0	0.0
13	21.9	297042.0	0.0	*******	0.	0.	44556.3	0.0	0.0
14	30.0	409070.3	0.0	*******	0.	0.	61360.6	0.0	0.0
15	35.0	481033.9	0.0	*******	0.	0.	72155.1	0.0	0.0
16	5.0	69581.8	0.0	30012.0	0.	0.	10437.3	0.0	0.0
17	23.0	334799.6	0.0	*******	0.	0.	50219.9	0.0	0.0
18	9.0	137592.8	0.0	55457.0	0.	0.	20638.9	0.0	0.0
19	8.0	125413.9	0.0	49656.6	0.	0.	18812.1	0.0	0.0
20	8.0	127194.6	0.0	49996.9	0.	0.	19079.2	0.0	0.0
21	2.0	31897.9	0.0	12552.4	0.	0.	4784.7	0.0	0.0
22	3.0	47921.2	0.0	18868.5	0.	0.	7188.2	0.0	0.0
23	14.0	225582.1	0.0	88685.4	0.	0.	33837.3	0.0	0.0
24	13.0	215018.5	0.0	83283.8	0.	0.	32252.8	0.0	0.0
25	1.0	16872.5	0.0	6443.7	0.	0.	2530.9	0.0	0.0

26	19.0	332028.7	0.0	*******	0.	0.	49804.3	0.0	0.0
27	8.0	145358.5	0.0	52548.8	0.	0.	21803.8	0.0	0.0
28	5.0	91536.7	0.0	33015.8	0.	0.	13730.5	0.0	0.0
29	17.0	312379.9	0.0	*******	0.	0.	46857.0	0.0	0.0
30	9.0	167775.9	0.0	60589.2	0.	0.	25166.4	0.0	0.0
31	31.0	596338.1	0.0	*******	0.	0.	89450.7	0.0	0.0
32	16.0	318275.0	0.0	*******	0.	0.	47741.2	0.0	0.0
33	24.0	480412.6	0.0	*******	0.	0.	72061.9	0.0	0.0
34	5.0	99106.8	0.0	32948.5	0.	0.	14866.0	0.0	0.0
35	11.0	211164.1	0.0	72112.4	0.	0.	31674.6	0.0	0.0
36	24.0	441495.6	0.0	*******	0.	0.	66224.3	0.0	0.0
37	40.0	669809.0	0.0	*******	0.	0.	*******	0.0	0.0
38	28.0	408360.0	0.0	*******	0.	0.	61254.0	0.0	0.0
39	1.0	13928.8	0.0	4928.3	0.	0.	2089.3	0.0	0.0
40	3.0	42721.5	0.0	14648.0	0.	0.	6408.2	0.0	0.0
41	5.0	71716.6	0.0	23956.8	0.	0.	10757.5	0.0	0.0
42	18.0	256974.6	0.0	81518.7	0.	0.	38546.2	0.0	0.0
43	2.0	29528.0	0.0	8601.0	0.	0.	4429.2	0.0	0.0
44	1.0	15192.2	0.0	4266.3	0.	0.	2278.8	0.0	0.0
45	2.0	30411.6	0.0	8461.6	0.	0.	4561.7	0.0	0.0
46	5.0	76189.9	0.0	20759.5	0.	0.	11428.5	0.0	0.0
47	25.0	384395.4	0.0	95345.1	0.	0.	57659.3	0.0	0.0
48	25.0	390138.6	0.0	81257.9	0.	0.	58520.8	0.0	0.0
49	35.0	518142.4	0.0	90094.5	0.	0.	77721.4	0.0	0.0
50	10.0	136189.1	0.0	20669.9	0.	0.	20428.4	0.0	0.0
51	44.0	535362.3	0.0	64170.6	0.	0.	80304.4	0.0	0.0
52	19.0	196253.4	0.0	13357.7	0.	0.	29438.0	0.0	0.0
53	12.3	113665.2	0.0	2436.2	0.	0.	17049.8	0.0	0.0
54	19.7	161098.7	0.0	0.0	0.	0.	24164.8	0.0	0.0
55	7.0	51014.1	0.0	0.0	0.	0.	7652.1	0.0	0.0
56	18.0	117859.0	0.0	0.0	0.	0.	17678.9	0.0	0.0
57	14.3	77796.6	0.0	0.0	0.	0.	11669.5	0.0	0.0
58	20.7	82805.0	0.0	0.0	0.	0.	12420.8	0.0	0.0
59	8.2	19885.2	0.0	0.0	0.	0.	2982.8	0.0	0.0
60	2.8	4031.0	0.0	0.0	0.	0.	604.7	0.0	0.0
61	6.1	3675.5	0.0	0.0	0.	0.	551.3	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.395	225.611
2	41.133	217.957
3	65.245	201.693
4	98.407	179.325
5	131.568	156.958
6	141.842	146.683
7	164.020	124.506
8	609.000	123.544
9	640.000	129.168
10	680.000	133.316
11	720.000	139.424
12	760.000	162.431
13	964.000	248.774
14	1022.000	280.390
15	1040.000	288.717
16	1075.000	312.693
17	1086.000	328.754
18	1092.071	338.858

Factor of Safety

*** 1.176 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.395	225.611
2	41.133	217.957
3	65.245	201.693
4	98.407	179.325
5	131.568	156.958
6	141.842	146.683
7	164.020	124.506
8	609.000	123.544

9	640.000	129.168
10	680.000	133.316
11	720.000	139.424
12	760.000	162.431
13	964.000	248.774
14	1022.000	280.390
15	1040.000	288.717
16	1075.000	312.693
17	1086.000	328.754
18	1092.071	338.858

Factor of Safety
*** 1.176 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.650	225.659
2	43.382	218.009
3	66.819	202.201
4	99.980	179.833
5	133.142	157.465
6	143.434	147.173
7	168.176	122.431
8	609.000	118.774
9	640.000	126.390
10	680.000	134.717
11	720.000	144.693
12	760.000	158.754
13	964.000	250.839
14	1022.000	280.385
15	1040.000	286.329
16	1075.000	315.110
17	1086.000	330.663
18	1090.932	338.871

Factor of Safety
*** 1.177 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.650	225.659
2	43.382	218.009
3	66.819	202.201
4	99.980	179.833
5	133.142	157.465
6	143.434	147.173
7	168.176	122.431
8	609.000	118.774
9	640.000	126.390
10	680.000	134.717
11	720.000	144.693
12	760.000	158.754
13	964.000	250.839
14	1022.000	280.385
15	1040.000	286.329
16	1075.000	315.110
17	1086.000	330.663
18	1090.932	338.871

Factor of Safety
*** 1.177 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.650	225.659
2	43.382	218.009
3	66.819	202.201
4	99.980	179.833
5	133.142	157.465
6	143.434	147.173
7	168.176	122.431
8	609.000	118.774
9	640.000	126.390

10	680.000	134.717
11	720.000	144.693
12	760.000	158.754
13	964.000	250.839
14	1022.000	280.385
15	1040.000	286.329
16	1075.000	315.110
17	1086.000	330.663
18	1090.932	338.871

Factor of Safety
*** 1.177 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.816	226.050
2	61.497	218.430
3	79.496	206.290
4	112.657	183.922
5	145.819	161.554
6	156.260	151.113
7	157.610	149.763
8	185.895	121.479
9	609.000	123.173
10	640.000	127.703
11	680.000	137.007
12	720.000	144.522
13	760.000	155.185
14	964.000	245.434
15	1022.000	277.206
16	1040.000	291.940
17	1075.000	308.572
18	1086.000	333.539
19	1089.216	338.892

Factor of Safety
*** 1.181 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.816	226.050
2	61.497	218.430
3	79.496	206.290
4	112.657	183.922
5	145.819	161.554
6	156.260	151.113
7	157.610	149.763
8	185.895	121.479
9	609.000	123.173
10	640.000	127.703
11	680.000	137.007
12	720.000	144.522
13	760.000	155.185
14	964.000	245.434
15	1022.000	277.206
16	1040.000	291.940
17	1075.000	308.572
18	1086.000	333.539
19	1089.216	338.892

Factor of Safety
*** 1.181 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.816	226.050
2	61.497	218.430
3	79.496	206.290
4	112.657	183.922
5	145.819	161.554
6	156.260	151.113
7	157.610	149.763
8	185.895	121.479

9	609.000	123.173
10	640.000	127.703
11	680.000	137.007
12	720.000	144.522
13	760.000	155.185
14	964.000	245.434
15	1022.000	277.206
16	1040.000	291.940
17	1075.000	308.572
18	1086.000	333.539
19	1089.216	338.892

Factor of Safety

*** 1.181 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.736	225.532
2	37.485	217.872
3	62.692	200.869
4	95.853	178.502
5	129.015	156.134
6	139.259	145.890
7	163.582	121.567
8	609.000	116.152
9	640.000	124.198
10	680.000	132.642
11	720.000	139.922
12	760.000	155.976
13	964.000	252.241
14	1022.000	275.654
15	1040.000	292.653
16	1075.000	307.175
17	1086.000	330.659
18	1090.935	338.871

Factor of Safety

*** 1.181 ***

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

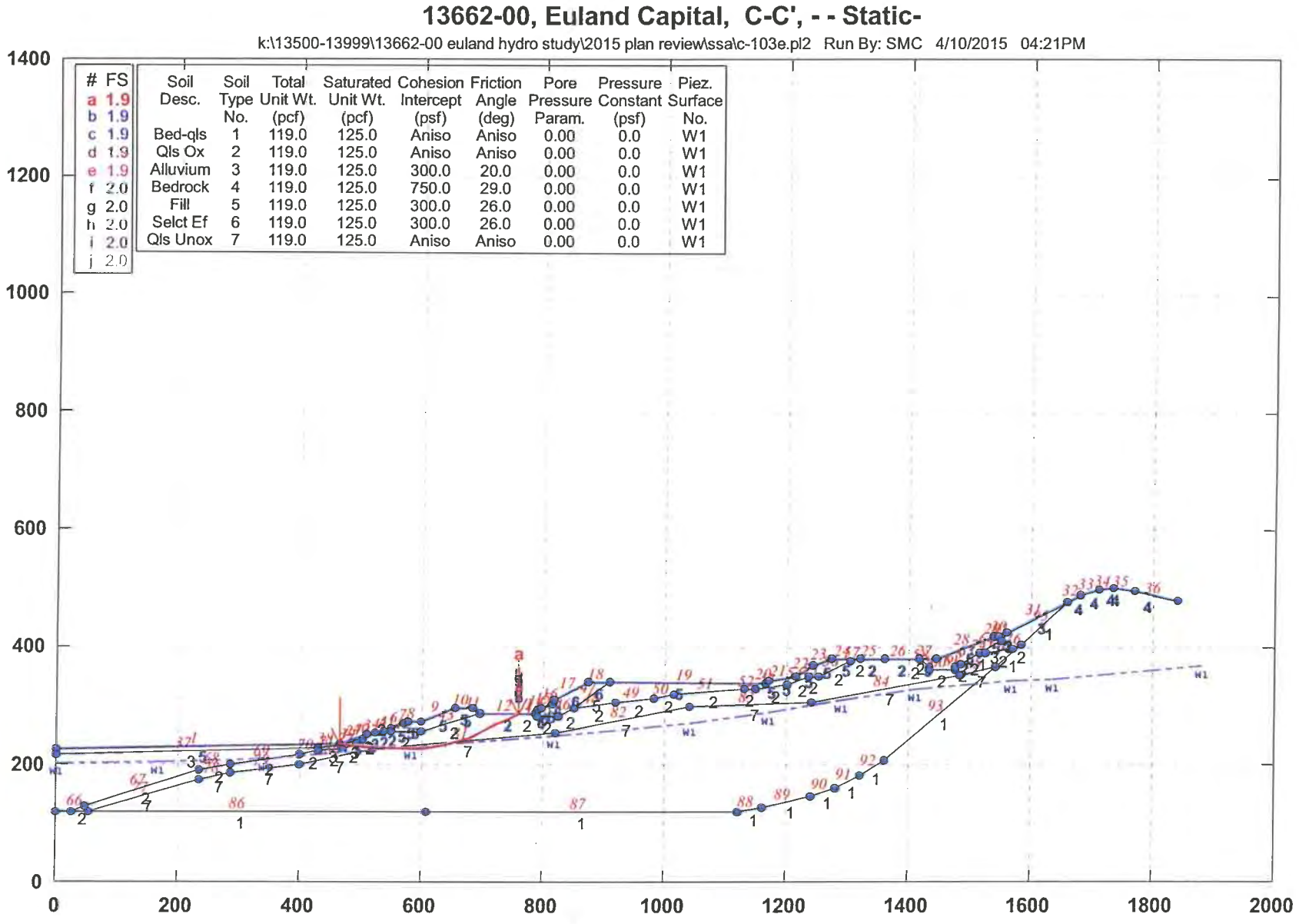
13662-00, Euland Capital, C-C', - - Static-
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103e.pl2 Run By: SMC 4/10/2015 04:21PM
FS
a 1.9
b 1.9
c 1.9
d 1.9
e 1.9
f 2.0
g 2.0
h 2.0
i 2.0
j 2.0
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Selct Ef | 6 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.9
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-17.1

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 04:21PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103e.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103e.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103e.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	297.00	6
15	797.00	297.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	465.00	235.00	465.00	235.00	0.00
2	498.00	233.00	520.00	232.00	3.00
3	600.00	229.00	600.00	229.00	5.00
4	640.00	233.00	640.00	233.00	5.00
5	680.00	248.00	680.00	248.00	5.00
6	720.00	268.00	720.00	268.00	5.00
7	760.00	287.00	760.00	287.00	0.00

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 = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.260 FS Min = 1.932 FS Ave = 2.146
Standard Deviation = 0.042 Coefficient of Variation = 1.96 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.046	231.137
3	600.000	226.776
4	640.000	235.256
5	680.000	245.966
6	720.000	268.376
7	760.000	287.000

Factor of Safety
*** 1.932 ***
Individual data on the 25 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.8	1691.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	15.6	13393.5	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.6	6538.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	9.0	16134.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	8.0	18092.8	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.0	114.3	0.0	0.0	0.	0.	0.0	0.0	0.0
7	13.0	33418.6	0.0	0.0	0.	0.	0.0	0.0	0.0
8	14.0	39701.8	0.0	0.0	0.	0.	0.0	0.0	0.0
9	13.0	43293.0	0.0	0.0	0.	0.	0.0	0.0	0.0
10	1.0	3697.9	0.0	0.0	0.	0.	0.0	0.0	0.0
11	8.9	35657.4	0.0	0.0	0.	0.	0.0	0.0	0.0
12	4.9	21998.3	0.0	0.0	0.	0.	0.0	0.0	0.0
13	5.2	25015.7	0.0	111.3	0.	0.	0.0	0.0	0.0
14	8.0	40959.7	0.0	604.6	0.	0.	0.0	0.0	0.0
15	5.0	26475.5	0.0	644.6	0.	0.	0.0	0.0	0.0
16	17.0	92256.1	0.0	3741.6	0.	0.	0.0	0.0	0.0
17	36.8	217591.0	0.0	5464.7	0.	0.	0.0	0.0	0.0
18	3.2	20169.0	0.0	0.0	0.	0.	0.0	0.0	0.0
19	5.4	34663.4	0.0	0.0	0.	0.	0.0	0.0	0.0
20	10.6	69027.5	0.0	0.0	0.	0.	0.0	0.0	0.0
21	24.0	149217.8	0.0	0.0	0.	0.	0.0	0.0	0.0
22	5.0	28341.9	0.0	0.0	0.	0.	0.0	0.0	0.0
23	11.0	51249.3	0.0	0.0	0.	0.	0.0	0.0	0.0
24	24.0	72391.7	0.0	0.0	0.	0.	0.0	0.0	0.0
25	40.0	44325.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.046	231.137
3	600.000	226.776
4	640.000	235.256
5	680.000	245.966
6	720.000	268.376
7	760.000	287.000

Factor of Safety
*** 1.932 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.347	231.469
3	600.000	228.524
4	640.000	235.050

5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.947 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.347	231.469
3	600.000	228.524
4	640.000	235.050
5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.947 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.347	231.469
3	600.000	228.524
4	640.000	235.050
5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.947 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	519.424	231.632
3	600.000	227.706
4	640.000	235.112
5	680.000	245.529
6	720.000	269.677
7	760.000	287.000

Factor of Safety
*** 1.952 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	519.424	231.632
3	600.000	227.706
4	640.000	235.112
5	680.000	245.529
6	720.000	269.677
7	760.000	287.000

Factor of Safety
*** 1.952 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	519.424	231.632
3	600.000	227.706
4	640.000	235.112
5	680.000	245.529
6	720.000	269.677
7	760.000	287.000

Factor of Safety
*** 1.952 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	517.351	230.629

3	600.000	228.514
4	640.000	235.275
5	680.000	245.517
6	720.000	268.708
7	760.000	287.000

Factor of Safety

*** 1.954 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	517.351	230.629
3	600.000	228.514
4	640.000	235.275
5	680.000	245.517
6	720.000	268.708
7	760.000	287.000

Factor of Safety

*** 1.954 ***

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

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
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Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

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Analysis Run Date: 4/10/2015
Time of Run: 04:21PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103e.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103e.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103e.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	297.00	6
15	797.00	297.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3

40	502.00	243.00	510.00	252.00	3
41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1

7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	465.00	235.00	465.00	235.00	0.00
2	498.00	233.00	520.00	232.00	3.00
3	600.00	229.00	600.00	229.00	5.00
4	640.00	233.00	640.00	233.00	5.00
5	680.00	248.00	680.00	248.00	5.00
6	720.00	268.00	720.00	268.00	5.00

7 760.00 287.00 760.00 287.00 0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 2.260 FS Min = 1.932 FS Ave = 2.146

Standard Deviation = 0.042 Coefficient of Variation = 1.96 %

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.046	231.137
3	600.000	226.776
4	640.000	235.256
5	680.000	245.966
6	720.000	268.376
7	760.000	287.000

Factor of Safety

*** 1.932 ***

Individual data on the 25 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.8	1691.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	15.6	13393.5	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.6	6538.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	9.0	16134.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	8.0	18092.8	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.0	114.3	0.0	0.0	0.	0.	0.0	0.0	0.0
7	13.0	33418.6	0.0	0.0	0.	0.	0.0	0.0	0.0
8	14.0	39701.8	0.0	0.0	0.	0.	0.0	0.0	0.0
9	13.0	43293.0	0.0	0.0	0.	0.	0.0	0.0	0.0
10	1.0	3697.9	0.0	0.0	0.	0.	0.0	0.0	0.0
11	8.9	35657.4	0.0	0.0	0.	0.	0.0	0.0	0.0
12	4.9	21998.3	0.0	0.0	0.	0.	0.0	0.0	0.0
13	5.2	25015.7	0.0	111.3	0.	0.	0.0	0.0	0.0
14	8.0	40959.7	0.0	604.6	0.	0.	0.0	0.0	0.0
15	5.0	26475.5	0.0	644.6	0.	0.	0.0	0.0	0.0
16	17.0	92256.1	0.0	3741.6	0.	0.	0.0	0.0	0.0
17	36.8	217591.0	0.0	5464.7	0.	0.	0.0	0.0	0.0
18	3.2	20169.0	0.0	0.0	0.	0.	0.0	0.0	0.0
19	5.4	34663.4	0.0	0.0	0.	0.	0.0	0.0	0.0
20	10.6	69027.5	0.0	0.0	0.	0.	0.0	0.0	0.0
21	24.0	149217.8	0.0	0.0	0.	0.	0.0	0.0	0.0
22	5.0	28341.9	0.0	0.0	0.	0.	0.0	0.0	0.0
23	11.0	51249.3	0.0	0.0	0.	0.	0.0	0.0	0.0
24	24.0	72391.7	0.0	0.0	0.	0.	0.0	0.0	0.0
25	40.0	44325.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.046	231.137
3	600.000	226.776
4	640.000	235.256
5	680.000	245.966
6	720.000	268.376
7	760.000	287.000

Factor of Safety

*** 1.932 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.347	231.469
3	600.000	228.524

4	640.000	235.050
5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.947 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.347	231.469
3	600.000	228.524
4	640.000	235.050
5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.947 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.347	231.469
3	600.000	228.524
4	640.000	235.050
5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.947 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	519.424	231.632
3	600.000	227.706
4	640.000	235.112
5	680.000	245.529
6	720.000	269.677
7	760.000	287.000

Factor of Safety
*** 1.952 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	519.424	231.632
3	600.000	227.706
4	640.000	235.112
5	680.000	245.529
6	720.000	269.677
7	760.000	287.000

Factor of Safety
*** 1.952 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	519.424	231.632
3	600.000	227.706
4	640.000	235.112
5	680.000	245.529
6	720.000	269.677
7	760.000	287.000

Factor of Safety
*** 1.952 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000

2	517.351	230.629
3	600.000	228.514
4	640.000	235.275
5	680.000	245.517
6	720.000	268.708
7	760.000	287.000

Factor of Safety

*** 1.954 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	517.351	230.629
3	600.000	228.514
4	640.000	235.275
5	680.000	245.517
6	720.000	268.708
7	760.000	287.000

Factor of Safety

*** 1.954 ***

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

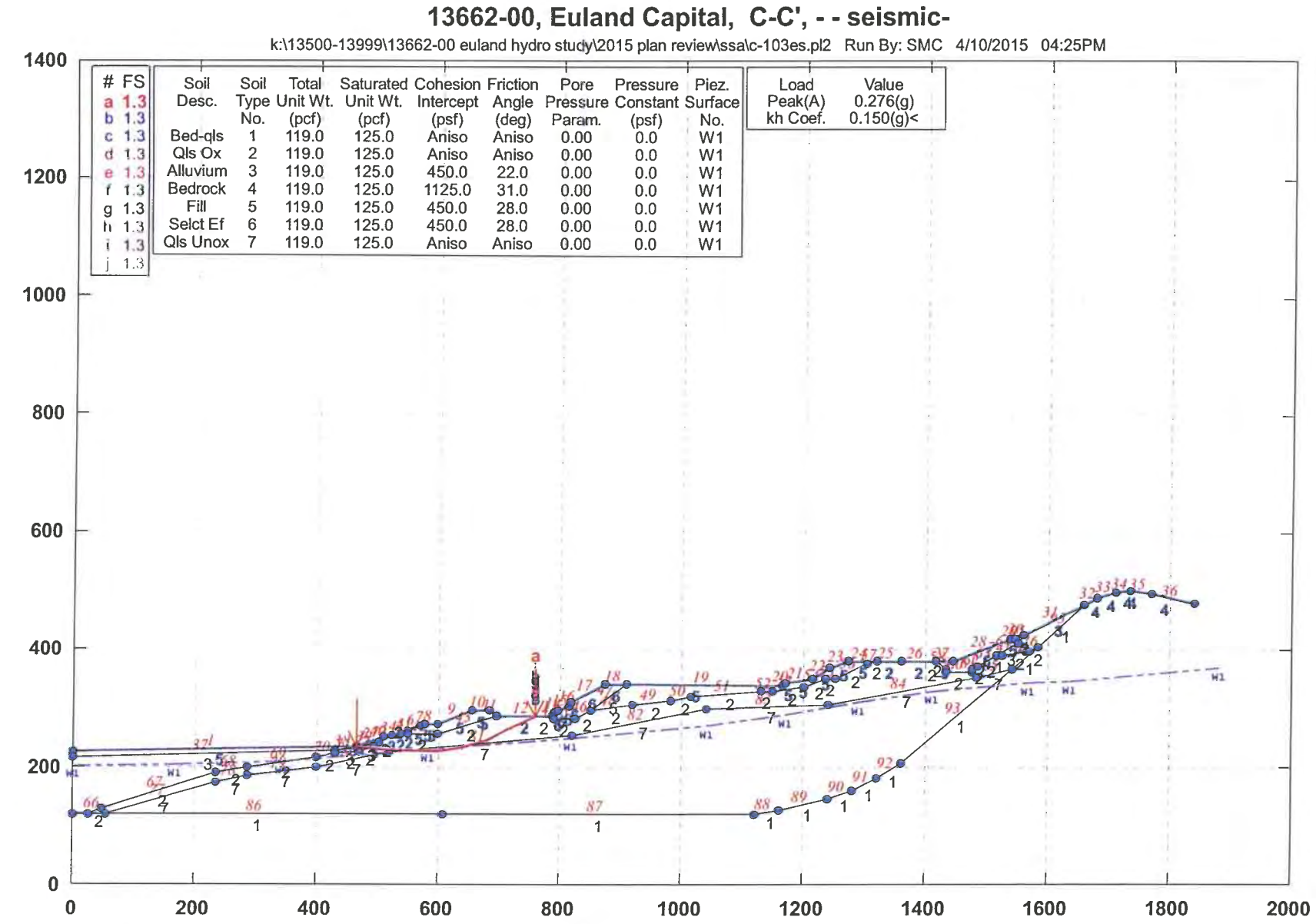

13662-00, Euland Capital, C-C', - - seismic-
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103es.pl2 Run By: SMC 4/10/2015 04:25PM
FS
a 1.3
b 1.3
c 1.3
d 1.3
e 1.3
f 1.3
g 1.3
h 1.3
i 1.3
j 1.3
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Selct Ef | 6 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.3
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-17.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

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: 4/10/2015
Time of Run: 04:25PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103es.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103es.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103es.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - seismic-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	297.00	6
15	797.00	297.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	465.00	235.00	465.00	235.00	0.00
2	498.00	233.00	520.00	232.00	3.00
3	600.00	229.00	600.00	229.00	5.00

4	640.00	233.00	640.00	233.00	5.00
5	680.00	248.00	680.00	248.00	5.00
6	720.00	268.00	720.00	268.00	5.00
7	760.00	287.00	760.00	287.00	0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 1.439 FS Min = 1.271 FS Ave = 1.393

Standard Deviation = 0.020 Coefficient of Variation = 1.40 %

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.046	231.137
3	600.000	226.776
4	640.000	235.256
5	680.000	245.966
6	720.000	268.376
7	760.000	287.000

Factor of Safety

*** 1.271 ***

Individual data on the 25 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.8	1691.7	0.0	0.0	0.	0.	253.8	0.0	0.0
2	15.6	13393.5	0.0	0.0	0.	0.	2009.0	0.0	0.0
3	4.6	6538.0	0.0	0.0	0.	0.	980.7	0.0	0.0
4	9.0	16134.6	0.0	0.0	0.	0.	2420.2	0.0	0.0
5	8.0	18092.8	0.0	0.0	0.	0.	2713.9	0.0	0.0
6	0.0	114.3	0.0	0.0	0.	0.	17.1	0.0	0.0
7	13.0	33418.6	0.0	0.0	0.	0.	5012.8	0.0	0.0
8	14.0	39701.8	0.0	0.0	0.	0.	5955.3	0.0	0.0
9	13.0	43293.0	0.0	0.0	0.	0.	6493.9	0.0	0.0
10	1.0	3697.9	0.0	0.0	0.	0.	554.7	0.0	0.0
11	8.9	35657.4	0.0	0.0	0.	0.	5348.6	0.0	0.0
12	4.9	21998.3	0.0	0.0	0.	0.	3299.7	0.0	0.0
13	5.2	25015.7	0.0	111.3	0.	0.	3752.3	0.0	0.0
14	8.0	40959.7	0.0	604.6	0.	0.	6143.9	0.0	0.0
15	5.0	26475.5	0.0	644.6	0.	0.	3971.3	0.0	0.0
16	17.0	92256.1	0.0	3741.6	0.	0.	13838.4	0.0	0.0
17	36.8	217591.0	0.0	5464.7	0.	0.	32638.7	0.0	0.0
18	3.2	20169.0	0.0	0.0	0.	0.	3025.3	0.0	0.0
19	5.4	34663.4	0.0	0.0	0.	0.	5199.5	0.0	0.0
20	10.6	69027.5	0.0	0.0	0.	0.	10354.1	0.0	0.0
21	24.0	149217.8	0.0	0.0	0.	0.	22382.7	0.0	0.0
22	5.0	28341.9	0.0	0.0	0.	0.	4251.3	0.0	0.0
23	11.0	51249.3	0.0	0.0	0.	0.	7687.4	0.0	0.0
24	24.0	72391.7	0.0	0.0	0.	0.	10858.8	0.0	0.0
25	40.0	44325.9	0.0	0.0	0.	0.	6648.9	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.046	231.137
3	600.000	226.776
4	640.000	235.256
5	680.000	245.966
6	720.000	268.376
7	760.000	287.000

Factor of Safety

*** 1.271 ***

Failure Surface Specified By 7 Coordinate Points

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

1	465.000	235.000
2	510.347	231.469
3	600.000	228.524
4	640.000	235.050
5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.281 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.347	231.469
3	600.000	228.524
4	640.000	235.050
5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.281 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	510.347	231.469
3	600.000	228.524
4	640.000	235.050
5	680.000	245.683
6	720.000	269.889
7	760.000	287.000

Factor of Safety
*** 1.281 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	517.351	230.629
3	600.000	228.514
4	640.000	235.275
5	680.000	245.517
6	720.000	268.708
7	760.000	287.000

Factor of Safety
*** 1.281 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	517.351	230.629
3	600.000	228.514
4	640.000	235.275
5	680.000	245.517
6	720.000	268.708
7	760.000	287.000

Factor of Safety
*** 1.281 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	517.351	230.629
3	600.000	228.514
4	640.000	235.275
5	680.000	245.517
6	720.000	268.708
7	760.000	287.000

Factor of Safety
*** 1.281 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	519.424	231.632
3	600.000	227.706
4	640.000	235.112
5	680.000	245.529
6	720.000	269.677
7	760.000	287.000

Factor of Safety

*** 1.283 ***

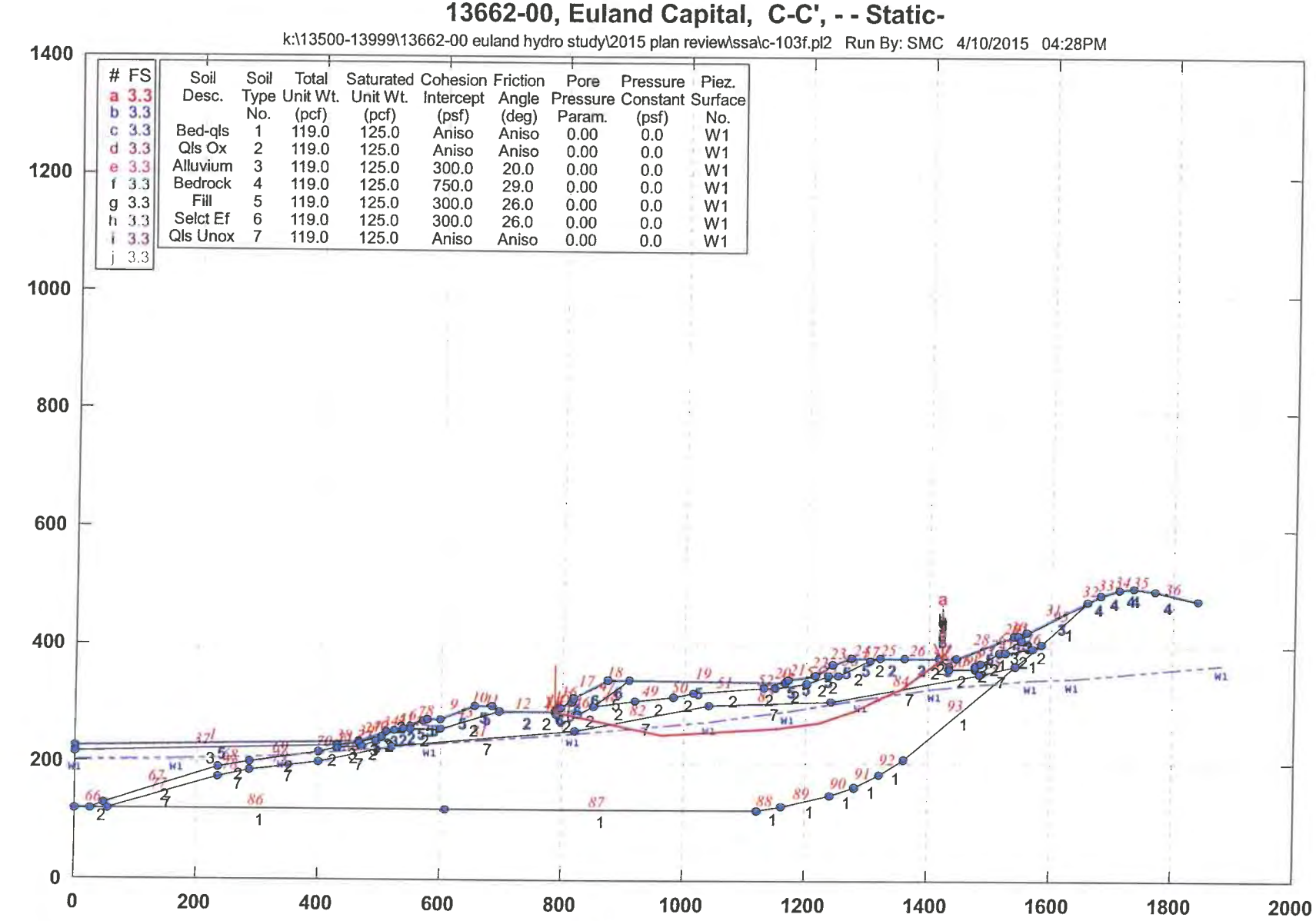
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	519.424	231.632
3	600.000	227.706
4	640.000	235.112
5	680.000	245.529
6	720.000	269.677
7	760.000	287.000

Factor of Safety

*** 1.283 ***

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


13662-00, Euland Capital, C-C', - - Static-
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FS
a 3.3
b 3.3
c 3.3
d 3.3
e 3.3
f 3.3
g 3.3
h 3.3
i 3.3
j 3.3
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Selct Ef | 6 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=3.3
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-18.1

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 04:28PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103f.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103f.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103f.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	788.00	287.00	815.00	303.00	0.00
2	964.00	250.00	964.00	250.00	5.00
3	1152.00	260.00	1152.00	260.00	5.00
4	1222.00	272.00	1222.00	272.00	5.00
5	1280.00	292.00	1280.00	292.00	5.00
6	1320.00	310.00	1320.00	310.00	5.00
7	1356.00	330.00	1356.00	330.00	5.00

8 1422.00 380.00 1422.00 380.00 0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 3.857 FS Min = 3.286 FS Ave = 3.371

Standard Deviation = 0.225 Coefficient of Variation = 6.67 %

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	788.043	287.075
2	788.084	287.050
3	964.000	249.594
4	1152.000	261.672
5	1222.000	269.636
6	1280.000	291.206
7	1320.000	311.850
8	1356.000	329.787
9	1422.000	380.000

Factor of Safety

*** 3.286 ***

Individual data on the 42 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.0	0.2	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.9	1836.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	5.0	4948.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	18.0	32697.2	0.0	0.0	0.	0.	0.0	0.0	0.0
5	1.5	4427.6	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.5	1735.2	0.0	0.0	0.	0.	0.0	0.0	0.0
7	8.0	31442.2	0.0	0.0	0.	0.	0.0	0.0	0.0
8	25.0	134098.4	0.0	0.0	0.	0.	0.0	0.0	0.0
9	25.0	188403.9	0.0	0.0	0.	0.	0.0	0.0	0.0
10	10.3	90028.0	0.0	0.0	0.	0.	0.0	0.0	0.0
11	24.7	227270.2	0.0	0.0	0.	0.	0.0	0.0	0.0
12	9.5	91632.0	0.0	0.0	0.	0.	0.0	0.0	0.0
13	0.5	4655.7	0.0	2.2	0.	0.	0.0	0.0	0.0
14	44.0	453888.4	0.0	18993.2	0.	0.	0.0	0.0	0.0
15	19.0	205152.2	0.0	16187.2	0.	0.	0.0	0.0	0.0
16	32.0	338261.1	0.0	28535.4	0.	0.	0.0	0.0	0.0
17	25.0	257928.6	0.0	23404.6	0.	0.	0.0	0.0	0.0
18	2.0	20394.1	0.0	1914.5	0.	0.	0.0	0.0	0.0
19	89.0	873019.0	0.0	*******	0.	0.	0.0	0.0	0.0
20	17.0	159098.5	0.0	25591.4	0.	0.	0.0	0.0	0.0
21	4.0	37078.0	0.0	6260.3	0.	0.	0.0	0.0	0.0
22	13.0	119041.3	0.0	20806.2	0.	0.	0.0	0.0	0.0
23	5.0	46331.7	0.0	8121.0	0.	0.	0.0	0.0	0.0
24	30.0	288886.7	0.0	50346.6	0.	0.	0.0	0.0	0.0
25	15.0	148014.7	0.0	26308.3	0.	0.	0.0	0.0	0.0
26	7.0	71215.4	0.0	12536.1	0.	0.	0.0	0.0	0.0
27	15.0	159660.4	0.0	27158.4	0.	0.	0.0	0.0	0.0
28	3.0	32809.7	0.0	5070.3	0.	0.	0.0	0.0	0.0
29	4.0	44201.3	0.0	6573.1	0.	0.	0.0	0.0	0.0
30	8.0	88781.0	0.0	12503.7	0.	0.	0.0	0.0	0.0
31	21.0	231702.1	0.0	28747.1	0.	0.	0.0	0.0	0.0
32	7.0	75794.9	0.0	8270.8	0.	0.	0.0	0.0	0.0
33	9.0	93447.7	0.0	9795.2	0.	0.	0.0	0.0	0.0
34	16.0	153432.6	0.0	12574.0	0.	0.	0.0	0.0	0.0
35	15.0	129080.9	0.0	6136.8	0.	0.	0.0	0.0	0.0
36	9.8	76965.4	0.0	1107.1	0.	0.	0.0	0.0	0.0
37	18.5	128813.2	0.0	0.0	0.	0.	0.0	0.0	0.0
38	7.7	47849.0	0.0	0.0	0.	0.	0.0	0.0	0.0
39	4.0	23177.0	0.0	0.0	0.	0.	0.0	0.0	0.0
40	58.0	173284.0	0.0	0.0	0.	0.	0.0	0.0	0.0
41	1.8	504.4	0.0	0.0	0.	0.	0.0	0.0	0.0

42 2.2 219.8 0.0 0.0 0. 0. 0.0 0.0 0.0

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	788.043	287.075
2	788.084	287.050
3	964.000	249.594
4	1152.000	261.672
5	1222.000	269.636
6	1280.000	291.206
7	1320.000	311.850
8	1356.000	329.787
9	1422.000	380.000

Factor of Safety
*** 3.286 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	788.043	287.075
2	788.084	287.050
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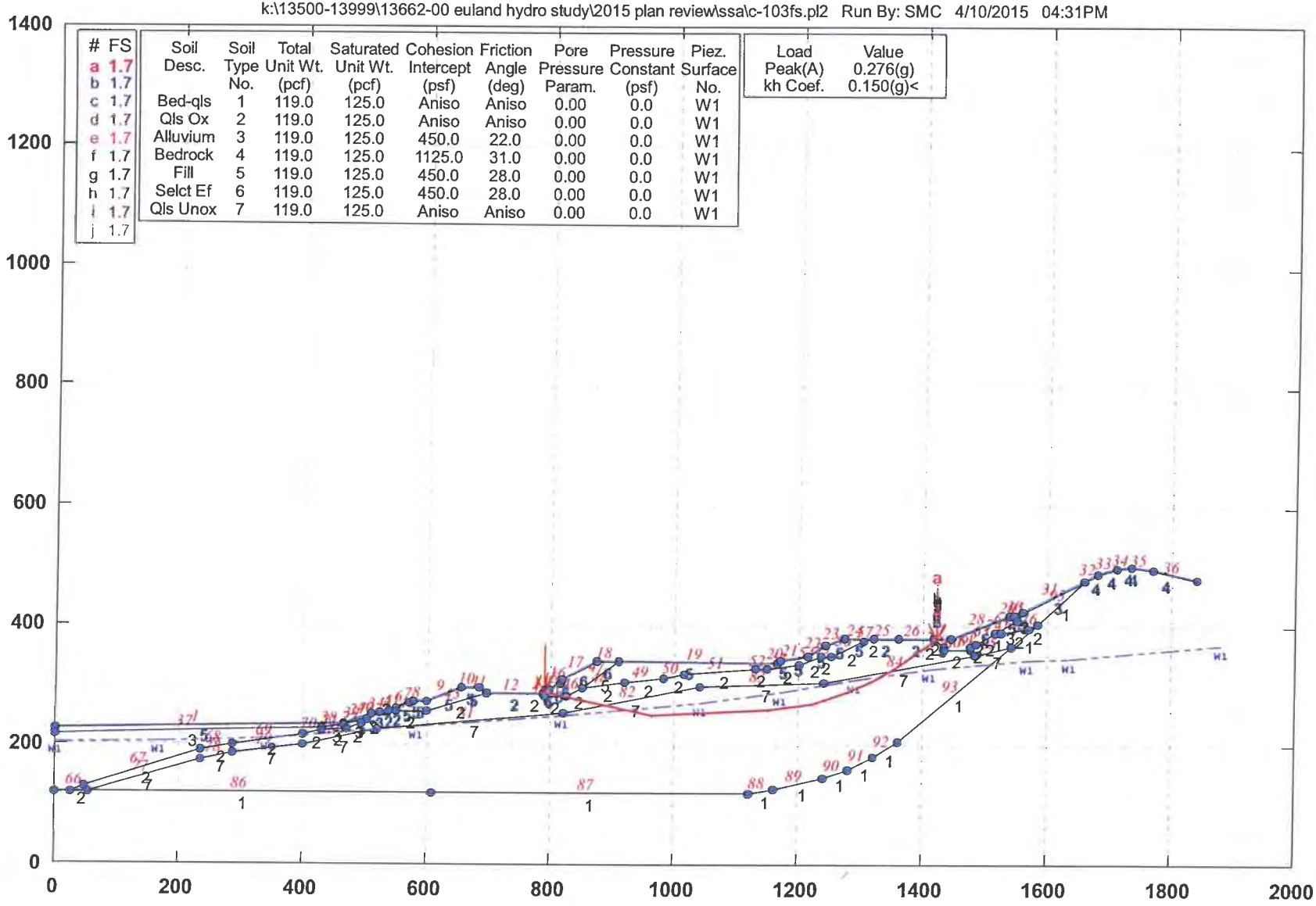
7	1320.000	311.850
8	1356.000	329.787
9	1422.000	380.000

Factor of Safety
*** 3.286 ***
**** END OF GSTABL7 OUTPUT ****



GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-18.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 04:31PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103fs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103fs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103fs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - seismic-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	788.00	287.00	815.00	303.00	0.00
2	964.00	250.00	964.00	250.00	5.00
3	1152.00	260.00	1152.00	260.00	5.00

4	1222.00	272.00	1222.00	272.00	5.00
5	1280.00	292.00	1280.00	292.00	5.00
6	1320.00	310.00	1320.00	310.00	5.00
7	1356.00	330.00	1356.00	330.00	5.00
8	1422.00	380.00	1422.00	380.00	0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 1.823 FS Min = 1.680 FS Ave = 1.665

Standard Deviation = 0.088 Coefficient of Variation = 5.27 %

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	788.846	288.480
2	789.666	287.987
3	964.000	251.372
4	1152.000	260.793
5	1222.000	269.851
6	1280.000	291.265
7	1320.000	310.503
8	1356.000	330.783
9	1422.000	380.000

Factor of Safety

*** 1.680 ***

Individual data on the 42 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.8	94.1	0.0	0.0	0.	0.	14.1	0.0	0.0
2	2.3	1170.8	0.0	0.0	0.	0.	175.6	0.0	0.0
3	5.0	4181.7	0.0	0.0	0.	0.	627.2	0.0	0.0
4	18.0	29866.6	0.0	0.0	0.	0.	4480.0	0.0	0.0
5	2.0	5841.4	0.0	0.0	0.	0.	876.2	0.0	0.0
6	5.9	21828.1	0.0	0.0	0.	0.	3274.2	0.0	0.0
7	2.1	8314.8	0.0	0.0	0.	0.	1247.2	0.0	0.0
8	25.0	129896.7	0.0	0.0	0.	0.	19484.5	0.0	0.0
9	25.0	183987.6	0.0	0.0	0.	0.	27598.1	0.0	0.0
10	14.0	120849.5	0.0	0.0	0.	0.	18127.4	0.0	0.0
11	21.0	189905.3	0.0	0.0	0.	0.	28485.8	0.0	0.0
12	10.0	94340.7	0.0	0.0	0.	0.	14151.1	0.0	0.0
13	5.0	48359.1	0.0	0.0	0.	0.	7253.9	0.0	0.0
14	39.0	396127.4	0.0	14433.4	0.	0.	59419.1	0.0	0.0
15	19.0	201250.6	0.0	14231.4	0.	0.	30187.6	0.0	0.0
16	32.0	333130.8	0.0	25957.8	0.	0.	49969.6	0.0	0.0
17	25.0	255178.7	0.0	22016.4	0.	0.	38276.8	0.0	0.0
18	2.0	20221.8	0.0	1827.1	0.	0.	3033.3	0.0	0.0
19	89.0	872501.6	0.0	*******	0.	0.	*******	0.0	0.0
20	17.0	160590.0	0.0	26307.9	0.	0.	24088.5	0.0	0.0
21	4.0	37503.1	0.0	6465.3	0.	0.	5625.5	0.0	0.0
22	13.0	120303.8	0.0	21473.4	0.	0.	18045.6	0.0	0.0
23	5.0	46729.4	0.0	8334.1	0.	0.	7009.4	0.0	0.0
24	30.0	290248.1	0.0	51117.3	0.	0.	43537.2	0.0	0.0
25	15.0	148036.7	0.0	26368.4	0.	0.	22205.5	0.0	0.0
26	7.0	71075.4	0.0	12490.1	0.	0.	10661.3	0.0	0.0
27	15.0	159295.7	0.0	26943.1	0.	0.	23894.4	0.0	0.0
28	3.0	32745.8	0.0	5032.3	0.	0.	4911.9	0.0	0.0
29	4.0	44120.9	0.0	6525.1	0.	0.	6618.1	0.0	0.0
30	8.0	88636.3	0.0	12416.8	0.	0.	13295.4	0.0	0.0
31	21.0	231424.8	0.0	28576.2	0.	0.	34713.7	0.0	0.0
32	7.0	75735.4	0.0	8232.3	0.	0.	11360.3	0.0	0.0
33	9.0	93559.7	0.0	9719.9	0.	0.	14034.0	0.0	0.0
34	16.0	154510.0	0.0	12988.0	0.	0.	23176.5	0.0	0.0
35	15.0	131112.1	0.0	7162.2	0.	0.	19666.8	0.0	0.0
36	11.6	91653.8	0.0	1895.7	0.	0.	13748.1	0.0	0.0
37	15.3	107055.2	0.0	0.0	0.	0.	16058.3	0.0	0.0

38	9.0	55735.3	0.0	0.0	0.	0.	8360.3	0.0	0.0
39	4.0	22717.2	0.0	0.0	0.	0.	3407.6	0.0	0.0
40	58.0	169846.5	0.0	0.0	0.	0.	25477.0	0.0	0.0
41	1.8	490.6	0.0	0.0	0.	0.	73.6	0.0	0.0
42	2.2	219.4	0.0	0.0	0.	0.	32.9	0.0	0.0

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	788.846	288.480
2	789.666	287.987
3	964.000	251.372
4	1152.000	260.793
5	1222.000	269.851
6	1280.000	291.265
7	1320.000	310.503
8	1356.000	330.783
9	1422.000	380.000

Factor of Safety
*** 1.680 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	788.846	288.480
2	789.666	287.987
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4	1152.000	260.793
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7	1320.000	310.503
8	1356.000	330.783
9	1422.000	380.000

Factor of Safety
*** 1.680 ***

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

Euland Capital Enterprises

Response to City of Laguna Niguel,
Geotechnical Review Sheet,
dated March 20, 2015
SunPointe, Tentative Tract 17433,
Colinas Sur, Laguna Niguel, California

Project No. 13662-05
Report No. 15-13851
dated April 24, 2015

Binder 2 of 2

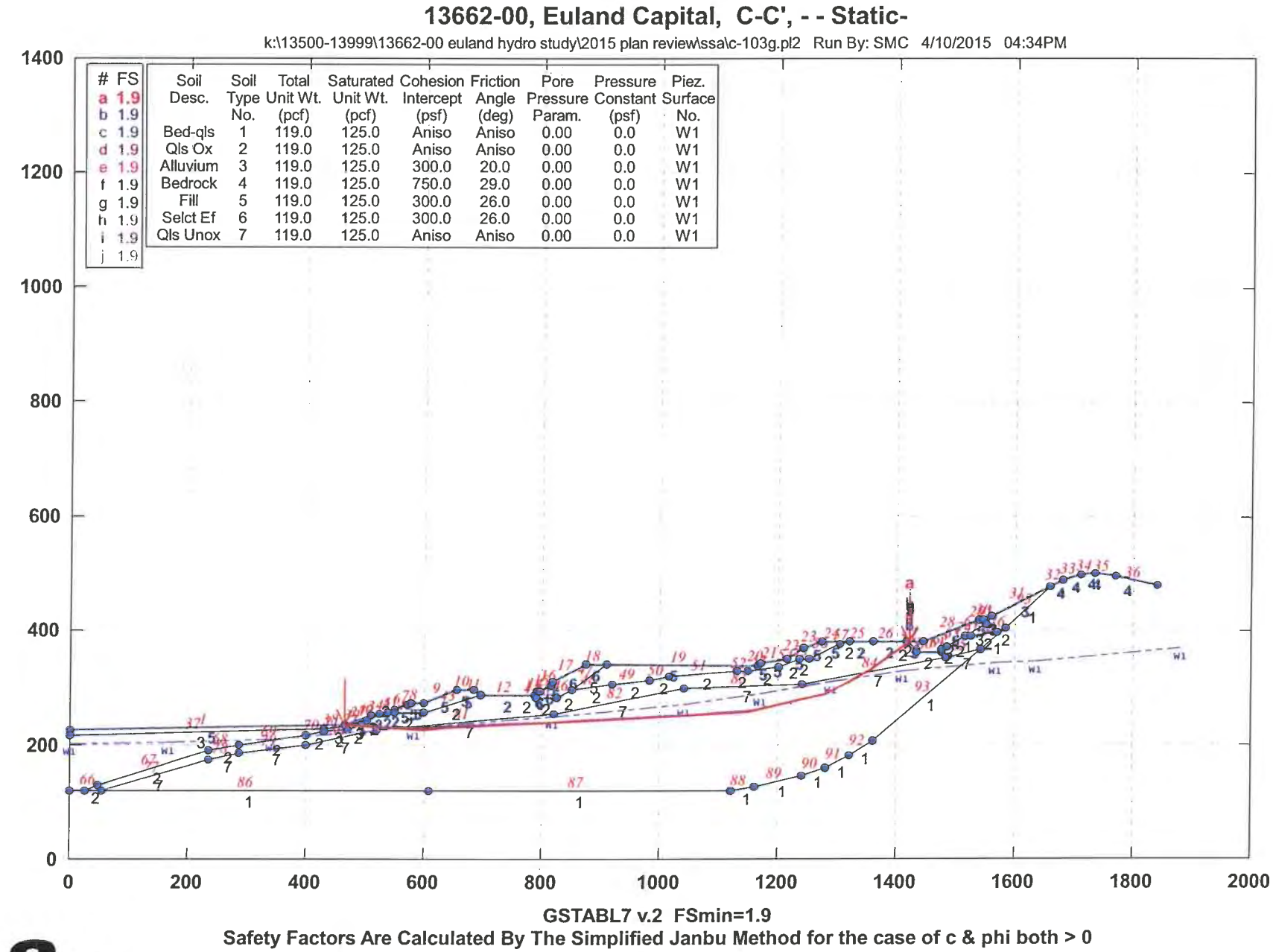

13662-00, Euland Capital, C-C', - - Static-
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103g.pl2 Run By: SMC 4/10/2015 04:34PM
FS
a 1.9
b 1.9
c 1.9
d 1.9
e 1.9
f 1.9
g 1.9
h 1.9
i 1.9
j 1.9
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Selct Ef | 6 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.9
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-19.1

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/10/2015
Time of Run: 04:34PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103g.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103g.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103g.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	465.00	235.00	465.00	235.00	0.00
2	498.00	233.00	520.00	232.00	3.00
3	600.00	229.00	600.00	229.00	5.00
4	640.00	233.00	640.00	233.00	5.00
5	964.00	250.00	964.00	250.00	5.00
6	1152.00	260.00	1152.00	260.00	5.00
7	1222.00	272.00	1222.00	272.00	5.00

8	1280.00	292.00	1280.00	292.00	5.00
9	1320.00	310.00	1320.00	310.00	5.00
10	1356.00	330.00	1356.00	330.00	5.00
11	1422.00	380.00	1422.00	380.00	0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 2.055 FS Min = 1.915 FS Ave = 2.012

Standard Deviation = 0.013 Coefficient of Variation = 0.66 %

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	499.336	233.028
3	600.000	226.675
4	640.000	231.308
5	964.000	247.514
6	1152.000	259.514
7	1222.000	274.275
8	1280.000	289.517
9	1320.000	310.708
10	1356.000	331.067
11	1422.000	380.000

Factor of Safety

*** 1.915 ***

Individual data on the 62 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.5	1852.2	0.0	0.0	0.	0.	0.0	0.0	0.0
2	16.3	13988.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	3.3	4460.3	0.0	0.0	0.	0.	0.0	0.0	0.0
4	6.3	10227.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	2.7	4923.2	0.0	0.0	0.	0.	0.0	0.0	0.0
6	8.0	17022.7	0.0	0.0	0.	0.	0.0	0.0	0.0
7	13.0	31798.2	0.0	0.0	0.	0.	0.0	0.0	0.0
8	14.0	38162.7	0.0	0.0	0.	0.	0.0	0.0	0.0
9	13.0	42169.3	0.0	0.0	0.	0.	0.0	0.0	0.0
10	1.0	3623.6	0.0	0.0	0.	0.	0.0	0.0	0.0
11	12.0	48631.5	0.0	0.0	0.	0.	0.0	0.0	0.0
12	4.6	21426.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	2.4	11525.0	0.0	25.7	0.	0.	0.0	0.0	0.0
14	8.0	40679.5	0.0	465.4	0.	0.	0.0	0.0	0.0
15	5.0	26359.8	0.0	587.4	0.	0.	0.0	0.0	0.0
16	17.0	92204.6	0.0	3719.0	0.	0.	0.0	0.0	0.0
17	40.0	247874.0	0.0	10408.4	0.	0.	0.0	0.0	0.0
18	16.0	114889.8	0.0	3808.9	0.	0.	0.0	0.0	0.0
19	29.0	215336.7	0.0	8328.8	0.	0.	0.0	0.0	0.0
20	11.0	75180.1	0.0	3639.7	0.	0.	0.0	0.0	0.0
21	92.0	557778.0	0.0	40790.2	0.	0.	0.0	0.0	0.0
22	1.0	5899.9	0.0	544.9	0.	0.	0.0	0.0	0.0
23	3.0	18914.7	0.0	1647.9	0.	0.	0.0	0.0	0.0
24	5.0	32971.6	0.0	2790.2	0.	0.	0.0	0.0	0.0
25	18.0	127148.0	0.0	10496.9	0.	0.	0.0	0.0	0.0
26	2.0	16035.7	0.0	1210.0	0.	0.	0.0	0.0	0.0
27	1.0	8516.0	0.0	608.3	0.	0.	0.0	0.0	0.0
28	2.0	17199.5	0.0	1223.2	0.	0.	0.0	0.0	0.0
29	5.0	43975.7	0.0	3100.7	0.	0.	0.0	0.0	0.0
30	25.0	240816.5	0.0	16420.1	0.	0.	0.0	0.0	0.0
31	25.0	275712.7	0.0	17947.3	0.	0.	0.0	0.0	0.0
32	35.0	406923.0	0.0	27691.9	0.	0.	0.0	0.0	0.0
33	10.0	114907.2	0.0	8461.8	0.	0.	0.0	0.0	0.0
34	44.0	497135.9	0.0	40134.7	0.	0.	0.0	0.0	0.0
35	19.0	210100.9	0.0	18652.9	0.	0.	0.0	0.0	0.0
36	32.0	346638.0	0.0	32709.1	0.	0.	0.0	0.0	0.0

37	25.0	264510.1	0.0	26683.7	0.	0.	0.0	0.0	0.0
38	2.0	20922.0	0.0	2177.5	0.	0.	0.0	0.0	0.0
39	89.0	896712.8	0.0	*******	0.	0.	0.0	0.0	0.0
40	17.0	163671.0	0.0	27852.0	0.	0.	0.0	0.0	0.0
41	4.0	38156.0	0.0	6793.2	0.	0.	0.0	0.0	0.0
42	13.0	121521.4	0.0	22378.3	0.	0.	0.0	0.0	0.0
43	5.0	46739.7	0.0	8452.2	0.	0.	0.0	0.0	0.0
44	30.0	284966.7	0.0	49150.3	0.	0.	0.0	0.0	0.0
45	15.0	141961.1	0.0	23666.5	0.	0.	0.0	0.0	0.0
46	7.0	67456.4	0.0	10837.0	0.	0.	0.0	0.0	0.0
47	15.0	152501.9	0.0	22672.9	0.	0.	0.0	0.0	0.0
48	3.0	31746.0	0.0	4371.8	0.	0.	0.0	0.0	0.0
49	4.0	42973.8	0.0	5744.7	0.	0.	0.0	0.0	0.0
50	8.0	86980.3	0.0	11200.2	0.	0.	0.0	0.0	0.0
51	21.0	231125.2	0.0	27565.1	0.	0.	0.0	0.0	0.0
52	7.0	76938.2	0.0	8597.7	0.	0.	0.0	0.0	0.0
53	9.0	95277.9	0.0	10870.8	0.	0.	0.0	0.0	0.0
54	16.0	156344.8	0.0	14269.1	0.	0.	0.0	0.0	0.0
55	15.0	131414.0	0.0	7472.7	0.	0.	0.0	0.0	0.0
56	11.0	87032.9	0.0	1723.4	0.	0.	0.0	0.0	0.0
57	15.2	106336.8	0.0	0.0	0.	0.	0.0	0.0	0.0
58	9.8	60014.1	0.0	0.0	0.	0.	0.0	0.0	0.0
59	4.0	22586.5	0.0	0.0	0.	0.	0.0	0.0	0.0
60	58.0	168869.2	0.0	0.0	0.	0.	0.0	0.0	0.0
61	1.8	486.6	0.0	0.0	0.	0.	0.0	0.0	0.0
62	2.2	219.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	499.336	233.028
3	600.000	226.675
4	640.000	231.308
5	964.000	247.514
6	1152.000	259.514
7	1222.000	274.275
8	1280.000	289.517
9	1320.000	310.708
10	1356.000	331.067
11	1422.000	380.000

Factor of Safety

*** 1.915 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	499.336	233.028
3	600.000	226.675
4	640.000	231.308
5	964.000	247.514
6	1152.000	259.514
7	1222.000	274.275
8	1280.000	289.517
9	1320.000	310.708
10	1356.000	331.067
11	1422.000	380.000

Factor of Safety

*** 1.915 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	518.608	231.159
3	600.000	227.247
4	640.000	230.668
5	964.000	249.726
6	1152.000	261.140
7	1222.000	274.378
8	1280.000	289.658
9	1320.000	309.951

10	1356.000	330.974
11	1422.000	380.000

Factor of Safety
*** 1.917 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	518.608	231.159
3	600.000	227.247
4	640.000	230.668
5	964.000	249.726
6	1152.000	261.140
7	1222.000	274.378
8	1280.000	289.658
9	1320.000	309.951
10	1356.000	330.974
11	1422.000	380.000

Factor of Safety
*** 1.917 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	500.851	232.129
3	600.000	229.764
4	640.000	231.525
5	964.000	248.767
6	1152.000	261.958
7	1222.000	274.317
8	1280.000	289.812
9	1320.000	310.163
10	1356.000	329.839
11	1422.000	380.000

Factor of Safety
*** 1.925 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	500.851	232.129
3	600.000	229.764
4	640.000	231.525
5	964.000	248.767
6	1152.000	261.958
7	1222.000	274.317
8	1280.000	289.812
9	1320.000	310.163
10	1356.000	329.839
11	1422.000	380.000

Factor of Safety
*** 1.925 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	515.943	232.933
3	600.000	228.907
4	640.000	232.485
5	964.000	247.949
6	1152.000	262.019
7	1222.000	274.163
8	1280.000	289.600
9	1320.000	311.299
10	1356.000	329.978
11	1422.000	380.000

Factor of Safety
*** 1.927 ***

Failure Surface Specified By 11 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	465.000	235.000
2	515.943	232.933
3	600.000	228.907
4	640.000	232.485
5	964.000	247.949
6	1152.000	262.019
7	1222.000	274.163
8	1280.000	289.600
9	1320.000	311.299
10	1356.000	329.978
11	1422.000	380.000

Factor of Safety

*** 1.927 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	508.972	232.094
3	600.000	226.961
4	640.000	230.988
5	964.000	251.120
6	1152.000	257.827
7	1222.000	274.326
8	1280.000	289.588
9	1320.000	310.329
10	1356.000	331.020
11	1422.000	380.000

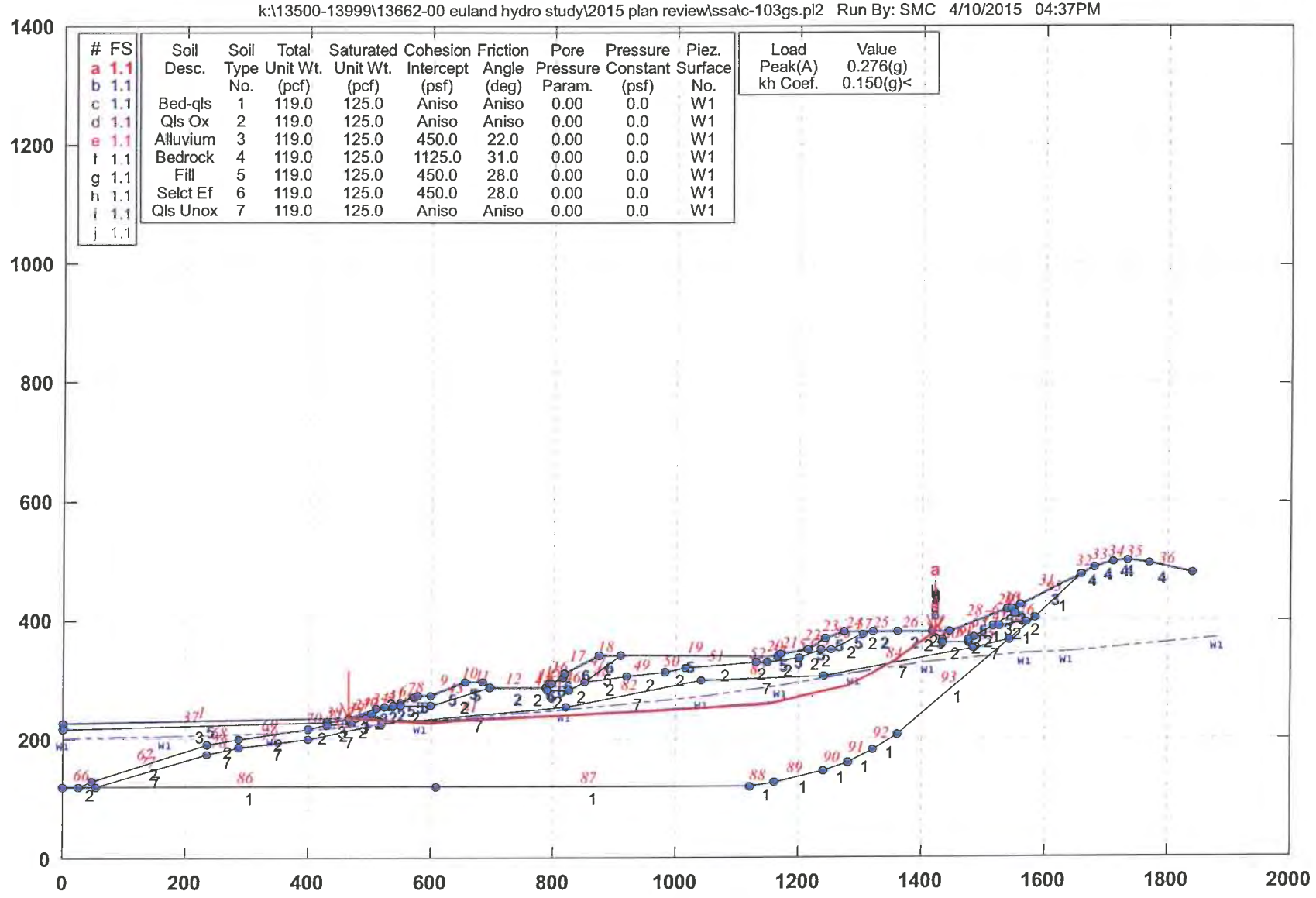
Factor of Safety

*** 1.928 ***

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

13662-00, Euland Capital, C-C', - - Seismic-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103gs.pl2 Run By: SMC 4/10/2015 04:37PM



#	FS
a	1.1
b	1.1
c	1.1
d	1.1
e	1.1
f	1.1
g	1.1
h	1.1
i	1.1
j	1.1

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Selct Ef	6	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.1

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-19.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 04:37PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103gs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103gs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103gs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	465.00	235.00	465.00	235.00	0.00
2	498.00	233.00	520.00	232.00	3.00
3	600.00	229.00	600.00	229.00	5.00

4	640.00	233.00	640.00	233.00	5.00
5	964.00	250.00	964.00	250.00	5.00
6	1152.00	260.00	1152.00	260.00	5.00
7	1222.00	272.00	1222.00	272.00	5.00
8	1280.00	292.00	1280.00	292.00	5.00
9	1320.00	310.00	1320.00	310.00	5.00
10	1356.00	330.00	1356.00	330.00	5.00
11	1422.00	380.00	1422.00	380.00	0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 1.155 FS Min = 1.086 FS Ave = 1.135

Standard Deviation = 0.007 Coefficient of Variation = 0.58 %

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	499.336	233.028
3	600.000	226.675
4	640.000	231.308
5	964.000	247.514
6	1152.000	259.514
7	1222.000	274.275
8	1280.000	289.517
9	1320.000	310.708
10	1356.000	331.067
11	1422.000	380.000

Factor of Safety

*** 1.086 ***

Individual data on the 62 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.5	1852.2	0.0	0.0	0.	0.	277.8	0.0	0.0
2	16.3	13988.6	0.0	0.0	0.	0.	2098.3	0.0	0.0
3	3.3	4460.3	0.0	0.0	0.	0.	669.0	0.0	0.0
4	6.3	10227.3	0.0	0.0	0.	0.	1534.1	0.0	0.0
5	2.7	4923.2	0.0	0.0	0.	0.	738.5	0.0	0.0
6	8.0	17022.7	0.0	0.0	0.	0.	2553.4	0.0	0.0
7	13.0	31798.2	0.0	0.0	0.	0.	4769.7	0.0	0.0
8	14.0	38162.7	0.0	0.0	0.	0.	5724.4	0.0	0.0
9	13.0	42169.3	0.0	0.0	0.	0.	6325.4	0.0	0.0
10	1.0	3623.6	0.0	0.0	0.	0.	543.5	0.0	0.0
11	12.0	48631.5	0.0	0.0	0.	0.	7294.7	0.0	0.0
12	4.6	21426.6	0.0	0.0	0.	0.	3214.0	0.0	0.0
13	2.4	11525.0	0.0	25.7	0.	0.	1728.8	0.0	0.0
14	8.0	40679.5	0.0	465.4	0.	0.	6101.9	0.0	0.0
15	5.0	26359.8	0.0	587.4	0.	0.	3954.0	0.0	0.0
16	17.0	92204.6	0.0	3719.0	0.	0.	13830.7	0.0	0.0
17	40.0	247874.0	0.0	10408.4	0.	0.	37181.1	0.0	0.0
18	16.0	114889.8	0.0	3808.9	0.	0.	17233.5	0.0	0.0
19	29.0	215336.7	0.0	8328.8	0.	0.	32300.5	0.0	0.0
20	11.0	75180.1	0.0	3639.7	0.	0.	11277.0	0.0	0.0
21	92.0	557778.0	0.0	40790.2	0.	0.	83666.7	0.0	0.0
22	1.0	5899.9	0.0	544.9	0.	0.	885.0	0.0	0.0
23	3.0	18914.7	0.0	1647.9	0.	0.	2837.2	0.0	0.0
24	5.0	32971.6	0.0	2790.2	0.	0.	4945.7	0.0	0.0
25	18.0	127148.0	0.0	10496.9	0.	0.	19072.2	0.0	0.0
26	2.0	16035.7	0.0	1210.0	0.	0.	2405.4	0.0	0.0
27	1.0	8516.0	0.0	608.3	0.	0.	1277.4	0.0	0.0
28	2.0	17199.5	0.0	1223.2	0.	0.	2579.9	0.0	0.0
29	5.0	43975.7	0.0	3100.7	0.	0.	6596.4	0.0	0.0
30	25.0	240816.5	0.0	16420.1	0.	0.	36122.5	0.0	0.0
31	25.0	275712.7	0.0	17947.3	0.	0.	41356.9	0.0	0.0
32	35.0	406923.0	0.0	27691.9	0.	0.	61038.5	0.0	0.0

33	10.0	114907.2	0.0	8461.8	0.	0.	17236.1	0.0	0.0
34	44.0	497135.9	0.0	40134.7	0.	0.	74570.4	0.0	0.0
35	19.0	210100.9	0.0	18652.9	0.	0.	31515.1	0.0	0.0
36	32.0	346638.0	0.0	32709.1	0.	0.	51995.7	0.0	0.0
37	25.0	264510.1	0.0	26683.7	0.	0.	39676.5	0.0	0.0
38	2.0	20922.0	0.0	2177.5	0.	0.	3138.3	0.0	0.0
39	89.0	896712.8	0.0	*******	0.	0.	*******	0.0	0.0
40	17.0	163671.0	0.0	27852.0	0.	0.	24550.7	0.0	0.0
41	4.0	38156.0	0.0	6793.2	0.	0.	5723.4	0.0	0.0
42	13.0	121521.4	0.0	22378.3	0.	0.	18228.2	0.0	0.0
43	5.0	46739.7	0.0	8452.2	0.	0.	7011.0	0.0	0.0
44	30.0	284966.7	0.0	49150.3	0.	0.	42745.0	0.0	0.0
45	15.0	141961.1	0.0	23666.5	0.	0.	21294.2	0.0	0.0
46	7.0	67456.4	0.0	10837.0	0.	0.	10118.5	0.0	0.0
47	15.0	152501.9	0.0	22672.9	0.	0.	22875.3	0.0	0.0
48	3.0	31746.0	0.0	4371.8	0.	0.	4761.9	0.0	0.0
49	4.0	42973.8	0.0	5744.7	0.	0.	6446.1	0.0	0.0
50	8.0	86980.3	0.0	11200.2	0.	0.	13047.0	0.0	0.0
51	21.0	231125.2	0.0	27565.1	0.	0.	34668.8	0.0	0.0
52	7.0	76938.2	0.0	8597.7	0.	0.	11540.7	0.0	0.0
53	9.0	95277.9	0.0	10870.8	0.	0.	14291.7	0.0	0.0
54	16.0	156344.8	0.0	14269.1	0.	0.	23451.7	0.0	0.0
55	15.0	131414.0	0.0	7472.7	0.	0.	19712.1	0.0	0.0
56	11.0	87032.9	0.0	1723.4	0.	0.	13054.9	0.0	0.0
57	15.2	106336.8	0.0	0.0	0.	0.	15950.5	0.0	0.0
58	9.8	60014.1	0.0	0.0	0.	0.	9002.1	0.0	0.0
59	4.0	22586.5	0.0	0.0	0.	0.	3388.0	0.0	0.0
60	58.0	168869.2	0.0	0.0	0.	0.	25330.4	0.0	0.0
61	1.8	486.6	0.0	0.0	0.	0.	73.0	0.0	0.0
62	2.2	219.2	0.0	0.0	0.	0.	32.9	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	499.336	233.028
3	600.000	226.675
4	640.000	231.308
5	964.000	247.514
6	1152.000	259.514
7	1222.000	274.275
8	1280.000	289.517
9	1320.000	310.708
10	1356.000	331.067
11	1422.000	380.000

Factor of Safety

*** 1.086 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	499.336	233.028
3	600.000	226.675
4	640.000	231.308
5	964.000	247.514
6	1152.000	259.514
7	1222.000	274.275
8	1280.000	289.517
9	1320.000	310.708
10	1356.000	331.067
11	1422.000	380.000

Factor of Safety

*** 1.086 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	518.608	231.159
3	600.000	227.247
4	640.000	230.668
5	964.000	249.726

6	1152.000	261.140
7	1222.000	274.378
8	1280.000	289.658
9	1320.000	309.951
10	1356.000	330.974
11	1422.000	380.000

Factor of Safety
*** 1.090 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	518.608	231.159
3	600.000	227.247
4	640.000	230.668
5	964.000	249.726
6	1152.000	261.140
7	1222.000	274.378
8	1280.000	289.658
9	1320.000	309.951
10	1356.000	330.974
11	1422.000	380.000

Factor of Safety
*** 1.090 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	500.851	232.129
3	600.000	229.764
4	640.000	231.525
5	964.000	248.767
6	1152.000	261.958
7	1222.000	274.317
8	1280.000	289.812
9	1320.000	310.163
10	1356.000	329.839
11	1422.000	380.000

Factor of Safety
*** 1.092 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	500.851	232.129
3	600.000	229.764
4	640.000	231.525
5	964.000	248.767
6	1152.000	261.958
7	1222.000	274.317
8	1280.000	289.812
9	1320.000	310.163
10	1356.000	329.839
11	1422.000	380.000

Factor of Safety
*** 1.092 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	515.943	232.933
3	600.000	228.907
4	640.000	232.485
5	964.000	247.949
6	1152.000	262.019
7	1222.000	274.163
8	1280.000	289.600
9	1320.000	311.299
10	1356.000	329.978
11	1422.000	380.000

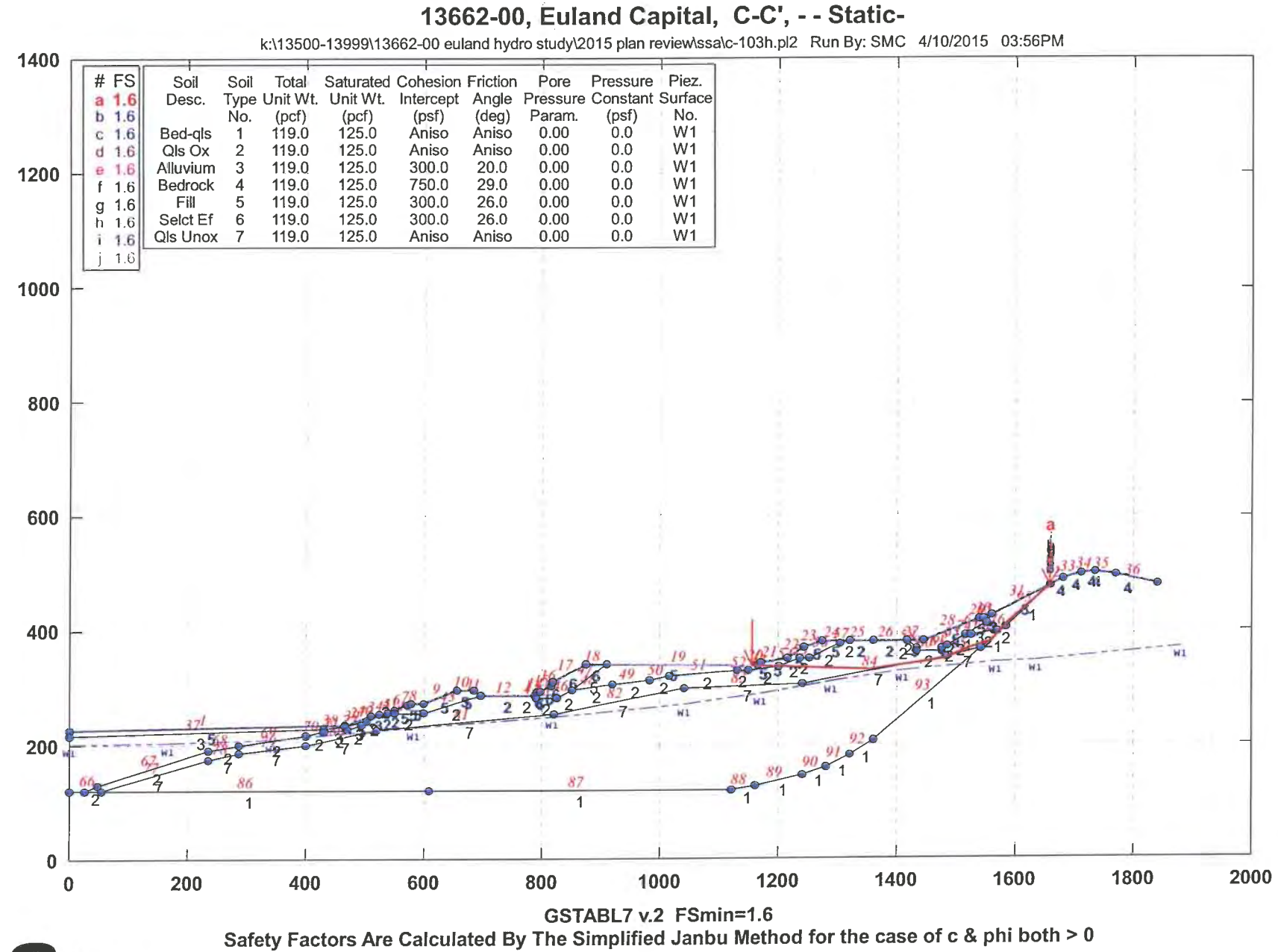
Factor of Safety
*** 1.093 ***
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	515.943	232.933
3	600.000	228.907
4	640.000	232.485
5	964.000	247.949
6	1152.000	262.019
7	1222.000	274.163
8	1280.000	289.600
9	1320.000	311.299
10	1356.000	329.978
11	1422.000	380.000

Factor of Safety
*** 1.093 ***
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	465.000	235.000
2	508.972	232.094
3	600.000	226.961
4	640.000	230.988
5	964.000	251.120
6	1152.000	257.827
7	1222.000	274.326
8	1280.000	289.588
9	1320.000	310.329
10	1356.000	331.020
11	1422.000	380.000

Factor of Safety
*** 1.094 ***
**** END OF GSTABL7 OUTPUT ****


13662-00, Euland Capital, C-C', - - Static-
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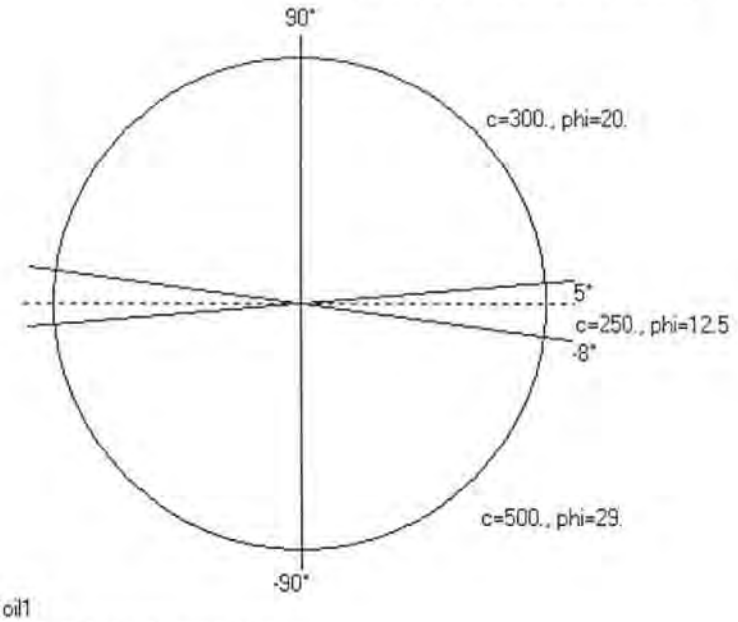
FS
a 1.6
b 1.6
c 1.6
d 1.6
e 1.6
f 1.6
g 1.6
h 1.6
i 1.6
j 1.6
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Selct Ef | 6 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls Unox | 7 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GSTABL7 v.2 FSmin=1.6
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-20.1

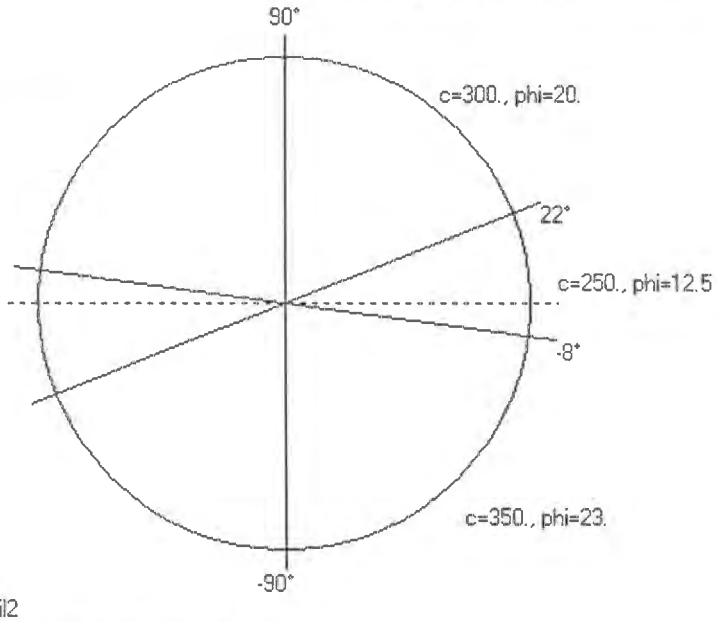
Anisotropic Soil Definition



Soil1

13662-00, Euland Capital, C-C',

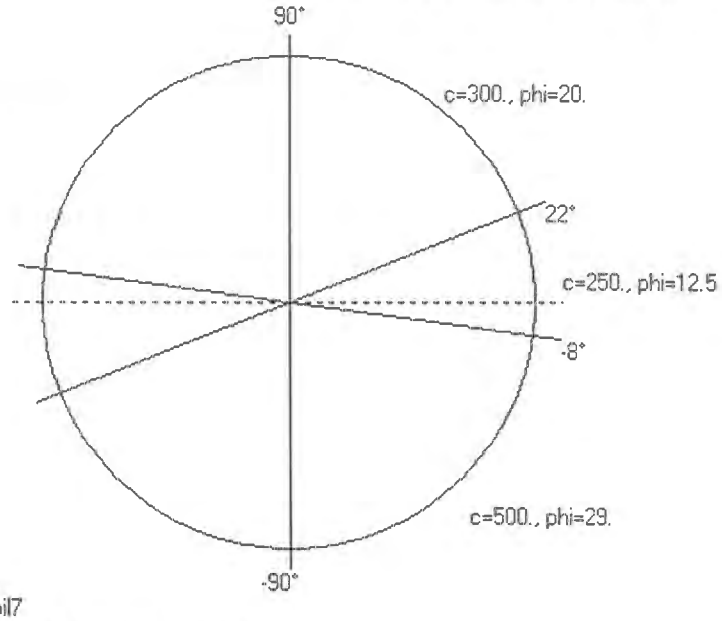
Anisotropic Soil Definition



Soil2

13662-00, Euland Capital, C-C',

Anisotropic Soil Definition



Soil7

13662-00, Euland Capital, C-C',

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 03:56PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103h.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103h.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103h.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	22.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	22.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	910.00	341.00	1165.00	338.00	0.00
2	1356.00	330.00	1356.00	330.00	5.00
3	1440.00	342.00	1440.00	342.00	5.00
4	1480.00	352.00	1480.00	352.00	5.00
5	1520.00	368.00	1520.00	368.00	5.00
6	1560.00	384.00	1560.00	384.00	5.00
7	1584.00	409.00	1584.00	409.00	5.00

8 1658.00 476.00 1658.00 476.00 0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 1.945 FS Min = 1.617 FS Ave = 1.782

Standard Deviation = 0.071 Coefficient of Variation = 3.96 %

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1155.833	338.108
2	1356.000	331.743
3	1440.000	344.258
4	1480.000	351.160
5	1520.000	367.167
6	1560.000	381.749
7	1584.000	408.123
8	1658.000	476.000

Factor of Safety

*** 1.617 ***

Individual data on the 37 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.2	100.2	0.0	0.0	0.	0.	0.0	0.0	0.0
2	5.0	1346.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	28.2	25564.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	1.8	2352.0	0.0	0.0	0.	0.	0.0	0.0	0.0
5	15.0	23267.6	0.0	0.0	0.	0.	0.0	0.0	0.0
6	22.0	58460.6	0.0	0.0	0.	0.	0.0	0.0	0.0
7	7.0	26898.7	0.0	0.0	0.	0.	0.0	0.0	0.0
8	8.0	34464.5	0.0	0.0	0.	0.	0.0	0.0	0.0
9	21.0	104116.6	0.0	0.0	0.	0.	0.0	0.0	0.0
10	32.0	175650.3	0.0	0.0	0.	0.	0.0	0.0	0.0
11	15.0	83669.9	0.0	0.0	0.	0.	0.0	0.0	0.0
12	36.0	204281.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	4.0	22828.6	0.0	0.0	0.	0.	0.0	0.0	0.0
14	58.0	299136.0	0.0	0.0	0.	0.	0.0	0.0	0.0
15	15.0	67655.7	0.0	0.0	0.	0.	0.0	0.0	0.0
16	1.0	4368.5	0.0	0.0	0.	0.	0.0	0.0	0.0
17	6.0	25838.9	0.0	0.0	0.	0.	0.0	0.0	0.0
18	5.0	21009.8	0.0	0.0	0.	0.	0.0	0.0	0.0
19	22.5	100460.2	0.0	0.0	0.	0.	0.0	0.0	0.0
20	7.5	36238.9	0.0	0.0	0.	0.	0.0	0.0	0.0
21	1.0	4976.2	0.0	0.0	0.	0.	0.0	0.0	0.0
22	4.0	20175.4	0.0	0.0	0.	0.	0.0	0.0	0.0
23	1.3	6407.9	0.0	0.0	0.	0.	0.0	0.0	0.0
24	3.7	19081.7	0.0	0.0	0.	0.	0.0	0.0	0.0
25	30.0	152926.2	0.0	0.0	0.	0.	0.0	0.0	0.0
26	5.0	25485.8	0.0	0.0	0.	0.	0.0	0.0	0.0
27	5.0	25538.3	0.0	0.0	0.	0.	0.0	0.0	0.0
28	15.0	77247.8	0.0	0.0	0.	0.	0.0	0.0	0.0
29	7.0	35207.7	0.0	0.0	0.	0.	0.0	0.0	0.0
30	3.0	14726.7	0.0	0.0	0.	0.	0.0	0.0	0.0
31	7.9	39434.7	0.0	0.0	0.	0.	0.0	0.0	0.0
32	2.1	10999.4	0.0	0.0	0.	0.	0.0	0.0	0.0
33	5.1	25281.1	0.0	0.0	0.	0.	0.0	0.0	0.0
34	4.9	22745.6	0.0	0.0	0.	0.	0.0	0.0	0.0
35	7.1	29982.2	0.0	0.0	0.	0.	0.0	0.0	0.0
36	6.9	25689.3	0.0	0.0	0.	0.	0.0	0.0	0.0
37	74.0	129301.0	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1155.833	338.108
2	1356.000	331.743

3	1440.000	344.258
4	1480.000	351.160
5	1520.000	367.167
6	1560.000	381.749
7	1584.000	408.123
8	1658.000	476.000

Factor of Safety
*** 1.617 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1155.833	338.108
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7	1584.000	408.123
8	1658.000	476.000

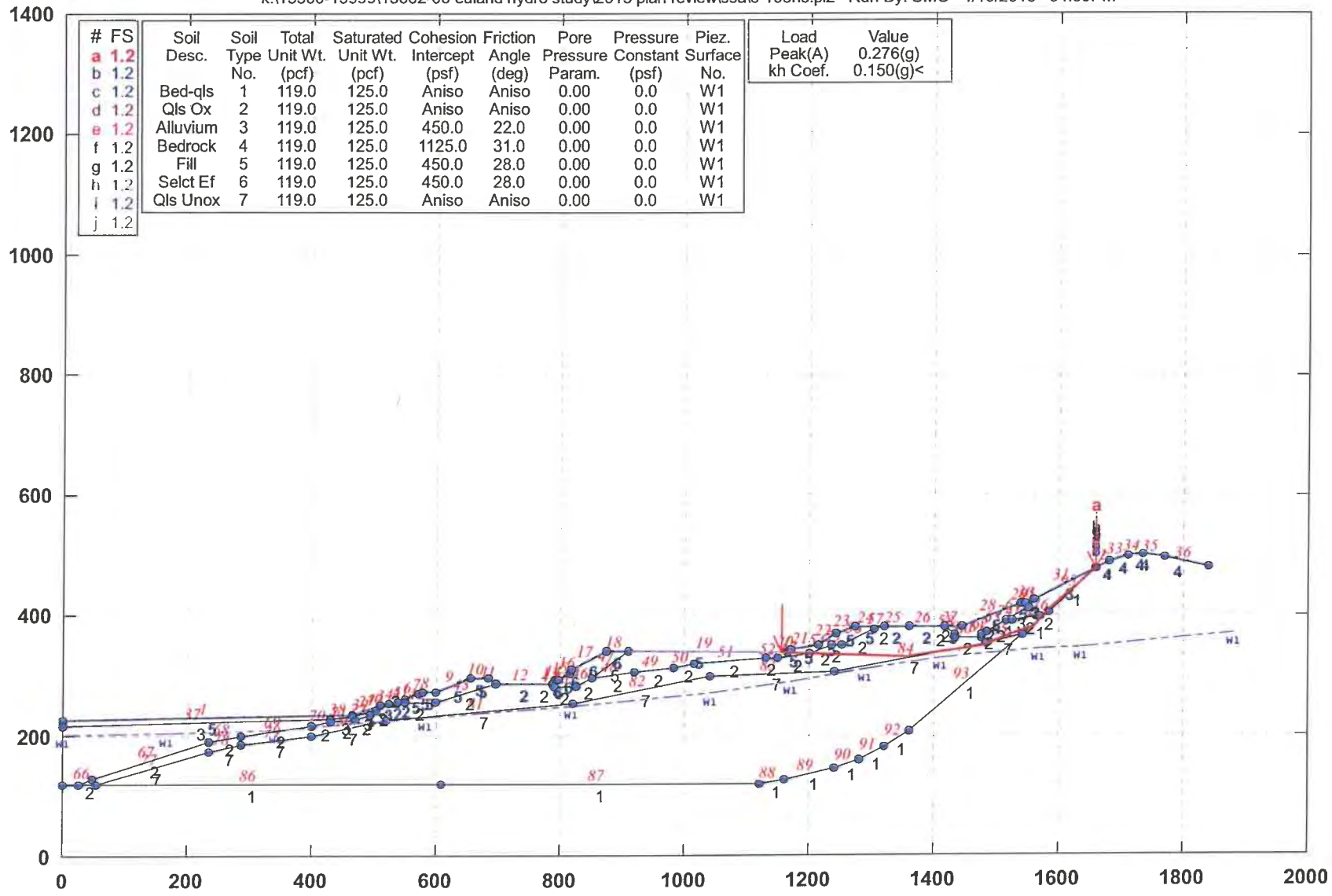
Factor of Safety

*** 1.617 ***

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

13662-00, Euland Capital, C-C', - - Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103hs.pl2 Run By: SMC 4/10/2015 04:09PM



#	FS
a	1.2
b	1.2
c	1.2
d	1.2
e	1.2
f	1.2
g	1.2
h	1.2
i	1.2
j	1.2

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Selct Ef	6	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.2

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-20.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/10/2015
Time of Run: 04:09PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103hs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103hs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103hs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	22.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	22.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	910.00	341.00	1165.00	338.00	0.00
2	1356.00	330.00	1356.00	330.00	5.00
3	1440.00	342.00	1440.00	342.00	5.00

4	1480.00	352.00	1480.00	352.00	5.00
5	1520.00	368.00	1520.00	368.00	5.00
6	1560.00	384.00	1560.00	384.00	5.00
7	1584.00	409.00	1584.00	409.00	5.00
8	1658.00	476.00	1658.00	476.00	0.00

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 = 5000

Number of Trial Surfaces With Valid FS = 5000

Statistical Data On All Valid FS Values:

FS Max = 1.396 FS Min = 1.162 FS Ave = 1.276

Standard Deviation = 0.054 Coefficient of Variation = 4.21 %

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1155.833	338.108
2	1356.000	331.743
3	1440.000	344.258
4	1480.000	351.160
5	1520.000	367.167
6	1560.000	381.749
7	1584.000	408.123
8	1658.000	476.000

Factor of Safety

*** 1.162 ***

Individual data on the 37 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.2	100.2	0.0	0.0	0.	0.	15.0	0.0	0.0
2	5.0	1346.6	0.0	0.0	0.	0.	202.0	0.0	0.0
3	28.2	25564.0	0.0	0.0	0.	0.	3834.6	0.0	0.0
4	1.8	2352.0	0.0	0.0	0.	0.	352.8	0.0	0.0
5	15.0	23267.6	0.0	0.0	0.	0.	3490.1	0.0	0.0
6	22.0	58460.6	0.0	0.0	0.	0.	8769.1	0.0	0.0
7	7.0	26898.7	0.0	0.0	0.	0.	4034.8	0.0	0.0
8	8.0	34464.5	0.0	0.0	0.	0.	5169.7	0.0	0.0
9	21.0	104116.6	0.0	0.0	0.	0.	15617.5	0.0	0.0
10	32.0	175650.3	0.0	0.0	0.	0.	26347.5	0.0	0.0
11	15.0	83669.9	0.0	0.0	0.	0.	12550.5	0.0	0.0
12	36.0	204281.6	0.0	0.0	0.	0.	30642.2	0.0	0.0
13	4.0	22828.6	0.0	0.0	0.	0.	3424.3	0.0	0.0
14	58.0	299136.0	0.0	0.0	0.	0.	44870.4	0.0	0.0
15	15.0	67655.7	0.0	0.0	0.	0.	10148.4	0.0	0.0
16	1.0	4368.5	0.0	0.0	0.	0.	655.3	0.0	0.0
17	6.0	25838.9	0.0	0.0	0.	0.	3875.8	0.0	0.0
18	5.0	21009.8	0.0	0.0	0.	0.	3151.5	0.0	0.0
19	22.5	100460.2	0.0	0.0	0.	0.	15069.0	0.0	0.0
20	7.5	36238.9	0.0	0.0	0.	0.	5435.8	0.0	0.0
21	1.0	4976.2	0.0	0.0	0.	0.	746.4	0.0	0.0
22	4.0	20175.4	0.0	0.0	0.	0.	3026.3	0.0	0.0
23	1.3	6407.9	0.0	0.0	0.	0.	961.2	0.0	0.0
24	3.7	19081.7	0.0	0.0	0.	0.	2862.3	0.0	0.0
25	30.0	152926.2	0.0	0.0	0.	0.	22938.9	0.0	0.0
26	5.0	25485.8	0.0	0.0	0.	0.	3822.9	0.0	0.0
27	5.0	25538.3	0.0	0.0	0.	0.	3830.7	0.0	0.0
28	15.0	77247.8	0.0	0.0	0.	0.	11587.2	0.0	0.0
29	7.0	35207.7	0.0	0.0	0.	0.	5281.2	0.0	0.0
30	3.0	14726.7	0.0	0.0	0.	0.	2209.0	0.0	0.0
31	7.9	39434.7	0.0	0.0	0.	0.	5915.2	0.0	0.0
32	2.1	10999.4	0.0	0.0	0.	0.	1649.9	0.0	0.0
33	5.1	25281.1	0.0	0.0	0.	0.	3792.2	0.0	0.0
34	4.9	22745.6	0.0	0.0	0.	0.	3411.8	0.0	0.0
35	7.1	29982.2	0.0	0.0	0.	0.	4497.3	0.0	0.0
36	6.9	25689.3	0.0	0.0	0.	0.	3853.4	0.0	0.0
37	74.0	129301.0	0.0	0.0	0.	0.	19395.2	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1155.833	338.108
2	1356.000	331.743
3	1440.000	344.258
4	1480.000	351.160
5	1520.000	367.167
6	1560.000	381.749
7	1584.000	408.123
8	1658.000	476.000

Factor of Safety
*** 1.162 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1155.833	338.108
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*** 1.162 ***

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Factor of Safety
*** 1.162 ***

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Point No.	X-Surf (ft)	Y-Surf (ft)
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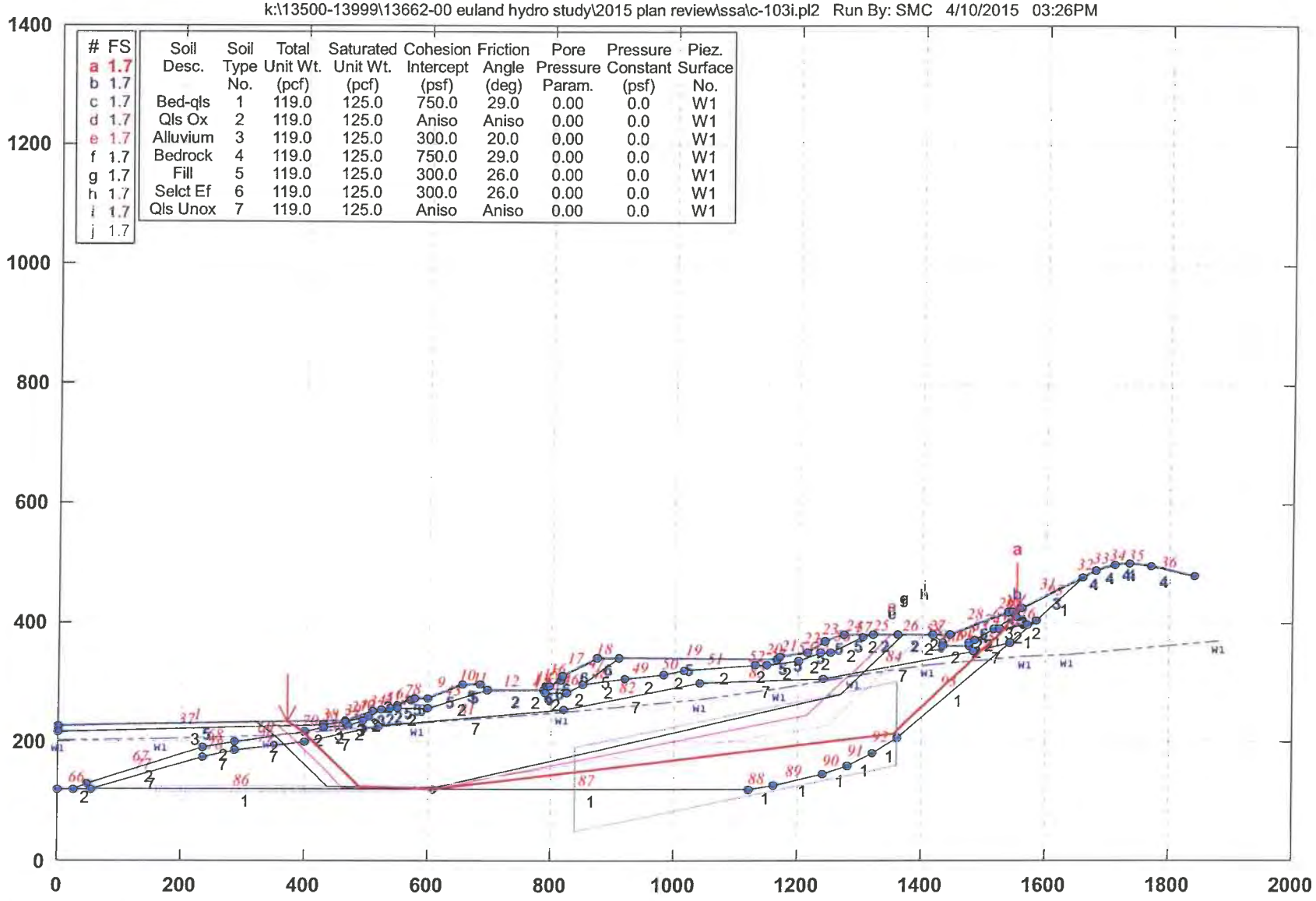
6	1560.000	381.749
7	1584.000	408.123
8	1658.000	476.000

Factor of Safety
*** 1.162 ***

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

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103i.pl2 Run By: SMC 4/10/2015 03:26PM



#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	750.0	29.0	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Selct Ef	6	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-21.1

13662-00, Euland Capital, C-C', - - Static-

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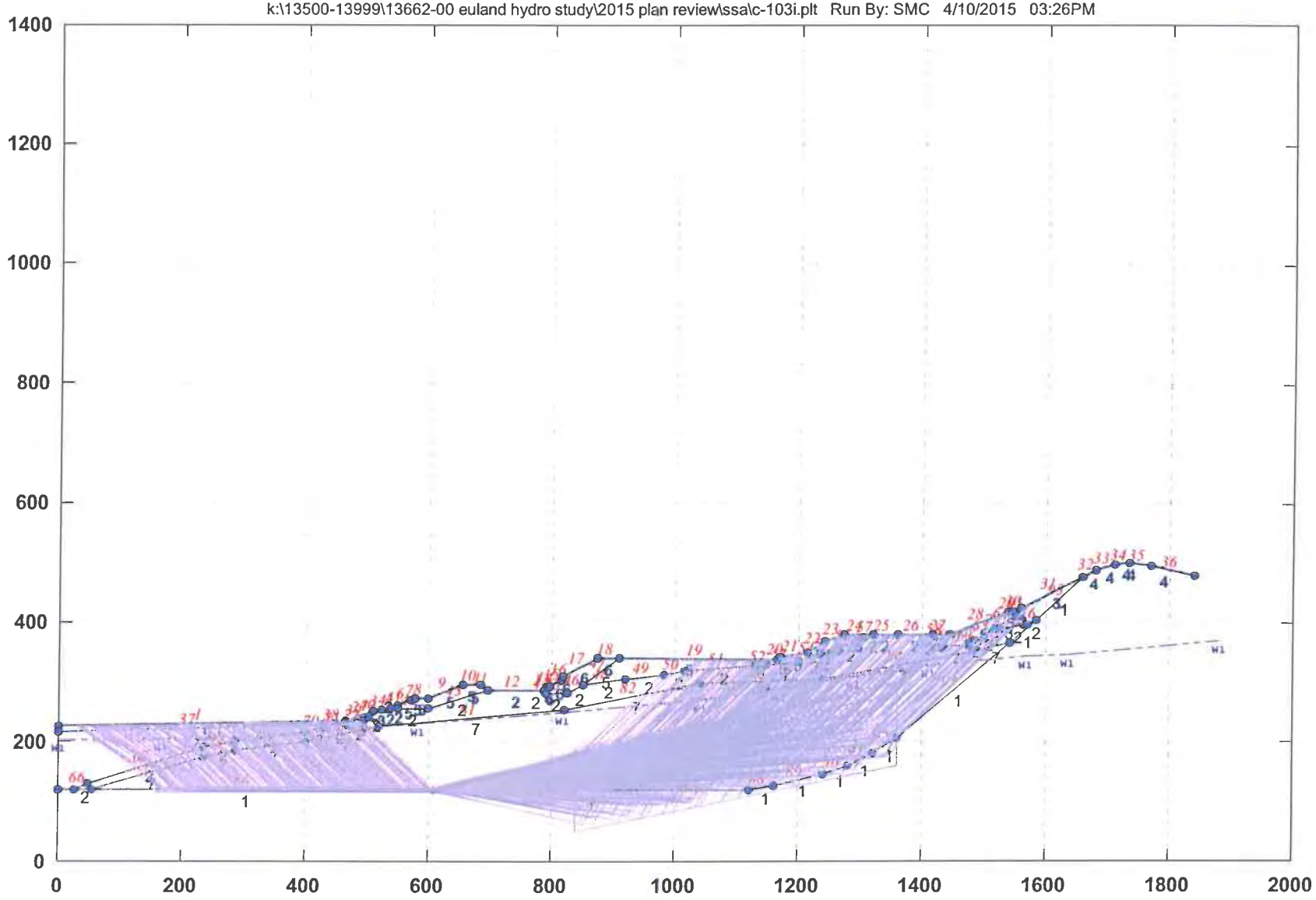

SMC

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 03:26PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103i.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103i.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103i.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
2 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	608.00	120.00	10.00
2	609.00	120.00	609.00	120.00	10.00
3	840.00	120.00	1360.00	230.00	140.00

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 = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 3.977 FS Min = 1.686 FS Ave = 2.150
Standard Deviation = 0.491 Coefficient of Variation = 22.83 %
Failure Surface Specified By 18 Coordinate Points

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

1	370.889	232.976
2	382.231	225.889
3	396.963	215.574
4	410.375	202.161
5	431.857	180.679
6	460.142	152.395
7	488.426	124.111
8	609.000	120.141
9	1356.794	214.548
10	1385.079	242.832
11	1413.363	271.116
12	1441.647	299.401
13	1469.932	327.685
14	1498.081	355.834
15	1526.365	384.118
16	1533.582	391.335
17	1546.520	409.813
18	1553.987	421.762

Factor of Safety
*** 1.686 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	370.889	232.976
2	382.231	225.889
3	396.963	215.574
4	410.375	202.161
5	431.857	180.679
6	460.142	152.395
7	488.426	124.111
8	609.000	120.141
9	1356.794	214.548
10	1385.079	242.832
11	1413.363	271.116
12	1441.647	299.401
13	1469.932	327.685
14	1498.081	355.834
15	1526.365	384.118
16	1533.582	391.335
17	1546.520	409.813
18	1553.987	421.762

Factor of Safety
*** 1.686 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.608	232.368
2	354.026	225.233
3	372.687	212.167
4	386.615	198.239
5	404.951	179.903
6	433.235	151.619
7	461.520	123.334
8	609.000	120.497
9	1215.876	244.963
10	1244.161	273.247
11	1272.445	301.531
12	1284.526	313.612
13	1312.810	341.896
14	1341.094	370.181
15	1350.914	380.000

Factor of Safety
*** 1.688 ***

Failure Surface Specified By 15 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	342.608	232.368
2	354.026	225.233
3	372.687	212.167
4	386.615	198.239
5	404.951	179.903
6	433.235	151.619
7	461.520	123.334
8	609.000	120.497
9	1215.876	244.963
10	1244.161	273.247
11	1272.445	301.531
12	1284.526	313.612
13	1312.810	341.896
14	1341.094	370.181
15	1350.914	380.000

Factor of Safety
*** 1.688 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.608	232.368
2	354.026	225.233
3	372.687	212.167
4	386.615	198.239
5	404.951	179.903
6	433.235	151.619
7	461.520	123.334
8	609.000	120.497
9	1215.876	244.963
10	1244.161	273.247
11	1272.445	301.531
12	1284.526	313.612
13	1312.810	341.896
14	1341.094	370.181
15	1350.914	380.000

Factor of Safety
*** 1.688 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	319.770	231.877
2	331.249	224.703
3	353.083	209.415
4	366.859	195.639
5	381.326	181.172
6	409.610	152.888
7	437.895	124.604
8	609.000	121.298
9	1269.705	278.498
10	1297.989	306.782
11	1309.685	318.478
12	1337.969	346.762
13	1366.253	375.047
14	1371.207	380.000

Factor of Safety
*** 1.689 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	319.770	231.877
2	331.249	224.703
3	353.083	209.415
4	366.859	195.639
5	381.326	181.172
6	409.610	152.888
7	437.895	124.604
8	609.000	121.298
9	1269.705	278.498
10	1297.989	306.782

11	1309.685	318.478
12	1337.969	346.762
13	1366.253	375.047
14	1371.207	380.000

Factor of Safety
*** 1.689 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	369.298	232.942
2	380.644	225.852
3	395.597	215.382
4	409.086	201.893
5	432.951	178.028
6	461.235	149.744
7	489.520	121.459
8	609.000	123.622
9	1248.376	225.588
10	1276.661	253.872
11	1304.945	282.156
12	1333.229	310.441
13	1348.840	326.051
14	1377.125	354.336
15	1402.789	380.000

Factor of Safety
*** 1.695 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	369.298	232.942
2	380.644	225.852
3	395.597	215.382
4	409.086	201.893
5	432.951	178.028
6	461.235	149.744
7	489.520	121.459
8	609.000	123.622
9	1248.376	225.588
10	1276.661	253.872
11	1304.945	282.156
12	1333.229	310.441
13	1348.840	326.051
14	1377.125	354.336
15	1402.789	380.000

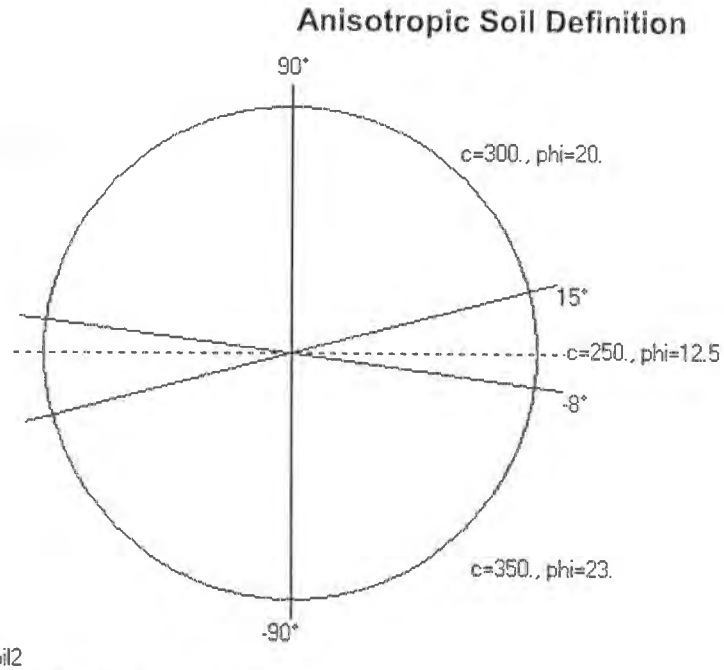
Factor of Safety
*** 1.695 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	369.298	232.942
2	380.644	225.852
3	395.597	215.382
4	409.086	201.893
5	432.951	178.028
6	461.235	149.744
7	489.520	121.459
8	609.000	123.622
9	1248.376	225.588
10	1276.661	253.872
11	1304.945	282.156
12	1333.229	310.441
13	1348.840	326.051
14	1377.125	354.336
15	1402.789	380.000

Factor of Safety
*** 1.695 ***

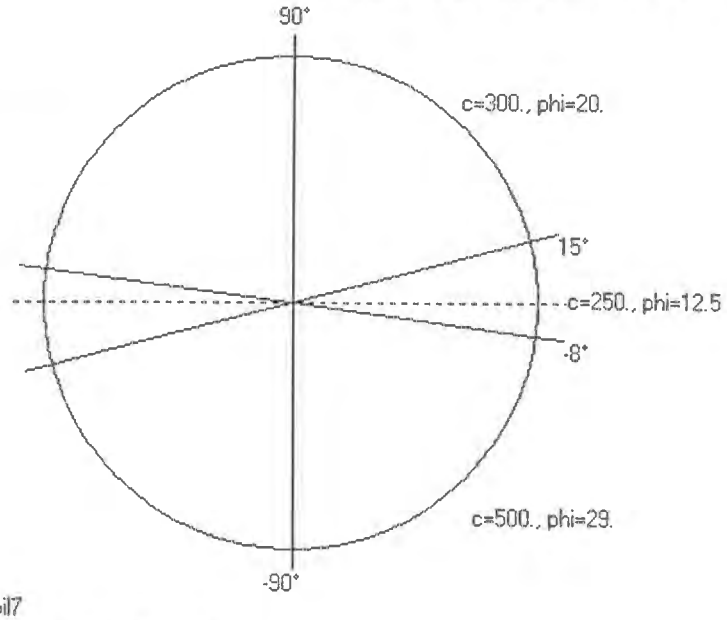
**** END OF GSTABL7 OUTPUT ****



Soil2

13662-00, Euland Capital, C-C',

Anisotropic Soil Definition

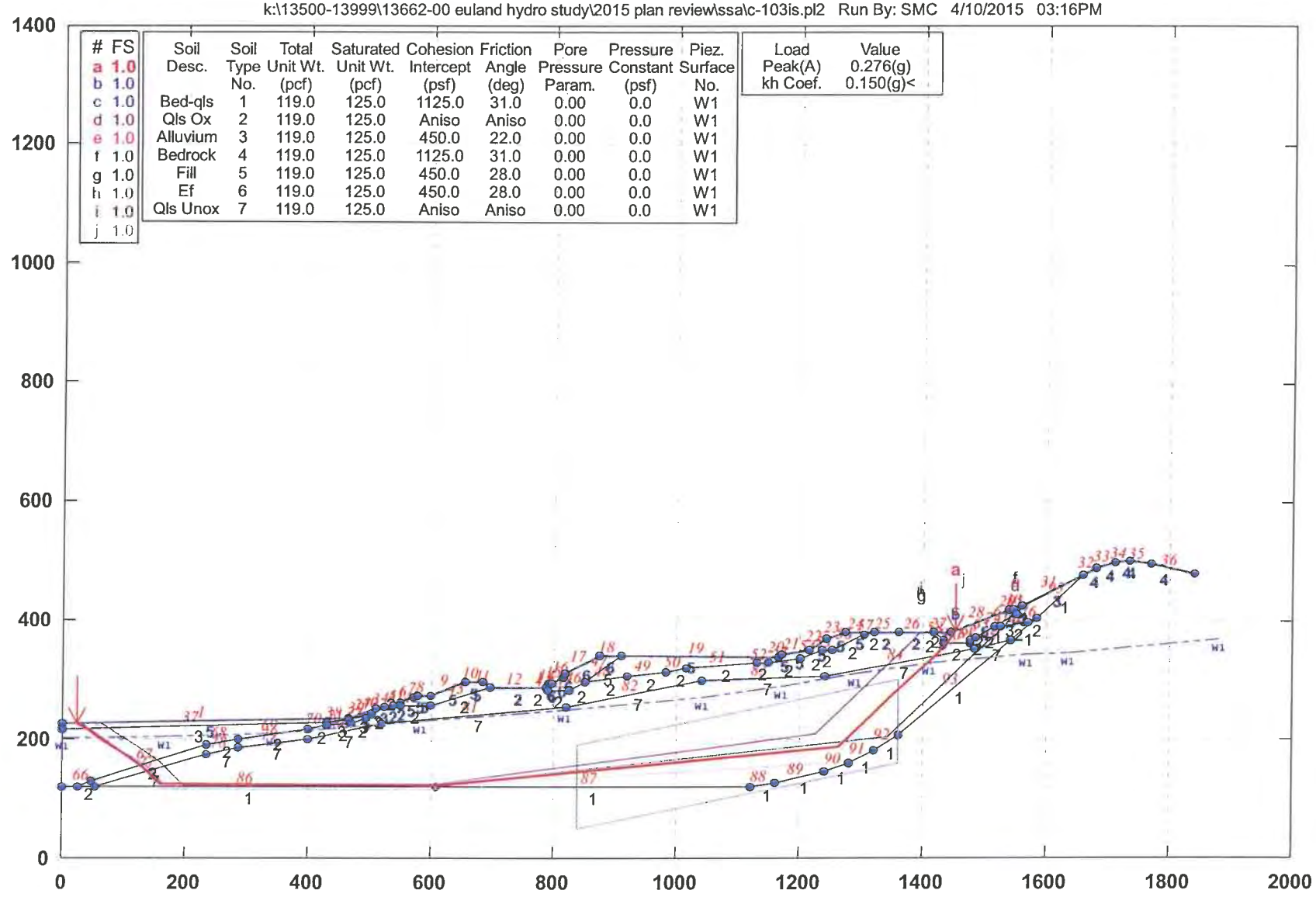


Soil7

13662-00, Euland Capital, C-C',

13662-00, Euland Capital, C-C', - - Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103is.pl2 Run By: SMC 4/10/2015 03:16PM



#	FS
a	1.0
b	1.0
c	1.0
d	1.0
e	1.0
f	1.0
g	1.0
h	1.0
i	1.0
j	1.0

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Ef	6	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.0

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-21.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 03:16PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103is.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103is.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103is.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
2 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	608.00	120.00	10.00
2	609.00	120.00	609.00	120.00	10.00
3	840.00	120.00	1360.00	230.00	140.00

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 = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.144 FS Min = 0.984 FS Ave = 1.280

Standard Deviation = 0.241 Coefficient of Variation = 18.82 %

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.452	225.526
2	37.202	217.865
3	62.494	200.805
4	95.656	178.438
5	128.817	156.070
6	139.059	145.828
7	160.957	123.930
8	609.000	121.796
9	1265.134	187.160
10	1293.419	215.444
11	1321.703	243.729
12	1349.987	272.013
13	1378.271	300.297
14	1406.556	328.581
15	1417.259	339.285
16	1438.974	361.000
17	1452.096	382.839

Factor of Safety

*** 0.984 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.452	225.526
2	37.202	217.865
3	62.494	200.805
4	95.656	178.438
5	128.817	156.070
6	139.059	145.828
7	160.957	123.930
8	609.000	121.796
9	1265.134	187.160
10	1293.419	215.444
11	1321.703	243.729
12	1349.987	272.013
13	1378.271	300.297
14	1406.556	328.581
15	1417.259	339.285
16	1438.974	361.000
17	1452.096	382.839

Factor of Safety

*** 0.984 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.452	225.526
2	37.202	217.865
3	62.494	200.805
4	95.656	178.438
5	128.817	156.070
6	139.059	145.828
7	160.957	123.930
8	609.000	121.796
9	1265.134	187.160
10	1293.419	215.444
11	1321.703	243.729
12	1349.987	272.013
13	1378.271	300.297
14	1406.556	328.581
15	1417.259	339.285
16	1438.974	361.000
17	1452.096	382.839

Factor of Safety
*** 0.984 ***
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.756	226.350
2	75.399	218.753
3	89.224	209.428
4	122.386	187.060
5	155.547	164.693
6	166.102	154.138
7	169.642	150.598
8	197.926	122.314
9	609.000	121.469
10	1344.607	204.313
11	1372.891	232.598
12	1401.176	260.882
13	1429.460	289.166
14	1457.744	317.450
15	1486.028	345.735
16	1495.462	355.168
17	1523.746	383.453
18	1531.269	390.975
19	1542.102	407.035
20	1549.498	419.345

Factor of Safety
*** 0.997 ***
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.756	226.350
2	75.399	218.753
3	89.224	209.428
4	122.386	187.060
5	155.547	164.693
6	166.102	154.138
7	169.642	150.598
8	197.926	122.314
9	609.000	121.469
10	1344.607	204.313
11	1372.891	232.598
12	1401.176	260.882
13	1429.460	289.166
14	1457.744	317.450
15	1486.028	345.735
16	1495.462	355.168
17	1523.746	383.453
18	1531.269	390.975
19	1542.102	407.035
20	1549.498	419.345

Factor of Safety
*** 0.997 ***
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.756	226.350
2	75.399	218.753
3	89.224	209.428
4	122.386	187.060
5	155.547	164.693
6	166.102	154.138
7	169.642	150.598
8	197.926	122.314
9	609.000	121.469
10	1344.607	204.313
11	1372.891	232.598
12	1401.176	260.882
13	1429.460	289.166
14	1457.744	317.450
15	1486.028	345.735

16	1495.462	355.168
17	1523.746	383.453
18	1531.269	390.975
19	1542.102	407.035
20	1549.498	419.345

Factor of Safety
*** 0.997 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.366	225.653
2	43.099	218.002
3	66.621	202.137
4	99.782	179.769
5	132.944	157.401
6	143.234	147.111
7	165.551	124.794
8	609.000	124.418
9	1225.779	209.528
10	1254.063	237.812
11	1282.347	266.097
12	1310.632	294.381
13	1338.916	322.665
14	1340.734	324.484
15	1369.019	352.768
16	1396.251	380.000

Factor of Safety
*** 0.998 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.366	225.653
2	43.099	218.002
3	66.621	202.137
4	99.782	179.769
5	132.944	157.401
6	143.234	147.111
7	165.551	124.794
8	609.000	124.418
9	1225.779	209.528
10	1254.063	237.812
11	1282.347	266.097
12	1310.632	294.381
13	1338.916	322.665
14	1340.734	324.484
15	1369.019	352.768
16	1396.251	380.000

Factor of Safety
*** 0.998 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.366	225.653
2	43.099	218.002
3	66.621	202.137
4	99.782	179.769
5	132.944	157.401
6	143.234	147.111
7	165.551	124.794
8	609.000	124.418
9	1225.779	209.528
10	1254.063	237.812
11	1282.347	266.097
12	1310.632	294.381
13	1338.916	322.665
14	1340.734	324.484
15	1369.019	352.768
16	1396.251	380.000

Factor of Safety
*** 0.998 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	52.475	226.128
2	65.146	218.515
3	82.049	207.114
4	115.211	184.746
5	148.372	162.378
6	158.843	151.907
7	186.332	124.418
8	609.000	120.566
9	1245.837	159.289
10	1274.122	187.573
11	1302.406	215.857
12	1330.690	244.142
13	1358.975	272.426
14	1387.259	300.710
15	1415.543	328.995
16	1427.889	341.341
17	1447.549	361.000
18	1463.383	387.353

Factor of Safety

*** 1.000 ***

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

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/10/2015
Time of Run: 03:17PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103is Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103is Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103is Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3

40	502.00	243.00	510.00	252.00	3
41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1

```
   7   119.0    125.0       0.0       0.0    0.00       0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     2 soil type(s)
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise      Cohesion      Friction
   Range        Direction Limit     Intercept       Angle
    No.             (deg)             (psf)         (deg)
     1              -8.0              525.00         25.00
     2              15.0              375.00         14.50
     3              90.0              450.00         22.00
 Soil Type  7 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise      Cohesion      Friction
   Range        Direction Limit     Intercept       Angle
    No.             (deg)             (psf)         (deg)
     1              -8.0              750.00         31.00
     2              15.0              375.00         14.50
     3              90.0              450.00         22.00
 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 12 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water      Y-Water
    No.         (ft)         (ft)
     1          0.00       202.00
     2        168.00       205.00
     3        343.00       210.00
     4        583.00       230.00
     5        818.00       250.00
     6       1042.00       270.00
     7       1170.00       290.00
     8       1289.00       310.00
     9       1410.00       330.00
    10       1568.00       343.00
    11       1636.00       345.00
    12       1880.00       370.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.276(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 Janbu's Empirical Coef. is being used for the case of  c & phi both > 0
 Trial Failure Surface Specified By 17 Coordinate Points
   Point      X-Surf       Y-Surf
    No.         (ft)         (ft)
     1         24.452       225.526
     2         37.202       217.865
     3         62.494       200.805
     4         95.656       178.438
     5        128.817       156.070
     6        139.059       145.828
     7        160.957       123.930
     8        609.000       121.796
     9       1265.134       187.160
    10       1293.419       215.444
    11       1321.703       243.729
    12       1349.987       272.013
    13       1378.271       300.297
    14       1406.556       328.581
    15       1417.259       339.285
    16       1438.974       361.000
    17       1452.096       382.838
 Janbu's Empirical Coefficient (fo) =  1.050
```

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 0.984

Table 1 - Individual Data on the 79 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Load Ver (lbs)	Surcharge Load (lbs)
1	12.8	6019.7	0.0	0.0	0.0	0.0	903.0	0.0	0.0
2	22.0	40691.8	0.0	0.0	0.0	0.0	6103.8	0.0	0.0
3	3.3	9705.5	0.0	290.2	0.0	0.0	1455.8	0.0	0.0
4	33.2	149067.6	0.0	34415.7	0.0	0.0	22360.1	0.0	0.0
5	33.2	244710.6	0.0	91713.3	0.0	0.0	36706.6	0.0	0.0
6	10.2	97047.5	0.0	48295.2	0.0	0.0	14557.1	0.0	0.0
7	21.9	252418.6	0.0	*******	0.0	0.0	37862.8	0.0	0.0
8	7.0	91110.5	0.0	35603.4	0.0	0.0	13666.6	0.0	0.0
9	66.0	861790.6	0.0	*******	0.0	0.0	*******	0.0	0.0
10	52.0	689190.3	0.0	*******	0.0	0.0	*******	0.0	0.0
11	57.0	765790.4	0.0	*******	0.0	0.0	*******	0.0	0.0
12	35.1	476772.0	0.0	*******	0.0	0.0	71515.8	0.0	0.0
13	21.9	300264.5	0.0	*******	0.0	0.0	45039.7	0.0	0.0
14	30.0	413733.4	0.0	*******	0.0	0.0	62060.0	0.0	0.0
15	35.0	486843.9	0.0	*******	0.0	0.0	73026.6	0.0	0.0
16	5.0	70444.3	0.0	30441.4	0.0	0.0	10566.7	0.0	0.0
17	23.0	338871.8	0.0	*******	0.0	0.0	50830.8	0.0	0.0
18	9.0	139233.1	0.0	56273.7	0.0	0.0	20885.0	0.0	0.0
19	8.0	126894.1	0.0	50393.5	0.0	0.0	19034.1	0.0	0.0
20	8.0	128695.6	0.0	50744.2	0.0	0.0	19304.3	0.0	0.0
21	2.0	32276.4	0.0	12740.8	0.0	0.0	4841.5	0.0	0.0
22	3.0	48491.4	0.0	19152.3	0.0	0.0	7273.7	0.0	0.0
23	14.0	228281.6	0.0	90029.4	0.0	0.0	34242.2	0.0	0.0
24	13.0	217582.2	0.0	84560.2	0.0	0.0	32637.3	0.0	0.0
25	1.0	17072.0	0.0	6543.0	0.0	0.0	2560.8	0.0	0.0
26	19.0	335880.7	0.0	*******	0.0	0.0	50382.1	0.0	0.0
27	8.0	147015.5	0.0	53373.8	0.0	0.0	22052.3	0.0	0.0
28	5.0	92582.9	0.0	33536.6	0.0	0.0	13887.4	0.0	0.0
29	17.0	315997.7	0.0	*******	0.0	0.0	47399.7	0.0	0.0
30	9.0	169729.2	0.0	61561.5	0.0	0.0	25459.4	0.0	0.0
31	47.0	934930.8	0.0	*******	0.0	0.0	*******	0.0	0.0
32	29.0	595572.8	0.0	*******	0.0	0.0	89335.9	0.0	0.0
33	11.0	218043.8	0.0	75078.4	0.0	0.0	32706.6	0.0	0.0
34	92.0	1723267.8	0.0	*******	0.0	0.0	*******	0.0	0.0
35	1.0	18280.0	0.0	6736.4	0.0	0.0	2742.0	0.0	0.0
36	3.0	56017.9	0.0	20203.9	0.0	0.0	8402.7	0.0	0.0
37	5.0	94686.2	0.0	33655.0	0.0	0.0	14202.9	0.0	0.0
38	18.0	348037.4	0.0	*******	0.0	0.0	52205.6	0.0	0.0
39	2.0	40455.0	0.0	13423.0	0.0	0.0	6068.2	0.0	0.0
40	1.0	20716.4	0.0	6710.1	0.0	0.0	3107.5	0.0	0.0
41	2.0	41581.1	0.0	13413.2	0.0	0.0	6237.2	0.0	0.0
42	5.0	104821.5	0.0	33521.8	0.0	0.0	15723.2	0.0	0.0
43	25.0	542720.5	0.0	*******	0.0	0.0	81408.1	0.0	0.0
44	25.0	573742.6	0.0	*******	0.0	0.0	86061.4	0.0	0.0
45	35.0	817656.0	0.0	*******	0.0	0.0	*******	0.0	0.0
46	10.0	230864.8	0.0	66446.5	0.0	0.0	34629.7	0.0	0.0
47	63.0	1423827.0	0.0	*******	0.0	0.0	*******	0.0	0.0
48	32.0	702972.5	0.0	*******	0.0	0.0	*******	0.0	0.0
49	25.0	539709.2	0.0	*******	0.0	0.0	80956.4	0.0	0.0
50	2.0	42817.2	0.0	13126.6	0.0	0.0	6422.6	0.0	0.0
51	89.0	1852567.2	0.0	*******	0.0	0.0	*******	0.0	0.0
52	17.0	342221.1	0.0	*******	0.0	0.0	51333.2	0.0	0.0
53	17.0	338487.6	0.0	*******	0.0	0.0	50773.1	0.0	0.0
54	5.0	100052.1	0.0	34752.9	0.0	0.0	15007.8	0.0	0.0
55	30.0	612109.6	0.0	*******	0.0	0.0	91816.4	0.0	0.0
56	15.0	310223.0	0.0	*******	0.0	0.0	46533.5	0.0	0.0
57	22.0	473128.4	0.0	*******	0.0	0.0	70969.3	0.0	0.0
58	3.0	67011.8	0.0	21709.6	0.0	0.0	10051.8	0.0	0.0
59	4.0	90280.4	0.0	29005.4	0.0	0.0	13542.1	0.0	0.0
60	8.0	182571.7	0.0	58213.9	0.0	0.0	27385.8	0.0	0.0
61	13.1	303843.8	0.0	96160.5	0.0	0.0	45576.6	0.0	0.0
62	7.9	180936.0	0.0	79110.4	0.0	0.0	27140.4	0.0	0.0
63	16.0	346960.9	0.0	*******	0.0	0.0	52044.1	0.0	0.0

64	4.4	90237.9	0.0	37373.6	0.0	0.0	13535.7	0.0	0.0
65	11.6	225001.1	0.0	91213.8	0.0	0.0	33750.2	0.0	0.0
66	15.0	266719.0	0.0	*******	0.0	0.0	40007.9	0.0	0.0
67	1.7	28518.7	0.0	10734.2	0.0	0.0	4277.8	0.0	0.0
68	28.3	421085.8	0.0	*******	0.0	0.0	63162.9	0.0	0.0
69	10.0	125308.6	0.0	38265.2	0.0	0.0	18796.3	0.0	0.0
70	18.3	196625.9	0.0	51042.7	0.0	0.0	29493.9	0.0	0.0
71	28.3	222793.0	0.0	31165.1	0.0	0.0	33418.9	0.0	0.0
72	1.0	6169.6	0.0	37.7	0.0	0.0	925.4	0.0	0.0
73	9.7	52506.6	0.0	0.0	0.0	0.0	7876.0	0.0	0.0
74	0.7	3557.4	0.0	0.0	0.0	0.0	533.6	0.0	0.0
75	15.0	57966.1	0.0	0.0	0.0	0.0	8694.9	0.0	0.0
76	1.0	2912.4	0.0	0.0	0.0	0.0	436.9	0.0	0.0
77	5.0	12718.2	0.0	0.0	0.0	0.0	1907.7	0.0	0.0
78	6.0	10028.9	0.0	0.0	0.0	0.0	1504.3	0.0	0.0
79	7.1	3787.7	0.0	0.0	0.0	0.0	568.2	0.0	0.0

Table 2 - Base Stress Data on the 79 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-31.00	30.83	14.87	1210.91	-182.46
2	-34.00	48.18	26.48	1999.82	-805.98
3	-34.00	60.83	4.03	2661.84	-1264.46
4	-34.00	79.07	40.00	3200.18	-1954.56
5	-34.00	112.24	40.00	4178.86	-3208.95
6	-45.00	133.94	14.48	9107.02	-5695.13
7	-45.00	150.01	30.97	18369.80	-6928.21
8	-0.27	164.48	7.04	2416.28	1878.81
9	-0.27	201.00	66.00	2428.91	1896.40
10	-0.27	260.00	52.00	2447.96	1924.90
11	-0.27	314.50	57.00	2465.55	1951.23
12	-0.27	360.54	35.08	2470.32	1974.07
13	-0.27	389.04	21.92	2456.85	1989.19
14	-0.27	415.00	30.00	2444.57	2002.96
15	-0.27	447.50	35.00	2429.21	2020.20
16	-0.27	467.50	5.00	2447.20	2046.20
17	-0.27	481.50	23.00	2594.28	2139.83
18	-0.27	497.50	9.00	2762.37	2246.84
19	-0.27	506.00	8.00	2851.67	2303.69
20	-0.27	514.00	8.00	2898.63	2336.39
21	-0.27	519.00	2.00	2904.80	2343.84
22	-0.27	521.50	3.00	2907.89	2347.56
23	-0.27	530.00	14.00	2932.61	2368.18
24	-0.27	543.50	13.00	3025.13	2430.82
25	-0.27	550.50	1.00	3101.93	2479.46
26	-0.27	560.50	19.00	3244.64	2567.46
27	-0.27	574.00	8.00	3406.50	2668.98
28	-0.27	580.50	5.00	3433.43	2689.26
29	-0.27	591.50	17.00	3436.37	2699.65
30	-0.27	604.50	9.00	3487.65	2738.97
31	5.69	632.50	47.23	3671.91	4941.02
32	5.69	670.50	29.14	3843.92	5101.19
33	5.69	690.50	11.05	3667.45	4923.63
34	5.69	742.00	92.46	3402.90	4652.64
35	5.69	788.50	1.00	3299.27	4540.58
36	5.69	790.50	3.01	3399.16	4638.10
37	5.69	794.50	5.02	3467.09	4703.83
38	5.69	806.00	18.09	3570.56	4802.73
39	5.69	816.00	2.01	3798.79	5024.32
40	5.69	817.50	1.00	3922.94	5145.75
41	5.69	819.00	2.01	3942.62	5164.18
42	5.69	822.50	5.02	3987.19	5207.33
43	5.69	837.50	25.12	4178.20	5392.26
44	5.69	862.50	25.12	4496.54	5700.49
45	5.69	892.50	35.17	4605.74	5802.80
46	5.69	915.00	10.05	4539.72	5734.46
47	5.69	951.50	63.31	4422.56	5613.73
48	5.69	999.00	32.16	4270.08	5456.61
49	5.69	1027.50	25.12	4178.60	5362.35
50	5.69	1041.00	2.01	4135.27	5317.69

51	5.69	1086.50	89.44	3959.05	5170.34
52	5.69	1139.50	17.08	3738.76	5000.26
53	5.69	1156.50	17.08	3668.11	4945.71
54	5.69	1167.50	5.02	3683.55	4970.40
55	5.69	1185.00	30.15	3768.16	5068.07
56	5.69	1207.50	15.07	3814.53	5137.10
57	5.69	1226.00	22.11	4003.57	5341.84
58	5.69	1238.50	3.01	4200.81	5548.37
59	5.69	1242.00	4.02	4256.04	5606.19
60	5.69	1248.00	8.04	4313.30	5668.63
61	5.69	1258.57	13.20	4381.20	5746.28
62	45.00	1269.07	11.12	6888.27	18704.65
63	45.00	1281.00	22.63	6602.12	17633.46
64	45.00	1291.21	6.25	6300.54	16604.87
65	45.00	1299.21	16.38	6065.52	15799.02
66	45.00	1312.50	21.21	5674.91	14459.45
67	45.00	1320.85	2.41	5429.46	13617.68
68	45.00	1335.84	40.00	4988.79	12106.37
69	45.00	1354.99	14.16	4426.04	10176.47
70	45.00	1369.14	25.84	4010.42	8751.14
71	45.00	1392.41	40.00	3326.30	6405.00
72	45.00	1407.06	1.44	2895.81	4928.66
73	45.00	1412.42	13.70	2647.39	4408.69
74	45.00	1417.63	1.05	2396.02	3904.04
75	45.00	1425.50	21.21	2016.62	3142.43
76	45.00	1433.50	1.41	1630.97	2368.29
77	45.00	1436.49	7.03	1486.98	2079.24
78	59.00	1441.99	11.70	1364.79	1555.13
79	59.00	1448.55	13.78	750.24	498.78

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 6036878.00 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 3895.79(psf)
Sum of the Driving Forces = 6442177.00 (lbs)
Average Mobilized Shear Stress = 4157.35(psf)
Total length of the failure surface = 1549.59(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1447(g)
Calculated Newmark Seismic Displacement = 0.098(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: C-C'

File: c-103is

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1447
T_m (s)	0.517
T_s (s)	0.30
M	6.95
T_s/T_m	0.586804

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.231	0.180	0.297
k-velmax (cm/s)	25.73	20.03	33.03

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.91	0.896	2.49	1.02	6.10
[kmax, k-velmax]	0.10	0.578	1.10	0.62	1.97
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.91	0.896	0.98	0.40	2.40
[kmax, k-velmax]	0.10	0.578	0.43	0.24	0.77

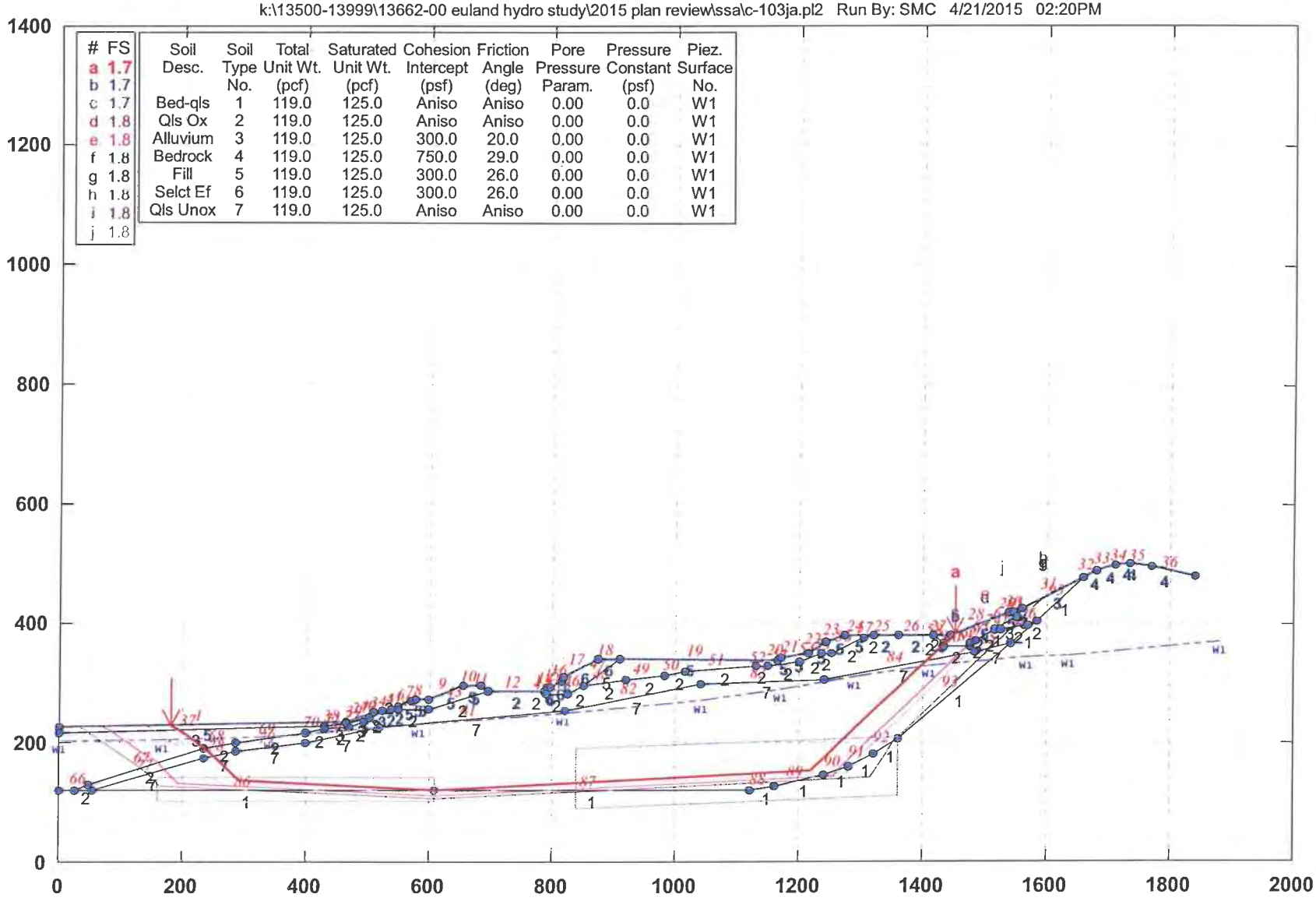
PGA Peak Ground Acceleration (g)
PGV Peak Ground Velocity (cm/s)
k_y Critical or Yield Acceleration (g)
T_m Mean Period of an Earthquake Motion (s)
T_s Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M Earthquake Magnitude
kmax maximum seismic coefficient (g)
k-velmax the maximum velocity of the seismic coefficient-time history (cm/s)
D Predicted Sliding Displacment (cm)

H_{avr} = 160 ft
V_s = 2110 ft/s
$T_s = 4\ H_{avr}/V_s$ = 0.30 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103ja.pl2 Run By: SMC 4/21/2015 02:20PM



#	FS
a	1.7
b	1.7
c	1.7
d	1.8
e	1.8
f	1.8
g	1.8
h	1.8
i	1.8
j	1.8

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Selct Ef	6	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

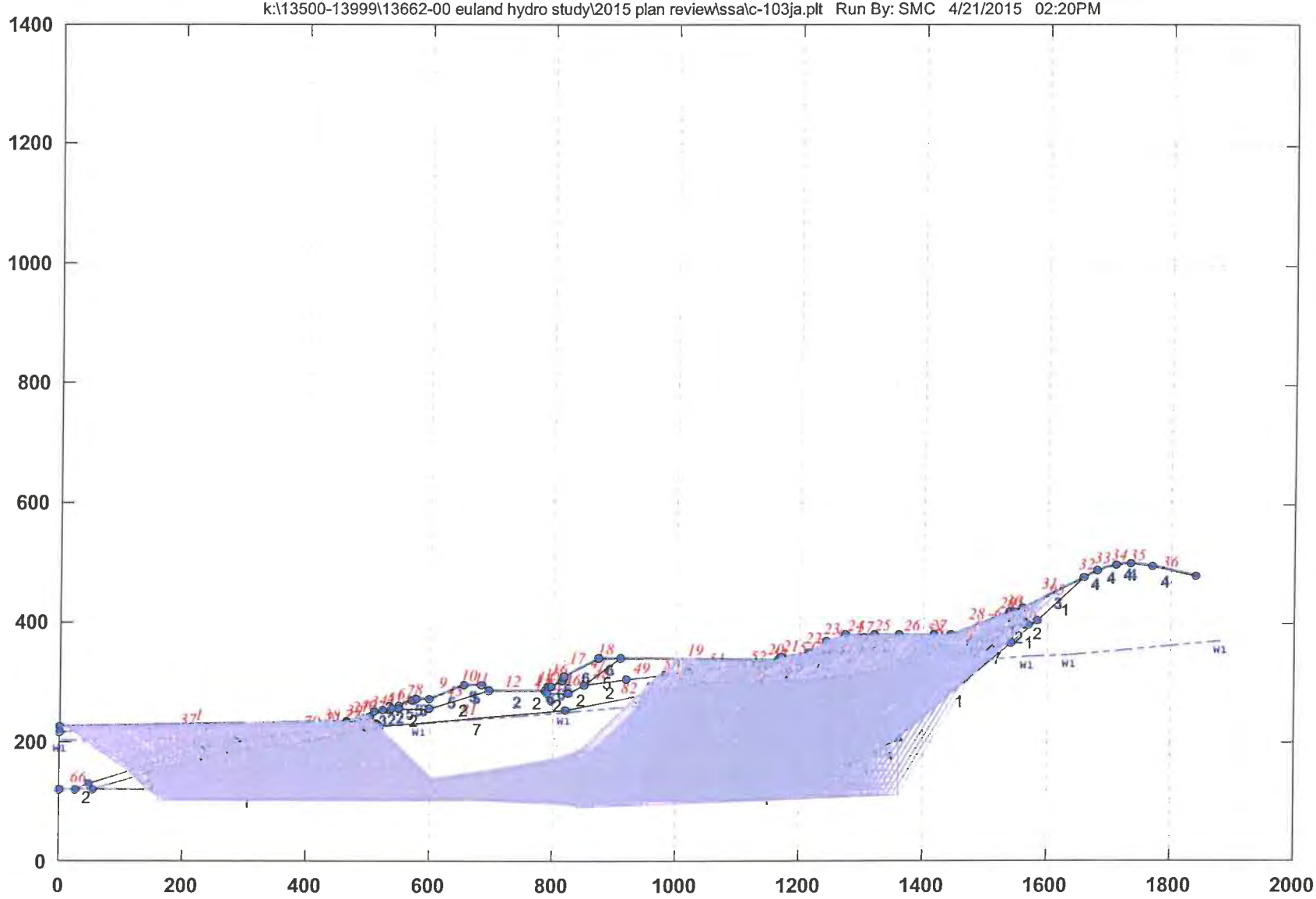
GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-22.1

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103ja.plt Run By: SMC 4/21/2015 02:20PM



*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/21/2015
Time of Run: 02:20PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103ja.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103ja.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103ja.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES

36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	300.0	26.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	608.00	120.00	40.00
2	609.00	120.00	609.00	120.00	40.00
3	840.00	140.00	1360.00	160.00	100.00

WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 23 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	489.31	244.19
2	494.69	240.83
3	498.39	238.23
4	513.07	223.56
5	519.51	217.12
6	547.79	188.83
7	576.08	160.55
8	604.36	132.26
9	609.00	116.70
10	1304.49	119.68
11	1324.79	154.14
12	1345.09	188.61
13	1352.45	201.09
14	1380.73	229.37
15	1409.02	257.66
16	1437.30	285.94
17	1465.58	314.23
18	1493.87	342.51
19	1510.30	358.94
20	1538.58	387.22
21	1544.37	393.01
22	1567.31	425.78
23	1570.65	430.54

Factor of Safety for the Preceding Surface is Between 2.419 and 2.438
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	493.88	245.91
2	499.66	242.30
3	502.20	240.52
4	518.12	224.61
5	519.73	222.99
6	548.01	194.71
7	576.30	166.43
8	604.58	138.14
9	609.00	111.48
10	1178.81	139.69
11	1207.09	167.98
12	1235.37	196.26
13	1263.66	224.55
14	1291.94	252.83
15	1320.23	281.12
16	1348.51	309.40
17	1369.08	329.97
18	1397.36	358.25
19	1418.57	379.46
20	1418.91	380.00

Factor Of Safety For The Preceding Specified Surface = 1.659
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	493.34	245.70
2	499.06	242.13
3	501.75	240.25
4	517.51	224.48
5	522.57	219.42
6	550.86	191.14
7	579.14	162.85
8	607.43	134.57
9	609.00	123.69
10	1104.92	159.95
11	1133.20	188.23
12	1161.49	216.52
13	1189.77	244.80
14	1218.06	273.09

15	1246.34	301.37
16	1252.36	307.39
17	1280.65	335.68
18	1308.93	363.96
19	1324.97	380.00

Factor Of Safety For The Preceding Specified Surface = 2.420
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	495.89	246.67
2	501.84	242.95
3	503.88	241.53
4	520.37	225.03
5	521.26	224.15
6	549.54	195.86
7	577.83	167.58
8	606.11	139.29
9	609.00	114.98
10	1339.02	119.83
11	1359.32	154.30
12	1379.62	188.76
13	1399.93	223.23
14	1420.23	257.69
15	1422.18	261.00
16	1442.48	295.47
17	1462.78	329.93
18	1474.85	350.42
19	1503.13	378.71
20	1513.57	389.14
21	1528.80	413.52

Factor Of Safety For The Preceding Specified Surface = 1.843
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	489.31	244.19
2	494.69	240.83
3	498.39	238.23
4	513.07	223.56
5	519.51	217.12
6	547.79	188.83
7	576.08	160.55
8	604.36	132.26
9	609.00	116.70
10	1304.49	119.68
11	1324.79	154.14
12	1345.09	188.61
13	1352.45	201.09
14	1380.73	229.37
15	1409.02	257.66
16	1437.30	285.94
17	1465.58	314.23
18	1493.87	342.51
19	1510.30	358.94
20	1538.58	387.22
21	1544.37	393.01
22	1567.31	425.78
23	1570.65	430.54

Factor of Safety for the Preceding Surface is Between 2.419 and 2.438
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	493.88	245.91
2	499.66	242.30
3	502.20	240.52

4	518.12	224.61
5	519.73	222.99
6	548.01	194.71
7	576.30	166.43
8	604.58	138.14
9	609.00	111.48
10	1178.81	139.69
11	1207.09	167.98
12	1235.37	196.26
13	1263.66	224.55
14	1291.94	252.83
15	1320.23	281.12
16	1348.51	309.40
17	1369.08	329.97
18	1397.36	358.25
19	1418.57	379.46
20	1418.91	380.00

Factor Of Safety For The Preceding Specified Surface = 1.659
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	493.34	245.70
2	499.06	242.13
3	501.75	240.25
4	517.51	224.48
5	522.57	219.42
6	550.86	191.14
7	579.14	162.85
8	607.43	134.57
9	609.00	123.69
10	1104.92	159.95
11	1133.20	188.23
12	1161.49	216.52
13	1189.77	244.80
14	1218.06	273.09
15	1246.34	301.37
16	1252.36	307.39
17	1280.65	335.68
18	1308.93	363.96
19	1324.97	380.00

Factor Of Safety For The Preceding Specified Surface = 2.420
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	495.89	246.67
2	501.84	242.95
3	503.88	241.53
4	520.37	225.03
5	521.26	224.15
6	549.54	195.86
7	577.83	167.58
8	606.11	139.29
9	609.00	114.98
10	1339.02	119.83
11	1359.32	154.30
12	1379.62	188.76
13	1399.93	223.23
14	1420.23	257.69
15	1422.18	261.00
16	1442.48	295.47
17	1462.78	329.93
18	1474.85	350.42
19	1503.13	378.71
20	1513.57	389.14
21	1528.80	413.52

Factor Of Safety For The Preceding Specified Surface = 1.843

WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	489.31	244.19
2	494.69	240.83
3	498.39	238.23
4	513.07	223.56
5	519.51	217.12
6	547.79	188.83
7	576.08	160.55
8	604.36	132.26
9	609.00	116.70
10	1304.49	119.68
11	1324.79	154.14
12	1345.09	188.61
13	1352.45	201.09
14	1380.73	229.37
15	1409.02	257.66
16	1437.30	285.94
17	1465.58	314.23
18	1493.87	342.51
19	1510.30	358.94
20	1538.58	387.22
21	1544.37	393.01
22	1567.31	425.78
23	1570.65	430.54

Factor of Safety for the Preceding Surface is Between 2.419 and 2.438
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	493.88	245.91
2	499.66	242.30
3	502.20	240.52
4	518.12	224.61
5	519.73	222.99
6	548.01	194.71
7	576.30	166.43
8	604.58	138.14
9	609.00	111.48
10	1178.81	139.69
11	1207.09	167.98
12	1235.37	196.26
13	1263.66	224.55
14	1291.94	252.83
15	1320.23	281.12
16	1348.51	309.40
17	1369.08	329.97
18	1397.36	358.25
19	1418.57	379.46
20	1418.91	380.00

Factor Of Safety For The Preceding Specified Surface = 1.659
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	493.34	245.70
2	499.06	242.13
3	501.75	240.25
4	517.51	224.48
5	522.57	219.42
6	550.86	191.14
7	579.14	162.85
8	607.43	134.57
9	609.00	123.69
10	1104.92	159.95

11	1133.20	188.23
12	1161.49	216.52
13	1189.77	244.80
14	1218.06	273.09
15	1246.34	301.37
16	1252.36	307.39
17	1280.65	335.68
18	1308.93	363.96
19	1324.97	380.00

Factor Of Safety For The Preceding Specified Surface = 2.420
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 = 5000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 3
Number of Trial Surfaces with Misleading FS = 8
Number of Trial Surfaces With Valid FS = 4989
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.2 %
Statistical Data On All Valid FS Values:
FS Max = 4.726 FS Min = 1.749 FS Ave = 2.143
Standard Deviation = 0.353 Coefficient of Variation = 16.49 %
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	179.876	228.868
2	191.734	221.459
3	203.322	213.345
4	236.088	190.402
5	248.669	177.821
6	262.173	164.317
7	290.457	136.033
8	609.000	119.998
9	1220.447	151.648
10	1248.731	179.932
11	1277.015	208.216
12	1305.300	236.501
13	1333.584	264.785
14	1361.868	293.069
15	1390.153	321.354
16	1405.884	337.084
17	1433.300	364.501
18	1451.332	382.533

Factor of Safety
*** 1.749 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	179.876	228.868
2	191.734	221.459
3	203.322	213.345
4	236.088	190.402
5	248.669	177.821
6	262.173	164.317
7	290.457	136.033
8	609.000	119.998
9	1220.447	151.648
10	1248.731	179.932
11	1277.015	208.216
12	1305.300	236.501
13	1333.584	264.785
14	1361.868	293.069

15	1390.153	321.354
16	1405.884	337.084
17	1433.300	364.501
18	1451.332	382.533

Factor of Safety
*** 1.749 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	179.876	228.868
2	191.734	221.459
3	203.322	213.345
4	236.088	190.402
5	248.669	177.821
6	262.173	164.317
7	290.457	136.033
8	609.000	119.998
9	1220.447	151.648
10	1248.731	179.932
11	1277.015	208.216
12	1305.300	236.501
13	1333.584	264.785
14	1361.868	293.069
15	1390.153	321.354
16	1405.884	337.084
17	1433.300	364.501
18	1451.332	382.533

Factor of Safety
*** 1.749 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.427	226.536
2	83.578	218.944
3	93.787	211.795
4	126.553	188.852
5	159.319	165.909
6	169.918	155.310
7	193.551	131.677
8	609.000	110.173
9	1258.279	142.996
10	1265.255	154.839
11	1293.540	183.124
12	1321.824	211.408
13	1350.108	239.692
14	1378.392	267.976
15	1406.677	296.261
16	1434.961	324.545
17	1457.480	347.064
18	1477.249	366.832
19	1498.445	400.754
20	1498.965	401.586

Factor of Safety
*** 1.751 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.427	226.536
2	83.578	218.944
3	93.787	211.795
4	126.553	188.852
5	159.319	165.909
6	169.918	155.310
7	193.551	131.677
8	609.000	110.173
9	1258.279	142.996
10	1265.255	154.839
11	1293.540	183.124
12	1321.824	211.408
13	1350.108	239.692

14	1378.392	267.976
15	1406.677	296.261
16	1434.961	324.545
17	1457.480	347.064
18	1477.249	366.832
19	1498.445	400.754
20	1498.965	401.586

Factor of Safety
*** 1.751 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	33.508	225.721
2	45.760	218.064
3	67.037	203.166
4	99.803	180.223
5	132.569	157.280
6	142.855	146.994
7	163.582	126.267
8	609.000	104.607
9	1316.931	140.320
10	1337.233	174.785
11	1352.902	201.386
12	1381.186	229.671
13	1409.471	257.955
14	1437.755	286.239
15	1466.039	314.523
16	1494.323	342.808
17	1510.510	358.994
18	1538.794	387.278
19	1544.558	393.042
20	1572.843	421.327
21	1594.438	442.922

Factor of Safety
*** 1.752 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	33.508	225.721
2	45.760	218.064
3	67.037	203.166
4	99.803	180.223
5	132.569	157.280
6	142.855	146.994
7	163.582	126.267
8	609.000	104.607
9	1316.931	140.320
10	1337.233	174.785
11	1352.902	201.386
12	1381.186	229.671
13	1409.471	257.955
14	1437.755	286.239
15	1466.039	314.523
16	1494.323	342.808
17	1510.510	358.994
18	1538.794	387.278
19	1544.558	393.042
20	1572.843	421.327
21	1594.438	442.922

Factor of Safety
*** 1.752 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	33.508	225.721
2	45.760	218.064
3	67.037	203.166
4	99.803	180.223
5	132.569	157.280
6	142.855	146.994

7	163.582	126.267
8	609.000	104.607
9	1316.931	140.320
10	1337.233	174.785
11	1352.902	201.386
12	1381.186	229.671
13	1409.471	257.955
14	1437.755	286.239
15	1466.039	314.523
16	1494.323	342.808
17	1510.510	358.994
18	1538.794	387.278
19	1544.558	393.042
20	1572.843	421.327
21	1594.438	442.922

Factor of Safety
*** 1.752 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	142.042	228.055
2	154.002	220.581
3	176.367	204.921
4	209.133	181.978
5	220.316	170.795
6	232.204	158.907
7	260.488	130.623
8	609.000	114.431
9	1279.099	148.972
10	1287.931	163.965
11	1316.215	192.250
12	1344.499	220.534
13	1372.784	248.818
14	1401.068	277.102
15	1429.352	305.387
16	1457.637	333.671
17	1474.279	350.313
18	1502.563	378.597
19	1512.414	388.449
20	1527.841	413.136

Factor of Safety
*** 1.755 ***

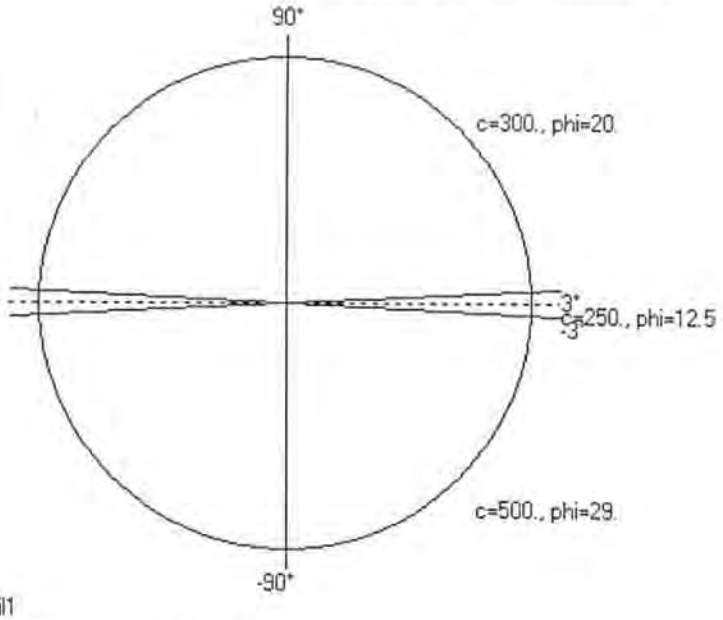
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	142.042	228.055
2	154.002	220.581
3	176.367	204.921
4	209.133	181.978
5	220.316	170.795
6	232.204	158.907
7	260.488	130.623
8	609.000	114.431
9	1279.099	148.972
10	1287.931	163.965
11	1316.215	192.250
12	1344.499	220.534
13	1372.784	248.818
14	1401.068	277.102
15	1429.352	305.387
16	1457.637	333.671
17	1474.279	350.313
18	1502.563	378.597
19	1512.414	388.449
20	1527.841	413.136

Factor of Safety
*** 1.755 ***

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

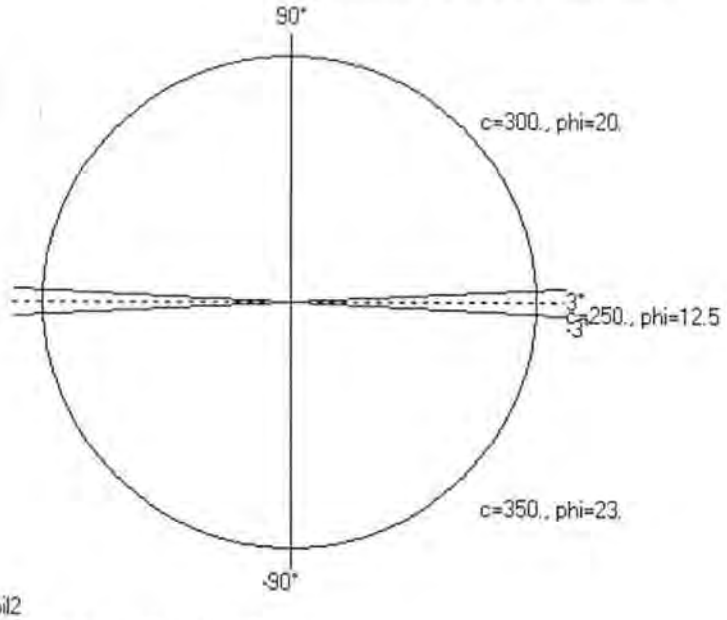
Anisotropic Soil Definition



Soil1

13662-00, Euland Capital, C-C'.

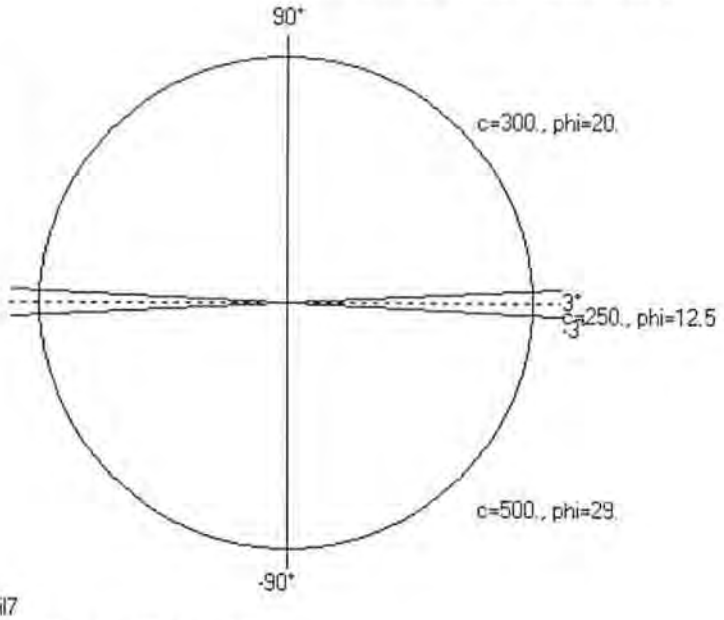
Anisotropic Soil Definition



Soil2

13662-00, Euland Capital, C-C',

Anisotropic Soil Definition



Soil7

13662-00, Euland Capital, C-C'.

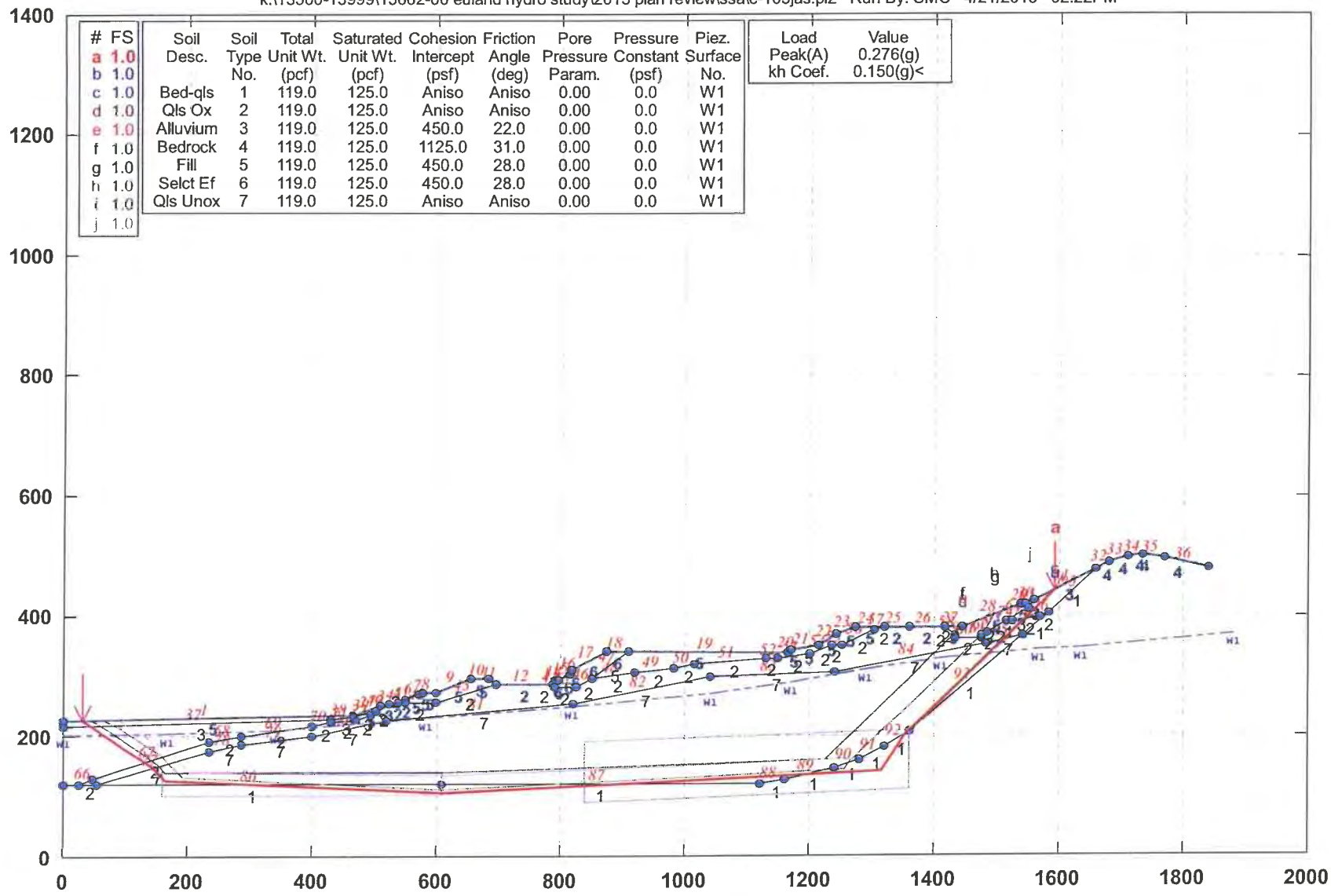
13662-00, Euland Capital, C-C', - - Seismic-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-103jas.pl2 Run By: SMC 4/21/2015 02:22PM

#	FS
a	1.0
b	1.0
c	1.0
d	1.0
e	1.0
f	1.0
g	1.0
h	1.0
i	1.0
j	1.0

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Selct Ef	6	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.0

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-22.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/21/2015
Time of Run: 02:22PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103jas.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103jas.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103jas.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic-

BOUNDARY COORDINATES
36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3
40	502.00	243.00	510.00	252.00	3

41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	608.00	120.00	40.00
2	609.00	120.00	609.00	120.00	40.00
3	840.00	140.00	1360.00	160.00	100.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	491.11	244.86
2	496.79	241.45
3	500.07	239.24
4	515.29	224.02
5	521.04	218.27
6	549.33	189.98
7	577.61	161.70
8	605.89	133.42
9	609.00	120.19
10	944.70	179.81
11	972.99	208.10
12	1001.27	236.38
13	1029.56	264.66
14	1057.84	292.95
15	1063.72	298.83
16	1090.07	325.18
17	1098.25	338.79

Factor Of Safety For The Preceding Specified Surface = 1.525
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	470.45	237.06
2	474.28	234.76
3	481.40	229.96
4	492.16	219.20
5	506.51	204.85
6	534.79	176.57
7	563.08	148.28
8	591.36	120.00
9	606.55	111.05
10	609.00	104.55
11	1087.65	159.87
12	1115.94	188.15
13	1144.22	216.44
14	1172.51	244.72
15	1200.79	273.01
16	1229.08	301.29
17	1232.52	304.74
18	1260.81	333.02
19	1289.09	361.31
20	1300.80	373.02
21	1305.00	380.00

Factor of Safety for the Preceding Surface is Between 1.457 and******
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	485.06	242.58
2	490.19	239.49
3	495.04	236.22
4	508.63	222.63
5	516.45	214.81
6	544.73	186.53
7	573.02	158.24
8	601.30	129.96
9	609.00	109.70
10	984.06	159.40
11	1012.34	187.69
12	1040.63	215.97
13	1068.91	244.25
14	1097.20	272.54
15	1125.48	300.82

16	1125.66	301.00
17	1153.94	329.28
18	1155.69	331.04
19	1159.91	338.06

Factor of Safety for the Preceding Surface is Between 1.974 and 2.291
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	489.09	244.10
2	494.59	240.80
3	498.39	238.23
4	513.07	223.56
5	519.51	217.12
6	547.79	188.83
7	576.08	160.55
8	604.36	132.26
9	609.00	116.70
10	1304.49	119.68
11	1324.79	154.14
12	1345.09	188.61
13	1352.45	201.09
14	1380.73	229.37
15	1409.02	257.66
16	1437.30	285.94
17	1465.58	314.23
18	1493.87	342.51
19	1510.30	358.94
20	1538.58	387.22
21	1544.37	393.01
22	1566.74	426.17
23	1569.16	429.77

Factor Of Safety For The Preceding Specified Surface = 1.150
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	493.68	245.83
2	499.59	242.28
3	502.20	240.52
4	518.12	224.61
5	519.73	222.99
6	548.01	194.71
7	576.30	166.43
8	604.58	138.14
9	609.00	111.48
10	1178.81	139.69
11	1207.09	167.98
12	1235.37	196.26
13	1263.66	224.55
14	1291.94	252.83
15	1320.23	281.12
16	1348.51	309.40
17	1369.08	329.97
18	1397.36	358.25
19	1418.57	379.46
20	1418.90	380.00

Factor Of Safety For The Preceding Specified Surface = 1.156
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	493.13	245.63
2	498.99	242.11
3	501.75	240.25
4	517.51	224.48
5	522.57	219.42

6	550.86	191.14
7	579.14	162.85
8	607.43	134.57
9	609.00	123.69
10	1104.92	159.95
11	1133.20	188.23
12	1161.49	216.52
13	1189.77	244.80
14	1218.06	273.09
15	1246.34	301.37
16	1252.36	307.39
17	1280.65	335.68
18	1308.93	363.96
19	1324.97	380.00

Factor Of Safety For The Preceding Specified Surface = 1.530
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	491.66	245.07
2	497.39	241.63
3	500.53	239.52
4	515.90	224.14
5	518.20	221.84
6	546.48	193.56
7	574.77	165.27
8	603.05	136.99
9	609.00	107.99
10	1018.59	159.56
11	1046.88	187.84
12	1075.16	216.13
13	1103.44	244.41
14	1131.73	272.70
15	1160.01	300.98
16	1161.28	302.24
17	1189.56	330.53
18	1195.42	336.38
19	1202.72	348.54

Factor Of Safety For The Preceding Specified Surface = 1.396
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	489.64	244.31
2	495.19	240.98
3	498.85	238.51
4	513.67	223.68
5	516.67	220.69
6	544.95	192.41
7	573.24	164.12
8	601.52	135.84
9	609.00	104.49
10	858.38	179.42
11	886.66	207.71
12	914.94	235.99
13	943.23	264.27
14	960.74	281.79
15	989.03	310.07
16	993.61	314.65
17	1018.68	339.72

Factor of Safety for the Preceding Surface is Between****** and-0.402
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	487.07	243.34
2	492.39	240.14

3	496.71	237.23
4	510.85	223.09
5	517.98	215.96
6	546.26	187.68
7	574.55	159.40
8	602.83	131.11
9	609.00	113.20
10	1144.27	139.54
11	1172.56	167.82
12	1200.84	196.11
13	1229.13	224.39
14	1257.41	252.68
15	1285.70	280.96
16	1313.98	309.24
17	1326.46	321.72
18	1354.74	350.01
19	1383.03	378.29
20	1384.74	380.00

Factor of Safety for the Preceding Surface is Between 1.080 and 1.087
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	496.13	246.76
2	501.79	242.94
3	503.88	241.53
4	520.37	225.03
5	521.26	224.15
6	549.54	195.86
7	577.83	167.58
8	606.11	139.29
9	609.00	114.98
10	1339.02	119.83
11	1359.32	154.30
12	1379.62	188.76
13	1399.93	223.23
14	1420.23	257.69
15	1422.18	261.00
16	1442.48	295.47
17	1462.78	329.93
18	1474.85	350.42
19	1503.13	378.71
20	1513.57	389.14
21	1528.03	413.21

Factor Of Safety For The Preceding Specified Surface = 1.163
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	481.06	241.07
2	485.84	238.20
3	491.53	234.36
4	504.19	221.71
5	513.39	212.51
6	541.67	184.22
7	569.95	155.94
8	598.24	127.65
9	609.00	102.71
10	1183.63	119.13
11	1192.86	134.81
12	1221.15	163.09
13	1249.43	191.37
14	1277.72	219.66
15	1306.00	247.94
16	1334.29	276.23
17	1362.57	304.51
18	1390.85	332.80
19	1392.57	334.51

20	1420.85	362.79
21	1428.38	370.32
22	1438.06	380.00

Factor of Safety for the Preceding Surface is Between 0.210 and 0.480
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	491.11	244.86
2	496.79	241.45
3	500.07	239.24
4	515.29	224.02
5	521.04	218.27
6	549.33	189.98
7	577.61	161.70
8	605.89	133.42
9	609.00	120.19
10	944.70	179.81
11	972.99	208.10
12	1001.27	236.38
13	1029.56	264.66
14	1057.84	292.95
15	1063.72	298.83
16	1090.07	325.18
17	1098.25	338.79

Factor Of Safety For The Preceding Specified Surface = 1.525
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 21 Coordinate Points

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

##################### SOME LINES SKIPPED #####################

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 = 5000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 13
Number of Trial Surfaces with Misleading FS = 17
Number of Trial Surfaces With Valid FS = 4970
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.6 %
Statistical Data On All Valid FS Values:
FS Max = 2.031 FS Min = 0.963 FS Ave = 1.230
Standard Deviation = 0.197 Coefficient of Variation = 16.04 %
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.829	225.641
2	42.563	217.990
3	66.246	202.016
4	99.407	179.648
5	132.569	157.280
6	142.855	146.994
7	163.582	126.267
8	609.000	104.607
9	1316.931	140.320
10	1337.233	174.785
11	1352.902	201.386
12	1381.186	229.671
13	1409.471	257.955
14	1437.755	286.239
15	1466.039	314.523
16	1494.323	342.808
17	1510.510	358.994
18	1538.794	387.278
19	1544.558	393.042

20	1572.843	421.327
21	1594.438	442.922

Factor of Safety
*** 0.963 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.829	225.641
2	42.563	217.990
3	66.246	202.016
4	99.407	179.648
5	132.569	157.280
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7	163.582	126.267
8	609.000	104.607
9	1316.931	140.320
10	1337.233	174.785
11	1352.902	201.386
12	1381.186	229.671
13	1409.471	257.955
14	1437.755	286.239
15	1466.039	314.523
16	1494.323	342.808
17	1510.510	358.994
18	1538.794	387.278
19	1544.558	393.042
20	1572.843	421.327
21	1594.438	442.922

Factor of Safety
*** 0.963 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.829	225.641
2	42.563	217.990
3	66.246	202.016
4	99.407	179.648
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18	1538.794	387.278
19	1544.558	393.042
20	1572.843	421.327
21	1594.438	442.922

Factor of Safety
*** 0.963 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	45.950	225.988
2	58.639	218.364
3	77.496	205.645
4	110.657	183.277
5	143.819	160.909
6	154.236	150.492

7	165.551	139.177
8	609.000	137.673
9	1225.779	160.496
10	1254.063	188.780
11	1282.347	217.064
12	1310.632	245.348
13	1338.916	273.633
14	1367.200	301.917
15	1395.485	330.201
16	1401.525	336.241
17	1429.809	364.526
18	1432.112	366.829
19	1445.472	380.189

Factor of Safety
*** 0.971 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	45.950	225.988
2	58.639	218.364
3	77.496	205.645
4	110.657	183.277
5	143.819	160.909
6	154.236	150.492
7	165.551	139.177
8	609.000	137.673
9	1225.779	160.496
10	1254.063	188.780
11	1282.347	217.064
12	1310.632	245.348
13	1338.916	273.633
14	1367.200	301.917
15	1395.485	330.201
16	1401.525	336.241
17	1429.809	364.526
18	1432.112	366.829
19	1445.472	380.189

Factor of Safety
*** 0.971 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	45.950	225.988
2	58.639	218.364
3	77.496	205.645
4	110.657	183.277
5	143.819	160.909
6	154.236	150.492
7	165.551	139.177
8	609.000	137.673
9	1225.779	160.496
10	1254.063	188.780
11	1282.347	217.064
12	1310.632	245.348
13	1338.916	273.633
14	1367.200	301.917
15	1395.485	330.201
16	1401.525	336.241
17	1429.809	364.526
18	1432.112	366.829
19	1445.472	380.189

Factor of Safety
*** 0.971 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.161	226.466
2	80.788	218.879
3	92.996	210.645
4	126.157	188.277

5	159.319	165.909
6	169.918	155.310
7	193.551	131.677
8	609.000	110.173
9	1258.279	142.996
10	1265.255	154.839
11	1293.540	183.124
12	1321.824	211.408
13	1350.108	239.692
14	1378.392	267.976
15	1406.677	296.261
16	1434.961	324.545
17	1457.480	347.064
18	1477.249	366.832
19	1497.850	401.119
20	1497.867	401.147

Factor of Safety
*** 0.972 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.161	226.466
2	80.788	218.879
3	92.996	210.645
4	126.157	188.277
5	159.319	165.909
6	169.918	155.310
7	193.551	131.677
8	609.000	110.173
9	1258.279	142.996
10	1265.255	154.839
11	1293.540	183.124
12	1321.824	211.408
13	1350.108	239.692
14	1378.392	267.976
15	1406.677	296.261
16	1434.961	324.545
17	1457.480	347.064
18	1477.249	366.832
19	1497.850	401.119
20	1497.867	401.147

Factor of Safety
*** 0.972 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.515	226.904
2	101.085	219.351
3	107.199	215.226
4	140.361	192.859
5	173.522	170.491
6	184.288	159.725
7	204.270	139.744
8	609.000	134.646
9	1339.783	163.953
10	1360.084	198.418
11	1369.501	214.405
12	1397.786	242.689
13	1426.070	270.974
14	1454.354	299.258
15	1482.639	327.542
16	1510.923	355.827
17	1515.311	360.215
18	1533.648	391.345
19	1545.799	409.359
20	1552.900	421.177

Factor of Safety
*** 0.978 ***

Failure Surface Specified By 20 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	88.515	226.904
2	101.085	219.351
3	107.199	215.226
4	140.361	192.859
5	173.522	170.491
6	184.288	159.725
7	204.270	139.744
8	609.000	134.646
9	1339.783	163.953
10	1360.084	198.418
11	1369.501	214.405
12	1397.786	242.689
13	1426.070	270.974
14	1454.354	299.258
15	1482.639	327.542
16	1510.923	355.827
17	1515.311	360.215
18	1533.648	391.345
19	1545.799	409.359
20	1552.900	421.177

Factor of Safety

*** 0.978 ***

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

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/21/2015
Time of Run: 02:23PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103jas Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103jas Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-103jas Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic-

BOUNDARY COORDINATES

36 Top Boundaries
95 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	792.00	294.00	6
14	792.00	294.00	797.00	294.00	6
15	797.00	294.00	815.00	303.00	6
16	815.00	303.00	817.00	311.00	6
17	817.00	311.00	875.00	341.00	6
18	875.00	341.00	910.00	341.00	6
19	910.00	341.00	1165.00	338.00	5
20	1165.00	338.00	1170.00	342.00	5
21	1170.00	342.00	1215.00	351.00	5
22	1215.00	351.00	1244.00	370.00	5
23	1244.00	370.00	1273.00	380.00	5
24	1273.00	380.00	1320.00	380.00	5
25	1320.00	380.00	1360.00	380.00	2
26	1360.00	380.00	1418.00	380.00	2
27	1418.00	380.00	1445.00	380.00	5
28	1445.00	380.00	1540.00	418.00	5
29	1540.00	418.00	1547.00	418.00	5
30	1547.00	418.00	1560.00	425.00	5
31	1560.00	425.00	1658.00	476.00	3
32	1658.00	476.00	1680.00	489.00	4
33	1680.00	489.00	1710.00	498.00	4
34	1710.00	498.00	1735.00	500.00	4
35	1735.00	500.00	1770.00	495.00	4
36	1770.00	495.00	1840.00	480.00	4
37	0.00	217.00	430.00	227.00	3
38	430.00	227.00	465.00	232.00	3
39	465.00	232.00	502.00	243.00	3

40	502.00	243.00	510.00	252.00	3
41	550.00	260.00	551.00	255.00	2
42	551.00	255.00	600.00	255.00	2
43	600.00	255.00	696.00	287.00	2
44	788.00	287.00	789.00	281.00	2
45	789.00	281.00	825.00	281.00	2
46	825.00	281.00	850.00	295.00	2
47	850.00	295.00	910.00	341.00	5
48	850.00	295.00	920.00	305.00	2
49	920.00	305.00	983.00	312.00	2
50	983.00	312.00	1015.00	320.00	2
51	1015.00	320.00	1131.00	328.00	2
52	1131.00	328.00	1148.00	330.00	2
53	1148.00	330.00	1200.00	337.00	2
54	1200.00	337.00	1237.00	350.00	2
55	1237.00	350.00	1252.00	350.00	2
56	1252.00	350.00	1305.00	375.00	2
57	1305.00	375.00	1320.00	380.00	2
58	1418.00	380.00	1433.00	366.00	2
59	1433.00	366.00	1434.00	361.00	2
60	1434.00	361.00	1475.00	361.00	2
61	1475.00	361.00	1476.00	366.00	2
62	1476.00	366.00	1485.00	372.00	2
63	1485.00	372.00	1515.00	390.00	2
64	1515.00	390.00	1550.00	412.00	3
65	1550.00	412.00	1560.00	425.00	3
66	27.00	120.00	48.00	130.00	2
67	48.00	130.00	234.00	190.00	2
68	234.00	190.00	286.00	200.00	2
69	286.00	200.00	400.00	216.00	2
70	400.00	216.00	430.00	224.00	2
71	430.00	224.00	470.00	225.00	2
72	470.00	225.00	493.00	235.00	2
73	493.00	235.00	523.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	2
76	1570.00	397.00	1584.00	404.00	2
77	55.00	120.00	234.00	175.00	7
78	234.00	175.00	286.00	185.00	7
79	286.00	185.00	400.00	200.00	7
80	400.00	200.00	520.00	225.00	7
81	520.00	225.00	820.00	253.00	7
82	820.00	253.00	1040.00	298.00	7
83	1040.00	298.00	1240.00	305.00	7
84	1240.00	305.00	1483.00	352.00	7
85	1483.00	352.00	1542.00	367.00	7
86	0.00	120.00	608.00	120.00	1
87	608.00	120.00	1120.00	120.00	1
88	1120.00	120.00	1160.00	127.00	1
89	1160.00	127.00	1240.00	146.00	1
90	1240.00	146.00	1280.00	160.00	1
91	1280.00	160.00	1320.00	180.00	1
92	1320.00	180.00	1360.00	206.00	1
93	1360.00	206.00	1542.00	367.00	1
94	1542.00	367.00	1584.00	404.00	1
95	1584.00	404.00	1658.00	476.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	450.0	28.0	0.00	0.0	1

```
   7   119.0    125.0       0.0       0.0    0.00       0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     3 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise     Cohesion      Friction
   Range        Direction Limit    Intercept       Angle
    No.             (deg)           (psf)         (deg)
     1              -3.0            750.00         31.00
     2               3.0            375.00         14.50
     3              90.0            450.00         22.00
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise     Cohesion      Friction
   Range        Direction Limit    Intercept       Angle
    No.             (deg)           (psf)         (deg)
     1              -3.0            525.00         25.00
     2               3.0            375.00         14.50
     3              90.0            450.00         22.00
 Soil Type  7 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise     Cohesion      Friction
   Range        Direction Limit    Intercept       Angle
    No.             (deg)           (psf)         (deg)
     1              -3.0            750.00         31.00
     2               3.0            375.00         14.50
     3              90.0            450.00         22.00
 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 12 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point       X-Water      Y-Water
    No.          (ft)         (ft)
     1          0.00       202.00
     2        168.00       205.00
     3        343.00       210.00
     4        583.00       230.00
     5        818.00       250.00
     6       1042.00       270.00
     7       1170.00       290.00
     8       1289.00       310.00
     9       1410.00       330.00
    10       1568.00       343.00
    11       1636.00       345.00
    12       1880.00       370.00
 Specified Peak Ground Acceleration Coefficient (A) =    0.276(g)
 Specified Horizontal Earthquake Coefficient (kh) =    0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =    0.000(g)
 Specified Seismic Pore-Pressure Factor =    0.000
 Janbu's Empirical Coef. is being used for the case of  c & phi both > 0
 Trial Failure Surface Specified By 21 Coordinate Points
   Point       X-Surf       Y-Surf
    No.          (ft)         (ft)
     1         29.829       225.641
     2         42.563       217.990
     3         66.246       202.016
     4         99.407       179.648
     5        132.569       157.280
     6        142.855       146.994
     7        163.582       126.267
     8        609.000       104.607
     9       1316.931       140.320
    10       1337.233       174.785
```

11	1352.902	201.386
12	1381.186	229.671
13	1409.471	257.955
14	1437.755	286.239
15	1466.039	314.523
16	1494.323	342.808
17	1510.510	358.994
18	1538.794	387.278
19	1544.558	393.042
20	1572.843	421.327
21	1594.438	442.922

Janbu's Empirical Coefficient (fo) = 1.064

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

Factor Of Safety For The Preceding Specified Surface = 0.963

Table 1 - Individual Data on the 99 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.7	6005.1	0.0	0.0	0.0	0.0	900.8	0.0	0.0
2	22.0	40784.7	0.0	0.0	0.0	0.0	6117.7	0.0	0.0
3	1.7	4784.1	0.0	74.0	0.0	0.0	717.6	0.0	0.0
4	33.2	144377.3	0.0	31561.8	0.0	0.0	21656.6	0.0	0.0
5	33.2	240034.0	0.0	88862.7	0.0	0.0	36005.1	0.0	0.0
6	10.3	96040.5	0.0	47485.7	0.0	0.0	14406.1	0.0	0.0
7	20.7	234560.1	0.0	*******	0.0	0.0	35184.0	0.0	0.0
8	4.4	55927.6	0.0	21746.3	0.0	0.0	8389.1	0.0	0.0
9	66.0	855948.6	0.0	*******	0.0	0.0	*******	0.0	0.0
10	52.0	701409.6	0.0	*******	0.0	0.0	*******	0.0	0.0
11	6.5	88760.0	0.0	35608.3	0.0	0.0	13314.0	0.0	0.0
12	50.5	707457.8	0.0	*******	0.0	0.0	*******	0.0	0.0
13	35.1	504347.1	0.0	*******	0.0	0.0	75652.1	0.0	0.0
14	21.9	320924.3	0.0	*******	0.0	0.0	48138.6	0.0	0.0
15	30.0	446274.5	0.0	*******	0.0	0.0	66941.2	0.0	0.0
16	35.0	531044.6	0.0	*******	0.0	0.0	79656.7	0.0	0.0
17	5.0	77307.0	0.0	33895.6	0.0	0.0	11596.0	0.0	0.0
18	23.0	372205.2	0.0	*******	0.0	0.0	55830.8	0.0	0.0
19	9.0	153066.0	0.0	63230.4	0.0	0.0	22959.9	0.0	0.0
20	8.0	139562.8	0.0	56763.4	0.0	0.0	20934.4	0.0	0.0
21	8.0	141715.2	0.0	57289.2	0.0	0.0	21257.3	0.0	0.0
22	2.0	35586.1	0.0	14404.5	0.0	0.0	5337.9	0.0	0.0
23	3.0	53497.1	0.0	21668.3	0.0	0.0	8024.6	0.0	0.0
24	14.0	252293.9	0.0	*******	0.0	0.0	37844.1	0.0	0.0
25	13.0	240841.5	0.0	96245.8	0.0	0.0	36126.2	0.0	0.0
26	1.0	18899.5	0.0	7461.0	0.0	0.0	2834.9	0.0	0.0
27	19.0	371645.8	0.0	*******	0.0	0.0	55746.9	0.0	0.0
28	8.0	162666.7	0.0	61232.8	0.0	0.0	24400.0	0.0	0.0
29	5.0	102543.0	0.0	38537.5	0.0	0.0	15381.4	0.0	0.0
30	17.0	350887.0	0.0	*******	0.0	0.0	52633.1	0.0	0.0
31	8.0	167645.8	0.0	63213.8	0.0	0.0	25146.9	0.0	0.0
32	1.0	21195.7	0.0	7939.2	0.0	0.0	3179.4	0.0	0.0
33	47.0	1042686.4	0.0	*******	0.0	0.0	*******	0.0	0.0
34	29.0	668832.6	0.0	*******	0.0	0.0	*******	0.0	0.0
35	11.0	247184.0	0.0	89319.0	0.0	0.0	37077.6	0.0	0.0
36	92.0	1996104.0	0.0	*******	0.0	0.0	*******	0.0	0.0
37	1.0	21531.4	0.0	8331.4	0.0	0.0	3229.7	0.0	0.0
38	3.0	65808.9	0.0	25007.1	0.0	0.0	9871.3	0.0	0.0
39	5.0	111127.5	0.0	41721.6	0.0	0.0	16669.1	0.0	0.0
40	18.0	408498.1	0.0	*******	0.0	0.0	61274.7	0.0	0.0
41	2.0	47295.8	0.0	16781.4	0.0	0.0	7094.4	0.0	0.0
42	1.0	24146.0	0.0	8393.9	0.0	0.0	3621.9	0.0	0.0
43	2.0	48458.7	0.0	16788.8	0.0	0.0	7268.8	0.0	0.0
44	5.0	122122.8	0.0	42014.4	0.0	0.0	18318.4	0.0	0.0
45	25.0	631531.8	0.0	*******	0.0	0.0	94729.8	0.0	0.0
46	25.0	666394.7	0.0	*******	0.0	0.0	99959.2	0.0	0.0
47	35.0	953821.8	0.0	*******	0.0	0.0	*******	0.0	0.0
48	4.1	112127.5	0.0	35615.3	0.0	0.0	16819.1	0.0	0.0
49	5.9	159024.6	0.0	50649.1	0.0	0.0	23853.7	0.0	0.0
50	63.0	1691768.0	0.0	*******	0.0	0.0	*******	0.0	0.0
51	32.0	848410.6	0.0	*******	0.0	0.0	*******	0.0	0.0

52	25.0	657711.4	0.0	*******	0.0	0.0	98656.7	0.0	0.0
53	2.0	52423.3	0.0	17862.0	0.0	0.0	7863.5	0.0	0.0
54	89.0	2304751.8	0.0	*******	0.0	0.0	*******	0.0	0.0
55	17.0	434128.3	0.0	*******	0.0	0.0	65119.3	0.0	0.0
56	17.0	432170.1	0.0	*******	0.0	0.0	64825.5	0.0	0.0
57	5.0	127943.7	0.0	48408.7	0.0	0.0	19191.6	0.0	0.0
58	18.9	490788.0	0.0	*******	0.0	0.0	73618.2	0.0	0.0
59	11.1	291881.2	0.0	*******	0.0	0.0	43782.2	0.0	0.0
60	15.0	397575.9	0.0	*******	0.0	0.0	59636.4	0.0	0.0
61	22.0	603746.1	0.0	*******	0.0	0.0	90561.9	0.0	0.0
62	3.0	85053.7	0.0	30530.1	0.0	0.0	12758.1	0.0	0.0
63	4.0	114422.1	0.0	40808.2	0.0	0.0	17163.3	0.0	0.0
64	8.0	231150.1	0.0	81964.4	0.0	0.0	34672.5	0.0	0.0
65	21.0	617647.9	0.0	*******	0.0	0.0	92647.2	0.0	0.0
66	7.0	208378.6	0.0	73164.8	0.0	0.0	31256.8	0.0	0.0
67	9.0	267533.2	0.0	94590.8	0.0	0.0	40130.0	0.0	0.0
68	16.0	474558.3	0.0	*******	0.0	0.0	71183.7	0.0	0.0
69	11.9	352986.1	0.0	*******	0.0	0.0	52947.9	0.0	0.0
70	3.1	89705.6	0.0	64014.2	0.0	0.0	13455.8	0.0	0.0
71	17.2	466793.6	0.0	*******	0.0	0.0	70019.0	0.0	0.0
72	15.7	370032.5	0.0	*******	0.0	0.0	55504.9	0.0	0.0
73	7.1	152735.8	0.0	71818.4	0.0	0.0	22910.4	0.0	0.0
74	21.2	418800.5	0.0	*******	0.0	0.0	62820.1	0.0	0.0
75	28.3	472420.9	0.0	*******	0.0	0.0	70863.1	0.0	0.0
76	0.5	7891.7	0.0	3304.7	0.0	0.0	1183.7	0.0	0.0
77	8.0	115120.8	0.0	47735.9	0.0	0.0	17268.1	0.0	0.0
78	15.0	194377.4	0.0	75581.7	0.0	0.0	29156.6	0.0	0.0
79	1.0	11962.6	0.0	4393.1	0.0	0.0	1794.4	0.0	0.0
80	3.8	43808.2	0.0	15775.4	0.0	0.0	6571.2	0.0	0.0
81	7.2	79564.2	0.0	27221.2	0.0	0.0	11934.6	0.0	0.0
82	21.0	204545.3	0.0	55033.8	0.0	0.0	30681.8	0.0	0.0
83	9.0	76784.8	0.0	12591.1	0.0	0.0	11517.7	0.0	0.0
84	1.0	8185.9	0.0	1003.1	0.0	0.0	1227.9	0.0	0.0
85	7.0	55148.1	0.0	4761.5	0.0	0.0	8272.2	0.0	0.0
86	2.0	15064.6	0.0	634.0	0.0	0.0	2259.7	0.0	0.0
87	2.9	21493.5	0.0	345.8	0.0	0.0	3224.0	0.0	0.0
88	6.4	44784.6	0.0	0.0	0.0	0.0	6717.7	0.0	0.0
89	16.2	100291.6	0.0	0.0	0.0	0.0	15043.7	0.0	0.0
90	4.5	24504.3	0.0	0.0	0.0	0.0	3675.6	0.0	0.0
91	10.0	49404.0	0.0	0.0	0.0	0.0	7410.6	0.0	0.0
92	13.8	56430.4	0.0	0.0	0.0	0.0	8464.6	0.0	0.0
93	1.2	4288.1	0.0	0.0	0.0	0.0	643.2	0.0	0.0
94	4.6	14774.8	0.0	0.0	0.0	0.0	2216.2	0.0	0.0
95	2.4	6896.5	0.0	0.0	0.0	0.0	1034.5	0.0	0.0
96	3.0	7791.1	0.0	0.0	0.0	0.0	1168.7	0.0	0.0
97	10.0	22400.3	0.0	0.0	0.0	0.0	3360.0	0.0	0.0
98	12.8	20535.3	0.0	0.0	0.0	0.0	3080.3	0.0	0.0
99	21.6	13307.3	0.0	0.0	0.0	0.0	1996.1	0.0	0.0

Table 2 - Base Stress Data on the 99 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-31.00	36.20	14.86	1223.36	-182.25
2	-34.00	53.56	26.53	2017.16	-806.21
3	-34.00	65.40	2.03	2661.38	-1234.18
4	-34.00	82.83	40.00	3179.98	-1893.26
5	-34.00	115.99	40.00	4166.75	-3147.44
6	-45.00	137.71	14.55	9203.49	-5611.92
7	-45.00	153.22	29.31	18789.46	-6801.77
8	-2.78	165.79	4.42	2411.68	1281.75
9	-2.78	201.00	66.08	2449.21	1313.13
10	-2.78	260.00	52.06	2511.03	1365.75
11	-2.78	289.23	6.46	2541.65	1391.82
12	-2.78	317.73	50.60	2571.51	1417.24
13	-2.78	360.54	35.12	2606.42	1455.83
14	-2.78	389.04	21.95	2613.37	1482.19
15	-2.78	415.00	30.04	2619.69	1506.20
16	-2.78	447.50	35.04	2627.62	1536.26
17	-2.78	467.50	5.01	2660.30	1565.50
18	-2.78	481.50	23.03	2819.43	1638.54

19	-2.78	497.50	9.01	3001.29	1722.02
20	-2.78	506.00	8.01	3097.90	1766.37
21	-2.78	514.00	8.01	3151.26	1793.62
22	-2.78	519.00	2.00	3161.13	1801.58
23	-2.78	521.50	3.00	3166.07	1805.56
24	-2.78	530.00	14.02	3197.25	1824.66
25	-2.78	543.50	13.02	3300.75	1875.82
26	-2.78	550.50	1.00	3383.61	1913.61
27	-2.78	560.50	19.02	3535.43	1980.52
28	-2.78	574.00	8.01	3709.17	2058.79
29	-2.78	580.50	5.01	3741.15	2076.53
30	-2.78	591.50	17.02	3752.11	2089.88
31	-2.78	604.00	8.01	3807.56	2121.81
32	-2.78	608.50	1.00	3860.71	2146.11
33	2.89	632.50	47.06	3998.40	4441.23
34	2.89	670.50	29.04	4201.89	4617.08
35	2.89	690.50	11.01	4039.66	4498.58
36	2.89	742.00	92.12	3813.43	4343.53
37	2.89	788.50	1.00	3745.57	4310.42
38	2.89	790.50	3.00	3847.92	4391.48
39	2.89	794.50	5.01	3919.60	4449.38
40	2.89	806.00	18.02	4033.05	4543.23
41	2.89	816.00	2.00	4271.17	4734.13
42	2.89	817.50	1.00	4397.59	4833.84
43	2.89	819.00	2.00	4418.77	4850.53
44	2.89	822.50	5.01	4466.49	4889.61
45	2.89	837.50	25.03	4671.01	5057.12
46	2.89	862.50	25.03	5011.87	5336.29
47	2.89	892.50	35.04	5145.70	5455.66
48	2.89	912.07	4.14	5104.05	5432.47
49	2.89	917.07	5.88	5091.80	5425.29
50	2.89	951.50	63.08	5007.48	5375.86
51	2.89	999.00	32.04	4891.16	5307.67
52	2.89	1027.50	25.03	4821.37	5266.75
53	2.89	1041.00	2.00	4788.31	5247.37
54	2.89	1086.50	89.11	4651.13	5184.20
55	2.89	1139.50	17.02	4471.04	5112.31
56	2.89	1156.50	17.02	4413.28	5089.25
57	2.89	1167.50	5.01	4437.60	5122.67
58	2.89	1179.44	18.91	4522.08	5202.24
59	2.89	1194.44	11.13	4565.21	5257.78
60	2.89	1207.50	15.02	4602.75	5306.11
61	2.89	1226.00	22.03	4808.17	5493.88
62	2.89	1238.50	3.00	5017.09	5675.70
63	2.89	1242.00	4.01	5075.59	5726.61
64	2.89	1248.00	8.01	5138.13	5784.31
65	2.89	1262.50	21.03	5243.67	5888.02
66	2.89	1276.50	7.01	5308.87	5959.40
67	2.89	1284.50	9.01	5283.23	5950.90
68	2.89	1297.00	16.02	5242.39	5937.69
69	2.89	1310.97	11.95	5198.17	5922.80
70	59.50	1318.47	6.05	9185.33	27410.47
71	59.50	1328.62	33.95	8634.39	25401.11
72	59.50	1345.07	30.87	7741.58	22144.67
73	45.00	1356.45	10.04	6230.60	17500.27
74	45.00	1370.59	29.96	5817.63	16074.92
75	45.00	1395.33	40.00	5095.23	13581.54
76	45.00	1409.74	0.75	4674.58	12129.75
77	45.00	1414.00	11.31	4542.18	11701.63
78	45.00	1425.50	21.21	4230.13	10537.49
79	45.00	1433.50	1.41	4013.05	9727.65
80	45.00	1435.88	5.31	3948.53	9486.98
81	45.00	1441.38	10.25	3799.29	8930.21
82	45.00	1455.52	29.75	3617.09	7905.79
83	45.00	1470.52	12.67	3497.48	6968.03
84	45.00	1475.50	1.41	3457.76	6656.62
85	45.00	1479.50	9.90	3425.85	6406.50
86	45.00	1484.00	2.83	3389.96	6125.13
87	45.00	1486.46	4.14	3370.30	5971.09
88	45.00	1491.13	9.05	3266.72	5693.89

89	45.00	1502.42	22.89	2942.17	5038.16
90	45.00	1512.76	6.35	2645.10	4438.05
91	45.00	1520.00	14.14	2436.89	4017.41
92	45.00	1531.90	19.51	2094.97	3326.66
93	45.00	1539.40	1.71	1879.42	2891.17
94	45.00	1542.28	6.45	1752.91	2635.61
95	45.00	1545.78	3.45	1585.28	2296.95
96	45.00	1548.50	4.24	1493.65	2111.83
97	45.00	1555.00	14.14	1349.95	1821.53
98	45.00	1566.42	18.16	1091.90	1300.20
99	45.00	1583.64	30.54	696.35	501.10

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 7324782.50 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 4222.96(psf)
Sum of the Driving Forces = 8089657.50 (lbs)
Average Mobilized Shear Stress = 4663.93(psf)
Total length of the failure surface = 1734.51(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1387(g)
Calculated Newmark Seismic Displacement = 0.106(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: C-C'

File: c-103jas

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1387
T_m (s)	0.517
T_s (s)	0.36
M	6.95
T_s/T_m	0.69683

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.212	0.165	0.272
k-velmax (cm/s)	25.37	19.76	32.57

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.78	0.905	2.18	0.88	5.39
[kmax, k-velmax]	-0.02	0.586	0.98	0.55	1.76
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.78	0.905	0.86	0.35	2.12
[kmax, k-velmax]	-0.02	0.586	0.39	0.21	0.69

PGA	Peak Ground Acceleration (g)
PGV	Peak Ground Velocity (cm/s)
k_y	Critical or Yield Acceleration (g)
T_m	Mean Period of an Earthquake Motion (s)
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M	Earthquake Magnitude
kmax	maximum seismic coefficient (g)
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)
D	Predicted Sliding Displacment (cm)

H_{avr} = 190 ft

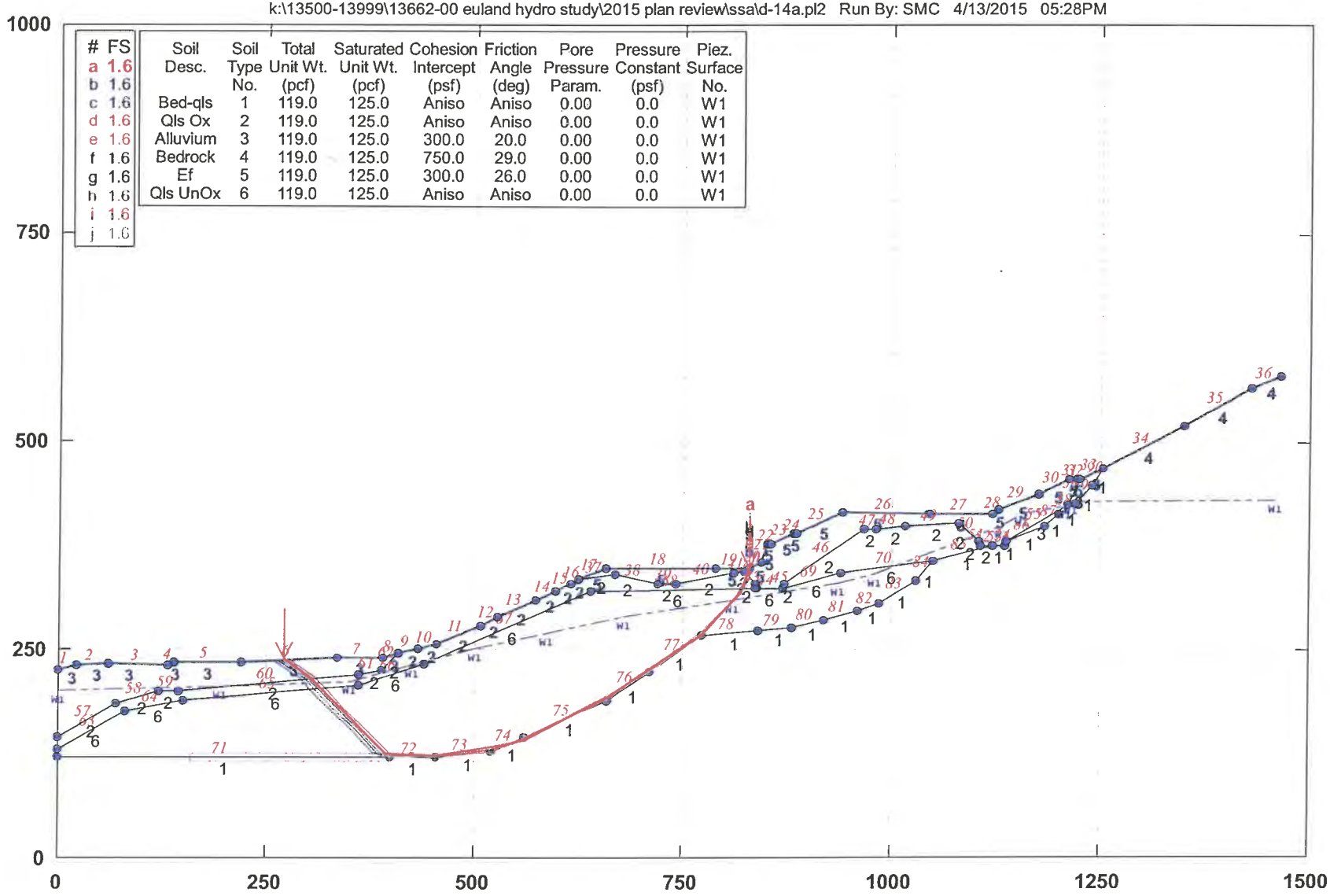
V_s = 2110 ft/s

$T_s = 4\ H_{avr}/V_s$ = 0.36 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland, Section D-D', - , static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-14a.pl2 Run By: SMC 4/13/2015 05:28PM



#	FS
a	1.6
b	1.6
c	1.6
d	1.6
e	1.6
f	1.6
g	1.6
h	1.6
i	1.6
j	1.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

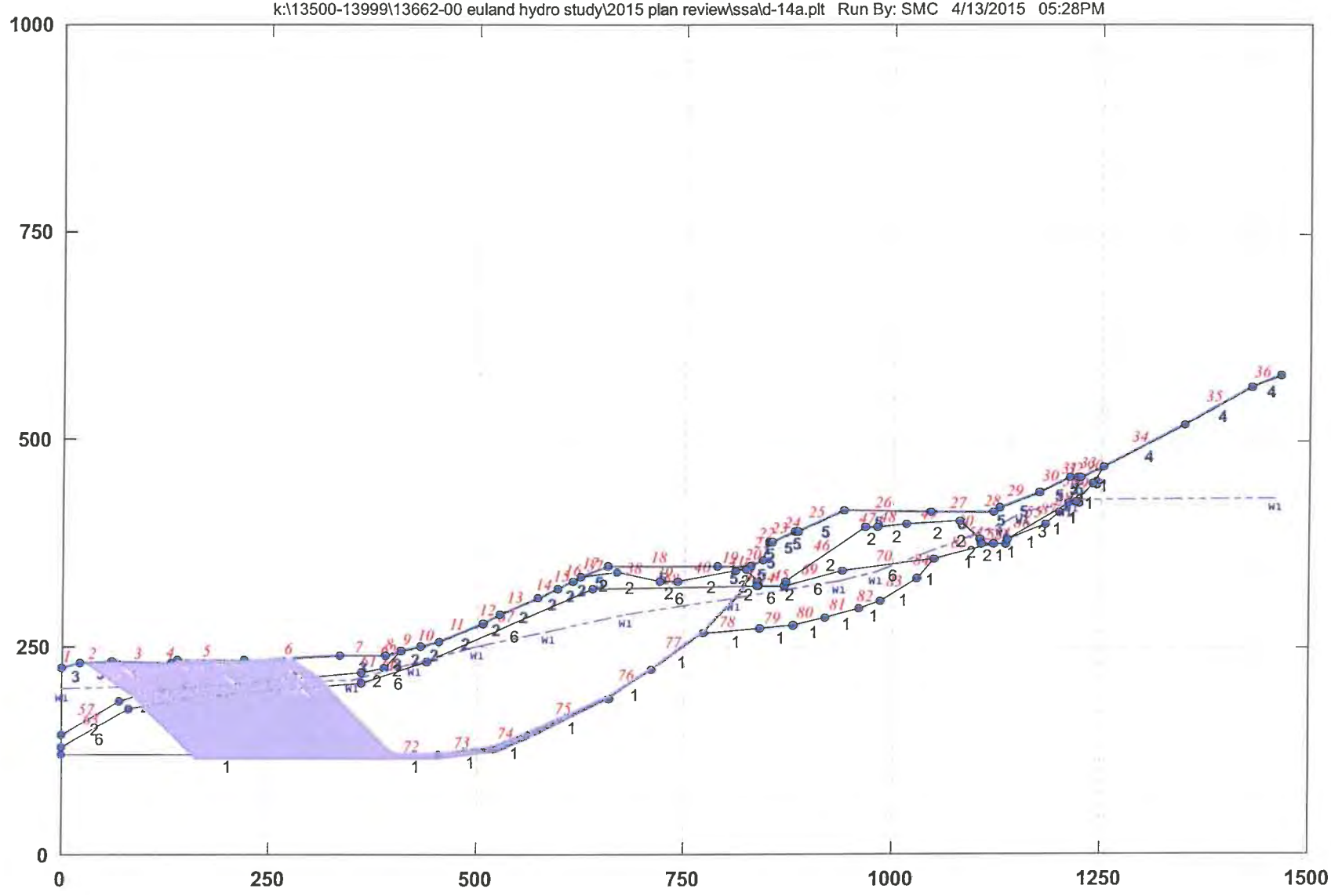
GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-23.1

13662-00, Euland, Section D-D', - , static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-14a.plt Run By: SMC 4/13/2015 05:28PM



SMC

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/13/2015
Time of Run: 05:28PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14a.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14a.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14a.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
90 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	625.00	335.00	2
17	625.00	335.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	5
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1225.00	456.00	5
33	1225.00	456.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	625.00	335.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	812.00	343.00	2
41	812.00	343.00	824.00	345.00	2
42	824.00	345.00	837.00	329.00	2
43	837.00	329.00	838.00	324.00	2
44	838.00	324.00	870.00	324.00	6
45	870.00	324.00	871.00	329.00	2
46	871.00	329.00	967.00	395.00	2
47	967.00	395.00	982.00	396.00	2
48	982.00	396.00	1016.00	400.00	2
49	1016.00	400.00	1080.00	403.00	2
50	1080.00	403.00	1105.00	380.00	2
51	1105.00	380.00	1106.00	375.00	2
52	1106.00	375.00	1120.00	375.00	2
53	1120.00	375.00	1136.00	375.00	1
54	1136.00	375.00	1137.00	380.00	1
55	1137.00	380.00	1210.00	425.00	3
56	1210.00	425.00	1225.00	456.00	3
57	0.00	145.00	70.00	185.00	2
58	70.00	185.00	120.00	200.00	2
59	120.00	200.00	145.00	200.00	2
60	145.00	200.00	360.00	220.00	2
61	360.00	220.00	388.00	226.00	2
62	388.00	226.00	408.00	245.00	2
63	0.00	130.00	80.00	175.00	6
64	80.00	175.00	150.00	188.00	6
65	150.00	188.00	360.00	207.00	6
66	360.00	207.00	440.00	232.00	6
67	440.00	232.00	640.00	320.00	6
68	640.00	320.00	837.00	324.00	6
69	870.00	324.00	940.00	343.00	6
70	940.00	343.00	1050.00	358.00	6
71	0.00	120.00	400.00	120.00	1
72	400.00	120.00	455.00	120.00	1
73	455.00	120.00	520.00	129.00	1
74	520.00	129.00	560.00	145.00	1
75	560.00	145.00	660.00	189.00	1
76	660.00	189.00	711.00	223.00	1
77	711.00	223.00	772.00	267.00	1
78	772.00	267.00	840.00	272.00	1
79	840.00	272.00	880.00	277.00	1
80	880.00	277.00	920.00	286.00	1
81	920.00	286.00	960.00	296.00	1
82	960.00	296.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	358.00	1
85	1050.00	358.00	1120.00	375.00	1
86	1137.00	380.00	1183.00	400.00	1
87	1183.00	400.00	1200.00	414.00	1
88	1200.00	414.00	1220.00	426.00	1
89	1220.00	426.00	1240.00	449.00	1
90	1240.00	449.00	1252.00	468.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	400.00	120.00	10.00
2	455.00	120.00	455.00	120.00	10.00
3	520.00	129.00	525.00	129.00	10.00
4	560.00	145.00	560.00	145.00	10.00
5	660.00	191.00	660.00	191.00	5.00
6	711.00	225.00	711.00	225.00	5.00
7	772.00	269.00	772.00	269.00	5.00
8	820.00	320.00	820.00	320.00	5.00
9	830.00	348.00	830.00	348.00	0.00

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 = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.813 FS Min = 1.610 FS Ave = 1.701
Standard Deviation = 0.038 Coefficient of Variation = 2.23 %
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.874	237.255
2	303.962	214.787
3	315.753	202.997
4	337.616	181.133
5	365.900	152.849
6	394.185	124.565
7	455.000	122.197
8	524.347	133.164
9	560.000	141.406
10	660.000	192.179
11	711.000	226.479
12	772.000	267.322
13	820.000	319.677
14	830.000	348.000

Factor of Safety
*** 1.610 ***

Individual data on the 48 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	32.1	45560.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	6.1	19463.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	5.7	22751.5	0.0	1498.9	0.	0.	0.0	0.0	0.0
4	19.2	107667.8	0.0	26924.2	0.	0.	0.0	0.0	0.0
5	2.6	18344.3	0.0	6263.7	0.	0.	0.0	0.0	0.0
6	11.4	89803.7	0.0	34513.8	0.	0.	0.0	0.0	0.0
7	11.0	102171.7	0.0	44332.2	0.	0.	0.0	0.0	0.0
8	5.9	61102.8	0.0	29157.1	0.	0.	0.0	0.0	0.0
9	22.1	267948.8	0.0	*******	0.	0.	0.0	0.0	0.0
10	2.0	27293.7	0.0	15502.7	0.	0.	0.0	0.0	0.0
11	4.2	59030.3	0.0	33831.8	0.	0.	0.0	0.0	0.0
12	13.8	203261.1	0.0	82989.5	0.	0.	0.0	0.0	0.0
13	17.0	259251.8	0.0	*******	0.	0.	0.0	0.0	0.0
14	7.0	109366.6	0.0	45518.2	0.	0.	0.0	0.0	0.0
15	8.0	127107.6	0.0	53127.9	0.	0.	0.0	0.0	0.0
16	11.5	187708.6	0.0	78706.5	0.	0.	0.0	0.0	0.0
17	2.5	40714.3	0.0	17108.7	0.	0.	0.0	0.0	0.0
18	1.0	16616.5	0.0	6982.3	0.	0.	0.0	0.0	0.0
19	45.0	781926.6	0.0	*******	0.	0.	0.0	0.0	0.0
20	8.0	145935.3	0.0	59577.2	0.	0.	0.0	0.0	0.0
21	16.3	306217.1	0.0	*******	0.	0.	0.0	0.0	0.0
22	2.7	50788.3	0.0	20283.1	0.	0.	0.0	0.0	0.0
23	11.7	226504.4	0.0	89544.1	0.	0.	0.0	0.0	0.0
24	21.3	420664.7	0.0	*******	0.	0.	0.0	0.0	0.0
25	14.0	279618.6	0.0	*******	0.	0.	0.0	0.0	0.0
26	12.0	238188.1	0.0	95771.0	0.	0.	0.0	0.0	0.0
27	11.0	217060.5	0.0	85685.2	0.	0.	0.0	0.0	0.0
28	16.1	316187.4	0.0	*******	0.	0.	0.0	0.0	0.0
29	2.9	57733.8	0.0	21482.8	0.	0.	0.0	0.0	0.0
30	9.0	177322.0	0.0	64835.0	0.	0.	0.0	0.0	0.0
31	15.0	294085.7	0.0	*******	0.	0.	0.0	0.0	0.0
32	18.0	348366.8	0.0	*******	0.	0.	0.0	0.0	0.0
33	2.0	38308.2	0.0	12852.7	0.	0.	0.0	0.0	0.0
34	9.0	168476.9	0.0	60584.0	0.	0.	0.0	0.0	0.0
35	11.0	196815.5	0.0	70326.0	0.	0.	0.0	0.0	0.0
36	31.0	500779.9	0.0	*******	0.	0.	0.0	0.0	0.0
37	9.0	130443.0	0.0	44070.7	0.	0.	0.0	0.0	0.0

38	22.0	290647.6	0.0	94674.9	0.	0.	0.0	0.0	0.0
39	30.0	331803.2	0.0	99243.4	0.	0.	0.0	0.0	0.0
40	18.0	154815.9	0.0	46656.1	0.	0.	0.0	0.0	0.0
41	20.0	120583.5	0.0	19346.8	0.	0.	0.0	0.0	0.0
42	1.3	6052.1	0.0	74.0	0.	0.	0.0	0.0	0.0
43	0.7	3029.9	0.0	0.0	0.	0.	0.0	0.0	0.0
44	8.0	31116.6	0.0	0.0	0.	0.	0.0	0.0	0.0
45	1.4	4430.2	0.0	0.0	0.	0.	0.0	0.0	0.0
46	2.6	6355.0	0.0	0.0	0.	0.	0.0	0.0	0.0
47	3.4	4965.8	0.0	0.0	0.	0.	0.0	0.0	0.0
48	2.6	1100.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.874	237.255
2	303.962	214.787
3	315.753	202.997
4	337.616	181.133
5	365.900	152.849
6	394.185	124.565
7	455.000	122.197
8	524.347	133.164
9	560.000	141.406
10	660.000	192.179
11	711.000	226.479
12	772.000	267.322
13	820.000	319.677
14	830.000	348.000

Factor of Safety

*** 1.610 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	257.518	236.631
2	257.736	236.478
3	290.502	213.535
4	302.261	201.776
5	322.499	181.539
6	350.783	153.254
7	379.067	124.970
8	455.000	120.375
9	520.243	132.554
10	560.000	142.944
11	660.000	193.241
12	711.000	225.803
13	772.000	266.627
14	820.000	319.431
15	830.000	348.000

Factor of Safety

*** 1.614 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.349	237.450
2	308.157	215.177
3	319.957	203.377
4	343.124	180.211
5	371.408	151.926
6	399.692	123.642
7	455.000	120.922
8	522.547	129.976
9	560.000	142.241
10	660.000	191.327
11	711.000	224.826
12	772.000	269.088
13	820.000	317.829
14	830.000	348.000

Factor of Safety

*** 1.622 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	270.793	237.208
2	302.948	214.693
3	314.736	202.905
4	336.796	180.845
5	365.080	152.561
6	393.364	124.277
7	455.000	121.323
8	522.806	125.767
9	560.000	144.047
10	660.000	193.050
11	711.000	222.683
12	772.000	270.889
13	820.000	318.889
14	830.000	348.000

Factor of Safety
*** 1.624 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	267.548	237.067
2	299.906	214.410
3	311.687	202.629
4	334.335	179.981
5	362.619	151.697
6	390.903	123.412
7	455.000	118.701
8	523.185	133.575
9	560.000	141.972
10	660.000	190.665
11	711.000	226.294
12	772.000	266.590
13	820.000	321.523
14	830.000	348.000

Factor of Safety
*** 1.625 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	263.688	236.899
2	296.287	214.073
3	308.060	202.301
4	330.350	180.010
5	358.635	151.726
6	386.919	123.442
7	455.000	123.027
8	524.273	129.073
9	560.000	140.517
10	660.000	189.899
11	711.000	226.425
12	772.000	271.058
13	820.000	321.264
14	830.000	348.000

Factor of Safety
*** 1.627 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	263.688	236.899
2	296.287	214.073
3	308.060	202.301
4	330.350	180.010
5	358.635	151.726
6	386.919	123.442
7	455.000	123.027
8	524.273	129.073
9	560.000	140.517
10	660.000	189.899
11	711.000	226.425

12	772.000	271.058
13	820.000	321.264
14	830.000	348.000

Factor of Safety
*** 1.627 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.637	237.289
2	304.677	214.854
3	316.469	203.061
4	341.366	178.165
5	369.650	149.880
6	397.935	121.596
7	455.000	120.478
8	520.675	132.696
9	560.000	142.187
10	660.000	193.195
11	711.000	223.120
12	772.000	269.588
13	820.000	317.568
14	830.000	348.000

Factor of Safety
*** 1.627 ***

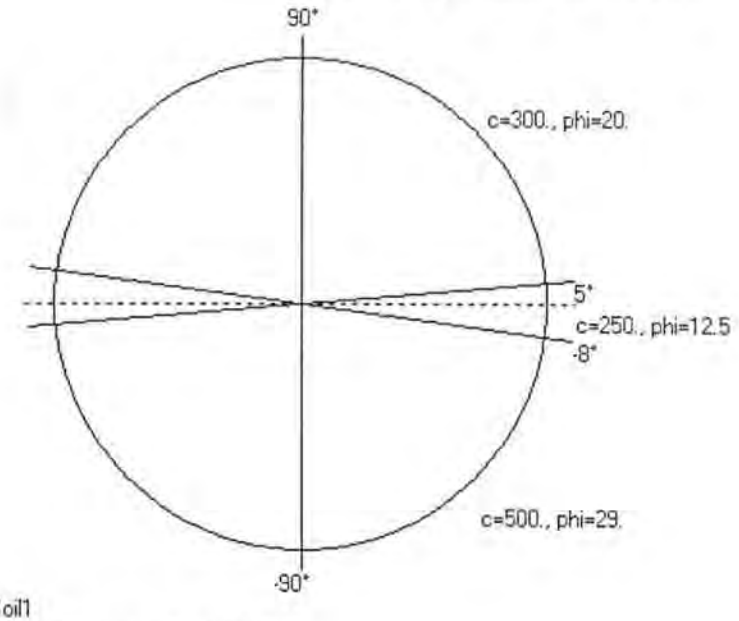
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.637	237.289
2	304.677	214.854
3	316.469	203.061
4	341.366	178.165
5	369.650	149.880
6	397.935	121.596
7	455.000	120.478
8	520.675	132.696
9	560.000	142.187
10	660.000	193.195
11	711.000	223.120
12	772.000	269.588
13	820.000	317.568
14	830.000	348.000

Factor of Safety
*** 1.627 ***

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

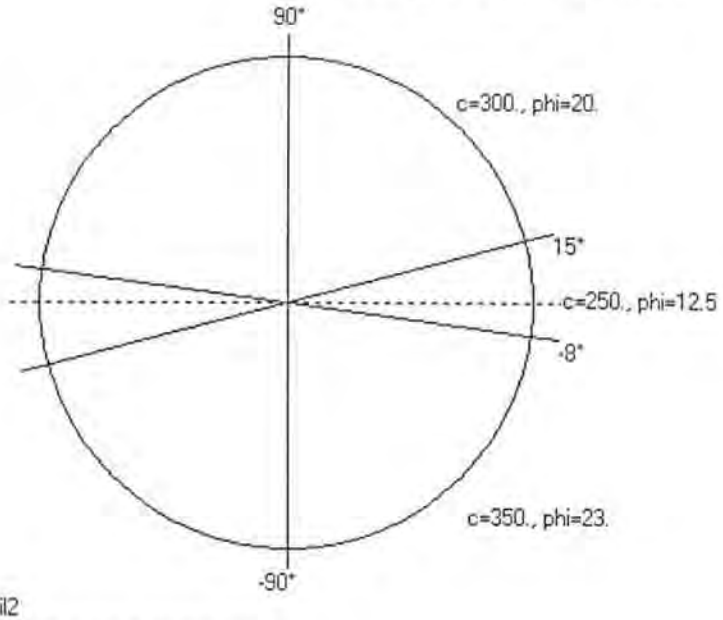
Anisotropic Soil Definition



Soil1

13662-00, Euland, Section D-D',

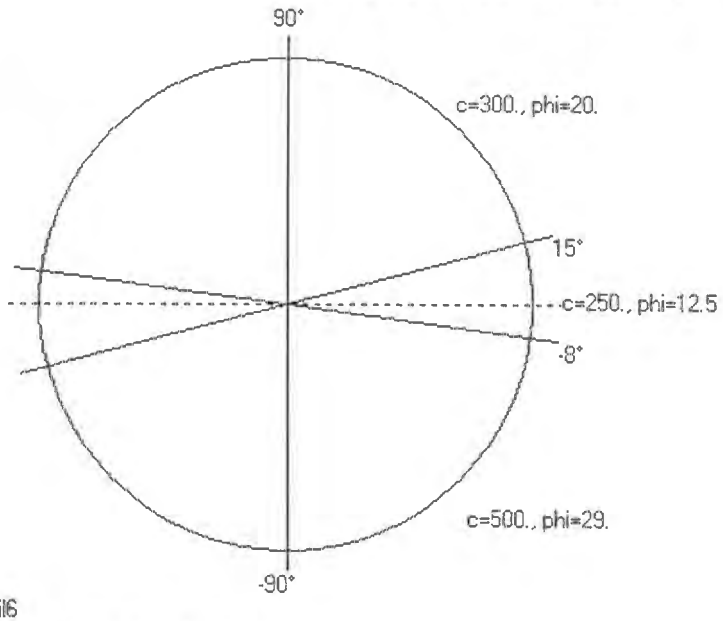
Anisotropic Soil Definition



Soil2

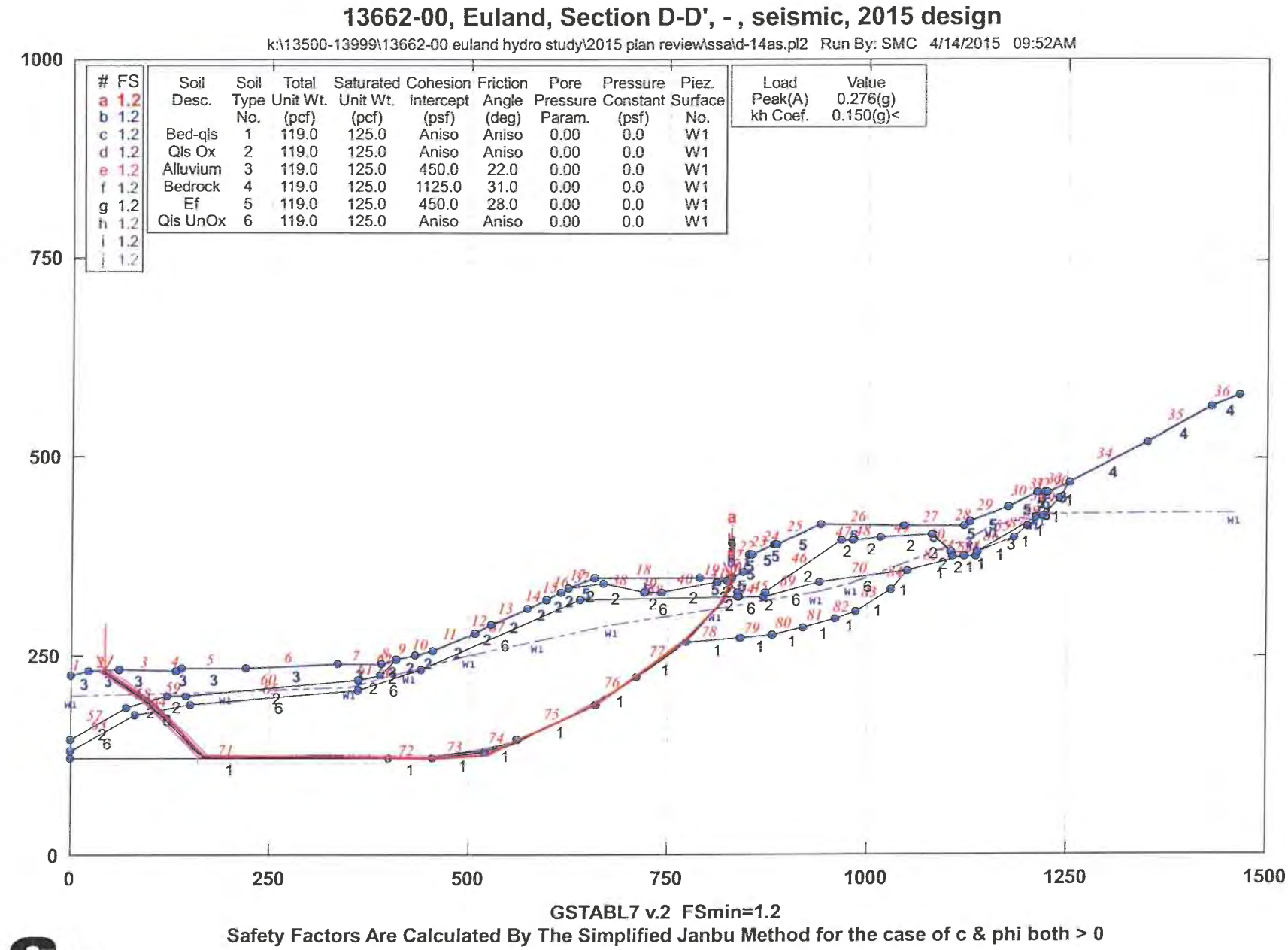
13662-00, Euland, Section D-D'.

Anisotropic Soil Definition



Soil6

13662-00, Euland, Section D-D',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b 1.2
c 1.2
d 1.2
e 1.2
f 1.2
g 1.2
h 1.2
i 1.2
j 1.2
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
1000
750
500
250
0
0
250
500
750
1000
1250
1500
GSTABL7 v.2 FSmin=1.2
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-23.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/14/2015
Time of Run: 09:52AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14as.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14as.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14as.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
90 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	625.00	335.00	2
17	625.00	335.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	5
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1225.00	456.00	5
33	1225.00	456.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	625.00	335.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	812.00	343.00	2
41	812.00	343.00	824.00	345.00	2
42	824.00	345.00	837.00	329.00	2
43	837.00	329.00	838.00	324.00	2
44	838.00	324.00	870.00	324.00	6
45	870.00	324.00	871.00	329.00	2
46	871.00	329.00	967.00	395.00	2
47	967.00	395.00	982.00	396.00	2
48	982.00	396.00	1016.00	400.00	2
49	1016.00	400.00	1080.00	403.00	2
50	1080.00	403.00	1105.00	380.00	2
51	1105.00	380.00	1106.00	375.00	2
52	1106.00	375.00	1120.00	375.00	2
53	1120.00	375.00	1136.00	375.00	1
54	1136.00	375.00	1137.00	380.00	1
55	1137.00	380.00	1210.00	425.00	3
56	1210.00	425.00	1225.00	456.00	3
57	0.00	145.00	70.00	185.00	2
58	70.00	185.00	120.00	200.00	2
59	120.00	200.00	145.00	200.00	2
60	145.00	200.00	360.00	220.00	2
61	360.00	220.00	388.00	226.00	2
62	388.00	226.00	408.00	245.00	2
63	0.00	130.00	80.00	175.00	6
64	80.00	175.00	150.00	188.00	6
65	150.00	188.00	360.00	207.00	6
66	360.00	207.00	440.00	232.00	6
67	440.00	232.00	640.00	320.00	6
68	640.00	320.00	837.00	324.00	6
69	870.00	324.00	940.00	343.00	6
70	940.00	343.00	1050.00	358.00	6
71	0.00	120.00	400.00	120.00	1
72	400.00	120.00	455.00	120.00	1
73	455.00	120.00	520.00	129.00	1
74	520.00	129.00	560.00	145.00	1
75	560.00	145.00	660.00	189.00	1
76	660.00	189.00	711.00	223.00	1
77	711.00	223.00	772.00	267.00	1
78	772.00	267.00	840.00	272.00	1
79	840.00	272.00	880.00	277.00	1
80	880.00	277.00	920.00	286.00	1
81	920.00	286.00	960.00	296.00	1
82	960.00	296.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	358.00	1
85	1050.00	358.00	1120.00	375.00	1
86	1137.00	380.00	1183.00	400.00	1
87	1183.00	400.00	1200.00	414.00	1
88	1200.00	414.00	1220.00	426.00	1
89	1220.00	426.00	1240.00	449.00	1
90	1240.00	449.00	1252.00	468.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	400.00	120.00	10.00
2	455.00	120.00	455.00	120.00	10.00
3	520.00	129.00	525.00	129.00	10.00
4	560.00	145.00	560.00	145.00	10.00
5	660.00	191.00	660.00	191.00	5.00

6	711.00	225.00	711.00	225.00	5.00
7	772.00	269.00	772.00	269.00	5.00
8	820.00	320.00	820.00	320.00	5.00
9	830.00	348.00	830.00	348.00	0.00

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 = 3000

Number of Trial Surfaces With Valid FS = 3000

Statistical Data On All Valid FS Values:

FS Max = 1.359 FS Min = 1.177 FS Ave = 1.255

Standard Deviation = 0.033 Coefficient of Variation = 2.63 %

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.498	231.079
2	65.087	215.842
3	98.248	193.475
4	110.971	180.752
5	138.674	153.049
6	166.958	124.765
7	455.000	120.092
8	522.621	124.068
9	560.000	143.129
10	660.000	188.607
11	711.000	224.880
12	772.000	270.352
13	820.000	321.242
14	830.000	348.000

Factor of Safety

*** 1.177 ***

Individual data on the 57 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	17.5	13253.1	0.0	0.0	0.	0.	1988.0	0.0	0.0
2	5.1	8699.2	0.0	0.0	0.	0.	1304.9	0.0	0.0
3	20.2	54337.6	0.0	0.0	0.	0.	8150.6	0.0	0.0
4	12.9	51500.1	0.0	4395.7	0.	0.	7725.0	0.0	0.0
5	12.7	67244.5	0.0	17474.4	0.	0.	10086.7	0.0	0.0
6	9.0	59680.6	0.0	21285.5	0.	0.	8952.1	0.0	0.0
7	11.0	86127.7	0.0	35899.8	0.	0.	12919.2	0.0	0.0
8	7.7	70855.8	0.0	31526.9	0.	0.	10628.4	0.0	0.0
9	1.3	13387.6	0.0	5988.8	0.	0.	2008.1	0.0	0.0
10	5.0	52669.7	0.0	24008.9	0.	0.	7900.5	0.0	0.0
11	5.0	55798.5	0.0	26270.9	0.	0.	8369.8	0.0	0.0
12	17.0	212547.2	0.0	*******	0.	0.	31882.1	0.0	0.0
13	28.0	382085.9	0.0	*******	0.	0.	57312.9	0.0	0.0
14	5.8	78703.6	0.0	29043.9	0.	0.	11805.5	0.0	0.0
15	19.2	263390.5	0.0	97731.8	0.	0.	39508.6	0.0	0.0
16	115.0	1625736.5	0.0	*******	0.	0.	*******	0.0	0.0
17	14.0	204087.7	0.0	76713.2	0.	0.	30613.2	0.0	0.0
18	11.0	160555.2	0.0	59600.6	0.	0.	24083.3	0.0	0.0
19	28.0	410625.8	0.0	*******	0.	0.	61593.9	0.0	0.0
20	2.0	29437.0	0.0	12000.6	0.	0.	4415.5	0.0	0.0
21	18.0	270927.3	0.0	*******	0.	0.	40639.1	0.0	0.0
22	17.0	265572.6	0.0	*******	0.	0.	39835.9	0.0	0.0
23	7.0	111731.1	0.0	46632.9	0.	0.	16759.7	0.0	0.0
24	8.0	129639.6	0.0	54318.8	0.	0.	19445.9	0.0	0.0
25	11.5	191041.0	0.0	80268.4	0.	0.	28656.2	0.0	0.0
26	2.5	41376.4	0.0	17418.1	0.	0.	6206.5	0.0	0.0
27	1.0	16880.6	0.0	7105.6	0.	0.	2532.1	0.0	0.0
28	1.2	19589.4	0.0	8251.4	0.	0.	2938.4	0.0	0.0
29	43.8	786712.1	0.0	*******	0.	0.	*******	0.0	0.0
30	8.0	152900.2	0.0	62345.0	0.	0.	22935.0	0.0	0.0
31	12.0	235574.9	0.0	94787.5	0.	0.	35336.2	0.0	0.0
32	2.6	52529.8	0.0	20902.3	0.	0.	7879.5	0.0	0.0
33	4.4	88116.1	0.0	39030.6	0.	0.	13217.4	0.0	0.0

34	33.0	659020.2	0.0	*******	0.	0.	98853.0	0.0	0.0
35	14.0	277253.9	0.0	*******	0.	0.	41588.1	0.0	0.0
36	12.0	237192.5	0.0	93277.8	0.	0.	35578.9	0.0	0.0
37	11.0	216984.2	0.0	83890.1	0.	0.	32547.6	0.0	0.0
38	19.0	375673.8	0.0	*******	0.	0.	56351.1	0.0	0.0
39	9.0	178985.3	0.0	64401.2	0.	0.	26847.8	0.0	0.0
40	15.0	298048.2	0.0	*******	0.	0.	44707.2	0.0	0.0
41	18.0	355085.7	0.0	*******	0.	0.	53262.9	0.0	0.0
42	2.0	39187.0	0.0	13061.6	0.	0.	5878.0	0.0	0.0
43	8.8	168833.2	0.0	62699.4	0.	0.	25325.0	0.0	0.0
44	0.2	3462.2	0.0	1281.7	0.	0.	519.3	0.0	0.0
45	11.0	200951.2	0.0	74091.4	0.	0.	30142.7	0.0	0.0
46	31.0	509294.9	0.0	*******	0.	0.	76394.2	0.0	0.0
47	9.0	131857.1	0.0	46546.0	0.	0.	19778.6	0.0	0.0
48	22.0	290871.4	0.0	98259.5	0.	0.	43630.7	0.0	0.0
49	30.0	324713.9	0.0	98491.0	0.	0.	48707.1	0.0	0.0
50	18.0	148620.3	0.0	41493.6	0.	0.	22293.1	0.0	0.0
51	19.3	111977.6	0.0	15164.1	0.	0.	16796.6	0.0	0.0
52	2.7	11811.4	0.0	0.0	0.	0.	1771.7	0.0	0.0
53	8.0	29510.5	0.0	0.0	0.	0.	4426.6	0.0	0.0
54	0.9	2761.4	0.0	0.0	0.	0.	414.2	0.0	0.0
55	3.1	7427.9	0.0	0.0	0.	0.	1114.2	0.0	0.0
56	3.3	4606.4	0.0	0.0	0.	0.	691.0	0.0	0.0
57	2.7	1125.0	0.0	0.0	0.	0.	168.7	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	38.420	230.864
2	62.045	214.930
3	95.206	192.562
4	107.636	180.132
5	134.689	153.079
6	162.974	124.794
7	455.000	124.418
8	523.709	129.566
9	560.000	141.674
10	660.000	192.841
11	711.000	225.012
12	772.000	269.820
13	820.000	320.984
14	830.000	348.000

Factor of Safety
*** 1.178 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	38.420	230.864
2	62.045	214.930
3	95.206	192.562
4	107.636	180.132
5	134.689	153.079
6	162.974	124.794
7	455.000	124.418
8	523.709	129.566
9	560.000	141.674
10	660.000	192.841
11	711.000	225.012
12	772.000	269.820
13	820.000	320.984
14	830.000	348.000

Factor of Safety
*** 1.178 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.499	230.658
2	59.119	214.052
3	92.280	191.684
4	104.428	179.537
5	104.647	179.317

6	132.932	151.033
7	161.216	122.748
8	455.000	123.974
9	521.837	132.286
10	560.000	141.620
11	660.000	189.708
12	711.000	223.305
13	772.000	270.320
14	820.000	320.722
15	830.000	348.000

Factor of Safety
*** 1.180 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.499	230.658
2	59.119	214.052
3	92.280	191.684
4	104.428	179.537
5	104.647	179.317
6	132.932	151.033
7	161.216	122.748
8	455.000	123.974
9	521.837	132.286
10	560.000	141.620
11	660.000	189.708
12	711.000	223.305
13	772.000	270.320
14	820.000	320.722
15	830.000	348.000

Factor of Safety
*** 1.180 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	37.278	230.804
2	61.192	214.674
3	94.354	192.306
4	106.701	179.959
5	133.869	152.790
6	162.153	124.506
7	455.000	123.544
8	522.169	132.168
9	560.000	144.316
10	660.000	188.712
11	711.000	226.216
12	772.000	268.387
13	820.000	320.195
14	830.000	348.000

Factor of Safety
*** 1.180 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	39.719	230.933
2	63.014	215.220
3	96.175	192.853
4	108.698	180.330
5	109.452	179.576
6	137.736	151.291
7	166.021	123.007
8	455.000	120.522
9	522.289	124.185
10	560.000	140.434
11	660.000	189.603
12	711.000	226.970
13	772.000	267.286
14	820.000	321.770
15	830.000	348.000

Factor of Safety

*** 1.183 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.874	231.362
2	69.098	217.046
3	102.260	194.678
4	115.369	181.569
5	117.421	179.517
6	145.705	151.233
7	173.989	122.949
8	455.000	121.870
9	520.111	133.189
10	560.000	143.344
11	660.000	191.136
12	711.000	226.706
13	772.000	268.350
14	820.000	322.287
15	830.000	348.000

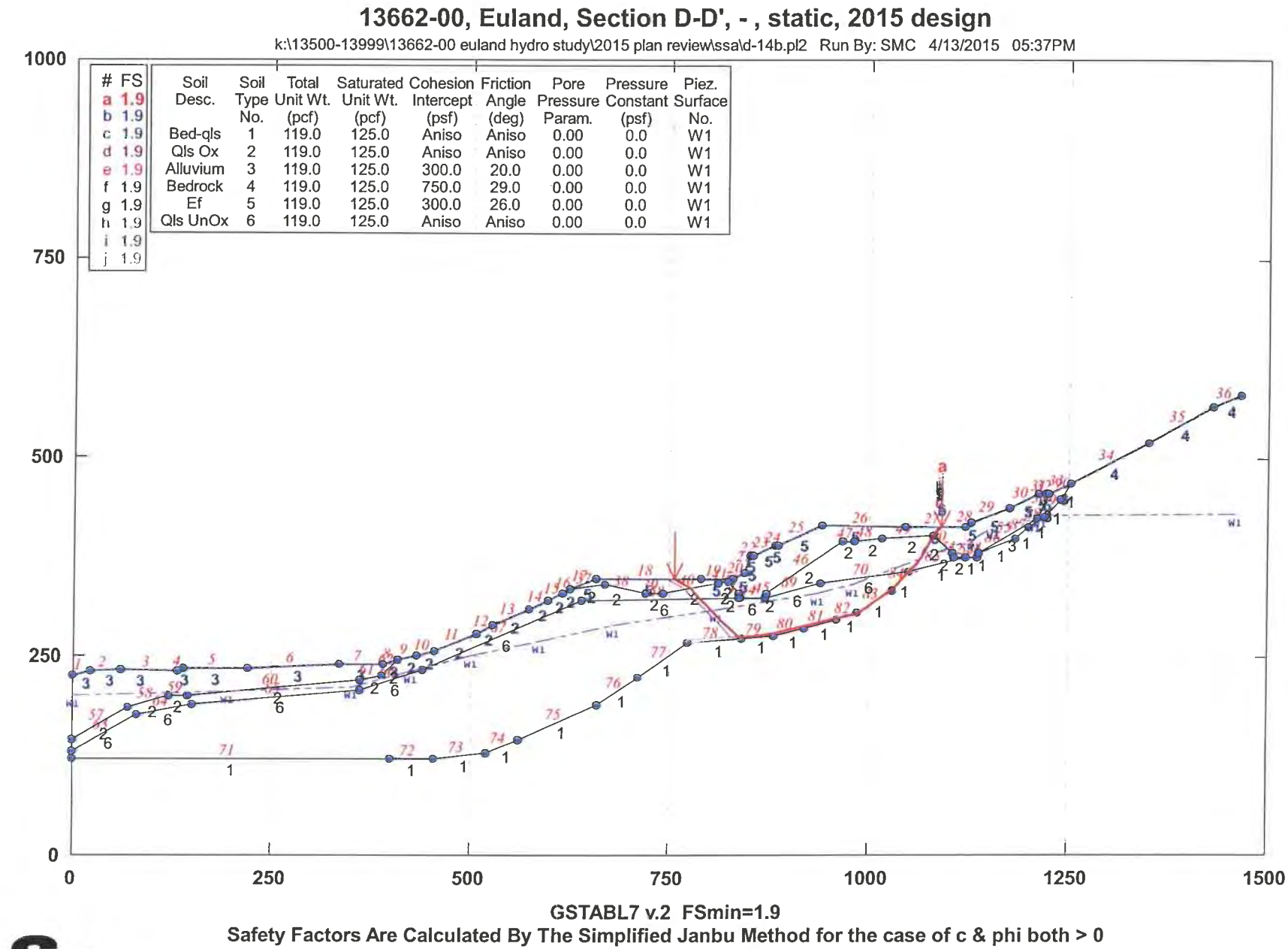
Factor of Safety
*** 1.184 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.874	231.362
2	69.098	217.046
3	102.260	194.678
4	115.369	181.569
5	117.421	179.517
6	145.705	151.233
7	173.989	122.949
8	455.000	121.870
9	520.111	133.189
10	560.000	143.344
11	660.000	191.136
12	711.000	226.706
13	772.000	268.350
14	820.000	322.287
15	830.000	348.000

Factor of Safety
*** 1.184 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.135	230.744
2	60.339	214.418
3	93.501	192.050
4	105.766	179.785
5	133.049	152.502
6	161.333	124.218
7	455.000	122.670
8	520.628	124.771
9	560.000	146.957
10	660.000	189.584
11	711.000	227.419
12	772.000	266.954
13	820.000	319.406
14	830.000	348.000

Factor of Safety
*** 1.184 ***
**** END OF GSTABL7 OUTPUT ****


13662-00, Euland, Section D-D', - , static, 2015 design
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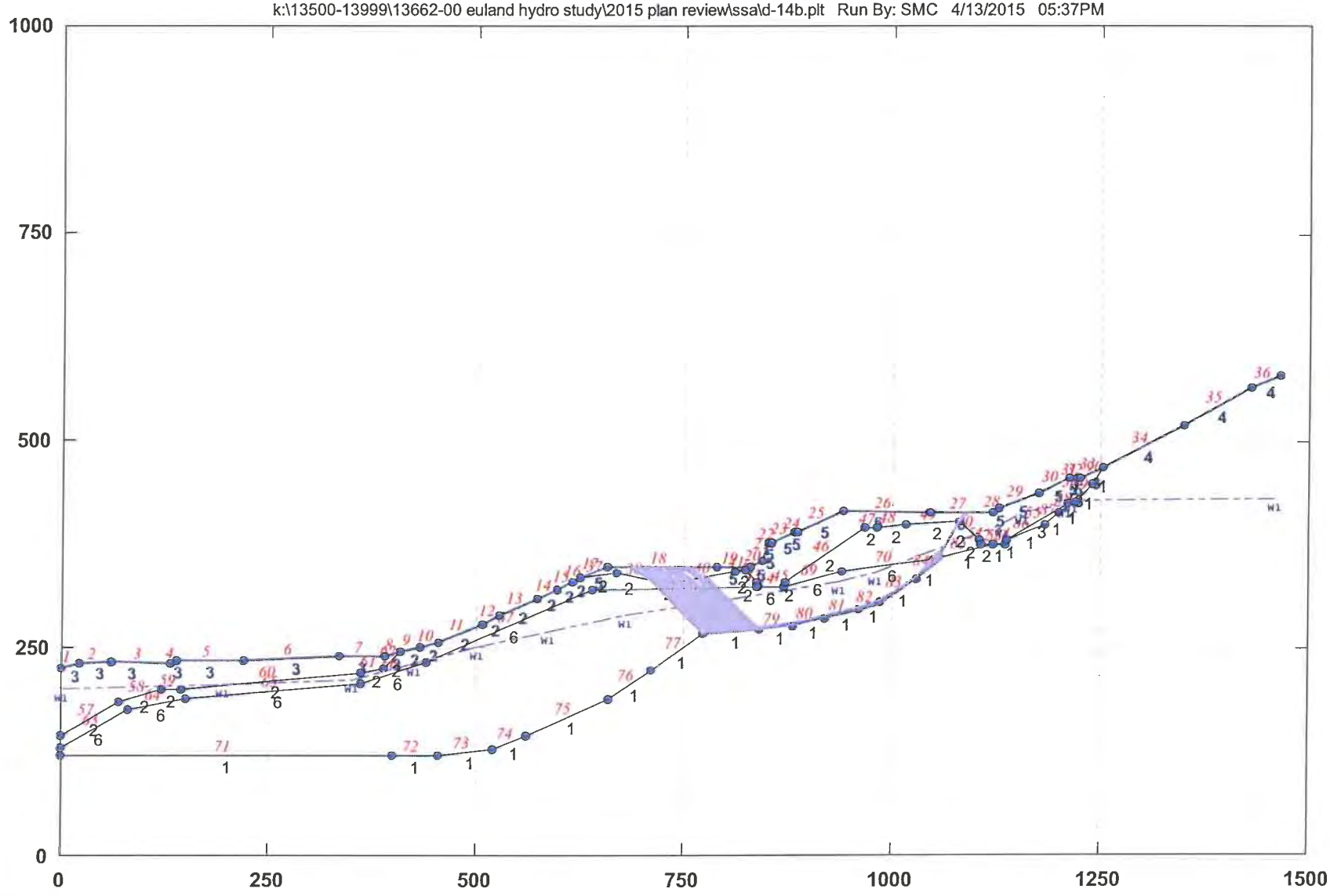
FS
a 1.9
b 1.9
c 1.9
d 1.9
e 1.9
f 1.9
g 1.9
h 1.9
i 1.9
j 1.9
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1000
750
500
250
0
0
250
500
750
1000
1250
1500
GSTABL7 v.2 FSmin=1.9
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-24.1

13662-00, Euland, Section D-D', - , static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-14b.plt Run By: SMC 4/13/2015 05:37PM



SMC

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/13/2015
Time of Run: 05:37PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14b.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14b.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14b.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
90 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	625.00	335.00	2
17	625.00	335.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	5
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1225.00	456.00	5
33	1225.00	456.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	625.00	335.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	812.00	343.00	2
41	812.00	343.00	824.00	345.00	2
42	824.00	345.00	837.00	329.00	2
43	837.00	329.00	838.00	324.00	2
44	838.00	324.00	870.00	324.00	6
45	870.00	324.00	871.00	329.00	2
46	871.00	329.00	967.00	395.00	2
47	967.00	395.00	982.00	396.00	2
48	982.00	396.00	1016.00	400.00	2
49	1016.00	400.00	1080.00	403.00	2
50	1080.00	403.00	1105.00	380.00	2
51	1105.00	380.00	1106.00	375.00	2
52	1106.00	375.00	1120.00	375.00	2
53	1120.00	375.00	1136.00	375.00	1
54	1136.00	375.00	1137.00	380.00	1
55	1137.00	380.00	1210.00	425.00	3
56	1210.00	425.00	1225.00	456.00	3
57	0.00	145.00	70.00	185.00	2
58	70.00	185.00	120.00	200.00	2
59	120.00	200.00	145.00	200.00	2
60	145.00	200.00	360.00	220.00	2
61	360.00	220.00	388.00	226.00	2
62	388.00	226.00	408.00	245.00	2
63	0.00	130.00	80.00	175.00	6
64	80.00	175.00	150.00	188.00	6
65	150.00	188.00	360.00	207.00	6
66	360.00	207.00	440.00	232.00	6
67	440.00	232.00	640.00	320.00	6
68	640.00	320.00	837.00	324.00	6
69	870.00	324.00	940.00	343.00	6
70	940.00	343.00	1050.00	358.00	6
71	0.00	120.00	400.00	120.00	1
72	400.00	120.00	455.00	120.00	1
73	455.00	120.00	520.00	129.00	1
74	520.00	129.00	560.00	145.00	1
75	560.00	145.00	660.00	189.00	1
76	660.00	189.00	711.00	223.00	1
77	711.00	223.00	772.00	267.00	1
78	772.00	267.00	840.00	272.00	1
79	840.00	272.00	880.00	277.00	1
80	880.00	277.00	920.00	286.00	1
81	920.00	286.00	960.00	296.00	1
82	960.00	296.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	358.00	1
85	1050.00	358.00	1120.00	375.00	1
86	1137.00	380.00	1183.00	400.00	1
87	1183.00	400.00	1200.00	414.00	1
88	1200.00	414.00	1220.00	426.00	1
89	1220.00	426.00	1240.00	449.00	1
90	1240.00	449.00	1252.00	468.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
10 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	772.00	269.00	840.00	274.00	5.00
2	880.00	279.00	880.00	279.00	5.00
3	920.00	288.00	920.00	288.00	5.00
4	960.00	298.00	960.00	298.00	5.00
5	985.00	307.00	985.00	305.00	5.00
6	1030.00	335.00	1030.00	335.00	5.00
7	1050.00	360.00	1060.00	360.00	5.00
8	1061.00	368.00	1061.00	368.00	5.00
9	1070.00	383.00	1070.00	383.00	5.00

10 1080.00 403.00 1080.00 403.00 5.00

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 = 3000

Number of Trial Surfaces With Valid FS = 3000

Statistical Data On All Valid FS Values:

FS Max = 2.391 FS Min = 1.925 FS Ave = 2.119

Standard Deviation = 0.089 Coefficient of Variation = 4.21 %

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	757.158	348.000
2	775.891	336.294
3	789.157	323.029
4	795.395	316.791
5	816.608	295.578
6	837.821	274.364
7	880.000	280.528
8	920.000	290.199
9	960.000	298.508
10	985.000	304.567
11	1030.000	335.659
12	1054.142	362.190
13	1061.000	368.732
14	1070.000	381.005
15	1080.000	402.477
16	1080.272	402.750
17	1091.133	413.610

Factor of Safety

*** 1.925 ***

Individual data on the 46 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	18.7	13047.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	13.3	28949.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.8	2547.8	0.0	0.0	0.	0.	0.0	0.0	0.0
4	5.4	18303.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	7.8	32740.3	0.0	0.0	0.	0.	0.0	0.0	0.0
6	6.8	34351.7	0.0	2308.2	0.	0.	0.0	0.0	0.0
7	2.0	11248.2	0.0	1564.3	0.	0.	0.0	0.0	0.0
8	4.6	27831.3	0.0	5141.6	0.	0.	0.0	0.0	0.0
9	7.4	50230.9	0.0	12727.9	0.	0.	0.0	0.0	0.0
10	6.0	45827.9	0.0	14388.6	0.	0.	0.0	0.0	0.0
11	7.0	60553.4	0.0	21382.1	0.	0.	0.0	0.0	0.0
12	0.8	7684.9	0.0	2832.2	0.	0.	0.0	0.0	0.0
13	0.2	1688.9	0.0	446.5	0.	0.	0.0	0.0	0.0
14	7.0	67024.5	0.0	17483.3	0.	0.	0.0	0.0	0.0
15	6.0	66151.5	0.0	15016.3	0.	0.	0.0	0.0	0.0
16	4.0	49228.7	0.0	10026.6	0.	0.	0.0	0.0	0.0
17	15.0	188090.2	0.0	37711.5	0.	0.	0.0	0.0	0.0
18	1.0	12823.9	0.0	2520.4	0.	0.	0.0	0.0	0.0
19	9.0	117016.3	0.0	22718.7	0.	0.	0.0	0.0	0.0
20	2.0	26371.0	0.0	5136.1	0.	0.	0.0	0.0	0.0
21	4.0	52602.5	0.0	10209.1	0.	0.	0.0	0.0	0.0
22	34.0	459480.5	0.0	83375.3	0.	0.	0.0	0.0	0.0
23	16.0	226701.7	0.0	37133.8	0.	0.	0.0	0.0	0.0
24	4.0	57831.3	0.0	9080.4	0.	0.	0.0	0.0	0.0
25	1.0	14531.5	0.0	2273.1	0.	0.	0.0	0.0	0.0
26	19.0	271529.6	0.0	43421.0	0.	0.	0.0	0.0	0.0
27	7.0	97486.1	0.0	16174.8	0.	0.	0.0	0.0	0.0
28	13.0	176989.6	0.0	29915.8	0.	0.	0.0	0.0	0.0
29	1.3	17666.5	0.0	2904.6	0.	0.	0.0	0.0	0.0
30	0.7	9077.7	0.0	1502.1	0.	0.	0.0	0.0	0.0
31	3.0	39889.4	0.0	6678.5	0.	0.	0.0	0.0	0.0
32	6.3	81765.9	0.0	16252.0	0.	0.	0.0	0.0	0.0
33	21.4	252481.7	0.0	49047.2	0.	0.	0.0	0.0	0.0

34	3.3	35143.6	0.0	6656.3	0.	0.	0.0	0.0	0.0
35	14.0	139686.4	0.0	25896.7	0.	0.	0.0	0.0	0.0
36	16.0	132460.1	0.0	25516.9	0.	0.	0.0	0.0	0.0
37	1.6	11320.4	0.0	1694.1	0.	0.	0.0	0.0	0.0
38	2.4	16346.5	0.0	2249.6	0.	0.	0.0	0.0	0.0
39	0.4	2805.1	0.0	360.6	0.	0.	0.0	0.0	0.0
40	3.7	23602.3	0.0	2696.7	0.	0.	0.0	0.0	0.0
41	6.9	39119.7	0.0	2845.6	0.	0.	0.0	0.0	0.0
42	3.3	16836.0	0.0	533.6	0.	0.	0.0	0.0	0.0
43	5.7	24315.3	0.0	0.0	0.	0.	0.0	0.0	0.0
44	10.0	25764.4	0.0	0.0	0.	0.	0.0	0.0	0.0
45	0.3	351.4	0.0	0.0	0.	0.	0.0	0.0	0.0
46	10.9	6923.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	757.158	348.000
2	775.891	336.294
3	789.157	323.029
4	795.395	316.791
5	816.608	295.578
6	837.821	274.364
7	880.000	280.528
8	920.000	290.199
9	960.000	298.508
10	985.000	304.567
11	1030.000	335.659
12	1054.142	362.190
13	1061.000	368.732
14	1070.000	381.005
15	1080.000	402.477
16	1080.272	402.750
17	1091.133	413.610

Factor of Safety
*** 1.925 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	757.158	348.000
2	775.891	336.294
3	789.157	323.029
4	795.395	316.791
5	816.608	295.578
6	837.821	274.364
7	880.000	280.528
8	920.000	290.199
9	960.000	298.508
10	985.000	304.567
11	1030.000	335.659
12	1054.142	362.190
13	1061.000	368.732
14	1070.000	381.005
15	1080.000	402.477
16	1080.272	402.750
17	1091.133	413.610

Factor of Safety
*** 1.925 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	756.782	348.000
2	775.601	336.240
3	788.820	323.022
4	796.457	315.385
5	817.670	294.171
6	838.884	272.958
7	880.000	279.669
8	920.000	289.965
9	960.000	298.898
10	985.000	304.552

11	1030.000	337.299
12	1051.799	359.455
13	1061.000	366.623
14	1070.000	384.521
15	1080.000	401.618
16	1080.720	402.338
17	1087.735	413.564

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	756.782	348.000
2	775.601	336.240
3	788.820	323.022
4	796.457	315.385
5	817.670	294.171
6	838.884	272.958
7	880.000	279.669
8	920.000	289.965
9	960.000	298.898
10	985.000	304.552
11	1030.000	337.299
12	1051.799	359.455
13	1061.000	366.623
14	1070.000	384.521
15	1080.000	401.618
16	1080.720	402.338
17	1087.735	413.564

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 17 Coordinate Points

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1	756.782	348.000
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10	985.000	304.552
11	1030.000	337.299
12	1051.799	359.455
13	1061.000	366.623
14	1070.000	384.521
15	1080.000	401.618
16	1080.720	402.338
17	1087.735	413.564

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	747.916	348.000
2	768.767	334.971
3	780.878	322.860
4	785.766	317.972
5	806.979	296.759
6	828.192	275.546
7	880.000	279.566
8	920.000	289.823
9	960.000	299.655
10	985.000	305.521
11	1030.000	332.666
12	1052.258	358.532
13	1061.000	370.348
14	1070.000	381.332

15	1080.000	402.453
16	1080.285	402.738
17	1087.044	413.555

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	747.916	348.000
2	768.767	334.971
3	780.878	322.860
4	785.766	317.972
5	806.979	296.759
6	828.192	275.546
7	880.000	279.566
8	920.000	289.823
9	960.000	299.655
10	985.000	305.521
11	1030.000	332.666
12	1052.258	358.532
13	1061.000	370.348
14	1070.000	381.332
15	1080.000	402.453
16	1080.285	402.738
17	1087.044	413.555

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	747.916	348.000
2	768.767	334.971
3	780.878	322.860
4	785.766	317.972
5	806.979	296.759
6	828.192	275.546
7	880.000	279.566
8	920.000	289.823
9	960.000	299.655
10	985.000	305.521
11	1030.000	332.666
12	1052.258	358.532
13	1061.000	370.348
14	1070.000	381.332
15	1080.000	402.453
16	1080.285	402.738
17	1087.044	413.555

Factor of Safety
*** 1.932 ***

Failure Surface Specified By 17 Coordinate Points

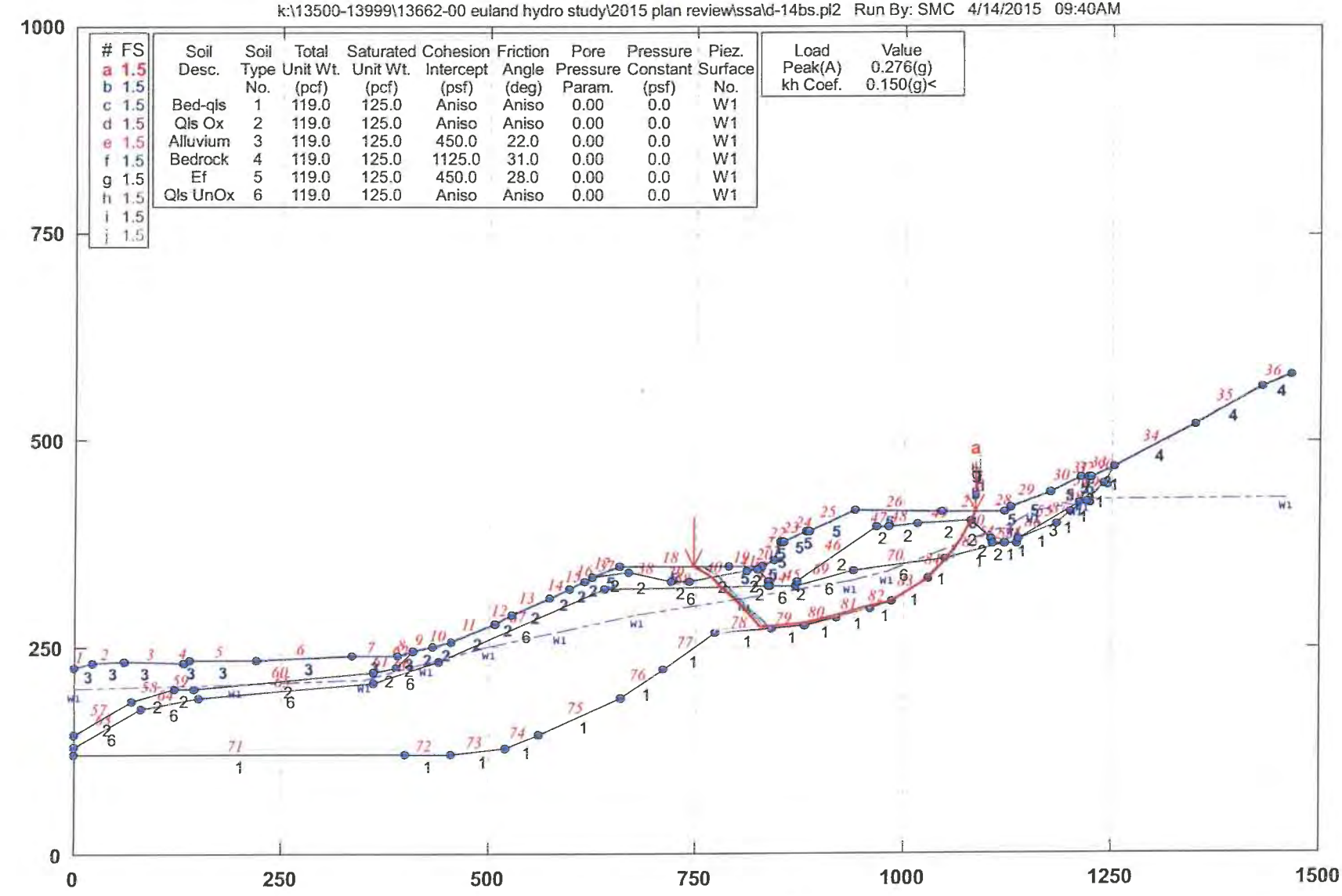
Point No.	X-Surf (ft)	Y-Surf (ft)
1	758.055	348.000
2	776.583	336.423
3	789.961	323.045
4	796.723	316.283
5	817.936	295.070
6	839.149	273.857
7	880.000	279.454
8	920.000	289.906
9	960.000	300.246
10	985.000	303.298
11	1030.000	335.210
12	1053.713	357.522
13	1061.000	366.095
14	1070.000	381.650
15	1080.000	402.653
16	1080.181	402.834
17	1090.954	413.607

Factor of Safety

*** 1.940 ***
**** END OF GSTABL7 OUTPUT ****

13662-00, Euland, Section D-D', - , seismic, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-14bs.pl2 Run By: SMC 4/14/2015 09:40AM



#	FS
a	1.5
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.5
h	1.5
i	1.5
j	1.5

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Ef	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-24.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/14/2015
Time of Run: 09:40AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14bs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14bs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14bs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
90 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	625.00	335.00	2
17	625.00	335.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	5
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1225.00	456.00	5
33	1225.00	456.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	625.00	335.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	812.00	343.00	2
41	812.00	343.00	824.00	345.00	2
42	824.00	345.00	837.00	329.00	2
43	837.00	329.00	838.00	324.00	2
44	838.00	324.00	870.00	324.00	6
45	870.00	324.00	871.00	329.00	2
46	871.00	329.00	967.00	395.00	2
47	967.00	395.00	982.00	396.00	2
48	982.00	396.00	1016.00	400.00	2
49	1016.00	400.00	1080.00	403.00	2
50	1080.00	403.00	1105.00	380.00	2
51	1105.00	380.00	1106.00	375.00	2
52	1106.00	375.00	1120.00	375.00	2
53	1120.00	375.00	1136.00	375.00	1
54	1136.00	375.00	1137.00	380.00	1
55	1137.00	380.00	1210.00	425.00	3
56	1210.00	425.00	1225.00	456.00	3
57	0.00	145.00	70.00	185.00	2
58	70.00	185.00	120.00	200.00	2
59	120.00	200.00	145.00	200.00	2
60	145.00	200.00	360.00	220.00	2
61	360.00	220.00	388.00	226.00	2
62	388.00	226.00	408.00	245.00	2
63	0.00	130.00	80.00	175.00	6
64	80.00	175.00	150.00	188.00	6
65	150.00	188.00	360.00	207.00	6
66	360.00	207.00	440.00	232.00	6
67	440.00	232.00	640.00	320.00	6
68	640.00	320.00	837.00	324.00	6
69	870.00	324.00	940.00	343.00	6
70	940.00	343.00	1050.00	358.00	6
71	0.00	120.00	400.00	120.00	1
72	400.00	120.00	455.00	120.00	1
73	455.00	120.00	520.00	129.00	1
74	520.00	129.00	560.00	145.00	1
75	560.00	145.00	660.00	189.00	1
76	660.00	189.00	711.00	223.00	1
77	711.00	223.00	772.00	267.00	1
78	772.00	267.00	840.00	272.00	1
79	840.00	272.00	880.00	277.00	1
80	880.00	277.00	920.00	286.00	1
81	920.00	286.00	960.00	296.00	1
82	960.00	296.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	358.00	1
85	1050.00	358.00	1120.00	375.00	1
86	1137.00	380.00	1183.00	400.00	1
87	1183.00	400.00	1200.00	414.00	1
88	1200.00	414.00	1220.00	426.00	1
89	1220.00	426.00	1240.00	449.00	1
90	1240.00	449.00	1252.00	468.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
10 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	772.00	269.00	840.00	274.00	5.00
2	880.00	279.00	880.00	279.00	5.00
3	920.00	288.00	920.00	288.00	5.00
4	960.00	298.00	960.00	298.00	5.00
5	985.00	307.00	985.00	305.00	5.00

6	1030.00	335.00	1030.00	335.00	5.00
7	1050.00	360.00	1060.00	360.00	5.00
8	1061.00	368.00	1061.00	368.00	5.00
9	1070.00	383.00	1070.00	383.00	5.00
10	1080.00	403.00	1080.00	403.00	5.00

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 = 3000

Number of Trial Surfaces With Valid FS = 3000

Statistical Data On All Valid FS Values:

FS Max = 1.698 FS Min = 1.483 FS Ave = 1.561

Standard Deviation = 0.038 Coefficient of Variation = 2.42 %

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	747.083	348.000
2	768.767	334.971
3	780.878	322.860
4	785.766	317.972
5	806.979	296.759
6	828.192	275.546
7	880.000	279.566
8	920.000	289.823
9	960.000	299.655
10	985.000	305.521
11	1030.000	332.666
12	1052.258	358.532
13	1061.000	370.348
14	1070.000	381.332
15	1080.000	402.453
16	1080.285	402.738
17	1086.782	413.551

Factor of Safety

*** 1.483 ***

Individual data on the 44 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	21.7	16809.8	0.0	0.0	0.	0.	2521.5	0.0	0.0
2	12.1	27503.3	0.0	0.0	0.	0.	4125.5	0.0	0.0
3	4.9	16044.8	0.0	0.0	0.	0.	2406.7	0.0	0.0
4	4.2	16197.0	0.0	0.0	0.	0.	2429.5	0.0	0.0
5	5.9	26157.2	0.0	0.0	0.	0.	3923.6	0.0	0.0
6	11.1	60641.1	0.0	6169.7	0.	0.	9096.2	0.0	0.0
7	3.0	19224.5	0.0	3826.0	0.	0.	2883.7	0.0	0.0
8	2.0	13358.8	0.0	3036.8	0.	0.	2003.8	0.0	0.0
9	12.0	90725.6	0.0	26704.9	0.	0.	13608.8	0.0	0.0
10	4.2	35966.4	0.0	12757.1	0.	0.	5395.0	0.0	0.0
11	1.8	15973.2	0.0	4181.5	0.	0.	2396.0	0.0	0.0
12	7.0	62938.6	0.0	16345.2	0.	0.	9440.8	0.0	0.0
13	1.0	9178.3	0.0	2355.1	0.	0.	1376.8	0.0	0.0
14	7.0	65558.3	0.0	16626.0	0.	0.	9833.7	0.0	0.0
15	6.0	65228.6	0.0	14446.5	0.	0.	9784.3	0.0	0.0
16	4.0	48784.7	0.0	9731.3	0.	0.	7317.7	0.0	0.0
17	15.0	187645.3	0.0	37207.2	0.	0.	28146.8	0.0	0.0
18	1.0	12862.8	0.0	2520.6	0.	0.	1929.4	0.0	0.0
19	9.0	117751.1	0.0	22911.1	0.	0.	17662.7	0.0	0.0
20	2.0	26607.7	0.0	5274.4	0.	0.	3991.2	0.0	0.0
21	4.0	53053.9	0.0	10474.1	0.	0.	7958.1	0.0	0.0
22	34.0	462135.2	0.0	85014.3	0.	0.	69320.3	0.0	0.0
23	16.0	226844.1	0.0	37512.3	0.	0.	34026.6	0.0	0.0
24	4.0	57676.7	0.0	9077.7	0.	0.	8651.5	0.0	0.0
25	1.0	14481.0	0.0	2266.5	0.	0.	2172.2	0.0	0.0
26	19.0	269665.9	0.0	42843.3	0.	0.	40449.9	0.0	0.0
27	7.0	96506.9	0.0	15656.2	0.	0.	14476.0	0.0	0.0
28	13.0	175296.7	0.0	29015.9	0.	0.	26294.5	0.0	0.0
29	2.0	26498.8	0.0	4281.3	0.	0.	3974.8	0.0	0.0

30	3.0	39528.4	0.0	6493.7	0.	0.	5929.3	0.0	0.0
31	27.4	331787.1	0.0	62598.7	0.	0.	49768.1	0.0	0.0
32	0.3	3364.7	0.0	634.9	0.	0.	504.7	0.0	0.0
33	3.3	35805.7	0.0	6756.7	0.	0.	5370.9	0.0	0.0
34	14.0	143836.5	0.0	27145.6	0.	0.	21575.5	0.0	0.0
35	16.0	137418.8	0.0	29880.9	0.	0.	20612.8	0.0	0.0
36	4.0	28591.5	0.0	4731.5	0.	0.	4288.7	0.0	0.0
37	2.3	15141.8	0.0	2186.9	0.	0.	2271.3	0.0	0.0
38	0.0	93.5	0.0	14.0	0.	0.	14.0	0.0	0.0
39	8.7	50858.3	0.0	4953.9	0.	0.	7628.8	0.0	0.0
40	2.0	9769.4	0.0	146.9	0.	0.	1465.4	0.0	0.0
41	7.0	30319.9	0.0	0.0	0.	0.	4548.0	0.0	0.0
42	10.0	25584.3	0.0	0.0	0.	0.	3837.6	0.0	0.0
43	0.3	368.6	0.0	0.0	0.	0.	55.3	0.0	0.0
44	6.5	4146.4	0.0	0.0	0.	0.	622.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	747.083	348.000
2	768.767	334.971
3	780.878	322.860
4	785.766	317.972
5	806.979	296.759
6	828.192	275.546
7	880.000	279.566
8	920.000	289.823
9	960.000	299.655
10	985.000	305.521
11	1030.000	332.666
12	1052.258	358.532
13	1061.000	370.348
14	1070.000	381.332
15	1080.000	402.453
16	1080.285	402.738
17	1086.782	413.551

Factor of Safety

*** 1.483 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	747.083	348.000
2	768.767	334.971
3	780.878	322.860
4	785.766	317.972
5	806.979	296.759
6	828.192	275.546
7	880.000	279.566
8	920.000	289.823
9	960.000	299.655
10	985.000	305.521
11	1030.000	332.666
12	1052.258	358.532
13	1061.000	370.348
14	1070.000	381.332
15	1080.000	402.453
16	1080.285	402.738
17	1086.782	413.551

Factor of Safety

*** 1.483 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	756.409	348.000
2	775.891	336.294
3	789.157	323.029
4	795.395	316.791
5	816.608	295.578
6	837.821	274.364
7	880.000	280.528
8	920.000	290.199

9	960.000	298.508
10	985.000	304.567
11	1030.000	335.659
12	1054.142	362.190
13	1061.000	368.732
14	1070.000	381.005
15	1080.000	402.477
16	1080.272	402.750
17	1091.133	413.610

Factor of Safety
*** 1.490 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	756.409	348.000
2	775.891	336.294
3	789.157	323.029
4	795.395	316.791
5	816.608	295.578
6	837.821	274.364
7	880.000	280.528
8	920.000	290.199
9	960.000	298.508
10	985.000	304.567
11	1030.000	335.659
12	1054.142	362.190
13	1061.000	368.732
14	1070.000	381.005
15	1080.000	402.477
16	1080.272	402.750
17	1091.133	413.610

Factor of Safety
*** 1.490 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	756.409	348.000
2	775.891	336.294
3	789.157	323.029
4	795.395	316.791
5	816.608	295.578
6	837.821	274.364
7	880.000	280.528
8	920.000	290.199
9	960.000	298.508
10	985.000	304.567
11	1030.000	335.659
12	1054.142	362.190
13	1061.000	368.732
14	1070.000	381.005
15	1080.000	402.477
16	1080.272	402.750
17	1091.133	413.610

Factor of Safety
*** 1.490 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	751.049	348.000
2	771.796	335.534
3	784.398	322.932
4	789.152	318.177
5	810.366	296.964
6	831.579	275.751
7	880.000	278.077
8	920.000	286.576
9	960.000	296.838
10	985.000	307.034
11	1030.000	337.270
12	1054.162	360.129

13	1061.000	366.125
14	1070.000	380.976
15	1080.000	403.151
16	1086.245	413.544

Factor of Safety
*** 1.494 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	751.049	348.000
2	771.796	335.534
3	784.398	322.932
4	789.152	318.177
5	810.366	296.964
6	831.579	275.751
7	880.000	278.077
8	920.000	286.576
9	960.000	296.838
10	985.000	307.034
11	1030.000	337.270
12	1054.162	360.129
13	1061.000	366.125
14	1070.000	380.976
15	1080.000	403.151
16	1086.245	413.544

Factor of Safety
*** 1.494 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	760.302	348.000
2	778.865	336.846
3	792.612	323.099
4	797.055	318.656
5	818.268	297.443
6	839.481	276.230
7	880.000	277.935
8	920.000	287.333
9	960.000	296.930
10	985.000	308.230
11	1030.000	336.347
12	1058.605	358.855
13	1061.000	367.936
14	1070.000	381.811
15	1080.000	401.447
16	1080.809	402.256
17	1092.177	413.624

Factor of Safety
*** 1.495 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	760.302	348.000
2	778.865	336.846
3	792.612	323.099
4	797.055	318.656
5	818.268	297.443
6	839.481	276.230
7	880.000	277.935
8	920.000	287.333
9	960.000	296.930
10	985.000	308.230
11	1030.000	336.347
12	1058.605	358.855
13	1061.000	367.936
14	1070.000	381.811
15	1080.000	401.447
16	1080.809	402.256
17	1092.177	413.624

Factor of Safety

```
 ***     1.495    ***
     **** END OF GSTABL7 OUTPUT ****
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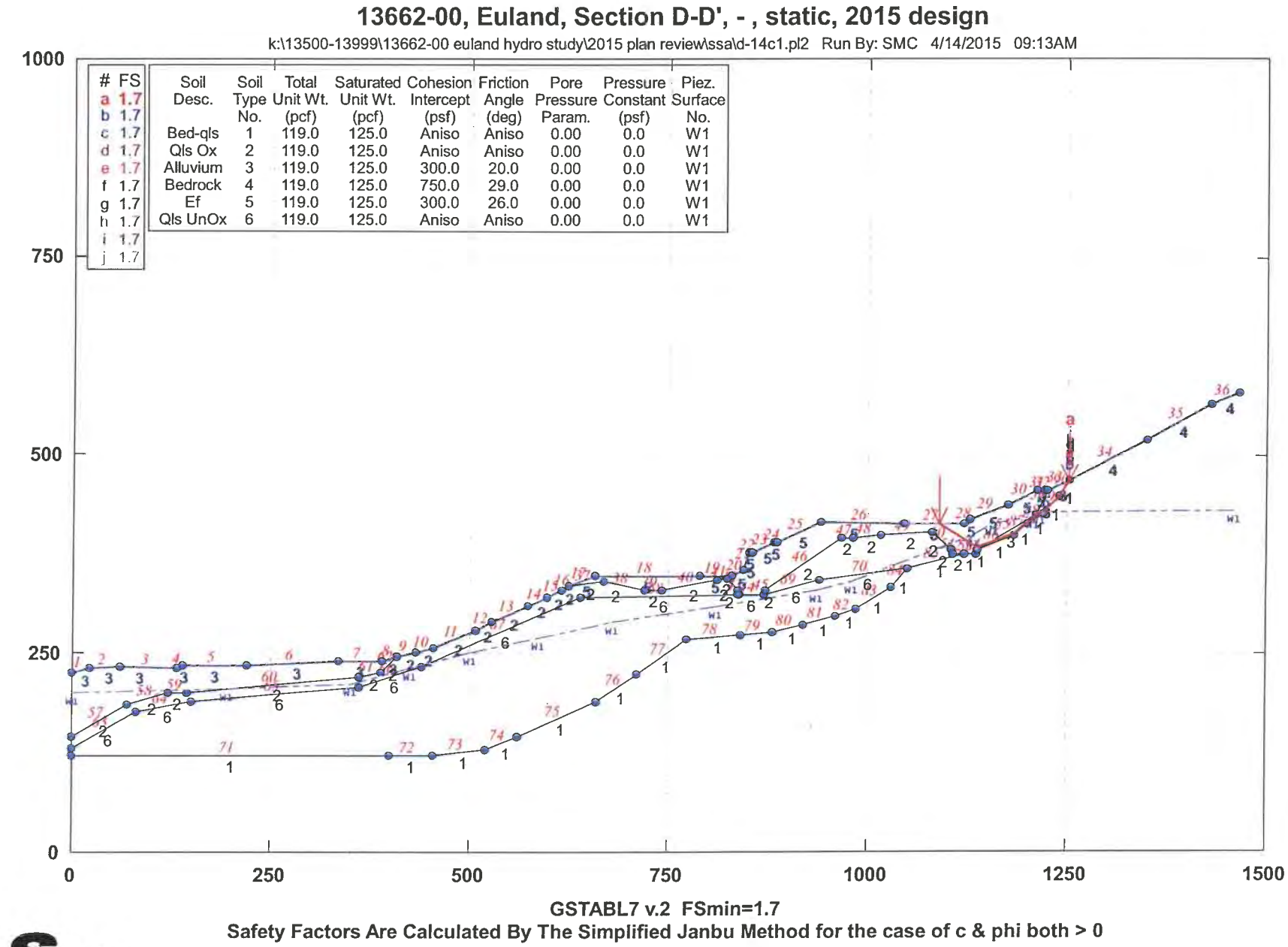
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FS
a 1.7
b 1.7
c 1.7
d 1.7
e 1.7
f 1.7
g 1.7
h 1.7
i 1.7
j 1.7
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1000
750
500
250
0
0
250
500
750
1000
1250
1500
GSTABL7 v.2 FSmin=1.7
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-25.1

13662-00, Euland, Section D-D', - , static, 2015 design

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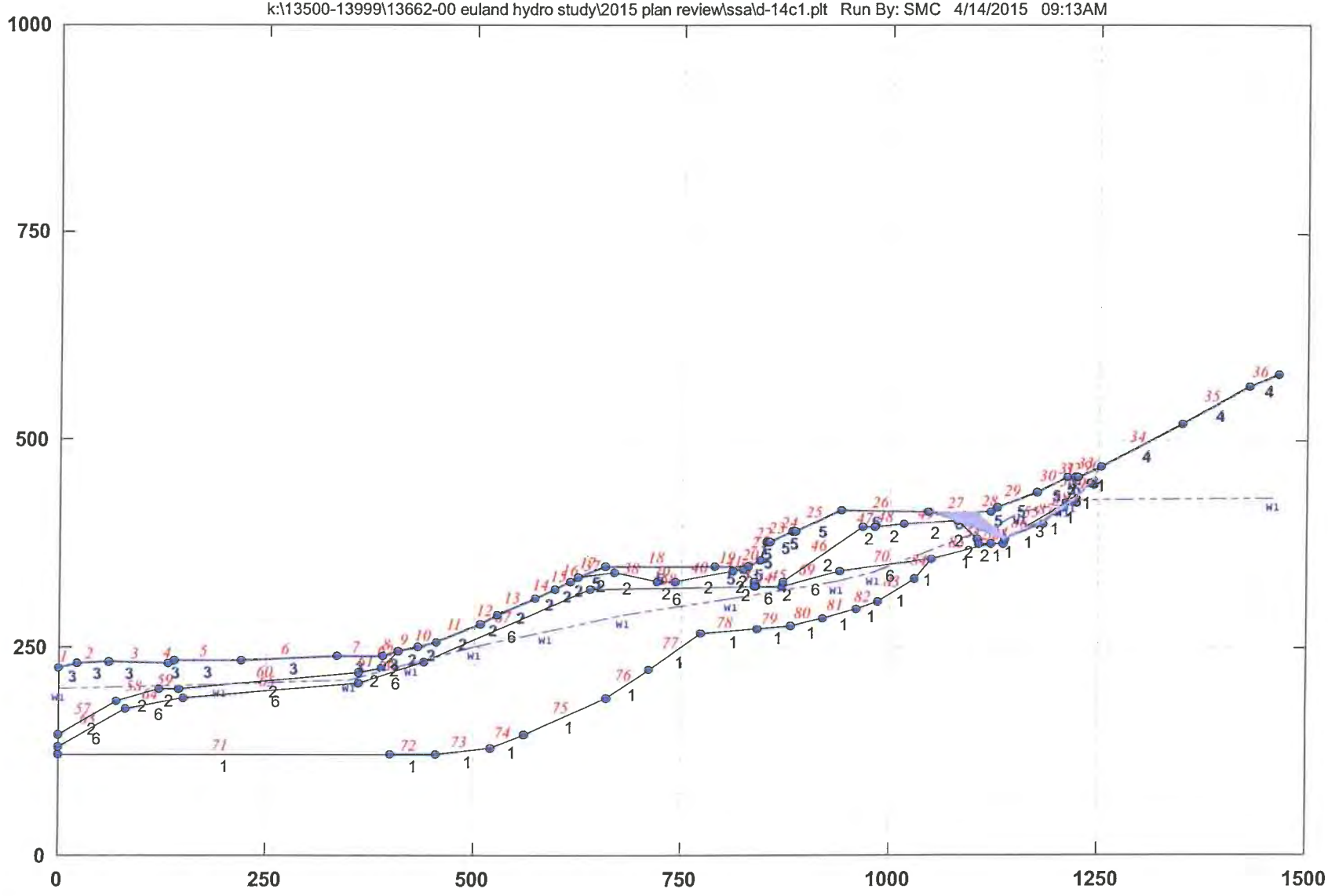

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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****

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: 4/14/2015
Time of Run: 09:13AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14c1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14c1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14c1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
90 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	625.00	335.00	2
17	625.00	335.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	5
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1225.00	456.00	5
33	1225.00	456.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	625.00	335.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	812.00	343.00	2
41	812.00	343.00	824.00	345.00	2
42	824.00	345.00	837.00	329.00	2
43	837.00	329.00	838.00	324.00	2
44	838.00	324.00	870.00	324.00	6
45	870.00	324.00	871.00	329.00	2
46	871.00	329.00	967.00	395.00	2
47	967.00	395.00	982.00	396.00	2
48	982.00	396.00	1016.00	400.00	2
49	1016.00	400.00	1080.00	403.00	2
50	1080.00	403.00	1105.00	380.00	2
51	1105.00	380.00	1106.00	375.00	2
52	1106.00	375.00	1120.00	375.00	2
53	1120.00	375.00	1136.00	375.00	1
54	1136.00	375.00	1137.00	380.00	1
55	1137.00	380.00	1210.00	425.00	3
56	1210.00	425.00	1225.00	456.00	3
57	0.00	145.00	70.00	185.00	2
58	70.00	185.00	120.00	200.00	2
59	120.00	200.00	145.00	200.00	2
60	145.00	200.00	360.00	220.00	2
61	360.00	220.00	388.00	226.00	2
62	388.00	226.00	408.00	245.00	2
63	0.00	130.00	80.00	175.00	6
64	80.00	175.00	150.00	188.00	6
65	150.00	188.00	360.00	207.00	6
66	360.00	207.00	440.00	232.00	6
67	440.00	232.00	640.00	320.00	6
68	640.00	320.00	837.00	324.00	6
69	870.00	324.00	940.00	343.00	6
70	940.00	343.00	1050.00	358.00	6
71	0.00	120.00	400.00	120.00	1
72	400.00	120.00	455.00	120.00	1
73	455.00	120.00	520.00	129.00	1
74	520.00	129.00	560.00	145.00	1
75	560.00	145.00	660.00	189.00	1
76	660.00	189.00	711.00	223.00	1
77	711.00	223.00	772.00	267.00	1
78	772.00	267.00	840.00	272.00	1
79	840.00	272.00	880.00	277.00	1
80	880.00	277.00	920.00	286.00	1
81	920.00	286.00	960.00	296.00	1
82	960.00	296.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	358.00	1
85	1050.00	358.00	1120.00	375.00	1
86	1137.00	380.00	1183.00	400.00	1
87	1183.00	400.00	1200.00	414.00	1
88	1200.00	414.00	1220.00	426.00	1
89	1220.00	426.00	1240.00	449.00	1
90	1240.00	449.00	1252.00	468.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1046.00	413.00	1105.00	413.00	0.00
2	1137.00	382.00	1137.00	382.00	4.00
3	1183.00	402.00	1183.00	402.00	4.00
4	1200.00	416.00	1200.00	416.00	4.00
5	1220.00	428.00	1220.00	428.00	4.00
6	1240.00	451.00	1240.00	451.00	4.00
7	1252.00	468.00	1252.00	468.00	0.00

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 * *

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1046.00	413.00	1105.00	413.00	0.00
2	1137.00	382.00	1137.00	382.00	4.00
3	1183.00	402.00	1183.00	402.00	4.00
4	1200.00	416.00	1200.00	416.00	4.00
5	1220.00	428.00	1220.00	428.00	4.00
6	1240.00	451.00	1240.00	451.00	4.00
7	1252.00	468.00	1252.00	468.00	0.00

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 = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.928 FS Min = 1.736 FS Ave = 1.821
Standard Deviation = 0.041 Coefficient of Variation = 2.25 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1089.423	413.587
2	1090.030	413.000
3	1137.000	383.976
4	1183.000	400.420
5	1200.000	415.222
6	1220.000	427.760
7	1240.000	449.406
8	1252.000	468.000

Factor of Safety
*** 1.736 ***
Individual data on the 22 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.6	21.5	0.0	0.0	0.	0.	0.0	0.0	0.0
2	29.2	34095.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.8	1773.2	0.0	20.7	0.	0.	0.0	0.0	0.0
4	8.0	24007.5	0.0	2644.8	0.	0.	0.0	0.0	0.0
5	4.0	15676.9	0.0	2985.0	0.	0.	0.0	0.0	0.0
6	5.0	22332.9	0.0	5122.9	0.	0.	0.0	0.0	0.0
7	15.4	73483.1	0.0	18283.6	0.	0.	0.0	0.0	0.0
8	2.6	12701.0	0.0	3438.8	0.	0.	0.0	0.0	0.0
9	20.0	96234.1	0.0	27254.8	0.	0.	0.0	0.0	0.0
10	8.0	39019.2	0.0	9698.0	0.	0.	0.0	0.0	0.0
11	17.0	77391.9	0.0	16851.9	0.	0.	0.0	0.0	0.0
12	6.6	27268.9	0.0	2397.3	0.	0.	0.0	0.0	0.0
13	0.4	1437.8	0.0	89.1	0.	0.	0.0	0.0	0.0
14	3.0	12066.2	0.0	643.2	0.	0.	0.0	0.0	0.0
15	2.0	7976.6	0.0	428.2	0.	0.	0.0	0.0	0.0
16	3.0	11588.7	0.0	641.4	0.	0.	0.0	0.0	0.0
17	5.0	17790.7	0.0	676.8	0.	0.	0.0	0.0	0.0
18	0.3	942.8	0.0	3.9	0.	0.	0.0	0.0	0.0
19	0.7	2353.7	0.0	0.0	0.	0.	0.0	0.0	0.0
20	4.0	11896.9	0.0	0.0	0.	0.	0.0	0.0	0.0
21	15.0	32209.9	0.0	0.0	0.	0.	0.0	0.0	0.0
22	12.0	9468.1	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1089.423	413.587
2	1090.030	413.000
3	1137.000	383.976
4	1183.000	400.420
5	1200.000	415.222
6	1220.000	427.760
7	1240.000	449.406
8	1252.000	468.000

Factor of Safety
*** 1.736 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1089.423	413.587
2	1090.030	413.000
3	1137.000	383.976
4	1183.000	400.420
5	1200.000	415.222
6	1220.000	427.760
7	1240.000	449.406
8	1252.000	468.000

Factor of Safety

*** 1.736 ***
Failure Surface Specified By 8 Coordinate Points

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Factor of Safety
*** 1.736 ***
Failure Surface Specified By 8 Coordinate Points

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Factor of Safety
*** 1.736 ***
Failure Surface Specified By 8 Coordinate Points

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*** 1.736 ***
Failure Surface Specified By 8 Coordinate Points

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*** 1.736 ***
Failure Surface Specified By 8 Coordinate Points

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Factor of Safety

*** 1.736 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1089.423	413.587
2	1090.030	413.000
3	1137.000	383.976
4	1183.000	400.420
5	1200.000	415.222
6	1220.000	427.760
7	1240.000	449.406
8	1252.000	468.000

Factor of Safety

*** 1.736 ***

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

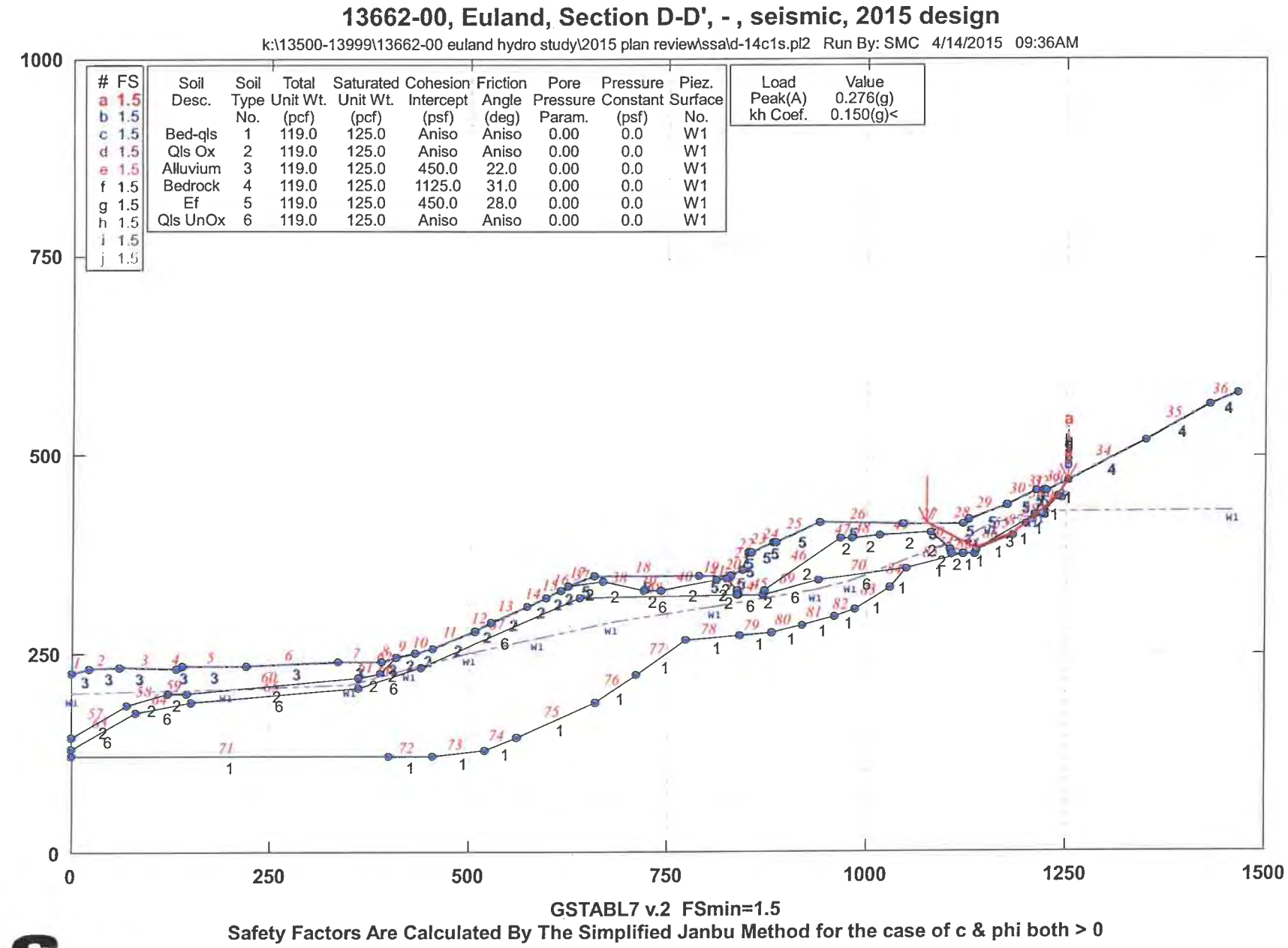
13662-00, Euland, Section D-D', - , seismic, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-14c1s.pl2 Run By: SMC 4/14/2015 09:36AM
FS
a 1.5
b 1.5
c 1.5
d 1.5
e 1.5
f 1.5
g 1.5
h 1.5
i 1.5
j 1.5
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
1000
750
500
250
0
0
250
500
750
1000
1250
1500
GSTABL7 v.2 FSmin=1.5
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-25.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/14/2015
Time of Run: 09:36AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14c1s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14c1s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14c1s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
90 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	625.00	335.00	2
17	625.00	335.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	5
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1225.00	456.00	5
33	1225.00	456.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	625.00	335.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	812.00	343.00	2
41	812.00	343.00	824.00	345.00	2
42	824.00	345.00	837.00	329.00	2
43	837.00	329.00	838.00	324.00	2
44	838.00	324.00	870.00	324.00	6
45	870.00	324.00	871.00	329.00	2
46	871.00	329.00	967.00	395.00	2
47	967.00	395.00	982.00	396.00	2
48	982.00	396.00	1016.00	400.00	2
49	1016.00	400.00	1080.00	403.00	2
50	1080.00	403.00	1105.00	380.00	2
51	1105.00	380.00	1106.00	375.00	2
52	1106.00	375.00	1120.00	375.00	2
53	1120.00	375.00	1136.00	375.00	1
54	1136.00	375.00	1137.00	380.00	1
55	1137.00	380.00	1210.00	425.00	3
56	1210.00	425.00	1225.00	456.00	3
57	0.00	145.00	70.00	185.00	2
58	70.00	185.00	120.00	200.00	2
59	120.00	200.00	145.00	200.00	2
60	145.00	200.00	360.00	220.00	2
61	360.00	220.00	388.00	226.00	2
62	388.00	226.00	408.00	245.00	2
63	0.00	130.00	80.00	175.00	6
64	80.00	175.00	150.00	188.00	6
65	150.00	188.00	360.00	207.00	6
66	360.00	207.00	440.00	232.00	6
67	440.00	232.00	640.00	320.00	6
68	640.00	320.00	837.00	324.00	6
69	870.00	324.00	940.00	343.00	6
70	940.00	343.00	1050.00	358.00	6
71	0.00	120.00	400.00	120.00	1
72	400.00	120.00	455.00	120.00	1
73	455.00	120.00	520.00	129.00	1
74	520.00	129.00	560.00	145.00	1
75	560.00	145.00	660.00	189.00	1
76	660.00	189.00	711.00	223.00	1
77	711.00	223.00	772.00	267.00	1
78	772.00	267.00	840.00	272.00	1
79	840.00	272.00	880.00	277.00	1
80	880.00	277.00	920.00	286.00	1
81	920.00	286.00	960.00	296.00	1
82	960.00	296.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	358.00	1
85	1050.00	358.00	1120.00	375.00	1
86	1137.00	380.00	1183.00	400.00	1
87	1183.00	400.00	1200.00	414.00	1
88	1200.00	414.00	1220.00	426.00	1
89	1220.00	426.00	1240.00	449.00	1
90	1240.00	449.00	1252.00	468.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1046.00	413.00	1105.00	413.00	0.00
2	1137.00	382.00	1137.00	382.00	4.00
3	1183.00	402.00	1183.00	402.00	4.00
4	1200.00	416.00	1200.00	416.00	4.00
5	1220.00	428.00	1220.00	428.00	4.00
6	1240.00	451.00	1240.00	451.00	4.00
7	1252.00	468.00	1252.00	468.00	0.00

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 = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.643 FS Min = 1.469 FS Ave = 1.523
Standard Deviation = 0.031 Coefficient of Variation = 2.05 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1075.609	413.400
2	1076.822	413.000
3	1137.000	383.077
4	1183.000	400.606
5	1200.000	414.432
6	1220.000	429.430
7	1240.000	450.475
8	1252.000	468.000

Factor of Safety
*** 1.469 ***
Individual data on the 22 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.2	30.1	0.0	0.0	0.	0.	4.5	0.0	0.0
2	39.0	48139.2	0.0	0.0	0.	0.	7220.9	0.0	0.0
3	4.2	10702.6	0.0	507.7	0.	0.	1605.4	0.0	0.0
4	8.0	26467.8	0.0	3796.0	0.	0.	3970.2	0.0	0.0
5	4.0	16546.1	0.0	3289.3	0.	0.	2481.9	0.0	0.0
6	5.0	23079.2	0.0	5234.9	0.	0.	3461.9	0.0	0.0
7	13.1	63751.4	0.0	16076.7	0.	0.	9562.7	0.0	0.0
8	4.9	23969.4	0.0	6538.8	0.	0.	3595.4	0.0	0.0
9	20.0	96829.6	0.0	27777.4	0.	0.	14524.4	0.0	0.0
10	8.0	38927.2	0.0	9724.4	0.	0.	5839.1	0.0	0.0
11	17.0	78032.5	0.0	16787.0	0.	0.	11704.9	0.0	0.0
12	6.6	27585.3	0.0	2732.9	0.	0.	4137.8	0.0	0.0
13	0.4	1435.6	0.0	93.0	0.	0.	215.3	0.0	0.0
14	3.0	11970.9	0.0	629.7	0.	0.	1795.6	0.0	0.0
15	2.0	7836.7	0.0	377.9	0.	0.	1175.5	0.0	0.0
16	3.0	11264.3	0.0	504.1	0.	0.	1689.6	0.0	0.0
17	3.1	10924.0	0.0	284.3	0.	0.	1638.6	0.0	0.0
18	1.9	6022.2	0.0	0.0	0.	0.	903.3	0.0	0.0
19	1.0	3099.2	0.0	0.0	0.	0.	464.9	0.0	0.0
20	4.0	11144.5	0.0	0.0	0.	0.	1671.7	0.0	0.0
21	15.0	29898.5	0.0	0.0	0.	0.	4484.8	0.0	0.0
22	12.0	8704.6	0.0	0.0	0.	0.	1305.7	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1075.609	413.400
2	1076.822	413.000
3	1137.000	383.077
4	1183.000	400.606
5	1200.000	414.432
6	1220.000	429.430
7	1240.000	450.475
8	1252.000	468.000

Factor of Safety
*** 1.469 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1075.609	413.400
2	1076.822	413.000
3	1137.000	383.077
4	1183.000	400.606
5	1200.000	414.432

6	1220.000	429.430
7	1240.000	450.475
8	1252.000	468.000

Factor of Safety
*** 1.469 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1075.609	413.400
2	1076.822	413.000
3	1137.000	383.077
4	1183.000	400.606
5	1200.000	414.432
6	1220.000	429.430
7	1240.000	450.475
8	1252.000	468.000

Factor of Safety
*** 1.469 ***

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Factor of Safety

*** 1.469 ***

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

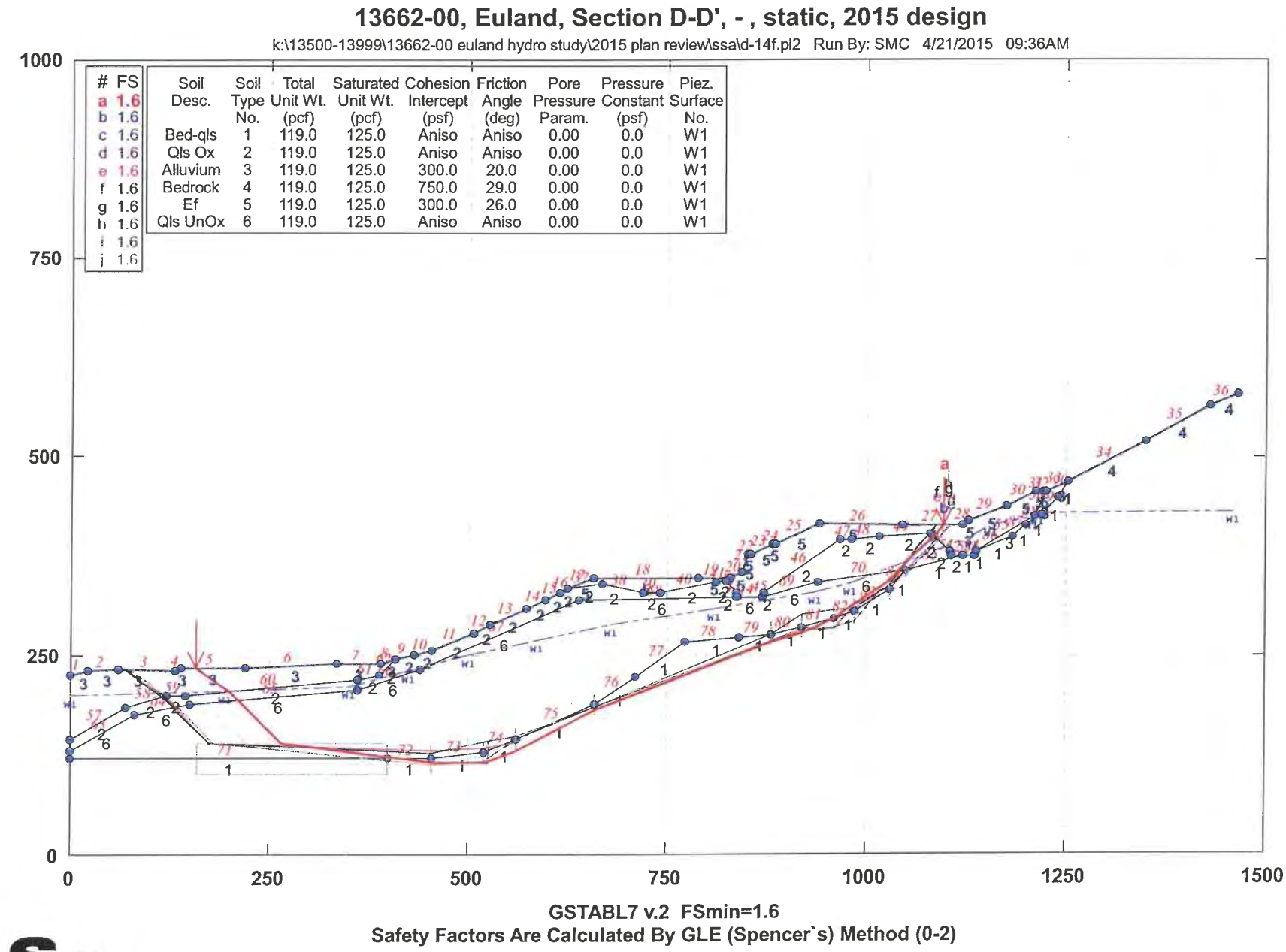
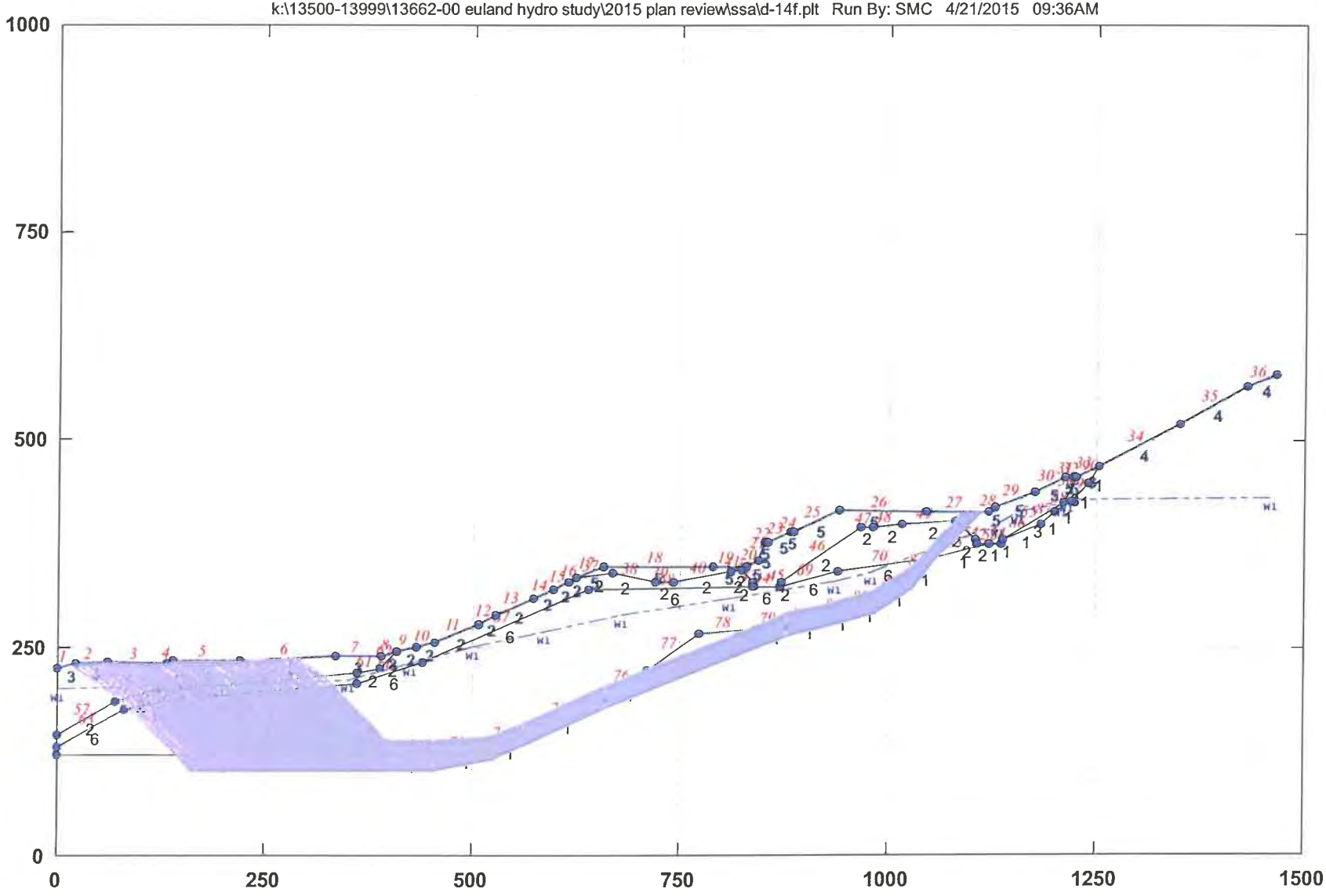

13662-00, Euland, Section D-D', - , static, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-14f.pl2 Run By: SMC 4/21/2015 09:36AM
FS
a 1.6
b 1.6
c 1.6
d 1.6
e 1.6
f 1.6
g 1.6
h 1.6
i 1.6
j 1.6
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
1000
750
500
250
0
0
250
500
750
1000
1250
1500
GSTABL7 v.2 FSmin=1.6
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-26.1

13662-00, Euland, Section D-D', - , static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-14f.plt Run By: SMC 4/21/2015 09:36AM



*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/21/2015
Time of Run: 09:36AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14f.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14f.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14f.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
90 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	625.00	335.00	2
17	625.00	335.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	5
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1225.00	456.00	5
33	1225.00	456.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	625.00	335.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	812.00	343.00	2
41	812.00	343.00	824.00	345.00	2
42	824.00	345.00	837.00	329.00	2
43	837.00	329.00	838.00	324.00	2
44	838.00	324.00	870.00	324.00	6
45	870.00	324.00	871.00	329.00	2
46	871.00	329.00	967.00	395.00	2
47	967.00	395.00	982.00	396.00	2
48	982.00	396.00	1016.00	400.00	2
49	1016.00	400.00	1080.00	403.00	2
50	1080.00	403.00	1105.00	380.00	2
51	1105.00	380.00	1106.00	375.00	2
52	1106.00	375.00	1120.00	375.00	2
53	1120.00	375.00	1136.00	375.00	1
54	1136.00	375.00	1137.00	380.00	1
55	1137.00	380.00	1210.00	425.00	3
56	1210.00	425.00	1225.00	456.00	3
57	0.00	145.00	70.00	185.00	2
58	70.00	185.00	120.00	200.00	2
59	120.00	200.00	145.00	200.00	2
60	145.00	200.00	360.00	220.00	2
61	360.00	220.00	388.00	226.00	2
62	388.00	226.00	408.00	245.00	2
63	0.00	130.00	80.00	175.00	6
64	80.00	175.00	150.00	188.00	6
65	150.00	188.00	360.00	207.00	6
66	360.00	207.00	440.00	232.00	6
67	440.00	232.00	640.00	320.00	6
68	640.00	320.00	837.00	324.00	6
69	870.00	324.00	940.00	343.00	6
70	940.00	343.00	1050.00	358.00	6
71	0.00	120.00	400.00	120.00	1
72	400.00	120.00	455.00	120.00	1
73	455.00	120.00	520.00	129.00	1
74	520.00	129.00	560.00	145.00	1
75	560.00	145.00	660.00	189.00	1
76	660.00	189.00	711.00	223.00	1
77	711.00	223.00	772.00	267.00	1
78	772.00	267.00	840.00	272.00	1
79	840.00	272.00	880.00	277.00	1
80	880.00	277.00	920.00	286.00	1
81	920.00	286.00	960.00	296.00	1
82	960.00	296.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	358.00	1
85	1050.00	358.00	1120.00	375.00	1
86	1137.00	380.00	1183.00	400.00	1
87	1183.00	400.00	1200.00	414.00	1
88	1200.00	414.00	1220.00	426.00	1
89	1220.00	426.00	1240.00	449.00	1
90	1240.00	449.00	1252.00	468.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	400.00	120.00	40.00
2	455.00	120.00	455.00	120.00	40.00
3	520.00	129.00	525.00	129.00	30.00
4	560.00	145.00	560.00	145.00	30.00
5	660.00	191.00	660.00	191.00	30.00
6	880.00	279.00	880.00	279.00	30.00
7	920.00	288.00	920.00	288.00	30.00
8	960.00	298.00	960.00	298.00	30.00
9	985.00	307.00	985.00	305.00	30.00

10	1030.00	335.00	1030.00	335.00	30.00
11	1050.00	360.00	1070.00	383.00	20.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 2.722 FS Min = 1.577 FS Ave = 1.946
Standard Deviation = 0.177 Coefficient of Variation = 9.12 %
((Simplified Janbu FS for Critical Surface = 1.424))
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	156.940	235.000
2	175.089	222.292
3	199.664	205.085
4	211.210	193.538
5	222.618	182.131
6	243.831	160.918
7	265.044	139.705
8	455.000	115.544
9	521.109	114.921
10	560.000	130.379
11	660.000	181.345
12	880.000	267.631
13	920.000	278.550
14	960.000	296.914
15	985.000	314.325
16	1030.000	343.729
17	1056.547	373.065
18	1077.760	394.278
19	1083.376	399.894
20	1097.174	413.692

*** FOS = 1.577 Theta (ki=1.0) = 8.02 ***
Lambda = 0.141
Individual data on the 79 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	18.1	13722.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	24.5	61999.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.1	322.5	0.0	0.2	0.	0.	0.0	0.0	0.0
4	1.1	3981.1	0.0	61.2	0.	0.	0.0	0.0	0.0
5	10.4	45475.1	0.0	6077.3	0.	0.	0.0	0.0	0.0
6	8.8	48835.2	0.0	12811.4	0.	0.	0.0	0.0	0.0
7	2.6	16430.0	0.0	5174.8	0.	0.	0.0	0.0	0.0
8	21.2	166103.8	0.0	64955.3	0.	0.	0.0	0.0	0.0
9	21.2	224768.2	0.0	*******	0.	0.	0.0	0.0	0.0
10	70.0	890000.5	0.0	*******	0.	0.	0.0	0.0	0.0
11	14.0	190103.2	0.0	70287.2	0.	0.	0.0	0.0	0.0
12	11.0	151488.5	0.0	55651.1	0.	0.	0.0	0.0	0.0
13	28.0	395108.3	0.0	*******	0.	0.	0.0	0.0	0.0
14	2.0	28744.1	0.0	11757.7	0.	0.	0.0	0.0	0.0
15	18.0	267183.9	0.0	*******	0.	0.	0.0	0.0	0.0
16	12.0	186115.1	0.0	77466.8	0.	0.	0.0	0.0	0.0
17	5.0	80042.2	0.0	33581.0	0.	0.	0.0	0.0	0.0
18	7.0	113135.1	0.0	47686.5	0.	0.	0.0	0.0	0.0
19	8.0	132075.2	0.0	55936.0	0.	0.	0.0	0.0	0.0
20	11.5	196114.8	0.0	83376.8	0.	0.	0.0	0.0	0.0
21	2.5	42697.4	0.0	18199.8	0.	0.	0.0	0.0	0.0
22	1.0	17441.2	0.0	7435.1	0.	0.	0.0	0.0	0.0

23	45.0	840462.3	0.0	*******	0.	0.	0.0	0.0	0.0
24	8.0	160781.1	0.0	66078.5	0.	0.	0.0	0.0	0.0
25	12.0	248418.4	0.0	*******	0.	0.	0.0	0.0	0.0
26	1.1	23438.4	0.0	9432.9	0.	0.	0.0	0.0	0.0
27	5.9	124924.7	0.0	53764.6	0.	0.	0.0	0.0	0.0
28	33.0	703904.4	0.0	*******	0.	0.	0.0	0.0	0.0
29	14.0	298867.9	0.0	*******	0.	0.	0.0	0.0	0.0
30	12.0	254650.0	0.0	*******	0.	0.	0.0	0.0	0.0
31	11.0	232123.0	0.0	94017.2	0.	0.	0.0	0.0	0.0
32	19.0	399869.7	0.0	*******	0.	0.	0.0	0.0	0.0
33	9.0	189583.1	0.0	71613.6	0.	0.	0.0	0.0	0.0
34	15.0	314477.6	0.0	*******	0.	0.	0.0	0.0	0.0
35	18.0	372765.7	0.0	*******	0.	0.	0.0	0.0	0.0
36	2.0	41014.4	0.0	14347.7	0.	0.	0.0	0.0	0.0
37	9.0	182070.3	0.0	61138.9	0.	0.	0.0	0.0	0.0
38	11.0	217280.4	0.0	73430.9	0.	0.	0.0	0.0	0.0
39	31.0	581282.1	0.0	*******	0.	0.	0.0	0.0	0.0
40	9.0	160103.7	0.0	55065.6	0.	0.	0.0	0.0	0.0
41	22.0	374967.1	0.0	*******	0.	0.	0.0	0.0	0.0
42	30.0	473811.2	0.0	*******	0.	0.	0.0	0.0	0.0
43	18.0	263513.3	0.0	91512.0	0.	0.	0.0	0.0	0.0
44	20.0	274519.7	0.0	95679.0	0.	0.	0.0	0.0	0.0
45	2.0	26393.5	0.0	9214.3	0.	0.	0.0	0.0	0.0
46	12.0	154324.3	0.0	53987.6	0.	0.	0.0	0.0	0.0
47	6.0	74567.1	0.0	26159.1	0.	0.	0.0	0.0	0.0
48	7.0	86168.9	0.0	29815.6	0.	0.	0.0	0.0	0.0
49	1.0	12339.8	0.0	4197.5	0.	0.	0.0	0.0	0.0
50	2.0	24701.9	0.0	8348.7	0.	0.	0.0	0.0	0.0
51	5.0	61885.7	0.0	20601.3	0.	0.	0.0	0.0	0.0
52	6.0	81721.0	0.0	24211.5	0.	0.	0.0	0.0	0.0
53	4.0	58993.5	0.0	15831.8	0.	0.	0.0	0.0	0.0
54	15.0	220327.7	0.0	57166.7	0.	0.	0.0	0.0	0.0
55	1.0	14727.2	0.0	3687.5	0.	0.	0.0	0.0	0.0
56	9.0	132762.0	0.0	32491.5	0.	0.	0.0	0.0	0.0
57	2.0	29585.6	0.0	6818.9	0.	0.	0.0	0.0	0.0
58	4.0	58984.8	0.0	13550.2	0.	0.	0.0	0.0	0.0
59	34.0	511213.7	0.0	*******	0.	0.	0.0	0.0	0.0
60	16.0	245966.8	0.0	50464.9	0.	0.	0.0	0.0	0.0
61	4.0	61389.2	0.0	11691.5	0.	0.	0.0	0.0	0.0
62	1.0	15342.5	0.0	2884.1	0.	0.	0.0	0.0	0.0
63	14.6	218185.6	0.0	40413.4	0.	0.	0.0	0.0	0.0
64	4.4	62789.3	0.0	11433.4	0.	0.	0.0	0.0	0.0
65	7.0	97489.7	0.0	19158.3	0.	0.	0.0	0.0	0.0
66	13.0	169626.9	0.0	31055.7	0.	0.	0.0	0.0	0.0
67	2.0	24765.3	0.0	4092.6	0.	0.	0.0	0.0	0.0
68	3.0	36496.7	0.0	5978.5	0.	0.	0.0	0.0	0.0
69	27.7	302339.8	0.0	46372.8	0.	0.	0.0	0.0	0.0
70	3.3	31608.4	0.0	4569.3	0.	0.	0.0	0.0	0.0
71	14.0	125152.0	0.0	17341.7	0.	0.	0.0	0.0	0.0
72	11.9	89954.0	0.0	12170.9	0.	0.	0.0	0.0	0.0
73	4.1	26320.8	0.0	2157.7	0.	0.	0.0	0.0	0.0
74	6.5	37437.9	0.0	1316.0	0.	0.	0.0	0.0	0.0
75	4.0	20171.1	0.0	0.0	0.	0.	0.0	0.0	0.0
76	21.2	74758.6	0.0	0.0	0.	0.	0.0	0.0	0.0
77	2.2	4810.8	0.0	0.0	0.	0.	0.0	0.0	0.0
78	3.4	6137.4	0.0	0.0	0.	0.	0.0	0.0	0.0
79	13.8	11174.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	156.940	235.000
2	175.089	222.292
3	199.664	205.085
4	211.210	193.538
5	222.618	182.131
6	243.831	160.918
7	265.044	139.705
8	455.000	115.544
9	521.109	114.921
10	560.000	130.379

11	660.000	181.345
12	880.000	267.631
13	920.000	278.550
14	960.000	296.914
15	985.000	314.325
16	1030.000	343.729
17	1056.547	373.065
18	1077.760	394.278
19	1083.376	399.894
20	1097.174	413.692

*** FOS = 1.577 Theta (ki=1.0) = 8.02 ***
Lambda = 0.141

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.004	231.718
2	92.137	216.221
3	116.712	199.013
4	131.214	184.511
5	133.321	182.404
6	154.534	161.191
7	175.747	139.978
8	455.000	129.255
9	521.983	133.407
10	560.000	140.193
11	660.000	180.612
12	880.000	269.477
13	920.000	281.099
14	960.000	283.291
15	985.000	314.024
16	1030.000	337.137
17	1053.793	360.972
18	1075.006	382.185
19	1088.240	395.419
20	1106.641	413.819

*** FOS = 1.584 Theta (ki=1.0) = 7.59 ***
Lambda = 0.133

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.004	231.718
2	92.137	216.221
3	116.712	199.013
4	131.214	184.511
5	133.321	182.404
6	154.534	161.191
7	175.747	139.978
8	455.000	129.255
9	521.983	133.407
10	560.000	140.193
11	660.000	180.612
12	880.000	269.477
13	920.000	281.099
14	960.000	283.291
15	985.000	314.024
16	1030.000	337.137
17	1053.793	360.972
18	1075.006	382.185
19	1088.240	395.419
20	1106.641	413.819

*** FOS = 1.584 Theta (ki=1.0) = 7.59 ***
Lambda = 0.133

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.746	231.782
2	90.620	215.766
3	115.194	198.558
4	129.550	184.202
5	132.500	181.252

6	153.714	160.039
7	174.927	138.826
8	455.000	125.759
9	520.443	141.215
10	560.000	148.118
11	660.000	185.842
12	880.000	276.698
13	920.000	302.500
14	960.000	308.560
15	985.000	309.292
16	1030.000	339.202
17	1068.256	390.934
18	1080.167	402.846
19	1086.857	413.552

*** FOS = 1.593 Theta (ki=1.0) = 7.62 ***
Lambda = 0.134

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.746	231.782
2	90.620	215.766
3	115.194	198.558
4	129.550	184.202
5	132.500	181.252
6	153.714	160.039
7	174.927	138.826
8	455.000	125.759
9	520.443	141.215
10	560.000	148.118
11	660.000	185.842
12	880.000	276.698
13	920.000	302.500
14	960.000	308.560
15	985.000	309.292
16	1030.000	339.202
17	1068.256	390.934
18	1080.167	402.846
19	1086.857	413.552

*** FOS = 1.593 Theta (ki=1.0) = 7.62 ***
Lambda = 0.134

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.432	231.593
2	95.112	217.113
3	119.686	199.906
4	134.475	185.117
5	137.305	182.287
6	158.518	161.074
7	179.731	139.861
8	455.000	111.951
9	520.894	116.913
10	560.000	144.559
11	660.000	185.212
12	880.000	268.686
13	920.000	284.292
14	960.000	284.844
15	985.000	292.153
16	1030.000	348.533
17	1060.687	364.154
18	1081.901	385.368
19	1090.173	393.640
20	1102.750	413.767

*** FOS = 1.605 Theta (ki=1.0) = 7.54 ***
Lambda = 0.132

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.432	231.593
2	95.112	217.113

3	119.686	199.906
4	134.475	185.117
5	137.305	182.287
6	158.518	161.074
7	179.731	139.861
8	455.000	111.951
9	520.894	116.913
10	560.000	144.559
11	660.000	185.212
12	880.000	268.686
13	920.000	284.292
14	960.000	284.844
15	985.000	292.153
16	1030.000	348.533
17	1060.687	364.154
18	1081.901	385.368
19	1090.173	393.640
20	1102.750	413.767

*** FOS = 1.605 Theta (ki=1.0) = 7.54 ***
Lambda = 0.132

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.316	230.385
2	134.294	218.497
3	158.869	201.290
4	170.320	189.839
5	180.313	179.846
6	201.526	158.633
7	222.739	137.419
8	455.000	118.103
9	522.376	123.285
10	560.000	140.501
11	660.000	181.037
12	880.000	267.206
13	920.000	280.820
14	960.000	297.193
15	985.000	300.839
16	1030.000	325.960
17	1050.990	354.126
18	1056.425	359.560
19	1077.638	380.773
20	1090.346	393.482
21	1103.024	413.771

*** FOS = 1.611 Theta (ki=1.0) = 7.76 ***
Lambda = 0.136

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.316	230.385
2	134.294	218.497
3	158.869	201.290
4	170.320	189.839
5	180.313	179.846
6	201.526	158.633
7	222.739	137.419
8	455.000	118.103
9	522.376	123.285
10	560.000	140.501
11	660.000	181.037
12	880.000	267.206
13	920.000	280.820
14	960.000	297.193
15	985.000	300.839
16	1030.000	325.960
17	1050.990	354.126
18	1056.425	359.560
19	1077.638	380.773
20	1090.346	393.482
21	1103.024	413.771

```
***  FOS =      1.611    Theta (ki=1.0) =      7.76  ***
                     Lambda =    0.136
          **** END OF GSTABL7 OUTPUT ****
```

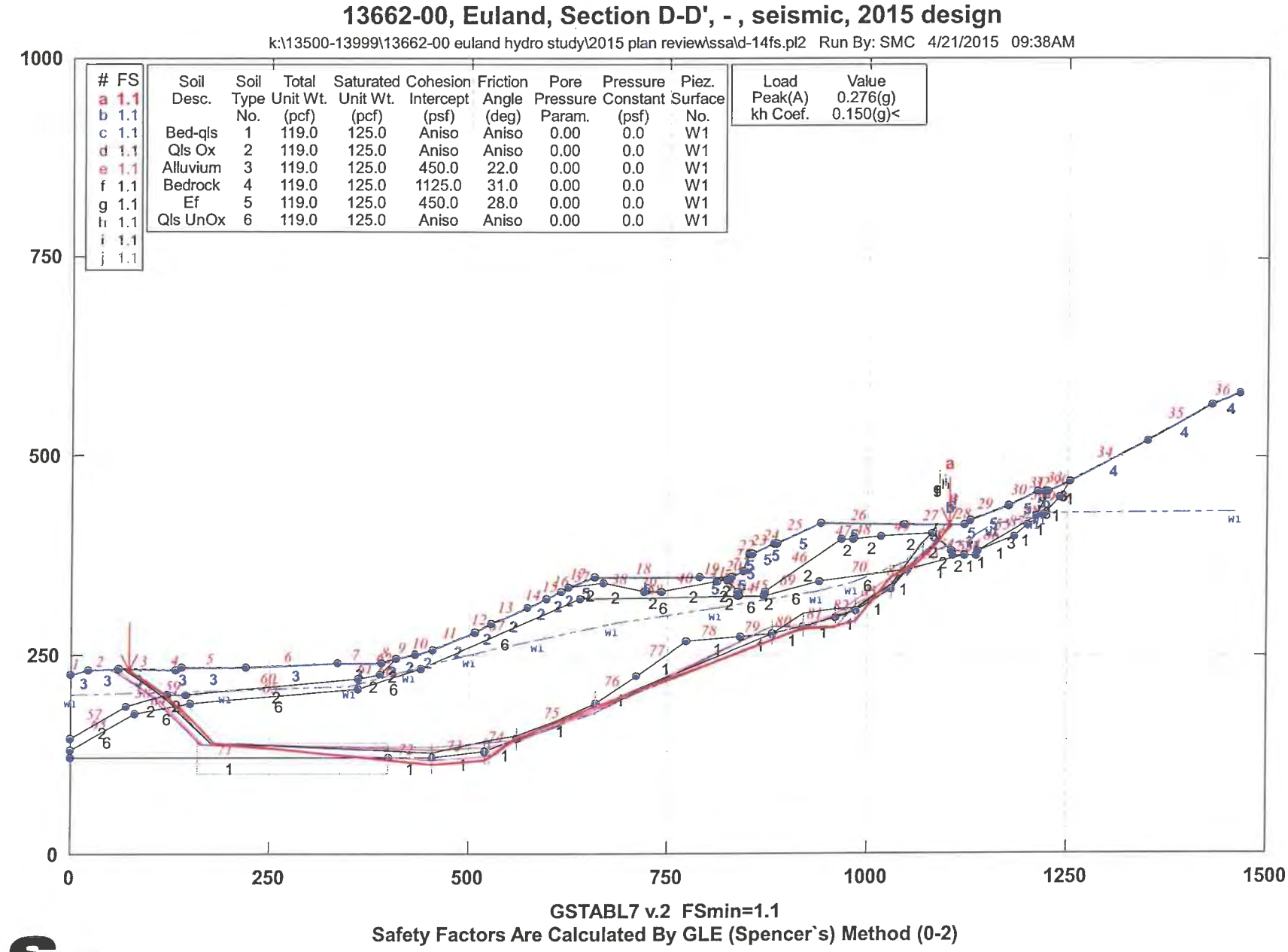
13662-00, Euland, Section D-D', - , seismic, 2015 design
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-14fs.pl2 Run By: SMC 4/21/2015 09:38AM
FS
a 1.1
b 1.1
c 1.1
d 1.1
e 1.1
f 1.1
g 1.1
h 1.1
i 1.1
j 1.1
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
1000
750
500
250
0
0
250
500
750
1000
1250
1500
GSTABL7 v.2 FSmin=1.1
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-26.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/21/2015
Time of Run: 09:38AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14fs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14fs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-14fs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic, 2015 design

BOUNDARY COORDINATES

36 Top Boundaries
90 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	625.00	335.00	2
17	625.00	335.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	5
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1225.00	456.00	5
33	1225.00	456.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	625.00	335.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	812.00	343.00	2
41	812.00	343.00	824.00	345.00	2
42	824.00	345.00	837.00	329.00	2
43	837.00	329.00	838.00	324.00	2
44	838.00	324.00	870.00	324.00	6
45	870.00	324.00	871.00	329.00	2
46	871.00	329.00	967.00	395.00	2
47	967.00	395.00	982.00	396.00	2
48	982.00	396.00	1016.00	400.00	2
49	1016.00	400.00	1080.00	403.00	2
50	1080.00	403.00	1105.00	380.00	2
51	1105.00	380.00	1106.00	375.00	2
52	1106.00	375.00	1120.00	375.00	2
53	1120.00	375.00	1136.00	375.00	1
54	1136.00	375.00	1137.00	380.00	1
55	1137.00	380.00	1210.00	425.00	3
56	1210.00	425.00	1225.00	456.00	3
57	0.00	145.00	70.00	185.00	2
58	70.00	185.00	120.00	200.00	2
59	120.00	200.00	145.00	200.00	2
60	145.00	200.00	360.00	220.00	2
61	360.00	220.00	388.00	226.00	2
62	388.00	226.00	408.00	245.00	2
63	0.00	130.00	80.00	175.00	6
64	80.00	175.00	150.00	188.00	6
65	150.00	188.00	360.00	207.00	6
66	360.00	207.00	440.00	232.00	6
67	440.00	232.00	640.00	320.00	6
68	640.00	320.00	837.00	324.00	6
69	870.00	324.00	940.00	343.00	6
70	940.00	343.00	1050.00	358.00	6
71	0.00	120.00	400.00	120.00	1
72	400.00	120.00	455.00	120.00	1
73	455.00	120.00	520.00	129.00	1
74	520.00	129.00	560.00	145.00	1
75	560.00	145.00	660.00	189.00	1
76	660.00	189.00	711.00	223.00	1
77	711.00	223.00	772.00	267.00	1
78	772.00	267.00	840.00	272.00	1
79	840.00	272.00	880.00	277.00	1
80	880.00	277.00	920.00	286.00	1
81	920.00	286.00	960.00	296.00	1
82	960.00	296.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	358.00	1
85	1050.00	358.00	1120.00	375.00	1
86	1137.00	380.00	1183.00	400.00	1
87	1183.00	400.00	1200.00	414.00	1
88	1200.00	414.00	1220.00	426.00	1
89	1220.00	426.00	1240.00	449.00	1
90	1240.00	449.00	1252.00	468.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	400.00	120.00	40.00
2	455.00	120.00	455.00	120.00	40.00
3	520.00	129.00	525.00	129.00	30.00
4	560.00	145.00	560.00	145.00	30.00
5	660.00	191.00	660.00	191.00	30.00

6	880.00	279.00	880.00	279.00	30.00
7	920.00	288.00	920.00	288.00	30.00
8	960.00	298.00	960.00	298.00	30.00
9	985.00	307.00	985.00	305.00	30.00
10	1030.00	335.00	1030.00	335.00	30.00
11	1050.00	360.00	1070.00	383.00	20.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.777 FS Min = 1.109 FS Ave = 1.350
Standard Deviation = 0.117 Coefficient of Variation = 8.63 %
((Simplified Janbu FS for Critical Surface = 1.043))
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.632	231.644
2	94.815	216.682
3	119.686	199.906
4	134.475	185.117
5	137.305	182.287
6	158.518	161.074
7	179.731	139.861
8	455.000	111.951
9	520.894	116.913
10	560.000	144.559
11	660.000	185.212
12	880.000	268.686
13	920.000	284.292
14	960.000	284.844
15	985.000	292.153
16	1030.000	348.533
17	1060.687	364.154
18	1081.901	385.368
19	1090.173	393.640
20	1102.263	413.760

*** FOS = 1.109 Theta (ki=1.0) = 5.65 ***
Lambda = 0.099
Individual data on the 86 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	22.2	18923.8	0.0	0.0	0.	0.	2838.6	0.0	0.0
2	20.4	50658.3	0.0	0.0	0.	0.	7598.7	0.0	0.0
3	4.5	15607.6	0.0	537.6	0.	0.	2341.1	0.0	0.0
4	0.3	1147.0	0.0	92.0	0.	0.	172.1	0.0	0.0
5	11.0	47808.1	0.0	8855.5	0.	0.	7171.2	0.0	0.0
6	3.5	18588.1	0.0	5073.8	0.	0.	2788.2	0.0	0.0
7	2.8	16840.3	0.0	4938.1	0.	0.	2526.0	0.0	0.0
8	2.7	17462.5	0.0	5376.7	0.	0.	2619.4	0.0	0.0
9	5.0	35251.7	0.0	11716.0	0.	0.	5287.8	0.0	0.0
10	5.0	38380.5	0.0	13978.0	0.	0.	5757.1	0.0	0.0
11	8.5	72592.6	0.0	29023.1	0.	0.	10888.9	0.0	0.0
12	21.2	220245.7	0.0	*******	0.	0.	33036.9	0.0	0.0
13	15.3	180288.8	0.0	62913.2	0.	0.	27043.3	0.0	0.0
14	5.8	68797.5	0.0	24221.0	0.	0.	10319.6	0.0	0.0
15	19.2	232866.3	0.0	82911.8	0.	0.	34929.9	0.0	0.0
16	115.0	1525457.2	0.0	*******	0.	0.	*******	0.0	0.0
17	14.0	201493.0	0.0	75795.1	0.	0.	30224.0	0.0	0.0
18	11.0	159981.3	0.0	59619.2	0.	0.	23997.2	0.0	0.0

19	15.6	230007.3	0.0	89213.4	0.	0.	34501.1	0.0	0.0
20	12.4	184961.3	0.0	74624.3	0.	0.	27744.2	0.0	0.0
21	2.0	30066.1	0.0	12366.4	0.	0.	4509.9	0.0	0.0
22	10.0	152834.1	0.0	63159.5	0.	0.	22925.1	0.0	0.0
23	8.0	125668.4	0.0	52120.5	0.	0.	18850.3	0.0	0.0
24	17.0	275889.2	0.0	*******	0.	0.	41383.4	0.0	0.0
25	7.0	116871.8	0.0	49363.5	0.	0.	17530.8	0.0	0.0
26	8.0	136152.5	0.0	57754.6	0.	0.	20422.9	0.0	0.0
27	11.5	201632.7	0.0	85815.6	0.	0.	30244.9	0.0	0.0
28	2.5	43819.1	0.0	18692.0	0.	0.	6572.9	0.0	0.0
29	1.0	17891.3	0.0	7632.2	0.	0.	2683.7	0.0	0.0
30	45.0	849937.1	0.0	*******	0.	0.	*******	0.0	0.0
31	8.0	160223.2	0.0	65990.2	0.	0.	24033.5	0.0	0.0
32	12.0	246312.1	0.0	*******	0.	0.	36946.8	0.0	0.0
33	0.9	18674.7	0.0	7519.3	0.	0.	2801.2	0.0	0.0
34	6.1	127167.7	0.0	62052.5	0.	0.	19075.2	0.0	0.0
35	33.0	666522.8	0.0	*******	0.	0.	99978.4	0.0	0.0
36	14.0	275345.7	0.0	*******	0.	0.	41301.9	0.0	0.0
37	12.0	236496.6	0.0	91292.0	0.	0.	35474.5	0.0	0.0
38	11.0	217108.2	0.0	82498.6	0.	0.	32566.2	0.0	0.0
39	19.0	377605.0	0.0	*******	0.	0.	56640.8	0.0	0.0
40	9.0	180659.2	0.0	64166.1	0.	0.	27098.9	0.0	0.0
41	15.0	301922.3	0.0	*******	0.	0.	45288.3	0.0	0.0
42	18.0	361523.8	0.0	*******	0.	0.	54228.6	0.0	0.0
43	2.0	40022.8	0.0	13275.9	0.	0.	6003.4	0.0	0.0
44	9.0	177788.9	0.0	58638.2	0.	0.	26668.3	0.0	0.0
45	11.0	212223.2	0.0	70471.9	0.	0.	31833.5	0.0	0.0
46	31.0	568062.7	0.0	*******	0.	0.	85209.4	0.0	0.0
47	9.0	156553.3	0.0	52954.9	0.	0.	23483.0	0.0	0.0
48	22.0	366833.0	0.0	*******	0.	0.	55024.9	0.0	0.0
49	30.0	463965.0	0.0	*******	0.	0.	69594.8	0.0	0.0
50	18.0	258295.6	0.0	88364.8	0.	0.	38744.3	0.0	0.0
51	20.0	269329.1	0.0	92528.2	0.	0.	40399.4	0.0	0.0
52	2.0	25909.6	0.0	8919.5	0.	0.	3886.4	0.0	0.0
53	12.0	151555.0	0.0	52295.0	0.	0.	22733.3	0.0	0.0
54	6.0	73268.7	0.0	25361.9	0.	0.	10990.3	0.0	0.0
55	7.0	84726.8	0.0	28926.9	0.	0.	12709.0	0.0	0.0
56	1.0	12140.1	0.0	4074.2	0.	0.	1821.0	0.0	0.0
57	2.0	24307.5	0.0	8104.8	0.	0.	3646.1	0.0	0.0
58	5.0	60927.5	0.0	20007.4	0.	0.	9139.1	0.0	0.0
59	6.0	80623.8	0.0	23528.8	0.	0.	12093.6	0.0	0.0
60	4.0	58294.0	0.0	15394.9	0.	0.	8744.1	0.0	0.0
61	15.0	217932.0	0.0	55657.7	0.	0.	32689.8	0.0	0.0
62	1.0	14580.2	0.0	3594.1	0.	0.	2187.0	0.0	0.0
63	9.0	131511.5	0.0	31692.5	0.	0.	19726.7	0.0	0.0
64	2.0	29292.8	0.0	6906.1	0.	0.	4393.9	0.0	0.0
65	4.0	58223.6	0.0	13628.5	0.	0.	8733.5	0.0	0.0
66	34.0	495285.6	0.0	*******	0.	0.	74292.8	0.0	0.0
67	16.0	241610.0	0.0	43717.1	0.	0.	36241.5	0.0	0.0
68	4.0	62524.5	0.0	11179.8	0.	0.	9378.7	0.0	0.0
69	1.0	15765.4	0.0	2827.4	0.	0.	2364.8	0.0	0.0
70	19.0	299572.6	0.0	56190.4	0.	0.	44935.9	0.0	0.0
71	7.0	109274.8	0.0	22365.4	0.	0.	16391.2	0.0	0.0
72	13.0	198071.7	0.0	40999.2	0.	0.	29710.8	0.0	0.0
73	2.0	29887.5	0.0	5991.6	0.	0.	4483.1	0.0	0.0
74	3.0	44557.7	0.0	9034.0	0.	0.	6683.6	0.0	0.0
75	20.4	269035.0	0.0	78063.9	0.	0.	40355.2	0.0	0.0
76	7.4	81186.5	0.0	20016.7	0.	0.	12178.0	0.0	0.0
77	3.3	33474.9	0.0	7529.4	0.	0.	5021.2	0.0	0.0
78	14.0	124090.9	0.0	22477.5	0.	0.	18613.6	0.0	0.0
79	16.0	116202.1	0.0	10750.0	0.	0.	17430.3	0.0	0.0
80	2.1	13946.6	0.0	1259.5	0.	0.	2092.0	0.0	0.0
81	12.6	78833.5	0.0	6926.5	0.	0.	11825.0	0.0	0.0
82	12.7	64992.2	0.0	4026.6	0.	0.	9748.8	0.0	0.0
83	6.6	26103.1	0.0	0.0	0.	0.	3915.5	0.0	0.0
84	1.9	6571.1	0.0	0.0	0.	0.	985.7	0.0	0.0
85	8.3	23664.0	0.0	0.0	0.	0.	3549.6	0.0	0.0
86	12.1	14355.0	0.0	0.0	0.	0.	2153.3	0.0	0.0

Failure Surface Specified By 20 Coordinate Points

Point	X-Surf	Y-Surf

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.632	231.644
2	94.815	216.682
3	119.686	199.906
4	134.475	185.117
5	137.305	182.287
6	158.518	161.074
7	179.731	139.861
8	455.000	111.951
9	520.894	116.913
10	560.000	144.559
11	660.000	185.212
12	880.000	268.686
13	920.000	284.292
14	960.000	284.844
15	985.000	292.153
16	1030.000	348.533
17	1060.687	364.154
18	1081.901	385.368
19	1090.173	393.640
20	1102.263	413.760

*** FOS = 1.109 Theta (ki=1.0) = 5.65 ***
Lambda = 0.099
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.147	231.770
2	91.840	215.789
3	116.712	199.013
4	131.214	184.511
5	133.321	182.404
6	154.534	161.191
7	175.747	139.978
8	455.000	129.255
9	521.983	133.407
10	560.000	140.193
11	660.000	180.612
12	880.000	269.477
13	920.000	281.099
14	960.000	283.291
15	985.000	314.024
16	1030.000	337.137
17	1053.793	360.972
18	1075.006	382.185
19	1088.240	395.419
20	1106.641	413.819

*** FOS = 1.109 Theta (ki=1.0) = 5.86 ***
Lambda = 0.103
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.147	231.770
2	91.840	215.789
3	116.712	199.013
4	131.214	184.511
5	133.321	182.404
6	154.534	161.191
7	175.747	139.978
8	455.000	129.255
9	521.983	133.407
10	560.000	140.193
11	660.000	180.612
12	880.000	269.477
13	920.000	281.099
14	960.000	283.291
15	985.000	314.024
16	1030.000	337.137
17	1053.793	360.972
18	1075.006	382.185
19	1088.240	395.419

20	1106.641	413.819

*** FOS = 1.109 Theta (ki=1.0) = 5.86 ***
Lambda = 0.103

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	55.201	231.747
2	57.985	229.870
3	82.856	213.094
4	107.727	196.318
5	121.364	182.682
6	123.711	180.334
7	144.924	159.121
8	166.138	137.908
9	455.000	116.873
10	521.080	122.011
11	560.000	147.313
12	660.000	181.872
13	880.000	285.502
14	920.000	287.515
15	960.000	300.723
16	985.000	318.302
17	1030.000	348.475
18	1068.929	374.531
19	1089.062	394.663
20	1108.239	413.841

*** FOS = 1.116 Theta (ki=1.0) = 5.74 ***
Lambda = 0.100

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.859	231.835
2	90.323	215.334
3	115.194	198.558
4	129.550	184.202
5	132.500	181.252
6	153.714	160.039
7	174.927	138.826
8	455.000	125.759
9	520.443	141.215
10	560.000	148.118
11	660.000	185.842
12	880.000	276.698
13	920.000	302.500
14	960.000	308.560
15	985.000	309.292
16	1030.000	339.202
17	1068.256	390.934
18	1080.167	402.846
19	1086.598	413.549

*** FOS = 1.119 Theta (ki=1.0) = 5.94 ***
Lambda = 0.104

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.859	231.835
2	90.323	215.334
3	115.194	198.558
4	129.550	184.202
5	132.500	181.252
6	153.714	160.039
7	174.927	138.826
8	455.000	125.759
9	520.443	141.215
10	560.000	148.118
11	660.000	185.842
12	880.000	276.698
13	920.000	302.500
14	960.000	308.560
15	985.000	309.292

16	1030.000	339.202
17	1068.256	390.934
18	1080.167	402.846
19	1086.598	413.549

*** FOS = 1.119 Theta (ki=1.0) = 5.94 ***
Lambda = 0.104
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.214	231.538
2	55.010	228.977
3	79.881	212.202
4	104.752	195.426
5	118.102	182.076
6	119.727	180.451
7	140.940	159.238
8	162.153	138.025
9	455.000	134.177
10	522.169	138.505
11	560.000	142.947
12	660.000	177.273
13	880.000	286.293
14	920.000	284.321
15	960.000	299.170
16	985.000	308.173
17	1030.000	337.078
18	1062.035	371.349
19	1083.248	392.562
20	1087.128	396.442
21	1097.495	413.696

*** FOS = 1.120 Theta (ki=1.0) = 5.93 ***
Lambda = 0.104
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.214	231.538
2	55.010	228.977
3	79.881	212.202
4	104.752	195.426
5	118.102	182.076
6	119.727	180.451
7	140.940	159.238
8	162.153	138.025
9	455.000	134.177
10	522.169	138.505
11	560.000	142.947
12	660.000	177.273
13	880.000	286.293
14	920.000	284.321
15	960.000	299.170
16	985.000	308.173
17	1030.000	337.078
18	1062.035	371.349
19	1083.248	392.562
20	1087.128	396.442
21	1097.495	413.696

*** FOS = 1.120 Theta (ki=1.0) = 5.93 ***
Lambda = 0.104
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.764	231.246
2	108.217	216.776
3	133.088	200.000
4	145.858	187.231
5	152.422	180.666
6	173.635	159.453
7	194.849	138.240
8	455.000	119.236
9	524.998	118.744

10	560.000	139.944
11	660.000	178.840
12	880.000	272.743
13	920.000	288.467
14	960.000	286.323
15	985.000	295.936
16	1030.000	336.185
17	1062.728	380.847
18	1082.542	400.661
19	1090.316	413.599

*** FOS = 1.123 Theta (ki=1.0) = 5.78 ***

Lambda = 0.101

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

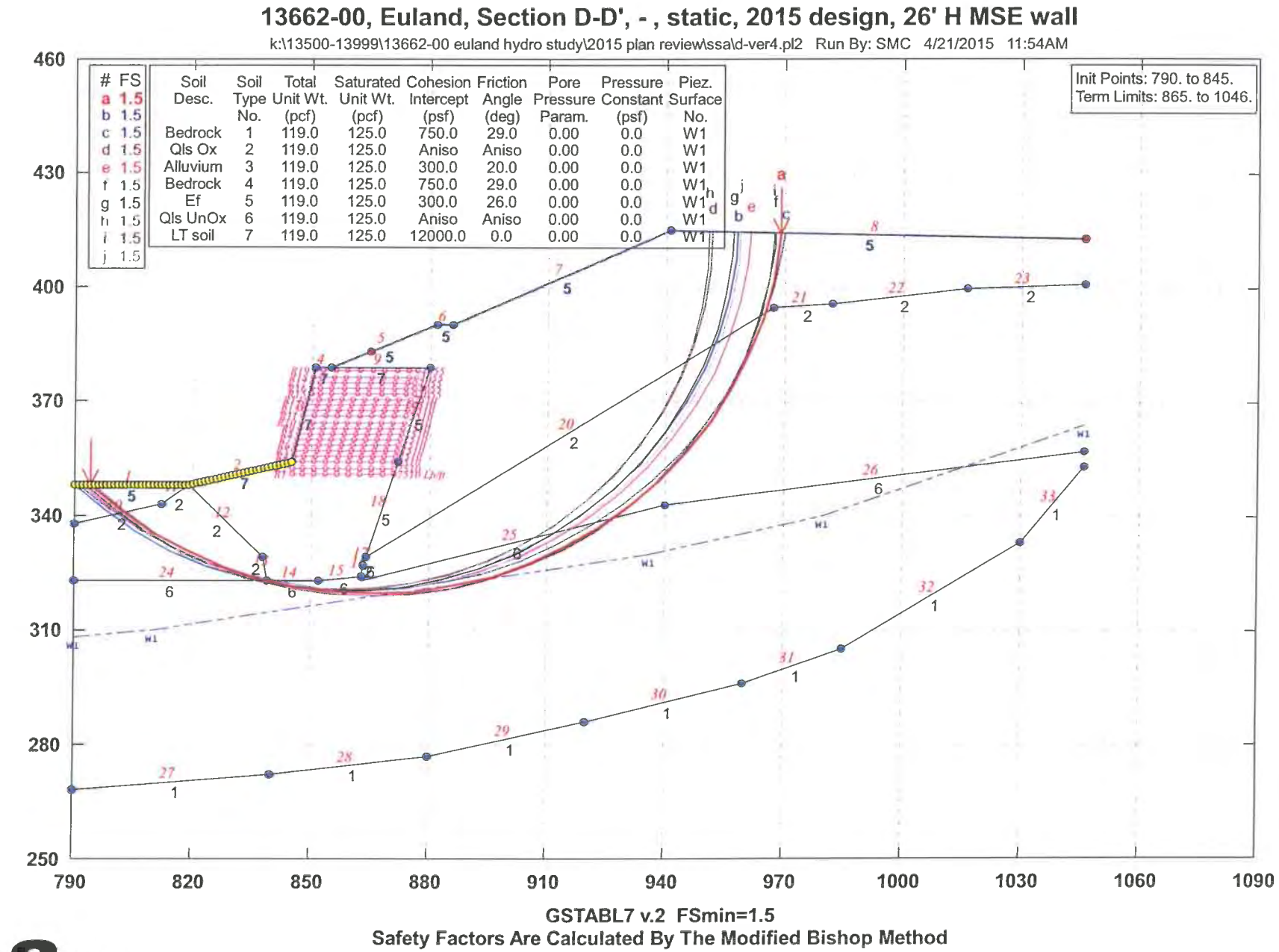
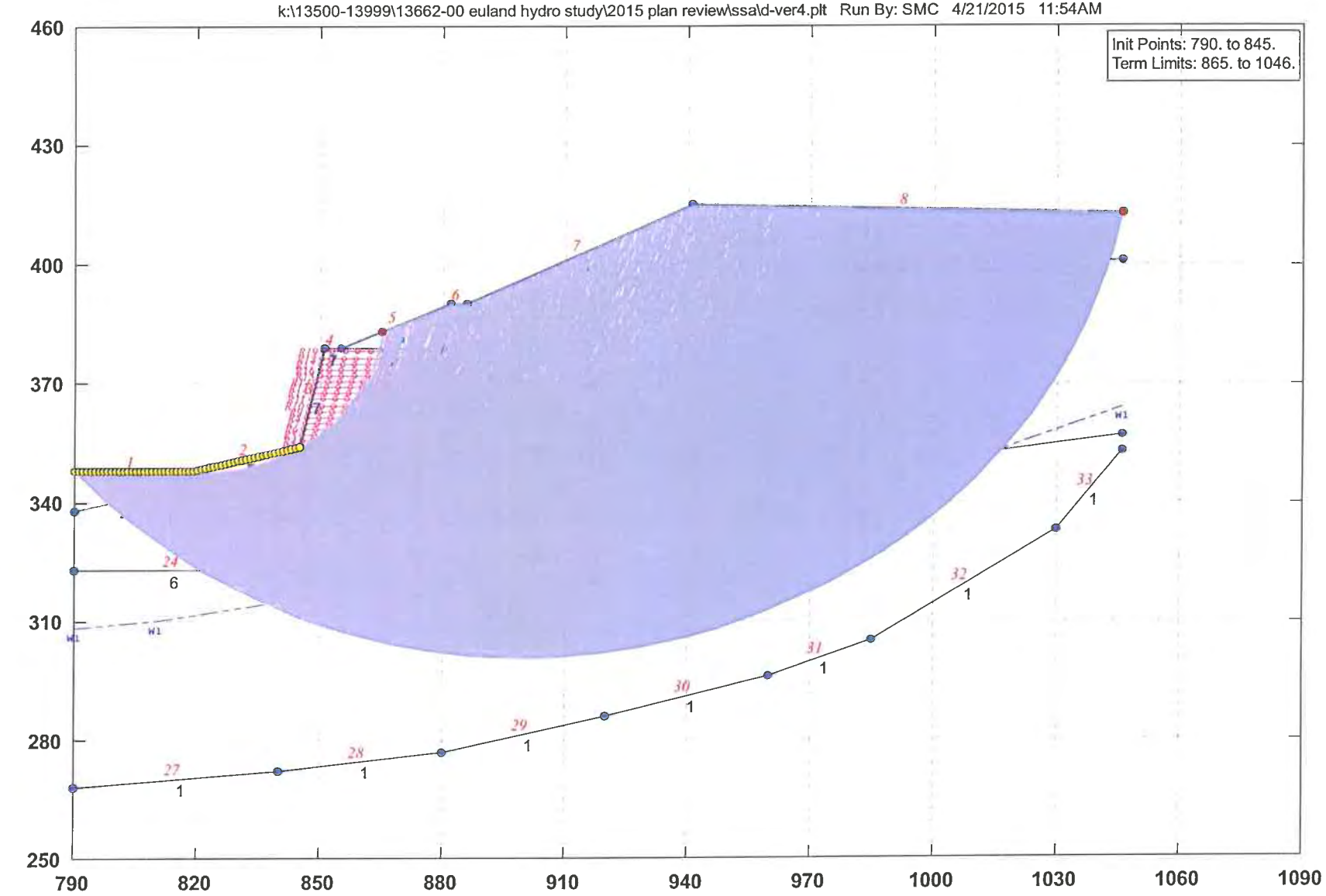

13662-00, Euland, Section D-D', - , static, 2015 design, 26' H MSE wall
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-ver4.pl2 Run By: SMC 4/21/2015 11:54AM
Init Points: 790. to 845.
Term Limits: 865. to 1046.
FS
a 1.5
b 1.5
c 1.5
d 1.5
e 1.5
f 1.5
g 1.5
h 1.5
i 1.5
j 1.5
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedrock | 1 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 750.0 | 29.0 | 0.00 | 0.0 | W1
Ef | 5 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
LT soil | 7 | 119.0 | 125.0 | 12000.0 | 0.0 | 0.00 | 0.0 | W1
460
430
400
370
340
310
280
250
790
820
850
880
910
940
970
1000
1030
1060
1090
GSTABL7 v.2 FSmin=1.5
Safety Factors Are Calculated By The Modified Bishop Method

Figure E-27.1

13662-00, Euland, Section D-D', - , static, 2015 design, 26' H MSE wall

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-ver4.plt Run By: SMC 4/21/2015 11:54AM



*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/21/2015
Time of Run: 11:54AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver4.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver4.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver4.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , static, 2015 design, 26' H MSE wall
BOUNDARY COORDINATES

8 Top Boundaries
33 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	790.00	348.00	819.00	348.00	5
2	819.00	348.00	845.00	354.00	7
3	845.00	354.00	851.00	379.00	7
4	851.00	379.00	855.00	379.00	7
5	855.00	379.00	882.00	390.00	5
6	882.00	390.00	886.00	390.00	5
7	886.00	390.00	941.00	415.00	5
8	941.00	415.00	1046.00	413.00	5
9	855.00	379.00	880.00	379.00	7
10	790.00	338.00	812.00	343.00	2
11	812.00	343.00	819.00	348.00	2
12	819.00	348.00	838.00	329.00	2
13	838.00	329.00	839.00	323.00	2
14	839.00	323.00	852.00	323.00	6
15	852.00	323.00	863.00	324.00	6
16	863.00	324.00	863.50	327.00	6
17	863.50	327.00	864.00	329.00	2
18	864.00	329.00	872.00	354.00	5
19	872.00	354.00	880.00	379.00	5
20	864.00	329.00	967.00	395.00	2
21	967.00	395.00	982.00	396.00	2
22	982.00	396.00	1016.00	400.00	2
23	1016.00	400.00	1046.00	401.00	2
24	790.00	323.00	839.00	323.00	6
25	863.00	323.00	940.00	343.00	6
26	940.00	343.00	1046.00	357.00	6
27	790.00	268.00	840.00	272.00	1
28	840.00	272.00	880.00	277.00	1
29	880.00	277.00	920.00	286.00	1
30	920.00	286.00	960.00	296.00	1
31	960.00	296.00	985.00	305.00	1
32	985.00	305.00	1030.00	333.00	1
33	1030.00	333.00	1046.00	353.00	1

User Specified Y-Origin = 250.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1
7	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
2 soil type(s)

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	790.00	308.00
2	810.00	310.00
3	936.00	330.00
4	980.00	340.00
5	1046.00	364.00

REINFORCING LAYER(S)
19 REINFORCING LAYER(S) SPECIFIED

REINFORCING LAYER NO. 1
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	351.00	7510.00	1.000
2	847.89	351.00	7510.00	1.000
3	850.78	351.00	7510.00	1.000
4	853.67	351.00	7510.00	1.000
5	856.56	351.00	7510.00	1.000
6	859.44	351.00	7510.00	1.000
7	862.33	351.00	7510.00	1.000
8	865.22	351.00	7510.00	1.000
9	868.11	351.00	7510.00	1.000
10	871.00	351.00	7510.00	1.000

REINFORCING LAYER NO. 2
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	352.50	7510.00	1.000
2	847.89	352.50	7510.00	1.000
3	850.78	352.50	7510.00	1.000
4	853.67	352.50	7510.00	1.000
5	856.56	352.50	7510.00	1.000
6	859.44	352.50	7510.00	1.000
7	862.33	352.50	7510.00	1.000
8	865.22	352.50	7510.00	1.000
9	868.11	352.50	7510.00	1.000
10	871.00	352.50	7510.00	1.000

REINFORCING LAYER NO. 3
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	354.00	7510.00	1.000
2	847.89	354.00	7510.00	1.000
3	850.78	354.00	7510.00	1.000
4	853.67	354.00	7510.00	1.000
5	856.56	354.00	7510.00	1.000
6	859.44	354.00	7510.00	1.000
7	862.33	354.00	7510.00	1.000
8	865.22	354.00	7510.00	1.000
9	868.11	354.00	7510.00	1.000
10	871.00	354.00	7510.00	1.000

REINFORCING LAYER NO. 4
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.36	355.50	7510.00	1.000
2	848.25	355.50	7510.00	1.000
3	851.14	355.50	7510.00	1.000
4	854.03	355.50	7510.00	1.000

5	856.92	355.50	7510.00	1.000
6	859.80	355.50	7510.00	1.000
7	862.69	355.50	7510.00	1.000
8	865.58	355.50	7510.00	1.000
9	868.47	355.50	7510.00	1.000
10	871.36	355.50	7510.00	1.000

REINFORCING LAYER NO. 5
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.72	357.00	7510.00	1.000
2	848.61	357.00	7510.00	1.000
3	851.50	357.00	7510.00	1.000
4	854.39	357.00	7510.00	1.000
5	857.28	357.00	7510.00	1.000
6	860.16	357.00	7510.00	1.000
7	863.05	357.00	7510.00	1.000
8	865.94	357.00	7510.00	1.000
9	868.83	357.00	7510.00	1.000
10	871.72	357.00	7510.00	1.000

REINFORCING LAYER NO. 6
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.08	358.50	7510.00	1.000
2	848.97	358.50	7510.00	1.000
3	851.86	358.50	7510.00	1.000
4	854.75	358.50	7510.00	1.000
5	857.64	358.50	7510.00	1.000
6	860.52	358.50	7510.00	1.000
7	863.41	358.50	7510.00	1.000
8	866.30	358.50	7510.00	1.000
9	869.19	358.50	7510.00	1.000
10	872.08	358.50	7510.00	1.000

REINFORCING LAYER NO. 7
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.44	360.00	7510.00	1.000
2	849.33	360.00	7510.00	1.000
3	852.22	360.00	7510.00	1.000
4	855.11	360.00	7510.00	1.000
5	858.00	360.00	7510.00	1.000
6	860.88	360.00	7510.00	1.000
7	863.77	360.00	7510.00	1.000
8	866.66	360.00	7510.00	1.000
9	869.55	360.00	7510.00	1.000
10	872.44	360.00	7510.00	1.000

REINFORCING LAYER NO. 8
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.80	361.50	7510.00	1.000
2	849.69	361.50	7510.00	1.000
3	852.58	361.50	7510.00	1.000
4	855.47	361.50	7510.00	1.000
5	858.36	361.50	7510.00	1.000
6	861.24	361.50	7510.00	1.000
7	864.13	361.50	7510.00	1.000
8	867.02	361.50	7510.00	1.000
9	869.91	361.50	7510.00	1.000
10	872.80	361.50	7510.00	1.000

REINFORCING LAYER NO. 9
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.16	363.00	7510.00	1.000
2	850.05	363.00	7510.00	1.000
3	852.94	363.00	7510.00	1.000
4	855.83	363.00	7510.00	1.000

5	858.72	363.00	7510.00	1.000
6	861.60	363.00	7510.00	1.000
7	864.49	363.00	7510.00	1.000
8	867.38	363.00	7510.00	1.000
9	870.27	363.00	7510.00	1.000
10	873.16	363.00	7510.00	1.000

REINFORCING LAYER NO. 10
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.52	364.50	7510.00	1.000
2	850.41	364.50	7510.00	1.000
3	853.30	364.50	7510.00	1.000
4	856.19	364.50	7510.00	1.000
5	859.08	364.50	7510.00	1.000
6	861.96	364.50	7510.00	1.000
7	864.85	364.50	7510.00	1.000
8	867.74	364.50	7510.00	1.000
9	870.63	364.50	7510.00	1.000
10	873.52	364.50	7510.00	1.000

REINFORCING LAYER NO. 11
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.88	366.00	7510.00	1.000
2	850.77	366.00	7510.00	1.000
3	853.66	366.00	7510.00	1.000
4	856.55	366.00	7510.00	1.000
5	859.44	366.00	7510.00	1.000
6	862.32	366.00	7510.00	1.000
7	865.21	366.00	7510.00	1.000
8	868.10	366.00	7510.00	1.000
9	870.99	366.00	7510.00	1.000
10	873.88	366.00	7510.00	1.000

REINFORCING LAYER NO. 12
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.24	367.50	7510.00	1.000
2	851.13	367.50	7510.00	1.000
3	854.02	367.50	7510.00	1.000
4	856.91	367.50	7510.00	1.000
5	859.80	367.50	7510.00	1.000
6	862.68	367.50	7510.00	1.000
7	865.57	367.50	7510.00	1.000
8	868.46	367.50	7510.00	1.000
9	871.35	367.50	7510.00	1.000
10	874.24	367.50	7510.00	1.000

REINFORCING LAYER NO. 13
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.60	369.00	7510.00	1.000
2	851.49	369.00	7510.00	1.000
3	854.38	369.00	7510.00	1.000
4	857.27	369.00	7510.00	1.000
5	860.16	369.00	7510.00	1.000
6	863.04	369.00	7510.00	1.000
7	865.93	369.00	7510.00	1.000
8	868.82	369.00	7510.00	1.000
9	871.71	369.00	7510.00	1.000
10	874.60	369.00	7510.00	1.000

REINFORCING LAYER NO. 14
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.96	370.50	7510.00	1.000
2	851.85	370.50	7510.00	1.000
3	854.74	370.50	7510.00	1.000
4	857.63	370.50	7510.00	1.000

5	860.52	370.50	7510.00	1.000
6	863.40	370.50	7510.00	1.000
7	866.29	370.50	7510.00	1.000
8	869.18	370.50	7510.00	1.000
9	872.07	370.50	7510.00	1.000
10	874.96	370.50	7510.00	1.000

REINFORCING LAYER NO. 15
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.00	372.00	0.00	1.000
2	852.00	372.00	4055.00	1.000
3	855.14	372.00	4055.00	1.000
4	858.29	372.00	4055.00	1.000
5	861.43	372.00	4055.00	1.000
6	864.57	372.00	4055.00	1.000
7	867.71	372.00	4055.00	1.000
8	870.86	372.00	4055.00	1.000
9	874.00	372.00	4055.00	1.000
10	876.00	372.00	0.00	1.000

REINFORCING LAYER NO. 16
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.00	373.50	0.00	1.000
2	852.00	373.50	4055.00	1.000
3	855.14	373.50	4055.00	1.000
4	858.29	373.50	4055.00	1.000
5	861.43	373.50	4055.00	1.000
6	864.57	373.50	4055.00	1.000
7	867.71	373.50	4055.00	1.000
8	870.86	373.50	4055.00	1.000
9	874.00	373.50	4055.00	1.000
10	876.00	373.50	0.00	1.000

REINFORCING LAYER NO. 17
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.04	375.00	0.00	1.000
2	852.04	375.00	4055.00	1.000
3	855.18	375.00	4055.00	1.000
4	858.33	375.00	4055.00	1.000
5	861.47	375.00	4055.00	1.000
6	864.61	375.00	4055.00	1.000
7	867.75	375.00	4055.00	1.000
8	870.90	375.00	4055.00	1.000
9	874.04	375.00	4055.00	1.000
10	876.04	375.00	0.00	1.000

REINFORCING LAYER NO. 18
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.40	376.50	0.00	1.000
2	852.40	376.50	4055.00	1.000
3	855.54	376.50	4055.00	1.000
4	858.69	376.50	4055.00	1.000
5	861.83	376.50	4055.00	1.000
6	864.97	376.50	4055.00	1.000
7	868.11	376.50	4055.00	1.000
8	871.26	376.50	4055.00	1.000
9	874.40	376.50	4055.00	1.000
10	876.40	376.50	0.00	1.000

REINFORCING LAYER NO. 19
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.76	378.00	0.00	1.000
2	852.76	378.00	4055.00	1.000
3	855.90	378.00	4055.00	1.000
4	859.05	378.00	4055.00	1.000

5	862.19	378.00	4055.00	1.000
6	865.33	378.00	4055.00	1.000
7	868.47	378.00	4055.00	1.000
8	871.62	378.00	4055.00	1.000
9	874.76	378.00	4055.00	1.000
10	876.76	378.00	0.00	1.000

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
11200 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 56 Points Equally Spaced
Along The Ground Surface Between X = 790.00(ft)
and X = 845.00(ft)
Each Surface Terminates Between X = 865.00(ft)
and X =1046.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 270.00(ft)
10.00(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 = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	794.000	348.000
2	801.582	341.480
3	809.756	335.719
4	818.446	330.771
5	827.572	326.682
6	837.048	323.490
7	846.788	321.223
8	856.701	319.905
9	866.695	319.546
10	876.676	320.149
11	886.554	321.710
12	896.235	324.214
13	905.631	327.638
14	914.654	331.949
15	923.220	337.108
16	931.250	343.068
17	938.670	349.772
18	945.411	357.158
19	951.410	365.159
20	956.612	373.700
21	960.968	382.701
22	964.438	392.080
23	966.990	401.749
24	968.600	411.618
25	968.786	414.471

Circle Center At X = 865.423 ; Y = 423.383 ; and Radius = 103.845
Factor of Safety
*** 1.479 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	790.000	348.000
2	797.547	341.440
3	805.715	335.670
4	814.421	330.750
5	823.577	326.729

6	833.090	323.647
7	842.865	321.536
8	852.802	320.417
9	862.801	320.301
10	872.762	321.189
11	882.583	323.073
12	892.165	325.933
13	901.411	329.741
14	910.229	334.458
15	918.529	340.037
16	926.226	346.420
17	933.244	353.544
18	939.511	361.337
19	944.964	369.719
20	949.548	378.606
21	953.217	387.909
22	955.933	397.533
23	957.670	407.381
24	958.210	414.672

Circle Center At X = 858.933 ; Y = 419.613 ; and Radius = 99.400

Factor of Safety

*** 1.479 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	791.000	348.000
2	798.746	341.676
3	807.045	336.096
4	815.824	331.308
5	825.009	327.353
6	834.520	324.266
7	844.277	322.072
8	854.194	320.791
9	864.188	320.434
10	874.172	321.003
11	884.060	322.494
12	893.768	324.894
13	903.211	328.182
14	912.310	332.330
15	920.986	337.303
16	929.165	343.058
17	936.775	349.545
18	943.752	356.708
19	950.037	364.487
20	955.574	372.814
21	960.316	381.618
22	964.223	390.823
23	967.261	400.350
24	969.405	410.118
25	969.941	414.449

Circle Center At X = 863.044 ; Y = 428.337 ; and Radius = 107.909

Factor of Safety

*** 1.479 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.438	341.316
3	808.552	335.472
4	817.248	330.533
5	826.424	326.559
6	835.975	323.594
7	845.789	321.674
8	855.752	320.821
9	865.750	321.044
10	875.665	322.341
11	885.384	324.697
12	894.793	328.085
13	903.782	332.465
14	912.249	337.786

15	920.094	343.987
16	927.227	350.996
17	933.565	358.731
18	939.033	367.103
19	943.570	376.015
20	947.122	385.363
21	949.648	395.039
22	951.119	404.930
23	951.512	414.800

Circle Center At X = 858.682 ; Y = 413.619 ; and Radius = 92.844

Factor of Safety

*** 1.482 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	792.000	348.000
2	799.567	341.462
3	807.746	335.710
4	816.458	330.799
5	825.615	326.781
6	835.126	323.693
7	844.898	321.567
8	854.832	320.425
9	864.831	320.276
10	874.795	321.123
11	884.626	322.958
12	894.224	325.761
13	903.497	329.506
14	912.350	334.155
15	920.697	339.662
16	928.455	345.973
17	935.546	353.023
18	941.901	360.745
19	947.455	369.061
20	952.154	377.888
21	955.952	387.138
22	958.810	396.721
23	960.700	406.541
24	961.433	414.611

Circle Center At X = 861.305 ; Y = 420.507 ; and Radius = 100.301

Factor of Safety

*** 1.484 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.509	341.396
3	808.622	335.550
4	817.263	330.517
5	826.351	326.344
6	835.800	323.070
7	845.522	320.727
8	855.424	319.335
9	865.415	318.909
10	875.401	319.452
11	885.286	320.959
12	894.980	323.415
13	904.390	326.799
14	913.428	331.078
15	922.010	336.211
16	930.055	342.151
17	937.486	348.842
18	944.235	356.222
19	950.238	364.219
20	955.439	372.760
21	959.789	381.765
22	963.246	391.148
23	965.779	400.822
24	967.363	410.696
25	967.599	414.493

Circle Center At X = 864.814 ; Y = 422.087 ; and Radius = 103.180

Factor of Safety

*** 1.486 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	791.000	348.000
2	798.500	341.386
3	806.637	335.572
4	815.324	330.620
5	824.472	326.580
6	833.984	323.496
7	843.762	321.398
8	853.703	320.310
9	863.702	320.242
10	873.657	321.196
11	883.462	323.161
12	893.015	326.117
13	902.217	330.032
14	910.970	334.867
15	919.185	340.570
16	926.774	347.082
17	933.659	354.334
18	939.767	362.252
19	945.035	370.752
20	949.407	379.745
21	952.839	389.138
22	955.294	398.832
23	956.746	408.726
24	957.006	414.695

Circle Center At X = 859.338 ; Y = 417.849 ; and Radius = 97.719

Factor of Safety

*** 1.486 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.397	341.270
3	808.479	335.382
4	817.152	330.403
5	826.313	326.394
6	835.854	323.401
7	845.664	321.459
8	855.626	320.592
9	865.624	320.809
10	875.539	322.109
11	885.255	324.475
12	894.658	327.879
13	903.636	332.283
14	912.084	337.633
15	919.903	343.868
16	927.000	350.912
17	933.293	358.685
18	938.706	367.093
19	943.176	376.038
20	946.650	385.415
21	949.088	395.113
22	950.461	405.019
23	950.747	414.814

Circle Center At X = 858.626 ; Y = 412.699 ; and Radius = 92.156

Factor of Safety

*** 1.492 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	795.000	348.000
2	802.474	341.356
3	810.565	335.480
4	819.196	330.429
5	828.281	326.251

6	837.734	322.989
7	847.462	320.672
8	857.371	319.324
9	867.364	318.958
10	877.345	319.578
11	887.216	321.176
12	896.882	323.739
13	906.249	327.240
14	915.226	331.647
15	923.726	336.915
16	931.665	342.995
17	938.968	349.826
18	945.563	357.344
19	951.386	365.473
20	956.381	374.137
21	960.499	383.249
22	963.699	392.723
23	965.952	402.466
24	967.235	412.384
25	967.299	414.499

Circle Center At X = 866.077 ; Y = 420.428 ; and Radius = 101.477

Factor of Safety

*** 1.496 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	791.000	348.000
2	798.485	341.369
3	806.602	335.528
4	815.267	330.536
5	824.393	326.447
6	833.884	323.300
7	843.646	321.128
8	853.577	319.954
9	863.575	319.789
10	873.539	320.636
11	883.367	322.485
12	892.957	325.317
13	902.213	329.104
14	911.038	333.807
15	919.342	339.378
16	927.042	345.759
17	934.057	352.886
18	940.316	360.685
19	945.755	369.076
20	950.318	377.974
21	953.959	387.288
22	956.640	396.922
23	958.334	406.777
24	958.879	414.659

Circle Center At X = 860.184 ; Y = 418.490 ; and Radius = 98.769

Factor of Safety

*** 1.498 ***

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

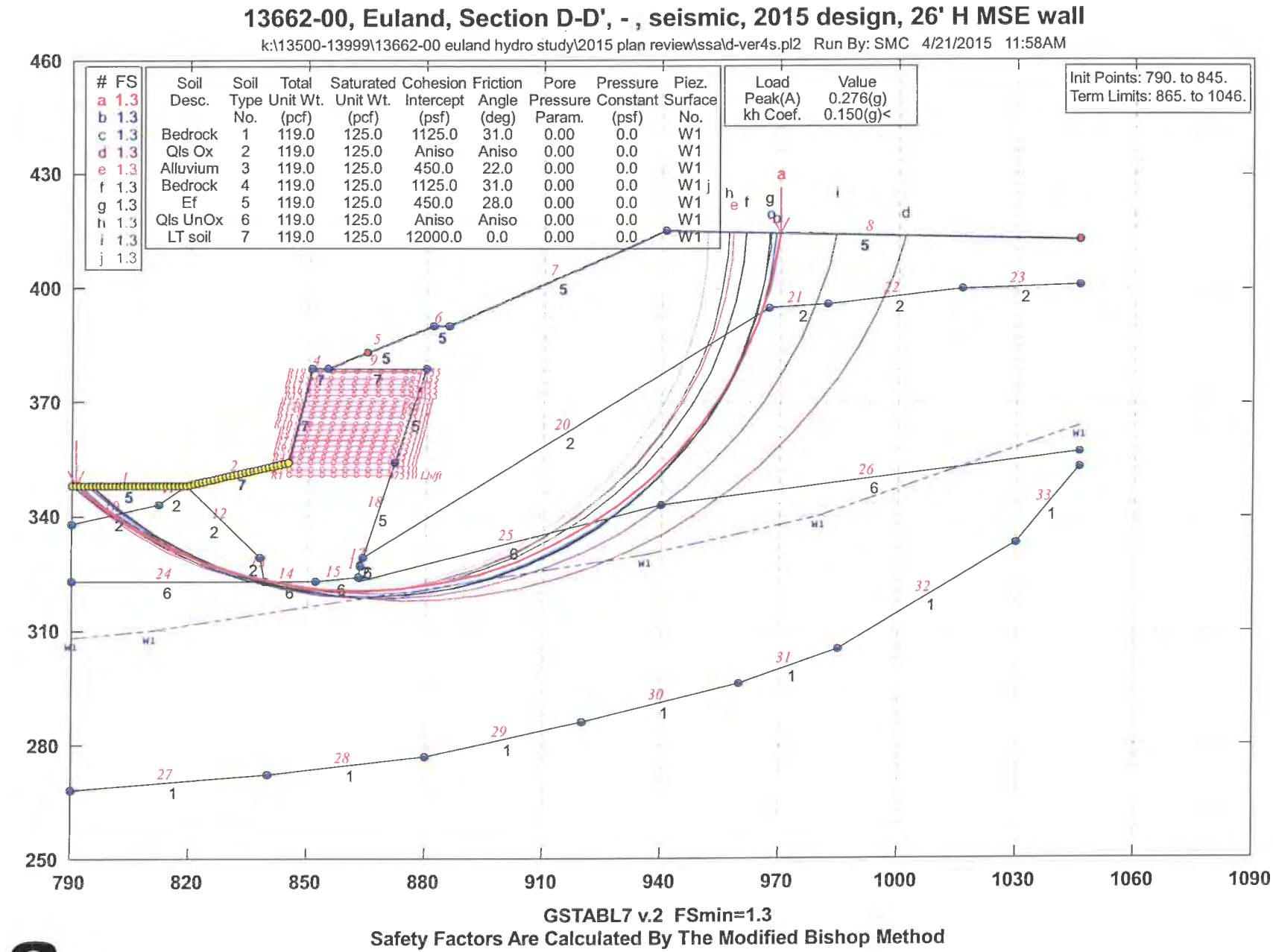
13662-00, Euland, Section D-D', - , seismic, 2015 design, 26' H MSE wall
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-ver4s.pl2 Run By: SMC 4/21/2015 11:58AM
FS
a 1.3
b 1.3
c 1.3
d 1.3
e 1.3
f 1.3
g 1.3
h 1.3
i 1.3
j 1.3
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedrock | 1 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1 j
Ef | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls UnOx | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
LT soil | 7 | 119.0 | 125.0 | 12000.0 | 0.0 | 0.00 | 0.0 | W1
Load
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
Init Points: 790. to 845.
Term Limits: 865. to 1046.
460
430
400
370
340
310
280
250
790
820
850
880
910
940
970
1000
1030
1060
1090
GSTABL7 v.2 FSmin=1.3
Safety Factors Are Calculated By The Modified Bishop Method

Figure E-27.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/21/2015
Time of Run: 11:58AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver4s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver4s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver4s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic, 2015 design, 26' H MSE wall

BOUNDARY COORDINATES

8 Top Boundaries
33 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	790.00	348.00	819.00	348.00	5
2	819.00	348.00	845.00	354.00	7
3	845.00	354.00	851.00	379.00	7
4	851.00	379.00	855.00	379.00	7
5	855.00	379.00	882.00	390.00	5
6	882.00	390.00	886.00	390.00	5
7	886.00	390.00	941.00	415.00	5
8	941.00	415.00	1046.00	413.00	5
9	855.00	379.00	880.00	379.00	7
10	790.00	338.00	812.00	343.00	2
11	812.00	343.00	819.00	348.00	2
12	819.00	348.00	838.00	329.00	2
13	838.00	329.00	839.00	323.00	2
14	839.00	323.00	852.00	323.00	6
15	852.00	323.00	863.00	324.00	6
16	863.00	324.00	863.50	327.00	6
17	863.50	327.00	864.00	329.00	2
18	864.00	329.00	872.00	354.00	5
19	872.00	354.00	880.00	379.00	5
20	864.00	329.00	967.00	395.00	2
21	967.00	395.00	982.00	396.00	2
22	982.00	396.00	1016.00	400.00	2
23	1016.00	400.00	1046.00	401.00	2
24	790.00	323.00	839.00	323.00	6
25	863.00	323.00	940.00	343.00	6
26	940.00	343.00	1046.00	357.00	6
27	790.00	268.00	840.00	272.00	1
28	840.00	272.00	880.00	277.00	1
29	880.00	277.00	920.00	286.00	1
30	920.00	286.00	960.00	296.00	1
31	960.00	296.00	985.00	305.00	1
32	985.00	305.00	1030.00	333.00	1
33	1030.00	333.00	1046.00	353.00	1

User Specified Y-Origin = 250.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1
7	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
2 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	790.00	308.00
2	810.00	310.00
3	936.00	330.00
4	980.00	340.00
5	1046.00	364.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000

REINFORCING LAYER(S)
19 REINFORCING LAYER(S) SPECIFIED
REINFORCING LAYER NO. 1
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	351.00	7510.00	1.000
2	847.89	351.00	7510.00	1.000
3	850.78	351.00	7510.00	1.000
4	853.67	351.00	7510.00	1.000
5	856.56	351.00	7510.00	1.000
6	859.44	351.00	7510.00	1.000
7	862.33	351.00	7510.00	1.000
8	865.22	351.00	7510.00	1.000
9	868.11	351.00	7510.00	1.000
10	871.00	351.00	7510.00	1.000

REINFORCING LAYER NO. 2
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	352.50	7510.00	1.000
2	847.89	352.50	7510.00	1.000

3	850.78	352.50	7510.00	1.000
4	853.67	352.50	7510.00	1.000
5	856.56	352.50	7510.00	1.000
6	859.44	352.50	7510.00	1.000
7	862.33	352.50	7510.00	1.000
8	865.22	352.50	7510.00	1.000
9	868.11	352.50	7510.00	1.000
10	871.00	352.50	7510.00	1.000

REINFORCING LAYER NO. 3
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	354.00	7510.00	1.000
2	847.89	354.00	7510.00	1.000
3	850.78	354.00	7510.00	1.000
4	853.67	354.00	7510.00	1.000
5	856.56	354.00	7510.00	1.000
6	859.44	354.00	7510.00	1.000
7	862.33	354.00	7510.00	1.000
8	865.22	354.00	7510.00	1.000
9	868.11	354.00	7510.00	1.000
10	871.00	354.00	7510.00	1.000

REINFORCING LAYER NO. 4
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.36	355.50	7510.00	1.000
2	848.25	355.50	7510.00	1.000
3	851.14	355.50	7510.00	1.000
4	854.03	355.50	7510.00	1.000
5	856.92	355.50	7510.00	1.000
6	859.80	355.50	7510.00	1.000
7	862.69	355.50	7510.00	1.000
8	865.58	355.50	7510.00	1.000
9	868.47	355.50	7510.00	1.000
10	871.36	355.50	7510.00	1.000

REINFORCING LAYER NO. 5
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.72	357.00	7510.00	1.000
2	848.61	357.00	7510.00	1.000
3	851.50	357.00	7510.00	1.000
4	854.39	357.00	7510.00	1.000
5	857.28	357.00	7510.00	1.000
6	860.16	357.00	7510.00	1.000
7	863.05	357.00	7510.00	1.000
8	865.94	357.00	7510.00	1.000
9	868.83	357.00	7510.00	1.000
10	871.72	357.00	7510.00	1.000

REINFORCING LAYER NO. 6
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.08	358.50	7510.00	1.000
2	848.97	358.50	7510.00	1.000
3	851.86	358.50	7510.00	1.000
4	854.75	358.50	7510.00	1.000
5	857.64	358.50	7510.00	1.000
6	860.52	358.50	7510.00	1.000
7	863.41	358.50	7510.00	1.000
8	866.30	358.50	7510.00	1.000
9	869.19	358.50	7510.00	1.000
10	872.08	358.50	7510.00	1.000

REINFORCING LAYER NO. 7
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.44	360.00	7510.00	1.000
2	849.33	360.00	7510.00	1.000

3	852.22	360.00	7510.00	1.000
4	855.11	360.00	7510.00	1.000
5	858.00	360.00	7510.00	1.000
6	860.88	360.00	7510.00	1.000
7	863.77	360.00	7510.00	1.000
8	866.66	360.00	7510.00	1.000
9	869.55	360.00	7510.00	1.000
10	872.44	360.00	7510.00	1.000

REINFORCING LAYER NO. 8
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.80	361.50	7510.00	1.000
2	849.69	361.50	7510.00	1.000
3	852.58	361.50	7510.00	1.000
4	855.47	361.50	7510.00	1.000
5	858.36	361.50	7510.00	1.000
6	861.24	361.50	7510.00	1.000
7	864.13	361.50	7510.00	1.000
8	867.02	361.50	7510.00	1.000
9	869.91	361.50	7510.00	1.000
10	872.80	361.50	7510.00	1.000

REINFORCING LAYER NO. 9
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.16	363.00	7510.00	1.000
2	850.05	363.00	7510.00	1.000
3	852.94	363.00	7510.00	1.000
4	855.83	363.00	7510.00	1.000
5	858.72	363.00	7510.00	1.000
6	861.60	363.00	7510.00	1.000
7	864.49	363.00	7510.00	1.000
8	867.38	363.00	7510.00	1.000
9	870.27	363.00	7510.00	1.000
10	873.16	363.00	7510.00	1.000

REINFORCING LAYER NO. 10
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.52	364.50	7510.00	1.000
2	850.41	364.50	7510.00	1.000
3	853.30	364.50	7510.00	1.000
4	856.19	364.50	7510.00	1.000
5	859.08	364.50	7510.00	1.000
6	861.96	364.50	7510.00	1.000
7	864.85	364.50	7510.00	1.000
8	867.74	364.50	7510.00	1.000
9	870.63	364.50	7510.00	1.000
10	873.52	364.50	7510.00	1.000

REINFORCING LAYER NO. 11
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.88	366.00	7510.00	1.000
2	850.77	366.00	7510.00	1.000
3	853.66	366.00	7510.00	1.000
4	856.55	366.00	7510.00	1.000
5	859.44	366.00	7510.00	1.000
6	862.32	366.00	7510.00	1.000
7	865.21	366.00	7510.00	1.000
8	868.10	366.00	7510.00	1.000
9	870.99	366.00	7510.00	1.000
10	873.88	366.00	7510.00	1.000

REINFORCING LAYER NO. 12
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.24	367.50	7510.00	1.000
2	851.13	367.50	7510.00	1.000

3	854.02	367.50	7510.00	1.000
4	856.91	367.50	7510.00	1.000
5	859.80	367.50	7510.00	1.000
6	862.68	367.50	7510.00	1.000
7	865.57	367.50	7510.00	1.000
8	868.46	367.50	7510.00	1.000
9	871.35	367.50	7510.00	1.000
10	874.24	367.50	7510.00	1.000

REINFORCING LAYER NO. 13
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.60	369.00	7510.00	1.000
2	851.49	369.00	7510.00	1.000
3	854.38	369.00	7510.00	1.000
4	857.27	369.00	7510.00	1.000
5	860.16	369.00	7510.00	1.000
6	863.04	369.00	7510.00	1.000
7	865.93	369.00	7510.00	1.000
8	868.82	369.00	7510.00	1.000
9	871.71	369.00	7510.00	1.000
10	874.60	369.00	7510.00	1.000

REINFORCING LAYER NO. 14
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.96	370.50	7510.00	1.000
2	851.85	370.50	7510.00	1.000
3	854.74	370.50	7510.00	1.000
4	857.63	370.50	7510.00	1.000
5	860.52	370.50	7510.00	1.000
6	863.40	370.50	7510.00	1.000
7	866.29	370.50	7510.00	1.000
8	869.18	370.50	7510.00	1.000
9	872.07	370.50	7510.00	1.000
10	874.96	370.50	7510.00	1.000

REINFORCING LAYER NO. 15
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.00	372.00	0.00	1.000
2	852.00	372.00	4055.00	1.000
3	855.14	372.00	4055.00	1.000
4	858.29	372.00	4055.00	1.000
5	861.43	372.00	4055.00	1.000
6	864.57	372.00	4055.00	1.000
7	867.71	372.00	4055.00	1.000
8	870.86	372.00	4055.00	1.000
9	874.00	372.00	4055.00	1.000
10	876.00	372.00	0.00	1.000

REINFORCING LAYER NO. 16
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.00	373.50	0.00	1.000
2	852.00	373.50	4055.00	1.000
3	855.14	373.50	4055.00	1.000
4	858.29	373.50	4055.00	1.000
5	861.43	373.50	4055.00	1.000
6	864.57	373.50	4055.00	1.000
7	867.71	373.50	4055.00	1.000
8	870.86	373.50	4055.00	1.000
9	874.00	373.50	4055.00	1.000
10	876.00	373.50	0.00	1.000

REINFORCING LAYER NO. 17
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.04	375.00	0.00	1.000
2	852.04	375.00	4055.00	1.000

3	855.18	375.00	4055.00	1.000
4	858.33	375.00	4055.00	1.000
5	861.47	375.00	4055.00	1.000
6	864.61	375.00	4055.00	1.000
7	867.75	375.00	4055.00	1.000
8	870.90	375.00	4055.00	1.000
9	874.04	375.00	4055.00	1.000
10	876.04	375.00	0.00	1.000

REINFORCING LAYER NO. 18
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.40	376.50	0.00	1.000
2	852.40	376.50	4055.00	1.000
3	855.54	376.50	4055.00	1.000
4	858.69	376.50	4055.00	1.000
5	861.83	376.50	4055.00	1.000
6	864.97	376.50	4055.00	1.000
7	868.11	376.50	4055.00	1.000
8	871.26	376.50	4055.00	1.000
9	874.40	376.50	4055.00	1.000
10	876.40	376.50	0.00	1.000

REINFORCING LAYER NO. 19
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.76	378.00	0.00	1.000
2	852.76	378.00	4055.00	1.000
3	855.90	378.00	4055.00	1.000
4	859.05	378.00	4055.00	1.000
5	862.19	378.00	4055.00	1.000
6	865.33	378.00	4055.00	1.000
7	868.47	378.00	4055.00	1.000
8	871.62	378.00	4055.00	1.000
9	874.76	378.00	4055.00	1.000
10	876.76	378.00	0.00	1.000

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
11200 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 56 Points Equally Spaced
Along The Ground Surface Between X = 790.00(ft)
and X = 845.00(ft)
Each Surface Terminates Between X = 865.00(ft)
and X =1046.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 270.00(ft)
10.00(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 = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	791.000	348.000
2	798.746	341.676
3	807.045	336.096
4	815.824	331.308
5	825.009	327.353
6	834.520	324.266
7	844.277	322.072
8	854.194	320.791
9	864.188	320.434
10	874.172	321.003
11	884.060	322.494

12	893.768	324.894
13	903.211	328.182
14	912.310	332.330
15	920.986	337.303
16	929.165	343.058
17	936.775	349.545
18	943.752	356.708
19	950.037	364.487
20	955.574	372.814
21	960.316	381.618
22	964.223	390.823
23	967.261	400.350
24	969.405	410.118
25	969.941	414.449

Circle Center At X = 863.044 ; Y = 428.337 ; and Radius = 107.909

Factor of Safety

*** 1.301 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	794.000	348.000
2	801.582	341.480
3	809.756	335.719
4	818.446	330.771
5	827.572	326.682
6	837.048	323.490
7	846.788	321.223
8	856.701	319.905
9	866.695	319.546
10	876.676	320.149
11	886.554	321.710
12	896.235	324.214
13	905.631	327.638
14	914.654	331.949
15	923.220	337.108
16	931.250	343.068
17	938.670	349.772
18	945.411	357.158
19	951.410	365.159
20	956.612	373.700
21	960.968	382.701
22	964.438	392.080
23	966.990	401.749
24	968.600	411.618
25	968.786	414.471

Circle Center At X = 865.423 ; Y = 423.383 ; and Radius = 103.845

Factor of Safety

*** 1.311 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.509	341.396
3	808.622	335.550
4	817.263	330.517
5	826.351	326.344
6	835.800	323.070
7	845.522	320.727
8	855.424	319.335
9	865.415	318.909
10	875.401	319.452
11	885.286	320.959
12	894.980	323.415
13	904.390	326.799
14	913.428	331.078

15	922.010	336.211
16	930.055	342.151
17	937.486	348.842
18	944.235	356.222
19	950.238	364.219
20	955.439	372.760
21	959.789	381.765
22	963.246	391.148
23	965.779	400.822
24	967.363	410.696
25	967.599	414.493

Circle Center At X = 864.814 ; Y = 422.087 ; and Radius = 103.180

Factor of Safety

*** 1.320 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	791.000	348.000
2	798.963	341.950
3	807.360	336.521
4	816.144	331.742
5	825.265	327.641
6	834.669	324.242
7	844.304	321.565
8	854.114	319.624
9	864.043	318.430
10	874.033	317.992
11	884.028	318.310
12	893.970	319.384
13	903.803	321.207
14	913.469	323.768
15	922.914	327.054
16	932.083	331.044
17	940.924	335.717
18	949.386	341.046
19	957.421	346.999
20	964.982	353.543
21	972.027	360.641
22	978.514	368.251
23	984.407	376.330
24	989.672	384.832
25	994.279	393.708
26	998.201	402.907
27	1001.415	412.376
28	1001.792	413.842

Circle Center At X = 874.816 ; Y = 450.011 ; and Radius = 132.027

Factor of Safety

*** 1.322 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	790.000	348.000
2	797.547	341.440
3	805.715	335.670
4	814.421	330.750
5	823.577	326.729
6	833.090	323.647
7	842.865	321.536
8	852.802	320.417
9	862.801	320.301
10	872.762	321.189
11	882.583	323.073
12	892.165	325.933
13	901.411	329.741
14	910.229	334.458
15	918.529	340.037
16	926.226	346.420
17	933.244	353.544
18	939.511	361.337
19	944.964	369.719

20	949.548	378.606
21	953.217	387.909
22	955.933	397.533
23	957.670	407.381
24	958.210	414.672

Circle Center At X = 858.933 ; Y = 419.613 ; and Radius = 99.400

Factor of Safety

*** 1.323 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	792.000	348.000
2	799.567	341.462
3	807.746	335.710
4	816.458	330.799
5	825.615	326.781
6	835.126	323.693
7	844.898	321.567
8	854.832	320.425
9	864.831	320.276
10	874.795	321.123
11	884.626	322.958
12	894.224	325.761
13	903.497	329.506
14	912.350	334.155
15	920.697	339.662
16	928.455	345.973
17	935.546	353.023
18	941.901	360.745
19	947.455	369.061
20	952.154	377.888
21	955.952	387.138
22	958.810	396.721
23	960.700	406.541
24	961.433	414.611

Circle Center At X = 861.305 ; Y = 420.507 ; and Radius = 100.301

Factor of Safety

*** 1.324 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	795.000	348.000
2	802.474	341.356
3	810.565	335.480
4	819.196	330.429
5	828.281	326.251
6	837.734	322.989
7	847.462	320.672
8	857.371	319.324
9	867.364	318.958
10	877.345	319.578
11	887.216	321.176
12	896.882	323.739
13	906.249	327.240
14	915.226	331.647
15	923.726	336.915
16	931.665	342.995
17	938.968	349.826
18	945.563	357.344
19	951.386	365.473
20	956.381	374.137
21	960.499	383.249
22	963.699	392.723
23	965.952	402.466
24	967.235	412.384
25	967.299	414.499

Circle Center At X = 866.077 ; Y = 420.428 ; and Radius = 101.477

Factor of Safety

*** 1.331 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	791.000	348.000
2	798.500	341.386
3	806.637	335.572
4	815.324	330.620
5	824.472	326.580
6	833.984	323.496
7	843.762	321.398
8	853.703	320.310
9	863.702	320.242
10	873.657	321.196
11	883.462	323.161
12	893.015	326.117
13	902.217	330.032
14	910.970	334.867
15	919.185	340.570
16	926.774	347.082
17	933.659	354.334
18	939.767	362.252
19	945.035	370.752
20	949.407	379.745
21	952.839	389.138
22	955.294	398.832
23	956.746	408.726
24	957.006	414.695

Circle Center At X = 859.338 ; Y = 417.849 ; and Radius = 97.719

Factor of Safety

*** 1.332 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	790.000	348.000
2	797.778	341.714
3	806.059	336.109
4	814.784	331.223
5	823.891	327.092
6	833.315	323.746
7	842.987	321.209
8	852.840	319.498
9	862.802	318.626
10	872.802	318.600
11	882.768	319.418
12	892.630	321.077
13	902.316	323.563
14	911.757	326.858
15	920.886	330.940
16	929.637	335.779
17	937.948	341.341
18	945.759	347.585
19	953.014	354.467
20	959.662	361.938
21	965.654	369.943
22	970.948	378.427
23	975.506	387.328
24	979.296	396.582
25	982.289	406.124
26	984.085	414.179

Circle Center At X = 868.102 ; Y = 436.637 ; and Radius = 118.138

Factor of Safety

*** 1.334 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.438	341.316
3	808.552	335.472
4	817.248	330.533
5	826.424	326.559
6	835.975	323.594

7	845.789	321.674
8	855.752	320.821
9	865.750	321.044
10	875.665	322.341
11	885.384	324.697
12	894.793	328.085
13	903.782	332.465
14	912.249	337.786
15	920.094	343.987
16	927.227	350.996
17	933.565	358.731
18	939.033	367.103
19	943.570	376.015
20	947.122	385.363
21	949.648	395.039
22	951.119	404.930
23	951.512	414.800

Circle Center At X = 858.682 ; Y = 413.619 ; and Radius = 92.844

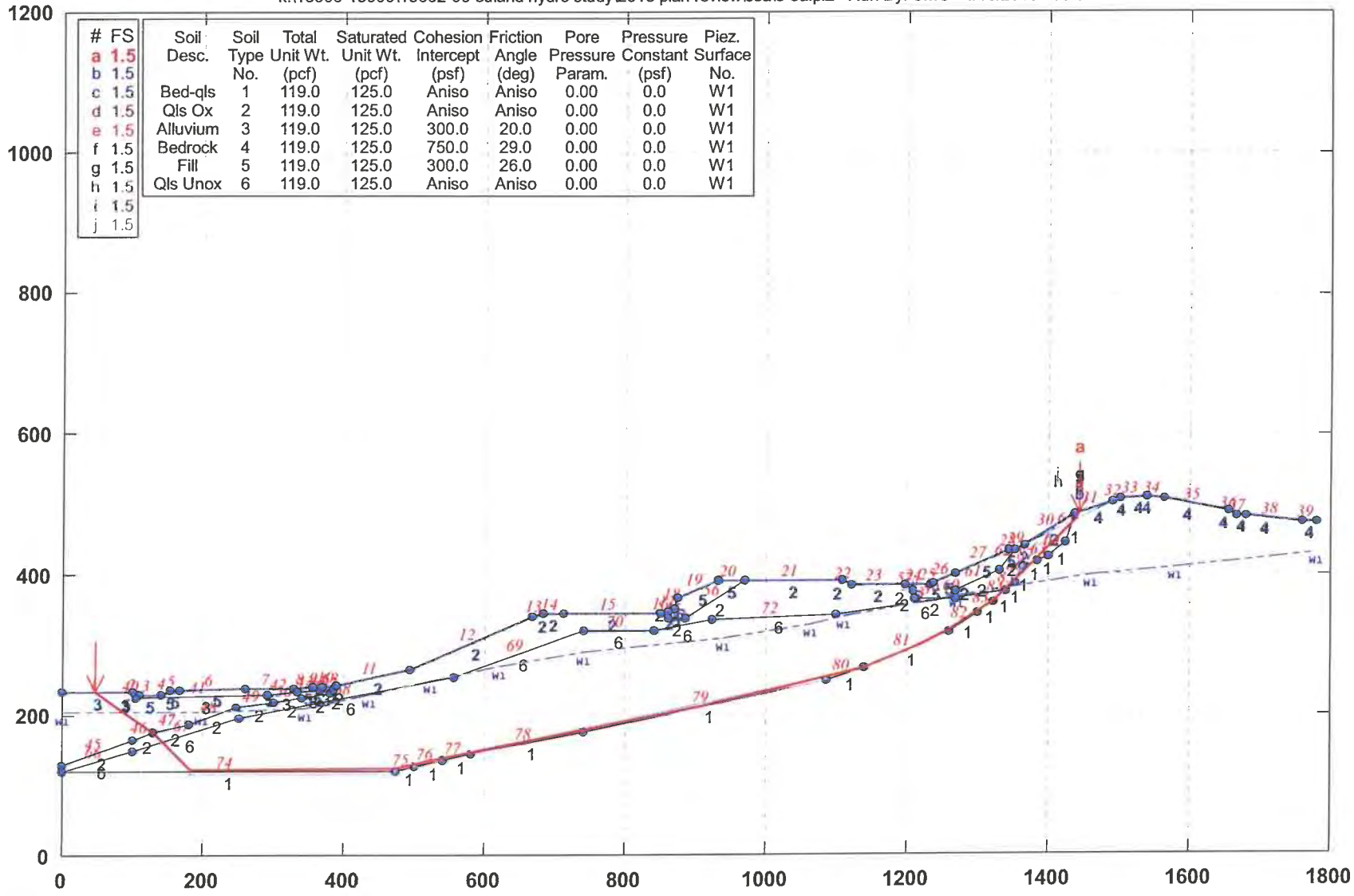
Factor of Safety

*** 1.340 ***

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

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8a.pl2 Run By: SMC 4/16/2015 03:54PM



#	FS
a	1.5
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.5
h	1.5
i	1.5
j	1.5

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

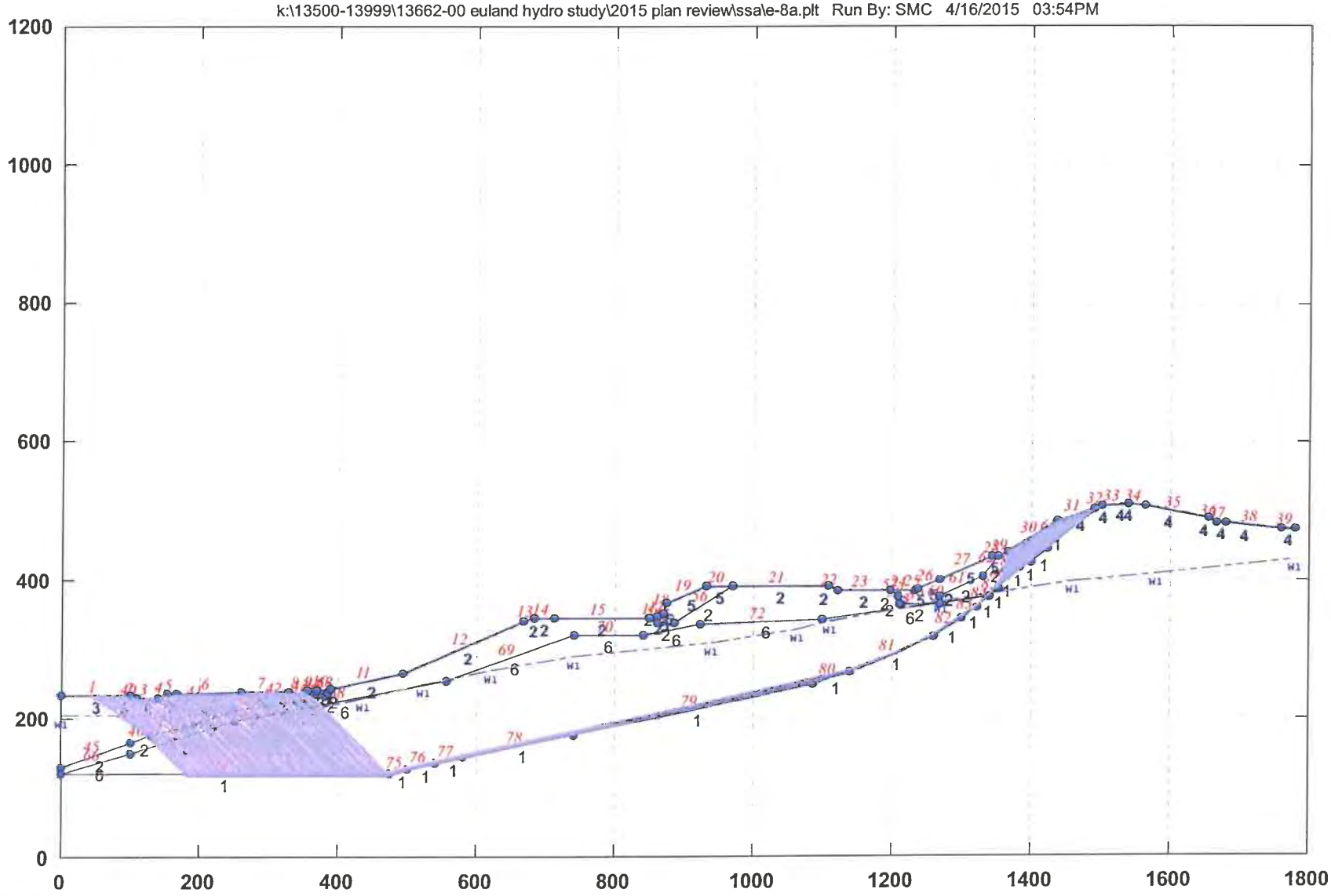
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-28.1

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8a.plt Run By: SMC 4/16/2015 03:54PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/16/2015
Time of Run: 03:54PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8a.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8a.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8a.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00

2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
12 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	10.00
2	475.00	120.00	475.00	120.00	10.00
3	500.00	128.00	540.00	138.00	5.00
4	580.00	147.00	1085.00	251.00	5.00
5	1140.00	268.00	1140.00	268.00	5.00
6	1220.00	301.00	1220.00	301.00	5.00
7	1260.00	320.00	1260.00	320.00	5.00
8	1300.00	346.00	1300.00	346.00	5.00
9	1322.00	362.00	1322.00	362.00	5.00
10	1340.00	378.00	1340.00	378.00	5.00
11	1352.00	390.00	1365.00	412.00	4.00
12	1366.00	440.00	1502.00	507.00	0.00

Following Are Displayed The Ten Most Critical Of The Trial

Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.973 FS Min = 1.533 FS Ave = 1.497
Standard Deviation = 0.175 Coefficient of Variation = 11.70 %
((Simplified Janbu FS for Critical Surface = 1.406))
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.318	233.000
2	80.293	209.210
3	129.442	174.796
4	141.848	162.389
5	181.489	122.748
6	475.000	123.974
7	514.695	133.316
8	905.334	212.310
9	1140.000	266.708
10	1220.000	299.305
11	1260.000	321.320
12	1300.000	346.722
13	1322.000	360.230
14	1340.000	377.311
15	1355.709	394.826
16	1438.208	475.573
17	1445.135	487.333

*** FOS = 1.533 Theta (ki=1.0) = 6.94 ***
Lambda = 0.122
Individual data on the 94 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	34.0	48092.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	6.8	21219.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	12.9	51102.1	0.0	4466.1	0.	0.	0.0	0.0	0.0
4	5.0	23286.3	0.0	4135.2	0.	0.	0.0	0.0	0.0
5	5.0	24582.7	0.0	5478.3	0.	0.	0.0	0.0	0.0
6	19.4	114657.7	0.0	34067.0	0.	0.	0.0	0.0	0.0
7	0.6	3783.1	0.0	1483.3	0.	0.	0.0	0.0	0.0
8	10.0	74433.6	0.0	31277.9	0.	0.	0.0	0.0	0.0
9	1.8	15206.0	0.0	6752.8	0.	0.	0.0	0.0	0.0
10	11.2	104117.2	0.0	47167.8	0.	0.	0.0	0.0	0.0
11	13.0	144320.9	0.0	68909.5	0.	0.	0.0	0.0	0.0
12	14.0	179301.3	0.0	90972.9	0.	0.	0.0	0.0	0.0
13	1.5	20546.2	0.0	10701.1	0.	0.	0.0	0.0	0.0
14	16.5	229613.2	0.0	84661.9	0.	0.	0.0	0.0	0.0
15	34.1	476309.7	0.0	*******	0.	0.	0.0	0.0	0.0
16	15.9	222636.1	0.0	82651.2	0.	0.	0.0	0.0	0.0
17	4.0	56154.8	0.0	20888.2	0.	0.	0.0	0.0	0.0
18	8.0	112415.8	0.0	41865.7	0.	0.	0.0	0.0	0.0
19	32.0	451524.6	0.0	*******	0.	0.	0.0	0.0	0.0
20	8.0	113374.3	0.0	42461.1	0.	0.	0.0	0.0	0.0
21	26.2	373316.9	0.0	*******	0.	0.	0.0	0.0	0.0
22	3.8	53593.4	0.0	20157.1	0.	0.	0.0	0.0	0.0
23	3.0	42849.7	0.0	16121.1	0.	0.	0.0	0.0	0.0
24	7.0	100138.1	0.0	37681.0	0.	0.	0.0	0.0	0.0
25	5.0	71660.5	0.0	26970.8	0.	0.	0.0	0.0	0.0
26	10.0	143591.7	0.0	53432.1	0.	0.	0.0	0.0	0.0
27	13.0	187093.3	0.0	71426.7	0.	0.	0.0	0.0	0.0
28	2.0	28795.1	0.0	11185.9	0.	0.	0.0	0.0	0.0

29	10.0	144914.0	0.0	56718.0	0.	0.	0.0	0.0	0.0
30	5.0	73155.1	0.0	28851.9	0.	0.	0.0	0.0	0.0
31	5.0	73620.5	0.0	29180.5	0.	0.	0.0	0.0	0.0
32	46.0	706640.8	0.0	*******	0.	0.	0.0	0.0	0.0
33	16.3	263176.4	0.0	*******	0.	0.	0.0	0.0	0.0
34	22.7	378522.0	0.0	*******	0.	0.	0.0	0.0	0.0
35	20.0	338500.0	0.0	*******	0.	0.	0.0	0.0	0.0
36	19.7	337348.6	0.0	*******	0.	0.	0.0	0.0	0.0
37	8.3	145173.5	0.0	59221.1	0.	0.	0.0	0.0	0.0
38	34.0	614477.0	0.0	*******	0.	0.	0.0	0.0	0.0
39	19.2	362141.7	0.0	*******	0.	0.	0.0	0.0	0.0
40	44.8	881817.1	0.0	*******	0.	0.	0.0	0.0	0.0
41	46.0	964492.6	0.0	*******	0.	0.	0.0	0.0	0.0
42	15.0	325763.8	0.0	*******	0.	0.	0.0	0.0	0.0
43	30.0	644062.0	0.0	*******	0.	0.	0.0	0.0	0.0
44	30.0	622208.0	0.0	*******	0.	0.	0.0	0.0	0.0
45	100.0	1914812.1	0.0	*******	0.	0.	0.0	0.0	0.0
46	8.0	142528.5	0.0	50771.3	0.	0.	0.0	0.0	0.0
47	10.0	176535.5	0.0	62887.2	0.	0.	0.0	0.0	0.0
48	1.0	17609.8	0.0	6253.5	0.	0.	0.0	0.0	0.0
49	10.0	178311.6	0.0	62182.0	0.	0.	0.0	0.0	0.0
50	4.0	75502.1	0.0	24693.3	0.	0.	0.0	0.0	0.0
51	10.0	198415.6	0.0	61284.6	0.	0.	0.0	0.0	0.0
52	20.3	411040.4	0.0	*******	0.	0.	0.0	0.0	0.0
53	17.7	364773.0	0.0	*******	0.	0.	0.0	0.0	0.0
54	10.0	209372.6	0.0	58138.1	0.	0.	0.0	0.0	0.0
55	7.0	146596.5	0.0	40200.7	0.	0.	0.0	0.0	0.0
56	30.0	612567.7	0.0	*******	0.	0.	0.0	0.0	0.0
57	93.0	1738839.2	0.0	*******	0.	0.	0.0	0.0	0.0
58	37.0	624512.8	0.0	*******	0.	0.	0.0	0.0	0.0
59	7.0	113885.7	0.0	35256.2	0.	0.	0.0	0.0	0.0
60	3.0	48142.8	0.0	15091.9	0.	0.	0.0	0.0	0.0
61	12.0	185096.6	0.0	60433.4	0.	0.	0.0	0.0	0.0
62	18.0	264128.6	0.0	89896.7	0.	0.	0.0	0.0	0.0
63	27.4	376197.7	0.0	*******	0.	0.	0.0	0.0	0.0
64	17.2	216894.2	0.0	80750.8	0.	0.	0.0	0.0	0.0
65	12.5	148152.8	0.0	55889.6	0.	0.	0.0	0.0	0.0
66	12.0	135440.3	0.0	51711.8	0.	0.	0.0	0.0	0.0
67	1.0	10963.1	0.0	4214.6	0.	0.	0.0	0.0	0.0
68	10.0	106892.6	0.0	41344.8	0.	0.	0.0	0.0	0.0
69	11.6	116852.9	0.0	48216.8	0.	0.	0.0	0.0	0.0
70	1.4	13156.2	0.0	5450.9	0.	0.	0.0	0.0	0.0
71	3.0	28914.4	0.0	11775.0	0.	0.	0.0	0.0	0.0
72	12.7	121510.8	0.0	47195.8	0.	0.	0.0	0.0	0.0
73	11.3	106097.3	0.0	38772.6	0.	0.	0.0	0.0	0.0
74	8.0	73061.6	0.0	26167.3	0.	0.	0.0	0.0	0.0
75	0.3	3019.8	0.0	1051.0	0.	0.	0.0	0.0	0.0
76	0.7	5980.5	0.0	2073.6	0.	0.	0.0	0.0	0.0
77	1.0	8974.5	0.0	3092.1	0.	0.	0.0	0.0	0.0
78	30.0	257147.1	0.0	76820.7	0.	0.	0.0	0.0	0.0
79	22.0	174279.5	0.0	35965.3	0.	0.	0.0	0.0	0.0
80	8.0	59218.3	0.0	9687.0	0.	0.	0.0	0.0	0.0
81	8.4	57520.3	0.0	5463.1	0.	0.	0.0	0.0	0.0
82	1.6	10623.2	0.0	505.3	0.	0.	0.0	0.0	0.0
83	3.0	19075.9	0.0	430.8	0.	0.	0.0	0.0	0.0
84	0.1	655.5	0.0	0.5	0.	0.	0.0	0.0	0.0
85	9.9	55000.0	0.0	0.0	0.	0.	0.0	0.0	0.0
86	2.7	13030.5	0.0	0.0	0.	0.	0.0	0.0	0.0
87	0.8	3609.8	0.0	0.0	0.	0.	0.0	0.0	0.0
88	8.5	37946.0	0.0	0.0	0.	0.	0.0	0.0	0.0
89	1.0	4203.3	0.0	0.0	0.	0.	0.0	0.0	0.0
90	9.9	39301.7	0.0	0.0	0.	0.	0.0	0.0	0.0
91	57.5	146629.1	0.0	0.0	0.	0.	0.0	0.0	0.0
92	4.6	5704.0	0.0	0.0	0.	0.	0.0	0.0	0.0
93	0.2	237.3	0.0	0.0	0.	0.	0.0	0.0	0.0
94	6.9	3913.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.318	233.000

2	80.293	209.210
3	129.442	174.796
4	141.848	162.389
5	181.489	122.748
6	475.000	123.974
7	514.695	133.316
8	905.334	212.310
9	1140.000	266.708
10	1220.000	299.305
11	1260.000	321.320
12	1300.000	346.722
13	1322.000	360.230
14	1340.000	377.311
15	1355.709	394.826
16	1438.208	475.573
17	1445.135	487.333

*** FOS = 1.533 Theta (ki=1.0) = 6.95 ***
Lambda = 0.122
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.318	233.000
2	80.293	209.210
3	129.442	174.796
4	141.848	162.389
5	181.489	122.748
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14	1340.000	377.311
15	1355.709	394.826
16	1438.208	475.573
17	1445.135	487.333

*** FOS = 1.533 Theta (ki=1.0) = 6.95 ***
Lambda = 0.122

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.489	233.000
2	82.580	209.830
3	131.729	175.415
4	144.091	163.053
5	182.638	124.506
6	475.000	123.544
7	517.351	133.922
8	639.026	158.814
9	1140.000	265.712

10	1220.000	302.216
11	1260.000	319.387
12	1300.000	346.195
13	1322.000	362.359
14	1340.000	378.346
15	1359.823	402.740
16	1400.490	456.991
17	1412.663	469.164

*** FOS = 1.537 Theta (ki=1.0) = 6.81 ***
Lambda = 0.119

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.489	233.000
2	82.580	209.830
3	131.729	175.415
4	144.091	163.053
5	182.638	124.506
6	475.000	123.544
7	517.351	133.922
8	639.026	158.814
9	1140.000	265.712
10	1220.000	302.216
11	1260.000	319.387
12	1300.000	346.195
13	1322.000	362.359
14	1340.000	378.346
15	1359.823	402.740
16	1400.490	456.991
17	1412.663	469.164

*** FOS = 1.537 Theta (ki=1.0) = 6.82 ***
Lambda = 0.120

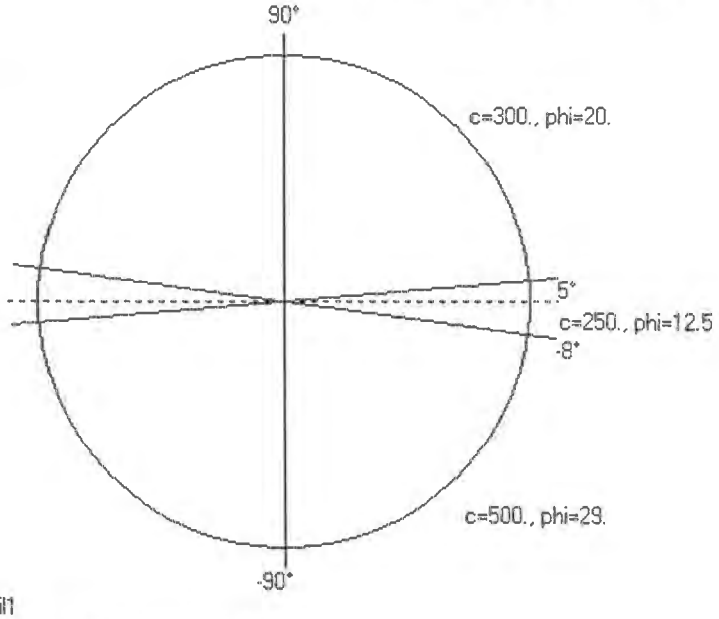
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.489	233.000
2	82.580	209.830
3	131.729	175.415
4	144.091	163.053
5	182.638	124.506
6	475.000	123.544
7	517.351	133.922
8	639.026	158.814
9	1140.000	265.712
10	1220.000	302.216
11	1260.000	319.387
12	1300.000	346.195
13	1322.000	362.359
14	1340.000	378.346
15	1359.823	402.740
16	1400.490	456.991
17	1412.663	469.164

*** FOS = 1.537 Theta (ki=1.0) = 6.82 ***
Lambda = 0.120

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

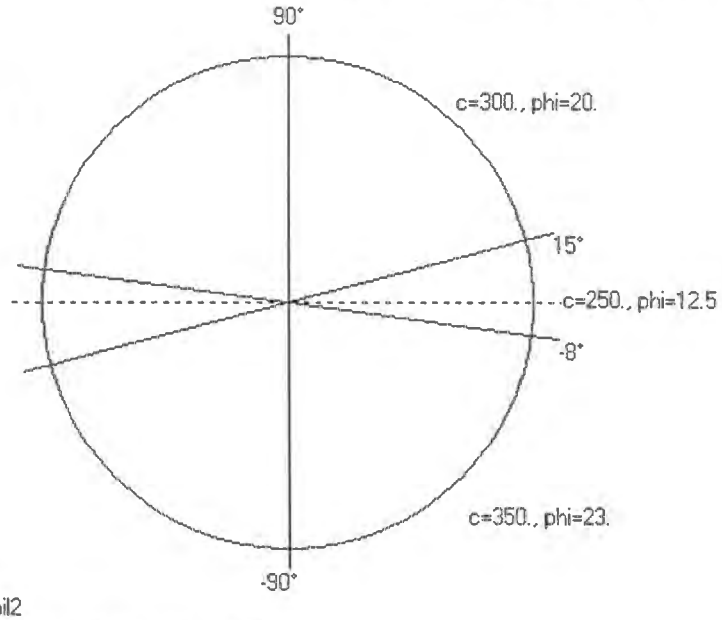
Anisotropic Soil Definition



Soil1

13662-00, Euland, Section E-E',

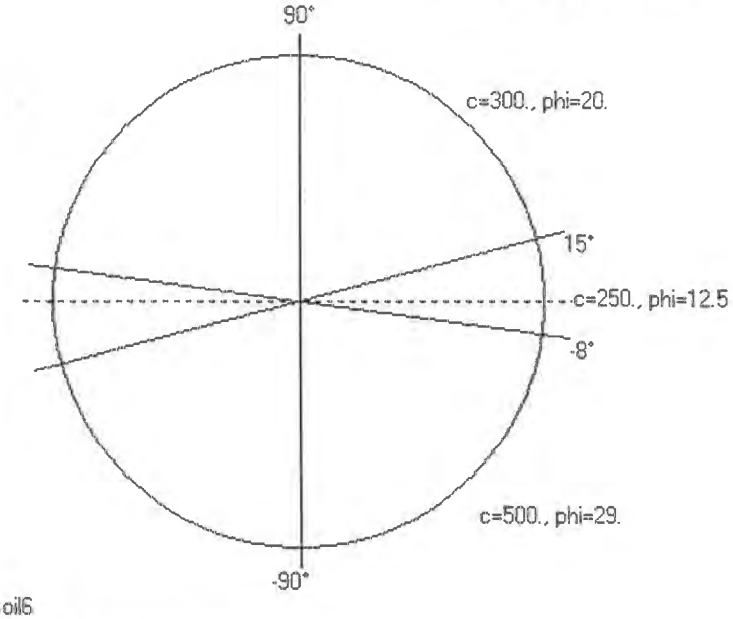
Anisotropic Soil Definition



Soil2

13662-00, Euland, Section E-E',

Anisotropic Soil Definition



Soil6

13662-00, Euland, Section E-E',

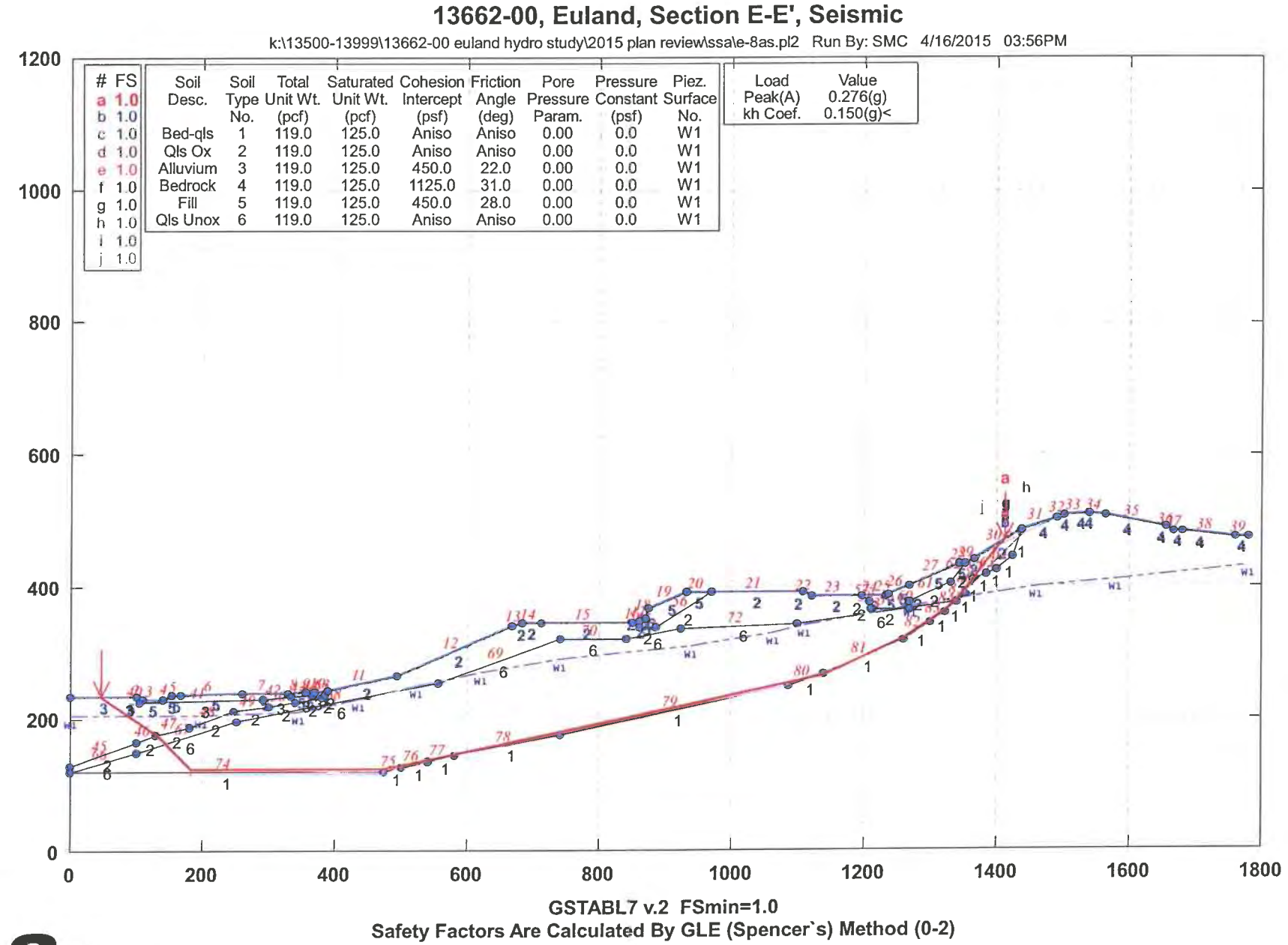

13662-00, Euland, Section E-E', Seismic
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8as.pl2 Run By: SMC 4/16/2015 03:56PM
FS
a 1.0
b 1.0
c 1.0
d 1.0
e 1.0
f 1.0
g 1.0
h 1.0
i 1.0
j 1.0
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls Unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
0
200
400
600
800
1000
1200
1400
1600
1800
GSTABL7 v.2 FSmin=1.0
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-28.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/16/2015
Time of Run: 03:56PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8as.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8as.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8as.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00

2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
12 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	10.00
2	475.00	120.00	475.00	120.00	10.00
3	500.00	128.00	540.00	138.00	5.00
4	580.00	147.00	1085.00	251.00	5.00
5	1140.00	268.00	1140.00	268.00	5.00
6	1220.00	301.00	1220.00	301.00	5.00
7	1260.00	320.00	1260.00	320.00	5.00
8	1300.00	346.00	1300.00	346.00	5.00
9	1322.00	362.00	1322.00	362.00	5.00

10	1340.00	378.00	1340.00	378.00	5.00
11	1352.00	390.00	1365.00	412.00	4.00
12	1366.00	440.00	1502.00	507.00	0.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.59	239.70
2	356.51	234.34
3	365.28	228.42
4	374.93	218.78
5	399.04	194.67
6	434.39	159.31
7	469.75	123.96
8	475.00	116.12
9	501.41	130.29
10	721.88	177.79
11	1140.00	266.69
12	1220.00	299.75
13	1260.00	320.99
14	1300.00	344.36
15	1322.00	359.59
16	1340.00	377.14
17	1361.14	407.26
18	1490.80	501.48
19	1491.43	502.60

Factor Of Safety For The Preceding Specified Surface = 0.932
Theta (ki = 1.0) = 2.94 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.59	239.70
2	356.51	234.34
3	365.28	228.42
4	374.93	218.78
5	399.04	194.67
6	434.39	159.31
7	469.75	123.96
8	475.00	116.12
9	501.41	130.29
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3	365.28	228.42
4	374.93	218.78
5	399.04	194.67
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By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.59	239.70
2	356.51	234.34
3	365.28	228.42
4	374.93	218.78
5	399.04	194.67
6	434.39	159.31
7	469.75	123.96
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15	1322.00	359.59
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Factor Of Safety For The Preceding Specified Surface = 0.932
Theta (ki = 1.0) = 2.94 Deg Lambda =
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Point No.	X-Surf (ft)	Y-Surf (ft)
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2	356.51	234.34
3	365.28	228.42
4	374.93	218.78
5	399.04	194.67
6	434.39	159.31
7	469.75	123.96
8	475.00	116.12
9	501.41	130.29
10	721.88	177.79
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14	1300.00	344.36
15	1322.00	359.59
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17	1361.14	407.26
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Factor Of Safety For The Preceding Specified Surface = 0.932
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1	347.59	239.70
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3	365.28	228.42
4	374.93	218.78
5	399.04	194.67
6	434.39	159.31
7	469.75	123.96
8	475.00	116.12
9	501.41	130.29
10	721.88	177.79
11	1140.00	266.69
12	1220.00	299.75
13	1260.00	320.99
14	1300.00	344.36
15	1322.00	359.59
16	1340.00	377.14
17	1361.14	407.26
18	1490.80	501.48
19	1491.43	502.60

Factor Of Safety For The Preceding Specified Surface = 0.932
Theta (ki = 1.0) = 2.94 Deg Lambda =
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces with Misleading FS = 6
Number of Trial Surfaces With Valid FS = 2994
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.2 %
Statistical Data On All Valid FS Values:
FS Max = 1.344 FS Min = 1.025 FS Ave = 1.032
Standard Deviation = 0.131 Coefficient of Variation = 12.65 %
((Simplified Janbu FS for Critical Surface = 0.959))
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.356	233.000
2	48.825	231.334
3	90.277	203.375
4	131.729	175.415
5	144.091	163.053
6	147.282	159.862
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	639.026	158.814
11	1140.000	265.712
12	1220.000	302.216
13	1260.000	319.387
14	1300.000	346.195
15	1322.000	362.359
16	1340.000	378.346
17	1359.823	402.740
18	1400.490	456.991
19	1412.663	469.164

*** FOS = 1.025 Theta (ki=1.0) = 5.43 ***
Lambda = 0.095
Individual data on the 93 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	2.5	244.8	0.0	0.0	0.	0.	36.7	0.0	0.0
2	39.9	71667.9	0.0	0.0	0.	0.	10750.2	0.0	0.0
3	1.6	5513.3	0.0	64.8	0.	0.	827.0	0.0	0.0

4	9.7	38326.7	0.0	3208.9	0.	0. 5749.0	0.0	0.0
5	5.0	22367.9	0.0	3532.8	0.	0. 3355.2	0.0	0.0
6	5.0	23584.0	0.0	4811.5	0.	0. 3537.6	0.0	0.0
7	21.7	125045.6	0.0	35763.5	0.	0. 18756.8	0.0	0.0
8	8.3	59452.9	0.0	24382.7	0.	0. 8917.9	0.0	0.0
9	4.1	32950.0	0.0	14302.3	0.	0. 4942.5	0.0	0.0
10	3.2	27692.4	0.0	12189.4	0.	0. 4153.9	0.0	0.0
11	5.7	53958.2	0.0	24094.9	0.	0. 8093.7	0.0	0.0
12	13.0	139598.2	0.0	65575.4	0.	0. 20939.7	0.0	0.0
13	14.0	174215.4	0.0	87382.4	0.	0. 26132.3	0.0	0.0
14	2.6	35624.1	0.0	18410.4	0.	0. 5343.6	0.0	0.0
15	15.4	210403.8	0.0	77147.8	0.	0. 31560.6	0.0	0.0
16	34.1	469866.2	0.0	*******	0.	0. 70479.9	0.0	0.0
17	15.9	220006.7	0.0	81339.1	0.	0. 33001.0	0.0	0.0
18	4.0	55529.7	0.0	20576.3	0.	0. 8329.5	0.0	0.0
19	8.0	111210.5	0.0	41264.2	0.	0. 16681.6	0.0	0.0
20	32.0	447300.7	0.0	*******	0.	0. 67095.1	0.0	0.0
21	8.0	112467.6	0.0	42008.6	0.	0. 16870.1	0.0	0.0
22	26.2	370761.9	0.0	*******	0.	0. 55614.3	0.0	0.0
23	3.8	53280.4	0.0	20000.9	0.	0. 7992.1	0.0	0.0
24	3.0	42609.1	0.0	16001.0	0.	0. 6391.4	0.0	0.0
25	7.0	99609.4	0.0	37417.1	0.	0. 14941.4	0.0	0.0
26	5.0	71310.8	0.0	26796.3	0.	0. 10696.6	0.0	0.0
27	10.0	142963.0	0.0	53124.9	0.	0. 21444.5	0.0	0.0
28	13.0	186415.3	0.0	71095.5	0.	0. 27962.3	0.0	0.0
29	2.0	28704.8	0.0	11141.7	0.	0. 4305.7	0.0	0.0
30	10.0	144518.3	0.0	56524.7	0.	0. 21677.7	0.0	0.0
31	5.0	72992.2	0.0	28772.3	0.	0. 10948.8	0.0	0.0
32	5.0	73481.0	0.0	29112.3	0.	0. 11022.1	0.0	0.0
33	46.0	706450.1	0.0	*******	0.	0. *******	0.0	0.0
34	16.3	263581.6	0.0	*******	0.	0. 39537.2	0.0	0.0
35	22.7	379500.2	0.0	*******	0.	0. 56925.0	0.0	0.0
36	20.0	339331.2	0.0	*******	0.	0. 50899.7	0.0	0.0
37	22.4	383911.9	0.0	*******	0.	0. 57586.8	0.0	0.0
38	5.6	98899.6	0.0	40285.5	0.	0. 14834.9	0.0	0.0
39	34.0	613959.8	0.0	*******	0.	0. 92094.0	0.0	0.0
40	19.2	361697.8	0.0	*******	0.	0. 54254.7	0.0	0.0
41	44.8	880362.9	0.0	*******	0.	0. *******	0.0	0.0
42	18.0	370233.0	0.0	*******	0.	0. 55535.0	0.0	0.0
43	28.0	591718.4	0.0	*******	0.	0. 88757.8	0.0	0.0
44	15.0	324355.2	0.0	*******	0.	0. 48653.3	0.0	0.0
45	30.0	640303.5	0.0	*******	0.	0. 96045.5	0.0	0.0
46	30.0	617194.1	0.0	*******	0.	0. 92579.1	0.0	0.0
47	100.0	1889022.6	0.0	*******	0.	0. *******	0.0	0.0
48	8.0	139862.5	0.0	49530.1	0.	0. 20979.4	0.0	0.0
49	10.0	173077.5	0.0	61270.6	0.	0. 25961.6	0.0	0.0
50	1.0	17256.4	0.0	6087.8	0.	0. 2588.5	0.0	0.0
51	10.0	174700.1	0.0	60485.9	0.	0. 26205.0	0.0	0.0
52	4.0	74018.4	0.0	23994.6	0.	0. 11102.8	0.0	0.0
53	10.0	194608.8	0.0	59487.2	0.	0. 29191.3	0.0	0.0
54	38.0	760651.8	0.0	*******	0.	0. *******	0.0	0.0
55	10.0	205734.3	0.0	56063.1	0.	0. 30860.1	0.0	0.0
56	7.0	144186.7	0.0	38819.7	0.	0. 21628.0	0.0	0.0
57	30.0	603521.9	0.0	*******	0.	0. 90528.3	0.0	0.0
58	93.0	1723966.2	0.0	*******	0.	0. *******	0.0	0.0
59	37.0	624133.3	0.0	*******	0.	0. 93620.0	0.0	0.0
60	7.0	114168.3	0.0	35259.9	0.	0. 17125.2	0.0	0.0
61	3.0	48298.4	0.0	15110.8	0.	0. 7244.8	0.0	0.0
62	12.0	185926.5	0.0	60614.4	0.	0. 27889.0	0.0	0.0
63	15.0	222119.5	0.0	75398.9	0.	0. 33317.9	0.0	0.0
64	3.0	43875.6	0.0	15084.4	0.	0. 6581.3	0.0	0.0
65	12.5	178028.5	0.0	66139.8	0.	0. 26704.3	0.0	0.0
66	32.0	414555.1	0.0	*******	0.	0. 62183.3	0.0	0.0
67	12.5	145845.8	0.0	55646.0	0.	0. 21876.9	0.0	0.0
68	12.0	132322.7	0.0	50955.8	0.	0. 19848.4	0.0	0.0
69	1.0	10663.6	0.0	4128.5	0.	0. 1599.5	0.0	0.0
70	10.0	103562.8	0.0	40288.3	0.	0. 15534.4	0.0	0.0
71	13.0	126562.0	0.0	49323.7	0.	0. 18984.3	0.0	0.0
72	3.0	28481.8	0.0	10995.0	0.	0. 4272.3	0.0	0.0
73	12.7	121185.3	0.0	44821.9	0.	0. 18177.8	0.0	0.0

74	11.3	107863.0	0.0	37909.1	0.	0.	16179.4	0.0	0.0
75	8.0	74853.1	0.0	27650.9	0.	0.	11228.0	0.0	0.0
76	0.3	3088.8	0.0	1108.8	0.	0.	463.3	0.0	0.0
77	0.7	6115.7	0.0	2187.2	0.	0.	917.4	0.0	0.0
78	1.0	9174.3	0.0	3260.3	0.	0.	1376.1	0.0	0.0
79	30.0	261100.2	0.0	80418.2	0.	0.	39165.0	0.0	0.0
80	22.0	172078.4	0.0	36682.9	0.	0.	25811.8	0.0	0.0
81	8.0	57333.4	0.0	8152.4	0.	0.	8600.0	0.0	0.0
82	6.9	46201.5	0.0	3871.7	0.	0.	6930.2	0.0	0.0
83	3.1	20269.2	0.0	813.3	0.	0.	3040.4	0.0	0.0
84	1.8	11394.2	0.0	175.3	0.	0.	1709.1	0.0	0.0
85	1.2	7233.2	0.0	0.0	0.	0.	1085.0	0.0	0.0
86	10.0	53322.6	0.0	0.0	0.	0.	7998.4	0.0	0.0
87	6.8	29468.0	0.0	0.0	0.	0.	4420.2	0.0	0.0
88	4.2	16093.3	0.0	0.0	0.	0.	2414.0	0.0	0.0
89	1.0	3544.2	0.0	0.0	0.	0.	531.6	0.0	0.0
90	0.4	1365.8	0.0	0.0	0.	0.	204.9	0.0	0.0
91	0.6	2134.8	0.0	0.0	0.	0.	320.2	0.0	0.0
92	34.5	68919.2	0.0	0.0	0.	0.	10337.9	0.0	0.0
93	12.2	3306.2	0.0	0.0	0.	0.	495.9	0.0	0.0

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.356	233.000
2	48.825	231.334
3	90.277	203.375
4	131.729	175.415
5	144.091	163.053
6	147.282	159.862
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	639.026	158.814
11	1140.000	265.712
12	1220.000	302.216
13	1260.000	319.387
14	1300.000	346.195
15	1322.000	362.359
16	1340.000	378.346
17	1359.823	402.740
18	1400.490	456.991
19	1412.663	469.164

*** FOS = 1.025 Theta (ki=1.0) = 5.43 ***
Lambda = 0.095

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.356	233.000
2	48.825	231.334
3	90.277	203.375
4	131.729	175.415
5	144.091	163.053
6	147.282	159.862
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	639.026	158.814
11	1140.000	265.712
12	1220.000	302.216
13	1260.000	319.387
14	1300.000	346.195
15	1322.000	362.359
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17	1359.823	402.740
18	1400.490	456.991
19	1412.663	469.164

*** FOS = 1.025 Theta (ki=1.0) = 5.43 ***
Lambda = 0.095

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Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	46.356	233.000
2	48.825	231.334
3	90.277	203.375
4	131.729	175.415
5	144.091	163.053
6	147.282	159.862
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	639.026	158.814
11	1140.000	265.712
12	1220.000	302.216
13	1260.000	319.387
14	1300.000	346.195
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Point No.	X-Surf (ft)	Y-Surf (ft)
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7	182.638	124.506
8	475.000	123.544
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11	1140.000	265.712
12	1220.000	302.216
13	1260.000	319.387
14	1300.000	346.195
15	1322.000	362.359
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Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.356	233.000
2	48.825	231.334
3	90.277	203.375
4	131.729	175.415
5	144.091	163.053
6	147.282	159.862
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	639.026	158.814
11	1140.000	265.712
12	1220.000	302.216
13	1260.000	319.387
14	1300.000	346.195
15	1322.000	362.359
16	1340.000	378.346
17	1359.823	402.740
18	1400.490	456.991
19	1412.663	469.164

*** FOS = 1.025 Theta (ki=1.0) = 5.43 ***
Lambda = 0.095

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.356	233.000
2	48.825	231.334
3	90.277	203.375
4	131.729	175.415
5	144.091	163.053
6	147.282	159.862
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	639.026	158.814
11	1140.000	265.712
12	1220.000	302.216
13	1260.000	319.387
14	1300.000	346.195
15	1322.000	362.359
16	1340.000	378.346
17	1359.823	402.740
18	1400.490	456.991
19	1412.663	469.164

*** FOS = 1.026 Theta (ki=1.0) = 5.47 ***
Lambda = 0.096

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	43.151	233.000
2	46.539	230.715
3	87.990	202.755
4	129.442	174.796
5	141.848	162.389
6	146.134	158.104
7	181.489	122.748
8	475.000	123.974
9	514.695	133.316
10	905.334	212.310
11	1140.000	266.708
12	1220.000	299.305
13	1260.000	321.320
14	1300.000	346.722
15	1322.000	360.230
16	1340.000	377.311
17	1355.709	394.826
18	1438.208	475.573
19	1444.800	487.223

*** FOS = 1.031 Theta (ki=1.0) = 5.64 ***
Lambda = 0.099

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.833	233.000
2	50.652	231.773
3	92.104	203.813
4	133.556	175.853
5	145.839	163.571
6	150.154	159.256
7	185.509	123.901
8	475.000	117.470
9	523.992	135.436
10	730.754	176.073
11	1140.000	268.222
12	1220.000	299.491
13	1260.000	322.053
14	1300.000	344.877
15	1322.000	362.681
16	1340.000	375.934
17	1357.106	398.525
18	1374.193	444.036
19	1377.084	446.928

*** FOS = 1.031 Theta (ki=1.0) = 5.24 ***
Lambda = 0.092

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.833	233.000
2	50.652	231.773
3	92.104	203.813
4	133.556	175.853
5	145.839	163.571
6	150.154	159.256
7	185.509	123.901
8	475.000	117.470
9	523.992	135.436
10	730.754	176.073
11	1140.000	268.222
12	1220.000	299.491
13	1260.000	322.053
14	1300.000	344.877
15	1322.000	362.681
16	1340.000	375.934
17	1357.106	398.525
18	1374.193	444.036
19	1377.084	446.928

*** FOS = 1.031 Theta (ki=1.0) = 5.24 ***
Lambda = 0.092

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

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/16/2015
Time of Run: 03:56PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8as Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8as Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8as Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E', Seismic

BOUNDARY COORDINATES

39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00

2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.356	233.000
2	48.825	231.334
3	90.277	203.375
4	131.729	175.415
5	144.091	163.053
6	147.282	159.862
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	639.026	158.814
11	1140.000	265.712
12	1220.000	302.216
13	1260.000	319.387
14	1300.000	346.195
15	1322.000	362.359
16	1340.000	378.346
17	1359.823	402.740
18	1400.490	456.991

19	1412.663	469.164	
Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	1.040	1.080	0.132
11.25	1.063	1.204	0.199
5.50	1.027	1.026	0.096

((Simplified Janbu FS for Specified Surface = 0.960))
Factor Of Safety For The Preceding Specified Surface = 1.027
Theta (ki = 1.0) = 5.50 Deg Lambda = 0.096
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 2.283(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	48.83	232.29	0.571	2878.	1.000	5.50	277.0
2	88.69	220.12	0.549	152460.	1.000	5.50	14675.0
3	90.28	219.27	0.537	162419.	1.000	5.50	15633.5
4	100.00	214.54	0.490	228236.	1.000	5.50	21968.7
5	105.00	212.32	0.496	264710.	1.000	5.50	25479.5
6	110.00	210.23	0.505	302071.	1.000	5.50	29075.7
7	131.73	201.46	0.477	487577.	1.000	5.50	46931.5
8	140.00	193.88	0.425	671711.	1.000	5.50	64655.2
9	144.09	190.53	0.401	771263.	1.000	5.50	74237.5
10	147.28	186.33	0.363	912061.	1.000	5.50	87790.0
11	153.00	180.11	0.321	1182582.	1.000	5.50	113828.8
12	166.00	169.28	0.300	1862100.	1.000	5.50	179235.4
13	180.00	159.70	0.301	2680085.	1.000	5.50	257970.2
14	182.64	157.99	0.302	2844381.	1.000	5.50	273784.4
15	198.00	159.37	0.314	2852973.	1.000	5.50	274611.4
16	232.12	162.41	0.340	2871975.	1.000	5.50	276440.5
17	248.00	163.82	0.351	2880718.	1.000	5.50	277282.0
18	252.00	164.17	0.354	2882909.	1.000	5.50	277492.9
19	260.00	164.88	0.360	2887279.	1.000	5.50	277913.5
20	292.00	167.71	0.383	2904639.	1.000	5.50	279584.5
21	300.00	168.41	0.388	2908952.	1.000	5.50	279999.6
22	326.24	170.72	0.406	2923025.	1.000	5.50	281354.3
23	330.00	171.05	0.409	2925030.	1.000	5.50	281547.2
24	333.00	171.31	0.411	2926630.	1.000	5.50	281701.2
25	340.00	171.93	0.415	2930363.	1.000	5.50	282060.6
26	345.00	172.36	0.419	2933029.	1.000	5.50	282317.2
27	355.00	173.23	0.425	2938519.	1.000	5.50	282845.6
28	368.00	174.37	0.435	2945189.	1.000	5.50	283487.6
29	370.00	174.55	0.436	2946165.	1.000	5.50	283581.6
30	380.00	175.43	0.438	2950941.	1.000	5.50	284041.3
31	385.00	175.87	0.439	2953276.	1.000	5.50	284266.1
32	390.00	176.31	0.440	2955576.	1.000	5.50	284487.5
33	436.00	180.36	0.440	2975897.	1.000	5.50	286443.4
34	452.28	181.80	0.439	2982802.	1.000	5.50	287108.1
35	475.00	183.80	0.439	2992086.	1.000	5.50	288001.7
36	495.00	187.28	0.431	2914994.	1.000	5.50	280581.2
37	517.35	191.18	0.407	2828274.	1.000	5.50	272234.0
38	523.00	192.10	0.401	2809919.	1.000	5.50	270467.3
39	557.00	197.68	0.371	2697121.	1.000	5.50	259610.0
40	576.25	200.89	0.356	2631770.	1.000	5.50	253319.7
41	621.00	208.51	0.324	2475668.	1.000	5.50	238294.1
42	639.03	211.65	0.313	2411018.	1.000	5.50	232071.2
43	667.00	216.71	0.296	2304306.	1.000	5.50	221799.8
44	682.00	219.47	0.291	2246518.	1.000	5.50	216237.4
45	712.00	225.02	0.297	2132406.	1.000	5.50	205253.6
46	742.00	230.58	0.303	2021608.	1.000	5.50	194588.8
47	842.00	249.14	0.329	1680024.	1.000	5.50	161709.9
48	850.00	250.62	0.331	1654745.	1.000	5.50	159276.6

49	860.00	252.47	0.332	1623504.	1.000	5.50	156269.5
50	861.00	252.66	0.331	1620396.	1.000	5.50	155970.3
51	871.00	254.52	0.322	1589162.	1.000	5.50	152964.0
52	875.00	255.28	0.292	1576245.	1.000	5.50	151720.7
53	885.00	257.23	0.287	1542981.	1.000	5.50	148518.8
54	923.00	264.81	0.271	1415763.	1.000	5.50	136273.5
55	933.00	266.87	0.267	1382070.	1.000	5.50	133030.4
56	940.00	268.32	0.270	1358570.	1.000	5.50	130768.4
57	970.00	274.60	0.280	1260365.	1.000	5.50	121315.7
58	1063.00	295.06	0.323	977244.	1.000	5.50	94064.1
59	1100.00	303.80	0.348	873441.	1.000	5.50	84072.6
60	1107.00	305.51	0.354	854252.	1.000	5.50	82225.5
61	1110.00	306.25	0.360	846100.	1.000	5.50	81440.9
62	1122.00	309.21	0.388	814282.	1.000	5.50	78378.3
63	1136.99	312.96	0.403	775775.	1.000	5.50	74671.9
64	1140.00	313.48	0.404	772038.	0.998	5.49	73987.1
65	1152.54	318.12	0.415	717142.	0.952	5.24	62550.8
66	1184.55	329.63	0.445	589963.	0.835	4.59	39573.7
67	1197.00	333.95	0.458	545498.	0.789	4.34	32704.6
68	1209.00	338.00	0.470	505312.	0.745	4.10	27017.7
69	1210.00	338.34	0.471	502080.	0.742	4.08	26581.9
70	1220.00	341.60	0.482	470762.	0.705	3.88	22524.9
71	1233.00	345.44	0.494	435533.	0.657	3.62	18121.9
72	1236.00	346.30	0.478	427678.	0.646	3.56	17205.7
73	1248.67	349.95	0.456	394946.	0.600	3.31	13692.1
74	1260.00	353.15	0.436	366578.	0.559	3.08	11012.8
75	1268.00	356.70	0.425	333119.	0.529	2.92	8986.3
76	1268.34	356.85	0.424	331752.	0.528	2.91	8908.0
77	1269.00	357.15	0.423	329049.	0.526	2.90	8754.2
78	1270.00	357.59	0.421	325004.	0.522	2.88	8526.6
79	1300.00	370.27	0.355	215071.	0.412	2.27	3518.9
80	1322.00	379.45	0.278	142295.	0.332	1.83	1507.7
81	1330.00	383.00	0.234	114568.	0.303	1.67	1009.1
82	1336.86	385.58	0.183	93469.	0.277	1.53	692.4
83	1340.00	386.57	0.154	84624.	0.266	1.47	575.9
84	1341.82	387.23	0.128	77885.	0.259	1.43	503.9
85	1343.00	387.60	0.109	73674.	0.255	1.41	460.9
86	1353.00	387.50	-0.177	43520.	0.218	1.20	199.7
87	1359.82	381.42	-0.628	27765.	0.193	1.07	99.9
88	1364.01	370.19	-1.246	18895.	0.178	0.98	57.6
89	1365.00	365.85	-1.469	16985.	0.174	0.96	49.7
90	1365.39	363.87	-1.569	16255.	0.173	0.95	46.8
91	1366.00	360.39	-1.743	15122.	0.171	0.94	42.4
92	1400.49	545.03	19.284	-9990.	0.045	0.25	-1.9
93	1412.66	654.14	0.000	-4286.	0.000	0.00	0.0

Table 1 - Individual data on the 93 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	2.5	244.7	0.0	0.0	0.0	0.0	36.7	0.0	0.0
2	39.9	71669.7	0.0	0.0	0.0	0.0	10750.5	0.0	0.0
3	1.6	5511.3	0.0	64.7	0.0	0.0	826.7	0.0	0.0
4	9.7	38327.1	0.0	3208.8	0.0	0.0	5749.1	0.0	0.0
5	5.0	22367.8	0.0	3532.8	0.0	0.0	3355.2	0.0	0.0
6	5.0	23583.9	0.0	4811.5	0.0	0.0	3537.6	0.0	0.0
7	21.7	125045.2	0.0	35763.4	0.0	0.0	18756.8	0.0	0.0
8	8.3	59453.2	0.0	24382.8	0.0	0.0	8918.0	0.0	0.0
9	4.1	32951.4	0.0	14303.0	0.0	0.0	4942.7	0.0	0.0
10	3.2	27686.6	0.0	12186.8	0.0	0.0	4153.0	0.0	0.0
11	5.7	53962.6	0.0	24096.8	0.0	0.0	8094.4	0.0	0.0
12	13.0	139598.3	0.0	65575.5	0.0	0.0	20939.7	0.0	0.0
13	14.0	174215.5	0.0	87382.4	0.0	0.0	26132.3	0.0	0.0
14	2.6	35626.6	0.0	18411.7	0.0	0.0	5344.0	0.0	0.0
15	15.4	210401.7	0.0	77147.1	0.0	0.0	31560.3	0.0	0.0
16	34.1	469867.2	0.0	*******	0.0	0.0	70480.1	0.0	0.0
17	15.9	220007.2	0.0	81339.4	0.0	0.0	33001.1	0.0	0.0
18	4.0	55529.9	0.0	20576.3	0.0	0.0	8329.5	0.0	0.0
19	8.0	111210.8	0.0	41264.3	0.0	0.0	16681.6	0.0	0.0
20	32.0	447301.8	0.0	*******	0.0	0.0	67095.3	0.0	0.0

21	8.0	112467.9	0.0	42008.8	0.0	0.0	16870.2	0.0	0.0
22	26.2	370762.8	0.0	*******	0.0	0.0	55614.4	0.0	0.0
23	3.8	53280.5	0.0	20000.9	0.0	0.0	7992.1	0.0	0.0
24	3.0	42609.2	0.0	16001.0	0.0	0.0	6391.4	0.0	0.0
25	7.0	99609.6	0.0	37417.2	0.0	0.0	14941.4	0.0	0.0
26	5.0	71311.0	0.0	26796.4	0.0	0.0	10696.6	0.0	0.0
27	10.0	142963.3	0.0	53125.1	0.0	0.0	21444.5	0.0	0.0
28	13.0	186415.8	0.0	71095.7	0.0	0.0	27962.4	0.0	0.0
29	2.0	28704.8	0.0	11141.8	0.0	0.0	4305.7	0.0	0.0
30	10.0	144518.6	0.0	56524.8	0.0	0.0	21677.8	0.0	0.0
31	5.0	72992.4	0.0	28772.4	0.0	0.0	10948.9	0.0	0.0
32	5.0	73481.1	0.0	29112.4	0.0	0.0	11022.2	0.0	0.0
33	46.0	706451.8	0.0	*******	0.0	0.0	*******	0.0	0.0
34	16.3	263582.2	0.0	*******	0.0	0.0	39537.3	0.0	0.0
35	22.7	379501.0	0.0	*******	0.0	0.0	56925.2	0.0	0.0
36	20.0	339331.7	0.0	*******	0.0	0.0	50899.8	0.0	0.0
37	22.4	383909.8	0.0	*******	0.0	0.0	57586.5	0.0	0.0
38	5.6	98901.7	0.0	40286.4	0.0	0.0	14835.3	0.0	0.0
39	34.0	613959.3	0.0	*******	0.0	0.0	92093.9	0.0	0.0
40	19.2	361697.4	0.0	*******	0.0	0.0	54254.6	0.0	0.0
41	44.8	880361.9	0.0	*******	0.0	0.0	*******	0.0	0.0
42	18.0	370241.4	0.0	*******	0.0	0.0	55536.2	0.0	0.0
43	28.0	591708.8	0.0	*******	0.0	0.0	88756.3	0.0	0.0
44	15.0	324354.8	0.0	*******	0.0	0.0	48653.2	0.0	0.0
45	30.0	640302.7	0.0	*******	0.0	0.0	96045.4	0.0	0.0
46	30.0	617193.4	0.0	*******	0.0	0.0	92579.0	0.0	0.0
47	100.0	1889020.6	0.0	*******	0.0	0.0	*******	0.0	0.0
48	8.0	139862.4	0.0	49530.0	0.0	0.0	20979.4	0.0	0.0
49	10.0	173077.3	0.0	61270.5	0.0	0.0	25961.6	0.0	0.0
50	1.0	17256.3	0.0	6087.8	0.0	0.0	2588.5	0.0	0.0
51	10.0	174700.0	0.0	60485.8	0.0	0.0	26205.0	0.0	0.0
52	4.0	74018.4	0.0	23994.6	0.0	0.0	11102.8	0.0	0.0
53	10.0	194608.6	0.0	59487.1	0.0	0.0	29191.3	0.0	0.0
54	38.0	760651.4	0.0	*******	0.0	0.0	*******	0.0	0.0
55	10.0	205734.2	0.0	56063.0	0.0	0.0	30860.1	0.0	0.0
56	7.0	144186.6	0.0	38819.7	0.0	0.0	21628.0	0.0	0.0
57	30.0	603521.7	0.0	*******	0.0	0.0	90528.3	0.0	0.0
58	93.0	1723966.0	0.0	*******	0.0	0.0	*******	0.0	0.0
59	37.0	624133.4	0.0	*******	0.0	0.0	93620.0	0.0	0.0
60	7.0	114168.3	0.0	35259.9	0.0	0.0	17125.3	0.0	0.0
61	3.0	48298.4	0.0	15110.8	0.0	0.0	7244.8	0.0	0.0
62	12.0	185926.5	0.0	60614.4	0.0	0.0	27889.0	0.0	0.0
63	15.0	222110.6	0.0	75395.8	0.0	0.0	33316.6	0.0	0.0
64	3.0	43884.5	0.0	15087.5	0.0	0.0	6582.7	0.0	0.0
65	12.5	178009.8	0.0	66133.0	0.0	0.0	26701.5	0.0	0.0
66	32.0	414572.9	0.0	*******	0.0	0.0	62185.9	0.0	0.0
67	12.5	145845.3	0.0	55645.9	0.0	0.0	21876.8	0.0	0.0
68	12.0	132322.1	0.0	50955.6	0.0	0.0	19848.3	0.0	0.0
69	1.0	10663.6	0.0	4128.5	0.0	0.0	1599.5	0.0	0.0
70	10.0	103562.2	0.0	40288.1	0.0	0.0	15534.3	0.0	0.0
71	13.0	126561.3	0.0	49323.1	0.0	0.0	18984.2	0.0	0.0
72	3.0	28481.7	0.0	10994.9	0.0	0.0	4272.3	0.0	0.0
73	12.7	121184.9	0.0	44821.5	0.0	0.0	18177.7	0.0	0.0
74	11.3	107862.8	0.0	37908.8	0.0	0.0	16179.4	0.0	0.0
75	8.0	74853.1	0.0	27650.9	0.0	0.0	11228.0	0.0	0.0
76	0.3	3088.8	0.0	1108.8	0.0	0.0	463.3	0.0	0.0
77	0.7	6115.7	0.0	2187.2	0.0	0.0	917.4	0.0	0.0
78	1.0	9174.2	0.0	3260.3	0.0	0.0	1376.1	0.0	0.0
79	30.0	261100.0	0.0	80418.1	0.0	0.0	39165.0	0.0	0.0
80	22.0	172077.9	0.0	36682.9	0.0	0.0	25811.7	0.0	0.0
81	8.0	57333.2	0.0	8152.1	0.0	0.0	8600.0	0.0	0.0
82	6.9	46203.1	0.0	3871.7	0.0	0.0	6930.5	0.0	0.0
83	3.1	20267.7	0.0	813.2	0.0	0.0	3040.2	0.0	0.0
84	1.8	11396.5	0.0	175.3	0.0	0.0	1709.5	0.0	0.0
85	1.2	7231.0	0.0	0.0	0.0	0.0	1084.7	0.0	0.0
86	10.0	53323.1	0.0	0.0	0.0	0.0	7998.5	0.0	0.0
87	6.8	29469.9	0.0	0.0	0.0	0.0	4420.5	0.0	0.0
88	4.2	16085.9	0.0	0.0	0.0	0.0	2412.9	0.0	0.0
89	1.0	3550.5	0.0	0.0	0.0	0.0	532.6	0.0	0.0
90	0.4	1368.0	0.0	0.0	0.0	0.0	205.2	0.0	0.0

91	0.6	2132.7	0.0	0.0	0.0	0.0	319.9	0.0	0.0	
92	34.5	68921.8	0.0	0.0	0.0	0.0	10338.3	0.0	0.0	
93	12.2	3306.6	0.0	0.0	0.0	0.0	496.0	0.0	0.0	

- TABLE 2 - Base Stress Data on the 93 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-34.01	47.59	2.98	689.70	82.17	709.71
2	-34.00	68.76	48.08	3339.56	1490.60	1752.50
3	-34.00	89.48	1.92	5923.58	2872.46	2756.10
4	-34.00	95.14	11.73	6552.87	3267.97	2909.34
5	-34.00	102.50	6.03	7232.39	3708.73	3053.91
6	-34.00	107.50	6.03	7510.03	3910.37	3079.73
7	-34.00	120.86	26.21	8857.22	4770.89	3386.86
8	-45.00	135.86	11.70	16279.86	5082.81	6958.66
9	-45.00	142.05	5.79	17908.37	5695.47	7522.25
10	-45.00	145.69	4.51	29063.06	6135.19	16158.94
11	-45.00	150.14	8.09	31239.21	6673.19	17269.02
12	-45.00	159.50	18.38	34693.68	7593.15	18947.21
13	-45.00	173.00	19.80	39033.64	8799.21	20991.65
14	-45.00	181.32	3.73	41746.14	9549.58	22273.78
15	-0.19	190.32	15.36	13758.28	13696.17	2565.89
16	-0.19	215.06	34.12	13834.33	13772.42	2574.77
17	-0.19	240.06	15.88	13912.40	13851.10	2579.78
18	-0.19	250.00	4.00	13943.44	13882.39	2581.77
19	-0.19	256.00	8.00	13962.18	13901.27	2582.98
20	-0.19	276.00	32.00	14038.68	13978.10	2590.53
21	-0.19	296.00	8.00	14118.69	14058.41	2598.96
22	-0.19	313.12	26.24	14187.19	14127.16	2606.18
23	-0.19	328.12	3.76	14247.20	14187.39	2612.51
24	-0.19	331.50	3.00	14262.77	14202.99	2614.45
25	-0.19	336.50	7.00	14289.65	14229.87	2618.29
26	-0.19	342.50	5.00	14321.90	14262.12	2622.90
27	-0.19	350.00	10.00	14357.63	14296.26	2643.68
28	-0.19	361.50	13.00	14397.44	14339.60	2614.31
29	-0.19	369.00	2.00	14407.70	14352.34	2591.21
30	-0.19	375.00	10.00	14506.16	14451.78	2595.46
31	-0.19	382.50	5.00	14651.80	14598.40	2606.45
32	-0.19	387.50	5.00	14748.90	14696.15	2613.78
33	-0.19	413.00	46.00	15408.83	15357.56	2692.66
34	-0.19	444.14	16.28	16236.02	16186.10	2796.59
35	-0.19	463.64	22.72	16755.18	16706.53	2857.69
36	13.77	485.00	20.59	15955.72	16479.03	2618.05
37	13.77	506.18	23.01	16149.96	16682.85	2671.90
38	11.56	520.18	5.77	16624.98	17152.42	2793.05
39	11.56	540.00	34.70	17143.72	17691.21	2913.53
40	11.56	566.62	19.65	17833.96	18409.62	3087.60
41	11.56	598.62	45.68	18663.58	19273.07	3296.82
42	11.56	630.01	18.40	19480.43	20122.53	3496.16
43	12.05	653.01	28.60	20008.79	20686.40	3645.18
44	12.05	674.50	15.34	20449.61	21147.58	3772.24
45	12.05	697.00	30.68	20184.71	20873.51	3722.30
46	12.05	727.00	30.68	19459.21	20120.16	3561.92
47	12.05	792.00	102.25	17870.18	18474.31	3246.55
48	12.05	846.00	8.18	16538.61	17097.89	3006.03
49	12.05	855.00	10.23	16372.53	16926.68	2980.01
50	12.05	860.50	1.02	16323.21	16876.42	2977.26
51	12.05	866.00	10.23	16522.67	17085.37	3037.17
52	12.05	873.00	4.09	17492.36	18097.19	3293.73
53	12.05	880.00	10.23	18388.54	19032.40	3531.77
54	12.05	904.00	38.86	18905.96	19576.43	3704.28
55	12.05	928.00	10.23	19423.37	20120.46	3876.79
56	12.05	936.50	7.16	19444.86	20144.59	3897.14
57	12.05	955.00	30.68	18990.48	19674.47	3811.36
58	12.05	1016.50	95.09	17501.99	18129.14	3484.87
59	12.05	1081.50	37.83	15930.32	16497.09	3136.92
60	12.05	1103.50	7.16	15405.89	15950.68	3005.02
61	12.05	1108.50	3.07	15208.52	15745.03	2955.35
62	12.05	1116.00	12.27	14640.50	15152.76	2808.76
63	12.05	1129.50	15.33	14003.58	14489.74	2653.72

64	12.05	1138.50	3.08	13590.75	14264.90	3856.63
65	24.53	1146.27	13.78	12030.71	12916.15	3284.34
66	24.53	1168.54	35.18	11004.20	11783.76	3024.90
67	24.53	1190.77	13.69	9972.91	10653.49	2763.31
68	24.53	1203.00	13.19	9402.04	10031.83	2617.99
69	24.53	1209.50	1.10	9097.67	9701.35	2540.39
70	24.53	1215.00	10.99	8839.49	9421.72	2474.48
71	23.23	1226.50	14.15	8384.06	8946.04	2365.64
72	23.23	1234.50	3.26	8178.05	8724.06	2331.25
73	23.23	1242.33	13.78	8237.91	8791.46	2400.53
74	23.23	1254.33	12.33	8191.66	8745.53	2452.36
75	33.83	1264.00	9.63	7500.50	7772.49	2260.05
76	33.83	1268.17	0.40	7376.20	7654.45	2259.70
77	33.83	1268.67	0.80	7362.74	7641.89	2260.23
78	33.83	1269.50	1.20	7340.35	7620.98	2261.11
79	33.83	1285.00	36.11	6913.95	7229.80	2282.82
80	36.31	1311.00	27.30	5978.44	6303.29	2262.18
81	41.61	1326.00	10.70	5107.56	5358.34	2148.42
82	41.61	1333.43	9.17	4722.90	5037.70	2130.75
83	41.61	1338.43	4.20	4462.78	4821.88	2118.37
84	50.90	1340.91	2.88	3796.44	3952.32	1908.36
85	50.90	1342.41	1.87	3682.56	3859.64	1887.47
86	50.90	1348.00	15.86	3169.01	3362.82	1685.38
87	50.90	1356.41	10.82	2507.28	2723.86	1424.98
88	53.14	1361.92	6.98	2104.35	2303.13	1266.41
89	53.14	1364.51	1.65	1948.21	2156.15	1204.97
90	53.14	1365.19	0.65	1906.66	2117.10	1188.62
91	53.14	1365.69	1.02	1876.44	2088.70	1176.72
92	53.14	1383.24	57.50	921.43	1198.58	800.91
93	45.00	1406.58	17.22	0.00	192.07	392.23

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1634(g)
Calculated Newmark Seismic Displacement = 0.077(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

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

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: E-E

File: e-8as

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1634
T_m (s)	0.517
T_s (s)	0.28
M	6.95
T_s/T_m	0.550129

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.238	0.185	0.305
k-velmax (cm/s)	25.81	20.10	33.14

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.35	0.915	1.43	0.57	3.56
[kmax, k-velmax]	-0.46	0.595	0.63	0.35	1.14
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.35	0.915	0.56	0.22	1.40
[kmax, k-velmax]	-0.46	0.595	0.25	0.14	0.45

PGA	Peak Ground Acceleration (g)
PGV	Peak Ground Velocity (cm/s)
k_y	Critical or Yield Acceleration (g)
T_m	Mean Period of an Earthquake Motion (s)
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M	Earthquake Magnitude
kmax	maximum seismic coefficient (g)
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)
D	Predicted Sliding Displacment (cm)

H_{avr} = 150 ft

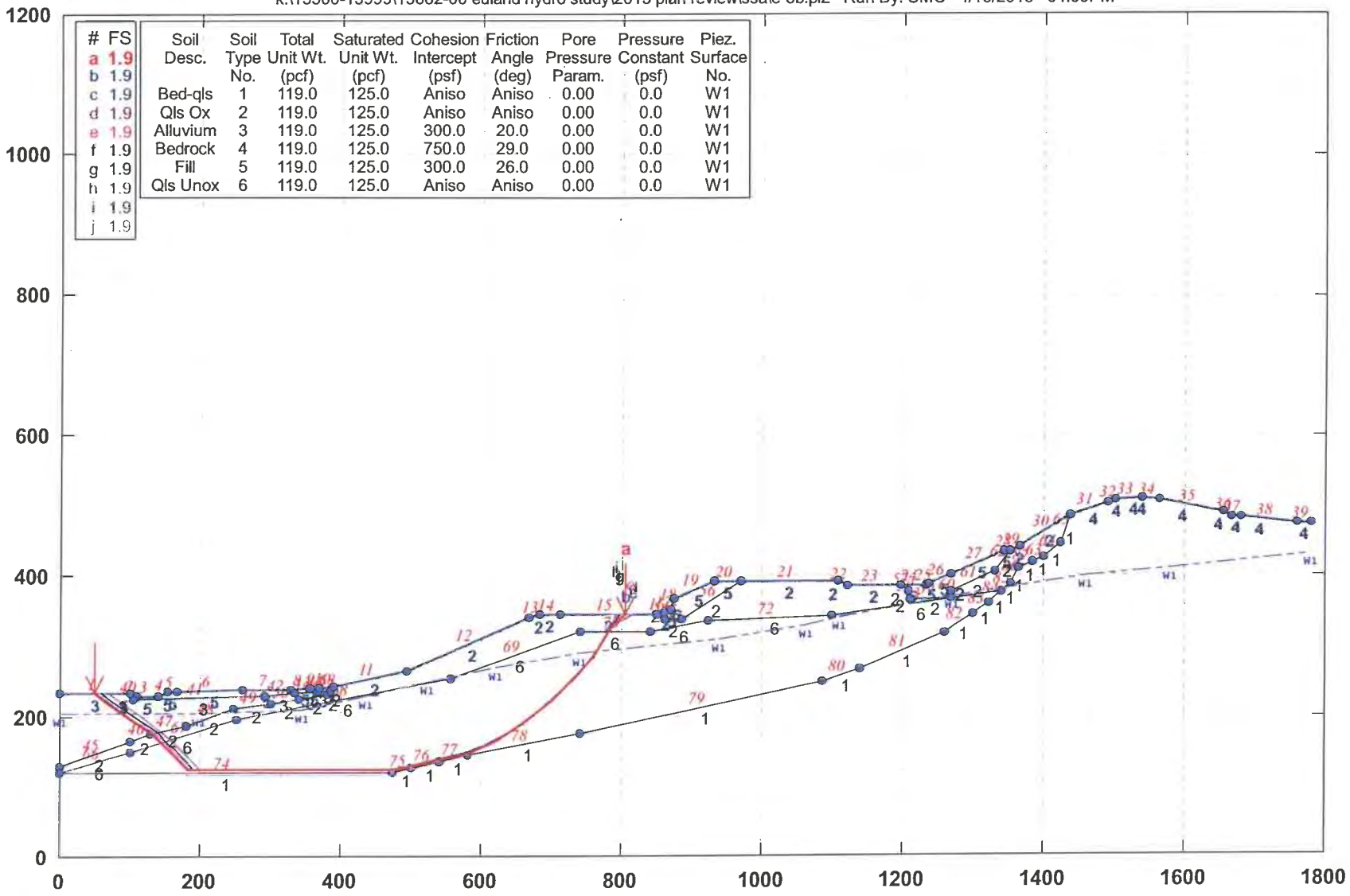
V_s = 2110 ft/s

$T_s = 4\ H_{avr}/V_s$ = 0.28 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8b.pl2 Run By: SMC 4/16/2015 04:09PM



#	FS
a	1.9
b	1.9
c	1.9
d	1.9
e	1.9
f	1.9
g	1.9
h	1.9
i	1.9
j	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

GSTABL7 v.2 FSmin=1.9

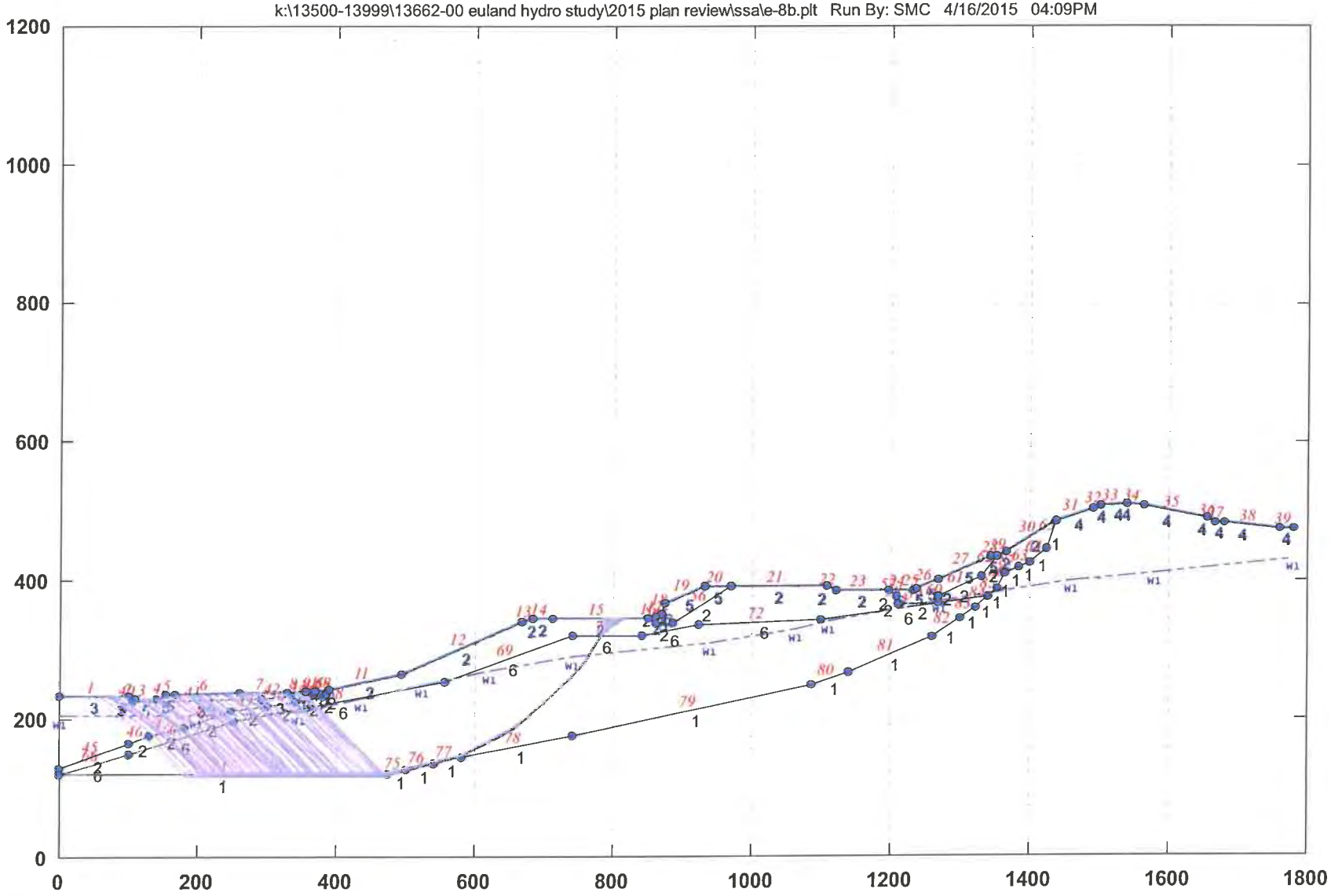
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

SMC

Figure E-29.1

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8b.plt Run By: SMC 4/16/2015 04:09PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/16/2015
Time of Run: 04:09PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8b.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8b.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8b.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	368.00	2
60	1268.00	368.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00

2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	10.00
2	475.00	120.00	475.00	120.00	10.00
3	500.00	128.00	540.00	138.00	5.00
4	580.00	147.00	580.00	147.00	5.00
5	620.00	168.00	620.00	168.00	5.00
6	660.00	190.00	660.00	190.00	5.00
7	700.00	224.00	700.00	224.00	5.00
8	740.00	262.00	740.00	262.00	5.00
9	760.00	286.00	760.00	286.00	5.00
10	785.00	326.00	785.00	326.00	5.00
11	786.00	345.00	820.00	345.00	0.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	3.093	2.696	0.132
11.25	1.673	1.764	0.199
10.32	1.609	1.678	0.182
6.04	1.344	1.361	0.106
2.72	1.175	1.179	0.048
0.42	1.074	1.074	0.007
0.00	1.057	1.056	0.000
0.80	1.090	1.090	0.014
0.47	1.076	1.076	0.008
0.51	1.078	1.078	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009

The Trial Failure Surface In Question Is Defined
By The Following 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	350.82	239.83
2	359.35	234.51
3	367.48	228.81
4	377.09	219.20
5	386.90	209.39
6	415.19	181.10
7	443.47	152.82
8	471.76	124.54
9	475.00	117.87
10	526.06	133.85
11	580.00	145.93
12	620.00	169.95
13	660.00	191.35
14	700.00	222.85
15	740.00	261.94
16	760.00	284.81
17	785.00	324.45
18	794.74	345.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	352.13	239.89
2	360.62	234.58
3	368.58	229.00
4	378.18	219.41
5	387.91	209.68
6	416.19	181.39
7	444.48	153.11
8	472.76	124.82
9	475.00	118.74
10	538.39	135.63
11	580.00	144.61
12	620.00	169.07
13	660.00	190.14
14	700.00	224.29
15	740.00	262.72
16	760.00	285.42
17	785.00	324.10
18	804.15	345.00

Factor Of Safety For The Preceding Specified Surface = 1.771
Theta (ki = 1.0) = 7.03 Deg Lambda =

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	3.093	2.696	0.132
11.25	1.673	1.764	0.199
10.32	1.609	1.678	0.182
6.04	1.344	1.361	0.106
2.73	1.175	1.179	0.048
0.42	1.074	1.074	0.007
0.00	1.057	1.056	0.000
0.80	1.090	1.090	0.014
0.47	1.076	1.076	0.008
0.51	1.078	1.078	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009
0.51	1.078	1.077	0.009

The Trial Failure Surface In Question Is Defined
By The Following 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	350.82	239.83
2	359.35	234.51
3	367.48	228.81
4	377.09	219.20
5	386.90	209.39
6	415.19	181.10
7	443.47	152.82
8	471.76	124.54
9	475.00	117.87
10	526.06	133.85
11	580.00	145.93
12	620.00	169.95
13	660.00	191.35
14	700.00	222.85
15	740.00	261.94
16	760.00	284.81
17	785.00	324.45
18	794.74	345.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 2
Number of Trial Surfaces with Misleading FS = 1
Number of Trial Surfaces With Valid FS = 2997
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.1 %
Statistical Data On All Valid FS Values:
FS Max = 3.315 FS Min = 1.858 FS Ave = 2.144
Standard Deviation = 0.197 Coefficient of Variation = 9.20 %
((Simplified Janbu FS for Critical Surface = 1.650))
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.489	233.000
2	66.197	221.301
3	98.963	198.358
4	131.729	175.415
5	144.091	163.053
6	154.354	152.790
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	580.000	146.658
11	620.000	165.712
12	660.000	191.216
13	700.000	223.387
14	740.000	262.195
15	760.000	286.359
16	785.000	326.346
17	806.459	345.000

*** FOS = 1.858 Theta (ki=1.0) = 6.28 ***

Lambda = 0.110

Individual data on the 55 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	16.7	11630.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	24.1	57604.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	8.7	32900.9	0.0	2037.2	0.	0.	0.0	0.0	0.0
4	1.0	4360.3	0.0	514.1	0.	0.	0.0	0.0	0.0
5	5.0	21898.4	0.0	3289.4	0.	0.	0.0	0.0	0.0
6	5.0	23194.8	0.0	4632.4	0.	0.	0.0	0.0	0.0
7	21.7	124287.2	0.0	35732.9	0.	0.	0.0	0.0	0.0
8	8.3	59452.9	0.0	24382.7	0.	0.	0.0	0.0	0.0
9	4.1	32950.0	0.0	14302.3	0.	0.	0.0	0.0	0.0
10	8.9	81650.6	0.0	36284.2	0.	0.	0.0	0.0	0.0
11	1.4	13549.3	0.0	6128.6	0.	0.	0.0	0.0	0.0
12	11.6	126048.9	0.0	59446.9	0.	0.	0.0	0.0	0.0
13	14.0	174215.4	0.0	87382.4	0.	0.	0.0	0.0	0.0
14	2.6	35624.1	0.0	18410.4	0.	0.	0.0	0.0	0.0
15	15.4	210403.8	0.0	77147.8	0.	0.	0.0	0.0	0.0
16	34.1	469866.2	0.0	*******	0.	0.	0.0	0.0	0.0
17	15.9	220006.7	0.0	81339.1	0.	0.	0.0	0.0	0.0
18	4.0	55529.7	0.0	20576.3	0.	0.	0.0	0.0	0.0
19	8.0	111210.5	0.0	41264.2	0.	0.	0.0	0.0	0.0
20	32.0	447300.7	0.0	*******	0.	0.	0.0	0.0	0.0
21	8.0	112467.6	0.0	42008.6	0.	0.	0.0	0.0	0.0
22	26.2	370761.9	0.0	*******	0.	0.	0.0	0.0	0.0
23	3.8	53280.4	0.0	20000.9	0.	0.	0.0	0.0	0.0
24	3.0	42609.1	0.0	16001.0	0.	0.	0.0	0.0	0.0
25	7.0	99609.4	0.0	37417.1	0.	0.	0.0	0.0	0.0
26	5.0	71310.8	0.0	26796.3	0.	0.	0.0	0.0	0.0
27	10.0	142963.0	0.0	53124.9	0.	0.	0.0	0.0	0.0
28	13.0	186415.3	0.0	71095.5	0.	0.	0.0	0.0	0.0
29	2.0	28704.8	0.0	11141.7	0.	0.	0.0	0.0	0.0
30	10.0	144518.3	0.0	56524.7	0.	0.	0.0	0.0	0.0
31	5.0	72992.2	0.0	28772.3	0.	0.	0.0	0.0	0.0
32	5.0	73481.0	0.0	29112.3	0.	0.	0.0	0.0	0.0
33	46.0	706450.1	0.0	*******	0.	0.	0.0	0.0	0.0
34	16.3	263581.6	0.0	*******	0.	0.	0.0	0.0	0.0
35	22.7	379500.2	0.0	*******	0.	0.	0.0	0.0	0.0
36	20.0	339331.2	0.0	*******	0.	0.	0.0	0.0	0.0
37	22.4	383911.9	0.0	*******	0.	0.	0.0	0.0	0.0
38	5.6	98902.2	0.0	40276.7	0.	0.	0.0	0.0	0.0
39	34.0	614083.4	0.0	*******	0.	0.	0.0	0.0	0.0
40	19.2	361850.0	0.0	*******	0.	0.	0.0	0.0	0.0
41	3.8	71718.3	0.0	26915.7	0.	0.	0.0	0.0	0.0
42	40.0	761656.9	0.0	*******	0.	0.	0.0	0.0	0.0
43	1.0	18900.2	0.0	7532.9	0.	0.	0.0	0.0	0.0
44	39.0	716387.4	0.0	*******	0.	0.	0.0	0.0	0.0

45	7.0	123760.7	0.0	45903.7	0.	0.	0.0	0.0	0.0
46	15.0	255971.9	0.0	90034.3	0.	0.	0.0	0.0	0.0
47	18.0	282971.8	0.0	93045.8	0.	0.	0.0	0.0	0.0
48	12.0	169246.9	0.0	56455.6	0.	0.	0.0	0.0	0.0
49	28.0	327586.6	0.0	93061.5	0.	0.	0.0	0.0	0.0
50	2.0	19733.0	0.0	5104.6	0.	0.	0.0	0.0	0.0
51	18.0	150558.6	0.0	27033.3	0.	0.	0.0	0.0	0.0
52	3.6	24220.7	0.0	1164.8	0.	0.	0.0	0.0	0.0
53	17.4	80509.4	0.0	0.0	0.	0.	0.0	0.0	0.0
54	4.0	10305.7	0.0	0.0	0.	0.	0.0	0.0	0.0
55	21.5	23817.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.489	233.000
2	66.197	221.301
3	98.963	198.358
4	131.729	175.415
5	144.091	163.053
6	154.354	152.790
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	580.000	146.658
11	620.000	165.712
12	660.000	191.216
13	700.000	223.387
14	740.000	262.195
15	760.000	286.359
16	785.000	326.346
17	806.459	345.000

*** FOS = 1.858 Theta (ki=1.0) = 6.28 ***
Lambda = 0.110

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.889	233.000
2	67.240	221.551
3	100.006	198.608
4	132.772	175.665
5	145.088	163.349
6	155.358	153.079
7	183.643	124.794
8	475.000	124.418
9	529.675	135.702
10	580.000	145.337
11	620.000	169.841
12	660.000	190.012
13	700.000	224.820
14	740.000	262.984
15	760.000	286.971
16	785.000	326.002
17	815.872	345.000

*** FOS = 1.866 Theta (ki=1.0) = 6.33 ***
Lambda = 0.111

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.889	233.000
2	67.240	221.551
3	100.006	198.608
4	132.772	175.665
5	145.088	163.349
6	155.358	153.079
7	183.643	124.794
8	475.000	124.418
9	529.675	135.702
10	580.000	145.337
11	620.000	169.841
12	660.000	190.012

13	700.000	224.820
14	740.000	262.984
15	760.000	286.971
16	785.000	326.002
17	815.872	345.000

*** FOS = 1.866 Theta (ki=1.0) = 6.33 ***
Lambda = 0.111

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.196	233.000
2	71.937	222.679
3	104.703	199.736
4	137.469	176.792
5	149.582	164.679
6	162.105	152.156
7	190.390	123.871
8	475.000	123.144
9	515.281	130.509
10	580.000	145.755
11	620.000	168.988
12	660.000	188.359
13	700.000	221.585
14	740.000	261.135
15	760.000	288.229
16	785.000	325.834
17	811.075	345.000

*** FOS = 1.868 Theta (ki=1.0) = 6.24 ***
Lambda = 0.109

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.996	233.000
2	74.022	223.179
3	106.788	200.236
4	139.554	177.293
5	151.578	165.270
6	164.115	152.732
7	192.400	124.448
8	475.000	124.892
9	539.929	139.068
10	580.000	148.113
11	620.000	167.245
12	660.000	190.952
13	700.000	224.451
14	740.000	262.713
15	760.000	284.454
16	785.000	325.145
17	795.901	345.000

*** FOS = 1.869 Theta (ki=1.0) = 6.33 ***
Lambda = 0.111

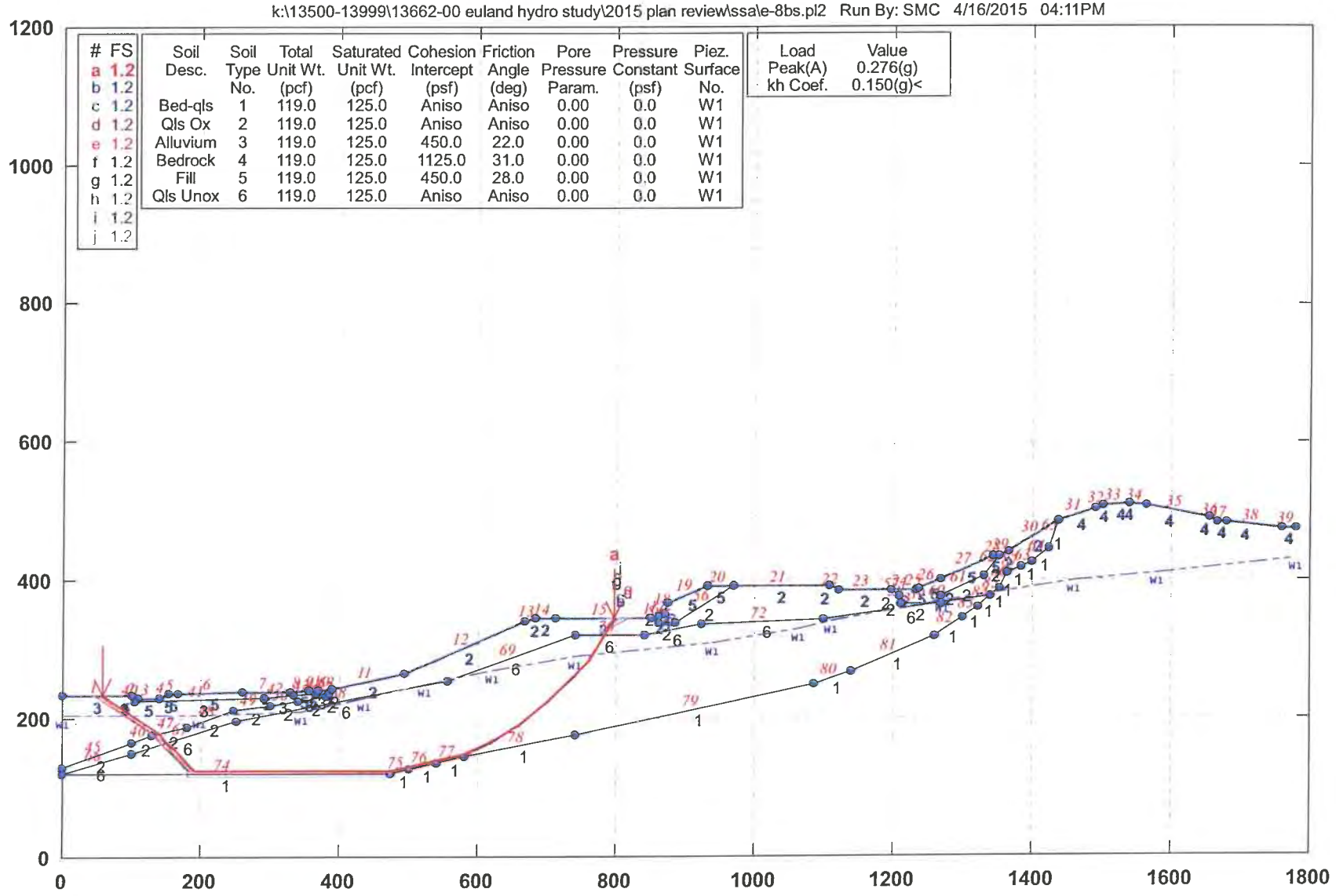
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.996	233.000
2	74.022	223.179
3	106.788	200.236
4	139.554	177.293
5	151.578	165.270
6	164.115	152.732
7	192.400	124.448
8	475.000	124.892
9	539.929	139.068
10	580.000	148.113
11	620.000	167.245
12	660.000	190.952
13	700.000	224.451
14	740.000	262.713
15	760.000	284.454
16	785.000	325.145

```
   17        795.901      345.000
***  FOS =      1.869   Theta (ki=1.0) =      6.33  ***
                    Lambda =    0.111
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         68.050      233.000
    2         80.020      224.619
    3        112.786      201.676
    4        145.552      178.733
    5        157.316      166.969
    6        171.006      153.279
    7        199.290      124.995
    8        475.000      122.314
    9        515.867      132.701
   10        580.000      146.199
   11        620.000      166.269
   12        660.000      188.413
   13        700.000      222.850
   14        740.000      259.549
   15        760.000      287.228
   16        785.000      326.356
   17        792.448      345.000
***  FOS =      1.869   Theta (ki=1.0) =      6.41  ***
                    Lambda =    0.112
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         68.050      233.000
    2         80.020      224.619
    3        112.786      201.676
    4        145.552      178.733
    5        157.316      166.969
    6        171.006      153.279
    7        199.290      124.995
    8        475.000      122.314
    9        515.867      132.701
   10        580.000      146.199
   11        620.000      166.269
   12        660.000      188.413
   13        700.000      222.850
   14        740.000      259.549
   15        760.000      287.228
   16        785.000      326.356
   17        792.448      345.000
***  FOS =      1.869   Theta (ki=1.0) =      6.41  ***
                    Lambda =    0.112
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         55.796      233.000
    2         70.894      222.428
    3        103.660      199.485
    4        136.426      176.542
    5        148.585      164.384
    6        161.101      151.868
    7        189.385      123.583
    8        475.000      122.270
    9        502.957      128.729
   10        580.000      147.075
   11        620.000      169.860
   12        660.000      189.563
   13        700.000      225.152
   14        740.000      260.347
   15        760.000      287.616
   16        785.000      326.178
   17        801.661      345.000
***  FOS =      1.873   Theta (ki=1.0) =      6.27  ***
                    Lambda =    0.110
          **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section E-E', seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8bs.pl2 Run By: SMC 4/16/2015 04:11PM



#	FS
a	1.2
b	1.2
c	1.2
d	1.2
e	1.2
f	1.2
g	1.2
h	1.2
i	1.2
j	1.2

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.2

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-29.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/16/2015
Time of Run: 04:11PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8bs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8bs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8bs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
seismic

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00

2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
11 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	10.00
2	475.00	120.00	475.00	120.00	10.00
3	500.00	128.00	540.00	138.00	5.00
4	580.00	147.00	580.00	147.00	5.00
5	620.00	168.00	620.00	168.00	5.00
6	660.00	190.00	660.00	190.00	5.00
7	700.00	224.00	700.00	224.00	5.00
8	740.00	262.00	740.00	262.00	5.00
9	760.00	286.00	760.00	286.00	5.00

10	785.00	326.00	785.00	326.00	5.00
11	786.00	345.00	820.00	345.00	0.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	350.21	239.81
2	359.06	234.49
3	367.48	228.81
4	377.09	219.20
5	386.90	209.39
6	415.19	181.10
7	443.47	152.82
8	471.76	124.54
9	475.00	117.87
10	526.06	133.85
11	580.00	145.93
12	620.00	169.95
13	660.00	191.35
14	700.00	222.85
15	740.00	261.94
16	760.00	284.81
17	785.00	324.45
18	794.74	345.00

Factor Of Safety For The Preceding Specified Surface = 1.253
Theta (ki = 1.0) = 3.90 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.20	239.85
2	360.02	234.54
3	368.31	228.95
4	377.91	219.36
5	388.77	208.49
6	417.05	180.21
7	445.34	151.93
8	473.62	123.64
9	475.00	120.92
10	520.38	133.58
11	580.00	145.62
12	620.00	168.33
13	660.00	189.83
14	700.00	224.09
15	740.00	259.83
16	760.00	284.52
17	785.00	327.38
18	812.22	345.00

Factor Of Safety For The Preceding Specified Surface = 1.374
Theta (ki = 1.0) = 5.22 Deg Lambda =
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.52	239.86
2	360.34	234.56
3	368.58	229.00
4	378.18	219.41
5	387.91	209.68
6	416.19	181.39
7	444.48	153.11
8	472.76	124.82
9	475.00	118.74
10	538.39	135.63
11	580.00	144.61
12	620.00	169.07
13	660.00	190.14

14	700.00	224.29
15	740.00	262.72
16	760.00	285.42
17	785.00	324.10
18	804.15	345.00

Factor of Safety for the Preceding Surface is Between 0.956 and 1.431
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	-0.038	-0.026	0.132
11.25	-6.084	4.473	0.199
7.49	-0.041	-0.031	0.132
6.24	-0.032	-0.024	0.109
0.00	-0.078	-0.032	0.000
10.00	-0.083	-0.072	0.176
14.19	-1.109	0.001	0.253
9.94	-0.081	-0.070	0.175
8.47	-0.051	-0.040	0.149
0.00	1.960	1.795	0.000
7.76	-0.034	-0.027	0.136
7.38	-0.031	-0.025	0.130
3.20	-0.002	-0.011	0.056
5.30	-0.019	-0.018	0.093
5.00	-0.017	-0.017	0.088
4.79	-0.016	-0.016	0.084
4.89	-0.017	-0.017	0.086
4.93	-0.017	-0.017	0.086
4.93	-0.017	-0.017	0.086
4.93	-0.017	-0.017	0.086

The Trial Failure Surface In Question Is Defined
By The Following 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.52	239.86
2	360.34	234.56
3	368.58	229.00
4	378.18	219.41
5	387.91	209.68
6	416.19	181.39
7	444.48	153.11
8	472.76	124.82
9	475.00	118.74
10	538.39	135.63
11	580.00	144.61
12	620.00	169.07
13	660.00	190.14
14	700.00	224.29
15	740.00	262.72
16	760.00	285.42
17	785.00	324.10
18	804.15	345.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	350.21	239.81
2	359.06	234.49
3	367.48	228.81
4	377.09	219.20
5	386.90	209.39
6	415.19	181.10
7	443.47	152.82
8	471.76	124.54
9	475.00	117.87
10	526.06	133.85
11	580.00	145.93
12	620.00	169.95

13	660.00	191.35
14	700.00	222.85
15	740.00	261.94
16	760.00	284.81
17	785.00	324.45
18	794.74	345.00

Factor Of Safety For The Preceding Specified Surface = 1.253
Theta (ki = 1.0) = 3.90 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.20	239.85
2	360.02	234.54
3	368.31	228.95
4	377.91	219.36
5	388.77	208.49
6	417.05	180.21
7	445.34	151.93
8	473.62	123.64
9	475.00	120.92
10	520.38	133.58
11	580.00	145.62
12	620.00	168.33
13	660.00	189.83
14	700.00	224.09
15	740.00	259.83
16	760.00	284.52
17	785.00	327.38
18	812.22	345.00

Factor Of Safety For The Preceding Specified Surface = 1.374
Theta (ki = 1.0) = 5.22 Deg Lambda =
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 2
Number of Trial Surfaces with Misleading FS = 4
Number of Trial Surfaces With Valid FS = 2994
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.2 %
Statistical Data On All Valid FS Values:
FS Max = 2.349 FS Min = 1.201 FS Ave = 1.439
Standard Deviation = 0.153 Coefficient of Variation = 10.64 %
((Simplified Janbu FS for Critical Surface = 1.160))
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.965	233.000
2	73.231	222.028
3	106.393	199.661
4	139.554	177.293
5	151.578	165.270
6	164.115	152.732
7	192.400	124.448
8	475.000	124.892
9	539.929	139.068
10	580.000	148.113
11	620.000	167.245
12	660.000	190.952

13	700.000	224.451
14	740.000	262.713
15	760.000	284.454
16	785.000	325.145
17	795.901	345.000

*** FOS = 1.201 Theta (ki=1.0) = 3.97 ***
Lambda = 0.069

Individual data on the 55 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	16.3	10618.6	0.0	0.0	0.	0.	1592.8	0.0	0.0
2	26.0	61026.4	0.0	0.0	0.	0.	9154.0	0.0	0.0
3	0.8	2682.9	0.0	15.7	0.	0.	402.4	0.0	0.0
4	5.0	17895.3	0.0	839.7	0.	0.	2684.3	0.0	0.0
5	1.4	5201.0	0.0	461.6	0.	0.	780.1	0.0	0.0
6	3.6	13910.4	0.0	1656.9	0.	0.	2086.6	0.0	0.0
7	29.6	153393.4	0.0	38638.6	0.	0.	23009.0	0.0	0.0
8	0.4	2882.1	0.0	1087.3	0.	0.	432.3	0.0	0.0
9	11.6	86612.1	0.0	34407.6	0.	0.	12991.8	0.0	0.0
10	1.4	12220.9	0.0	5047.6	0.	0.	1833.1	0.0	0.0
11	11.1	104568.1	0.0	45621.8	0.	0.	15685.2	0.0	0.0
12	1.9	19262.6	0.0	8822.3	0.	0.	2889.4	0.0	0.0
13	14.0	157234.9	0.0	75394.7	0.	0.	23585.2	0.0	0.0
14	12.4	160138.2	0.0	81291.9	0.	0.	24020.7	0.0	0.0
15	5.6	76795.5	0.0	28143.7	0.	0.	11519.3	0.0	0.0
16	34.1	469509.3	0.0	*******	0.	0.	70426.4	0.0	0.0
17	15.9	219599.2	0.0	81135.5	0.	0.	32939.9	0.0	0.0
18	4.0	55402.9	0.0	20512.9	0.	0.	8310.4	0.0	0.0
19	8.0	110927.8	0.0	41122.9	0.	0.	16639.2	0.0	0.0
20	32.0	445780.6	0.0	*******	0.	0.	66867.1	0.0	0.0
21	8.0	111990.3	0.0	41770.3	0.	0.	16798.6	0.0	0.0
22	26.2	368923.1	0.0	*******	0.	0.	55338.5	0.0	0.0
23	3.8	52983.0	0.0	19852.4	0.	0.	7947.5	0.0	0.0
24	3.0	42365.4	0.0	15879.3	0.	0.	6354.8	0.0	0.0
25	7.0	99019.4	0.0	37122.6	0.	0.	14852.9	0.0	0.0
26	5.0	70871.2	0.0	26576.8	0.	0.	10630.7	0.0	0.0
27	10.0	142039.2	0.0	52673.7	0.	0.	21305.9	0.0	0.0
28	13.0	185123.6	0.0	70464.5	0.	0.	27768.5	0.0	0.0
29	2.0	28496.9	0.0	11040.2	0.	0.	4274.5	0.0	0.0
30	10.0	143442.7	0.0	55999.3	0.	0.	21516.4	0.0	0.0
31	5.0	72431.7	0.0	28498.5	0.	0.	10864.8	0.0	0.0
32	5.0	72905.2	0.0	28831.1	0.	0.	10935.8	0.0	0.0
33	46.0	700441.2	0.0	*******	0.	0.	*******	0.0	0.0
34	16.3	261146.8	0.0	*******	0.	0.	39172.0	0.0	0.0
35	22.7	375834.8	0.0	*******	0.	0.	56375.2	0.0	0.0
36	20.0	336632.8	0.0	*******	0.	0.	50494.9	0.0	0.0
37	28.0	481193.3	0.0	*******	0.	0.	72179.0	0.0	0.0
38	16.9	300852.6	0.0	*******	0.	0.	45127.9	0.0	0.0
39	17.1	310728.9	0.0	*******	0.	0.	46609.3	0.0	0.0
40	19.2	359073.3	0.0	*******	0.	0.	53861.0	0.0	0.0
41	3.8	71056.3	0.0	26707.4	0.	0.	10658.4	0.0	0.0
42	40.0	754193.4	0.0	*******	0.	0.	*******	0.0	0.0
43	1.0	18711.5	0.0	7276.1	0.	0.	2806.7	0.0	0.0
44	39.0	713404.3	0.0	*******	0.	0.	*******	0.0	0.0
45	7.0	123889.7	0.0	46740.1	0.	0.	18583.4	0.0	0.0
46	15.0	255563.8	0.0	91249.9	0.	0.	38334.6	0.0	0.0
47	18.0	281250.3	0.0	93466.4	0.	0.	42187.5	0.0	0.0
48	12.0	167774.2	0.0	55066.8	0.	0.	25166.1	0.0	0.0
49	28.0	325106.7	0.0	90736.6	0.	0.	48766.0	0.0	0.0
50	2.0	19633.9	0.0	4735.5	0.	0.	2945.1	0.0	0.0
51	18.0	152390.6	0.0	26804.6	0.	0.	22858.6	0.0	0.0
52	4.8	32606.9	0.0	2106.4	0.	0.	4891.0	0.0	0.0
53	17.0	78658.1	0.0	0.0	0.	0.	11798.7	0.0	0.0
54	3.2	8436.6	0.0	0.0	0.	0.	1265.5	0.0	0.0
55	10.9	12877.7	0.0	0.0	0.	0.	1931.7	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

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

1	46.356	233.000
2	65.406	220.150
3	98.568	197.783
4	131.729	175.415
5	144.091	163.053
6	154.354	152.790
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	580.000	146.658
11	620.000	165.712
12	660.000	191.216
13	700.000	223.387
14	740.000	262.195
15	760.000	286.359
16	785.000	326.346
17	806.459	345.000

*** FOS = 1.204 Theta (ki=1.0) = 4.44 ***
Lambda = 0.078
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.356	233.000
2	65.406	220.150
3	98.568	197.783
4	131.729	175.415
5	144.091	163.053
6	154.354	152.790
7	182.638	124.506
8	475.000	123.544
9	517.351	133.922
10	580.000	146.658
11	620.000	165.712
12	660.000	191.216
13	700.000	223.387
14	740.000	262.195
15	760.000	286.359
16	785.000	326.346
17	806.459	345.000

*** FOS = 1.204 Theta (ki=1.0) = 4.44 ***
Lambda = 0.078
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.770	233.000
2	66.449	220.401
3	99.610	198.033
4	132.772	175.665
5	145.088	163.349
6	155.358	153.079
7	183.643	124.794
8	475.000	124.418
9	529.675	135.702
10	580.000	145.337
11	620.000	169.841
12	660.000	190.012
13	700.000	224.820
14	740.000	262.984
15	760.000	286.971
16	785.000	326.002
17	815.872	345.000

*** FOS = 1.205 Theta (ki=1.0) = 4.39 ***
Lambda = 0.077
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.770	233.000
2	66.449	220.401
3	99.610	198.033
4	132.772	175.665

5	145.088	163.349
6	155.358	153.079
7	183.643	124.794
8	475.000	124.418
9	529.675	135.702
10	580.000	145.337
11	620.000	169.841
12	660.000	190.012
13	700.000	224.820
14	740.000	262.984
15	760.000	286.971
16	785.000	326.002
17	815.872	345.000

*** FOS = 1.205 Theta (ki=1.0) = 4.40 ***
Lambda = 0.077
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.965	233.000
2	73.231	222.028
3	106.393	199.661
4	139.554	177.293
5	151.578	165.270
6	164.115	152.732
7	192.400	124.448
8	475.000	124.892
9	539.929	139.068
10	580.000	148.113
11	620.000	167.245
12	660.000	190.952
13	700.000	224.451
14	740.000	262.713
15	760.000	284.454
16	785.000	325.145
17	795.901	345.000

*** FOS = 1.205 Theta (ki=1.0) = 4.10 ***
Lambda = 0.072
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	52.724	233.000
2	70.103	221.278
3	103.265	198.910
4	136.426	176.542
5	148.585	164.384
6	161.101	151.868
7	189.385	123.583
8	475.000	122.270
9	502.957	128.729
10	580.000	147.075
11	620.000	169.860
12	660.000	189.563
13	700.000	225.152
14	740.000	260.347
15	760.000	287.616
16	785.000	326.178
17	801.661	345.000

*** FOS = 1.208 Theta (ki=1.0) = 4.19 ***
Lambda = 0.073
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	52.724	233.000
2	70.103	221.278
3	103.265	198.910
4	136.426	176.542
5	148.585	164.384
6	161.101	151.868
7	189.385	123.583
8	475.000	122.270

9	502.957	128.729
10	580.000	147.075
11	620.000	169.860
12	660.000	189.563
13	700.000	225.152
14	740.000	260.347
15	760.000	287.616
16	785.000	326.178
17	801.661	345.000

*** FOS = 1.208 Theta (ki=1.0) = 4.20 ***
Lambda = 0.073

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.592	233.000
2	64.105	219.838
3	97.267	197.470
4	130.428	175.103
5	142.846	162.685
6	154.210	151.321
7	182.494	123.036
8	475.000	124.848
9	527.019	135.096
10	580.000	148.989
11	620.000	165.837
12	660.000	192.102
13	700.000	221.754
14	740.000	263.511
15	760.000	284.842
16	785.000	324.967
17	805.115	345.000

*** FOS = 1.212 Theta (ki=1.0) = 4.42 ***
Lambda = 0.077

Failure Surface Specified By 17 Coordinate Points

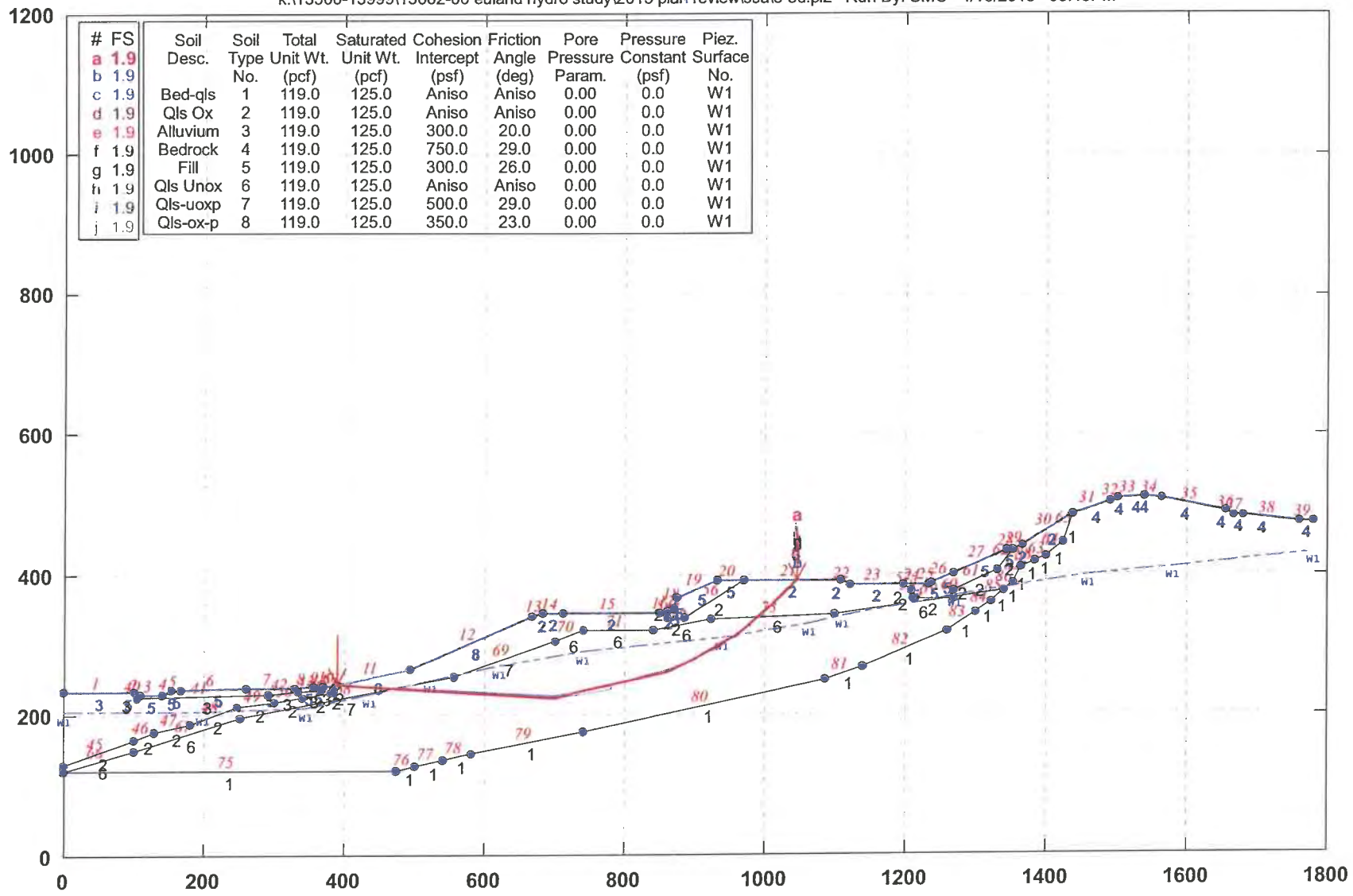
Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.592	233.000
2	64.105	219.838
3	97.267	197.470
4	130.428	175.103
5	142.846	162.685
6	154.210	151.321
7	182.494	123.036
8	475.000	124.848
9	527.019	135.096
10	580.000	148.989
11	620.000	165.837
12	660.000	192.102
13	700.000	221.754
14	740.000	263.511
15	760.000	284.842
16	785.000	324.967
17	805.115	345.000

*** FOS = 1.212 Theta (ki=1.0) = 4.43 ***
Lambda = 0.077

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

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8d.pl2 Run By: SMC 4/16/2015 03:48PM



#	FS
a	1.9
b	1.9
c	1.9
d	1.9
e	1.9
f	1.9
g	1.9
h	1.9
i	1.9
j	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls-uoxp	7	119.0	125.0	500.0	29.0	0.00	0.0	W1
Qls-ox-p	8	119.0	125.0	350.0	23.0	0.00	0.0	W1

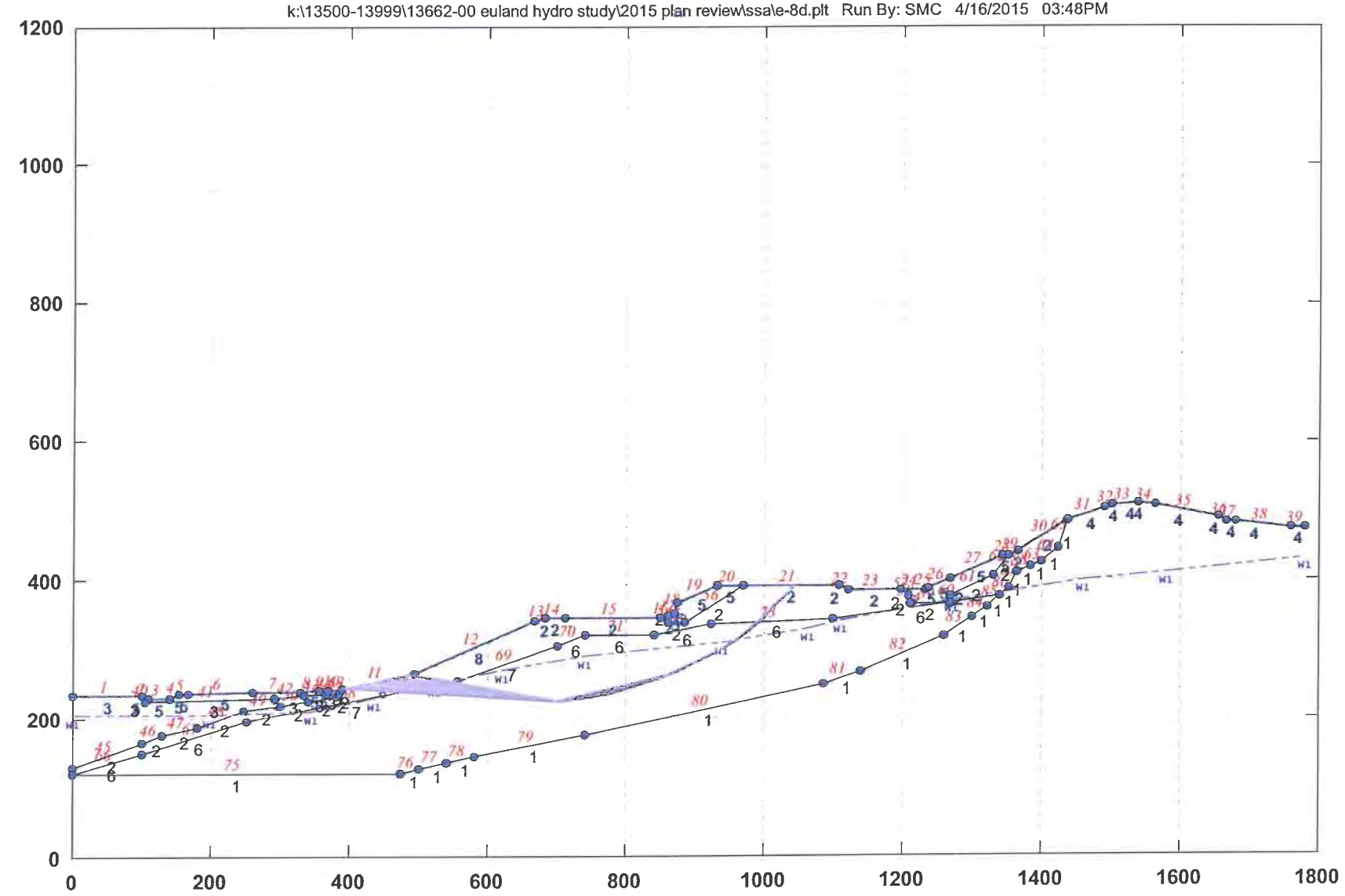
GSTABL7 v.2 FSmin=1.9

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-30.1

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8d.plt Run By: SMC 4/16/2015 03:48PM



SMC

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/16/2015
Time of Run: 03:48PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8d.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8d.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8d.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
39 Top Boundaries
88 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	8
12	495.00	265.00	667.00	340.00	8
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	7
69	557.00	254.00	700.00	304.00	7
70	700.00	304.00	742.00	320.00	6
71	742.00	320.00	842.00	320.00	6
72	842.00	320.00	923.00	335.00	6
73	923.00	335.00	1100.00	342.00	6
74	1100.00	342.00	1340.00	376.00	6
75	0.00	120.00	474.00	120.00	1
76	474.00	120.00	500.00	126.00	1
77	500.00	126.00	540.00	136.00	1
78	540.00	136.00	580.00	145.00	1
79	580.00	145.00	740.00	176.00	1
80	740.00	176.00	1085.00	249.00	1
81	1085.00	249.00	1140.00	266.00	1
82	1140.00	266.00	1260.00	318.00	1
83	1260.00	318.00	1300.00	344.00	1
84	1300.00	344.00	1322.00	360.00	1
85	1322.00	360.00	1340.00	376.00	1
86	1340.00	376.00	1352.00	388.00	1
87	1352.00	388.00	1365.00	410.00	1
88	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1
7	119.0	125.0	500.0	29.0	0.00	0.0	1
8	119.0	125.0	350.0	23.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
10 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	390.00	243.00	495.00	265.00	0.00
2	700.00	224.00	700.00	224.00	5.00
3	701.00	224.00	780.00	238.00	5.00
4	860.00	262.00	860.00	262.00	5.00
5	900.00	280.00	900.00	280.00	5.00
6	940.00	300.00	940.00	300.00	5.00
7	962.00	314.00	962.00	314.00	5.00
8	980.00	328.00	980.00	328.00	5.00
9	1000.00	344.00	1000.00	344.00	5.00
10	1013.00	360.00	1013.00	360.00	5.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 2.815 FS Min = 1.871 FS Ave = 2.013
Standard Deviation = 0.095 Coefficient of Variation = 4.73 %
((Simplified Janbu FS for Critical Surface = 1.813))
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.327	243.068
2	700.000	223.594
3	727.399	230.350
4	860.000	259.636
5	900.000	279.206
6	940.000	301.850
7	962.000	313.787
8	980.000	328.986
9	1000.000	346.165
10	1013.000	358.794
11	1041.284	387.078
12	1045.206	391.000

*** FOS = 1.871 Theta (ki=1.0) = 11.06 ***
Lambda = 0.195
Individual data on the 33 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	80.5	105034.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	2.6	6997.9	0.0	62.0	0.	0.	0.0	0.0	0.0
3	21.5	66054.7	0.0	5151.9	0.	0.	0.0	0.0	0.0
4	28.0	120113.2	0.0	19074.2	0.	0.	0.0	0.0	0.0
5	34.0	210169.3	0.0	41276.8	0.	0.	0.0	0.0	0.0
6	20.2	158127.2	0.0	33456.5	0.	0.	0.0	0.0	0.0
7	43.8	428602.0	0.0	95539.5	0.	0.	0.0	0.0	0.0
8	46.0	575741.6	0.0	*******	0.	0.	0.0	0.0	0.0
9	15.0	214147.9	0.0	49641.9	0.	0.	0.0	0.0	0.0
10	18.0	264956.2	0.0	63751.0	0.	0.	0.0	0.0	0.0
11	12.0	175444.3	0.0	44878.9	0.	0.	0.0	0.0	0.0
12	15.4	218850.6	0.0	56504.2	0.	0.	0.0	0.0	0.0
13	14.6	201313.7	0.0	52320.4	0.	0.	0.0	0.0	0.0
14	100.0	1224652.1	0.0	*******	0.	0.	0.0	0.0	0.0
15	8.0	86309.2	0.0	22360.5	0.	0.	0.0	0.0	0.0
16	10.0	106051.7	0.0	27264.8	0.	0.	0.0	0.0	0.0
17	1.0	10531.9	0.0	2909.0	0.	0.	0.0	0.0	0.0
18	10.0	105559.1	0.0	27614.6	0.	0.	0.0	0.0	0.0
19	4.0	45396.8	0.0	10294.5	0.	0.	0.0	0.0	0.0
20	10.0	120641.3	0.0	23857.8	0.	0.	0.0	0.0	0.0
21	15.0	178843.9	0.0	30755.5	0.	0.	0.0	0.0	0.0
22	23.0	266750.3	0.0	35122.8	0.	0.	0.0	0.0	0.0
23	10.0	112529.7	0.0	9795.9	0.	0.	0.0	0.0	0.0
24	7.0	76320.8	0.0	4882.9	0.	0.	0.0	0.0	0.0
25	21.4	213196.9	0.0	6124.5	0.	0.	0.0	0.0	0.0
26	0.6	5089.1	0.0	0.0	0.	0.	0.0	0.0	0.0
27	8.0	70291.1	0.0	0.0	0.	0.	0.0	0.0	0.0
28	10.0	78820.6	0.0	0.0	0.	0.	0.0	0.0	0.0
29	10.1	69260.5	0.0	0.0	0.	0.	0.0	0.0	0.0
30	9.9	57889.6	0.0	0.0	0.	0.	0.0	0.0	0.0
31	13.0	59591.3	0.0	0.0	0.	0.	0.0	0.0	0.0
32	28.3	60801.3	0.0	0.0	0.	0.	0.0	0.0	0.0

33 3.9 915.3 0.0 0.0 0. 0. 0.0 0.0 0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.327	243.068
2	700.000	223.594
3	727.399	230.350
4	860.000	259.636
5	900.000	279.206
6	940.000	301.850
7	962.000	313.787
8	980.000	328.986
9	1000.000	346.165
10	1013.000	358.794
11	1041.284	387.078
12	1045.206	391.000

*** FOS = 1.871 Theta (ki=1.0) = 11.06 ***
Lambda = 0.195

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.327	243.068
2	700.000	223.594
3	727.399	230.350
4	860.000	259.636
5	900.000	279.206
6	940.000	301.850
7	962.000	313.787
8	980.000	328.986
9	1000.000	346.165
10	1013.000	358.794
11	1041.284	387.078
12	1045.206	391.000

*** FOS = 1.871 Theta (ki=1.0) = 11.06 ***
Lambda = 0.195

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.942	243.197
2	700.000	225.772
3	735.268	231.657
4	860.000	261.658
5	900.000	277.712
6	940.000	301.216
7	962.000	313.387
8	980.000	328.195
9	1000.000	344.359
10	1013.000	360.346
11	1041.284	388.631
12	1043.654	391.000

*** FOS = 1.872 Theta (ki=1.0) = 11.01 ***
Lambda = 0.195

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.942	243.197
2	700.000	225.772
3	735.268	231.657
4	860.000	261.658
5	900.000	277.712
6	940.000	301.216
7	962.000	313.387
8	980.000	328.195
9	1000.000	344.359
10	1013.000	360.346
11	1041.284	388.631
12	1043.654	391.000

*** FOS = 1.872 Theta (ki=1.0) = 11.01 ***
Lambda = 0.195

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.942	243.197
2	700.000	225.772
3	735.268	231.657
4	860.000	261.658
5	900.000	277.712
6	940.000	301.216
7	962.000	313.387
8	980.000	328.195
9	1000.000	344.359
10	1013.000	360.346
11	1041.284	388.631
12	1043.654	391.000

*** FOS = 1.872 Theta (ki=1.0) = 11.01 ***
Lambda = 0.195

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.532	243.111
2	700.000	225.987
3	730.022	230.786
4	860.000	260.310
5	900.000	278.708
6	940.000	298.305
7	962.000	315.320
8	980.000	328.722
9	1000.000	342.230
10	1013.000	359.311
11	1041.284	387.595
12	1044.689	391.000

*** FOS = 1.873 Theta (ki=1.0) = 10.97 ***
Lambda = 0.194

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.532	243.111
2	700.000	225.987
3	730.022	230.786
4	860.000	260.310
5	900.000	278.708
6	940.000	298.305
7	962.000	315.320
8	980.000	328.722
9	1000.000	342.230
10	1013.000	359.311
11	1041.284	387.595
12	1044.689	391.000

*** FOS = 1.873 Theta (ki=1.0) = 10.97 ***
Lambda = 0.194

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.532	243.111
2	700.000	225.987
3	730.022	230.786
4	860.000	260.310
5	900.000	278.708
6	940.000	298.305
7	962.000	315.320
8	980.000	328.722
9	1000.000	342.230
10	1013.000	359.311
11	1041.284	387.595
12	1044.689	391.000

*** FOS = 1.873 Theta (ki=1.0) = 10.97 ***
Lambda = 0.194

Failure Surface Specified By 12 Coordinate Points

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

1	390.737	243.154
2	700.000	223.380
3	732.645	231.221
4	860.000	260.984
5	900.000	278.210
6	940.000	299.760
7	962.000	311.854
8	980.000	328.459
9	1000.000	343.294
10	1013.000	359.829
11	1041.284	388.113
12	1044.171	391.000

*** FOS = 1.875 Theta (ki=1.0) = 11.07 ***
Lambda = 0.196
**** END OF GSTABL7 OUTPUT ****

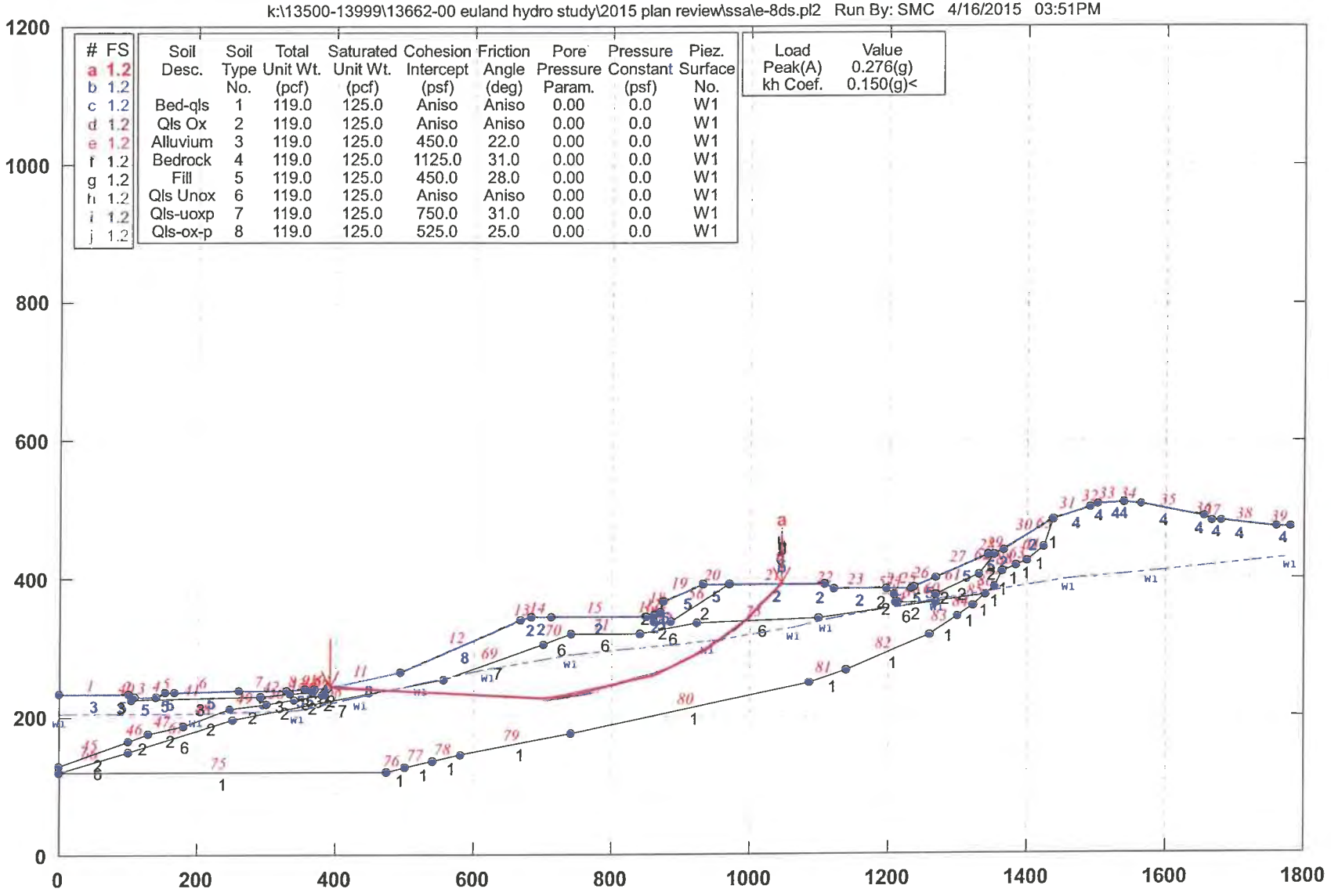
13662-00, Euland, Section E-E', Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8ds.pl2 Run By: SMC 4/16/2015 03:51PM

#	FS
a	1.2
b	1.2
c	1.2
d	1.2
e	1.2
f	1.2
g	1.2
h	1.2
i	1.2
j	1.2

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls-uoxp	7	119.0	125.0	750.0	31.0	0.00	0.0	W1
Qls-ox-p	8	119.0	125.0	525.0	25.0	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.2

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-30.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

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: 4/16/2015
Time of Run: 03:51PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8ds.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8ds.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8ds.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
39 Top Boundaries
88 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	8
12	495.00	265.00	667.00	340.00	8
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	7
69	557.00	254.00	700.00	304.00	7
70	700.00	304.00	742.00	320.00	6
71	742.00	320.00	842.00	320.00	6
72	842.00	320.00	923.00	335.00	6
73	923.00	335.00	1100.00	342.00	6
74	1100.00	342.00	1340.00	376.00	6
75	0.00	120.00	474.00	120.00	1
76	474.00	120.00	500.00	126.00	1
77	500.00	126.00	540.00	136.00	1
78	540.00	136.00	580.00	145.00	1
79	580.00	145.00	740.00	176.00	1
80	740.00	176.00	1085.00	249.00	1
81	1085.00	249.00	1140.00	266.00	1
82	1140.00	266.00	1260.00	318.00	1
83	1260.00	318.00	1300.00	344.00	1
84	1300.00	344.00	1322.00	360.00	1
85	1322.00	360.00	1340.00	376.00	1
86	1340.00	376.00	1352.00	388.00	1
87	1352.00	388.00	1365.00	410.00	1
88	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1
7	119.0	125.0	750.0	31.0	0.00	0.0	1
8	119.0	125.0	525.0	25.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction	Counterclockwise	Cohesion	Friction

Range No.	Direction Limit (deg)	Intercept (psf)	Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
10 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	390.00	243.00	495.00	265.00	0.00
2	700.00	224.00	700.00	224.00	5.00
3	701.00	224.00	780.00	238.00	5.00
4	860.00	262.00	860.00	262.00	5.00
5	900.00	280.00	900.00	280.00	5.00
6	940.00	300.00	940.00	300.00	5.00

7	962.00	314.00	962.00	314.00	5.00
8	980.00	328.00	980.00	328.00	5.00
9	1000.00	344.00	1000.00	344.00	5.00
10	1013.00	360.00	1013.00	360.00	5.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	397.61	244.59
2	700.00	226.03
3	702.02	222.31
4	860.00	263.56
5	900.00	281.53
6	940.00	301.01
7	962.00	315.72
8	980.00	327.13
9	1000.00	346.45
10	1013.00	359.67
11	1041.28	387.95
12	1044.33	391.00

Factor Of Safety For The Preceding Specified Surface = 1.106
Theta (ki = 1.0) = 8.31 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	480.97	262.06
2	700.00	226.11
3	701.79	222.86
4	860.00	262.47
5	900.00	279.07
6	940.00	299.99
7	962.00	316.46
8	980.00	327.44
9	1000.00	341.65
10	1013.00	357.56
11	1041.28	385.85
12	1046.44	391.00

Factor Of Safety For The Preceding Specified Surface = 1.136
Theta (ki = 1.0) = 7.50 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	459.34	257.53
2	700.00	226.20
3	701.55	223.41
4	860.00	261.38
5	900.00	281.61
6	940.00	298.98
7	962.00	312.21
8	980.00	327.76
9	1000.00	341.85
10	1013.00	360.46
11	1041.28	388.74
12	1043.54	391.00

Factor Of Safety For The Preceding Specified Surface = 1.140
Theta (ki = 1.0) = 7.87 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	416.06	248.46
2	700.00	226.36
3	701.09	224.51
4	860.00	264.20

5	900.00	281.70
6	940.00	301.96
7	962.00	313.70
8	980.00	328.40
9	1000.00	342.25
10	1013.00	361.25
11	1041.28	389.53
12	1042.75	391.00

Factor Of Safety For The Preceding Specified Surface = 1.150
Theta (ki = 1.0) = 8.67 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	437.70	252.99
2	700.00	226.28
3	701.32	223.96
4	860.00	260.29
5	900.00	279.16
6	940.00	297.97
7	962.00	312.96
8	980.00	328.08
9	1000.00	342.05
10	1013.00	358.35
11	1041.28	386.64
12	1045.65	391.00

Factor Of Safety For The Preceding Specified Surface = 1.141
Theta (ki = 1.0) = 8.22 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	419.24	249.13
2	700.00	225.95
3	702.25	221.76
4	860.00	259.65
5	900.00	278.98
6	940.00	302.02
7	962.00	314.97
8	980.00	326.81
9	1000.00	346.25
10	1013.00	361.77
11	1041.28	390.06
12	1042.23	391.00

Factor Of Safety For The Preceding Specified Surface = 1.094
Theta (ki = 1.0) = 7.89 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	397.61	244.59
2	700.00	226.03
3	702.02	222.31
4	860.00	263.56
5	900.00	281.53
6	940.00	301.01
7	962.00	315.72
8	980.00	327.13
9	1000.00	346.45
10	1013.00	359.67
11	1041.28	387.95
12	1044.33	391.00

Factor Of Safety For The Preceding Specified Surface = 1.106
Theta (ki = 1.0) = 8.31 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	480.97	262.06
2	700.00	226.11
3	701.79	222.86
4	860.00	262.47
5	900.00	279.07
6	940.00	299.99
7	962.00	316.46
8	980.00	327.44
9	1000.00	341.65
10	1013.00	357.56
11	1041.28	385.85
12	1046.44	391.00

Factor Of Safety For The Preceding Specified Surface = 1.136
Theta (ki = 1.0) = 7.50 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	459.34	257.53
2	700.00	226.20
3	701.55	223.41
4	860.00	261.38
5	900.00	281.61
6	940.00	298.98
7	962.00	312.21
8	980.00	327.76
9	1000.00	341.85
10	1013.00	360.46
11	1041.28	388.74
12	1043.54	391.00

Factor Of Safety For The Preceding Specified Surface = 1.140
Theta (ki = 1.0) = 7.87 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	416.06	248.46
2	700.00	226.36
3	701.09	224.51
4	860.00	264.20
5	900.00	281.70
6	940.00	301.96
7	962.00	313.70
8	980.00	328.40
9	1000.00	342.25
10	1013.00	361.25
11	1041.28	389.53
12	1042.75	391.00

Factor Of Safety For The Preceding Specified Surface = 1.150
Theta (ki = 1.0) = 8.67 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	437.70	252.99
2	700.00	226.28
3	701.32	223.96
4	860.00	260.29
5	900.00	279.16
6	940.00	297.97
7	962.00	312.96
8	980.00	328.08
9	1000.00	342.05
10	1013.00	358.35
11	1041.28	386.64

12	1045.65	391.00

Factor Of Safety For The Preceding Specified Surface = 1.141
Theta (ki = 1.0) = 8.22 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	419.24	249.13
2	700.00	225.95
3	702.25	221.76
4	860.00	259.65
5	900.00	278.98
6	940.00	302.02
7	962.00	314.97
8	980.00	326.81
9	1000.00	346.25
10	1013.00	361.77
11	1041.28	390.06
12	1042.23	391.00

Factor Of Safety For The Preceding Specified Surface = 1.094
Theta (ki = 1.0) = 7.89 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	397.61	244.59
2	700.00	226.03
3	702.02	222.31
4	860.00	263.56
5	900.00	281.53
6	940.00	301.01
7	962.00	315.72
8	980.00	327.13
9	1000.00	346.45
10	1013.00	359.67
11	1041.28	387.95
12	1044.33	391.00

Factor Of Safety For The Preceding Specified Surface = 1.106
Theta (ki = 1.0) = 8.31 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	480.97	262.06
2	700.00	226.11
3	701.79	222.86
4	860.00	262.47
5	900.00	279.07
6	940.00	299.99
7	962.00	316.46
8	980.00	327.44
9	1000.00	341.65
10	1013.00	357.56
11	1041.28	385.85
12	1046.44	391.00

Factor Of Safety For The Preceding Specified Surface = 1.136
Theta (ki = 1.0) = 7.50 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	459.34	257.53
2	700.00	226.20
3	701.55	223.41
4	860.00	261.38
5	900.00	281.61

6	940.00	298.98
7	962.00	312.21
8	980.00	327.76
9	1000.00	341.85
10	1013.00	360.46

##################### SOME LINES SKIPPED ####################

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces with Misleading FS = 17
Number of Trial Surfaces With Valid FS = 2983
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.6 %
Statistical Data On All Valid FS Values:
FS Max = 1.435 FS Min = 1.231 FS Ave = 1.298
Standard Deviation = 0.042 Coefficient of Variation = 3.26 %
((Simplified Janbu FS for Critical Surface = 1.227))
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.532	243.111
2	700.000	225.987
3	730.022	230.786
4	860.000	260.310
5	900.000	278.708
6	940.000	298.305
7	962.000	315.320
8	980.000	328.722
9	1000.000	342.230
10	1013.000	359.311
11	1041.284	387.595
12	1044.689	391.000

*** FOS = 1.231 Theta (ki=1.0) = 9.61 ***
Lambda = 0.169
Individual data on the 33 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	82.6	107563.5	0.0	0.0	0.	0.	16134.5	0.0	0.0
2	3.1	8113.4	0.0	81.2	0.	0.	1217.0	0.0	0.0
3	18.8	56709.8	0.0	4067.7	0.	0.	8506.5	0.0	0.0
4	28.0	116790.9	0.0	17444.4	0.	0.	17518.6	0.0	0.0
5	34.0	205140.2	0.0	38791.9	0.	0.	30771.0	0.0	0.0
6	20.2	154625.3	0.0	31724.2	0.	0.	23193.8	0.0	0.0
7	43.8	419680.2	0.0	91121.6	0.	0.	62952.0	0.0	0.0
8	46.0	564422.8	0.0	*******	0.	0.	84663.4	0.0	0.0
9	15.0	210025.5	0.0	47584.9	0.	0.	31503.8	0.0	0.0
10	18.0	259729.2	0.0	61142.4	0.	0.	38959.4	0.0	0.0
11	12.0	172637.8	0.0	42726.1	0.	0.	25895.7	0.0	0.0
12	18.0	254139.9	0.0	64260.4	0.	0.	38121.0	0.0	0.0
13	12.0	164888.2	0.0	43003.7	0.	0.	24733.2	0.0	0.0
14	100.0	1221576.8	0.0	*******	0.	0.	*******	0.0	0.0
15	8.0	85723.6	0.0	22092.2	0.	0.	12858.5	0.0	0.0
16	10.0	105248.9	0.0	26892.5	0.	0.	15787.3	0.0	0.0
17	1.0	10449.5	0.0	2831.2	0.	0.	1567.4	0.0	0.0
18	10.0	104936.7	0.0	26962.6	0.	0.	15740.5	0.0	0.0
19	4.0	45250.3	0.0	10098.3	0.	0.	6787.5	0.0	0.0
20	10.0	120531.5	0.0	23528.6	0.	0.	18079.7	0.0	0.0
21	15.0	179365.6	0.0	30693.8	0.	0.	26904.8	0.0	0.0
22	23.0	270699.7	0.0	36221.1	0.	0.	40605.0	0.0	0.0
23	10.0	115817.5	0.0	11311.8	0.	0.	17372.6	0.0	0.0

24	7.0	79188.6	0.0	6318.4	0.	0.	11878.3	0.0	0.0
25	19.1	194987.2	0.0	8717.7	0.	0.	29248.1	0.0	0.0
26	2.9	26077.6	0.0	0.0	0.	0.	3911.6	0.0	0.0
27	8.0	69211.7	0.0	0.0	0.	0.	10381.8	0.0	0.0
28	10.0	78540.5	0.0	0.0	0.	0.	11781.1	0.0	0.0
29	13.4	92211.3	0.0	0.0	0.	0.	13831.7	0.0	0.0
30	6.6	39935.8	0.0	0.0	0.	0.	5990.4	0.0	0.0
31	13.0	62235.1	0.0	0.0	0.	0.	9335.3	0.0	0.0
32	28.3	59059.2	0.0	0.0	0.	0.	8858.9	0.0	0.0
33	3.4	689.7	0.0	0.0	0.	0.	103.4	0.0	0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.532	243.111
2	700.000	225.987
3	730.022	230.786
4	860.000	260.310
5	900.000	278.708
6	940.000	298.305
7	962.000	315.320
8	980.000	328.722
9	1000.000	342.230
10	1013.000	359.311
11	1041.284	387.595
12	1044.689	391.000

*** FOS = 1.231 Theta (ki=1.0) = 9.61 ***
Lambda = 0.169

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.532	243.111
2	700.000	225.987
3	730.022	230.786
4	860.000	260.310
5	900.000	278.708
6	940.000	298.305
7	962.000	315.320
8	980.000	328.722
9	1000.000	342.230
10	1013.000	359.311
11	1041.284	387.595
12	1044.689	391.000

*** FOS = 1.231 Theta (ki=1.0) = 9.61 ***
Lambda = 0.169

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.942	243.197
2	700.000	225.772
3	735.268	231.657
4	860.000	261.658
5	900.000	277.712
6	940.000	301.216
7	962.000	313.387
8	980.000	328.195
9	1000.000	344.359
10	1013.000	360.346
11	1041.284	388.631
12	1043.654	391.000

*** FOS = 1.232 Theta (ki=1.0) = 9.66 ***
Lambda = 0.170

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.942	243.197
2	700.000	225.772
3	735.268	231.657
4	860.000	261.658
5	900.000	277.712
6	940.000	301.216

7	962.000	313.387
8	980.000	328.195
9	1000.000	344.359
10	1013.000	360.346
11	1041.284	388.631
12	1043.654	391.000

*** FOS = 1.232 Theta (ki=1.0) = 9.66 ***
Lambda = 0.170
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.942	243.197
2	700.000	225.772
3	735.268	231.657
4	860.000	261.658
5	900.000	277.712
6	940.000	301.216
7	962.000	313.387
8	980.000	328.195
9	1000.000	344.359
10	1013.000	360.346
11	1041.284	388.631
12	1043.654	391.000

*** FOS = 1.232 Theta (ki=1.0) = 9.66 ***
Lambda = 0.170
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	394.941	244.035
2	700.000	224.927
3	746.918	230.650
4	860.000	259.798
5	900.000	278.000
6	940.000	302.090
7	962.000	315.784
8	980.000	325.553
9	1000.000	342.615
10	1013.000	357.939
11	1041.284	386.223
12	1046.061	391.000

*** FOS = 1.232 Theta (ki=1.0) = 9.50 ***
Lambda = 0.167
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	394.941	244.035
2	700.000	224.927
3	746.918	230.650
4	860.000	259.798
5	900.000	278.000
6	940.000	302.090
7	962.000	315.784
8	980.000	325.553
9	1000.000	342.615
10	1013.000	357.939
11	1041.284	386.223
12	1046.061	391.000

*** FOS = 1.232 Theta (ki=1.0) = 9.50 ***
Lambda = 0.167
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	394.941	244.035
2	700.000	224.927
3	746.918	230.650
4	860.000	259.798
5	900.000	278.000
6	940.000	302.090
7	962.000	315.784
8	980.000	325.553

9	1000.000	342.615
10	1013.000	357.939
11	1041.284	386.223
12	1046.061	391.000

*** FOS = 1.232 Theta (ki=1.0) = 9.50 ***
Lambda = 0.167

Failure Surface Specified By 12 Coordinate Points

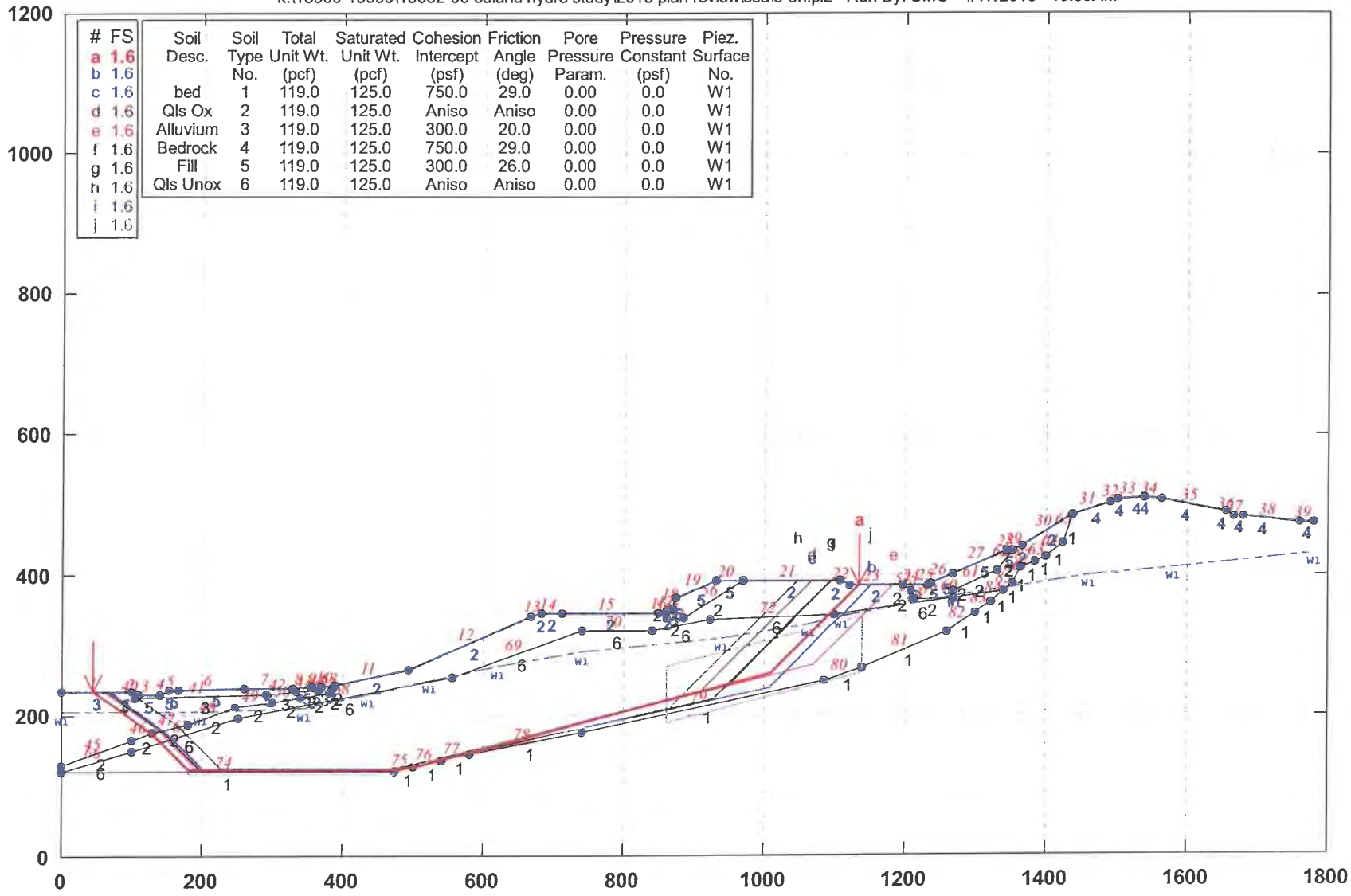
Point No.	X-Surf (ft)	Y-Surf (ft)
1	392.173	243.455
2	700.000	225.128
3	751.007	234.270
4	860.000	260.701
5	900.000	279.724
6	940.000	299.946
7	962.000	312.586
8	980.000	326.613
9	1000.000	345.745
10	1013.000	358.452
11	1041.284	386.736
12	1045.548	391.000

*** FOS = 1.233 Theta (ki=1.0) = 9.65 ***
Lambda = 0.170

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

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8h.pl2 Run By: SMC 4/17/2015 10:39AM



#	FS
a	1.6
b	1.6
c	1.6
d	1.6
e	1.6
f	1.6
g	1.6
h	1.6
i	1.6
j	1.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
bed	1	119.0	125.0	750.0	29.0	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

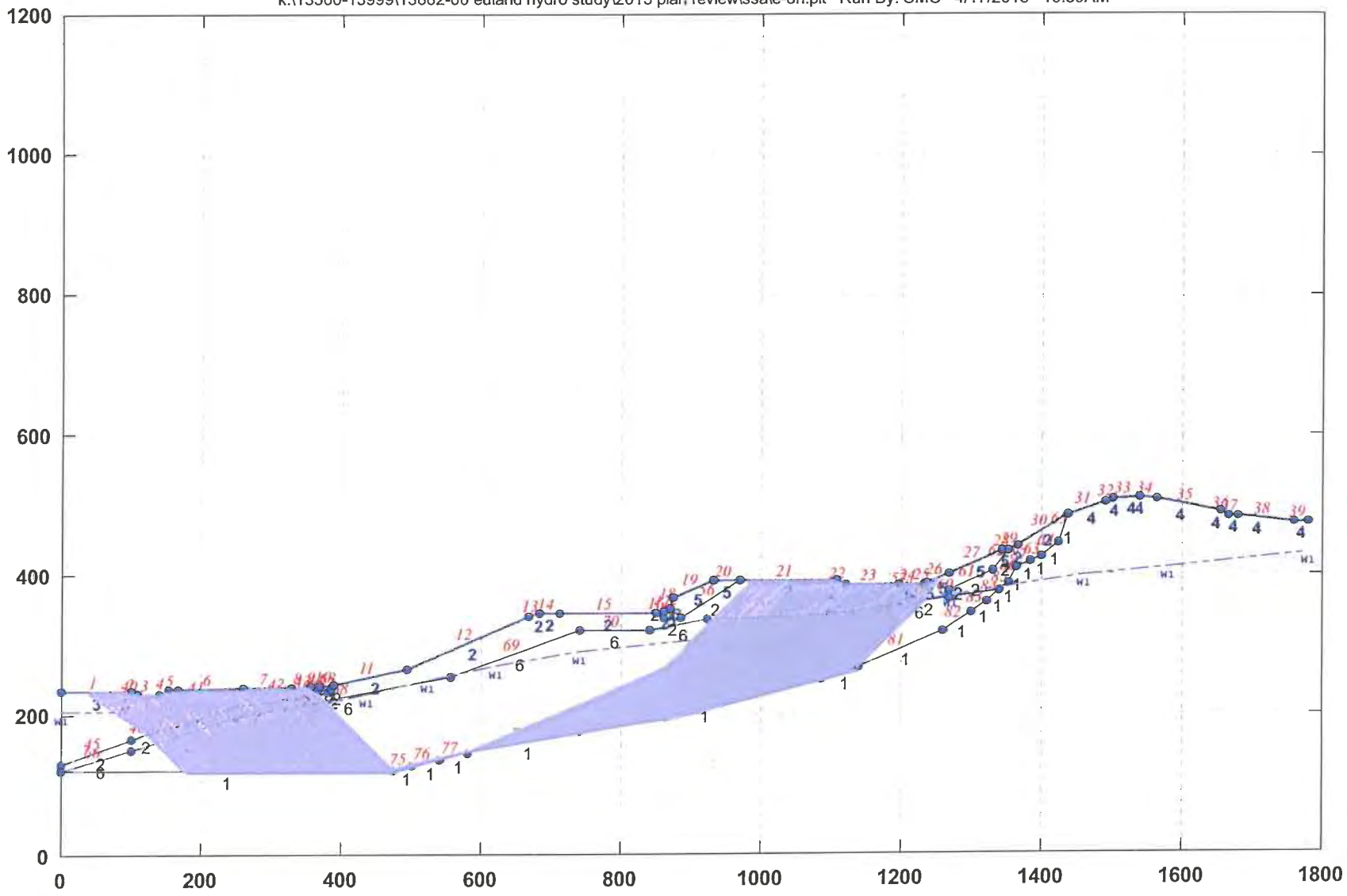
GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-31.1

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8h.plt Run By: SMC 4/17/2015 10:39AM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/17/2015
Time of Run: 10:39AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8h.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8h.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8h.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

2 soil type(s)

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00

2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
5 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	10.00
2	475.00	120.00	475.00	120.00	10.00
3	500.00	128.00	540.00	138.00	5.00
4	580.00	147.00	580.00	147.00	5.00
5	860.00	230.00	1140.00	300.00	80.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.913	2.055	0.176
15.00	1.610	2.557	0.268
8.82	1.897	1.960	0.155
6.18	1.785	1.766	0.108
6.14	1.784	1.763	0.108
10.05	1.913	2.059	0.177
6.78	1.818	1.808	0.119
5.97	1.773	1.751	0.105
7.90	1.868	1.889	0.139
6.64	1.811	1.798	0.116
6.84	1.821	1.812	0.120

7.42	1.848	1.854	0.130
7.11	1.834	1.831	0.125
7.13	1.835	1.833	0.125
0.00	-0.200	-0.041	0.000
7.01	1.829	1.825	0.123
6.74	1.816	1.805	0.118
7.41	1.848	1.853	0.130
7.11	1.834	1.831	0.125
7.14	1.835	1.833	0.125

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	352.13	239.89
2	360.62	234.58
3	368.58	229.00
4	378.18	219.41
5	387.91	209.68
6	430.34	167.25
7	472.76	124.82
8	475.00	118.74
9	538.39	135.63
10	580.00	144.61
11	1096.71	306.36
12	1137.69	347.34
13	1174.35	384.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.582	1.636	0.176
15.00	1.781	2.114	0.268
8.69	1.508	1.539	0.153
5.72	1.343	1.350	0.100
3.63	1.235	1.236	0.063
2.23	1.168	1.168	0.039
1.82	1.149	1.149	0.032
2.48	1.180	1.179	0.043
7.77	1.457	1.477	0.137
2.55	1.183	1.183	0.045
0.75	1.102	1.101	0.013
1.97	1.157	1.156	0.034
2.95	1.202	1.203	0.052
2.34	1.173	1.173	0.041
2.04	1.159	1.159	0.036
2.23	1.168	1.168	0.039
2.32	1.172	1.172	0.041
2.27	1.170	1.170	0.040
2.26	1.169	1.169	0.039
2.25	1.169	1.169	0.039

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	350.82	239.83
2	359.35	234.51
3	367.48	228.81
4	377.09	219.20
5	386.90	209.39
6	429.33	166.96
7	471.76	124.54
8	475.00	117.87
9	526.06	133.85
10	580.00	145.93
11	960.13	286.16
12	1002.56	328.59
13	1012.51	338.54
14	1054.94	380.97
15	1064.97	391.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.80	239.87
2	360.30	234.56
3	368.31	228.95
4	377.91	219.36
5	388.77	208.49
6	431.20	166.07
7	473.62	123.64
8	475.00	120.92
9	520.38	133.58
10	580.00	145.62
11	1053.78	283.67
12	1096.21	326.10
13	1114.10	344.00
14	1154.11	384.00

Factor Of Safety For The Preceding Specified Surface = 2.403
Theta (ki = 1.0) = 9.39 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.913	2.055	0.176
15.00	1.610	2.557	0.268
8.82	1.897	1.960	0.155
6.18	1.785	1.766	0.108
6.14	1.784	1.763	0.108
10.05	1.913	2.059	0.177
6.78	1.818	1.808	0.119
5.97	1.773	1.751	0.105
7.90	1.868	1.889	0.139
6.64	1.811	1.798	0.116
6.84	1.821	1.812	0.120
7.43	1.848	1.854	0.130
7.11	1.834	1.831	0.125
7.13	1.835	1.833	0.125
0.66	1.435	1.416	0.011
10.30	1.912	2.080	0.182
1.98	1.519	1.494	0.035
0.65	1.435	1.416	0.011
0.00	1.395	1.379	0.000
0.00	1.395	1.379	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	352.13	239.89
2	360.62	234.58
3	368.58	229.00
4	378.18	219.41
5	387.91	209.68
6	430.34	167.25
7	472.76	124.82
8	475.00	118.74
9	538.39	135.63
10	580.00	144.61
11	1096.71	306.36
12	1137.69	347.34
13	1174.35	384.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces

(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 3
Number of Trial Surfaces with Misleading FS = 1
Number of Trial Surfaces With Valid FS = 2996
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.1 %
Statistical Data On All Valid FS Values:
FS Max = 2.817 FS Min = 1.573 FS Ave = 1.988
Standard Deviation = 0.207 Coefficient of Variation = 10.43 %
((Simplified Janbu FS for Critical Surface = 1.411))
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.876	233.000
2	79.347	208.863
3	128.496	174.449
4	140.851	162.094
5	180.484	122.460
6	475.000	123.100
7	502.371	126.537
8	580.000	146.631
9	1010.852	260.989
10	1053.278	303.416
11	1091.528	341.665
12	1133.863	384.000

*** FOS = 1.573 Theta (ki=1.0) = 6.45 ***
Lambda = 0.113
Individual data on the 66 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	34.5	49505.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	6.3	19842.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	14.3	57683.8	0.0	5512.6	0.	0.	0.0	0.0	0.0
4	5.0	23917.2	0.0	4519.6	0.	0.	0.0	0.0	0.0
5	5.0	25213.6	0.0	5862.7	0.	0.	0.0	0.0	0.0
6	18.5	110645.9	0.0	33361.3	0.	0.	0.0	0.0	0.0
7	1.5	10354.8	0.0	4108.0	0.	0.	0.0	0.0	0.0
8	10.0	76049.9	0.0	32418.9	0.	0.	0.0	0.0	0.0
9	0.9	7064.3	0.0	3167.7	0.	0.	0.0	0.0	0.0
10	12.1	114360.1	0.0	52236.2	0.	0.	0.0	0.0	0.0
11	13.0	146421.9	0.0	70392.8	0.	0.	0.0	0.0	0.0
12	14.0	181564.0	0.0	92570.3	0.	0.	0.0	0.0	0.0
13	0.5	6731.0	0.0	3514.8	0.	0.	0.0	0.0	0.0
14	17.5	244230.2	0.0	90143.1	0.	0.	0.0	0.0	0.0
15	34.1	477815.8	0.0	*******	0.	0.	0.0	0.0	0.0
16	15.9	223436.7	0.0	83050.2	0.	0.	0.0	0.0	0.0
17	4.0	56366.4	0.0	20993.6	0.	0.	0.0	0.0	0.0
18	8.0	112851.0	0.0	42082.5	0.	0.	0.0	0.0	0.0
19	32.0	453425.7	0.0	*******	0.	0.	0.0	0.0	0.0
20	8.0	113889.6	0.0	42718.0	0.	0.	0.0	0.0	0.0
21	26.2	375120.0	0.0	*******	0.	0.	0.0	0.0	0.0
22	3.8	53865.5	0.0	20292.8	0.	0.	0.0	0.0	0.0
23	3.0	43069.6	0.0	16230.7	0.	0.	0.0	0.0	0.0
24	7.0	100660.0	0.0	37941.2	0.	0.	0.0	0.0	0.0
25	5.0	72040.8	0.0	27160.4	0.	0.	0.0	0.0	0.0
26	10.0	144370.3	0.0	53811.9	0.	0.	0.0	0.0	0.0
27	13.0	188142.8	0.0	71938.7	0.	0.	0.0	0.0	0.0
28	2.0	28960.3	0.0	11266.5	0.	0.	0.0	0.0	0.0
29	10.0	145755.1	0.0	57128.4	0.	0.	0.0	0.0	0.0
30	5.0	73585.1	0.0	29061.7	0.	0.	0.0	0.0	0.0
31	5.0	74056.7	0.0	29393.3	0.	0.	0.0	0.0	0.0
32	46.0	710947.2	0.0	*******	0.	0.	0.0	0.0	0.0
33	16.3	264827.7	0.0	*******	0.	0.	0.0	0.0	0.0

34	22.7	380936.2	0.0	*******	0.	0.	0.0	0.0	0.0
35	20.0	343424.0	0.0	*******	0.	0.	0.0	0.0	0.0
36	6.9	120472.3	0.0	50203.5	0.	0.	0.0	0.0	0.0
37	0.4	7891.4	0.0	3273.2	0.	0.	0.0	0.0	0.0
38	6.3	111435.0	0.0	47144.6	0.	0.	0.0	0.0	0.0
39	14.3	255145.1	0.0	*******	0.	0.	0.0	0.0	0.0
40	34.0	623633.4	0.0	*******	0.	0.	0.0	0.0	0.0
41	19.2	363700.9	0.0	*******	0.	0.	0.0	0.0	0.0
42	3.8	71779.7	0.0	27276.6	0.	0.	0.0	0.0	0.0
43	41.0	802844.3	0.0	*******	0.	0.	0.0	0.0	0.0
44	46.0	940621.2	0.0	*******	0.	0.	0.0	0.0	0.0
45	15.0	314367.2	0.0	*******	0.	0.	0.0	0.0	0.0
46	30.0	615939.1	0.0	*******	0.	0.	0.0	0.0	0.0
47	30.0	586978.6	0.0	*******	0.	0.	0.0	0.0	0.0
48	100.0	1745990.2	0.0	*******	0.	0.	0.0	0.0	0.0
49	8.0	125610.3	0.0	42791.2	0.	0.	0.0	0.0	0.0
50	10.0	154676.9	0.0	52538.5	0.	0.	0.0	0.0	0.0
51	1.0	15380.5	0.0	5195.8	0.	0.	0.0	0.0	0.0
52	10.0	155584.1	0.0	51376.8	0.	0.	0.0	0.0	0.0
53	4.0	66189.9	0.0	20255.0	0.	0.	0.0	0.0	0.0
54	10.0	174582.2	0.0	49898.2	0.	0.	0.0	0.0	0.0
55	38.0	678619.6	0.0	*******	0.	0.	0.0	0.0	0.0
56	10.0	182585.9	0.0	44828.9	0.	0.	0.0	0.0	0.0
57	7.0	127595.9	0.0	30751.9	0.	0.	0.0	0.0	0.0
58	30.0	528836.9	0.0	*******	0.	0.	0.0	0.0	0.0
59	40.9	673543.2	0.0	*******	0.	0.	0.0	0.0	0.0
60	42.4	560036.9	0.0	*******	0.	0.	0.0	0.0	0.0
61	9.7	96905.2	0.0	17727.2	0.	0.	0.0	0.0	0.0
62	21.4	172232.0	0.0	15592.3	0.	0.	0.0	0.0	0.0
63	7.1	44732.4	0.0	0.0	0.	0.	0.0	0.0	0.0
64	15.5	76592.5	0.0	0.0	0.	0.	0.0	0.0	0.0
65	15.0	40809.9	0.0	0.0	0.	0.	0.0	0.0	0.0
66	11.9	8372.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.050	233.000
2	96.403	213.147
3	145.552	178.733
4	157.316	166.969
5	199.290	124.995
6	475.000	122.314
7	515.867	132.701
8	580.000	146.199
9	1006.887	239.022
10	1049.314	281.448
11	1091.740	323.874
12	1111.494	343.628
13	1151.866	384.000

*** FOS = 1.574 Theta (ki=1.0) = 6.39 ***
Lambda = 0.112

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.675	233.000
2	80.528	209.296
3	129.677	174.881
4	142.096	162.463
5	180.628	123.930
6	475.000	121.796
7	532.703	135.362
8	580.000	149.299
9	910.364	233.875
10	952.790	276.302
11	995.217	318.728
12	1015.132	338.644
13	1057.559	381.070
14	1067.489	391.000

*** FOS = 1.578 Theta (ki=1.0) = 6.66 ***
Lambda = 0.117

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.675	233.000
2	80.528	209.296
3	129.677	174.881
4	142.096	162.463
5	180.628	123.930
6	475.000	121.796
7	532.703	135.362
8	580.000	149.299
9	910.364	233.875
10	952.790	276.302
11	995.217	318.728
12	1015.132	338.644
13	1057.559	381.070
14	1067.489	391.000

*** FOS = 1.578 Theta (ki=1.0) = 6.66 ***
Lambda = 0.117

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.996	233.000
2	90.405	211.708
3	139.554	177.293
4	151.578	165.270
5	192.400	124.448
6	475.000	124.892
7	539.929	139.068
8	580.000	148.113
9	1070.325	270.506
10	1112.751	312.932
11	1148.721	348.902
12	1183.819	384.000

*** FOS = 1.582 Theta (ki=1.0) = 6.31 ***
Lambda = 0.111

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.942	228.292
2	108.079	225.082
3	117.793	218.281
4	166.942	183.866
5	177.781	173.027
6	184.139	166.669
7	226.566	124.243
8	475.000	124.609
9	518.953	134.581
10	580.000	148.206
11	954.114	247.313
12	996.540	289.739
13	1038.967	332.165
14	1046.693	339.892
15	1089.119	382.318
16	1097.801	391.000

*** FOS = 1.583 Theta (ki=1.0) = 6.95 ***
Lambda = 0.122

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	64.556	233.000
2	93.801	212.523
3	142.950	178.108
4	154.827	166.232
5	156.577	164.481
6	199.003	122.055
7	475.000	124.921
8	535.203	135.050
9	580.000	145.862
10	927.864	223.250

11	970.290	265.677
12	1012.717	308.103
13	1044.415	339.802
14	1086.842	382.228
15	1095.614	391.000

*** FOS = 1.584 Theta (ki=1.0) = 6.74 ***
Lambda = 0.118

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.318	233.000
2	80.293	209.210
3	129.442	174.796
4	141.848	162.389
5	181.489	122.748
6	475.000	123.974
7	514.695	133.316
8	580.000	145.310
9	867.434	211.190
10	909.860	253.616
11	952.287	296.042
12	994.055	337.810
13	1036.481	380.236
14	1047.245	391.000

*** FOS = 1.588 Theta (ki=1.0) = 6.84 ***
Lambda = 0.120

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.210	233.000
2	98.756	213.712
3	147.905	179.297
4	159.568	167.635
5	162.462	164.740
6	204.889	122.314
7	475.000	121.469
8	538.816	136.903
9	580.000	145.269
10	1007.844	241.566
11	1050.271	283.992
12	1092.697	326.418
13	1109.645	343.366
14	1150.279	384.000

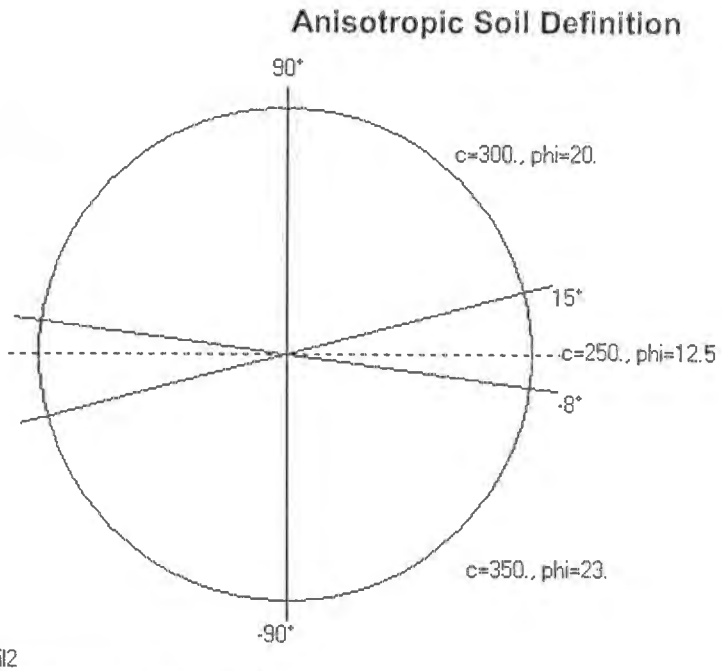
*** FOS = 1.593 Theta (ki=1.0) = 6.45 ***
Lambda = 0.113

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.210	233.000
2	98.756	213.712
3	147.905	179.297
4	159.568	167.635
5	162.462	164.740
6	204.889	122.314
7	475.000	121.469
8	538.816	136.903
9	580.000	145.269
10	1007.844	241.566
11	1050.271	283.992
12	1092.697	326.418
13	1109.645	343.366
14	1150.279	384.000

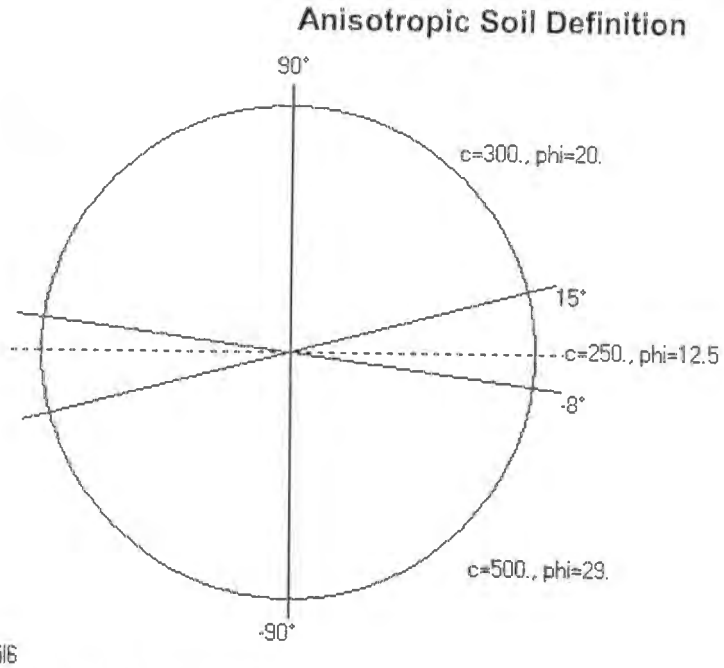
*** FOS = 1.594 Theta (ki=1.0) = 6.46 ***
Lambda = 0.113

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



Soil2

13662-00, Euland, Section E-E',

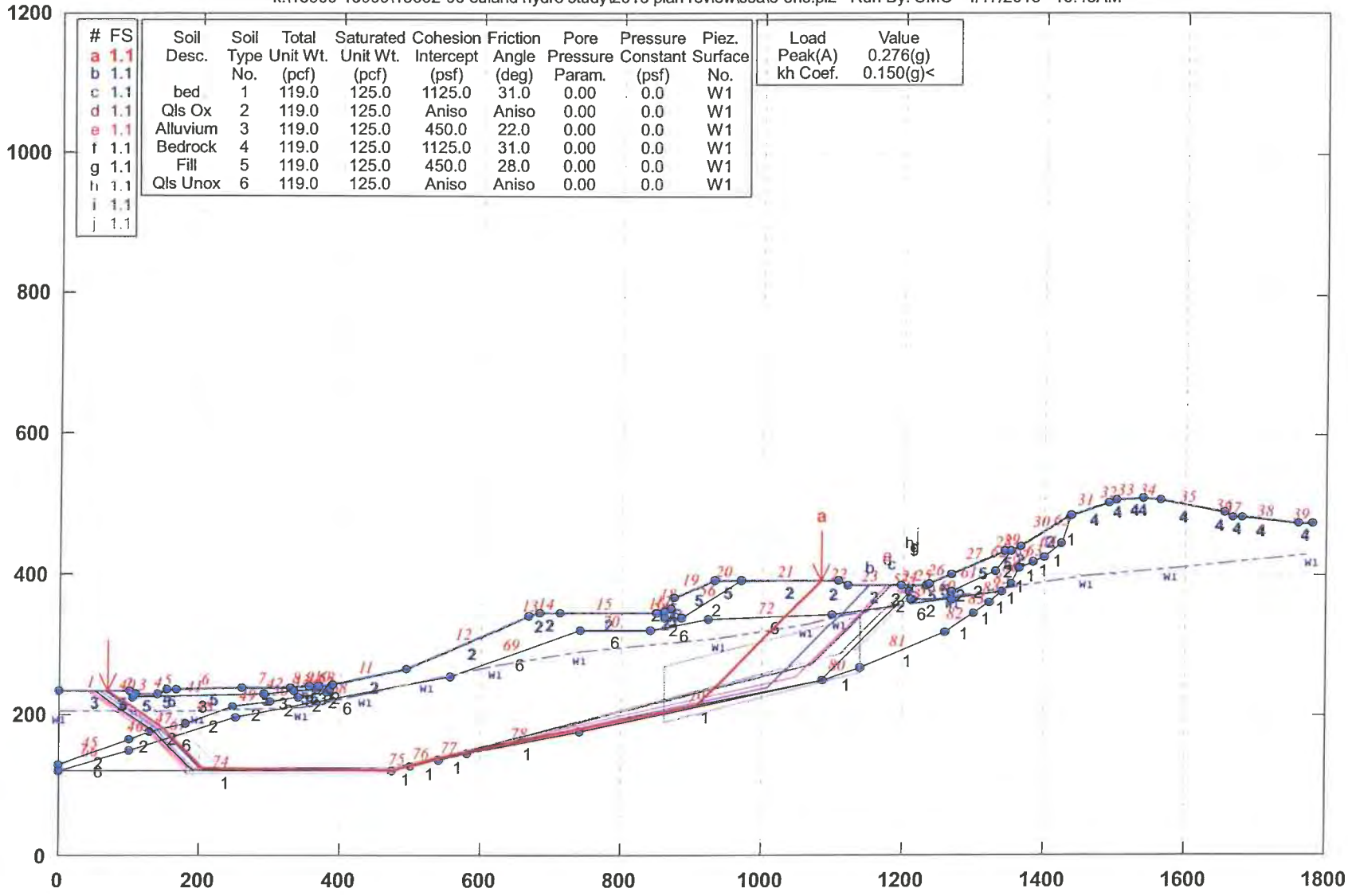


Soil6

13662-00, Euland, Section E-E',

13662-00, Euland, Section E-E', Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8hs.pl2 Run By: SMC 4/17/2015 10:43AM



#	FS
a	1.1
b	1.1
c	1.1
d	1.1
e	1.1
f	1.1
g	1.1
h	1.1
i	1.1
j	1.1

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
bed	1	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.1

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-31.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/17/2015
Time of Run: 10:43AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8hs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8hs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8hs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

2 soil type(s)

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00

2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
5 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	10.00
2	475.00	120.00	475.00	120.00	10.00
3	500.00	128.00	540.00	138.00	5.00
4	580.00	147.00	580.00	147.00	5.00
5	860.00	230.00	1140.00	300.00	80.00

The Factor Of Safety For The Trial Failure Surface Defined By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	346.27	239.65
2	355.23	234.27
3	364.18	228.23
4	373.84	218.57
5	383.89	208.52
6	426.32	166.10
7	468.74	123.67

8	475.00	115.25
9	529.09	133.51
10	580.00	144.89
11	1110.38	285.56
12	1152.81	327.99
13	1177.85	353.03
14	1203.76	378.93
15	1206.80	384.00

Factor Of Safety For The Preceding Specified Surface = 1.248
Theta (ki = 1.0) = 11.25 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	-4.175	1.373	0.132
11.25	-4.560	1.518	0.199
0.00	-31.018	0.002	0.000
18.66	-31.018	1.966	0.338
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000
0.00	-31.018	0.009	0.000

The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.50	230.00
2	138.34	225.89
3	140.61	224.36
4	190.35	190.81
5	201.20	179.96
6	218.73	162.43
7	261.16	120.00
8	261.31	119.92
9	475.00	119.11
10	539.30	135.40
11	580.00	148.97
12	995.95	255.66
13	1038.38	298.09
14	1080.80	340.52
15	1081.56	341.27
16	1123.98	383.70
17	1124.29	384.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	-5.012	1.436	0.132
11.25	-5.560	1.596	0.199
0.00	-39.708	0.001	0.000
18.30	-39.708	2.059	0.331
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000

0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000
0.00	-39.708	0.001	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	174.34	235.18
2	187.61	227.21
3	223.51	202.99
4	236.18	190.32
5	262.95	163.55
6	305.38	121.12
7	475.00	118.87
8	531.24	134.88
9	580.00	148.19
10	946.05	271.59
11	988.47	314.01
12	1013.02	338.56
13	1055.45	380.99
14	1065.46	391.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	-4.249	1.390	0.132
11.25	-4.651	1.540	0.199
0.00	-38.727	-0.037	0.000
17.86	-38.727	1.938	0.322
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000
0.00	-38.727	-0.046	0.000

The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	125.28	230.00
2	132.38	225.73
3	136.60	222.88
4	186.34	189.33
5	196.97	178.71
6	213.25	162.43
7	255.68	120.00
8	261.02	116.98
9	475.00	121.72
10	518.64	132.75
11	580.00	148.64
12	916.93	239.89

13	959.35	282.32
14	1001.78	324.74
15	1015.70	338.67
16	1058.13	381.09
17	1068.04	391.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	-4.651	1.201	0.132
11.25	-4.651	1.350	0.199
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000
0.00	-0.436	0.001	0.000

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	175.40	235.20
2	188.65	227.24
3	224.21	203.25
4	236.92	190.54
5	260.37	167.09
6	302.79	124.67
7	475.00	122.34
8	505.26	131.02
9	580.00	145.16
10	1074.84	259.64
11	1117.26	302.07
12	1159.69	344.49
13	1166.63	351.44
14	1198.25	383.06
15	1198.82	384.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	-4.651	1.331	0.132
11.25	-4.651	1.480	0.199
0.00	-37.739	-0.050	0.000
17.91	-37.739	1.877	0.323
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000

0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000
0.00	-37.739	-0.063	0.000

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.91	230.00
2	130.11	225.67
3	170.96	184.83
4	181.62	174.16
5	193.36	162.43
6	235.79	120.00
7	237.76	118.88
8	475.00	122.92
9	524.85	132.98
10	580.00	146.35
11	956.03	252.40
12	998.45	294.83
13	1040.88	337.25
14	1043.39	339.76
15	1085.81	382.19
16	1094.63	391.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	-3.551	1.305	0.132
11.25	-3.787	1.434	0.199
0.00	-2.059	0.004	0.000
0.00	-2.059	0.004	0.000
8.27	-3.783	1.329	0.145
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000
0.00	-2.059	0.003	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.67	233.00
2	85.91	209.91
3	135.65	176.36
4	147.84	164.16
5	149.54	162.46
6	191.97	120.04
7	475.00	118.80
8	528.93	137.59
9	580.00	145.11
10	1091.79	281.85
11	1134.22	324.28
12	1160.51	350.57
13	1193.94	384.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg)	FOS (Moment)	FOS (Force)

(ki=1.0)	(Equil.)	(Equil.)	Lambda
7.50	2.191	1.500	0.132
11.25	2.040	1.628	0.199
18.66	1.416	2.031	0.338
15.22	-2.059	1.811	0.272
20.67	26.865	2.198	0.377
16.20	-2.059	1.867	0.291
15.53	-2.059	1.829	0.278
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000
0.00	0.012	-0.390	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	87.95	233.00
2	112.67	216.33
3	162.41	182.78
4	173.44	171.74
5	182.76	162.43
6	225.19	120.00
7	230.73	116.86
8	475.00	116.80
9	518.58	130.53
10	580.00	145.59
11	1119.95	311.00
12	1159.36	350.41
13	1192.95	384.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
7.50	1.096	1.306	0.132
11.25	1.046	1.434	0.199
1.59	1.157	1.159	0.028
0.00	1.168	1.128	0.000
1.48	1.158	1.157	0.026
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027
1.53	1.157	1.158	0.027

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.90	233.00
2	89.76	210.83
3	139.50	177.28

```
  4        151.53      165.26
#################### SOME LINES SKIPPED ####################
    Following Are Displayed The Ten Most Critical Of The Trial
    Failure Surfaces Evaluated. They Are
    Ordered - Most Critical First.
    * * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
    Selected ki function = Bi-linear
    Selected Lambda Coefficient =  1.00
    Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
    (if applicable) have been applied to the slice base(s)
    on which they intersect.
    Specified Tension Crack Water Force Factor =   0.000
    Total Number of Trial Surfaces Attempted =  3000
    WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
    Did Not Converge in 20 Iterations.
    Number of Trial Surfaces with Non-Converged FS =   30
    Number of Trial Surfaces with Misleading FS =    4
    Number of Trial Surfaces With Valid FS = 2966
    Percentage of Trial Surfaces With Non-Valid FS Solutions
    of the Total Attempted =   1.1 %
    Statistical Data On All Valid FS Values:
       FS Max =   1.789   FS Min =   1.050   FS Ave =   1.322
       Standard Deviation =    0.124   Coefficient of Variation =    9.37 %
              ((Simplified Janbu FS for Critical Surface =  0.996))
    Failure Surface Specified By 15 Coordinate Points
      Point       X-Surf       Y-Surf
       No.         (ft)         (ft)
        1          70.052       233.000
        2          99.464       213.161
        3         149.206       179.610
        4         160.812       168.004
        5         162.606       166.210
        6         205.032       123.784
        7         475.000       120.165
        8         529.148       135.729
        9         580.000       147.937
       10         907.356       214.451
       11         949.782       256.878
       12         992.209       299.304
       13        1032.224       339.320
       14        1074.651       381.746
       15        1083.905       391.000
    ***  FOS =     1.050   Theta (ki=1.0) =     3.60  ***
                         Lambda =   0.063
          Individual data on the    65  slices
                      Water  Water     Tie     Tie     Earthquake
                      Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight   Top    Bot     Norm    Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1     29.4   34718.8    0.0     0.0       0.      0.  5207.8     0.0      0.0
  2      0.5    1276.6    0.0     0.0       0.      0.   191.5     0.0      0.0
  3      5.0   12576.3    0.0     0.0       0.      0.  1886.4     0.0      0.0
  4      5.0   13690.4    0.0     0.0       0.      0.  2053.6     0.0      0.0
  5      2.2    6480.9    0.0     0.0       0.      0.   972.1     0.0      0.0
  6     27.8  116699.1    0.0 19756.4       0.      0. 17504.9     0.0      0.0
  7      9.2   54960.0    0.0 15255.7       0.      0.  8244.0     0.0      0.0
  8      3.8   26148.1    0.0  9055.7       0.      0.  3922.2     0.0      0.0
  9      7.8   60193.9    0.0 22669.4       0.      0.  9029.1     0.0      0.0
 10      1.8   14897.3    0.0  5968.8       0.      0.  2234.6     0.0      0.0
 11      3.4   29290.2    0.0 12075.4       0.      0.  4393.5     0.0      0.0
 12     14.0  136289.6    0.0 60608.1       0.      0. 20443.4     0.0      0.0
 13     18.0  211967.4    0.0 *******       0.      0. 31795.1     0.0      0.0
 14      7.0   94042.9    0.0 48265.8       0.      0. 14106.4     0.0      0.0
 15     27.1  375973.8    0.0 *******       0.      0. 56396.1     0.0      0.0
 16     15.9  221998.4    0.0 82339.8       0.      0. 33299.8     0.0      0.0
 17      4.0   56081.6    0.0 20853.3       0.      0.  8412.2     0.0      0.0
 18      8.0  112374.9    0.0 41848.6       0.      0. 16856.2     0.0      0.0
 19     32.0  452767.0    0.0 *******       0.      0. 67915.1     0.0      0.0
 20      8.0  114036.4    0.0 42795.0       0.      0. 17105.5     0.0      0.0
 21     26.2  376476.4    0.0 *******       0.      0. 56471.5     0.0      0.0
```

22	3.8	54169.3	0.0	20446.1	0.	0.	8125.4	0.0	0.0
23	3.0	43332.0	0.0	16363.1	0.	0.	6499.8	0.0	0.0
24	7.0	101340.4	0.0	38284.0	0.	0.	15201.1	0.0	0.0
25	5.0	72585.2	0.0	27434.4	0.	0.	10887.8	0.0	0.0
26	10.0	145603.7	0.0	54418.8	0.	0.	21840.6	0.0	0.0
27	13.0	190037.0	0.0	72869.9	0.	0.	28505.6	0.0	0.0
28	2.0	29280.9	0.0	11424.0	0.	0.	4392.1	0.0	0.0
29	10.0	147474.6	0.0	57973.0	0.	0.	22121.2	0.0	0.0
30	5.0	74517.8	0.0	29519.6	0.	0.	11177.7	0.0	0.0
31	5.0	75038.0	0.0	29875.0	0.	0.	11255.7	0.0	0.0
32	46.0	722256.3	0.0	*******	0.	0.	*******	0.0	0.0
33	16.3	269816.9	0.0	*******	0.	0.	40472.5	0.0	0.0
34	22.4	384091.7	0.0	*******	0.	0.	57613.8	0.0	0.0
35	0.3	4665.4	0.0	1934.3	0.	0.	699.8	0.0	0.0
36	1.2	20106.3	0.0	8673.8	0.	0.	3015.9	0.0	0.0
37	18.8	326603.7	0.0	*******	0.	0.	48990.6	0.0	0.0
38	28.0	489505.5	0.0	*******	0.	0.	73425.8	0.0	0.0
39	6.1	109320.7	0.0	45292.1	0.	0.	16398.1	0.0	0.0
40	27.9	505690.9	0.0	*******	0.	0.	75853.6	0.0	0.0
41	19.2	359957.8	0.0	*******	0.	0.	53993.7	0.0	0.0
42	3.8	71151.3	0.0	26840.1	0.	0.	10672.7	0.0	0.0
43	41.0	802689.3	0.0	*******	0.	0.	*******	0.0	0.0
44	46.0	956004.6	0.0	*******	0.	0.	*******	0.0	0.0
45	15.0	322940.4	0.0	*******	0.	0.	48441.1	0.0	0.0
46	30.0	638333.6	0.0	*******	0.	0.	95750.0	0.0	0.0
47	30.0	616370.4	0.0	*******	0.	0.	92455.6	0.0	0.0
48	100.0	1894557.8	0.0	*******	0.	0.	*******	0.0	0.0
49	8.0	140855.7	0.0	49932.9	0.	0.	21128.4	0.0	0.0
50	10.0	174433.6	0.0	61833.5	0.	0.	26165.0	0.0	0.0
51	1.0	17399.0	0.0	6147.8	0.	0.	2609.8	0.0	0.0
52	10.0	176196.4	0.0	61121.5	0.	0.	26429.5	0.0	0.0
53	4.0	74652.6	0.0	24267.3	0.	0.	11197.9	0.0	0.0
54	10.0	196283.5	0.0	60215.2	0.	0.	29442.5	0.0	0.0
55	22.4	447654.2	0.0	*******	0.	0.	67148.1	0.0	0.0
56	15.6	308338.2	0.0	*******	0.	0.	46250.7	0.0	0.0
57	10.0	187463.7	0.0	64703.0	0.	0.	28119.6	0.0	0.0
58	7.0	125548.2	0.0	40595.6	0.	0.	18832.2	0.0	0.0
59	9.8	165232.8	0.0	50113.6	0.	0.	24784.9	0.0	0.0
60	20.2	303902.0	0.0	81450.2	0.	0.	45585.3	0.0	0.0
61	22.2	275431.4	0.0	55105.3	0.	0.	41314.7	0.0	0.0
62	22.9	220064.9	0.0	19144.3	0.	0.	33009.7	0.0	0.0
63	17.1	122604.6	0.0	0.0	0.	0.	18390.7	0.0	0.0
64	42.4	153820.7	0.0	0.0	0.	0.	23073.1	0.0	0.0
65	9.3	5095.4	0.0	0.0	0.	0.	764.3	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.097	233.000
2	95.810	212.284
3	145.552	178.733
4	157.316	166.969
5	199.290	124.995
6	475.000	122.314
7	515.867	132.701
8	580.000	146.199
9	1006.887	239.022
10	1049.314	281.448
11	1091.740	323.874
12	1111.494	343.628
13	1151.866	384.000

*** FOS = 1.056 Theta (ki=1.0) = 5.00 ***
Lambda = 0.087

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.965	233.000
2	89.812	210.845
3	139.554	177.293
4	151.578	165.270
5	192.400	124.448

6	475.000	124.892
7	539.929	139.068
8	580.000	148.113
9	1070.325	270.506
10	1112.751	312.932
11	1148.721	348.902
12	1183.819	384.000

*** FOS = 1.060 Theta (ki=1.0) = 5.18 ***
Lambda = 0.091
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.942	233.000
2	80.944	208.716
3	130.686	175.165
4	143.093	162.758
5	181.633	124.218
6	475.000	122.670
7	505.027	127.142
8	580.000	147.979
9	1046.946	254.075
10	1089.372	296.502
11	1131.799	338.928
12	1140.626	347.755
13	1176.871	384.000

*** FOS = 1.063 Theta (ki=1.0) = 5.10 ***
Lambda = 0.089
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.942	233.000
2	80.944	208.716
3	130.686	175.165
4	143.093	162.758
5	181.633	124.218
6	475.000	122.670
7	505.027	127.142
8	580.000	147.979
9	1046.946	254.075
10	1089.372	296.502
11	1131.799	338.928
12	1140.626	347.755
13	1176.871	384.000

*** FOS = 1.063 Theta (ki=1.0) = 5.10 ***
Lambda = 0.089
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.310	233.000
2	85.641	209.844
3	135.383	176.292
4	147.587	164.088
5	188.380	123.295
6	475.000	121.396
7	530.632	136.949
8	580.000	148.396
9	1083.997	249.705
10	1126.423	292.132
11	1168.849	334.558
12	1188.883	354.592
13	1209.029	374.738
14	1214.594	384.000

*** FOS = 1.063 Theta (ki=1.0) = 5.09 ***
Lambda = 0.089
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.310	233.000
2	85.641	209.844
3	135.383	176.292

4	147.587	164.088
5	188.380	123.295
6	475.000	121.396
7	530.632	136.949
8	580.000	148.396
9	1083.997	249.705
10	1126.423	292.132
11	1168.849	334.558
12	1188.883	354.592
13	1209.029	374.738
14	1214.594	384.000

*** FOS = 1.063 Theta (ki=1.0) = 5.09 ***
Lambda = 0.089
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	39.868	233.000
2	77.574	207.567
3	127.316	174.016
4	139.606	161.725
5	180.341	120.991
6	475.000	124.404
7	512.039	132.711
8	580.000	148.963
9	1111.340	288.104
10	1153.767	330.530
11	1176.004	352.767
12	1202.849	379.613
13	1207.237	384.000

*** FOS = 1.067 Theta (ki=1.0) = 5.26 ***
Lambda = 0.092
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.626	233.000
2	101.427	230.716
3	110.687	225.152
4	120.854	218.295
5	170.596	184.743
6	181.277	174.062
7	189.881	165.458
8	232.308	123.032
9	475.000	122.460
10	532.234	137.608
11	580.000	144.944
12	1134.583	292.742
13	1177.009	335.169
14	1197.678	355.838
15	1209.784	367.944
16	1219.432	384.000

*** FOS = 1.068 Theta (ki=1.0) = 4.56 ***
Lambda = 0.080
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.626	233.000
2	101.427	230.716
3	110.687	225.152
4	120.854	218.295
5	170.596	184.743
6	181.277	174.062
7	189.881	165.458
8	232.308	123.032
9	475.000	122.460
10	532.234	137.608
11	580.000	144.944
12	1134.583	292.742
13	1177.009	335.169
14	1197.678	355.838
15	1209.784	367.944

```
    16        1219.432       384.000
***  FOS =      1.070   Theta (ki=1.0) =      4.63  ***
                     Lambda =   0.081
          **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section E-E', Static

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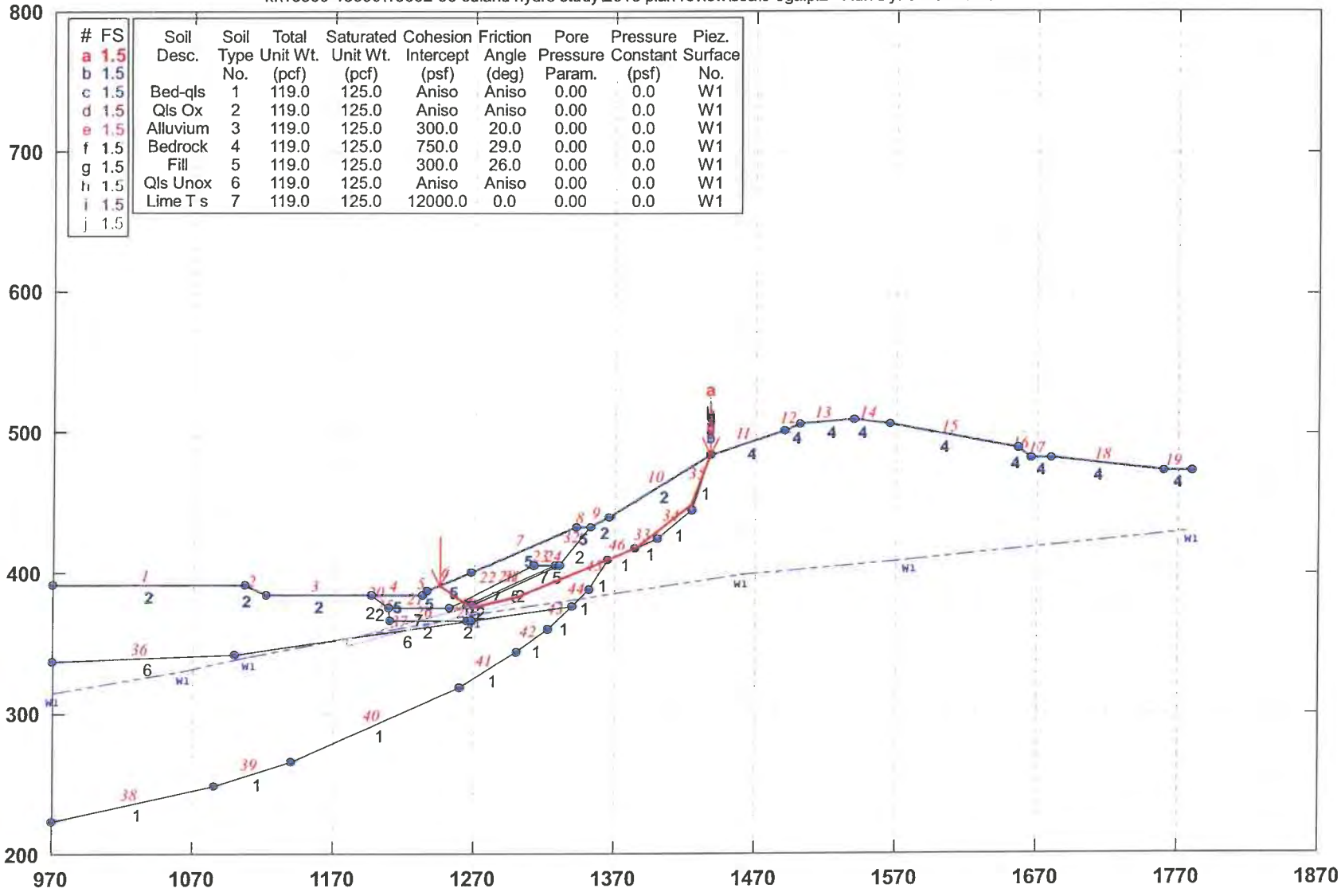

#	FS
a	1.5
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.5
h	1.5
i	1.5
j	1.5

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Lime T s	7	119.0	125.0	12000.0	0.0	0.00	0.0	W1

GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-32.1

13662-00, Euland, Section E-E', Static

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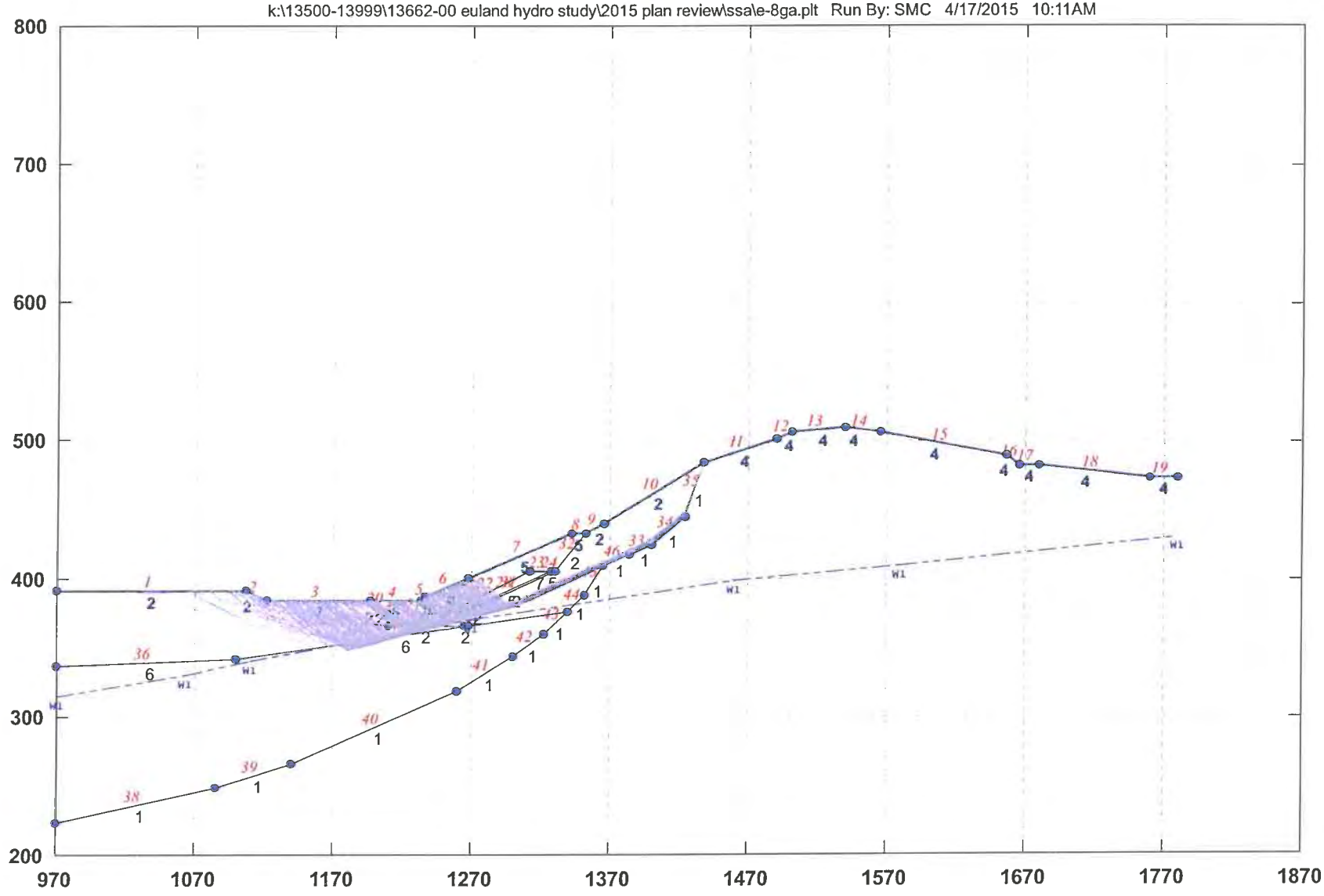


*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****
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: 4/17/2015
Time of Run: 10:11AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8ga.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8ga.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8ga.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E', Static

BOUNDARY COORDINATES
19 Top Boundaries
46 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	970.00	391.00	1107.00	391.00	2
2	1107.00	391.00	1122.00	384.00	2
3	1122.00	384.00	1197.00	384.00	2
4	1197.00	384.00	1233.00	384.00	5
5	1233.00	384.00	1236.00	387.00	5
6	1236.00	387.00	1268.00	400.00	5
7	1268.00	400.00	1343.00	433.00	5
8	1343.00	433.00	1353.00	433.00	5
9	1353.00	433.00	1366.00	440.00	2
10	1366.00	440.00	1438.00	485.00	2
11	1438.00	485.00	1490.00	502.00	4
12	1490.00	502.00	1502.00	507.00	4
13	1502.00	507.00	1540.00	510.00	4
14	1540.00	510.00	1565.00	507.00	4
15	1565.00	507.00	1656.00	490.00	4
16	1656.00	490.00	1666.00	482.00	4
17	1666.00	482.00	1680.00	482.00	4
18	1680.00	482.00	1760.00	473.00	4
19	1760.00	473.00	1780.00	473.00	4
20	1197.00	384.00	1209.00	375.00	2
21	1209.00	375.00	1252.00	375.00	7
22	1252.00	375.00	1312.00	406.00	7
23	1312.00	406.00	1327.00	406.00	7
24	1327.00	406.00	1330.00	406.00	5
25	1209.00	375.00	1210.00	366.00	2
26	1210.00	366.00	1265.00	366.00	2
27	1265.00	366.00	1265.10	377.00	5
28	1265.10	377.00	1327.00	406.00	5
29	1265.00	366.00	1268.00	366.00	2
30	1268.00	366.00	1269.00	377.00	2
31	1269.00	377.00	1330.00	406.00	2
32	1330.00	406.00	1353.00	433.00	2
33	1384.00	418.00	1400.00	425.00	1
34	1400.00	425.00	1425.00	445.00	1
35	1425.00	445.00	1438.00	485.00	1
36	970.00	337.00	1100.00	342.00	6
37	1100.00	342.00	1340.00	376.00	6
38	970.00	223.00	1085.00	249.00	1
39	1085.00	249.00	1140.00	266.00	1

40	1140.00	266.00	1260.00	318.00	1
41	1260.00	318.00	1300.00	344.00	1
42	1300.00	344.00	1322.00	360.00	1
43	1322.00	360.00	1340.00	376.00	1
44	1340.00	376.00	1352.00	388.00	1
45	1352.00	388.00	1365.00	410.00	1
46	1365.00	410.00	1384.00	418.00	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1
7	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 7 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	970.00	314.00
2	1063.00	330.00
3	1110.00	340.00
4	1270.00	370.00
5	1460.00	398.00
6	1580.00	410.00
7	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random

Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
6 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1180.00	350.00	1300.00	382.00	5.00
2	1301.00	382.00	1301.00	382.00	5.00
3	1384.00	420.00	1384.00	420.00	4.00
4	1400.00	428.00	1400.00	428.00	4.00
5	1425.00	447.00	1425.00	447.00	4.00
6	1438.00	485.00	1438.00	485.00	0.00

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 = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 3.560 FS Min = 1.496 FS Ave = 2.332
Standard Deviation = 0.558 Coefficient of Variation = 23.94 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***
Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	2.1	301.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	14.0	16513.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.0	9433.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	2.4	6591.1	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.4	1029.2	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.5	1513.4	0.0	0.0	0.	0.	0.0	0.0	0.0
7	0.1	401.3	0.0	0.0	0.	0.	0.0	0.0	0.0
8	32.0	107740.4	0.0	0.0	0.	0.	0.0	0.0	0.0
9	11.0	41591.7	0.0	0.0	0.	0.	0.0	0.0	0.0
10	15.0	57083.2	0.0	0.0	0.	0.	0.0	0.0	0.0
11	3.0	11467.5	0.0	0.0	0.	0.	0.0	0.0	0.0
12	13.0	49888.3	0.0	0.0	0.	0.	0.0	0.0	0.0
13	10.0	35974.2	0.0	0.0	0.	0.	0.0	0.0	0.0
14	12.0	41065.7	0.0	0.0	0.	0.	0.0	0.0	0.0
15	0.0	54.0	0.0	0.0	0.	0.	0.0	0.0	0.0
16	1.0	3515.0	0.0	0.0	0.	0.	0.0	0.0	0.0
17	5.2	18807.5	0.0	0.0	0.	0.	0.0	0.0	0.0
18	12.8	48457.3	0.0	0.0	0.	0.	0.0	0.0	0.0
19	16.0	61880.5	0.0	0.0	0.	0.	0.0	0.0	0.0
20	25.0	89047.4	0.0	0.0	0.	0.	0.0	0.0	0.0
21	13.0	21714.8	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040

6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

Failure Surface Specified By 8 Coordinate Points

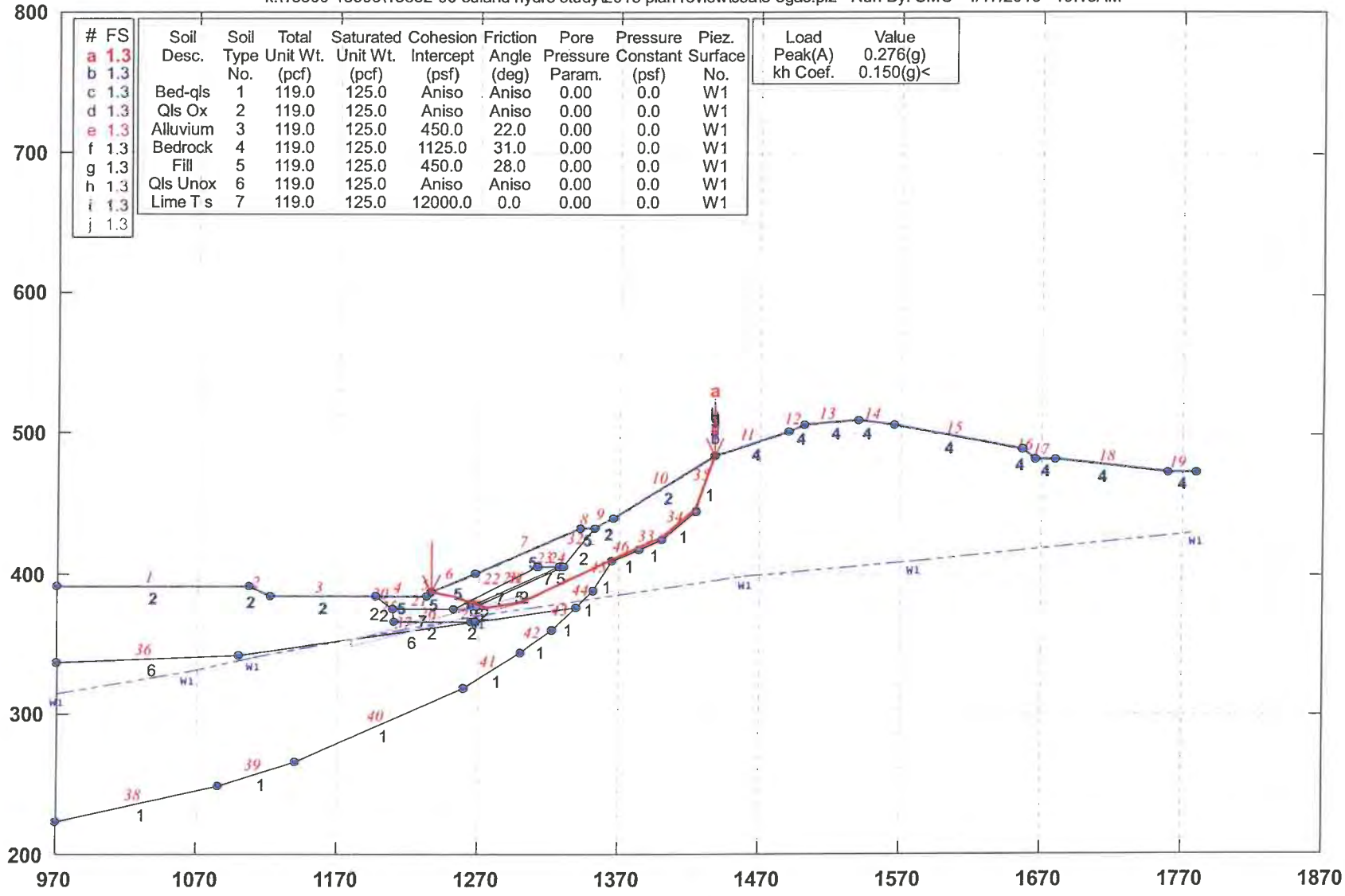
Point No.	X-Surf (ft)	Y-Surf (ft)
1	1245.473	390.848
2	1247.577	389.299
3	1268.352	375.393
4	1301.000	382.833
5	1384.000	418.040
6	1400.000	429.460
7	1425.000	448.802
8	1438.000	485.000

Factor of Safety
*** 1.496 ***

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

13662-00, Euland, Section E-E', seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8gas.pl2 Run By: SMC 4/17/2015 10:18AM



#	FS
a	1.3
b	1.3
c	1.3
d	1.3
e	1.3
f	1.3
g	1.3
h	1.3
i	1.3
j	1.3

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Lime T s	7	119.0	125.0	12000.0	0.0	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.3

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-32.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/17/2015
Time of Run: 10:18AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gas.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gas.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gas.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
seismic

BOUNDARY COORDINATES
19 Top Boundaries
46 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	970.00	391.00	1107.00	391.00	2
2	1107.00	391.00	1122.00	384.00	2
3	1122.00	384.00	1197.00	384.00	2
4	1197.00	384.00	1233.00	384.00	5
5	1233.00	384.00	1236.00	387.00	5
6	1236.00	387.00	1268.00	400.00	5
7	1268.00	400.00	1343.00	433.00	5
8	1343.00	433.00	1353.00	433.00	5
9	1353.00	433.00	1366.00	440.00	2
10	1366.00	440.00	1438.00	485.00	2
11	1438.00	485.00	1490.00	502.00	4
12	1490.00	502.00	1502.00	507.00	4
13	1502.00	507.00	1540.00	510.00	4
14	1540.00	510.00	1565.00	507.00	4
15	1565.00	507.00	1656.00	490.00	4
16	1656.00	490.00	1666.00	482.00	4
17	1666.00	482.00	1680.00	482.00	4
18	1680.00	482.00	1760.00	473.00	4
19	1760.00	473.00	1780.00	473.00	4
20	1197.00	384.00	1209.00	375.00	2
21	1209.00	375.00	1252.00	375.00	7
22	1252.00	375.00	1312.00	406.00	7
23	1312.00	406.00	1327.00	406.00	7
24	1327.00	406.00	1330.00	406.00	5
25	1209.00	375.00	1210.00	366.00	2
26	1210.00	366.00	1265.00	366.00	2
27	1265.00	366.00	1265.10	377.00	5
28	1265.10	377.00	1327.00	406.00	5
29	1265.00	366.00	1268.00	366.00	2
30	1268.00	366.00	1269.00	377.00	2
31	1269.00	377.00	1330.00	406.00	2
32	1330.00	406.00	1353.00	433.00	2
33	1384.00	418.00	1400.00	425.00	1
34	1400.00	425.00	1425.00	445.00	1
35	1425.00	445.00	1438.00	485.00	1
36	970.00	337.00	1100.00	342.00	6
37	1100.00	342.00	1340.00	376.00	6
38	970.00	223.00	1085.00	249.00	1
39	1085.00	249.00	1140.00	266.00	1

40	1140.00	266.00	1260.00	318.00	1
41	1260.00	318.00	1300.00	344.00	1
42	1300.00	344.00	1322.00	360.00	1
43	1322.00	360.00	1340.00	376.00	1
44	1340.00	376.00	1352.00	388.00	1
45	1352.00	388.00	1365.00	410.00	1
46	1365.00	410.00	1384.00	418.00	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1
7	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 7 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	970.00	314.00
2	1063.00	330.00
3	1110.00	340.00
4	1270.00	370.00
5	1460.00	398.00
6	1580.00	410.00
7	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
3000 Trial Surfaces Have Been Generated.
6 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1180.00	350.00	1300.00	382.00	5.00
2	1301.00	382.00	1301.00	382.00	5.00
3	1384.00	420.00	1384.00	420.00	4.00
4	1400.00	428.00	1400.00	428.00	4.00
5	1425.00	447.00	1425.00	447.00	4.00
6	1438.00	485.00	1438.00	485.00	0.00

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 = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 2.837 FS Min = 1.298 FS Ave = 1.910
Standard Deviation = 0.398 Coefficient of Variation = 20.86 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1236.013	387.005
2	1252.411	383.917
3	1276.233	376.333
4	1301.000	380.159
5	1384.000	419.752
6	1400.000	426.586
7	1425.000	447.404
8	1438.000	485.000

Factor of Safety
*** 1.298 ***
Individual data on the 17 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	16.4	9513.0	0.0	0.0	0.	0.	1426.9	0.0	0.0
2	10.4	16780.2	0.0	0.0	0.	0.	2517.0	0.0	0.0
3	5.2	11784.8	0.0	0.0	0.	0.	1767.7	0.0	0.0
4	0.8	1921.0	0.0	0.0	0.	0.	288.2	0.0	0.0
5	2.3	6167.3	0.0	0.0	0.	0.	925.1	0.0	0.0
6	5.2	15589.0	0.0	0.0	0.	0.	2338.4	0.0	0.0
7	24.8	90850.6	0.0	0.0	0.	0.	13627.6	0.0	0.0
8	11.0	44712.2	0.0	0.0	0.	0.	6706.8	0.0	0.0
9	15.0	60112.0	0.0	0.0	0.	0.	9016.8	0.0	0.0
10	3.0	11903.5	0.0	0.0	0.	0.	1785.5	0.0	0.0
11	13.0	51123.5	0.0	0.0	0.	0.	7668.5	0.0	0.0
12	10.0	36201.1	0.0	0.0	0.	0.	5430.2	0.0	0.0
13	13.0	43989.5	0.0	0.0	0.	0.	6598.4	0.0	0.0
14	18.0	64616.7	0.0	0.0	0.	0.	9692.5	0.0	0.0
15	16.0	62986.8	0.0	0.0	0.	0.	9448.0	0.0	0.0
16	25.0	95401.2	0.0	0.0	0.	0.	14310.2	0.0	0.0
17	13.0	22795.8	0.0	0.0	0.	0.	3419.4	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1236.013	387.005
2	1252.411	383.917
3	1276.233	376.333
4	1301.000	380.159
5	1384.000	419.752

6	1400.000	426.586
7	1425.000	447.404
8	1438.000	485.000

Factor of Safety
*** 1.298 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1236.013	387.005
2	1252.411	383.917
3	1276.233	376.333
4	1301.000	380.159
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6	1400.000	426.586
7	1425.000	447.404
8	1438.000	485.000

Factor of Safety
*** 1.298 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1236.013	387.005
2	1252.411	383.917
3	1276.233	376.333
4	1301.000	380.159
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Factor of Safety
*** 1.298 ***

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4	1301.000	380.159
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Factor of Safety
*** 1.298 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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6	1400.000	426.586
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Factor of Safety
*** 1.298 ***

Failure Surface Specified By 8 Coordinate Points

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Factor of Safety
*** 1.298 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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Factor of Safety

*** 1.298 ***

Failure Surface Specified By 8 Coordinate Points

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4	1301.000	380.159
5	1384.000	419.752
6	1400.000	426.586
7	1425.000	447.404
8	1438.000	485.000

Factor of Safety

*** 1.298 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1236.013	387.005
2	1252.411	383.917
3	1276.233	376.333
4	1301.000	380.159
5	1384.000	419.752
6	1400.000	426.586
7	1425.000	447.404
8	1438.000	485.000

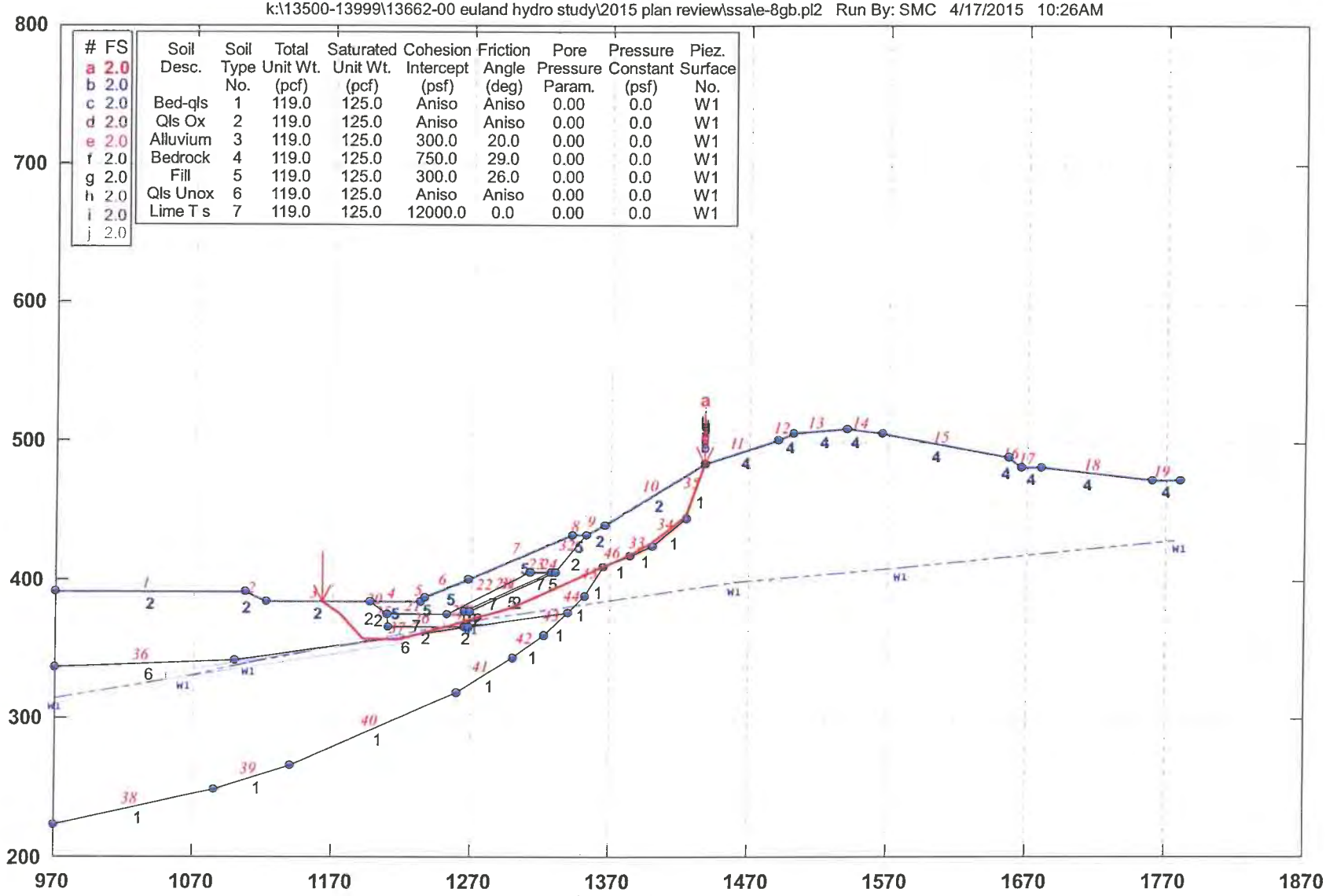
Factor of Safety

*** 1.298 ***

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

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8gb.pl2 Run By: SMC 4/17/2015 10:26AM



#	FS
a	2.0
b	2.0
c	2.0
d	2.0
e	2.0
f	2.0
g	2.0
h	2.0
i	2.0
j	2.0

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Lime T s	7	119.0	125.0	12000.0	0.0	0.00	0.0	W1

GSTABL7 v.2 FSmin=2.0

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-33.1

13662-00, Euland, Section E-E', Static

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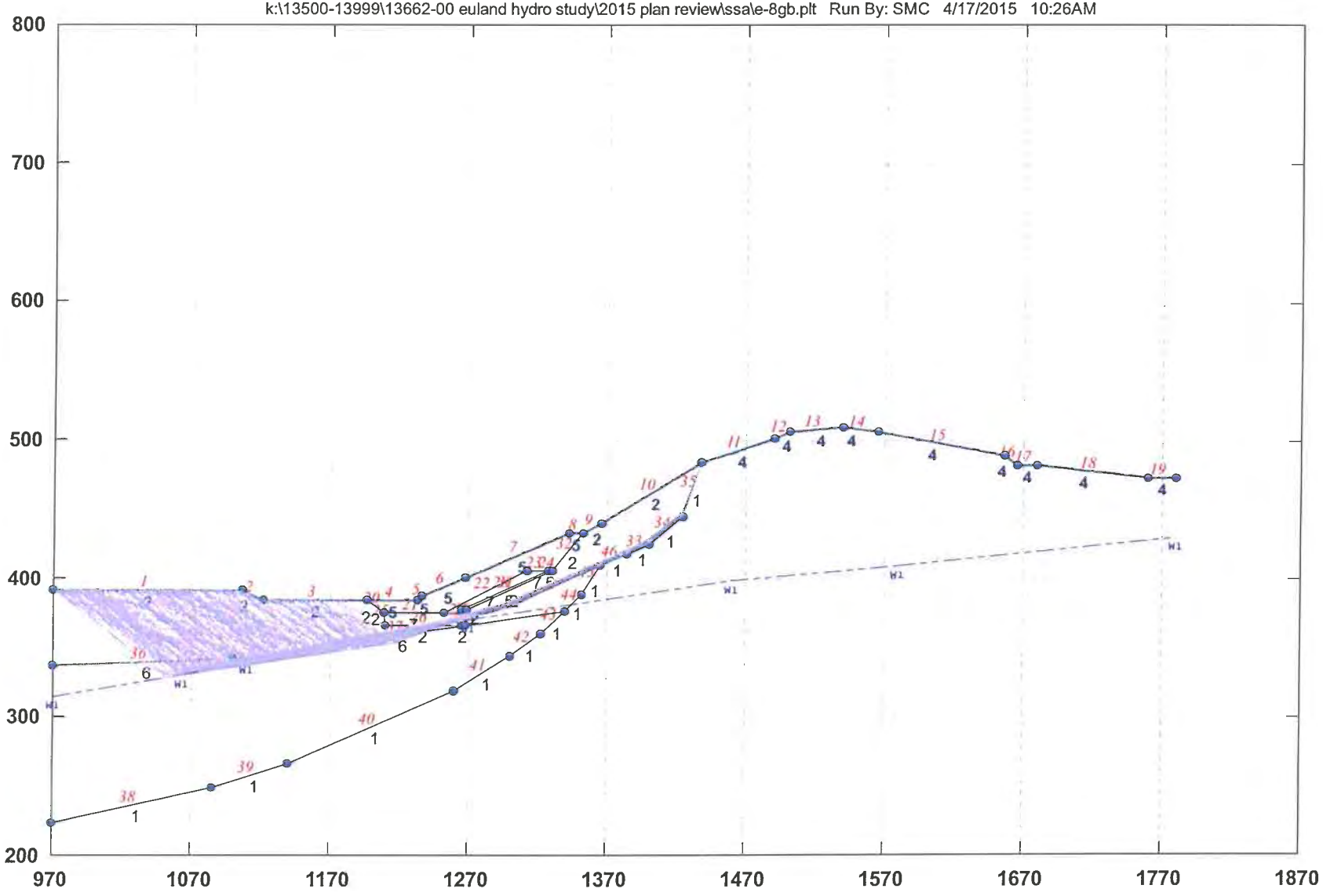

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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****

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: 4/17/2015
Time of Run: 10:26AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gb.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gb.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gb.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E', Static

BOUNDARY COORDINATES
19 Top Boundaries
46 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	970.00	391.00	1107.00	391.00	2
2	1107.00	391.00	1122.00	384.00	2
3	1122.00	384.00	1197.00	384.00	2
4	1197.00	384.00	1233.00	384.00	5
5	1233.00	384.00	1236.00	387.00	5
6	1236.00	387.00	1268.00	400.00	5
7	1268.00	400.00	1343.00	433.00	5
8	1343.00	433.00	1353.00	433.00	5
9	1353.00	433.00	1366.00	440.00	2
10	1366.00	440.00	1438.00	485.00	2
11	1438.00	485.00	1490.00	502.00	4
12	1490.00	502.00	1502.00	507.00	4
13	1502.00	507.00	1540.00	510.00	4
14	1540.00	510.00	1565.00	507.00	4
15	1565.00	507.00	1656.00	490.00	4
16	1656.00	490.00	1666.00	482.00	4
17	1666.00	482.00	1680.00	482.00	4
18	1680.00	482.00	1760.00	473.00	4
19	1760.00	473.00	1780.00	473.00	4
20	1197.00	384.00	1209.00	375.00	2
21	1209.00	375.00	1252.00	375.00	7
22	1252.00	375.00	1312.00	406.00	7
23	1312.00	406.00	1327.00	406.00	7
24	1327.00	406.00	1330.00	406.00	5
25	1209.00	375.00	1210.00	366.00	2
26	1210.00	366.00	1265.00	366.00	2
27	1265.00	366.00	1265.10	377.00	5
28	1265.10	377.00	1327.00	406.00	5
29	1265.00	366.00	1268.00	366.00	2
30	1268.00	366.00	1269.00	377.00	2
31	1269.00	377.00	1330.00	406.00	2
32	1330.00	406.00	1353.00	433.00	2
33	1384.00	418.00	1400.00	425.00	1
34	1400.00	425.00	1425.00	445.00	1
35	1425.00	445.00	1438.00	485.00	1
36	970.00	337.00	1100.00	342.00	6
37	1100.00	342.00	1340.00	376.00	6
38	970.00	223.00	1085.00	249.00	1
39	1085.00	249.00	1140.00	266.00	1

40	1140.00	266.00	1260.00	318.00	1
41	1260.00	318.00	1300.00	344.00	1
42	1300.00	344.00	1322.00	360.00	1
43	1322.00	360.00	1340.00	376.00	1
44	1340.00	376.00	1352.00	388.00	1
45	1352.00	388.00	1365.00	410.00	1
46	1365.00	410.00	1384.00	418.00	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1
7	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

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 7 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	970.00	314.00
2	1063.00	330.00
3	1110.00	340.00
4	1270.00	370.00
5	1460.00	398.00
6	1580.00	410.00
7	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random

Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1050.00	330.00	1220.00	356.00	5.00
2	1250.00	368.00	1250.00	368.00	5.00
3	1300.00	382.00	1300.00	382.00	5.00
4	1384.00	420.00	1384.00	420.00	4.00
5	1400.00	428.00	1400.00	428.00	4.00
6	1425.00	447.00	1425.00	447.00	4.00
7	1438.00	485.00	1438.00	485.00	0.00

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 = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 4.792 FS Min = 2.046 FS Ave = 3.403
Standard Deviation = 0.684 Coefficient of Variation = 20.09 %
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
5	1250.000	365.624
6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

Factor of Safety
*** 2.046 ***
Individual data on the 35 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.3	6038.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	17.7	36009.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	5.0	15578.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	7.5	23221.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	4.5	14278.1	0.0	136.2	0.	0.	0.0	0.0	0.0
6	0.9	2700.9	0.0	56.2	0.	0.	0.0	0.0	0.0
7	0.1	450.3	0.0	10.3	0.	0.	0.0	0.0	0.0
8	7.0	22056.4	0.0	827.5	0.	0.	0.0	0.0	0.0
9	11.1	33452.6	0.0	1639.2	0.	0.	0.0	0.0	0.0
10	5.0	13759.5	0.0	576.3	0.	0.	0.0	0.0	0.0
11	3.0	8506.1	0.0	301.9	0.	0.	0.0	0.0	0.0
12	12.7	39067.8	0.0	883.7	0.	0.	0.0	0.0	0.0
13	1.3	4282.9	0.0	56.3	0.	0.	0.0	0.0	0.0
14	1.3	4156.7	0.0	45.9	0.	0.	0.0	0.0	0.0
15	0.7	2317.6	0.0	20.7	0.	0.	0.0	0.0	0.0
16	4.0	13017.8	0.0	52.9	0.	0.	0.0	0.0	0.0
17	9.1	30477.9	0.0	0.0	0.	0.	0.0	0.0	0.0
18	0.1	217.4	0.0	0.0	0.	0.	0.0	0.0	0.0
19	2.9	9990.7	0.0	0.0	0.	0.	0.0	0.0	0.0
20	0.5	1582.3	0.0	0.0	0.	0.	0.0	0.0	0.0
21	0.5	1891.1	0.0	0.0	0.	0.	0.0	0.0	0.0
22	31.0	116398.9	0.0	0.0	0.	0.	0.0	0.0	0.0
23	12.0	48213.9	0.0	0.0	0.	0.	0.0	0.0	0.0
24	15.0	59946.8	0.0	0.0	0.	0.	0.0	0.0	0.0
25	3.0	11946.6	0.0	0.0	0.	0.	0.0	0.0	0.0
26	13.0	51604.2	0.0	0.0	0.	0.	0.0	0.0	0.0

27	10.0	36895.5	0.0	0.0	0.	0.	0.0	0.0	0.0
28	11.8	40914.6	0.0	0.0	0.	0.	0.0	0.0	0.0
29	0.2	853.1	0.0	0.0	0.	0.	0.0	0.0	0.0
30	1.0	3546.5	0.0	0.0	0.	0.	0.0	0.0	0.0
31	8.3	30019.5	0.0	0.0	0.	0.	0.0	0.0	0.0
32	9.7	37219.0	0.0	0.0	0.	0.	0.0	0.0	0.0
33	16.0	63343.8	0.0	0.0	0.	0.	0.0	0.0	0.0
34	25.0	94471.5	0.0	0.0	0.	0.	0.0	0.0	0.0
35	13.0	23134.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
5	1250.000	365.624
6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

Factor of Safety
*** 2.046 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
5	1250.000	365.624
6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

Factor of Safety
*** 2.046 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
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8	1400.000	427.648
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Factor of Safety
*** 2.046 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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8	1400.000	427.648
9	1425.000	446.967
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Factor of Safety
*** 2.046 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
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4	1216.960	357.371
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8	1400.000	427.648
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Factor of Safety
*** 2.046 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
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4	1216.960	357.371
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6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

Factor of Safety
*** 2.046 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
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6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

Factor of Safety
*** 2.046 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
5	1250.000	365.624
6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

Factor of Safety
*** 2.046 ***

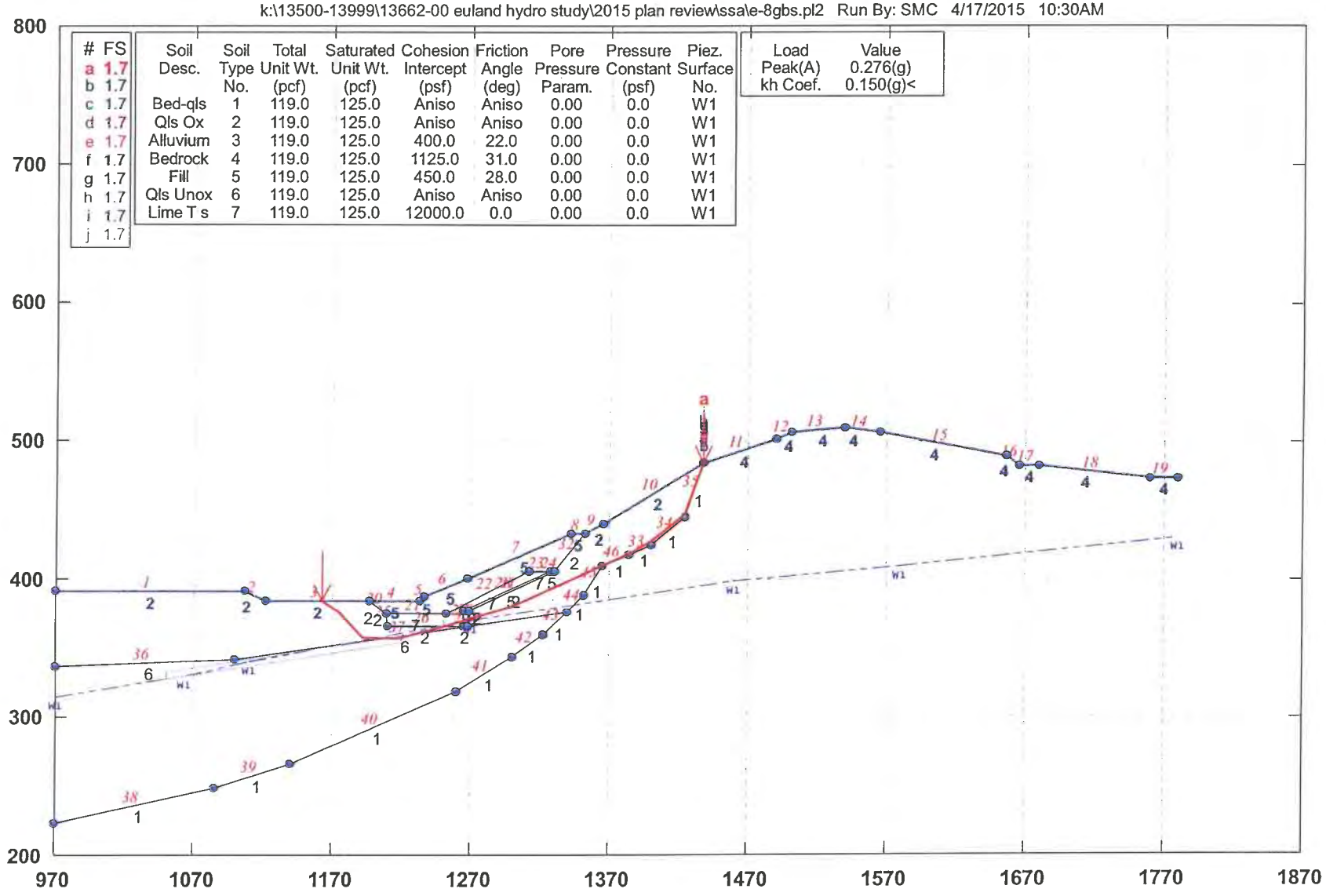
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
5	1250.000	365.624
6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648

```
    9       1425.000       446.967
   10       1438.000       485.000
        Factor of Safety
      ***     2.046    ***
          **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section E-E', seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8gbs.pl2 Run By: SMC 4/17/2015 10:30AM



#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	400.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Lime T s	7	119.0	125.0	12000.0	0.0	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-33.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/17/2015
Time of Run: 10:30AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gbs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gbs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8gbs.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E', seismic

BOUNDARY COORDINATES
19 Top Boundaries
46 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	970.00	391.00	1107.00	391.00	2
2	1107.00	391.00	1122.00	384.00	2
3	1122.00	384.00	1197.00	384.00	2
4	1197.00	384.00	1233.00	384.00	5
5	1233.00	384.00	1236.00	387.00	5
6	1236.00	387.00	1268.00	400.00	5
7	1268.00	400.00	1343.00	433.00	5
8	1343.00	433.00	1353.00	433.00	5
9	1353.00	433.00	1366.00	440.00	2
10	1366.00	440.00	1438.00	485.00	2
11	1438.00	485.00	1490.00	502.00	4
12	1490.00	502.00	1502.00	507.00	4
13	1502.00	507.00	1540.00	510.00	4
14	1540.00	510.00	1565.00	507.00	4
15	1565.00	507.00	1656.00	490.00	4
16	1656.00	490.00	1666.00	482.00	4
17	1666.00	482.00	1680.00	482.00	4
18	1680.00	482.00	1760.00	473.00	4
19	1760.00	473.00	1780.00	473.00	4
20	1197.00	384.00	1209.00	375.00	2
21	1209.00	375.00	1252.00	375.00	7
22	1252.00	375.00	1312.00	406.00	7
23	1312.00	406.00	1327.00	406.00	7
24	1327.00	406.00	1330.00	406.00	5
25	1209.00	375.00	1210.00	366.00	2
26	1210.00	366.00	1265.00	366.00	2
27	1265.00	366.00	1265.10	377.00	5
28	1265.10	377.00	1327.00	406.00	5
29	1265.00	366.00	1268.00	366.00	2
30	1268.00	366.00	1269.00	377.00	2
31	1269.00	377.00	1330.00	406.00	2
32	1330.00	406.00	1353.00	433.00	2
33	1384.00	418.00	1400.00	425.00	1
34	1400.00	425.00	1425.00	445.00	1
35	1425.00	445.00	1438.00	485.00	1
36	970.00	337.00	1100.00	342.00	6
37	1100.00	342.00	1340.00	376.00	6
38	970.00	223.00	1085.00	249.00	1
39	1085.00	249.00	1140.00	266.00	1

40	1140.00	266.00	1260.00	318.00	1
41	1260.00	318.00	1300.00	344.00	1
42	1300.00	344.00	1322.00	360.00	1
43	1322.00	360.00	1340.00	376.00	1
44	1340.00	376.00	1352.00	388.00	1
45	1352.00	388.00	1365.00	410.00	1
46	1365.00	410.00	1384.00	418.00	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	400.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1
7	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-8.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

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 7 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	970.00	314.00
2	1063.00	330.00
3	1110.00	340.00
4	1270.00	370.00
5	1460.00	398.00
6	1580.00	410.00
7	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
3000 Trial Surfaces Have Been Generated.
7 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1050.00	330.00	1220.00	356.00	5.00
2	1250.00	368.00	1250.00	368.00	5.00
3	1300.00	382.00	1300.00	382.00	5.00
4	1384.00	420.00	1384.00	420.00	4.00
5	1400.00	428.00	1400.00	428.00	4.00
6	1425.00	447.00	1425.00	447.00	4.00
7	1438.00	485.00	1438.00	485.00	0.00

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 = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 2.888 FS Min = 1.679 FS Ave = 2.353
Standard Deviation = 0.277 Coefficient of Variation = 11.76 %
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
5	1250.000	365.624
6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

Factor of Safety
*** 1.679 ***
Individual data on the 35 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.3	6038.1	0.0	0.0	0.	0.	905.7	0.0	0.0
2	17.7	36009.0	0.0	0.0	0.	0.	5401.4	0.0	0.0
3	5.0	15578.2	0.0	0.0	0.	0.	2336.7	0.0	0.0
4	7.5	23221.6	0.0	0.0	0.	0.	3483.2	0.0	0.0
5	4.5	14278.1	0.0	136.2	0.	0.	2141.7	0.0	0.0
6	0.9	2700.9	0.0	56.2	0.	0.	405.1	0.0	0.0
7	0.1	450.3	0.0	10.3	0.	0.	67.6	0.0	0.0
8	7.0	22056.4	0.0	827.5	0.	0.	3308.5	0.0	0.0
9	11.1	33452.6	0.0	1639.2	0.	0.	5017.9	0.0	0.0
10	5.0	13759.5	0.0	576.3	0.	0.	2063.9	0.0	0.0
11	3.0	8506.1	0.0	301.9	0.	0.	1275.9	0.0	0.0
12	12.7	39067.8	0.0	883.7	0.	0.	5860.2	0.0	0.0
13	1.3	4282.9	0.0	56.3	0.	0.	642.4	0.0	0.0
14	1.3	4156.7	0.0	45.9	0.	0.	623.5	0.0	0.0
15	0.7	2317.6	0.0	20.7	0.	0.	347.6	0.0	0.0
16	4.0	13017.8	0.0	52.9	0.	0.	1952.7	0.0	0.0
17	9.1	30477.9	0.0	0.0	0.	0.	4571.7	0.0	0.0
18	0.1	217.4	0.0	0.0	0.	0.	32.6	0.0	0.0
19	2.9	9990.7	0.0	0.0	0.	0.	1498.6	0.0	0.0
20	0.5	1582.3	0.0	0.0	0.	0.	237.4	0.0	0.0
21	0.5	1891.1	0.0	0.0	0.	0.	283.7	0.0	0.0
22	31.0	116398.9	0.0	0.0	0.	0.	17459.8	0.0	0.0

23	12.0	48213.9	0.0	0.0	0.	0.	7232.1	0.0	0.0
24	15.0	59946.8	0.0	0.0	0.	0.	8992.0	0.0	0.0
25	3.0	11946.6	0.0	0.0	0.	0.	1792.0	0.0	0.0
26	13.0	51604.2	0.0	0.0	0.	0.	7740.6	0.0	0.0
27	10.0	36895.5	0.0	0.0	0.	0.	5534.3	0.0	0.0
28	11.8	40914.6	0.0	0.0	0.	0.	6137.2	0.0	0.0
29	0.2	853.1	0.0	0.0	0.	0.	128.0	0.0	0.0
30	1.0	3546.5	0.0	0.0	0.	0.	532.0	0.0	0.0
31	8.3	30019.5	0.0	0.0	0.	0.	4502.9	0.0	0.0
32	9.7	37219.0	0.0	0.0	0.	0.	5582.8	0.0	0.0
33	16.0	63343.8	0.0	0.0	0.	0.	9501.6	0.0	0.0
34	25.0	94471.5	0.0	0.0	0.	0.	14170.7	0.0	0.0
35	13.0	23134.2	0.0	0.0	0.	0.	3470.1	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
5	1250.000	365.624
6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

Factor of Safety
*** 1.679 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371
5	1250.000	365.624
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Factor of Safety
*** 1.679 ***

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Factor of Safety
*** 1.679 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1162.029	384.000
2	1174.289	375.723
3	1191.969	358.048
4	1216.960	357.371

5	1250.000	365.624
6	1300.000	380.237
7	1384.000	418.314
8	1400.000	427.648
9	1425.000	446.967
10	1438.000	485.000

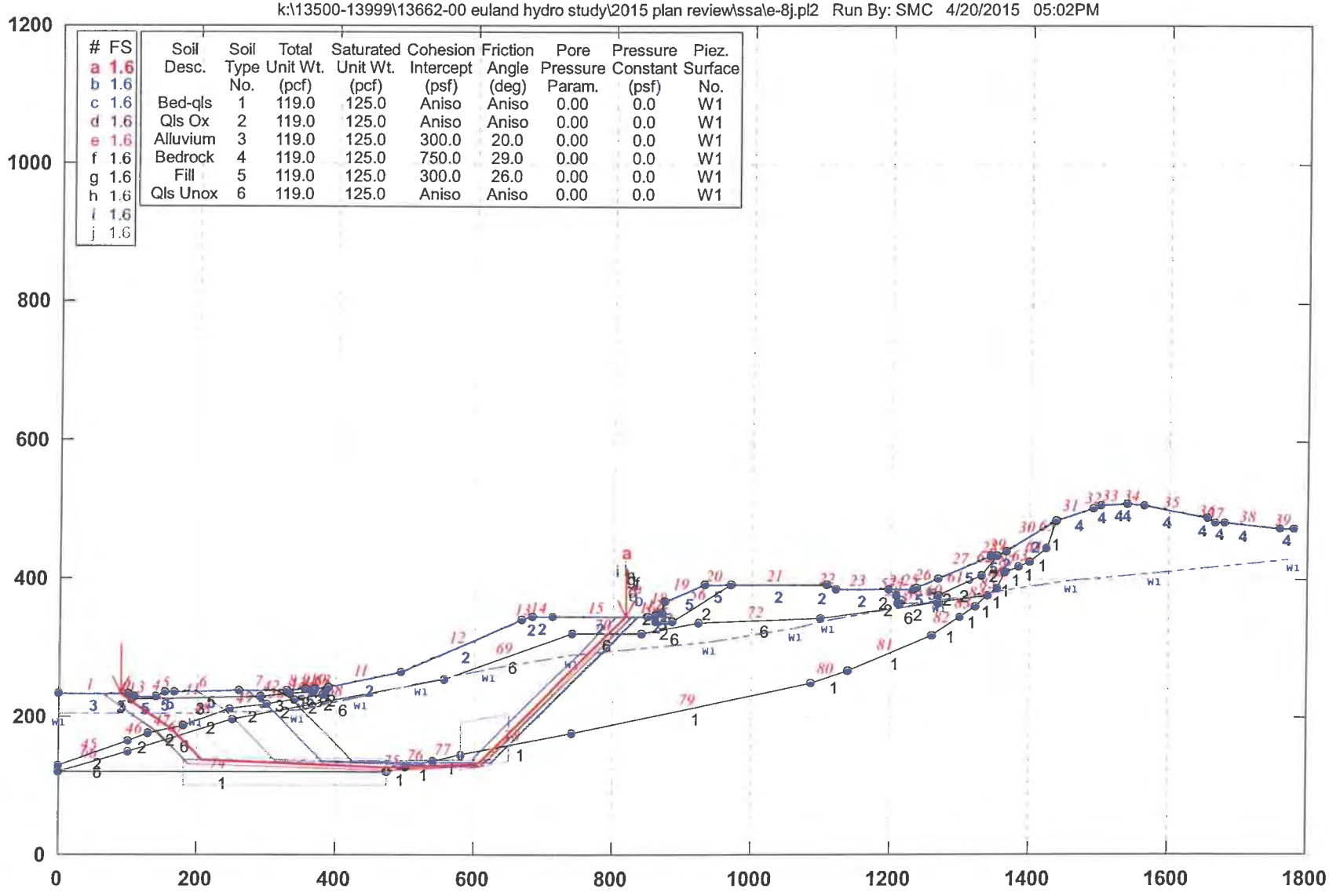
Factor of Safety

*** 1.679 ***

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

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8j.pl2 Run By: SMC 4/20/2015 05:02PM



FS
a 1.6
b 1.6
c 1.6
d 1.6
e 1.6
f 1.6
g 1.6
h 1.6
i 1.6
j 1.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-34.1

13662-00, Euland, Section E-E', Static

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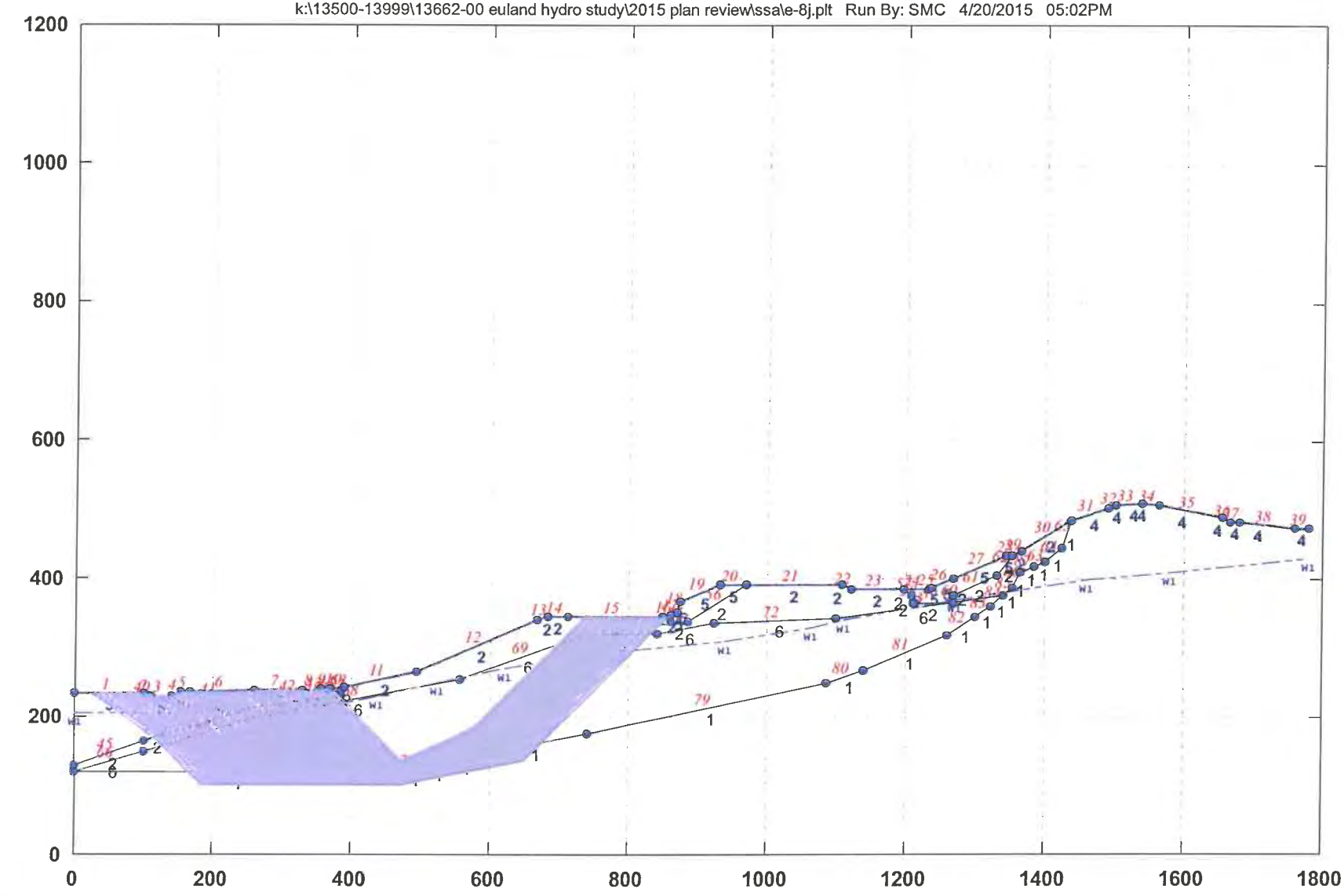

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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****

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: 4/20/2015
Time of Run: 05:02PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8j.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8j.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8j.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00

2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	40.00
2	475.00	120.00	475.00	120.00	40.00
3	580.00	157.00	650.00	170.00	70.00

The Factor Of Safety For The Trial Failure Surface Defined By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.10	240.00
2	368.22	235.55
3	375.77	230.26
4	385.26	220.78
5	401.91	204.13

6	437.26	168.77
7	472.62	133.42
8	475.00	120.19
9	594.09	184.67
10	629.45	220.02
11	664.81	255.38
12	700.16	290.73
13	722.46	313.03
14	754.43	345.00

Factor Of Safety For The Preceding Specified Surface = 1.585
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.94	239.88
2	360.44	234.57
3	368.43	228.98
4	378.03	219.38
5	397.89	199.52
6	433.24	164.16
7	468.60	128.81
8	475.00	106.21
9	647.83	197.52
10	683.18	232.87
11	718.54	268.23
12	753.89	303.58
13	770.31	320.00
14	795.31	345.00

Factor of Safety for the Preceding Surface is Between-3.110 and 1.829
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	338.52	239.34
2	347.36	233.82
3	357.11	226.99
4	366.88	217.22
5	393.39	190.71
6	428.75	155.36
7	464.10	120.00
8	473.05	111.05
9	475.00	104.55
10	613.34	170.43
11	648.69	205.79
12	684.05	241.14
13	719.40	276.50
14	754.76	311.85
15	762.90	320.00
16	787.90	345.00

Factor of Safety for the Preceding Surface is Between 1.952 and 2.884
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	354.12	239.96
2	362.56	234.69
3	370.27	229.30
4	379.83	219.73
5	398.89	200.67
6	434.25	165.31
7	469.60	129.96
8	475.00	109.70
9	599.39	170.30
10	634.75	205.66
11	670.10	241.01
12	705.46	276.37
13	740.81	311.73

14	749.09	320.00
15	774.09	345.00

Factor of Safety for the Preceding Surface is Between 2.065 and 6.457
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	358.21	240.00
2	366.37	234.91
3	373.56	229.87
4	383.07	220.35
5	398.03	205.40
6	433.39	170.04
7	468.74	134.69
8	475.00	100.99
9	630.91	141.77
10	647.14	158.01
11	682.50	193.36
12	717.85	228.72
13	753.21	264.08
14	788.56	299.43
15	809.13	320.00
16	834.13	345.00

Factor of Safety for the Preceding Surface is Between 1.263 and 1.155
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	358.70	240.00
2	366.81	234.93
3	373.94	229.94
4	383.45	220.43
5	400.90	202.97
6	436.26	167.62
7	471.61	132.26
8	475.00	116.70
9	642.53	141.88
10	661.42	160.78
11	696.78	196.13
12	732.13	231.49
13	767.49	266.84
14	802.85	302.20
15	820.65	320.00
16	845.65	345.00

Factor Of Safety For The Preceding Specified Surface = 1.498
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	365.60	240.00
2	369.12	237.80
3	379.06	230.84
4	388.50	221.40
5	401.05	208.85
6	436.40	173.50
7	471.76	138.14
8	475.00	111.48
9	625.61	156.13
10	660.96	191.49
11	696.32	226.85
12	731.67	262.20
13	767.03	297.56
14	789.47	320.00
15	814.47	345.00

Factor Of Safety For The Preceding Specified Surface = 1.424
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.

Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	363.61	240.00
2	368.72	236.80
3	377.61	230.58
4	387.06	221.13
5	402.91	205.28
6	438.27	169.92
7	473.62	134.57
8	475.00	123.69
9	615.66	170.45
10	651.02	205.81
11	686.37	241.17
12	721.73	276.52
13	757.08	311.88
14	765.21	320.00
15	790.21	345.00

Factor Of Safety For The Preceding Specified Surface = 1.618
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	367.05	240.00
2	369.35	238.39
3	377.23	230.51
4	386.69	221.05
5	400.04	207.70
6	435.40	172.35
7	470.75	136.99
8	475.00	107.99
9	604.04	170.35
10	639.40	205.70
11	674.75	241.06
12	710.11	276.41
13	745.46	311.77
14	753.69	320.00
15	778.69	345.00

Factor Of Safety For The Preceding Specified Surface = 1.388
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	363.69	240.00
2	368.74	236.85
3	375.39	230.19
4	384.88	220.70
5	399.04	206.55
6	434.39	171.19
7	469.75	135.84
8	475.00	104.49
9	582.47	184.56
10	617.83	219.91
11	653.18	255.27
12	688.54	290.63
13	704.56	306.64
14	739.91	342.00
15	742.91	345.00

Factor Of Safety For The Preceding Specified Surface = 0.154
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	356.38	240.00
2	364.69	234.81
3	372.10	229.62
4	381.64	220.08

5	399.90	201.82
6	435.25	166.47
7	470.61	131.11
8	475.00	113.20
9	620.96	156.09
10	656.32	191.45
11	691.67	226.80
12	727.03	262.16
13	762.38	297.51
14	784.87	320.00
15	809.87	345.00

Factor of Safety for the Preceding Surface is Between 1.517 and 1.079
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	368.25	240.00
2	369.65	239.13
3	380.59	231.47
4	390.30	221.75
5	402.05	210.01
6	437.41	174.65
7	472.76	139.29
8	475.00	114.98
9	647.18	141.92
10	667.14	161.88
11	702.49	197.24
12	737.85	232.59
13	773.20	267.95
14	808.56	303.30
15	825.25	320.00
16	850.28	345.03

Factor Of Safety For The Preceding Specified Surface = 1.490
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	349.77	239.79
2	358.32	234.45
3	366.59	228.65
4	376.22	219.03
5	396.88	198.36
6	432.24	163.01
7	467.59	127.65
8	475.00	102.71
9	626.26	141.73
10	641.43	156.90
11	676.79	192.26
12	712.14	227.61
13	747.50	262.97
14	782.85	298.32
15	804.53	320.00
16	829.53	345.00

Factor of Safety for the Preceding Surface is Between 1.845 and******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.10	240.00
2	368.22	235.55
3	375.77	230.26
4	385.26	220.78
5	401.91	204.13
6	437.26	168.77
7	472.62	133.42
8	475.00	120.19
9	594.09	184.67

10	629.45	220.02
11	664.81	255.38
12	700.16	290.73
13	722.46	313.03
14	754.43	345.00

Factor Of Safety For The Preceding Specified Surface = 1.585
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

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

##################### SOME LINES SKIPPED ####################

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 = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 10
Number of Trial Surfaces with Misleading FS = 9
Number of Trial Surfaces With Valid FS = 2981
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.6 %
Statistical Data On All Valid FS Values:
FS Max = 2.591 FS Min = 1.554 FS Ave = 1.927
Standard Deviation = 0.153 Coefficient of Variation = 7.95 %
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.920	233.000
2	120.882	211.320
3	161.840	182.641
4	172.899	171.582
5	207.042	137.439
6	475.000	127.654
7	604.144	131.231
8	627.024	154.111
9	662.379	189.466
10	697.735	224.822
11	733.090	260.177
12	768.445	295.532
13	792.913	320.000
14	817.913	345.000

Factor of Safety
*** 1.554 ***

Individual data on the 54 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.1	4233.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	5.0	4794.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	5.0	5985.4	0.0	0.0	0.	0.	0.0	0.0	0.0
4	10.9	19255.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	9.5	24919.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	9.6	33000.3	0.0	2477.6	0.	0.	0.0	0.0	0.0
7	13.0	61400.8	0.0	11247.1	0.	0.	0.0	0.0	0.0
8	8.8	52831.9	0.0	12833.4	0.	0.	0.0	0.0	0.0
9	4.2	27557.8	0.0	8909.2	0.	0.	0.0	0.0	0.0
10	6.9	50528.6	0.0	18157.5	0.	0.	0.0	0.0	0.0
11	7.1	58347.0	0.0	23097.1	0.	0.	0.0	0.0	0.0
12	18.0	176720.8	0.0	78584.9	0.	0.	0.0	0.0	0.0
13	9.0	104374.6	0.0	50395.6	0.	0.	0.0	0.0	0.0
14	25.1	306211.1	0.0	*******	0.	0.	0.0	0.0	0.0
15	15.9	196348.7	0.0	69581.4	0.	0.	0.0	0.0	0.0
16	4.0	49737.1	0.0	17697.8	0.	0.	0.0	0.0	0.0
17	8.0	99824.5	0.0	35606.9	0.	0.	0.0	0.0	0.0
18	32.0	404414.9	0.0	*******	0.	0.	0.0	0.0	0.0
19	8.0	102410.7	0.0	37015.4	0.	0.	0.0	0.0	0.0

20	26.2	339635.8	0.0	*******	0.	0.	0.0	0.0	0.0
21	3.8	49060.3	0.0	17907.2	0.	0.	0.0	0.0	0.0
22	3.0	39280.1	0.0	14349.5	0.	0.	0.0	0.0	0.0
23	7.0	91987.0	0.0	33636.3	0.	0.	0.0	0.0	0.0
24	5.0	65990.9	0.0	24158.0	0.	0.	0.0	0.0	0.0
25	10.0	132645.8	0.0	48119.4	0.	0.	0.0	0.0	0.0
26	13.0	173623.2	0.0	64892.7	0.	0.	0.0	0.0	0.0
27	2.0	26799.0	0.0	10218.0	0.	0.	0.0	0.0	0.0
28	10.0	135238.3	0.0	52028.2	0.	0.	0.0	0.0	0.0
29	5.0	68507.8	0.0	26600.4	0.	0.	0.0	0.0	0.0
30	5.0	69100.2	0.0	26991.3	0.	0.	0.0	0.0	0.0
31	46.0	671014.2	0.0	*******	0.	0.	0.0	0.0	0.0
32	16.3	253142.1	0.0	*******	0.	0.	0.0	0.0	0.0
33	22.7	366775.2	0.0	*******	0.	0.	0.0	0.0	0.0
34	20.0	334496.8	0.0	*******	0.	0.	0.0	0.0	0.0
35	15.6	269709.1	0.0	*******	0.	0.	0.0	0.0	0.0
36	12.4	224488.5	0.0	90708.6	0.	0.	0.0	0.0	0.0
37	17.0	319130.0	0.0	*******	0.	0.	0.0	0.0	0.0
38	17.0	333473.3	0.0	*******	0.	0.	0.0	0.0	0.0
39	19.2	394895.3	0.0	*******	0.	0.	0.0	0.0	0.0
40	3.8	79104.7	0.0	30004.7	0.	0.	0.0	0.0	0.0
41	24.1	525815.2	0.0	*******	0.	0.	0.0	0.0	0.0
42	16.9	367007.0	0.0	*******	0.	0.	0.0	0.0	0.0
43	6.0	126236.8	0.0	62629.0	0.	0.	0.0	0.0	0.0
44	35.4	688182.6	0.0	*******	0.	0.	0.0	0.0	0.0
45	4.6	83284.4	0.0	34377.2	0.	0.	0.0	0.0	0.0
46	15.0	258390.6	0.0	*******	0.	0.	0.0	0.0	0.0
47	15.7	245759.1	0.0	88272.6	0.	0.	0.0	0.0	0.0
48	14.3	196286.5	0.0	64476.5	0.	0.	0.0	0.0	0.0
49	21.1	243986.1	0.0	68226.3	0.	0.	0.0	0.0	0.0
50	8.9	86512.0	0.0	19109.8	0.	0.	0.0	0.0	0.0
51	23.3	179403.0	0.0	21357.9	0.	0.	0.0	0.0	0.0
52	3.2	19336.5	0.0	0.0	0.	0.	0.0	0.0	0.0
53	24.5	108412.6	0.0	0.0	0.	0.	0.0	0.0	0.0
54	25.0	37187.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.152	237.319
2	283.239	229.766
3	298.838	218.844
4	311.225	206.457
5	345.531	172.150
6	380.887	136.794
7	475.000	132.478
8	625.301	133.485
9	650.469	158.653
10	685.825	194.009
11	721.180	229.364
12	756.535	264.719
13	791.891	300.075
14	811.816	320.000
15	836.816	345.000

Factor of Safety

*** 1.557 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.765	233.000
2	100.658	206.467
3	141.616	177.788
4	153.550	165.854
5	187.375	132.029
6	475.000	122.087
7	612.039	129.245
8	639.280	156.486
9	674.635	191.841
10	709.991	227.196
11	745.346	262.552
12	780.701	297.907

13	802.795	320.000
14	827.795	345.000

Factor of Safety
*** 1.575 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.765	233.000
2	100.658	206.467
3	141.616	177.788
4	153.550	165.854
5	187.375	132.029
6	475.000	122.087
7	612.039	129.245
8	639.280	156.486
9	674.635	191.841
10	709.991	227.196
11	745.346	262.552
12	780.701	297.907
13	802.795	320.000
14	827.795	345.000

Factor of Safety
*** 1.575 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	314.534	238.558
2	324.432	232.373
3	336.937	223.617
4	347.148	213.406
5	354.104	206.450
6	389.459	171.095
7	424.815	135.740
8	475.000	136.736
9	628.104	137.628
10	648.806	158.331
11	684.162	193.687
12	719.517	229.042
13	754.872	264.397
14	790.228	299.753
15	810.475	320.000
16	835.475	345.000

Factor of Safety
*** 1.576 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	314.534	238.558
2	324.432	232.373
3	336.937	223.617
4	347.148	213.406
5	354.104	206.450
6	389.459	171.095
7	424.815	135.740
8	475.000	136.736
9	628.104	137.628
10	648.806	158.331
11	684.162	193.687
12	719.517	229.042
13	754.872	264.397
14	790.228	299.753
15	810.475	320.000
16	835.475	345.000

Factor of Safety
*** 1.576 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	200.307	235.730
2	212.863	227.884

3	239.835	208.998
4	253.536	195.297
5	276.195	172.638
6	311.550	137.283
7	475.000	131.248
8	607.151	127.141
9	635.827	155.817
10	671.183	191.172
11	706.538	226.527
12	741.893	261.883
13	777.249	297.238
14	800.011	320.000
15	825.011	345.000

Factor of Safety
*** 1.578 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	200.307	235.730
2	212.863	227.884
3	239.835	208.998
4	253.536	195.297
5	276.195	172.638
6	311.550	137.283
7	475.000	131.248
8	607.151	127.141
9	635.827	155.817
10	671.183	191.172
11	706.538	226.527
12	741.893	261.883
13	777.249	297.238
14	800.011	320.000
15	825.011	345.000

Factor of Safety
*** 1.578 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.792	233.000
2	99.934	206.293
3	140.892	177.614
4	152.857	165.648
5	181.633	136.873
6	475.000	130.681
7	588.797	129.030
8	610.719	150.952
9	646.074	186.307
10	681.430	221.662
11	716.785	257.018
12	752.140	292.373
13	779.767	320.000
14	804.767	345.000

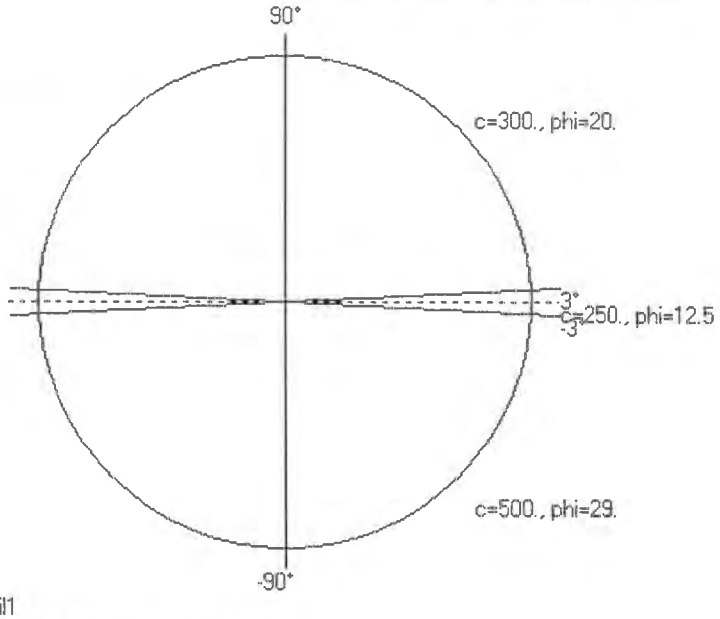
Factor of Safety
*** 1.578 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	140.383	230.147
2	146.830	226.118
3	153.925	221.150
4	194.883	192.472
5	205.979	181.375
6	215.615	171.740
7	250.970	136.384
8	475.000	131.912
9	606.946	135.374
10	625.361	153.789
11	660.716	189.144
12	696.072	224.499
13	731.427	259.855

```
14          766.782       295.210
15          791.572       320.000
16          816.572       345.000
     Factor of Safety
***     1.580    ***
     **** END OF GSTABL7 OUTPUT ****
```

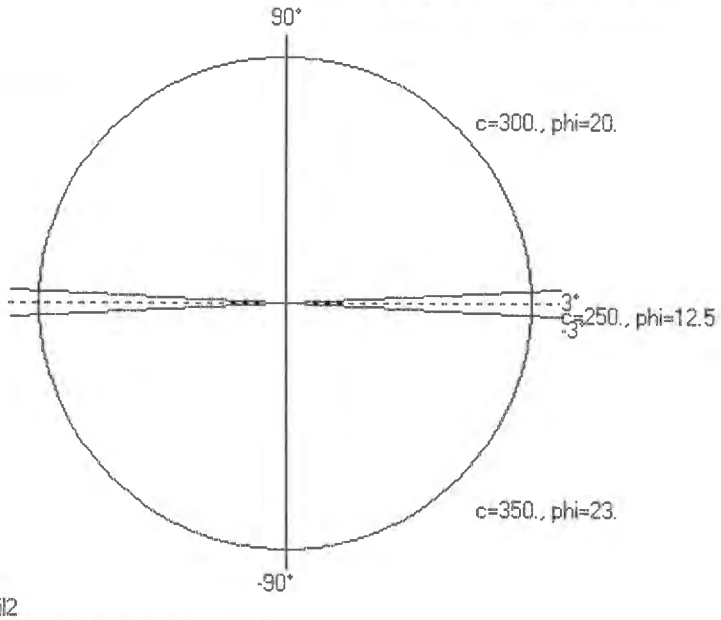
Anisotropic Soil Definition



Soil1

13662-00, Euland, Section E-E',

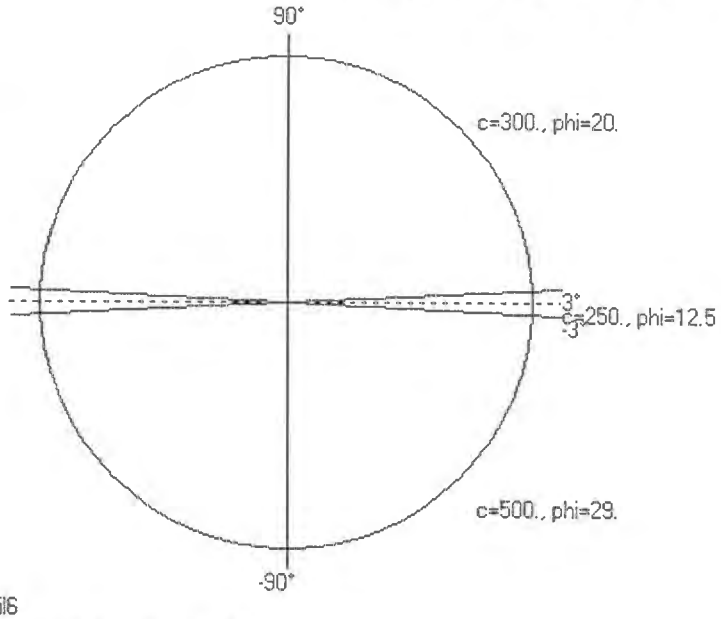
Anisotropic Soil Definition



Soil2

13662-00, Euland, Section E-E',

Anisotropic Soil Definition

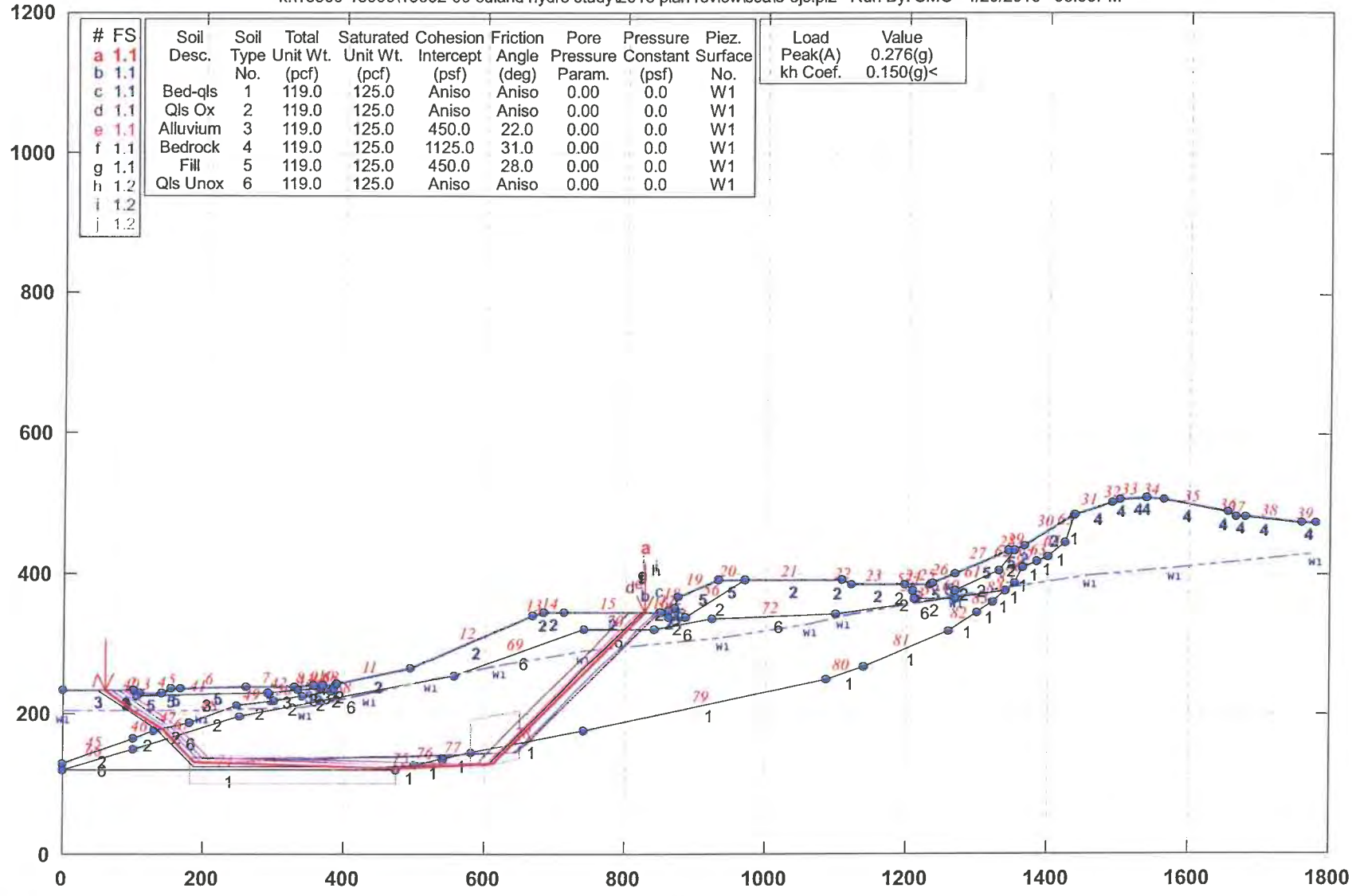


Soil6

13662-00, Euland, Section E-E',

13662-00, Euland, Section E-E', Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8js.pl2 Run By: SMC 4/20/2015 05:05PM



#	FS
a	1.1
b	1.1
c	1.1
d	1.1
e	1.1
f	1.1
g	1.1
h	1.2
i	1.2
j	1.2

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.1

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-34.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 05:05PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8js.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8js.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8js.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00

2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	40.00
2	475.00	120.00	475.00	120.00	40.00
3	580.00	157.00	650.00	170.00	70.00

The Factor Of Safety For The Trial Failure Surface Defined By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	360.50	240.00

2	368.16	235.40
3	375.77	230.26
4	385.26	220.78
5	401.91	204.13
6	437.26	168.77
7	472.62	133.42
8	475.00	120.19
9	594.09	184.67
10	629.45	220.02
11	664.81	255.38
12	700.16	290.73
13	722.46	313.03
14	754.43	345.00

Factor Of Safety For The Preceding Specified Surface = 1.403
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.34	239.85
2	360.16	234.55
3	368.43	228.98
4	378.03	219.38
5	397.89	199.52
6	433.24	164.16
7	468.60	128.81
8	475.00	106.21
9	647.83	197.52
10	683.18	232.87
11	718.54	268.23
12	753.89	303.58
13	770.31	320.00
14	795.31	345.00

Factor of Safety for the Preceding Surface is Between 1.866 and-0.261
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	337.84	239.31
2	347.02	233.80
3	357.11	226.99
4	366.88	217.22
5	393.39	190.71
6	428.75	155.36
7	464.10	120.00
8	473.05	111.05
9	475.00	104.55
10	613.34	170.43
11	648.69	205.79
12	684.05	241.14
13	719.40	276.50
14	754.76	311.85
15	762.90	320.00
16	787.90	345.00

Factor Of Safety For The Preceding Specified Surface = 1.444
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	353.53	239.94
2	362.29	234.67
3	370.27	229.30
4	379.83	219.73
5	398.89	200.67
6	434.25	165.31
7	469.60	129.96
8	475.00	109.70
9	599.39	170.30

10	634.75	205.66
11	670.10	241.01
12	705.46	276.37
13	740.81	311.73
14	749.09	320.00
15	774.09	345.00

Factor of Safety for the Preceding Surface is Between 0.650 and 1.640
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	357.61	240.00
2	366.11	234.89
3	373.56	229.87
4	383.07	220.35
5	398.03	205.40
6	433.39	170.04
7	468.74	134.69
8	475.00	100.99
9	630.91	141.77
10	647.14	158.01
11	682.50	193.36
12	717.85	228.72
13	753.21	264.08
14	788.56	299.43
15	809.13	320.00
16	834.13	345.00

Factor Of Safety For The Preceding Specified Surface = 0.233
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	358.10	240.00
2	366.56	234.92
3	373.94	229.94
4	383.45	220.43
5	400.90	202.97
6	436.26	167.62
7	471.61	132.26
8	475.00	116.70
9	642.53	141.88
10	661.42	160.78
11	696.78	196.13
12	732.13	231.49
13	767.49	266.84
14	802.85	302.20
15	820.65	320.00
16	845.65	345.00

Factor Of Safety For The Preceding Specified Surface = 1.277
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	352.16	239.89
2	360.96	234.60
3	369.12	229.10
4	378.70	219.51
5	390.28	207.93
6	425.64	172.58
7	460.99	137.22
8	475.00	102.60
9	634.53	182.98
10	669.88	218.34
11	705.24	253.69
12	740.60	289.05
13	771.55	320.00
14	796.55	345.00

Factor of Safety for the Preceding Surface is Between 1.402 and-3.362
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	354.35	239.97
2	363.09	234.72
3	370.95	229.42
4	380.51	219.86
5	391.28	209.09
6	426.64	173.73
7	462.00	138.38
8	475.00	106.09
9	586.10	155.77
10	621.45	191.12
11	656.81	226.48
12	692.16	261.84
13	727.52	297.19
14	750.33	320.00
15	775.33	345.00

Factor of Safety for the Preceding Surface is Between 1.433 and-5.365
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	365.04	240.00
2	369.04	237.60
3	379.06	230.84
4	388.50	221.40
5	401.05	208.85
6	436.40	173.50
7	471.76	138.14
8	475.00	111.48
9	625.61	156.13
10	660.96	191.49
11	696.32	226.85
12	731.67	262.20
13	767.03	297.56
14	789.47	320.00
15	814.47	345.00

Factor Of Safety For The Preceding Specified Surface = 1.240
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	335.65	239.23
2	344.88	233.68
3	355.27	226.67
4	365.07	216.87
5	391.23	190.71
6	426.59	155.36
7	461.94	120.00
8	472.04	109.90
9	475.00	101.05
10	591.77	184.65
11	627.13	220.00
12	662.48	255.36
13	697.84	290.71
14	718.88	311.75
15	752.13	345.00

Factor of Safety for the Preceding Surface is Between 2.118 and-0.698
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	356.64	240.00

2	365.22	234.84
3	372.79	229.74
4	382.32	220.21
5	392.29	210.24
6	427.64	174.88
7	463.00	139.53
8	475.00	109.59
9	607.66	141.56
10	618.58	152.48
11	653.94	187.83
12	689.29	223.19
13	724.65	258.54
14	760.00	293.90
15	786.11	320.00
16	811.11	345.00

Factor of Safety for the Preceding Surface is Between 1.422 and 6.253
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	363.03	240.00
2	368.65	236.62
3	377.61	230.58
4	387.06	221.13
5	402.91	205.28
6	438.27	169.92
7	473.62	134.57
8	475.00	123.69
9	615.66	170.45
10	651.02	205.81
11	686.37	241.17
12	721.73	276.52
13	757.08	311.88
14	765.21	320.00
15	790.21	345.00

Factor Of Safety For The Preceding Specified Surface = 1.373
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	366.96	240.00
2	369.35	238.39
3	377.23	230.51
4	386.69	221.05
5	400.04	207.70
6	435.40	172.35
7	470.75	136.99
8	475.00	107.99
9	604.04	170.35
10	639.40	205.70
11	674.75	241.06
12	710.11	276.41
13	745.46	311.77
14	753.69	320.00
15	778.69	345.00

Factor of Safety for the Preceding Surface is Between 1.153 and 1.144
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	363.49	240.00
2	368.74	236.85
3	375.39	230.19
4	384.88	220.70
5	399.04	206.55
6	434.39	171.19
7	469.75	135.84

8	475.00	104.49
9	582.47	184.56
10	617.83	219.91
11	653.18	255.27
12	688.54	290.63
13	704.56	306.64
14	739.91	342.00
15	742.91	345.00

Factor of Safety for the Preceding Surface is Between 0.099 and 0.091
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	355.76	240.00

###################### SOME LINES SKIPPED ######################

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 = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 13
Number of Trial Surfaces with Misleading FS = 12
Number of Trial Surfaces With Valid FS = 2975
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.8 %
Statistical Data On All Valid FS Values:
FS Max = 1.976 FS Min = 1.113 FS Ave = 1.425
Standard Deviation = 0.111 Coefficient of Variation = 7.79 %
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.761	233.000
2	100.164	205.747
3	141.616	177.788
4	153.550	165.854
5	187.375	132.029
6	475.000	122.087
7	612.039	129.245
8	639.280	156.486
9	674.635	191.841
10	709.991	227.196
11	745.346	262.552
12	780.701	297.907
13	802.795	320.000
14	827.795	345.000

Factor of Safety
*** 1.113 ***

Individual data on the 55 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	40.2	64983.8	0.0	0.0	0.	0.	9747.6	0.0	0.0
2	0.2	530.9	0.0	0.0	0.	0.	79.6	0.0	0.0
3	1.8	5989.0	0.0	0.0	0.	0.	898.4	0.0	0.0
4	3.0	10204.9	0.0	231.5	0.	0.	1530.7	0.0	0.0
5	5.0	17932.9	0.0	1408.8	0.	0.	2689.9	0.0	0.0
6	30.0	149200.3	0.0	35305.8	0.	0.	22380.0	0.0	0.0
7	1.6	10251.8	0.0	3208.6	0.	0.	1537.8	0.0	0.0
8	11.4	84479.7	0.0	32797.7	0.	0.	12671.9	0.0	0.0
9	0.6	4637.2	0.0	1876.5	0.	0.	695.6	0.0	0.0
10	12.4	115038.7	0.0	49634.4	0.	0.	17255.8	0.0	0.0
11	14.0	152760.6	0.0	72236.0	0.	0.	22914.1	0.0	0.0
12	7.4	90528.1	0.0	45044.4	0.	0.	13579.2	0.0	0.0
13	10.6	135804.6	0.0	48511.6	0.	0.	20370.7	0.0	0.0
14	34.1	441412.2	0.0	*******	0.	0.	66211.8	0.0	0.0
15	15.9	208311.6	0.0	75548.8	0.	0.	31246.7	0.0	0.0

16	4.0	52740.0	0.0	19195.7	0.	0.	7911.0	0.0	0.0
17	8.0	105818.6	0.0	38596.8	0.	0.	15872.8	0.0	0.0
18	32.0	428235.1	0.0	*******	0.	0.	64235.3	0.0	0.0
19	8.0	108326.6	0.0	39966.2	0.	0.	16249.0	0.0	0.0
20	26.2	358933.8	0.0	*******	0.	0.	53840.1	0.0	0.0
21	3.8	51808.0	0.0	19277.7	0.	0.	7771.2	0.0	0.0
22	3.0	41472.6	0.0	15443.1	0.	0.	6220.9	0.0	0.0
23	7.0	97094.2	0.0	36183.6	0.	0.	14564.1	0.0	0.0
24	5.0	69631.6	0.0	25973.8	0.	0.	10444.7	0.0	0.0
25	10.0	139901.0	0.0	51660.5	0.	0.	20985.2	0.0	0.0
26	13.0	183018.5	0.0	69478.1	0.	0.	27452.8	0.0	0.0
27	2.0	28240.8	0.0	10921.7	0.	0.	4236.1	0.0	0.0
28	10.0	142432.5	0.0	55539.2	0.	0.	21364.9	0.0	0.0
29	5.0	72095.8	0.0	28351.4	0.	0.	10814.4	0.0	0.0
30	5.0	72682.1	0.0	28739.2	0.	0.	10902.3	0.0	0.0
31	46.0	703681.4	0.0	*******	0.	0.	*******	0.0	0.0
32	16.3	264581.7	0.0	*******	0.	0.	39687.2	0.0	0.0
33	22.7	382624.6	0.0	*******	0.	0.	57393.7	0.0	0.0
34	10.4	179841.9	0.0	74623.7	0.	0.	26976.3	0.0	0.0
35	9.6	167941.6	0.0	69937.7	0.	0.	25191.2	0.0	0.0
36	5.0	88517.7	0.0	36816.7	0.	0.	13277.7	0.0	0.0
37	23.0	422223.0	0.0	*******	0.	0.	63333.5	0.0	0.0
38	17.0	328004.7	0.0	*******	0.	0.	49200.7	0.0	0.0
39	17.0	341462.6	0.0	*******	0.	0.	51219.4	0.0	0.0
40	19.2	402872.5	0.0	*******	0.	0.	60430.9	0.0	0.0
41	3.8	80527.3	0.0	30731.7	0.	0.	12079.1	0.0	0.0
42	32.0	714438.5	0.0	*******	0.	0.	*******	0.0	0.0
43	9.0	203618.7	0.0	*******	0.	0.	30542.8	0.0	0.0
44	18.3	397560.0	0.0	*******	0.	0.	59634.0	0.0	0.0
45	27.7	556925.4	0.0	*******	0.	0.	83538.8	0.0	0.0
46	7.6	143321.7	0.0	59975.9	0.	0.	21498.3	0.0	0.0
47	7.4	133584.6	0.0	53834.6	0.	0.	20037.7	0.0	0.0
48	28.0	450475.8	0.0	*******	0.	0.	67571.4	0.0	0.0
49	2.0	28601.3	0.0	9915.5	0.	0.	4290.2	0.0	0.0
50	30.0	367529.6	0.0	*******	0.	0.	55129.4	0.0	0.0
51	3.3	34080.8	0.0	8605.2	0.	0.	5112.1	0.0	0.0
52	30.9	248976.2	0.0	37703.6	0.	0.	37346.4	0.0	0.0
53	4.4	26096.7	0.0	0.0	0.	0.	3914.5	0.0	0.0
54	22.1	94769.5	0.0	0.0	0.	0.	14215.4	0.0	0.0
55	25.0	37187.5	0.0	0.0	0.	0.	5578.1	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.761	233.000
2	100.164	205.747
3	141.616	177.788
4	153.550	165.854
5	187.375	132.029
6	475.000	122.087
7	612.039	129.245
8	639.280	156.486
9	674.635	191.841
10	709.991	227.196
11	745.346	262.552
12	780.701	297.907
13	802.795	320.000
14	827.795	345.000

Factor of Safety

*** 1.113 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.254	233.000
2	113.067	208.844
3	154.519	180.884
4	165.895	169.508
5	200.151	135.251
6	475.000	137.966
7	646.253	143.973
8	663.448	161.168

9	698.804	196.523
10	734.159	231.879
11	769.515	267.234
12	804.870	302.589
13	822.280	320.000
14	847.280	345.000

Factor of Safety
*** 1.115 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	58.778	233.000
2	99.440	205.574
3	140.892	177.614
4	152.857	165.648
5	181.633	136.873
6	475.000	130.681
7	588.797	129.030
8	610.719	150.952
9	646.074	186.307
10	681.430	221.662
11	716.785	257.018
12	752.140	292.373
13	779.767	320.000
14	804.767	345.000

Factor of Safety
*** 1.116 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	87.180	233.000
2	120.388	210.601
3	161.840	182.641
4	172.899	171.582
5	207.042	137.439
6	475.000	127.654
7	604.144	131.231
8	627.024	154.111
9	662.379	189.466
10	697.735	224.822
11	733.090	260.177
12	768.445	295.532
13	792.913	320.000
14	817.913	345.000

Factor of Safety
*** 1.117 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.817	233.000
2	52.116	232.124
3	93.568	204.164
4	135.020	176.205
5	147.239	163.985
6	150.871	160.353
7	186.227	124.998
8	475.000	123.806
9	607.391	129.202
10	633.568	155.379
11	668.923	190.734
12	704.279	226.089
13	739.634	261.445
14	774.989	296.800
15	798.189	320.000
16	823.189	345.000

Factor of Safety
*** 1.148 ***

Failure Surface Specified By 16 Coordinate Points

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

1	50.817	233.000
2	52.116	232.124
3	93.568	204.164
4	135.020	176.205
5	147.239	163.985
6	150.871	160.353
7	186.227	124.998
8	475.000	123.806
9	607.391	129.202
10	633.568	155.379
11	668.923	190.734
12	704.279	226.089
13	739.634	261.445
14	774.989	296.800
15	798.189	320.000
16	823.189	345.000

Factor of Safety
*** 1.148 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.310	233.000
2	106.470	207.261
3	147.922	179.301
4	159.583	167.640
5	163.648	163.576
6	199.003	128.220
7	475.000	139.685
8	641.605	143.930
9	657.736	160.061
10	693.092	195.417
11	728.447	230.772
12	763.802	266.127
13	799.158	301.483
14	817.675	320.000
15	842.675	345.000

Factor of Safety
*** 1.151 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.310	233.000
2	106.470	207.261
3	147.922	179.301
4	159.583	167.640
5	163.648	163.576
6	199.003	128.220
7	475.000	139.685
8	641.605	143.930
9	657.736	160.061
10	693.092	195.417
11	728.447	230.772
12	763.802	266.127
13	799.158	301.483
14	817.675	320.000
15	842.675	345.000

Factor of Safety
*** 1.151 ***

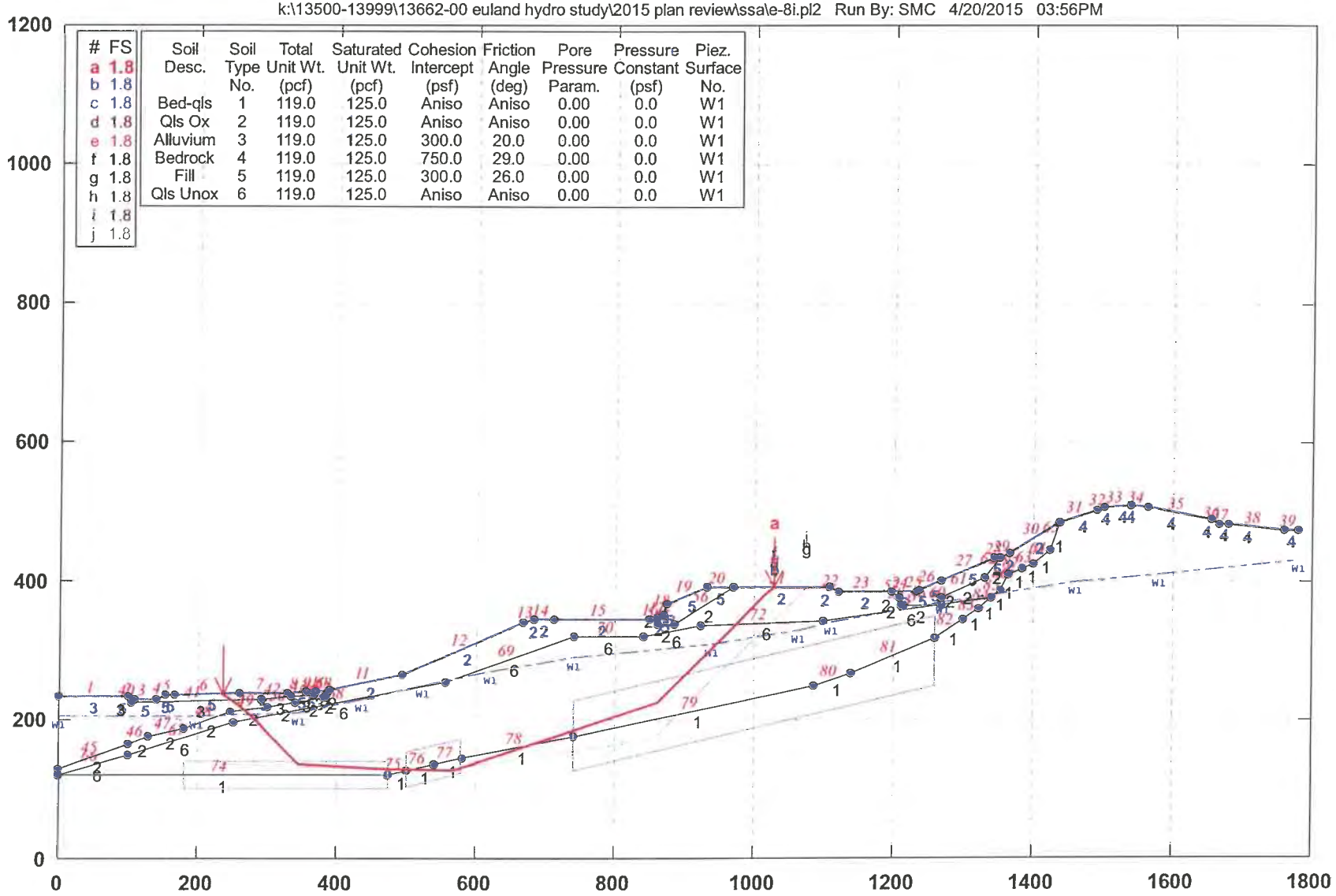
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.420	233.000
2	97.700	205.156
3	139.152	177.196
4	151.193	165.156
5	180.628	135.720
6	475.000	127.185
7	637.230	156.242
8	672.585	191.598
9	707.940	226.953

```
10          743.296       262.308
11          778.651       297.664
12          800.987       320.000
13          825.987       345.000
    Factor of Safety
***     1.152    ***
     **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8i.pl2 Run By: SMC 4/20/2015 03:56PM



#	FS
a	1.8
b	1.8
c	1.8
d	1.8
e	1.8
f	1.8
g	1.8
h	1.8
i	1.8
j	1.8

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bed-qls	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

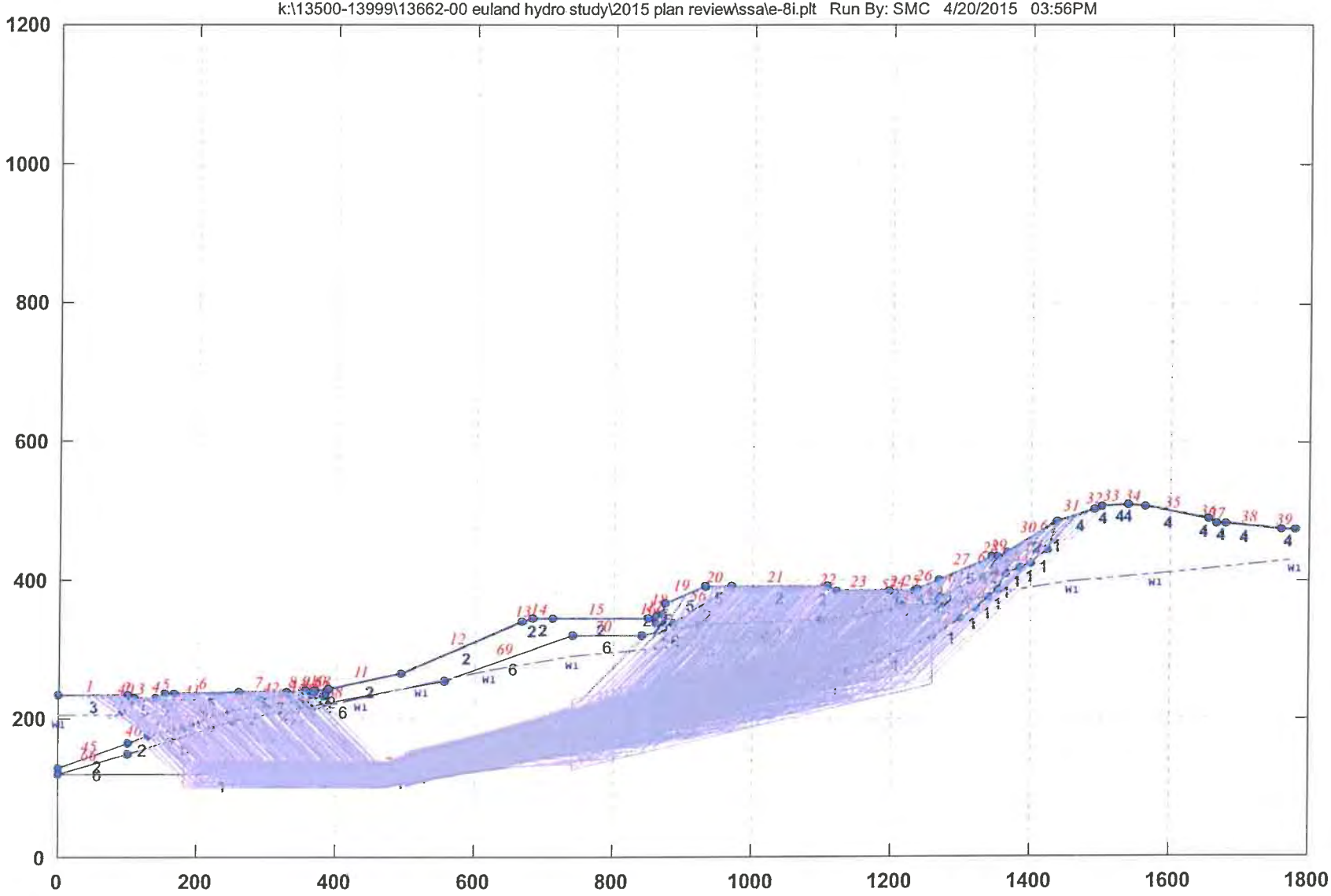
GSTABL7 v.2 FSmin=1.8

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-35.1

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-8i.plt Run By: SMC 4/20/2015 03:56PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 03:56PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8i.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8i.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8i.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00

2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	40.00
2	475.00	120.00	475.00	120.00	40.00
3	500.00	128.00	579.00	147.00	50.00
4	740.00	176.00	1260.00	300.00	100.00

The Factor Of Safety For The Trial Failure Surface Defined By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.10	240.00
2	368.22	235.55
3	375.77	230.26
4	385.26	220.78

5	387.77	218.27
6	430.19	175.84
7	472.62	133.42
8	475.00	120.19
9	515.91	149.72
10	980.54	232.18
11	1022.97	274.61
12	1065.40	317.04
13	1089.96	341.60
14	1132.36	384.00

Factor Of Safety For The Preceding Specified Surface = 1.953
Theta (ki = 1.0) = 8.17 Deg Lambda =
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.94	239.88
2	360.44	234.57
3	368.43	228.98
4	378.03	219.38
5	383.75	213.66
6	426.17	171.23
7	468.60	128.81
8	475.00	106.21
9	576.55	166.35
10	1160.31	280.71
11	1202.74	323.14
12	1241.67	362.07
13	1245.60	366.00
14	1266.45	399.37

Factor of Safety for the Preceding Surface is Between 2.690 and 2.734
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.94	239.88
2	360.44	234.57
3	368.43	228.98
4	378.03	219.38
5	383.75	213.66
6	426.17	171.23
7	468.60	128.81
8	475.00	106.21
9	576.55	166.35
10	1160.31	280.71
11	1202.74	323.14
12	1241.67	362.07
13	1245.60	366.00
14	1266.45	399.37

Factor Of Safety For The Preceding Specified Surface = 1.532
Theta (ki = 1.0) = 3.08 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	3.192	3.097	0.176
15.00	1.573	1.796	0.268
12.00	3.371	3.593	0.213
89.94	2.062	1.997	*****
66.41	0.000	-0.004	2.290
56.42	0.000	-0.003	1.506
0.00	0.000	-0.059	0.000
79.95	0.000	-0.002	5.644
83.48	0.000	28.244	8.748
79.95	0.000	-0.002	5.644
78.78	0.000	-0.003	5.041
83.93	4.675	2.312	9.397

78.77	0.000	-0.003	5.036
77.04	0.000	0.845	4.345
78.76	0.000	0.000	5.032
78.76	0.000	0.000	5.032
78.76	0.000	0.000	5.032
78.76	0.000	0.000	5.032
78.76	0.000	0.000	5.032
78.76	0.000	0.000	5.032

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	343.69	239.55
2	352.40	234.11
3	361.47	227.76
4	371.17	218.05
5	382.60	206.63
6	425.02	164.20
7	467.45	121.77
8	475.00	107.93
9	571.30	165.68
10	914.53	195.15
11	937.08	217.70
12	979.50	260.13
13	1021.93	302.55
14	1059.79	340.41
15	1102.21	382.84
16	1109.30	389.93

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	336.35	239.25
2	345.24	233.70
3	355.27	226.67
4	365.07	216.87
5	377.09	204.85
6	419.52	162.43
7	461.94	120.00
8	472.04	109.90
9	475.00	101.05
10	513.28	149.38
11	857.65	189.40
12	872.23	203.98
13	914.66	246.41
14	957.08	288.83
15	999.51	331.26
16	1006.56	338.30
17	1048.98	380.73
18	1059.25	391.00

Factor Of Safety For The Preceding Specified Surface = 2.013
Theta (ki = 1.0) = 8.58 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	360.57	240.00
2	368.12	235.29
3	375.39	230.19
4	384.88	220.70
5	384.89	220.69
6	427.32	178.26
7	469.75	135.84
8	475.00	104.49
9	502.79	148.03
10	886.09	242.28
11	928.52	284.70
12	970.94	327.13

13	981.11	337.30
14	1023.54	379.72
15	1034.81	391.00

Factor Of Safety For The Preceding Specified Surface = 1.666
Theta (ki = 1.0) = 7.68 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.10	240.00
2	368.22	235.55
3	375.77	230.26
4	385.26	220.78
5	387.77	218.27
6	430.19	175.84
7	472.62	133.42
8	475.00	120.19
9	515.91	149.72
10	980.54	232.18
11	1022.97	274.61
12	1065.40	317.04
13	1089.96	341.60
14	1132.36	384.00

Factor Of Safety For The Preceding Specified Surface = 1.953
Theta (ki = 1.0) = 8.17 Deg Lambda =
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.94	239.88
2	360.44	234.57
3	368.43	228.98
4	378.03	219.38
5	383.75	213.66
6	426.17	171.23
7	468.60	128.81
8	475.00	106.21
9	576.55	166.35
10	1160.31	280.71
11	1202.74	323.14
12	1241.67	362.07
13	1245.60	366.00
14	1266.45	399.37

Factor of Safety for the Preceding Surface is Between 2.690 and 2.734
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.94	239.88
2	360.44	234.57
3	368.43	228.98
4	378.03	219.38
5	383.75	213.66
6	426.17	171.23
7	468.60	128.81
8	475.00	106.21
9	576.55	166.35
10	1160.31	280.71
11	1202.74	323.14
12	1241.67	362.07
13	1245.60	366.00
14	1266.45	399.37

Factor Of Safety For The Preceding Specified Surface = 1.532
Theta (ki = 1.0) = 3.08 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta	FOS	FOS

(deg) (ki=1.0)	(Moment) (Equil.)	(Force) (Equil.)	Lambda
10.00	3.193	3.097	0.176
15.00	1.573	1.796	0.268
12.00	3.371	3.594	0.213
89.94	2.062	1.997	*****
66.42	0.000	-0.004	2.291
56.43	0.000	-0.003	1.507
0.00	0.000	-0.059	0.000
79.97	0.000	-0.002	5.656
83.61	0.000	27.289	8.925
79.97	0.000	-0.002	5.656
78.76	0.000	-0.003	5.034
83.96	0.000	2.317	9.456
78.77	0.000	-0.003	5.038
77.05	0.000	0.846	4.350
78.76	0.000	0.000	5.034
78.76	0.000	0.000	5.034
78.76	0.000	0.000	5.034
78.76	0.000	0.000	5.034
78.76	0.000	0.000	5.034
78.76	0.000	0.000	5.034

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	343.69	239.55
2	352.40	234.11
3	361.47	227.76
4	371.17	218.05
5	382.60	206.63
6	425.02	164.20
7	467.45	121.77
8	475.00	107.93
9	571.30	165.68
10	914.53	195.15
11	937.08	217.70
12	979.50	260.13
13	1021.93	302.55
14	1059.79	340.41
15	1102.21	382.84
16	1109.30	389.93

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	2.091	2.156	0.176
15.00	2.234	2.856	0.268
9.22	2.049	2.075	0.162
6.96	1.912	1.868	0.122
8.12	1.985	1.969	0.143
8.96	2.035	2.050	0.158
8.42	2.003	1.997	0.148
8.45	2.005	2.000	0.148
5.63	1.826	1.762	0.099
9.70	2.076	2.125	0.171
7.33	1.936	1.899	0.129
7.89	1.971	1.949	0.139
9.06	2.041	2.060	0.160
8.35	1.999	1.991	0.147
8.40	2.002	1.996	0.148
89.94	1.159	0.000	*****
7.78	1.965	1.939	0.137
0.00	2.824	2.115	0.000
10.77	2.128	2.242	0.190
8.78	2.024	2.032	0.154

The Trial Failure Surface In Question Is Defined
By The Following 18 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	336.35	239.25
2	345.24	233.70
3	355.27	226.67
4	365.07	216.87
5	377.09	204.85
6	419.52	162.43
7	461.94	120.00
8	472.04	109.90
9	475.00	101.05
10	513.28	149.38
11	857.65	189.40
12	872.23	203.98
13	914.66	246.41
14	957.08	288.83
15	999.51	331.26
16	1006.56	338.30
17	1048.98	380.73
18	1059.25	391.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.30	233.00
2	83.19	209.98
3	132.34	175.56
4	144.67	163.23
5	145.47	162.43
6	187.90	120.00
7	203.31	104.59
8	475.00	103.24
9	549.70	145.25
10	1064.84	231.78
11	1081.28	248.21
12	1123.70	290.64
13	1166.13	333.07
14	1187.45	354.39
15	1208.47	375.40
16	1213.84	384.00

##################### SOME LINES SKIPPED #####################
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 14
Number of Trial Surfaces with Misleading FS = 30
Number of Trial Surfaces With Valid FS = 2956
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 1.5 %
Statistical Data On All Valid FS Values:
FS Max = 3.836 FS Min = 1.750 FS Ave = 2.106
Standard Deviation = 0.251 Coefficient of Variation = 11.90 %
((Simplified Janbu FS for Critical Surface = 1.439))
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	235.040	236.469
2	247.305	228.805
3	267.547	214.631
4	281.476	200.702

5	303.290	178.889
6	345.716	136.462
7	475.000	130.115
8	568.214	127.044
9	861.716	225.526
10	904.143	267.953
11	946.569	310.379
12	973.174	336.984
13	1015.601	379.411
14	1027.190	391.000

*** FOS = 1.750 Theta (ki=1.0) = 7.98 ***

Lambda = 0.140

Individual data on the 55 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.3	5783.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	12.7	18890.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	7.5	17813.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	7.0	21906.5	0.0	0.0	0.	0.	0.0	0.0	0.0
5	6.9	27551.2	0.0	2172.5	0.	0.	0.0	0.0	0.0
6	10.5	53796.3	0.0	11674.3	0.	0.	0.0	0.0	0.0
7	8.0	50424.2	0.0	15631.8	0.	0.	0.0	0.0	0.0
8	3.3	23122.1	0.0	8121.1	0.	0.	0.0	0.0	0.0
9	23.0	200086.6	0.0	84140.4	0.	0.	0.0	0.0	0.0
10	3.8	39184.4	0.0	18339.4	0.	0.	0.0	0.0	0.0
11	3.0	32611.2	0.0	15574.3	0.	0.	0.0	0.0	0.0
12	7.0	80641.3	0.0	39531.9	0.	0.	0.0	0.0	0.0
13	5.0	61499.8	0.0	30972.9	0.	0.	0.0	0.0	0.0
14	0.7	9065.2	0.0	4521.8	0.	0.	0.0	0.0	0.0
15	9.3	118513.8	0.0	42467.3	0.	0.	0.0	0.0	0.0
16	13.0	167310.7	0.0	61841.9	0.	0.	0.0	0.0	0.0
17	2.0	25851.4	0.0	9760.3	0.	0.	0.0	0.0	0.0
18	10.0	130594.6	0.0	49786.2	0.	0.	0.0	0.0	0.0
19	5.0	66244.9	0.0	25508.5	0.	0.	0.0	0.0	0.0
20	5.0	66876.6	0.0	25918.8	0.	0.	0.0	0.0	0.0
21	46.0	652399.2	0.0	*******	0.	0.	0.0	0.0	0.0
22	16.3	247349.4	0.0	99423.7	0.	0.	0.0	0.0	0.0
23	22.7	359390.7	0.0	*******	0.	0.	0.0	0.0	0.0
24	20.0	329865.9	0.0	*******	0.	0.	0.0	0.0	0.0
25	16.6	287310.1	0.0	*******	0.	0.	0.0	0.0	0.0
26	11.4	205491.4	0.0	83010.2	0.	0.	0.0	0.0	0.0
27	17.0	321178.5	0.0	*******	0.	0.	0.0	0.0	0.0
28	17.0	337710.2	0.0	*******	0.	0.	0.0	0.0	0.0
29	11.2	231812.1	0.0	89781.1	0.	0.	0.0	0.0	0.0
30	8.0	169036.6	0.0	68233.2	0.	0.	0.0	0.0	0.0
31	3.8	79170.4	0.0	31670.6	0.	0.	0.0	0.0	0.0
32	41.0	875521.4	0.0	*******	0.	0.	0.0	0.0	0.0
33	46.0	1004660.8	0.0	*******	0.	0.	0.0	0.0	0.0
34	11.7	259347.9	0.0	88782.0	0.	0.	0.0	0.0	0.0
35	3.3	71894.5	0.0	24352.0	0.	0.	0.0	0.0	0.0
36	30.0	643777.2	0.0	*******	0.	0.	0.0	0.0	0.0
37	30.0	606933.7	0.0	*******	0.	0.	0.0	0.0	0.0
38	100.0	1755577.1	0.0	*******	0.	0.	0.0	0.0	0.0
39	8.0	122591.9	0.0	42043.6	0.	0.	0.0	0.0	0.0
40	10.0	150115.2	0.0	51172.2	0.	0.	0.0	0.0	0.0
41	1.0	14876.2	0.0	5032.7	0.	0.	0.0	0.0	0.0
42	0.7	10670.4	0.0	3595.6	0.	0.	0.0	0.0	0.0
43	9.3	135809.7	0.0	59009.1	0.	0.	0.0	0.0	0.0
44	4.0	59986.5	0.0	23327.8	0.	0.	0.0	0.0	0.0
45	10.0	152647.6	0.0	52794.3	0.	0.	0.0	0.0	0.0
46	19.1	271253.7	0.0	79045.6	0.	0.	0.0	0.0	0.0
47	18.9	240293.0	0.0	49586.5	0.	0.	0.0	0.0	0.0
48	10.0	116587.5	0.0	14906.8	0.	0.	0.0	0.0	0.0
49	7.0	75934.9	0.0	5738.2	0.	0.	0.0	0.0	0.0
50	6.6	65724.5	0.0	1968.2	0.	0.	0.0	0.0	0.0
51	0.8	7854.8	0.0	24.7	0.	0.	0.0	0.0	0.0
52	22.6	184274.3	0.0	0.0	0.	0.	0.0	0.0	0.0
53	3.2	21003.2	0.0	0.0	0.	0.	0.0	0.0	0.0

54	42.4	165611.4	0.0	0.0	0.	0.	0.0	0.0	0.0
55	11.6	7991.6	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	235.040	236.469
2	247.305	228.805
3	267.547	214.631
4	281.476	200.702
5	303.290	178.889
6	345.716	136.462
7	475.000	130.115
8	568.214	127.044
9	861.716	225.526
10	904.143	267.953
11	946.569	310.379
12	973.174	336.984
13	1015.601	379.411
14	1027.190	391.000

*** FOS = 1.750 Theta (ki=1.0) = 7.98 ***
Lambda = 0.140

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	235.040	236.469
2	247.305	228.805
3	267.547	214.631
4	281.476	200.702
5	303.290	178.889
6	345.716	136.462
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Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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7	475.000	130.115
8	568.214	127.044
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11	946.569	310.379
12	973.174	336.984
13	1015.601	379.411
14	1027.190	391.000

*** FOS = 1.750 Theta (ki=1.0) = 7.98 ***
Lambda = 0.140

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	129.947	230.000
2	136.597	225.845
3	138.767	224.325
4	187.916	189.910
5	198.628	179.199
6	198.782	179.045
7	241.208	136.619
8	475.000	126.521
9	564.819	129.548
10	855.623	171.339
11	892.566	208.282
12	934.992	250.708
13	977.418	293.135
14	1019.845	335.561
15	1023.248	338.965
16	1065.675	381.391
17	1075.284	391.000

*** FOS = 1.752 Theta (ki=1.0) = 7.53 ***
Lambda = 0.132

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	129.947	230.000
2	136.597	225.845
3	138.767	224.325
4	187.916	189.910
5	198.628	179.199
6	198.782	179.045
7	241.208	136.619
8	475.000	126.521
9	564.819	129.548
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11	892.566	208.282
12	934.992	250.708
13	977.418	293.135
14	1019.845	335.561
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Point No.	X-Surf (ft)	Y-Surf (ft)
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10	855.623	171.339
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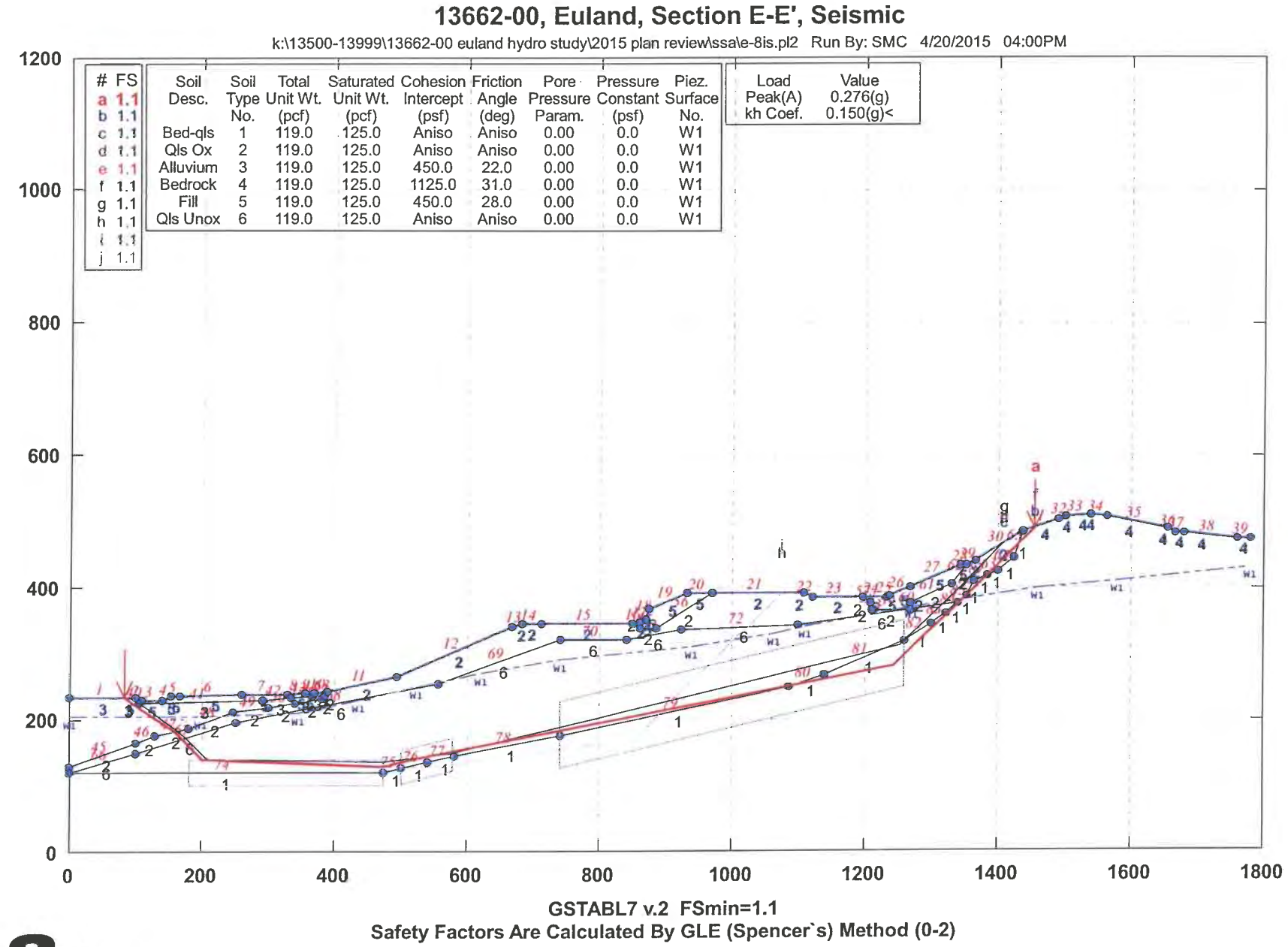
12	934.992	250.708
13	977.418	293.135
14	1019.845	335.561
15	1023.248	338.965
16	1065.675	381.391
17	1075.284	391.000

*** FOS = 1.752 Theta (ki=1.0) = 7.54 ***

Lambda = 0.132

**** END OF GSTABL7 OUTPUT ****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e 1.1
f 1.1
g 1.1
h 1.1
i 1.1
j 1.1
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bed-qls | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls Ox | 2 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Alluvium | 3 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Bedrock | 4 | 119.0 | 125.0 | 1125.0 | 31.0 | 0.00 | 0.0 | W1
Fill | 5 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls Unox | 6 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load | Value
Peak(A) | 0.276(g)
kh Coef. | 0.150(g)<
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
GSTABL7 v.2 FSmin=1.1
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-35.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 04:00PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8is.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8is.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-8is.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
39 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1366.00	440.00	2
30	1366.00	440.00	1438.00	485.00	2
31	1438.00	485.00	1490.00	502.00	4
32	1490.00	502.00	1502.00	507.00	4
33	1502.00	507.00	1540.00	510.00	4
34	1540.00	510.00	1565.00	507.00	4
35	1565.00	507.00	1656.00	490.00	4
36	1656.00	490.00	1666.00	482.00	4
37	1666.00	482.00	1680.00	482.00	4
38	1680.00	482.00	1760.00	473.00	4
39	1760.00	473.00	1780.00	473.00	4

40	100.00	233.00	105.00	225.00	3
41	105.00	225.00	292.00	230.00	3
42	292.00	230.00	333.00	233.00	3
43	333.00	233.00	368.00	235.00	3
44	368.00	235.00	370.00	240.00	3
45	0.00	128.00	100.00	164.00	2
46	100.00	164.00	130.00	175.00	2
47	130.00	175.00	180.00	187.00	2
48	180.00	187.00	248.00	212.00	2
49	248.00	212.00	300.00	219.00	2
50	300.00	219.00	340.00	224.00	2
51	340.00	224.00	380.00	231.00	2
52	380.00	231.00	385.00	235.00	2
53	385.00	235.00	390.00	243.00	2
54	860.00	346.00	861.00	338.00	2
55	861.00	338.00	885.00	338.00	2
56	885.00	338.00	970.00	391.00	2
57	1197.00	384.00	1209.00	375.00	2
58	1209.00	375.00	1210.00	366.00	2
59	1210.00	366.00	1268.00	366.00	2
60	1268.00	366.00	1269.00	377.00	2
61	1269.00	377.00	1330.00	406.00	2
62	1330.00	406.00	1353.00	433.00	2
63	1384.00	418.00	1400.00	425.00	1
64	1400.00	425.00	1425.00	445.00	1
65	1425.00	445.00	1438.00	485.00	1
66	0.00	120.00	100.00	150.00	6
67	100.00	150.00	252.00	195.00	6
68	252.00	195.00	557.00	254.00	6
69	557.00	254.00	742.00	320.00	6
70	742.00	320.00	842.00	320.00	6
71	842.00	320.00	923.00	335.00	6
72	923.00	335.00	1100.00	342.00	6
73	1100.00	342.00	1340.00	376.00	6
74	0.00	120.00	474.00	120.00	1
75	474.00	120.00	500.00	126.00	1
76	500.00	126.00	540.00	136.00	1
77	540.00	136.00	580.00	145.00	1
78	580.00	145.00	740.00	176.00	1
79	740.00	176.00	1085.00	249.00	1
80	1085.00	249.00	1140.00	266.00	1
81	1140.00	266.00	1260.00	318.00	1
82	1260.00	318.00	1300.00	344.00	1
83	1300.00	344.00	1322.00	360.00	1
84	1322.00	360.00	1340.00	376.00	1
85	1340.00	376.00	1352.00	388.00	1
86	1352.00	388.00	1365.00	410.00	1
87	1365.00	410.00	1384.00	418.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00

2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	120.00	474.00	120.00	40.00
2	475.00	120.00	475.00	120.00	40.00
3	500.00	128.00	579.00	147.00	50.00
4	740.00	176.00	1260.00	300.00	100.00

**** ERROR - BK12 ****
>>Points on active or passive wedges are outside defined ground surface
The Factor Of Safety For The Trial Failure Surface Defined By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	360.50	240.00
2	368.16	235.40
3	375.77	230.26
4	385.26	220.78
5	387.77	218.27
6	430.19	175.84
7	472.62	133.42
8	475.00	120.19
9	515.91	149.72
10	980.54	232.18
11	1022.97	274.61
12	1065.40	317.04
13	1089.96	341.60
14	1132.36	384.00

Factor Of Safety For The Preceding Specified Surface = 1.388
Theta (ki = 1.0) = 7.04 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.34	239.85
2	360.16	234.55
3	368.43	228.98
4	378.03	219.38
5	383.75	213.66
6	426.17	171.23
7	468.60	128.81
8	475.00	106.21
9	576.55	166.35
10	1160.31	280.71
11	1202.74	323.14
12	1241.67	362.07
13	1245.60	366.00
14	1265.39	398.94

Factor Of Safety For The Preceding Specified Surface = 1.286
Theta (ki = 1.0) = 5.43 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	343.04	239.52
2	352.08	234.09
3	361.47	227.76
4	371.17	218.05
5	382.60	206.63
6	425.02	164.20
7	467.45	121.77
8	475.00	107.93
9	571.30	165.68
10	914.53	195.15
11	937.08	217.70
12	979.50	260.13
13	1021.93	302.55
14	1059.79	340.41
15	1102.21	382.84
16	1109.30	389.93

Factor Of Safety For The Preceding Specified Surface = 1.079
Theta (ki = 1.0) = 3.29 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.184	1.380	0.176
15.00	1.354	1.592	0.268
0.00	0.004	0.001	0.000

0.00	0.001	0.001	0.000
0.00	0.000	0.005	0.000
9.90	1.186	1.377	0.174
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
7.62	1.220	1.305	0.134
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000
0.00	0.000	0.002	0.000

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	55.14	233.00
2	88.47	210.52
3	138.21	176.97
4	150.29	164.89
5	152.75	162.43
6	195.18	120.00
7	198.72	116.46
8	475.00	110.11
9	528.71	142.54
10	1121.72	237.53
11	1157.98	273.79
12	1200.41	316.22
13	1242.84	358.65
14	1247.02	362.83
15	1250.19	366.00
16	1271.56	401.57

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	335.65	239.23
2	344.88	233.68
3	355.27	226.67
4	365.07	216.87
5	377.09	204.85
6	419.52	162.43
7	461.94	120.00
8	472.04	109.90
9	475.00	101.05
10	513.28	149.38
11	857.65	189.40
12	872.23	203.98
13	914.66	246.41
14	957.08	288.83
15	999.51	331.26
16	1006.56	338.30
17	1048.98	380.73
18	1059.25	391.00

Factor Of Safety For The Preceding Specified Surface = 1.571
Theta (ki = 1.0) = 8.19 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.151	1.233	0.176
15.00	1.204	1.492	0.268
7.37	1.082	1.125	0.129

3.06	0.961	0.977	0.054
0.00	0.878	0.888	0.000
0.00	0.878	0.888	0.000
7.72	1.092	1.139	0.136
0.00	0.878	0.888	0.000
0.00	0.878	0.888	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000
0.00	-0.010	-0.010	0.000

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	341.67	239.47
2	350.75	234.01
3	360.32	227.56
4	370.04	217.83
5	373.98	213.89
6	416.41	171.47
7	458.84	129.04
8	475.00	100.82
9	531.95	160.61
10	1151.17	249.43
11	1188.95	287.21
12	1231.37	329.64
13	1267.46	365.72
14	1287.56	385.82
15	1306.17	416.79

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	359.97	240.00
2	368.06	235.14
3	375.39	230.19
4	384.88	220.70
5	384.89	220.69
6	427.32	178.26
7	469.75	135.84
8	475.00	104.49
9	502.79	148.03
10	886.09	242.28
11	928.52	284.70
12	970.94	327.13
13	981.11	337.30
14	1023.54	379.72
15	1034.81	391.00

Factor Of Safety For The Preceding Specified Surface = 1.350
Theta (ki = 1.0) = 7.17 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.494	1.534	0.176
15.00	1.302	1.353	0.268
0.00	-0.002	-0.021	0.000
0.48	0.403	0.413	0.008
0.26	-0.004	-0.003	0.004
0.17	-0.004	-0.003	0.003
0.00	-0.004	-0.003	0.000

0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000

The Trial Failure Surface In Question Is Defined
By The Following 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.79	239.87
2	360.61	234.58
3	368.81	229.04
4	378.40	219.45
5	386.62	211.24
6	429.04	168.81
7	471.47	126.38
8	475.00	121.91
9	510.66	149.04
10	1254.76	270.62
11	1297.19	313.05
12	1339.62	355.47
13	1382.04	397.90
14	1424.47	440.33
15	1466.90	482.75
16	1484.27	500.13

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	360.50	240.00
2	368.16	235.40
3	375.77	230.26
4	385.26	220.78
5	387.77	218.27
6	430.19	175.84
7	472.62	133.42
8	475.00	120.19
9	515.91	149.72
10	980.54	232.18
11	1022.97	274.61
12	1065.40	317.04
13	1089.96	341.60
14	1132.36	384.00

Factor Of Safety For The Preceding Specified Surface = 1.388
Theta (ki = 1.0) = 7.04 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.34	239.85
2	360.16	234.55
3	368.43	228.98
4	378.03	219.38
5	383.75	213.66
6	426.17	171.23
7	468.60	128.81
8	475.00	106.21
9	576.55	166.35
10	1160.31	280.71
11	1202.74	323.14

12	1241.67	362.07
13	1245.60	366.00
14	1265.39	398.94

Factor Of Safety For The Preceding Specified Surface = 1.286
Theta (ki = 1.0) = 5.42 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	343.04	239.52
2	352.08	234.09
3	361.47	227.76
4	371.17	218.05
5	382.60	206.63
6	425.02	164.20
7	467.45	121.77
8	475.00	107.93
9	571.30	165.68
10	914.53	195.15
11	937.08	217.70
12	979.50	260.13
13	1021.93	302.55
14	1059.79	340.41
15	1102.21	382.84
16	1109.30	389.93

Factor Of Safety For The Preceding Specified Surface = 1.081
Theta (ki = 1.0) = 3.34 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	335.65	239.23
2	344.88	233.68
3	355.27	226.67
4	365.07	216.87

###################### SOME LINES SKIPPED ####################
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 121
Number of Trial Surfaces with Misleading FS = 39
Number of Trial Surfaces With Valid FS = 2840
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 5.3 %
Statistical Data On All Valid FS Values:
FS Max = 2.033 FS Min = 1.086 FS Ave = 1.312
Standard Deviation = 0.159 Coefficient of Variation = 12.10 %
((Simplified Janbu FS for Critical Surface = 1.082))
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.480	233.000
2	107.893	215.184
3	157.636	181.633
4	168.877	170.391
5	199.290	139.978
6	475.000	129.255
7	531.337	142.882

8	1244.607	280.308
9	1287.033	322.734
10	1329.460	365.160
11	1371.886	407.587
12	1381.062	416.763
13	1423.489	459.190
14	1432.560	468.260
15	1454.788	490.488

*** FOS = 1.086 Theta (ki=1.0) = 3.99 ***

Lambda = 0.070

Individual data on the 93 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	18.5	13764.9	0.0	0.0	0.	0.	2064.7	0.0	0.0
2	5.0	7989.7	0.0	0.0	0.	0.	1198.4	0.0	0.0
3	2.9	5132.3	0.0	0.0	0.	0.	769.9	0.0	0.0
4	2.1	3971.5	0.0	0.0	0.	0.	595.7	0.0	0.0
5	13.5	33547.9	0.0	0.0	0.	0.	5032.2	0.0	0.0
6	16.5	61089.2	0.0	6920.9	0.	0.	9163.4	0.0	0.0
7	13.0	68288.8	0.0	15260.5	0.	0.	10243.3	0.0	0.0
8	4.6	29177.7	0.0	7532.5	0.	0.	4376.6	0.0	0.0
9	8.4	58656.0	0.0	20200.0	0.	0.	8798.4	0.0	0.0
10	2.9	22207.4	0.0	8382.1	0.	0.	3331.1	0.0	0.0
11	11.1	95790.7	0.0	39312.7	0.	0.	14368.6	0.0	0.0
12	18.0	188449.8	0.0	86865.1	0.	0.	28267.5	0.0	0.0
13	1.3	15094.5	0.0	7327.7	0.	0.	2264.2	0.0	0.0
14	32.8	390853.7	0.0	*******	0.	0.	58628.1	0.0	0.0
15	15.9	192061.8	0.0	67447.2	0.	0.	28809.3	0.0	0.0
16	4.0	48669.3	0.0	17166.3	0.	0.	7300.4	0.0	0.0
17	8.0	97703.2	0.0	34550.9	0.	0.	14655.5	0.0	0.0
18	32.0	396119.5	0.0	*******	0.	0.	59417.9	0.0	0.0
19	8.0	100384.3	0.0	36006.9	0.	0.	15057.6	0.0	0.0
20	26.2	333121.5	0.0	*******	0.	0.	49968.2	0.0	0.0
21	3.8	48144.9	0.0	17451.7	0.	0.	7221.7	0.0	0.0
22	3.0	38551.8	0.0	13987.2	0.	0.	5782.8	0.0	0.0
23	7.0	90298.0	0.0	32796.0	0.	0.	13544.7	0.0	0.0
24	5.0	64793.4	0.0	23562.2	0.	0.	9719.0	0.0	0.0
25	10.0	130275.6	0.0	46965.6	0.	0.	19541.3	0.0	0.0
26	13.0	170586.2	0.0	63414.6	0.	0.	25587.9	0.0	0.0
27	2.0	26336.2	0.0	9992.8	0.	0.	3950.4	0.0	0.0
28	10.0	132942.1	0.0	50910.9	0.	0.	19941.3	0.0	0.0
29	5.0	67370.9	0.0	26047.2	0.	0.	10105.6	0.0	0.0
30	5.0	67970.7	0.0	26441.8	0.	0.	10195.6	0.0	0.0
31	46.0	660970.1	0.0	*******	0.	0.	99145.5	0.0	0.0
32	16.3	249737.0	0.0	*******	0.	0.	37460.6	0.0	0.0
33	22.7	362156.7	0.0	*******	0.	0.	54323.5	0.0	0.0
34	20.0	325149.5	0.0	*******	0.	0.	48772.4	0.0	0.0
35	28.0	463141.3	0.0	*******	0.	0.	69471.2	0.0	0.0
36	8.3	141407.5	0.0	57159.8	0.	0.	21211.1	0.0	0.0
37	25.7	447307.1	0.0	*******	0.	0.	67096.1	0.0	0.0
38	19.2	348046.8	0.0	*******	0.	0.	52207.0	0.0	0.0
39	44.8	850754.8	0.0	*******	0.	0.	*******	0.0	0.0
40	46.0	935042.2	0.0	*******	0.	0.	*******	0.0	0.0
41	15.0	316705.9	0.0	*******	0.	0.	47505.9	0.0	0.0
42	30.0	626751.3	0.0	*******	0.	0.	94012.7	0.0	0.0
43	30.0	605970.5	0.0	*******	0.	0.	90895.6	0.0	0.0
44	100.0	1868420.0	0.0	*******	0.	0.	*******	0.0	0.0
45	8.0	139332.5	0.0	49062.3	0.	0.	20899.9	0.0	0.0
46	10.0	172647.9	0.0	60806.3	0.	0.	25897.2	0.0	0.0
47	1.0	17227.6	0.0	6048.8	0.	0.	2584.1	0.0	0.0
48	10.0	174555.2	0.0	60168.8	0.	0.	26183.3	0.0	0.0
49	4.0	74033.0	0.0	23905.3	0.	0.	11104.9	0.0	0.0
50	10.0	194826.2	0.0	59357.5	0.	0.	29223.9	0.0	0.0
51	38.0	763838.8	0.0	*******	0.	0.	*******	0.0	0.0
52	10.0	207194.2	0.0	56575.7	0.	0.	31079.1	0.0	0.0
53	7.0	145362.6	0.0	39258.2	0.	0.	21804.4	0.0	0.0
54	30.0	609995.6	0.0	*******	0.	0.	91499.3	0.0	0.0
55	93.0	1758833.2	0.0	*******	0.	0.	*******	0.0	0.0

56	26.8	469359.4	0.0	*******	0.	0.	70403.9	0.0	0.0
57	10.2	174859.7	0.0	54225.4	0.	0.	26229.0	0.0	0.0
58	7.0	118366.6	0.0	37208.1	0.	0.	17755.0	0.0	0.0
59	3.0	50136.5	0.0	15965.1	0.	0.	7520.5	0.0	0.0
60	12.0	193513.2	0.0	64164.7	0.	0.	29027.0	0.0	0.0
61	18.0	278073.6	0.0	96159.8	0.	0.	41711.0	0.0	0.0
62	44.5	656179.2	0.0	*******	0.	0.	98426.9	0.0	0.0
63	12.5	175314.1	0.0	66294.7	0.	0.	26297.1	0.0	0.0
64	12.0	165546.5	0.0	63827.5	0.	0.	24832.0	0.0	0.0
65	1.0	13646.3	0.0	5316.9	0.	0.	2046.9	0.0	0.0
66	23.0	307528.9	0.0	*******	0.	0.	46129.3	0.0	0.0
67	3.0	39752.6	0.0	15926.4	0.	0.	5962.9	0.0	0.0
68	8.6	116229.5	0.0	45676.3	0.	0.	17434.4	0.0	0.0
69	4.1	54644.6	0.0	29329.6	0.	0.	8196.7	0.0	0.0
70	11.3	145969.1	0.0	75730.8	0.	0.	21895.4	0.0	0.0
71	8.0	97201.9	0.0	48006.1	0.	0.	14580.3	0.0	0.0
72	0.3	3967.6	0.0	1913.0	0.	0.	595.1	0.0	0.0
73	0.7	7845.1	0.0	3770.6	0.	0.	1176.8	0.0	0.0
74	1.0	11741.3	0.0	5613.1	0.	0.	1761.2	0.0	0.0
75	17.0	189025.3	0.0	84824.5	0.	0.	28353.8	0.0	0.0
76	13.0	129950.2	0.0	50093.9	0.	0.	19492.5	0.0	0.0
77	22.0	192902.1	0.0	56359.0	0.	0.	28935.3	0.0	0.0
78	7.5	57530.2	0.0	10930.3	0.	0.	8629.5	0.0	0.0
79	0.5	4011.8	0.0	630.8	0.	0.	601.8	0.0	0.0
80	10.0	70474.4	0.0	7751.5	0.	0.	10571.2	0.0	0.0
81	3.0	19744.1	0.0	873.8	0.	0.	2961.6	0.0	0.0
82	2.1	13083.8	0.0	212.1	0.	0.	1962.6	0.0	0.0
83	0.4	2174.6	0.0	4.6	0.	0.	326.2	0.0	0.0
84	6.6	38091.4	0.0	0.0	0.	0.	5713.7	0.0	0.0
85	1.0	5331.1	0.0	0.0	0.	0.	799.7	0.0	0.0
86	12.0	59305.0	0.0	0.0	0.	0.	8895.7	0.0	0.0
87	1.0	4585.1	0.0	0.0	0.	0.	687.8	0.0	0.0
88	5.9	26053.6	0.0	0.0	0.	0.	3908.0	0.0	0.0
89	9.2	37533.3	0.0	0.0	0.	0.	5630.0	0.0	0.0
90	42.4	124683.6	0.0	0.0	0.	0.	18702.5	0.0	0.0
91	9.1	16234.6	0.0	0.0	0.	0.	2435.2	0.0	0.0
92	5.4	7975.7	0.0	0.0	0.	0.	1196.4	0.0	0.0
93	16.8	11286.5	0.0	0.0	0.	0.	1693.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.480	233.000
2	107.893	215.184
3	157.636	181.633
4	168.877	170.391
5	199.290	139.978
6	475.000	129.255
7	531.337	142.882
8	1244.607	280.308
9	1287.033	322.734
10	1329.460	365.160
11	1371.886	407.587
12	1381.062	416.763
13	1423.489	459.190
14	1432.560	468.260
15	1454.788	490.488

*** FOS = 1.120 Theta (ki=1.0) = 5.93 ***
Lambda = 0.104

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.897	233.000
2	115.577	217.028
3	165.319	183.477
4	176.228	172.568
5	209.052	139.744
6	475.000	134.646
7	575.929	148.626
8	1253.748	311.589
9	1260.453	318.295

10	1302.880	360.721
11	1314.554	372.395
12	1356.980	414.822
13	1399.407	457.248
14	1409.090	466.931

*** FOS = 1.124 Theta (ki=1.0) = 4.91 ***
Lambda = 0.086

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.897	233.000
2	115.577	217.028
3	165.319	183.477
4	176.228	172.568
5	209.052	139.744
6	475.000	134.646
7	575.929	148.626
8	1253.748	311.589
9	1260.453	318.295
10	1302.880	360.721
11	1314.554	372.395
12	1356.980	414.822
13	1399.407	457.248
14	1409.090	466.931

*** FOS = 1.125 Theta (ki=1.0) = 4.92 ***
Lambda = 0.086

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.897	233.000
2	115.577	217.028
3	165.319	183.477
4	176.228	172.568
5	209.052	139.744
6	475.000	134.646
7	575.929	148.626
8	1253.748	311.589
9	1260.453	318.295
10	1302.880	360.721
11	1314.554	372.395
12	1356.980	414.822
13	1399.407	457.248
14	1409.090	466.931

*** FOS = 1.127 Theta (ki=1.0) = 5.02 ***
Lambda = 0.088

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.480	233.000
2	107.893	215.184
3	157.636	181.633
4	168.877	170.391
5	199.290	139.978
6	475.000	129.255
7	531.337	142.882
8	1244.607	280.308
9	1287.033	322.734
10	1329.460	365.160
11	1371.886	407.587
12	1381.062	416.763
13	1423.489	459.190
14	1432.560	468.260
15	1454.788	490.488

*** FOS = 1.132 Theta (ki=1.0) = 6.55 ***
Lambda = 0.115

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.897	233.000
2	115.577	217.028

3	165.319	183.477
4	176.228	172.568
5	209.052	139.744
6	475.000	134.646
7	575.929	148.626
8	1253.748	311.589
9	1260.453	318.295
10	1302.880	360.721
11	1314.554	372.395
12	1356.980	414.822
13	1399.407	457.248
14	1409.090	466.931

*** FOS = 1.134 Theta (ki=1.0) = 5.43 ***
Lambda = 0.095
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	127.717	230.000
2	134.716	225.795
3	138.174	223.462
4	187.916	189.910
5	198.628	179.199
6	198.782	179.045
7	241.208	136.619
8	475.000	126.521
9	564.819	129.548
10	855.623	171.339
11	892.566	208.282
12	934.992	250.708
13	977.418	293.135
14	1019.845	335.561
15	1023.248	338.965
16	1065.675	381.391
17	1075.284	391.000

*** FOS = 1.137 Theta (ki=1.0) = 5.42 ***
Lambda = 0.095
Failure Surface Specified By 17 Coordinate Points

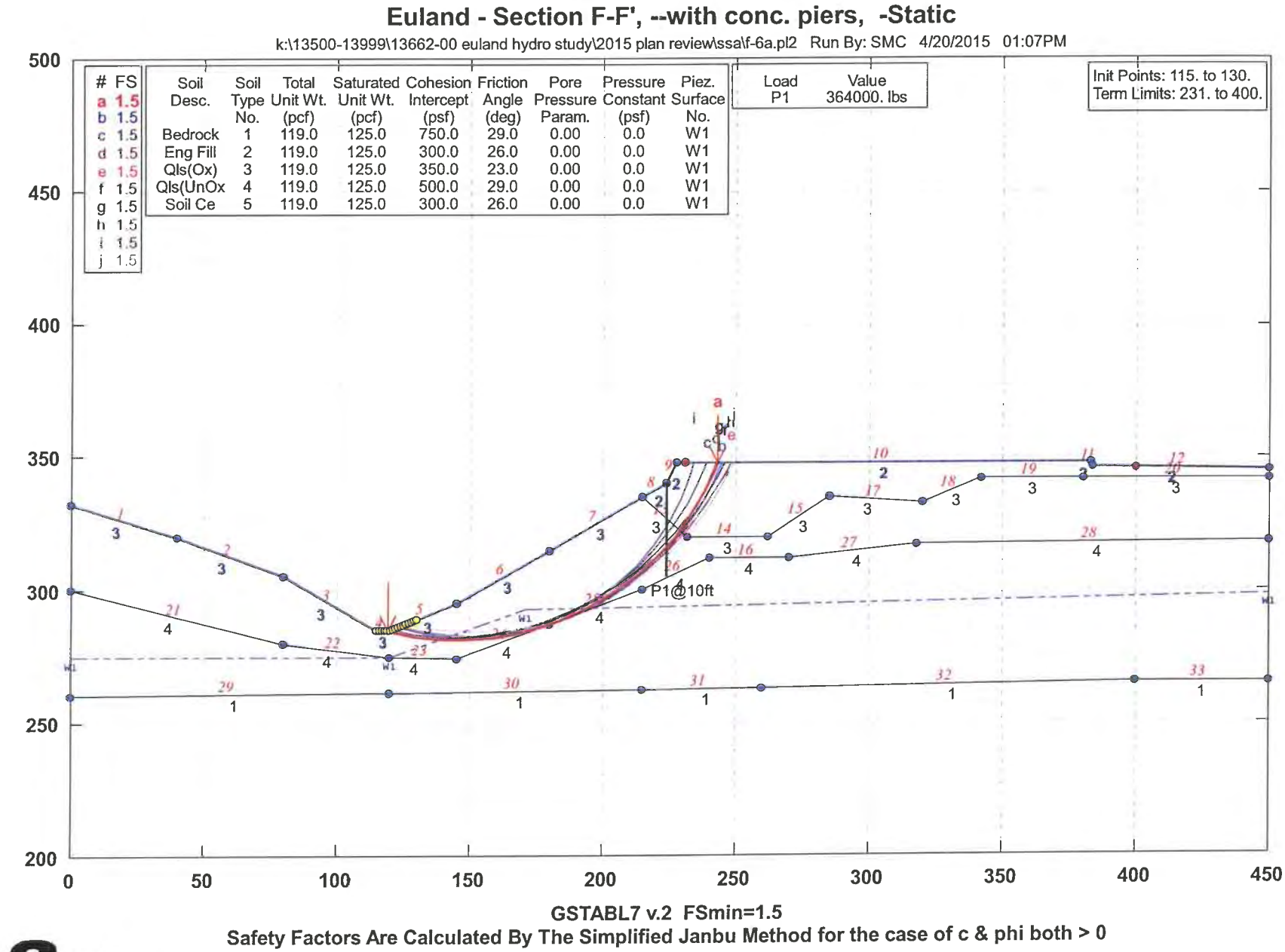
Point No.	X-Surf (ft)	Y-Surf (ft)
1	127.717	230.000
2	134.716	225.795
3	138.174	223.462
4	187.916	189.910
5	198.628	179.199
6	198.782	179.045
7	241.208	136.619
8	475.000	126.521
9	564.819	129.548
10	855.623	171.339
11	892.566	208.282
12	934.992	250.708
13	977.418	293.135
14	1019.845	335.561
15	1023.248	338.965
16	1065.675	381.391
17	1075.284	391.000

*** FOS = 1.137 Theta (ki=1.0) = 5.42 ***
Lambda = 0.095
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	127.717	230.000
2	134.716	225.795
3	138.174	223.462
4	187.916	189.910
5	198.628	179.199
6	198.782	179.045
7	241.208	136.619
8	475.000	126.521
9	564.819	129.548

10	855.623	171.339
11	892.566	208.282
12	934.992	250.708
13	977.418	293.135
14	1019.845	335.561
15	1023.248	338.965
16	1065.675	381.391
17	1075.284	391.000

*** FOS = 1.137 Theta (ki=1.0) = 5.42 ***
Lambda = 0.095
**** END OF GSTABL7 OUTPUT ****



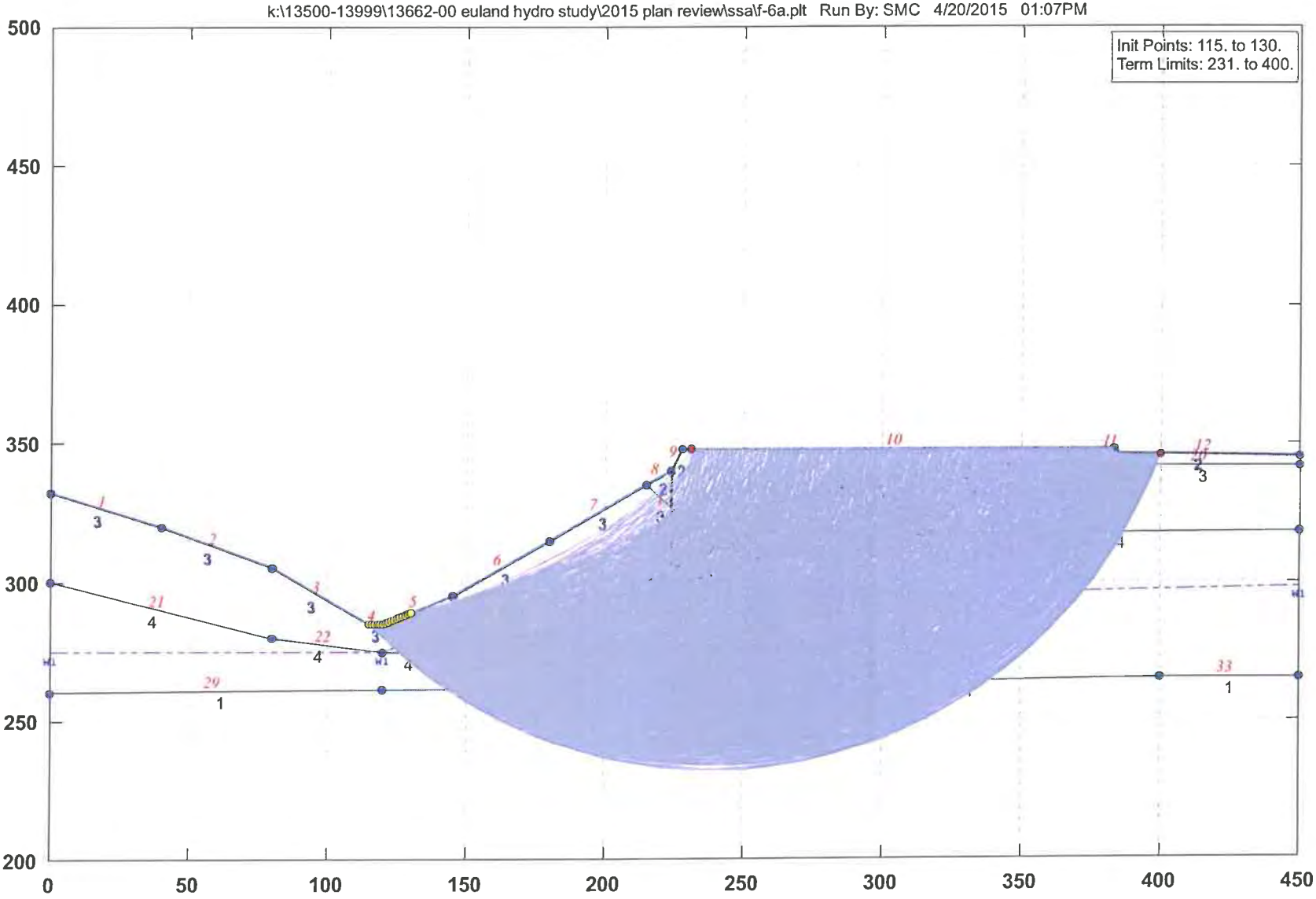
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-36.1

Euland - Section F-F', --with conc. piers, -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6a.plt Run By: SMC 4/20/2015 01:07PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 01:07PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6a.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6a.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6a.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Static

BOUNDARY COORDINATES
12 Top Boundaries
33 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	450.00	345.00	2
13	215.00	335.00	232.00	320.00	3
14	232.00	320.00	262.00	320.00	3
15	262.00	320.00	285.00	335.00	3
16	240.00	312.00	270.00	312.00	4
17	285.00	335.00	320.00	333.00	3
18	320.00	333.00	342.00	342.00	3
19	342.00	342.00	380.00	342.00	3
20	380.00	342.00	450.00	342.00	3
21	0.00	300.00	80.00	280.00	4
22	80.00	280.00	120.00	275.00	4
23	120.00	275.00	145.00	274.00	4
24	145.00	274.00	180.00	287.00	4
25	180.00	287.00	215.00	300.00	4
26	215.00	300.00	240.00	312.00	4
27	270.00	312.00	318.00	317.00	4
28	318.00	317.00	450.00	318.00	4
29	0.00	260.00	120.00	261.50	1
30	120.00	261.50	215.00	262.50	1
31	215.00	262.50	260.00	263.00	1
32	260.00	263.00	400.00	265.00	1
33	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(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 Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

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	223.90	339.94	364000.0	10.0	90.00	35.0

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.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
1600 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 16 Points Equally Spaced
Along The Ground Surface Between X = 115.00(ft)
and X = 130.00(ft)
Each Surface Terminates Between X = 231.00(ft)
and X = 400.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 200.00(ft)
10.00(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 = 1600
Number of Trial Surfaces With Valid FS = 1600
Statistical Data On All Valid FS Values:
FS Max = 3.718 FS Min = 1.495 FS Ave = 2.518
Standard Deviation = 0.584 Coefficient of Variation = 23.19 %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.766	282.850
3	138.694	281.648
4	148.691	281.407
5	158.665	282.127
6	168.523	283.804
7	178.175	286.420
8	187.530	289.953
9	196.503	294.368
10	205.009	299.625
11	212.970	305.676
12	220.313	312.465
13	226.970	319.928
14	232.877	327.996
15	237.982	336.595
16	242.237	345.645
17	243.078	348.000

Factor of Safety
*** 1.495 ***
Individual data on the 26 slices

	Water Force	Water Force	Tie Force	Tie Force	Earthquake Force	Surcharge

Slice No.	Width (ft)	Weight (lbs)	Top (lbs)	Bot (lbs)	Norm (lbs)	Tan (lbs)	Hor (lbs)	Ver (lbs)	Load (lbs)
1	1.0	13.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	8.8	3065.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	9.9	9738.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	0.1	172.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	6.2	8998.7	0.0	423.6	0.	0.	0.0	0.0	0.0
6	3.7	6476.9	0.0	658.0	0.	0.	0.0	0.0	0.0
7	10.0	21881.1	0.0	3017.5	0.	0.	0.0	0.0	0.0
8	9.9	26997.8	0.0	4373.9	0.	0.	0.0	0.0	0.0
9	2.5	7489.8	0.0	1274.1	0.	0.	0.0	0.0	0.0
10	7.2	22918.8	0.0	3532.5	0.	0.	0.0	0.0	0.0
11	1.8	6089.2	0.0	776.6	0.	0.	0.0	0.0	0.0
12	7.5	25858.8	0.0	2359.1	0.	0.	0.0	0.0	0.0
13	7.1	24934.0	0.0	819.7	0.	0.	0.0	0.0	0.0
14	1.9	6854.7	0.0	0.0	0.	0.	0.0	0.0	0.0
15	8.5	30229.9	0.0	0.0	0.	0.	0.0	0.0	0.0
16	8.0	27394.2	0.0	0.0	0.	0.	0.0	0.0	0.0
17	2.0	6715.4	0.0	0.0	0.	0.	0.0	0.0	0.0
18	5.3	16734.8	0.0	0.0	0.	0.	0.0	0.0	0.0
19	3.7	10724.0	0.0	0.0	0.	0.	0.0	0.0	0.0
20	3.0	8730.6	0.0	0.0	0.	0.	0.0	0.0	0.0
21	1.0	3229.8	0.0	0.0	0.	0.	0.0	0.0	0.0
22	1.0	3019.8	0.0	0.0	0.	0.	0.0	0.0	0.0
23	3.9	10523.5	0.0	0.0	0.	0.	0.0	0.0	0.0
24	5.1	9540.0	0.0	0.0	0.	0.	0.0	0.0	0.0
25	4.3	3483.2	0.0	0.0	0.	0.	0.0	0.0	0.0
26	0.8	117.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.000	286.200
2	132.756	284.004
3	142.681	282.781
4	152.678	282.544
5	162.650	283.295
6	172.499	285.027
7	182.129	287.722
8	191.445	291.355
9	200.358	295.889
10	208.780	301.282
11	216.628	307.479
12	223.826	314.420
13	230.304	322.038
14	235.999	330.259
15	240.854	339.001
16	244.745	348.000

Factor of Safety

*** 1.509 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	285.000
2	129.800	283.010
3	139.750	282.008
4	149.750	282.004
5	159.700	282.996
6	169.502	284.976
7	179.058	287.924
8	188.272	291.811
9	197.052	296.597
10	205.311	302.235
11	212.967	308.668
12	219.943	315.833
13	226.169	323.659
14	231.584	332.066
15	236.133	340.971
16	238.879	348.000

Factor of Safety

*** 1.516 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.000	286.600
2	133.733	284.304
3	143.651	283.025
4	153.648	282.778
5	163.617	283.564
6	173.451	285.375
7	183.046	288.192
8	192.299	291.985
9	201.111	296.713
10	209.387	302.325
11	217.040	308.763
12	223.987	315.956
13	230.154	323.828
14	235.475	332.294
15	239.893	341.265
16	242.383	348.000

Factor of Safety
*** 1.516 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.000	285.000
2	124.801	283.013
3	134.736	281.877
4	144.732	281.601
5	154.715	282.185
6	164.611	283.626
7	174.345	285.914
8	183.847	289.031
9	193.046	292.954
10	201.873	297.653
11	210.262	303.095
12	218.152	309.239
13	225.485	316.039
14	232.204	323.445
15	238.262	331.401
16	243.613	339.849
17	247.840	348.000

Factor of Safety
*** 1.519 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.000	285.000
2	126.825	283.140
3	136.777	282.154
4	146.776	282.051
5	156.746	282.831
6	166.607	284.489
7	176.284	287.010
8	185.701	290.377
9	194.783	294.561
10	203.460	299.531
11	211.665	305.248
12	219.333	311.667
13	226.404	318.738
14	232.823	326.406
15	238.541	334.610
16	243.511	343.288
17	245.682	348.000

Factor of Safety
*** 1.519 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.849	283.268

3	138.814	282.435
4	148.814	282.509
5	158.766	283.489
6	168.588	285.367
7	178.199	288.128
8	187.521	291.748
9	196.476	296.199
10	204.991	301.443
11	212.995	307.437
12	220.423	314.132
13	227.214	321.472
14	233.312	329.398
15	238.666	337.844
16	243.232	346.741
17	243.740	348.000

Factor of Safety

*** 1.519 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.877	283.439
3	138.851	282.716
4	148.850	282.838
5	158.804	283.803
6	168.640	285.604
7	178.290	288.229
8	187.683	291.659
9	196.754	295.868
10	205.437	300.829
11	213.671	306.504
12	221.396	312.853
13	228.558	319.832
14	235.106	327.390
15	240.993	335.474
16	246.176	344.026
17	248.148	348.000

Factor of Safety

*** 1.524 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.000	285.400
2	130.697	282.958
3	140.606	281.612
4	150.604	281.377
5	160.565	282.258
6	170.366	284.242
7	179.885	287.306
8	189.004	291.410
9	197.609	296.505
10	205.593	302.526
11	212.856	309.399
12	219.309	317.038
13	224.871	325.349
14	229.473	334.227
15	233.058	343.563
16	234.215	348.000

Factor of Safety

*** 1.525 ***

Failure Surface Specified By 16 Coordinate Points

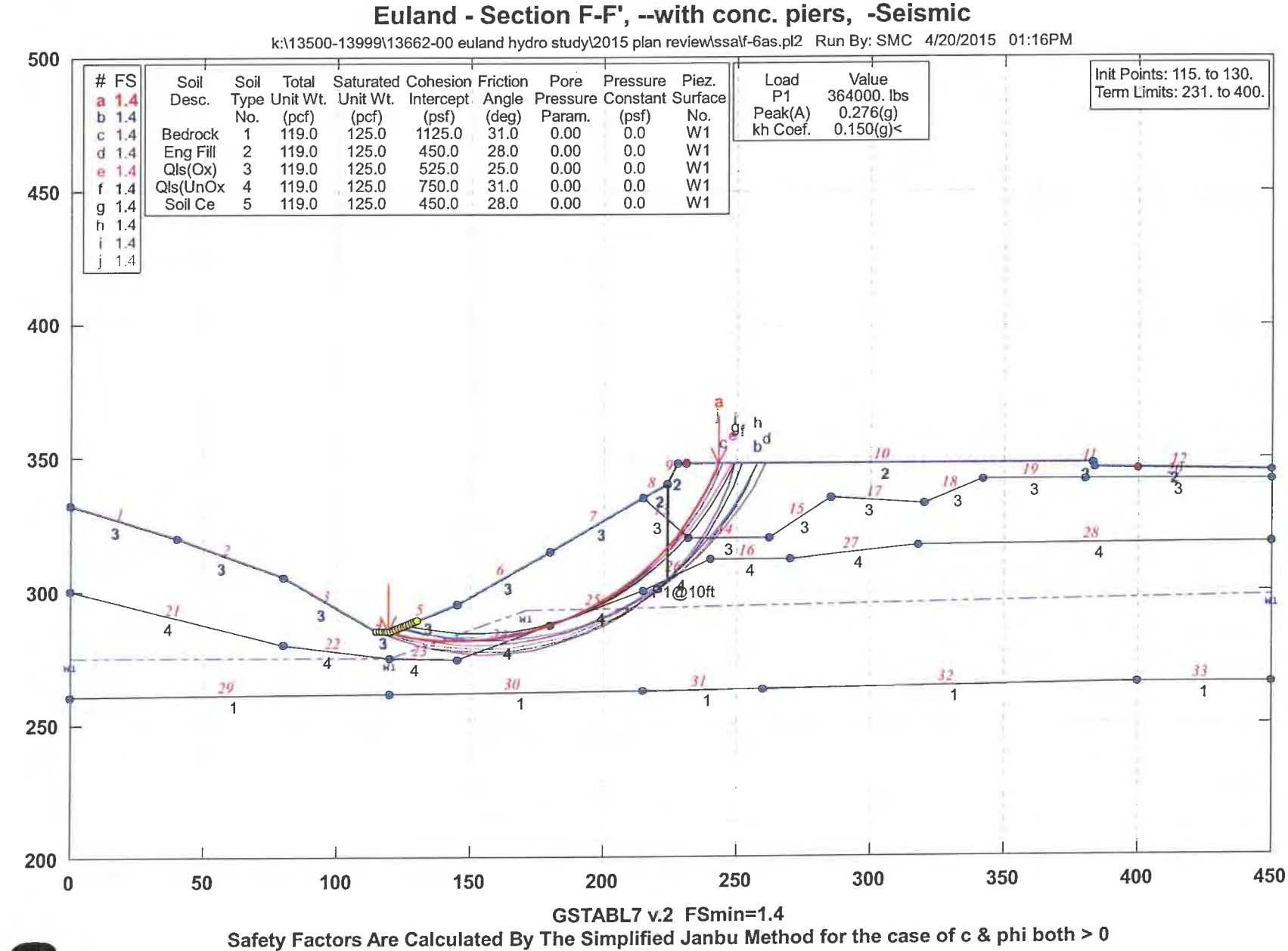
Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.000	287.400
2	135.799	285.407
3	145.743	284.349
4	155.743	284.236
5	165.708	285.068
6	175.550	286.840
7	185.180	289.534

8	194.513	293.126
9	203.464	297.584
10	211.953	302.869
11	219.905	308.933
12	227.248	315.721
13	233.916	323.173
14	239.850	331.223
15	244.996	339.797
16	248.917	348.000

Factor of Safety

*** 1.530 ***

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



GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-36.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

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: 4/20/2015
Time of Run: 01:16PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6as.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6as.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6as.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Seismic

BOUNDARY COORDINATES
12 Top Boundaries
33 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	450.00	345.00	2
13	215.00	335.00	232.00	320.00	3
14	232.00	320.00	262.00	320.00	3
15	262.00	320.00	285.00	335.00	3
16	240.00	312.00	270.00	312.00	4
17	285.00	335.00	320.00	333.00	3
18	320.00	333.00	342.00	342.00	3
19	342.00	342.00	380.00	342.00	3
20	380.00	342.00	450.00	342.00	3
21	0.00	300.00	80.00	280.00	4
22	80.00	280.00	120.00	275.00	4
23	120.00	275.00	145.00	274.00	4
24	145.00	274.00	180.00	287.00	4
25	180.00	287.00	215.00	300.00	4
26	215.00	300.00	240.00	312.00	4
27	270.00	312.00	318.00	317.00	4
28	318.00	317.00	450.00	318.00	4
29	0.00	260.00	120.00	261.50	1
30	120.00	261.50	215.00	262.50	1
31	215.00	262.50	260.00	263.00	1
32	260.00	263.00	400.00	265.00	1
33	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(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	Pressure Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
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	223.90	339.94	364000.0	10.0	90.00	35.0

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.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
1600 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 16 Points Equally Spaced
Along The Ground Surface Between X = 115.00(ft)
and X = 130.00(ft)
Each Surface Terminates Between X = 231.00(ft)
and X = 400.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 200.00(ft)
10.00(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 = 1600
Number of Trial Surfaces With Valid FS = 1600
Statistical Data On All Valid FS Values:
FS Max = 3.057 FS Min = 1.350 FS Ave = 1.834
Standard Deviation = 0.248 Coefficient of Variation = 13.51 %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.766	282.850
3	138.694	281.648
4	148.691	281.407
5	158.665	282.127
6	168.523	283.804
7	178.175	286.420
8	187.530	289.953
9	196.503	294.368
10	205.009	299.625
11	212.970	305.676
12	220.313	312.465
13	226.970	319.928
14	232.877	327.996
15	237.982	336.595
16	242.237	345.645
17	243.078	348.000

Factor of Safety

*** 1.350 ***

Individual data on the 26 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.0	13.1	0.0	0.0	0.	0.	2.0	0.0	0.0
2	8.8	3065.3	0.0	0.0	0.	0.	459.8	0.0	0.0
3	9.9	9738.2	0.0	0.0	0.	0.	1460.7	0.0	0.0
4	0.1	172.6	0.0	0.0	0.	0.	25.9	0.0	0.0
5	6.2	8998.7	0.0	423.6	0.	0.	1349.8	0.0	0.0
6	3.7	6476.9	0.0	658.0	0.	0.	971.5	0.0	0.0
7	10.0	21881.1	0.0	3017.5	0.	0.	3282.2	0.0	0.0
8	9.9	26997.8	0.0	4373.9	0.	0.	4049.7	0.0	0.0
9	2.5	7489.8	0.0	1274.1	0.	0.	1123.5	0.0	0.0
10	7.2	22918.8	0.0	3532.5	0.	0.	3437.8	0.0	0.0
11	1.8	6089.2	0.0	776.6	0.	0.	913.4	0.0	0.0
12	7.5	25858.8	0.0	2359.1	0.	0.	3878.8	0.0	0.0
13	7.1	24934.0	0.0	819.7	0.	0.	3740.1	0.0	0.0
14	1.9	6854.7	0.0	0.0	0.	0.	1028.2	0.0	0.0
15	8.5	30229.9	0.0	0.0	0.	0.	4534.5	0.0	0.0
16	8.0	27394.2	0.0	0.0	0.	0.	4109.1	0.0	0.0
17	2.0	6715.4	0.0	0.0	0.	0.	1007.3	0.0	0.0
18	5.3	16734.8	0.0	0.0	0.	0.	2510.2	0.0	0.0
19	3.7	10724.0	0.0	0.0	0.	0.	1608.6	0.0	0.0
20	3.0	8730.6	0.0	0.0	0.	0.	1309.6	0.0	0.0
21	1.0	3229.8	0.0	0.0	0.	0.	484.5	0.0	0.0
22	1.0	3019.8	0.0	0.0	0.	0.	453.0	0.0	0.0
23	3.9	10523.5	0.0	0.0	0.	0.	1578.5	0.0	0.0
24	5.1	9540.0	0.0	0.0	0.	0.	1431.0	0.0	0.0
25	4.3	3483.2	0.0	0.0	0.	0.	522.5	0.0	0.0
26	0.8	117.9	0.0	0.0	0.	0.	17.7	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.000	286.600
2	133.657	284.005
3	143.512	282.304
4	153.480	281.513
5	163.480	281.638
6	173.425	282.678
7	183.234	284.625
8	192.824	287.461
9	202.113	291.163
10	211.024	295.700
11	219.483	301.034
12	227.418	307.120
13	234.762	313.907
14	241.454	321.338
15	247.438	329.350
16	252.663	337.876
17	257.085	346.845
18	257.528	348.000

Factor of Safety

*** 1.357 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.000	286.200
2	132.756	284.004
3	142.681	282.781
4	152.678	282.544
5	162.650	283.295
6	172.499	285.027
7	182.129	287.722
8	191.445	291.355
9	200.358	295.889
10	208.780	301.282
11	216.628	307.479
12	223.826	314.420

13	230.304	322.038
14	235.999	330.259
15	240.854	339.001
16	244.745	348.000

Factor of Safety
*** 1.359 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.000	285.000
2	126.679	282.485
3	136.532	280.779
4	146.493	279.895
5	156.493	279.839
6	166.463	280.610
7	176.335	282.204
8	186.042	284.609
9	195.516	287.809
10	204.692	291.783
11	213.509	296.502
12	221.904	301.935
13	229.821	308.044
14	237.205	314.787
15	244.006	322.119
16	250.177	329.988
17	255.675	338.340
18	260.463	347.120
19	260.853	348.000

Factor of Safety
*** 1.361 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.000	285.000
2	124.801	283.013
3	134.736	281.877
4	144.732	281.601
5	154.715	282.185
6	164.611	283.626
7	174.345	285.914
8	183.847	289.031
9	193.046	292.954
10	201.873	297.653
11	210.262	303.095
12	218.152	309.239
13	225.485	316.039
14	232.204	323.445
15	238.262	331.401
16	243.613	339.849
17	247.840	348.000

Factor of Safety
*** 1.364 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.000	285.000
2	124.380	281.533
3	134.054	279.002
4	143.930	277.431
5	153.912	276.835
6	163.905	277.220
7	173.812	278.582
8	183.538	280.907
9	192.989	284.175
10	202.074	288.352
11	210.707	293.400
12	218.803	299.269
13	226.286	305.903
14	233.083	313.238
15	239.128	321.204

16	244.364	329.724
17	248.740	338.715
18	252.181	348.000

Factor of Safety
*** 1.365 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.000	287.400
2	135.799	285.407
3	145.743	284.349
4	155.743	284.236
5	165.708	285.068
6	175.550	286.840
7	185.180	289.534
8	194.513	293.126
9	203.464	297.584
10	211.953	302.869
11	219.905	308.933
12	227.248	315.721
13	233.916	323.173
14	239.850	331.223
15	244.996	339.797
16	248.917	348.000

Factor of Safety
*** 1.367 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.000	285.000
2	125.549	282.030
3	135.324	279.922
4	145.248	278.693
5	155.242	278.353
6	165.227	278.905
7	175.123	280.345
8	184.851	282.660
9	194.335	285.833
10	203.497	289.838
11	212.267	294.644
12	220.574	300.211
13	228.351	306.497
14	235.538	313.451
15	242.076	321.017
16	247.915	329.135
17	253.007	337.742
18	257.312	346.768
19	257.770	348.000

Factor of Safety
*** 1.368 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.000	285.000
2	124.290	281.299
3	133.911	278.573
4	143.762	276.850
5	153.737	276.150
6	163.732	276.478
7	173.640	277.832
8	183.356	280.197
9	192.777	283.549
10	201.804	287.852
11	210.341	293.059
12	218.298	299.117
13	225.589	305.961
14	232.138	313.518
15	237.876	321.708
16	242.742	330.444
17	246.683	339.635

18	249.290	348.000

Factor of Safety

*** 1.368 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.000	286.600
2	133.733	284.304
3	143.651	283.025
4	153.648	282.778
5	163.617	283.564
6	173.451	285.375
7	183.046	288.192
8	192.299	291.985
9	201.111	296.713
10	209.387	302.325
11	217.040	308.763
12	223.987	315.956
13	230.154	323.828
14	235.475	332.294
15	239.893	341.265
16	242.383	348.000

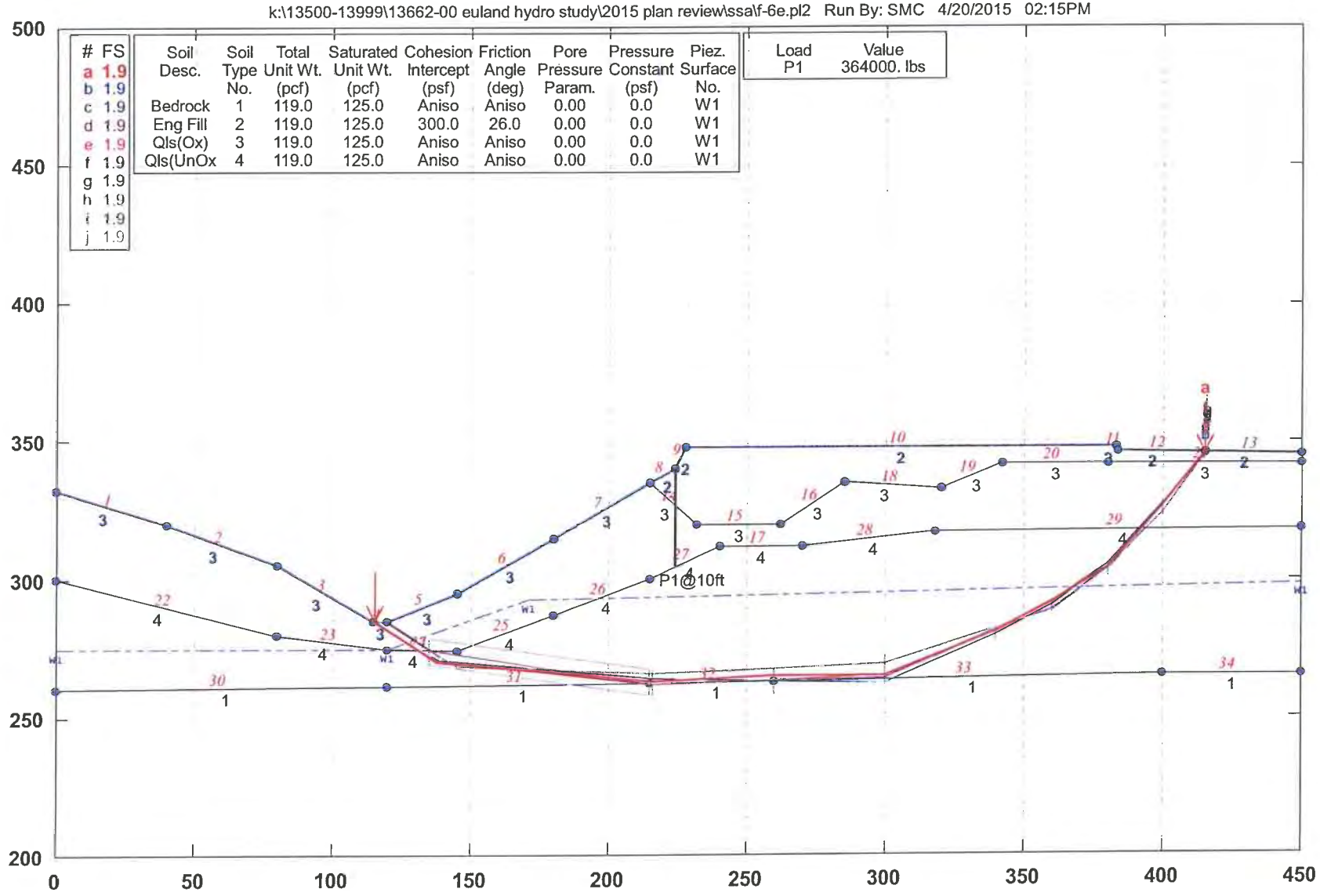
Factor of Safety

*** 1.369 ***

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

Euland - Section F-F', --with conc. piers, -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6e.pl2 Run By: SMC 4/20/2015 02:15PM



#	FS
a	1.9
b	1.9
c	1.9
d	1.9
e	1.9
f	1.9
g	1.9
h	1.9
i	1.9
j	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Eng Fill	2	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls(Ox)	3	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls(UnOx	4	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
P1	364000. lbs

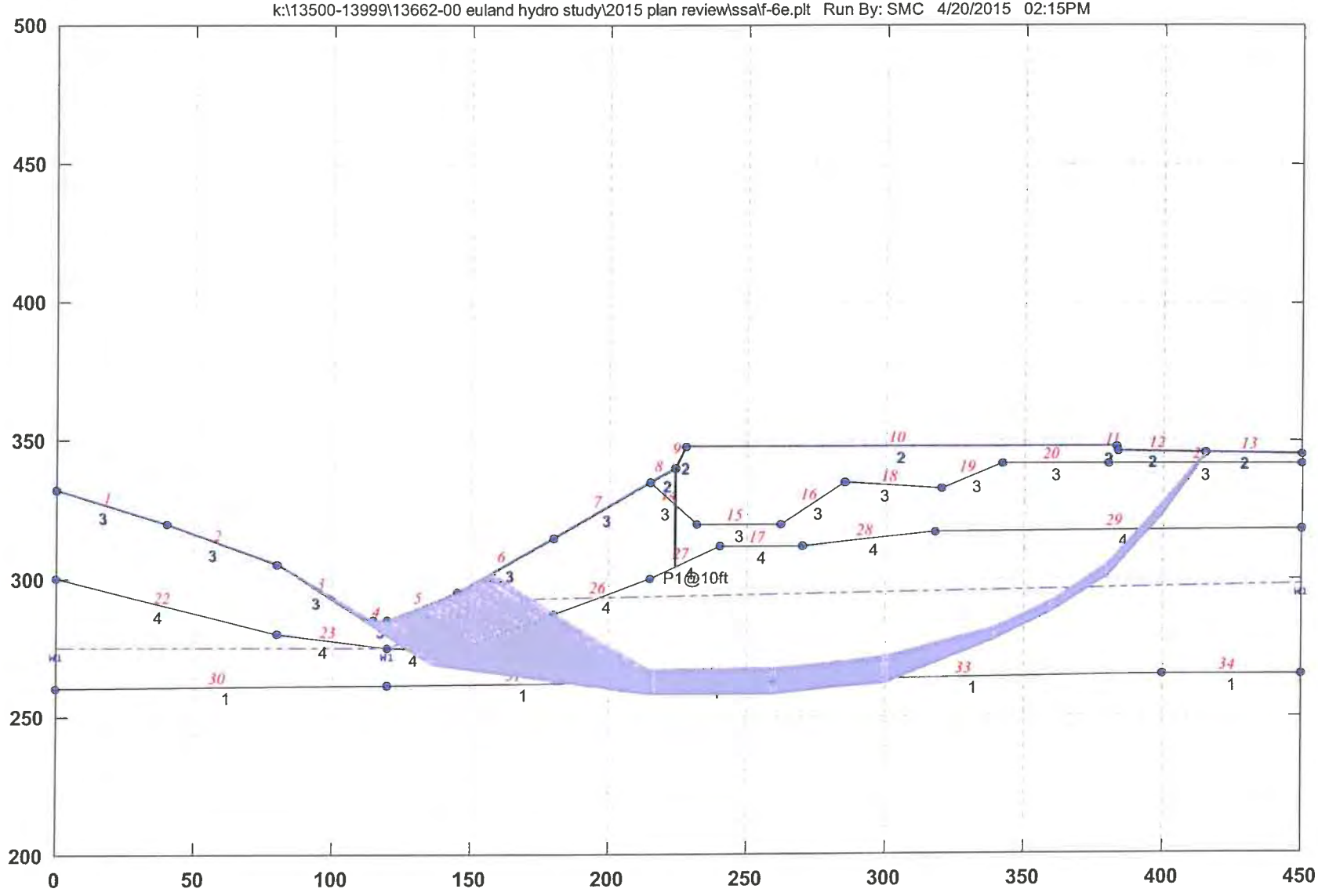
GSTABL7 v.2 FSmin=1.9

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-37.1

Euland - Section F-F', --with conc. piers, -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6e.plt Run By: SMC 4/20/2015 02:15PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 02:15PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6e.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6e.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6e.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Static

BOUNDARY COORDINATES
13 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	415.00	345.50	2
13	415.00	345.50	450.00	345.00	2
14	215.00	335.00	232.00	320.00	3
15	232.00	320.00	262.00	320.00	3
16	262.00	320.00	285.00	335.00	3
17	240.00	312.00	270.00	312.00	4
18	285.00	335.00	320.00	333.00	3
19	320.00	333.00	342.00	342.00	3
20	342.00	342.00	380.00	342.00	3
21	380.00	342.00	450.00	342.00	3
22	0.00	300.00	80.00	280.00	4
23	80.00	280.00	120.00	275.00	4
24	120.00	275.00	145.00	274.00	4
25	145.00	274.00	180.00	287.00	4
26	180.00	287.00	215.00	300.00	4
27	215.00	300.00	240.00	312.00	4
28	270.00	312.00	318.00	317.00	4
29	318.00	317.00	450.00	318.00	4
30	0.00	260.00	120.00	261.50	1
31	120.00	261.50	215.00	262.50	1
32	215.00	262.50	260.00	263.00	1
33	260.00	263.00	400.00	265.00	1
34	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil	Total	Saturated	Cohesion	Friction	Pore	Pressure	Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

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	223.90	339.94	364000.0	10.0	90.00	35.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles Assuming A Uniform Distribution Of Load Horizontally Between Individual Piers/Piles.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	135.00	274.00	215.00	262.70	10.00

2	216.00	262.70	216.00	262.70	10.00
3	260.00	263.00	260.00	263.00	10.00
4	300.00	267.00	300.00	267.00	10.00
5	340.00	280.00	340.00	280.00	5.00
6	360.00	290.00	360.00	290.00	5.00
7	380.00	303.00	380.00	303.00	5.00
8	400.00	325.00	400.00	325.00	5.00
9	415.00	345.50	416.00	345.50	0.00

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 = 3000

Number of Trial Surfaces With Valid FS = 3000

Statistical Data On All Valid FS Values:

FS Max = 5.212 FS Min = 1.893 FS Ave = 2.684

Standard Deviation = 0.415 Coefficient of Variation = 15.45 %

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.070	285.000
2	130.833	274.567
3	137.905	270.401
4	216.000	263.237
5	260.000	265.348
6	300.000	265.183
7	340.000	280.739
8	360.000	291.587
9	380.000	303.852
10	400.000	326.504
11	415.267	345.500

Factor of Safety

*** 1.893 ***

Individual data on the 33 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.9	957.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	6.6	5362.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.2	6309.4	0.0	631.0	0.	0.	0.0	0.0	0.0
4	7.1	15676.1	0.0	3671.3	0.	0.	0.0	0.0	0.0
5	7.1	20347.9	0.0	5247.8	0.	0.	0.0	0.0	0.0
6	26.0	107723.9	0.0	30555.8	0.	0.	0.0	0.0	0.0
7	9.0	50116.4	0.0	14733.2	0.	0.	0.0	0.0	0.0
8	17.4	115380.5	0.0	30114.1	0.	0.	0.0	0.0	0.0
9	17.6	140788.6	0.0	32471.8	0.	0.	0.0	0.0	0.0
10	1.0	8750.5	0.0	1911.8	0.	0.	0.0	0.0	0.0
11	8.0	72241.9	0.0	15215.5	0.	0.	0.0	0.0	0.0
12	4.0	38941.3	0.0	7562.7	0.	0.	0.0	0.0	0.0
13	4.0	40751.1	0.0	7532.6	0.	0.	0.0	0.0	0.0
14	8.0	81219.4	0.0	14975.1	0.	0.	0.0	0.0	0.0
15	20.0	201399.0	0.0	36912.0	0.	0.	0.0	0.0	0.0
16	2.0	20023.3	0.0	3652.2	0.	0.	0.0	0.0	0.0
17	8.0	80118.2	0.0	14663.9	0.	0.	0.0	0.0	0.0
18	15.0	150329.2	0.0	27732.1	0.	0.	0.0	0.0	0.0
19	15.0	150469.4	0.0	28041.6	0.	0.	0.0	0.0	0.0
20	18.0	172789.4	0.0	32280.8	0.	0.	0.0	0.0	0.0
21	2.0	18228.7	0.0	3090.1	0.	0.	0.0	0.0	0.0
22	20.0	171615.7	0.0	25436.9	0.	0.	0.0	0.0	0.0
23	2.0	16056.1	0.0	2095.9	0.	0.	0.0	0.0	0.0
24	18.0	132321.1	0.0	12162.9	0.	0.	0.0	0.0	0.0
25	8.1	51875.5	0.0	1416.5	0.	0.	0.0	0.0	0.0
26	11.9	67909.0	0.0	0.0	0.	0.	0.0	0.0	0.0
27	3.0	15154.4	0.0	0.0	0.	0.	0.0	0.0	0.0
28	0.5	2348.3	0.0	0.0	0.	0.	0.0	0.0	0.0
29	8.6	34039.5	0.0	0.0	0.	0.	0.0	0.0	0.0
30	7.9	22331.3	0.0	0.0	0.	0.	0.0	0.0	0.0
31	12.5	16876.4	0.0	0.0	0.	0.	0.0	0.0	0.0
32	2.5	586.6	0.0	0.0	0.	0.	0.0	0.0	0.0

33 0.3 5.2 0.0 0.0 0. 0. 0.0 0.0 0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.070	285.000
2	130.833	274.567
3	137.905	270.401
4	216.000	263.237
5	260.000	265.348
6	300.000	265.183
7	340.000	280.739
8	360.000	291.587
9	380.000	303.852
10	400.000	326.504
11	415.267	345.500

Factor of Safety
*** 1.893 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.187	285.075
2	136.147	274.511
3	216.000	261.904
4	260.000	263.507
5	300.000	265.022
6	340.000	281.342
7	360.000	291.467
8	380.000	305.353
9	400.000	325.720
10	415.089	345.500

Factor of Safety
*** 1.920 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.187	285.075
2	136.147	274.511
3	216.000	261.904
4	260.000	263.507
5	300.000	265.022
6	340.000	281.342
7	360.000	291.467
8	380.000	305.353
9	400.000	325.720
10	415.089	345.500

Factor of Safety
*** 1.920 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.470	285.000
2	135.516	274.379
3	145.327	268.600
4	216.000	265.531
5	260.000	267.565
6	300.000	269.197
7	340.000	282.082
8	360.000	288.203
9	380.000	304.179
10	400.000	326.479
11	415.797	345.500

Factor of Safety
*** 1.925 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.470	285.000
2	135.516	274.379
3	145.327	268.600
4	216.000	265.531

5	260.000	267.565
6	300.000	269.197
7	340.000	282.082
8	360.000	288.203
9	380.000	304.179
10	400.000	326.479
11	415.797	345.500

Factor of Safety
*** 1.925 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.772	285.000
2	131.580	274.537
3	138.179	270.650
4	216.000	264.111
5	260.000	262.745
6	300.000	262.541
7	340.000	279.868
8	360.000	290.383
9	380.000	305.285
10	400.000	327.292
11	415.739	345.500

Factor of Safety
*** 1.936 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.377	285.000
2	135.417	274.383
3	142.437	270.249
4	216.000	262.006
5	260.000	263.649
6	300.000	264.265
7	340.000	281.296
8	360.000	288.784
9	380.000	303.315
10	400.000	323.857
11	415.948	345.500

Factor of Safety
*** 1.947 ***

Failure Surface Specified By 11 Coordinate Points

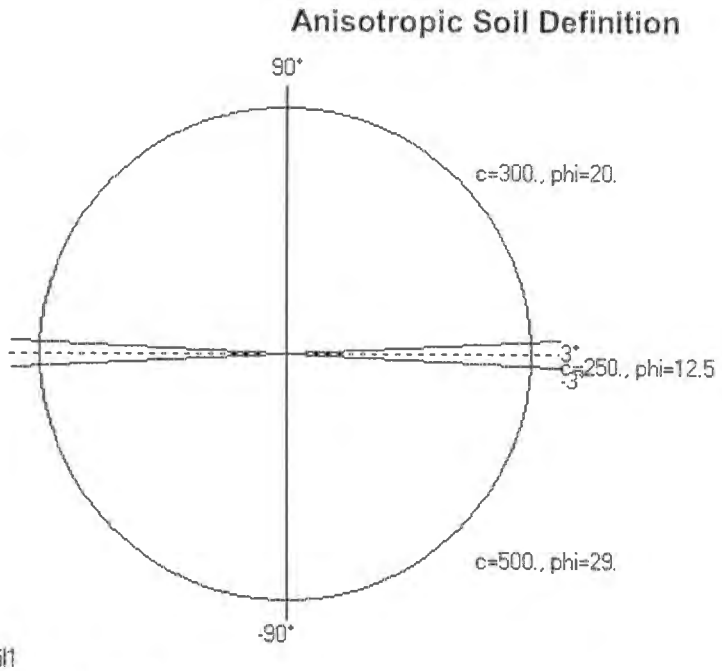
Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.377	285.000
2	135.417	274.383
3	142.437	270.249
4	216.000	262.006
5	260.000	263.649
6	300.000	264.265
7	340.000	281.296
8	360.000	288.784
9	380.000	303.315
10	400.000	323.857
11	415.948	345.500

Factor of Safety
*** 1.947 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.084	285.000
2	132.977	274.481
3	135.835	272.797
4	216.000	262.333
5	260.000	263.624
6	300.000	262.327
7	340.000	282.339
8	360.000	288.557
9	380.000	302.287
10	400.000	326.247

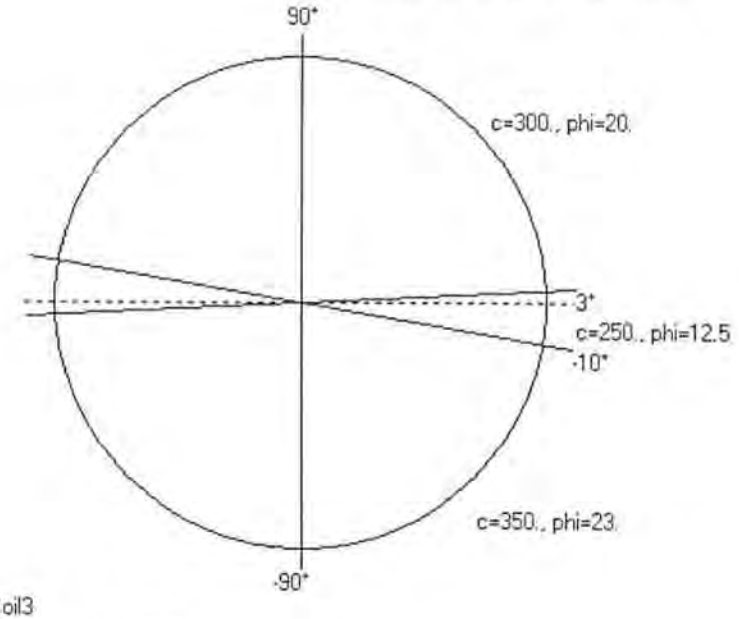
```
 11        415.835      345.500
     Factor of Safety
   ***     1.948    ***
        **** END OF GSTABL7 OUTPUT ****
```



Soil1

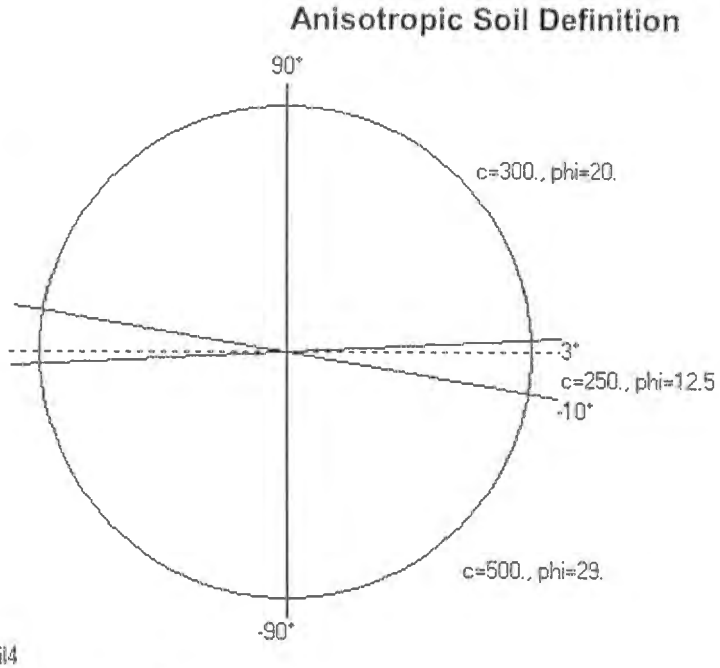
Euland - Section F-F',

Anisotropic Soil Definition



Soil3

Euland - Section F-F',



Soil4

Euland - Section F-F',

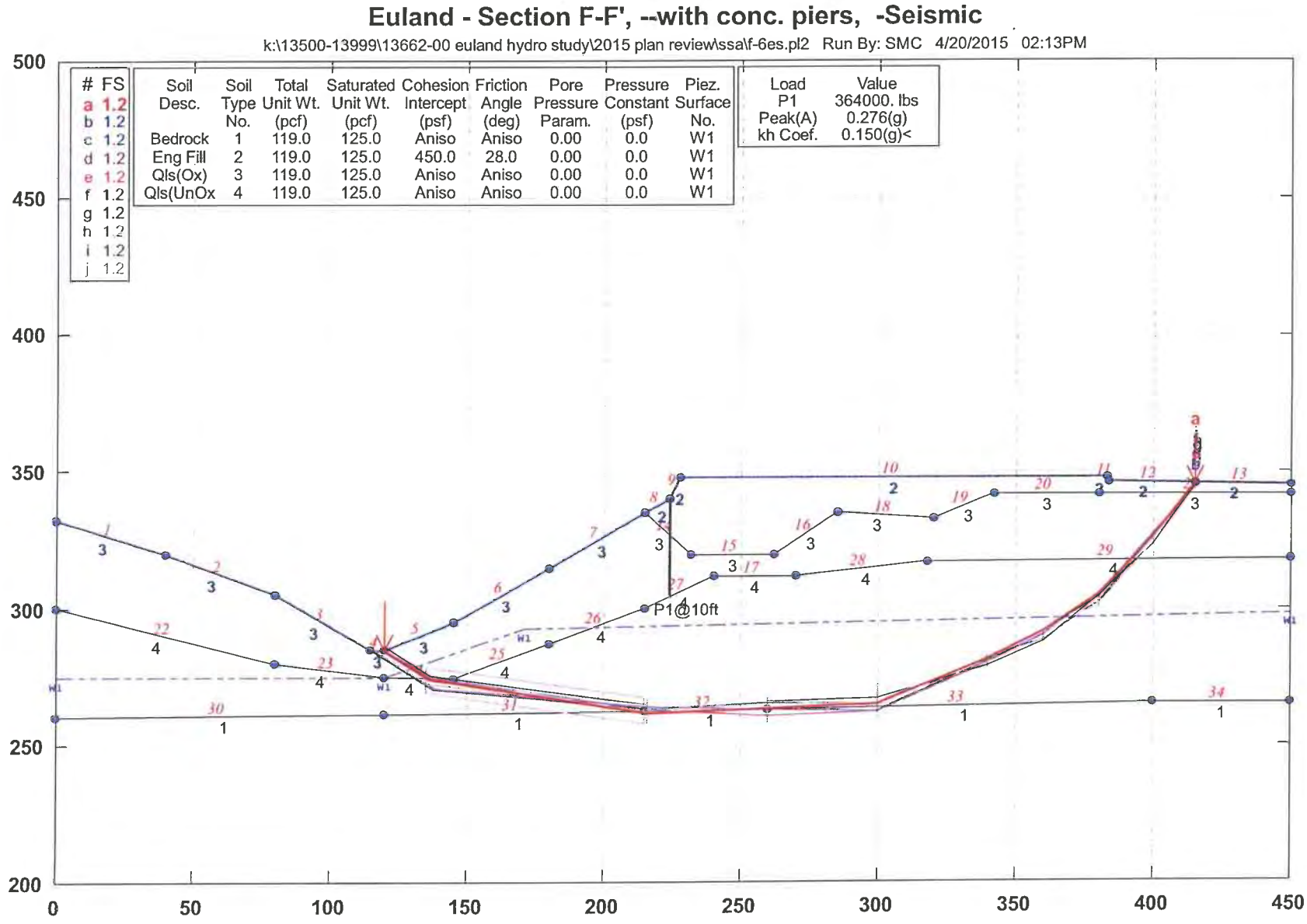

Euland - Section F-F', --with conc. piers, -Seismic
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6es.pl2 Run By: SMC 4/20/2015 02:13PM
FS
a 1.2
b 1.2
c 1.2
d 1.2
e 1.2
f 1.2
g 1.2
h 1.2
i 1.2
j 1.2
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedrock | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Eng Fill | 2 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls(Ox) | 3 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls(UnOx | 4 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load P1 364000. lbs
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
P1@10ft
500
450
400
350
300
250
200
0
50
100
150
200
250
300
350
400
450
GSTABL7 v.2 FSmin=1.2
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-37.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 02:13PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6es.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6es.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6es.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Seismic

BOUNDARY COORDINATES
13 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	415.00	345.50	2
13	415.00	345.50	450.00	345.00	2
14	215.00	335.00	232.00	320.00	3
15	232.00	320.00	262.00	320.00	3
16	262.00	320.00	285.00	335.00	3
17	240.00	312.00	270.00	312.00	4
18	285.00	335.00	320.00	333.00	3
19	320.00	333.00	342.00	342.00	3
20	342.00	342.00	380.00	342.00	3
21	380.00	342.00	450.00	342.00	3
22	0.00	300.00	80.00	280.00	4
23	80.00	280.00	120.00	275.00	4
24	120.00	275.00	145.00	274.00	4
25	145.00	274.00	180.00	287.00	4
26	180.00	287.00	215.00	300.00	4
27	215.00	300.00	240.00	312.00	4
28	270.00	312.00	318.00	317.00	4
29	318.00	317.00	450.00	318.00	4
30	0.00	260.00	120.00	261.50	1
31	120.00	261.50	215.00	262.50	1
32	215.00	262.50	260.00	263.00	1
33	260.00	263.00	400.00	265.00	1
34	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil	Total	Saturated	Cohesion	Friction	Pore	Pressure	Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000

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	223.90	339.94	364000.0	10.0	90.00	35.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles Assuming A Uniform Distribution Of Load Horizontally Between Individual Piers/Piles.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
9 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of

Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	135.00	274.00	215.00	262.70	10.00
2	216.00	262.70	216.00	262.70	10.00
3	260.00	263.00	260.00	263.00	10.00
4	300.00	267.00	300.00	267.00	10.00
5	340.00	280.00	340.00	280.00	5.00
6	360.00	290.00	360.00	290.00	5.00
7	380.00	303.00	380.00	303.00	5.00
8	400.00	325.00	400.00	325.00	5.00
9	415.00	345.50	416.00	345.50	0.00

WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.55	301.03
2	161.60	297.18
3	178.47	286.43
4	178.76	286.27
5	196.16	276.42
6	213.57	266.57
7	216.00	257.95
8	260.00	259.47
9	300.00	262.79
10	340.00	279.56
11	360.00	289.96
12	380.00	302.56
13	400.00	322.57
14	415.49	345.50

Factor of Safety for the Preceding Surface is Between 1.292 and 1.236
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	156.63	301.65
2	162.90	297.66
3	179.76	286.91
4	196.98	277.17
5	214.39	267.32
6	216.00	260.57
7	260.00	261.67
8	300.00	264.86
9	340.00	281.95
10	360.00	291.35
11	380.00	301.85
12	400.00	324.94
13	415.91	345.50

Factor Of Safety For The Preceding Specified Surface = 1.499
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	156.27	301.44
2	162.46	297.50
3	179.33	286.75
4	196.71	276.92
5	214.12	267.07
6	216.00	259.70
7	260.00	264.27
8	300.00	267.50
9	340.00	277.82
10	360.00	287.55
11	380.00	305.42
12	400.00	324.15
13	415.44	345.50

Factor Of Safety For The Preceding Specified Surface = 1.510

WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.91	301.24
2	162.03	297.34
3	178.90	286.59
4	179.03	286.52
5	196.44	276.67
6	213.84	266.82
7	216.00	258.82
8	260.00	266.87
9	300.00	270.14
10	340.00	278.69
11	360.00	288.75
12	380.00	303.99
13	400.00	323.36
14	415.97	345.50

Factor of Safety for the Preceding Surface is Between 1.367 and 1.338
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	156.99	301.85
2	163.33	297.82
3	180.19	287.07
4	197.26	277.42
5	214.66	267.57
6	216.00	261.44
7	260.00	259.06
8	300.00	262.22
9	340.00	281.07
10	360.00	290.14
11	380.00	303.29
12	400.00	325.72
13	415.38	345.50

Factor Of Safety For The Preceding Specified Surface = 1.753
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.55	301.03
2	161.60	297.18
3	178.47	286.43
4	178.76	286.27
5	196.16	276.42
6	213.57	266.57
7	216.00	257.95
8	260.00	259.47
9	300.00	262.79
10	340.00	279.56
11	360.00	289.96
12	380.00	302.56
13	400.00	322.57
14	415.49	345.50

Factor of Safety for the Preceding Surface is Between 1.292 and 1.236
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 = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 3
Number of Trial Surfaces with Misleading FS = 3
Number of Trial Surfaces With Valid FS = 2994
Percentage of Trial Surfaces With Non-Valid FS Solutions

of the Total Attempted = 0.2 %
Statistical Data On All Valid FS Values:
FS Max = 2.429 FS Min = 1.189 FS Ave = 1.600
Standard Deviation = 0.203 Coefficient of Variation = 12.68 %
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.683	285.000
2	136.147	274.511
3	216.000	261.904
4	260.000	263.507
5	300.000	265.022
6	340.000	281.342
7	360.000	291.467
8	380.000	305.353
9	400.000	325.720
10	415.089	345.500

Factor of Safety
*** 1.189 ***
Individual data on the 35 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.3	3.8	0.0	0.0	0.	0.	0.6	0.0	0.0
2	9.9	6281.8	0.0	0.0	0.	0.	942.3	0.0	0.0
3	6.3	10304.7	0.0	1351.6	0.	0.	1545.7	0.0	0.0
4	1.3	2794.8	0.0	518.9	0.	0.	419.2	0.0	0.0
5	7.5	18084.2	0.0	3944.4	0.	0.	2712.6	0.0	0.0
6	26.0	99608.3	0.0	26920.4	0.	0.	14941.2	0.0	0.0
7	9.0	48602.0	0.0	14088.1	0.	0.	7290.3	0.0	0.0
8	17.4	114352.3	0.0	29840.0	0.	0.	17152.8	0.0	0.0
9	15.0	119491.8	0.0	28316.2	0.	0.	17923.8	0.0	0.0
10	2.6	22802.9	0.0	5181.4	0.	0.	3420.4	0.0	0.0
11	1.0	8913.0	0.0	2009.5	0.	0.	1337.0	0.0	0.0
12	8.0	73621.1	0.0	15897.0	0.	0.	11043.2	0.0	0.0
13	4.0	39665.5	0.0	7920.7	0.	0.	5949.8	0.0	0.0
14	4.0	41498.4	0.0	7902.2	0.	0.	6224.8	0.0	0.0
15	8.0	82591.4	0.0	15712.4	0.	0.	12388.7	0.0	0.0
16	0.0	191.8	0.0	36.5	0.	0.	28.8	0.0	0.0
17	20.0	205712.5	0.0	39048.4	0.	0.	30856.9	0.0	0.0
18	2.0	20473.0	0.0	3879.4	0.	0.	3071.0	0.0	0.0
19	8.0	81707.1	0.0	15467.9	0.	0.	12256.1	0.0	0.0
20	15.0	152402.8	0.0	28787.4	0.	0.	22860.4	0.0	0.0
21	15.0	151362.1	0.0	28507.3	0.	0.	22704.3	0.0	0.0
22	18.0	172765.1	0.0	32480.4	0.	0.	25914.8	0.0	0.0
23	2.0	18178.2	0.0	3083.2	0.	0.	2726.7	0.0	0.0
24	20.0	170585.8	0.0	25049.3	0.	0.	25587.9	0.0	0.0
25	2.0	15914.4	0.0	1985.7	0.	0.	2387.2	0.0	0.0
26	18.0	131858.6	0.0	11724.8	0.	0.	19778.8	0.0	0.0
27	7.3	46857.3	0.0	1359.2	0.	0.	7028.6	0.0	0.0
28	12.7	71274.0	0.0	0.0	0.	0.	10691.1	0.0	0.0
29	3.0	14679.6	0.0	0.0	0.	0.	2201.9	0.0	0.0
30	0.5	2281.1	0.0	0.0	0.	0.	342.2	0.0	0.0
31	8.5	33021.1	0.0	0.0	0.	0.	4953.2	0.0	0.0
32	8.0	23037.6	0.0	0.0	0.	0.	3455.6	0.0	0.0
33	12.4	17408.2	0.0	0.0	0.	0.	2611.2	0.0	0.0
34	2.6	561.7	0.0	0.0	0.	0.	84.3	0.0	0.0
35	0.1	0.6	0.0	0.0	0.	0.	0.1	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.683	285.000
2	136.147	274.511
3	216.000	261.904
4	260.000	263.507
5	300.000	265.022
6	340.000	281.342
7	360.000	291.467
8	380.000	305.353

9	400.000	325.720
10	415.089	345.500

Factor of Safety
*** 1.189 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.214	285.086
2	136.421	274.761
3	216.000	262.778
4	260.000	260.905
5	300.000	262.380
6	340.000	280.471
7	360.000	290.263
8	380.000	301.786
9	400.000	326.508
10	415.561	345.500

Factor of Safety
*** 1.198 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.214	285.086
2	136.421	274.761
3	216.000	262.778
4	260.000	260.905
5	300.000	262.380
6	340.000	280.471
7	360.000	290.263
8	380.000	301.786
9	400.000	326.508
10	415.561	345.500

Factor of Safety
*** 1.198 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.869	289.646
2	113.652	285.325
3	130.520	274.579
4	137.905	270.401
5	216.000	263.237
6	260.000	265.348
7	300.000	265.183
8	340.000	280.739
9	360.000	291.587
10	380.000	303.852
11	400.000	326.504
12	415.267	345.500

Factor of Safety
*** 1.201 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.869	289.646
2	113.652	285.325
3	130.520	274.579
4	137.905	270.401
5	216.000	263.237
6	260.000	265.348
7	300.000	265.183
8	340.000	280.739
9	360.000	291.587
10	380.000	303.852
11	400.000	326.504
12	415.267	345.500

Factor of Safety
*** 1.201 ***

Failure Surface Specified By 10 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	121.031	285.412
2	136.968	275.260
3	216.000	264.526
4	260.000	265.700
5	300.000	267.097
6	340.000	278.728
7	360.000	287.856
8	380.000	304.653
9	400.000	323.086
10	415.505	345.500

Factor of Safety
*** 1.202 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.347	285.000
2	132.851	274.486
3	135.835	272.797
4	216.000	262.333
5	260.000	263.624
6	300.000	262.327
7	340.000	282.339
8	360.000	288.557
9	380.000	302.287
10	400.000	326.247
11	415.835	345.500

Factor of Safety
*** 1.203 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.860	285.651
2	114.420	285.294
3	131.288	274.548
4	138.179	270.650
5	216.000	264.111
6	260.000	262.745
7	300.000	262.541
8	340.000	279.868
9	360.000	290.383
10	380.000	305.285
11	400.000	327.292
12	415.739	345.500

Factor of Safety
*** 1.203 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.508	285.000
2	135.157	274.394
3	136.655	273.546
4	216.000	264.955
5	260.000	265.817
6	300.000	264.402
7	340.000	279.724
8	360.000	289.946
9	380.000	301.586
10	400.000	323.613
11	415.251	345.500

Factor of Safety
*** 1.210 ***

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

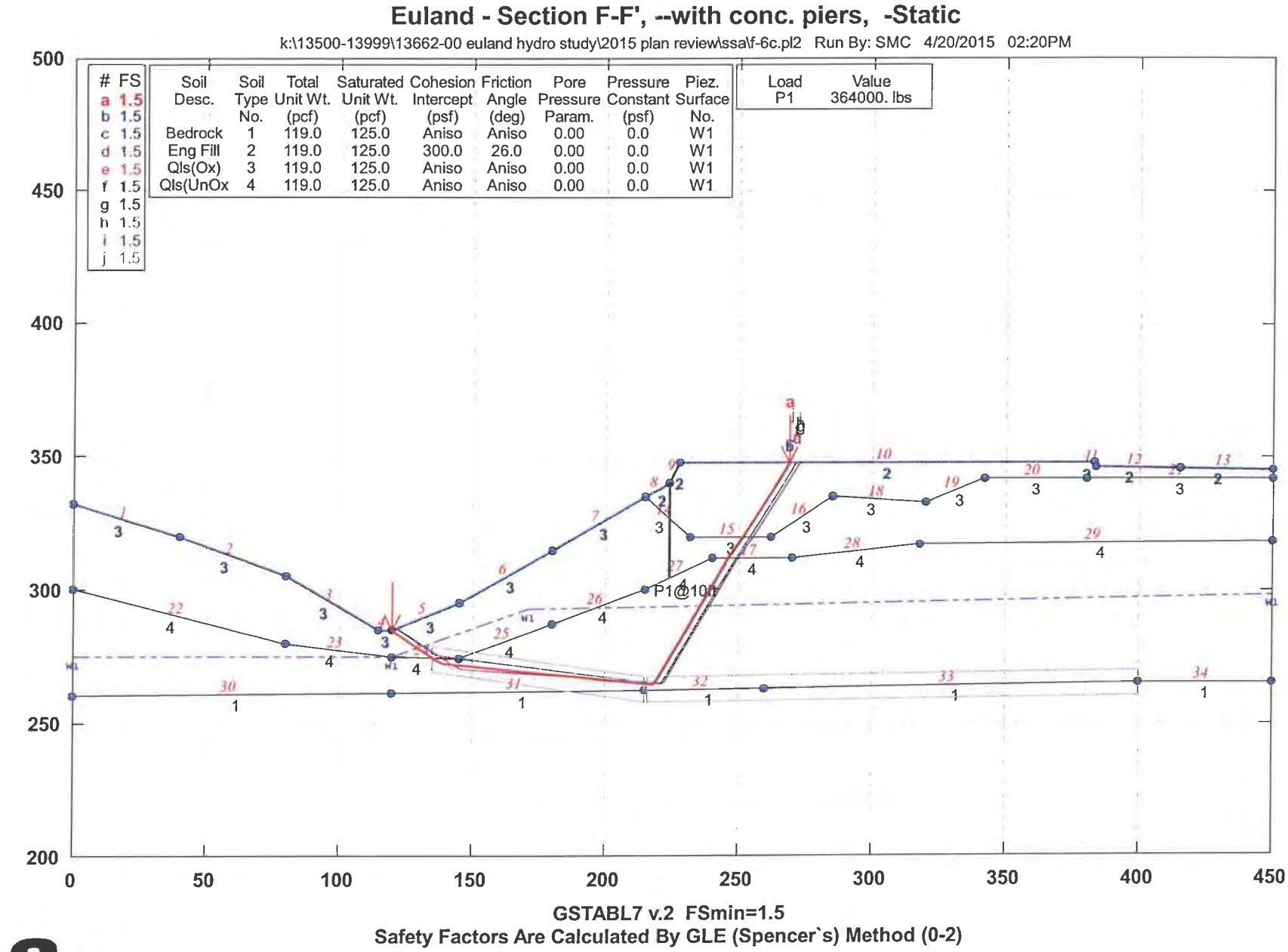
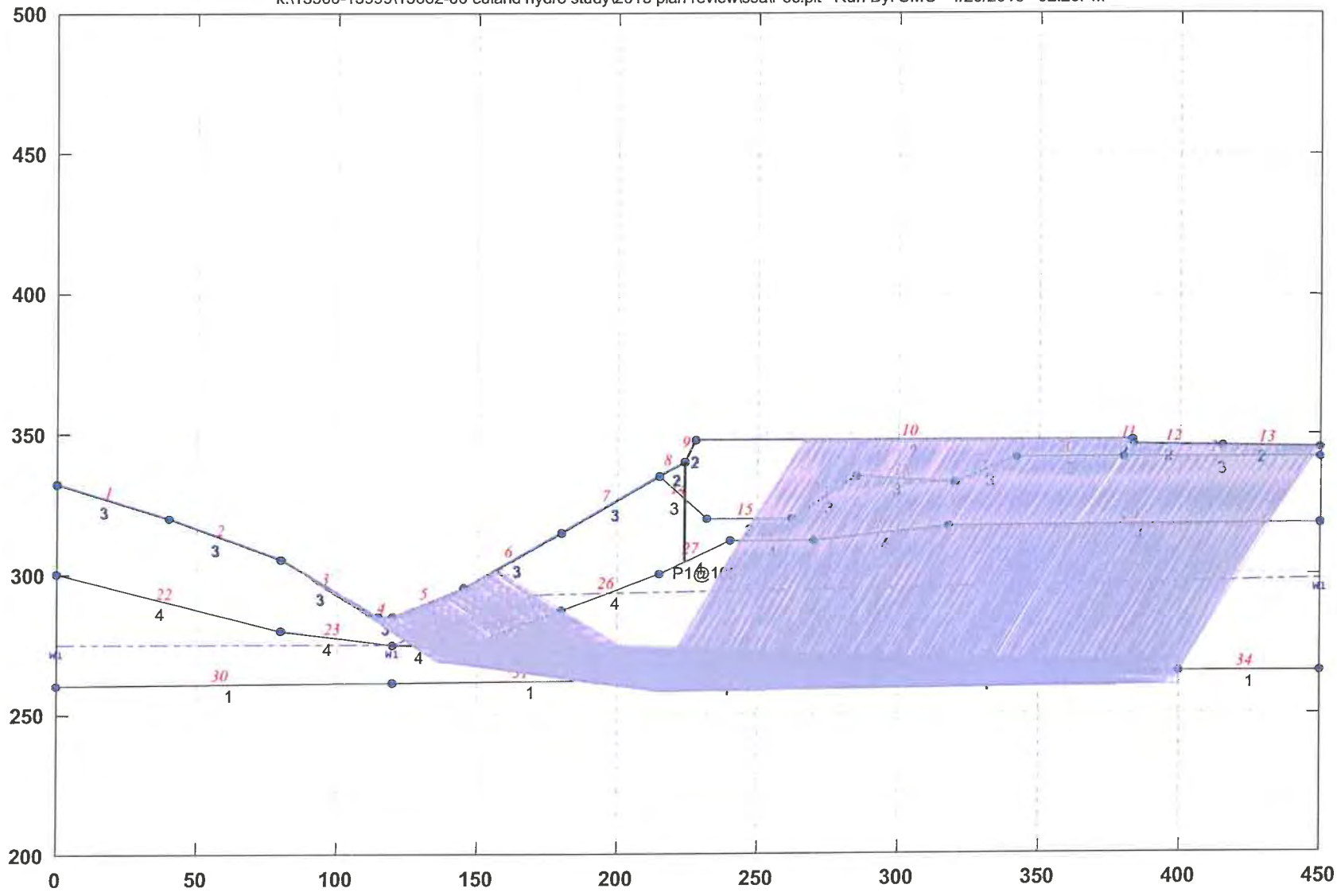

Euland - Section F-F', --with conc. piers, -Static
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6c.pl2 Run By: SMC 4/20/2015 02:20PM
FS
a 1.5
b 1.5
c 1.5
d 1.5
e 1.5
f 1.5
g 1.5
h 1.5
i 1.5
j 1.5
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedrock | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Eng Fill | 2 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls(Ox) | 3 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls(UnOx | 4 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load P1 Value 364000. lbs
P1@10°
500
450
400
350
300
250
200
0
50
100
150
200
250
300
350
400
450
GSTABL7 v.2 FSmin=1.5
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-38.1

Euland - Section F-F', --with conc. piers, -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6c.plt Run By: SMC 4/20/2015 02:20PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 02:20PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6c.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6c.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6c.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Static

BOUNDARY COORDINATES
13 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	415.00	345.50	2
13	415.00	345.50	450.00	345.00	2
14	215.00	335.00	232.00	320.00	3
15	232.00	320.00	262.00	320.00	3
16	262.00	320.00	285.00	335.00	3
17	240.00	312.00	270.00	312.00	4
18	285.00	335.00	320.00	333.00	3
19	320.00	333.00	342.00	342.00	3
20	342.00	342.00	380.00	342.00	3
21	380.00	342.00	450.00	342.00	3
22	0.00	300.00	80.00	280.00	4
23	80.00	280.00	120.00	275.00	4
24	120.00	275.00	145.00	274.00	4
25	145.00	274.00	180.00	287.00	4
26	180.00	287.00	215.00	300.00	4
27	215.00	300.00	240.00	312.00	4
28	270.00	312.00	318.00	317.00	4
29	318.00	317.00	450.00	318.00	4
30	0.00	260.00	120.00	261.50	1
31	120.00	261.50	215.00	262.50	1
32	215.00	262.50	260.00	263.00	1
33	260.00	263.00	400.00	265.00	1
34	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil	Total	Saturated	Cohesion	Friction	Pore	Pressure	Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 4 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

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	223.90	339.94	364000.0	10.0	90.00	35.0

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

Janbus Empirical Coef is being used for the case of c & phi both > 0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.

3000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	135.00	274.00	215.00	262.70	10.00

2 216.00 262.70 400.00 265.00 10.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.858	3.439	0.176
15.00	6.703	4.937	0.268
0.00	-0.040	-0.022	0.000
0.00	-0.056	-0.029	0.000
12.82	5.779	4.157	0.228
0.29	-0.053	-0.026	0.005
0.00	-0.052	-0.025	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000
0.00	-0.041	-0.023	0.000

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.67	300.52
2	160.18	296.87
3	176.86	285.83
4	192.86	276.41
5	210.09	266.26
6	216.84	263.99
7	226.99	281.22
8	237.14	298.45
9	245.12	312.00
10	250.42	320.00
11	261.02	336.96
12	267.91	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	2.962	2.638	0.176
15.00	3.105	3.386	0.268
11.91	3.029	2.883	0.211
12.29	3.041	2.937	0.218
13.53	3.075	3.127	0.241
12.97	3.060	3.039	0.230
13.00	3.061	3.043	0.231
0.00	-0.070	-0.048	0.000
5.12	2.750	2.158	0.090
0.24	-0.095	-0.037	0.004
0.00	0.035	0.027	0.000
0.00	0.035	0.027	0.000
0.00	-0.004	-0.004	0.000
0.00	-0.004	-0.004	0.000
0.00	-0.004	-0.004	0.000
0.00	-0.004	-0.004	0.000
0.00	-0.004	-0.004	0.000
0.00	-0.004	-0.004	0.000
0.00	-0.004	-0.004	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	142.81	294.12
2	146.39	291.75
3	163.07	280.71
4	177.12	272.43
5	194.36	262.28
6	195.56	261.57
7	249.55	259.38
8	251.62	262.91
9	261.77	280.14
10	271.93	297.37
11	281.23	313.17
12	292.27	329.85
13	295.29	334.41
14	303.78	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.104	3.066	0.176
15.00	5.196	4.191	0.268
89.94	-0.007	-0.003	*****
89.50	-0.007	0.288	*****
89.94	-0.007	0.240	*****
89.94	-0.007	0.240	*****
0.00	-0.011	0.000	0.000
0.00	-0.007	0.001	0.000
24.34	8.581	12.104	0.452
0.00	-0.013	-0.040	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000
0.00	0.001	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	146.57	295.89
2	150.51	293.28
3	167.19	282.24
4	183.73	272.50
5	200.96	262.35
6	204.86	260.05
7	217.74	258.70
8	220.01	262.56
9	230.16	279.79
10	240.31	297.02
11	249.14	312.00
12	254.43	320.00
13	265.03	336.96
14	271.93	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.867	3.774	0.176
15.00	6.181	5.431	0.268
29.53	12.487	28.026	0.566
15.89	6.463	5.880	0.285
12.00	5.344	4.308	0.213
23.87	9.769	20.108	0.443
13.44	5.726	4.788	0.239

11.13	5.128	4.058	0.197
36.34	11.969	31.886	0.736
12.84	5.562	4.575	0.228
6.48	4.162	3.083	0.114
89.94	0.000	-0.002	*****
89.94	0.000	-0.002	*****
0.00	0.000	-0.039	0.000
89.94	0.000	-0.002	*****
89.94	0.000	-0.002	*****
0.00	0.000	-0.039	0.000
89.94	0.000	-0.002	*****
89.94	0.000	-0.002	*****
0.00	0.000	-0.039	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.25	299.14
2	157.30	295.80
3	173.97	284.76
4	189.11	275.85
5	206.34	265.69
6	231.22	259.33
7	233.21	262.70
8	243.36	279.93
9	253.51	297.17
10	262.25	312.00
11	271.75	326.36
12	282.35	343.32
13	285.27	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	3.860	4.096	0.176
15.00	2.949	4.948	0.268
9.11	4.010	3.972	0.160
7.29	4.302	3.738	0.128
9.89	3.879	4.080	0.174
8.98	4.031	3.954	0.158
9.01	4.026	3.959	0.159
16.08	0.260	5.177	0.288
9.14	4.005	3.976	0.161
6.88	4.366	3.689	0.121
10.03	3.856	4.100	0.177
8.91	4.042	3.946	0.157
8.96	4.034	3.952	0.158
0.00	0.968	-0.278	0.000
12.79	3.367	4.534	0.227
4.54	4.708	3.427	0.079
7.55	4.262	3.769	0.132
10.05	3.852	4.103	0.177
8.92	4.041	3.947	0.157
8.96	4.035	3.951	0.158

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	144.10	294.64
2	148.71	291.93
3	165.94	281.78
4	166.84	281.25
5	184.08	271.10
6	397.07	264.51
7	397.33	264.96
8	407.48	282.19
9	417.63	299.43
10	427.79	316.66
11	428.48	317.84

12	439.52	334.51
13	444.47	342.00
14	446.38	345.05

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	3.550	2.745	0.176
15.00	4.183	3.531	0.268
43.39	0.000	27.204	0.945
15.89	4.304	3.715	0.285
7.50	3.271	2.462	0.132
48.76	21.642	20.000	1.141
0.00	-0.032	-0.075	0.000
0.00	-0.032	-0.075	0.000
12.14	3.809	3.038	0.215
0.00	-0.035	-0.017	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	147.05	296.17
2	151.09	293.49
3	167.76	282.46
4	173.72	278.95
5	190.95	268.80
6	217.38	262.81
7	227.53	280.05
8	237.68	297.28
9	246.35	312.00
10	251.65	320.00
11	262.25	336.96
12	269.15	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	5.294	4.081	0.176
15.00	6.870	6.040	0.268
29.46	16.149	30.185	0.565
16.08	7.294	6.714	0.288
12.32	5.955	4.817	0.218
22.54	10.729	19.072	0.415
13.96	6.492	5.501	0.249
12.31	5.952	4.813	0.218
29.26	15.991	28.552	0.560
14.19	6.574	5.614	0.253
10.60	5.453	4.249	0.187
34.32	18.133	34.335	0.683
12.78	6.100	4.993	0.227
7.44	-0.211	-0.040	0.131
6.61	4.503	3.319	0.116
7.30	0.385	0.387	0.128
7.30	0.386	0.387	0.128
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

The Trial Failure Surface In Question Is Defined

By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.63	299.93
2	158.95	296.41
3	175.63	285.38
4	187.31	278.49
5	204.55	268.34
6	234.27	259.33
7	236.28	262.74
8	246.43	279.97
9	256.58	297.20
10	265.29	312.00
11	276.33	328.68
12	277.11	329.86
13	287.71	346.82
14	288.45	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	7.754	4.668	0.176
15.00	18.825	8.702	0.268
7.08	5.699	3.651	0.124
1.75	3.776	2.589	0.031
0.00	3.381	2.356	0.000
0.00	3.381	2.356	0.000
18.07	22.115	18.035	0.326
0.00	-0.162	-0.059	0.000
0.00	0.527	0.536	0.000
18.30	34.875	19.597	0.331
0.01	0.527	0.537	0.000
0.00	0.527	0.536	0.000
16.32	26.348	11.200	0.293
0.01	0.527	0.537	0.000
0.00	0.527	0.537	0.000
9.78	0.000	0.000	0.172
9.78	0.000	0.000	0.172
9.78	0.000	0.000	0.172
9.78	0.000	0.000	0.172
9.78	0.000	0.000	0.172

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.43	300.96
2	161.09	297.21
3	177.77	286.17
4	179.07	285.41
5	196.30	275.26
6	213.53	265.11
7	219.00	259.29
8	220.93	262.57
9	231.08	279.80
10	241.23	297.03
11	250.05	312.00
12	255.34	320.00
13	265.94	336.96
14	272.84	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	2.227	1.895	0.176
15.00	2.258	2.177	0.268
17.14	2.250	2.323	0.308
15.78	2.257	2.228	0.283
15.83	2.256	2.232	0.284

4.46	-0.035	-0.021	0.078
6.28	2.172	1.724	0.110
4.53	-0.034	-0.018	0.079
4.03	-0.036	-0.019	0.070
18.47	-0.014	-0.013	0.334
18.88	-0.014	-0.014	0.342
18.72	-0.014	-0.014	0.339
18.73	-0.014	-0.014	0.339
18.73	-0.014	-0.014	0.339
18.73	-0.014	-0.014	0.339
18.73	-0.014	-0.014	0.339
18.73	-0.014	-0.014	0.339
18.73	-0.014	-0.014	0.339
18.73	-0.014	-0.014	0.339

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	125.83	287.33
2	128.94	285.27
3	145.62	274.23
4	152.05	270.44
5	251.52	261.74
6	252.21	262.91
7	262.37	280.15
8	272.52	297.38
9	281.86	313.24
10	292.90	329.91
11	295.85	334.38
12	304.36	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	3.204	2.828	0.176
15.00	3.422	3.687	0.268
12.24	3.314	3.161	0.217
12.66	3.332	3.232	0.225
13.74	3.377	3.428	0.245
13.26	3.357	3.337	0.236
13.28	3.358	3.341	0.236
1.60	-0.044	-0.027	0.028
5.47	2.950	2.322	0.096
1.73	-0.040	-0.020	0.030
0.64	0.011	0.009	0.011
0.39	0.009	0.008	0.007

##################### SOME LINES SKIPPED #####################

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 84
Number of Trial Surfaces With Valid FS = 2916
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 2.8 %
Statistical Data On All Valid FS Values:
FS Max = 6.612 FS Min = 1.493 FS Ave = 3.030
Standard Deviation = 0.796 Coefficient of Variation = 26.25 %
((Simplified Janbu FS for Critical Surface = 1.162))

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.722	285.000
2	135.784	274.369
3	138.765	272.613
4	218.100	264.581
5	228.251	281.814
6	238.402	299.046
7	246.032	312.000
8	251.327	320.000
9	261.925	336.961
10	268.823	348.000

*** FOS = 1.493 Theta (ki=1.0) = 17.02 ***
Lambda = 0.306

Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.3	3.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	9.7	6123.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	6.1	10071.5	0.0	1339.7	0.	0.	0.0	0.0	0.0
4	3.0	6660.7	0.0	1550.7	0.	0.	0.0	0.0	0.0
5	6.2	16288.5	0.0	3851.4	0.	0.	0.0	0.0	0.0
6	26.0	100889.3	0.0	27335.7	0.	0.	0.0	0.0	0.0
7	9.0	47931.4	0.0	13650.5	0.	0.	0.0	0.0	0.0
8	17.4	111422.9	0.0	28156.0	0.	0.	0.0	0.0	0.0
9	17.6	137164.1	0.0	30683.0	0.	0.	0.0	0.0	0.0
10	3.1	26778.9	0.0	5652.9	0.	0.	0.0	0.0	0.0
11	5.9	49144.4	0.0	17629.3	0.	0.	0.0	0.0	0.0
12	4.0	31803.4	0.0	7864.0	0.	0.	0.0	0.0	0.0
13	0.3	2000.9	0.0	383.1	0.	0.	0.0	0.0	0.0
14	3.7	28312.8	0.0	4177.1	0.	0.	0.0	0.0	0.0
15	3.5	23876.8	0.0	1280.1	0.	0.	0.0	0.0	0.0
16	2.9	17617.9	0.0	0.0	0.	0.	0.0	0.0	0.0
17	1.6	9053.2	0.0	0.0	0.	0.	0.0	0.0	0.0
18	6.0	29516.3	0.0	0.0	0.	0.	0.0	0.0	0.0
19	5.3	20163.7	0.0	0.0	0.	0.	0.0	0.0	0.0
20	10.6	24618.2	0.0	0.0	0.	0.	0.0	0.0	0.0
21	6.9	4530.7	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.722	285.000
2	135.784	274.369
3	138.765	272.613
4	218.100	264.581
5	228.251	281.814
6	238.402	299.046
7	246.032	312.000
8	251.327	320.000
9	261.925	336.961
10	268.823	348.000

*** FOS = 1.493 Theta (ki=1.0) = 17.02 ***
Lambda = 0.306

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.722	285.000
2	135.784	274.369
3	138.765	272.613
4	218.100	264.581
5	228.251	281.814
6	238.402	299.046
7	246.032	312.000
8	251.327	320.000
9	261.925	336.961
10	268.823	348.000

*** FOS = 1.493 Theta (ki=1.0) = 17.02 ***

Lambda = 0.306
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.403	285.561
2	136.968	275.260
3	221.155	264.590
4	231.306	281.823
5	241.456	299.055
6	249.081	312.000
7	254.377	320.000
8	264.975	336.961
9	271.873	348.000

*** FOS = 1.521 Theta (ki=1.0) = 17.56 ***

Lambda = 0.316
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.403	285.561
2	136.968	275.260
3	221.155	264.590
4	231.306	281.823
5	241.456	299.055
6	249.081	312.000
7	254.377	320.000
8	264.975	336.961
9	271.873	348.000

*** FOS = 1.521 Theta (ki=1.0) = 17.56 ***

Lambda = 0.316
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.403	285.561
2	136.968	275.260
3	221.155	264.590
4	231.306	281.823
5	241.456	299.055
6	249.081	312.000
7	254.377	320.000
8	264.975	336.961
9	271.873	348.000

*** FOS = 1.521 Theta (ki=1.0) = 17.56 ***

Lambda = 0.316
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.694	285.678
2	122.295	285.280
3	138.973	274.241
4	145.640	270.314
5	222.413	265.182
6	232.563	282.414
7	242.714	299.647
8	249.991	312.000
9	255.286	320.000
10	265.884	336.961
11	272.782	348.000

*** FOS = 1.525 Theta (ki=1.0) = 15.75 ***

Lambda = 0.282
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.694	285.678
2	122.295	285.280
3	138.973	274.241
4	145.640	270.314
5	222.413	265.182
6	232.563	282.414
7	242.714	299.647
8	249.991	312.000

9	255.286	320.000
10	265.884	336.961
11	272.782	348.000

*** FOS = 1.525 Theta (ki=1.0) = 15.75 ***
Lambda = 0.282

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.694	285.678
2	122.295	285.280
3	138.973	274.241
4	145.640	270.314
5	222.413	265.182
6	232.563	282.414
7	242.714	299.647
8	249.991	312.000
9	255.286	320.000
10	265.884	336.961
11	272.782	348.000

*** FOS = 1.525 Theta (ki=1.0) = 15.75 ***
Lambda = 0.282

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	285.000
2	136.080	274.357
3	147.437	267.668
4	219.358	265.173
5	229.509	282.406
6	239.659	299.638
7	246.941	312.000
8	252.236	320.000
9	262.835	336.961
10	269.733	348.000

*** FOS = 1.533 Theta (ki=1.0) = 15.56 ***
Lambda = 0.279

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

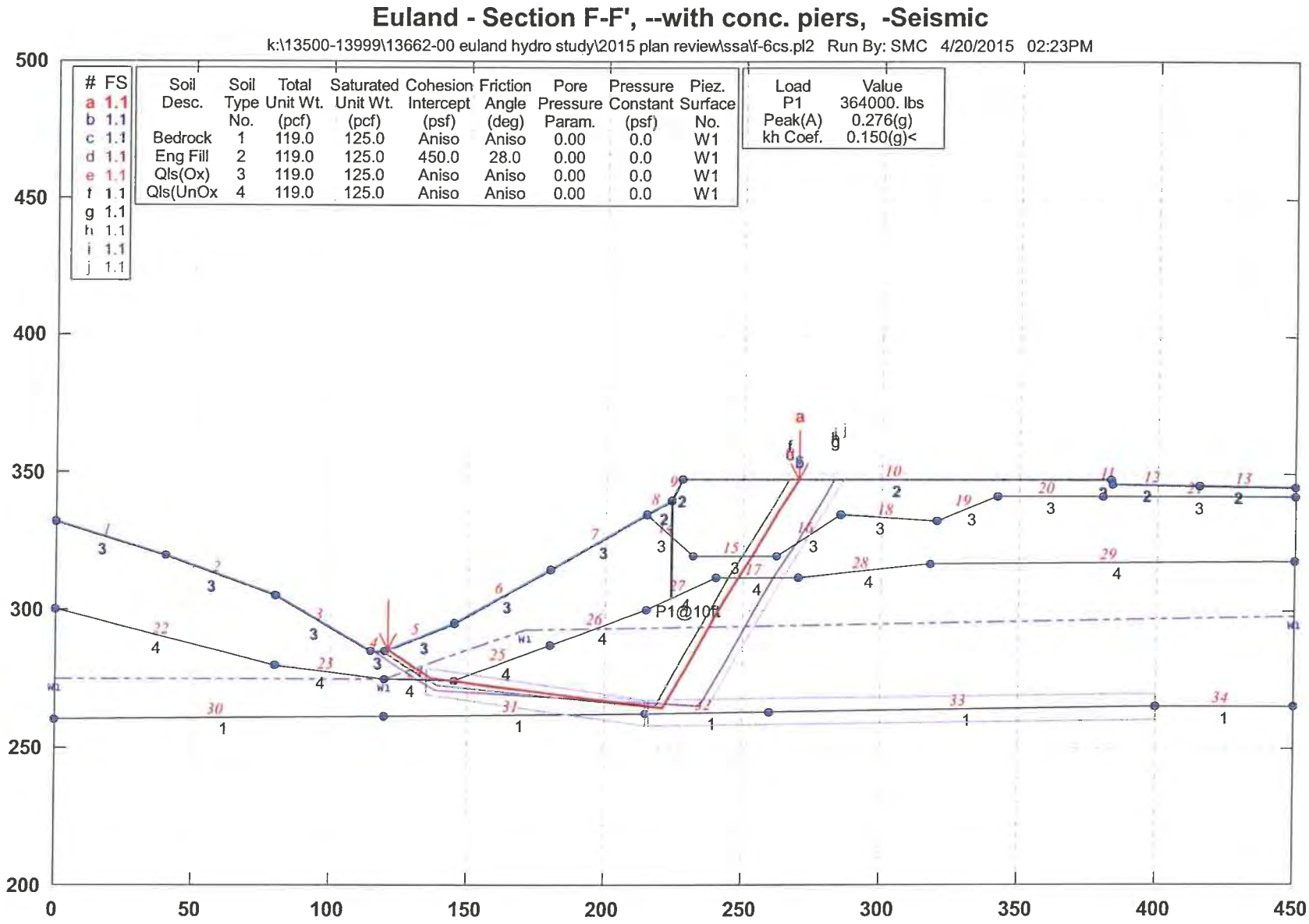
Euland - Section F-F', --with conc. piers, -Seismic
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6cs.pl2 Run By: SMC 4/20/2015 02:23PM
FS
a 1.1
b 1.1
c 1.1
d 1.1
e 1.1
f 1.1
g 1.1
h 1.1
i 1.1
j 1.1
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedrock | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Eng Fill | 2 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls(Ox) | 3 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls(UnOx | 4 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load P1 364000. lbs
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
P1@10ft
W1
500
450
400
350
300
250
200
0
50
100
150
200
250
300
350
400
450
GSTABL7 v.2 FSmin=1.1
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-38.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

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: 4/20/2015
Time of Run: 02:23PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6cs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6cs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6cs.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Seismic

BOUNDARY COORDINATES
13 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	415.00	345.50	2
13	415.00	345.50	450.00	345.00	2
14	215.00	335.00	232.00	320.00	3
15	232.00	320.00	262.00	320.00	3
16	262.00	320.00	285.00	335.00	3
17	240.00	312.00	270.00	312.00	4
18	285.00	335.00	320.00	333.00	3
19	320.00	333.00	342.00	342.00	3
20	342.00	342.00	380.00	342.00	3
21	380.00	342.00	450.00	342.00	3
22	0.00	300.00	80.00	280.00	4
23	80.00	280.00	120.00	275.00	4
24	120.00	275.00	145.00	274.00	4
25	145.00	274.00	180.00	287.00	4
26	180.00	287.00	215.00	300.00	4
27	215.00	300.00	240.00	312.00	4
28	270.00	312.00	318.00	317.00	4
29	318.00	317.00	450.00	318.00	4
30	0.00	260.00	120.00	261.50	1
31	120.00	261.50	215.00	262.50	1
32	215.00	262.50	260.00	263.00	1
33	260.00	263.00	400.00	265.00	1
34	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil	Total	Saturated	Cohesion	Friction	Pore	Pressure	Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 4 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

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	223.90	339.94	364000.0	10.0	90.00	35.0

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

Janbus Empirical Coef is being used for the case of c & phi both > 0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.

3000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of

Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	135.00	274.00	215.00	262.70	10.00
2	216.00	262.70	400.00	265.00	10.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	3.102	2.588	0.176
15.00	3.665	3.224	0.268
55.63	8.582	11.553	1.462
22.01	4.714	4.798	0.404
9.48	3.051	2.535	0.167
19.66	4.323	4.132	0.357
27.59	5.819	7.666	0.523
20.64	4.482	4.390	0.377
18.77	4.186	3.924	0.340
22.63	4.826	5.012	0.417
20.49	4.457	4.348	0.374
20.83	4.513	4.442	0.380
21.68	4.658	4.695	0.398
21.29	4.590	4.575	0.390
21.31	4.594	4.581	0.390
0.00	-0.021	-0.016	0.000
1.59	2.393	1.912	0.028
0.02	-0.014	-0.009	0.000
0.00	-0.014	-0.009	0.000
0.00	-0.013	-0.008	0.000

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.52	299.87
2	159.17	296.27
3	176.04	285.53
4	192.69	276.11
5	210.09	266.26
6	216.84	263.99
7	226.69	281.40
8	236.54	298.80
9	244.01	312.00
10	249.10	320.00
11	259.40	337.14
12	265.93	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.223	3.269	0.176
15.00	5.952	4.572	0.268
0.00	0.356	0.486	0.000
0.00	2.599	2.037	0.000
4.47	3.158	2.462	0.078
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

0.00	0.000	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.23	300.27
2	160.02	296.59
3	176.88	285.84
4	178.72	284.81
5	196.12	274.96
6	213.53	265.11
7	219.00	259.29
8	220.85	262.57
9	230.70	279.97
10	240.55	297.38
11	248.82	312.00
12	253.92	320.00
13	264.22	337.14
14	270.74	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.099	3.256	0.176
15.00	5.529	4.472	0.268
0.00	-0.019	-0.014	0.000
0.00	-0.026	-0.018	0.000
15.66	5.786	4.697	0.280
0.15	-0.023	-0.017	0.003
0.00	-0.023	-0.017	0.000
0.00	-0.018	-0.012	0.000
24.69	14.688	14.243	0.460
0.47	0.000	0.000	0.008
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.68	301.10
2	161.76	297.23
3	178.62	286.49
4	194.33	277.60
5	211.73	267.76
6	222.05	259.30
7	223.92	262.60
8	233.77	280.01
9	243.62	297.41
10	251.87	312.00
11	256.97	320.00
12	267.27	337.14
13	273.79	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.670	2.144	0.176
15.00	1.425	2.385	0.268
3.52	1.861	1.894	0.062
0.00	1.928	1.779	0.000

2.67	1.879	1.865	0.047
3.04	1.871	1.877	0.053
2.89	1.874	1.872	0.051
2.89	1.874	1.872	0.051
24.43	0.000	3.051	0.454
2.91	1.874	1.873	0.051
0.00	1.928	1.779	0.000
3.91	1.852	1.907	0.068
2.51	1.882	1.859	0.044
2.59	1.881	1.862	0.045
3.05	1.871	1.878	0.053
2.89	1.875	1.872	0.051
2.89	1.875	1.872	0.051
0.00	0.000	0.108	0.000
2.82	1.876	1.870	0.049
2.61	1.880	1.863	0.046

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.91	301.24
2	162.03	297.34
3	178.90	286.59
4	179.03	286.52
5	196.44	276.67
6	213.84	266.82
7	386.47	260.95
8	388.67	264.84
9	398.51	282.25
10	408.36	299.65
11	418.21	317.06
12	418.61	317.76
13	429.35	334.63
14	434.05	342.00
15	435.97	345.20

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	2.719	2.332	0.176
15.00	3.107	2.835	0.268
30.81	4.565	7.694	0.596
16.69	3.251	3.051	0.300
13.11	2.954	2.625	0.233
25.26	4.063	4.859	0.472
17.86	3.355	3.218	0.322
16.83	3.264	3.070	0.302
21.46	3.690	3.860	0.393
18.57	3.419	3.330	0.336
18.94	3.453	3.390	0.343
20.13	3.563	3.597	0.366
19.58	3.512	3.498	0.356
19.61	3.515	3.503	0.356
0.00	2.097	1.686	0.000
26.89	4.221	5.453	0.507
8.96	2.645	2.247	0.158
8.82	2.636	2.236	0.155
63.20	-0.067	6.129	1.979
13.22	2.962	2.636	0.235

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	145.40	295.23
2	149.43	292.66
3	166.30	281.91
4	178.78	274.85
5	196.19	265.00
6	216.48	258.11

7	218.99	262.54
8	228.84	279.95
9	238.69	297.36
10	246.97	312.00
11	252.07	320.00
12	262.37	337.14
13	268.90	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	3.102	2.588	0.176
15.00	3.665	3.224	0.268
55.68	0.000	0.000	1.465
55.67	0.000	0.000	1.464
55.66	0.001	0.000	1.464
0.00	2.284	1.817	0.000
74.40	0.000	-0.002	3.581
74.79	0.000	-0.002	3.679
33.15	0.000	0.001	0.653
38.56	0.000	0.003	0.797
29.34	0.000	0.001	0.562
12.63	0.000	0.000	0.224
5.76	-0.017	-0.010	0.101
15.03	0.000	0.000	0.268
15.13	0.000	0.000	0.270
15.13	-0.037	-0.020	0.270
3.92	2.565	2.066	0.068
14.64	0.000	-0.016	0.261
15.12	-0.030	-0.018	0.270
14.85	-0.029	-0.017	0.265

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.52	299.87
2	159.17	296.27
3	176.04	285.53
4	192.69	276.11
5	210.09	266.26
6	216.84	263.99
7	226.69	281.40
8	236.54	298.80
9	244.01	312.00
10	249.10	320.00
11	259.40	337.14
12	265.93	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.223	3.269	0.176
15.00	5.952	4.572	0.268
0.00	0.356	0.486	0.000
0.00	2.599	2.037	0.000
4.47	3.158	2.462	0.078
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.23	300.27
2	160.02	296.59
3	176.88	285.84
4	178.72	284.81
5	196.12	274.96
6	213.53	265.11
7	219.00	259.29
8	220.85	262.57
9	230.70	279.97
10	240.55	297.38
11	248.82	312.00
12	253.92	320.00
13	264.22	337.14
14	270.74	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.099	3.256	0.176
15.00	5.529	4.472	0.268
0.00	-0.019	-0.014	0.000
0.00	-0.026	-0.018	0.000
15.66	5.786	4.697	0.280
0.15	-0.023	-0.017	0.003
0.00	-0.023	-0.017	0.000
0.00	-0.018	-0.012	0.000
24.69	14.688	14.243	0.460
0.47	0.000	0.000	0.008
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.68	301.10
2	161.76	297.23
3	178.62	286.49
4	194.33	277.60
5	211.73	267.76
6	222.05	259.30
7	223.92	262.60
8	233.77	280.01
9	243.62	297.41
10	251.87	312.00
11	256.97	320.00
12	267.27	337.14
13	273.79	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.670	2.144	0.176
15.00	1.425	2.385	0.268

3.52	1.861	1.894	0.062
0.00	1.928	1.779	0.000
2.67	1.879	1.865	0.047
3.04	1.871	1.877	0.053
2.89	1.874	1.872	0.051
2.89	1.874	1.872	0.051
24.43	0.000	3.051	0.454
2.91	1.874	1.873	0.051
0.00	1.928	1.779	0.000
3.91	1.852	1.907	0.068
2.51	1.882	1.859	0.044
2.59	1.881	1.862	0.045
3.05	1.871	1.878	0.053
2.89	1.875	1.872	0.051
2.89	1.875	1.872	0.051
0.00	0.000	0.108	0.000
2.82	1.876	1.870	0.049
2.61	1.880	1.863	0.046

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.91	301.24
2	162.03	297.34
3	178.90	286.59
4	179.03	286.52
5	196.44	276.67
6	213.84	266.82
7	386.47	260.95
8	388.67	264.84
9	398.51	282.25
10	408.36	299.65
11	418.21	317.06
12	418.61	317.76
13	429.35	334.63
14	434.05	342.00
15	435.97	345.20

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	2.719	2.332	0.176
15.00	3.107	2.835	0.268
30.81	4.565	7.694	0.596
16.69	3.251	3.051	0.300

###################### SOME LINES SKIPPED ######################

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 15
Number of Trial Surfaces With Valid FS = 2985
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.5 %
Statistical Data On All Valid FS Values:
FS Max = 3.646 FS Min = 1.124 FS Ave = 1.634
Standard Deviation = 0.386 Coefficient of Variation = 23.61 %
((Simplified Janbu FS for Critical Surface = 1.012))
Failure Surface Specified By 9 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	121.031	285.412
2	136.968	275.260
3	221.155	264.590
4	231.003	281.997
5	240.852	299.404
6	247.978	312.000
7	253.075	320.000
8	263.375	337.143
9	269.899	348.000

*** FOS = 1.124 Theta (ki=1.0) = 13.61 ***
Lambda = 0.242

Individual data on the 20 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)	
1	10.1	6357.0	0.0	0.0	0.	0.	953.5	0.0	0.0	
2	5.8	9409.1	0.0	1158.5	0.	0.	1411.4	0.0	0.0	
3	8.0	18168.1	0.0	3653.5	0.	0.	2725.2	0.0	0.0	
4	0.5	1234.2	0.0	279.4	0.	0.	185.1	0.0	0.0	
5	25.5	93404.9	0.0	24155.9	0.	0.	14010.7	0.0	0.0	
6	9.0	46264.0	0.0	12850.8	0.	0.	6939.6	0.0	0.0	
7	17.4	108927.9	0.0	26981.6	0.	0.	16339.2	0.0	0.0	
8	17.6	135628.8	0.0	29998.7	0.	0.	20344.3	0.0	0.0	
9	6.2	53601.9	0.0	11172.2	0.	0.	8040.3	0.0	0.0	
10	2.8	24871.2	0.0	9668.2	0.	0.	3730.7	0.0	0.0	
11	4.0	34222.6	0.0	10557.5	0.	0.	5133.4	0.0	0.0	
12	3.0	24802.1	0.0	5595.6	0.	0.	3720.3	0.0	0.0	
13	1.0	7791.3	0.0	1415.2	0.	0.	1168.7	0.0	0.0	
14	5.9	41669.4	0.0	3867.0	0.	0.	6250.4	0.0	0.0	
15	2.1	12940.6	0.0	0.0	0.	0.	1941.1	0.0	0.0	
16	0.9	5001.7	0.0	0.0	0.	0.	750.3	0.0	0.0	
17	7.1	35870.2	0.0	0.0	0.	0.	5380.5	0.0	0.0	
18	5.1	19407.7	0.0	0.0	0.	0.	2911.2	0.0	0.0	
19	10.3	23815.1	0.0	0.0	0.	0.	3572.3	0.0	0.0	
20	6.5	4213.9	0.0	0.0	0.	0.	632.1	0.0	0.0	

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.031	285.412
2	136.968	275.260
3	221.155	264.590
4	231.003	281.997
5	240.852	299.404
6	247.978	312.000
7	253.075	320.000
8	263.375	337.143
9	269.899	348.000

*** FOS = 1.124 Theta (ki=1.0) = 13.61 ***
Lambda = 0.242

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.031	285.412
2	136.968	275.260
3	221.155	264.590
4	231.003	281.997
5	240.852	299.404
6	247.978	312.000
7	253.075	320.000
8	263.375	337.143
9	269.899	348.000

*** FOS = 1.124 Theta (ki=1.0) = 13.61 ***
Lambda = 0.242

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.973	285.000
2	135.652	274.374

3	138.765	272.613
4	218.100	264.581
5	227.949	281.988
6	237.797	299.395
7	244.928	312.000
8	250.025	320.000
9	260.326	337.143
10	266.849	348.000

*** FOS = 1.132 Theta (ki=1.0) = 13.11 ***
Lambda = 0.233

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.973	285.000
2	135.652	274.374
3	138.765	272.613
4	218.100	264.581
5	227.949	281.988
6	237.797	299.395
7	244.928	312.000
8	250.025	320.000
9	260.326	337.143
10	266.849	348.000

*** FOS = 1.132 Theta (ki=1.0) = 13.11 ***
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Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.973	285.000
2	135.652	274.374
3	138.765	272.613
4	218.100	264.581
5	227.949	281.988
6	237.797	299.395
7	244.928	312.000
8	250.025	320.000
9	260.326	337.143
10	266.849	348.000

*** FOS = 1.132 Theta (ki=1.0) = 13.11 ***
Lambda = 0.233

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.603	285.000
2	132.057	274.518
3	138.452	270.899
4	234.631	265.217
5	244.480	282.625
6	254.328	300.032
7	261.100	312.000
8	269.179	324.682
9	279.480	341.825
10	283.190	348.000

*** FOS = 1.132 Theta (ki=1.0) = 11.50 ***
Lambda = 0.203

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.603	285.000
2	132.057	274.518
3	138.452	270.899
4	234.631	265.217
5	244.480	282.625
6	254.328	300.032
7	261.100	312.000
8	269.179	324.682
9	279.480	341.825
10	283.190	348.000

*** FOS = 1.132 Theta (ki=1.0) = 11.50 ***
Lambda = 0.203

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.603	285.000
2	132.057	274.518
3	138.452	270.899
4	234.631	265.217
5	244.480	282.625
6	254.328	300.032
7	261.100	312.000
8	269.179	324.682
9	279.480	341.825
10	283.190	348.000

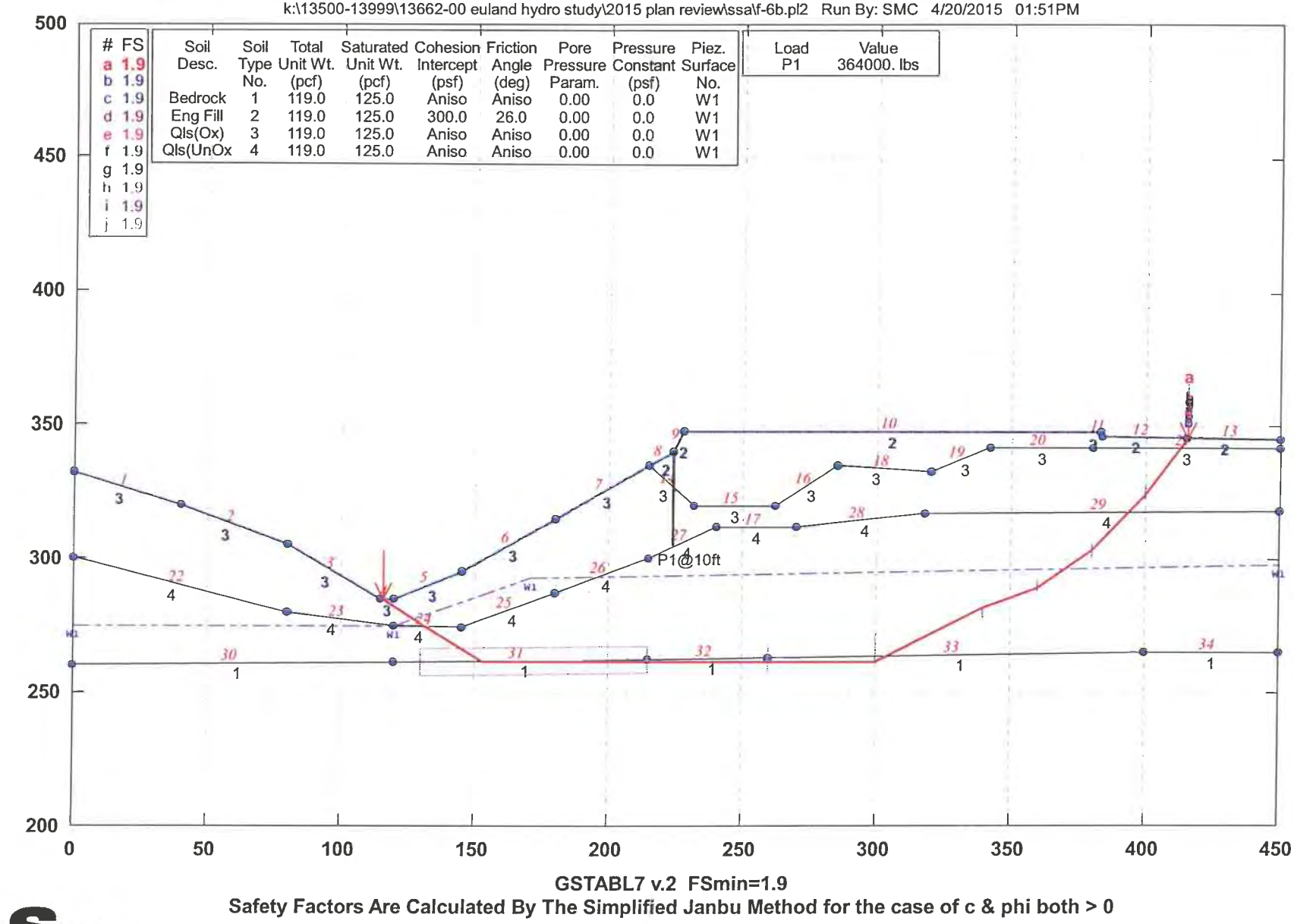
*** FOS = 1.132 Theta (ki=1.0) = 11.50 ***
Lambda = 0.203

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.508	285.000
2	135.157	274.394
3	136.655	273.546
4	237.686	265.226
5	247.535	282.633
6	257.383	300.041
7	264.149	312.000
8	274.396	328.085
9	284.697	345.228
10	286.363	348.000

*** FOS = 1.136 Theta (ki=1.0) = 12.39 ***
Lambda = 0.220

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



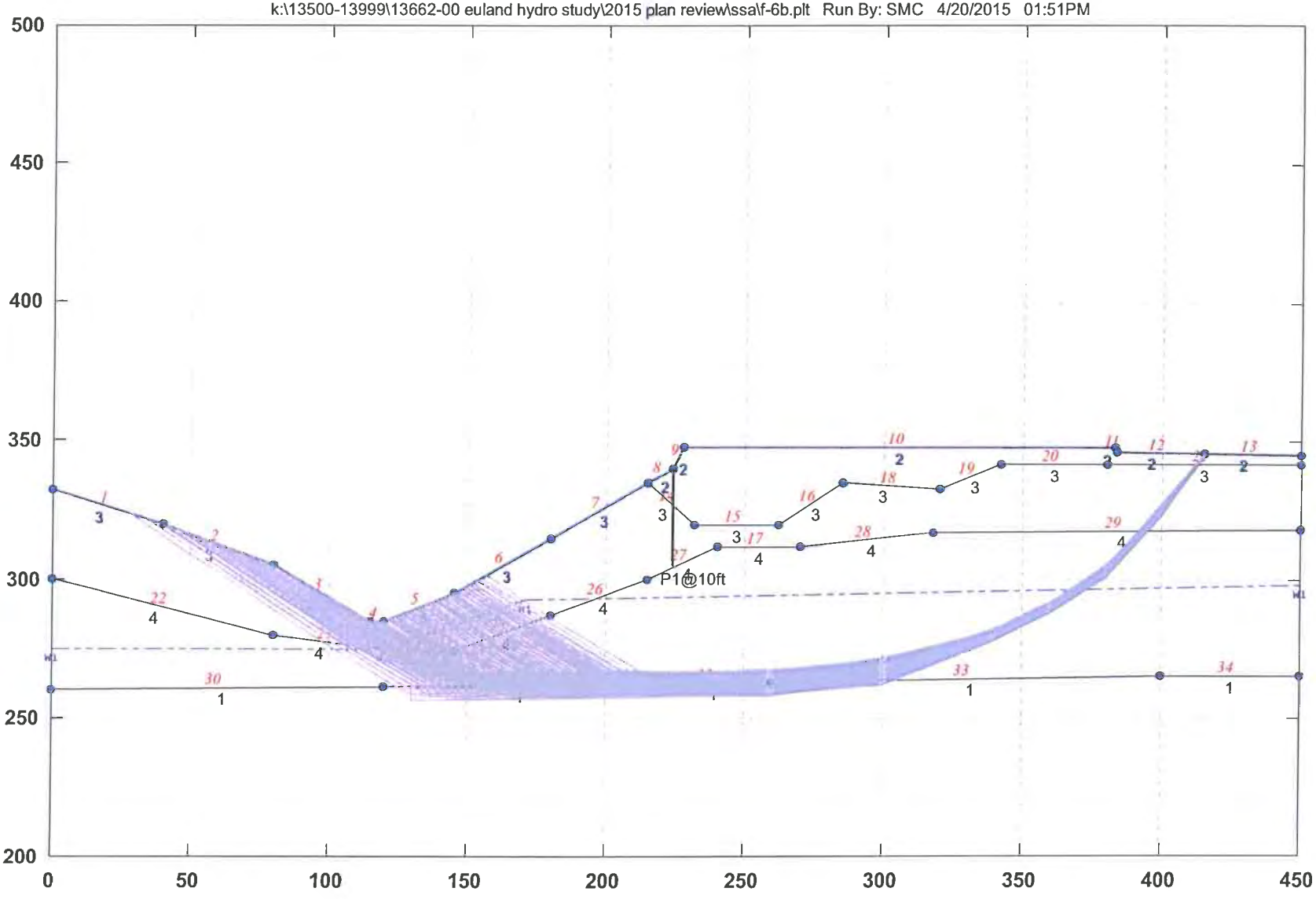
GSTABL7 v.2 FSmin=1.9

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-39.1

Euland - Section F-F', --with conc. piers, -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6b.plt Run By: SMC 4/20/2015 01:51PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 01:51PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6b.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6b.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6b.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Static

BOUNDARY COORDINATES
13 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	415.00	345.50	2
13	415.00	345.50	450.00	345.00	2
14	215.00	335.00	232.00	320.00	3
15	232.00	320.00	262.00	320.00	3
16	262.00	320.00	285.00	335.00	3
17	240.00	312.00	270.00	312.00	4
18	285.00	335.00	320.00	333.00	3
19	320.00	333.00	342.00	342.00	3
20	342.00	342.00	380.00	342.00	3
21	380.00	342.00	450.00	342.00	3
22	0.00	300.00	80.00	280.00	4
23	80.00	280.00	120.00	275.00	4
24	120.00	275.00	145.00	274.00	4
25	145.00	274.00	180.00	287.00	4
26	180.00	287.00	215.00	300.00	4
27	215.00	300.00	240.00	312.00	4
28	270.00	312.00	318.00	317.00	4
29	318.00	317.00	450.00	318.00	4
30	0.00	260.00	120.00	261.50	1
31	120.00	261.50	215.00	262.50	1
32	215.00	262.50	260.00	263.00	1
33	260.00	263.00	400.00	265.00	1
34	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(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.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 4 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

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	223.90	339.94	364000.0	10.0	90.00	35.0

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

Janbus Empirical Coef is being used for the case of c & phi both > 0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.

3000 Trial Surfaces Have Been Generated.

8 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)

1	130.00	261.50	215.00	262.50	10.00
2	260.00	263.00	260.00	263.00	10.00
3	300.00	267.00	300.00	267.00	10.00
4	340.00	280.00	340.00	280.00	5.00
5	360.00	290.00	360.00	290.00	5.00
6	380.00	303.00	380.00	303.00	5.00
7	400.00	325.00	400.00	325.00	5.00
8	415.00	345.50	416.00	345.50	0.00

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 = 3000

Number of Trial Surfaces With Valid FS = 3000

Statistical Data On All Valid FS Values:

FS Max = 3.957 FS Min = 1.921 FS Ave = 2.539

Standard Deviation = 0.453 Coefficient of Variation = 17.86 %

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
2	131.711	274.532
3	136.008	272.001
4	153.240	261.850
5	153.507	261.693
6	260.000	262.111
7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety

*** 1.921 ***

Individual data on the 35 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.1	663.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	7.2	5574.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.5	6936.6	0.0	737.5	0.	0.	0.0	0.0	0.0
4	4.3	8995.4	0.0	1947.4	0.	0.	0.0	0.0	0.0
5	9.0	26177.4	0.0	7926.0	0.	0.	0.0	0.0	0.0
6	8.2	33416.5	0.0	11838.6	0.	0.	0.0	0.0	0.0
7	0.3	1243.2	0.0	455.9	0.	0.	0.0	0.0	0.0
8	17.5	92581.8	0.0	29063.1	0.	0.	0.0	0.0	0.0
9	9.0	55935.5	0.0	17576.2	0.	0.	0.0	0.0	0.0
10	17.4	123895.6	0.0	34238.5	0.	0.	0.0	0.0	0.0
11	17.6	145696.3	0.0	34785.8	0.	0.	0.0	0.0	0.0
12	9.0	82635.3	0.0	17922.0	0.	0.	0.0	0.0	0.0
13	4.0	39810.9	0.0	7988.1	0.	0.	0.0	0.0	0.0
14	4.0	41708.7	0.0	8002.0	0.	0.	0.0	0.0	0.0
15	8.0	83399.1	0.0	16046.0	0.	0.	0.0	0.0	0.0
16	20.0	208390.6	0.0	40359.5	0.	0.	0.0	0.0	0.0
17	2.0	20831.4	0.0	4055.5	0.	0.	0.0	0.0	0.0
18	8.0	83326.2	0.0	16264.9	0.	0.	0.0	0.0	0.0
19	15.0	156238.9	0.0	30681.5	0.	0.	0.0	0.0	0.0
20	15.0	156241.8	0.0	30922.5	0.	0.	0.0	0.0	0.0
21	3.0	30671.4	0.0	6715.4	0.	0.	0.0	0.0	0.0
22	15.0	146798.3	0.0	29472.2	0.	0.	0.0	0.0	0.0
23	2.0	18481.6	0.0	3355.3	0.	0.	0.0	0.0	0.0
24	20.0	171205.2	0.0	26232.1	0.	0.	0.0	0.0	0.0
25	2.0	15789.6	0.0	1825.8	0.	0.	0.0	0.0	0.0
26	18.0	133680.1	0.0	12144.6	0.	0.	0.0	0.0	0.0
27	10.1	66067.7	0.0	2652.9	0.	0.	0.0	0.0	0.0
28	9.9	56662.2	0.0	0.0	0.	0.	0.0	0.0	0.0
29	3.0	15305.7	0.0	0.0	0.	0.	0.0	0.0	0.0
30	0.5	2382.8	0.0	0.0	0.	0.	0.0	0.0	0.0
31	9.9	39592.5	0.0	0.0	0.	0.	0.0	0.0	0.0

32	6.6	19399.0	0.0	0.0	0.	0.	0.0	0.0	0.0
33	13.2	19441.9	0.0	0.0	0.	0.	0.0	0.0	0.0
34	1.8	500.8	0.0	0.0	0.	0.	0.0	0.0	0.0
35	0.8	47.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
2	131.711	274.532
3	136.008	272.001
4	153.240	261.850
5	153.507	261.693
6	260.000	262.111
7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety
*** 1.921 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
2	131.711	274.532
3	136.008	272.001
4	153.240	261.850
5	153.507	261.693
6	260.000	262.111
7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
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Factor of Safety
*** 1.921 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
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4	153.240	261.850
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7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety
*** 1.921 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
2	131.711	274.532
3	136.008	272.001
4	153.240	261.850
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7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety
*** 1.921 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
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3	136.008	272.001
4	153.240	261.850
5	153.507	261.693
6	260.000	262.111
7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety
*** 1.921 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
2	131.711	274.532
3	136.008	272.001
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7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety
*** 1.921 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
2	131.711	274.532
3	136.008	272.001
4	153.240	261.850
5	153.507	261.693
6	260.000	262.111
7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety
*** 1.921 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
2	131.711	274.532
3	136.008	272.001
4	153.240	261.850
5	153.507	261.693
6	260.000	262.111
7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety
*** 1.921 ***

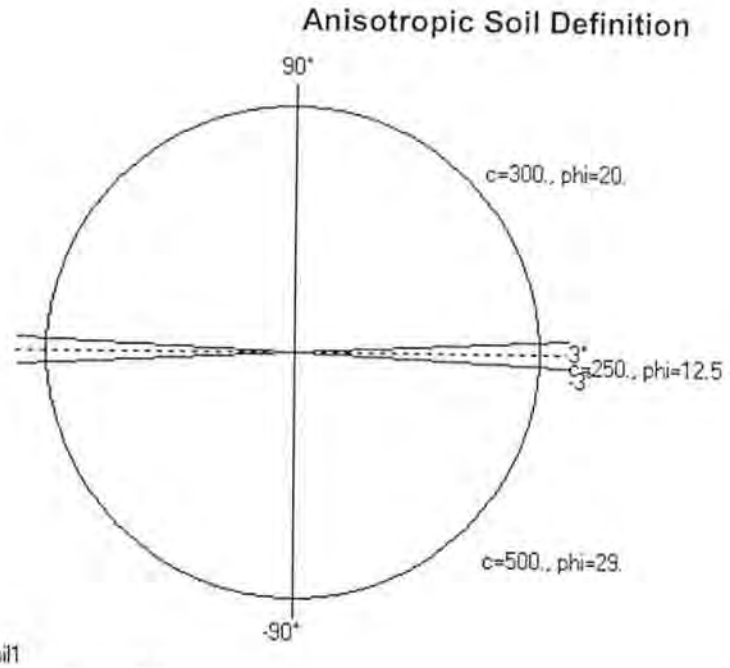
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.895	285.000
2	131.711	274.532
3	136.008	272.001
4	153.240	261.850
5	153.507	261.693
6	260.000	262.111
7	300.000	262.141
8	340.000	281.972
9	360.000	289.480
10	380.000	303.561
11	400.000	324.436
12	415.781	345.500

Factor of Safety

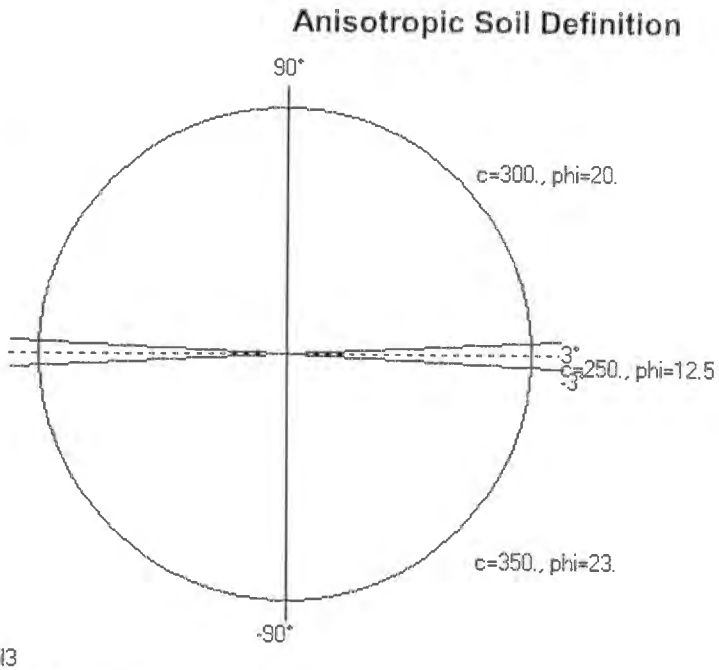
*** 1.921 ***

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



Soil1

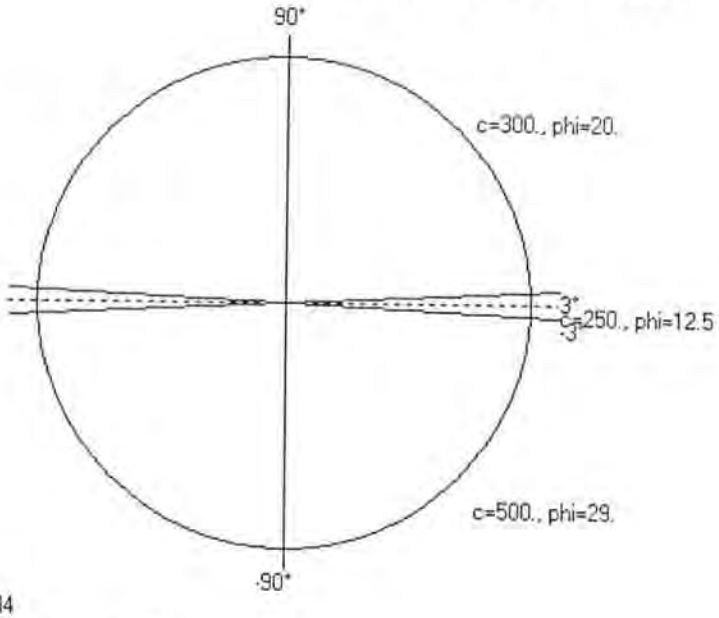
Euland - Section F-F'.



Soil3

Euland - Section F-F',

Anisotropic Soil Definition

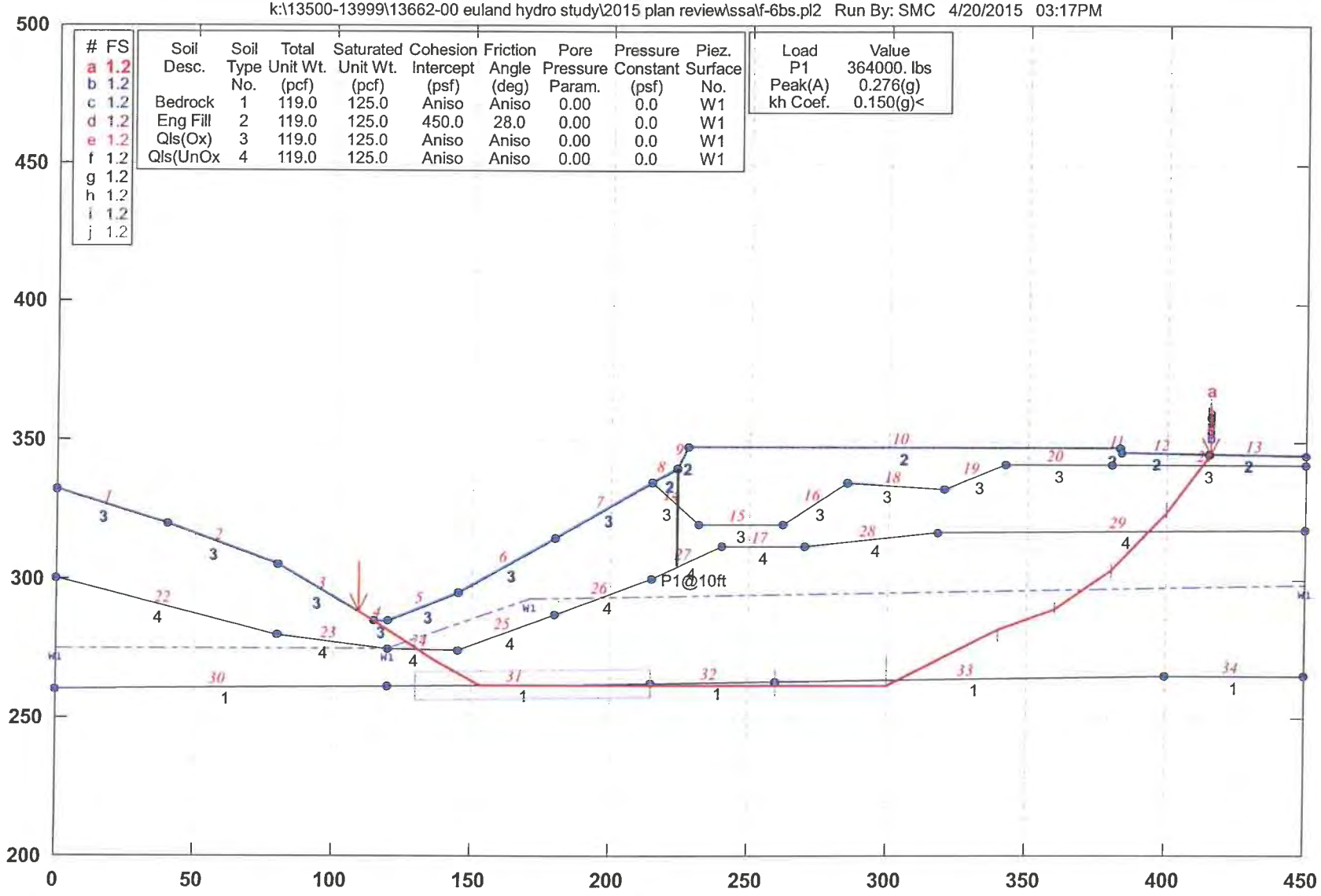


Soil4

Euland - Section F-F',

Euland - Section F-F', --with conc. piers, -Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6bs.pl2 Run By: SMC 4/20/2015 03:17PM



#	FS
a	1.2
b	1.2
c	1.2
d	1.2
e	1.2
f	1.2
g	1.2
h	1.2
i	1.2
j	1.2

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Eng Fill	2	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls(Ox)	3	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls(UnOx	4	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
P1	364000. lbs
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.2

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-39.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 03:17PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6bs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6bs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6bs.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Seismic

BOUNDARY COORDINATES
13 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	415.00	345.50	2
13	415.00	345.50	450.00	345.00	2
14	215.00	335.00	232.00	320.00	3
15	232.00	320.00	262.00	320.00	3
16	262.00	320.00	285.00	335.00	3
17	240.00	312.00	270.00	312.00	4
18	285.00	335.00	320.00	333.00	3
19	320.00	333.00	342.00	342.00	3
20	342.00	342.00	380.00	342.00	3
21	380.00	342.00	450.00	342.00	3
22	0.00	300.00	80.00	280.00	4
23	80.00	280.00	120.00	275.00	4
24	120.00	275.00	145.00	274.00	4
25	145.00	274.00	180.00	287.00	4
26	180.00	287.00	215.00	300.00	4
27	215.00	300.00	240.00	312.00	4
28	270.00	312.00	318.00	317.00	4
29	318.00	317.00	450.00	318.00	4
30	0.00	260.00	120.00	261.50	1
31	120.00	261.50	215.00	262.50	1
32	215.00	262.50	260.00	263.00	1
33	260.00	263.00	400.00	265.00	1
34	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil	Total	Saturated	Cohesion	Friction	Pore	Pressure	Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Constant Param.	Surface (psf)	No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	23.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
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	223.90	339.94	364000.0	10.0	90.00	35.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles Assuming A Uniform Distribution Of Load Horizontally Between Individual Piers/Piles.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
8 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of

Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	130.00	261.50	215.00	262.50	10.00
2	260.00	263.00	260.00	263.00	10.00
3	300.00	267.00	300.00	267.00	10.00
4	340.00	280.00	340.00	280.00	5.00
5	360.00	290.00	360.00	290.00	5.00
6	380.00	303.00	380.00	303.00	5.00
7	400.00	325.00	400.00	325.00	5.00
8	415.00	345.50	416.00	345.50	0.00

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 = 3000

Number of Trial Surfaces With Valid FS = 3000

Statistical Data On All Valid FS Values:

FS Max = 2.155 FS Min = 1.234 FS Ave = 1.542

Standard Deviation = 0.213 Coefficient of Variation = 13.82 %

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.294	285.975
2	114.358	285.297
3	131.226	274.551
4	134.439	272.733
5	151.847	262.884
6	260.000	264.259
7	300.000	262.727
8	340.000	280.234
9	360.000	289.460
10	380.000	304.010
11	400.000	324.104
12	415.793	345.500

Factor of Safety

*** 1.234 ***

Individual data on the 37 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.1	4.4	0.0	0.0	0.	0.	0.7	0.0	0.0
2	0.6	6.9	0.0	0.0	0.	0.	1.0	0.0	0.0
3	5.0	1014.3	0.0	0.0	0.	0.	152.1	0.0	0.0
4	6.8	5484.9	0.0	0.0	0.	0.	822.7	0.0	0.0
5	4.5	6751.9	0.0	686.8	0.	0.	1012.8	0.0	0.0
6	3.2	6413.7	0.0	1281.3	0.	0.	962.1	0.0	0.0
7	10.6	29814.3	0.0	8735.8	0.	0.	4472.1	0.0	0.0
8	6.8	26966.2	0.0	9371.3	0.	0.	4044.9	0.0	0.0
9	19.2	97201.5	0.0	30048.9	0.	0.	14580.2	0.0	0.0
10	9.0	54353.9	0.0	16788.1	0.	0.	8153.1	0.0	0.0
11	17.4	120579.9	0.0	32585.9	0.	0.	18087.0	0.0	0.0
12	17.6	142015.8	0.0	32951.2	0.	0.	21302.4	0.0	0.0
13	9.0	80618.8	0.0	16916.8	0.	0.	12092.8	0.0	0.0
14	4.0	38886.1	0.0	7527.0	0.	0.	5832.9	0.0	0.0
15	4.0	40766.4	0.0	7532.2	0.	0.	6115.0	0.0	0.0
16	8.0	81461.6	0.0	15080.0	0.	0.	12219.2	0.0	0.0
17	20.0	203239.2	0.0	37791.1	0.	0.	30485.9	0.0	0.0
18	2.0	20304.1	0.0	3795.1	0.	0.	3045.6	0.0	0.0
19	8.0	81412.2	0.0	15320.8	0.	0.	12211.8	0.0	0.0
20	13.9	142632.2	0.0	27237.8	0.	0.	21394.8	0.0	0.0
21	1.1	10860.1	0.0	2094.3	0.	0.	1629.0	0.0	0.0
22	15.0	154593.8	0.0	30122.0	0.	0.	23189.1	0.0	0.0
23	2.0	20521.5	0.0	4369.5	0.	0.	3078.2	0.0	0.0
24	16.0	156806.5	0.0	30944.4	0.	0.	23521.0	0.0	0.0
25	2.0	18611.1	0.0	3352.0	0.	0.	2791.7	0.0	0.0
26	20.0	174098.3	0.0	27231.0	0.	0.	26114.7	0.0	0.0
27	2.0	16202.7	0.0	2109.5	0.	0.	2430.4	0.0	0.0
28	18.0	135464.3	0.0	13502.1	0.	0.	20319.6	0.0	0.0

29	9.8	64081.4	0.0	2608.6	0.	0.	9612.2	0.0	0.0
30	10.2	58131.5	0.0	0.0	0.	0.	8719.7	0.0	0.0
31	3.0	15166.3	0.0	0.0	0.	0.	2274.9	0.0	0.0
32	0.5	2363.6	0.0	0.0	0.	0.	354.5	0.0	0.0
33	10.0	39706.2	0.0	0.0	0.	0.	5955.9	0.0	0.0
34	6.5	19304.6	0.0	0.0	0.	0.	2895.7	0.0	0.0
35	13.2	19776.8	0.0	0.0	0.	0.	2966.5	0.0	0.0
36	1.8	490.4	0.0	0.0	0.	0.	73.6	0.0	0.0
37	0.8	50.1	0.0	0.0	0.	0.	7.5	0.0	0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.294	285.975
2	114.358	285.297
3	131.226	274.551
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11	400.000	324.104
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Factor of Safety
*** 1.234 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.294	285.975
2	114.358	285.297
3	131.226	274.551
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*** 1.234 ***

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*** 1.234 ***

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Factor of Safety
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Failure Surface Specified By 12 Coordinate Points

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Factor of Safety

*** 1.234 ***

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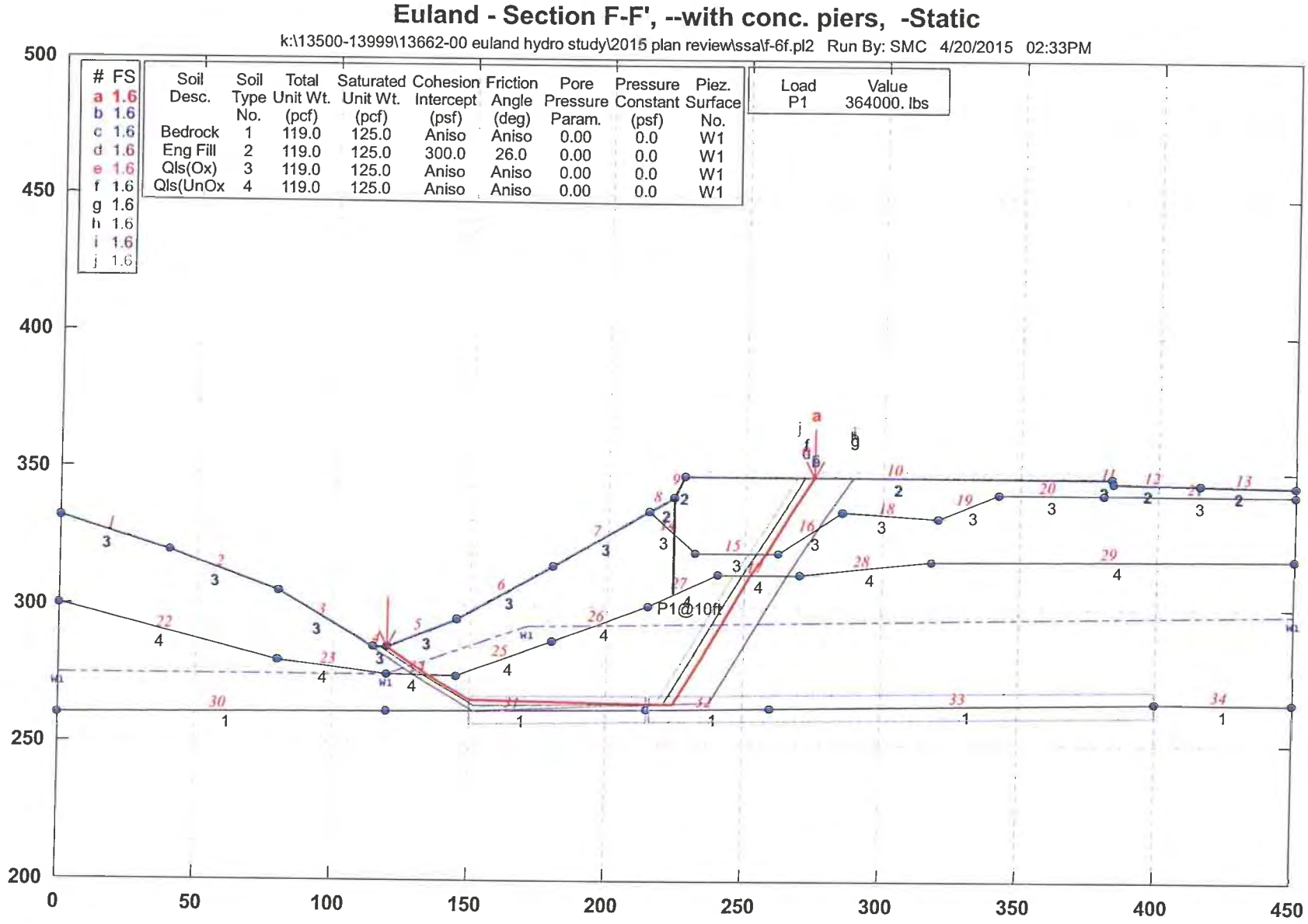
Euland - Section F-F', --with conc. piers, -Static
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-6f.pl2 Run By: SMC 4/20/2015 02:33PM
FS
a 1.6
b 1.6
c 1.6
d 1.6
e 1.6
f 1.6
g 1.6
h 1.6
i 1.6
j 1.6
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedrock | 1 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Eng Fill | 2 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls(Ox) | 3 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Qls(UnOx | 4 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load P1 | Value 364000. lbs
P1@10ft
500
450
400
350
300
250
200
0
50
100
150
200
250
300
350
400
450
GSTABL7 v.2 FSmin=1.6
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E40.1

Euland - Section F-F', --with conc. piers, -Static

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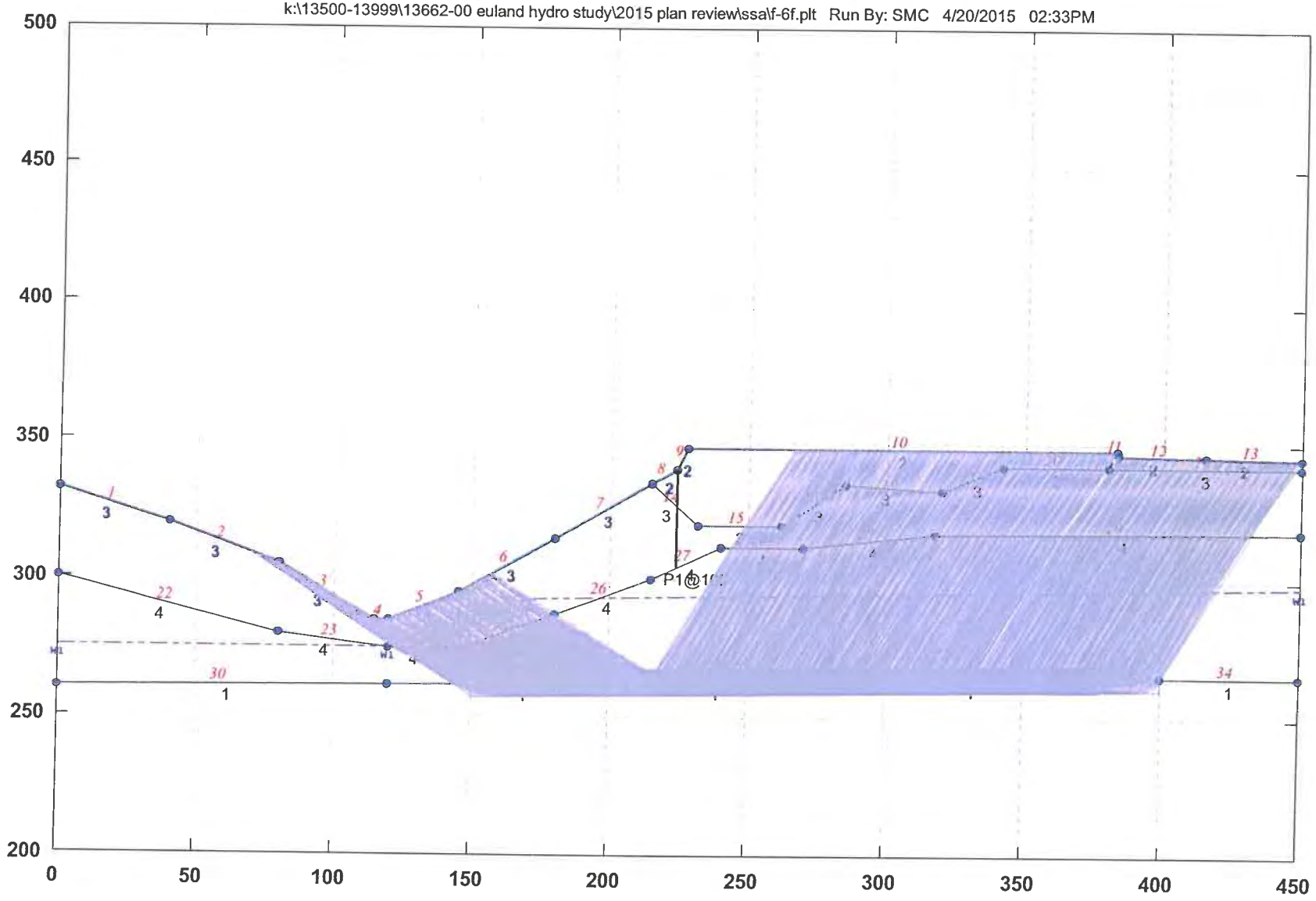

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price 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: 4/20/2015
Time of Run: 02:33PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6f.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6f.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6f.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Static

BOUNDARY COORDINATES
13 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	415.00	345.50	2
13	415.00	345.50	450.00	345.00	2
14	215.00	335.00	232.00	320.00	3
15	232.00	320.00	262.00	320.00	3
16	262.00	320.00	285.00	335.00	3
17	240.00	312.00	270.00	312.00	4
18	285.00	335.00	320.00	333.00	3
19	320.00	333.00	342.00	342.00	3
20	342.00	342.00	380.00	342.00	3
21	380.00	342.00	450.00	342.00	3
22	0.00	300.00	80.00	280.00	4
23	80.00	280.00	120.00	275.00	4
24	120.00	275.00	145.00	274.00	4
25	145.00	274.00	180.00	287.00	4
26	180.00	287.00	215.00	300.00	4
27	215.00	300.00	240.00	312.00	4
28	270.00	312.00	318.00	317.00	4
29	318.00	317.00	450.00	318.00	4
30	0.00	260.00	120.00	261.50	1
31	120.00	261.50	215.00	262.50	1
32	215.00	262.50	260.00	263.00	1
33	260.00	263.00	400.00	265.00	1
34	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil	Total	Saturated	Cohesion	Friction	Pore	Pressure	Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	350.00	23.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	300.00	20.00

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

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	223.90	339.94	364000.0	10.0	90.00	35.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles Assuming A Uniform Distribution Of Load Horizontally Between Individual Piers/Piles.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	262.00	215.00	262.70	10.00

2	216.00	262.70	400.00	265.00	10.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.817	3.424	0.176
15.00	6.617	4.906	0.268
0.00	-0.040	-0.022	0.000
0.00	-0.056	-0.028	0.000
11.52	5.272	3.776	0.204
0.28	-0.050	-0.024	0.005
0.00	-0.049	-0.024	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000
0.00	-0.040	-0.021	0.000

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.50	300.43
2	159.98	296.80
3	176.66	285.76
4	193.78	275.67
5	211.01	265.52
6	216.84	263.99
7	226.99	281.22
8	237.14	298.45
9	245.12	312.00
10	250.42	320.00
11	261.02	336.96
12	267.91	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	3.302	2.934	0.176
15.00	3.500	3.855	0.268
11.73	3.383	3.201	0.208
12.12	3.400	3.268	0.215
13.50	3.454	3.526	0.240
12.85	3.430	3.400	0.228
12.88	3.431	3.407	0.229
0.00	-0.109	-0.056	0.000
7.47	3.167	2.611	0.131
0.87	0.020	0.017	0.015
0.00	-0.052	-0.013	0.000
0.78	0.020	0.016	0.014
0.70	0.020	0.016	0.012
0.00	-0.004	-0.003	0.000
0.00	0.017	-0.057	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000
0.00	-0.004	-0.003	0.000

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	150.72	298.27
2	155.48	295.12
3	172.15	284.09
4	186.23	275.80
5	203.46	265.65
6	248.65	264.67
7	258.80	281.90
8	268.95	299.14
9	276.95	312.72
10	287.99	329.40
11	291.45	334.63
12	299.81	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.629	3.896	0.176
15.00	5.101	5.482	0.268
12.72	4.907	4.633	0.226
13.23	4.954	4.801	0.235
14.10	5.030	5.113	0.251
13.69	4.995	4.962	0.244
13.71	4.997	4.969	0.244
0.00	-0.206	-0.055	0.000
10.85	4.720	4.103	0.192
2.84	3.824	2.705	0.050
26.66	4.766	21.442	0.502
4.84	4.049	2.965	0.085
0.00	3.512	2.396	0.000
89.94	-0.009	-0.001	*****
89.07	-0.009	0.226	*****
89.94	-0.009	0.000	*****
89.99	-0.009	0.178	*****
0.00	-0.009	0.000	0.000
0.00	-0.009	0.000	0.000
0.00	-0.009	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.61	298.77
2	156.53	295.52
3	173.21	284.48
4	189.02	275.16
5	206.25	265.01
6	250.80	259.97
7	252.54	262.92
8	262.69	280.15
9	272.84	297.38
10	282.20	313.27
11	293.24	329.95
12	296.16	334.36
13	304.68	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	3.833	2.923	0.176
15.00	4.879	4.015	0.268
89.94	295.143	1275.329	*****
15.09	4.901	4.041	0.270
0.00	-0.018	-0.027	0.000
0.00	-0.018	-0.027	0.000
10.05	3.842	2.931	0.177
0.00	-0.015	-0.019	0.000
0.00	-0.015	-0.019	0.000
2.84	2.834	2.074	0.050

0.00	-0.013	-0.024	0.000
0.00	-0.013	-0.024	0.000
8.23	3.542	2.660	0.145
0.00	-0.014	-0.018	0.000
0.00	-0.014	-0.018	0.000
89.94	11.800	-0.002	*****
0.00	-0.014	-0.018	0.000
0.00	-0.014	-0.018	0.000
0.00	-0.014	-0.018	0.000
0.00	-0.014	-0.018	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	146.22	295.69
2	150.10	293.13
3	166.77	282.09
4	183.06	272.50
5	200.29	262.35
6	206.76	258.53
7	217.74	258.70
8	220.01	262.56
9	230.16	279.79
10	240.31	297.02
11	249.14	312.00
12	254.43	320.00
13	265.03	336.96
14	271.93	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	5.170	4.019	0.176
15.00	6.634	5.903	0.268
26.61	12.644	25.905	0.501
15.81	6.922	6.373	0.283
12.78	5.922	4.899	0.227
21.50	9.484	13.994	0.394
14.93	6.610	5.866	0.267
13.98	6.294	5.398	0.249
21.46	9.464	13.885	0.393
15.66	6.868	6.282	0.280
14.63	6.509	5.712	0.261
19.82	8.622	10.385	0.360
16.79	7.293	7.045	0.302
16.27	7.096	6.677	0.292
17.95	7.771	8.048	0.324
17.06	7.403	7.260	0.307
17.17	7.447	7.347	0.309
17.49	7.579	7.622	0.315
17.36	7.524	7.508	0.313
17.37	7.526	7.512	0.313

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.27	299.73
2	158.52	296.25
3	175.20	285.22
4	189.27	276.92
5	206.51	266.77
6	234.27	259.33
7	236.28	262.74
8	246.43	279.97
9	256.58	297.20
10	265.29	312.00
11	276.33	328.68
12	277.11	329.86
13	287.71	346.82

14	288.45	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	7.722	4.658	0.176
15.00	18.633	8.670	0.268
7.04	5.664	3.635	0.123
1.67	3.750	2.574	0.029
0.00	3.376	2.354	0.000
0.00	3.376	2.354	0.000
17.55	21.892	15.207	0.316
0.00	-0.084	-0.048	0.000
0.00	-0.084	-0.048	0.000
20.32	0.000	27.861	0.370
0.00	-0.162	-0.070	0.000
0.00	-0.162	-0.070	0.000
21.66	0.000	27.861	0.397
0.00	-0.162	-0.078	0.000
0.00	-0.162	-0.078	0.000
23.05	0.000	20.000	0.425
0.00	-0.162	-0.087	0.000
0.00	-0.162	-0.087	0.000
23.19	0.000	20.000	0.428
0.00	-0.162	-0.088	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.38	300.93
2	161.03	297.19
3	177.71	286.15
4	179.34	285.19
5	196.57	275.04
6	213.81	264.89
7	219.00	259.29
8	220.93	262.57
9	231.08	279.80
10	241.23	297.03
11	250.05	312.00
12	255.34	320.00
13	265.94	336.96
14	272.84	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	5.008	3.996	0.176
15.00	6.369	5.902	0.268
20.72	8.619	12.356	0.378
15.85	6.649	6.407	0.284
14.62	6.249	5.699	0.261
17.55	7.263	7.718	0.316
15.78	6.626	6.363	0.283
16.05	6.719	6.542	0.288
16.81	6.989	7.093	0.302
16.44	6.854	6.810	0.295
16.46	6.862	6.827	0.295
14.47	6.202	5.622	0.258
17.30	7.168	7.493	0.311
15.94	6.681	6.467	0.286
16.20	6.772	6.645	0.291
16.72	6.955	7.021	0.300
16.48	6.871	6.845	0.296
16.50	6.875	6.852	0.296
17.69	7.319	7.855	0.319
16.56	6.897	6.899	0.297

The Trial Failure Surface In Question Is Defined

By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.71	299.98
2	159.04	296.45
3	175.72	285.41
4	179.09	283.43
5	196.32	273.28
6	213.55	263.13
7	235.53	259.93
8	237.19	262.75
9	247.34	279.98
10	257.49	297.21
11	266.20	312.00
12	277.24	328.68
13	278.71	330.90
14	289.31	347.86
15	289.40	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.039	3.202	0.176
15.00	5.024	4.442	0.268
30.19	10.275	26.023	0.582
15.72	5.193	4.700	0.281
11.49	4.300	3.495	0.203
26.08	8.624	20.618	0.489
12.71	4.534	3.778	0.226
9.31	3.925	3.081	0.164
52.84	-0.013	54.765	1.319
10.19	4.071	3.237	0.180
0.00	-0.115	-0.099	0.000
0.00	-0.039	0.000	0.000
14.94	5.010	4.422	0.267
1.23	0.000	0.000	0.021
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.18	297.96
2	154.83	294.89
3	171.51	283.85
4	173.41	282.73
5	190.65	272.58
6	207.88	262.43
7	213.68	259.01
8	227.26	264.61
9	237.41	281.84
10	247.57	299.07
11	255.18	312.00
12	260.48	320.00
13	271.07	336.96
14	277.97	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	4.236	3.268	0.176
15.00	5.270	4.512	0.268
39.10	6.380	32.422	0.813
15.91	5.489	4.838	0.285

8.93	4.049	3.082	0.157
37.39	7.584	31.131	0.764
10.43	4.313	3.349	0.184
2.86	-0.048	-0.023	0.050
0.59	0.000	0.000	0.010
0.00	0.000	0.000	0.000
0.29	0.000	0.000	0.005
0.29	0.000	0.000	0.005
0.29	0.000	0.000	0.005
0.29	0.000	0.000	0.005
0.29	0.000	0.000	0.005
0.29	0.000	0.000	0.005
0.29	0.000	0.000	0.005
0.29	0.000	0.000	0.005
0.29	0.000	0.000	0.005

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	148.86	297.21
2	153.25	294.30
3	169.93	283.26
4	186.61	273.44
5	203.84	263.29
6	223.85	258.72
7	226.15	262.62
8	236.30	279.86
9	246.45	297.09
10	255.24	312.00
11	260.53	320.00
12	271.13	336.96
13	278.03	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	5.241	4.331	0.176
15.00	5.765	6.272	0.268
12.61	5.543	5.178	0.224
13.15	5.598	5.391	0.234
14.09	5.688	5.806	0.251
13.63	5.645	5.597	0.243
13.66	5.648	5.608	0.243
10.77	5.335	4.554	0.190
14.82	5.750	6.176	0.265
12.92	5.575	5.298	0.229

##################### SOME LINES SKIPPED #####################

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 77
Number of Trial Surfaces With Valid FS = 2923
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 2.6 %
Statistical Data On All Valid FS Values:
FS Max = 6.621 FS Min = 1.556 FS Ave = 2.861
Standard Deviation = 0.752 Coefficient of Variation = 26.28 %
((Simplified Janbu FS for Critical Surface = 1.231))

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.753	285.000
2	135.818	274.367
3	150.139	265.932
4	224.209	264.599
5	234.360	281.831
6	244.511	299.064
7	252.131	312.000
8	257.426	320.000
9	268.024	336.961
10	274.922	348.000

*** FOS = 1.556 Theta (ki=1.0) = 14.75 ***
Lambda = 0.263

Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.2	2.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	9.7	6124.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	6.1	10098.7	0.0	1345.4	0.	0.	0.0	0.0	0.0
4	9.2	24041.9	0.0	6620.9	0.	0.	0.0	0.0	0.0
5	5.1	18251.8	0.0	6076.6	0.	0.	0.0	0.0	0.0
6	20.9	97501.1	0.0	28993.1	0.	0.	0.0	0.0	0.0
7	9.0	51777.4	0.0	15503.2	0.	0.	0.0	0.0	0.0
8	17.4	116474.3	0.0	30539.0	0.	0.	0.0	0.0	0.0
9	17.6	139056.8	0.0	31476.8	0.	0.	0.0	0.0	0.0
10	9.0	79562.1	0.0	16390.6	0.	0.	0.0	0.0	0.0
11	0.2	1921.6	0.0	383.6	0.	0.	0.0	0.0	0.0
12	3.8	35053.9	0.0	12194.6	0.	0.	0.0	0.0	0.0
13	4.0	35490.7	0.0	9651.3	0.	0.	0.0	0.0	0.0
14	2.4	19349.7	0.0	4145.0	0.	0.	0.0	0.0	0.0
15	5.6	41450.9	0.0	5246.3	0.	0.	0.0	0.0	0.0
16	1.7	11076.7	0.0	293.2	0.	0.	0.0	0.0	0.0
17	2.8	17262.4	0.0	0.0	0.	0.	0.0	0.0	0.0
18	7.6	38508.4	0.0	0.0	0.	0.	0.0	0.0	0.0
19	5.3	20163.7	0.0	0.0	0.	0.	0.0	0.0	0.0
20	10.6	24618.2	0.0	0.0	0.	0.	0.0	0.0	0.0
21	6.9	4530.7	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.753	285.000
2	135.818	274.367
3	150.139	265.932
4	224.209	264.599
5	234.360	281.831
6	244.511	299.064
7	252.131	312.000
8	257.426	320.000
9	268.024	336.961
10	274.922	348.000

*** FOS = 1.556 Theta (ki=1.0) = 14.75 ***
Lambda = 0.263

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.753	285.000
2	135.818	274.367
3	150.139	265.932
4	224.209	264.599
5	234.360	281.831
6	244.511	299.064
7	252.131	312.000
8	257.426	320.000
9	268.024	336.961
10	274.922	348.000

*** FOS = 1.556 Theta (ki=1.0) = 14.75 ***

Lambda = 0.263
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.158	285.000
2	133.055	274.478
3	134.366	273.705
4	151.599	263.555
5	221.155	264.590
6	231.306	281.823
7	241.456	299.055
8	249.081	312.000
9	254.377	320.000
10	264.975	336.961
11	271.873	348.000

*** FOS = 1.579 Theta (ki=1.0) = 14.81 ***
Lambda = 0.264
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.158	285.000
2	133.055	274.478
3	134.366	273.705
4	151.599	263.555
5	221.155	264.590
6	231.306	281.823
7	241.456	299.055
8	249.081	312.000
9	254.377	320.000
10	264.975	336.961
11	271.873	348.000

*** FOS = 1.579 Theta (ki=1.0) = 14.81 ***
Lambda = 0.264
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.158	285.000
2	133.055	274.478
3	134.366	273.705
4	151.599	263.555
5	221.155	264.590
6	231.306	281.823
7	241.456	299.055
8	249.081	312.000
9	254.377	320.000
10	264.975	336.961
11	271.873	348.000

*** FOS = 1.579 Theta (ki=1.0) = 14.81 ***
Lambda = 0.264
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.870	289.645
2	112.898	285.656
3	129.576	274.617
4	134.053	271.980
5	151.285	261.829
6	151.345	261.794
7	237.686	265.226
8	247.837	282.459
9	257.988	299.691
10	265.238	312.000
11	276.277	328.678
12	277.014	329.792
13	288.053	346.469
14	289.066	348.000

*** FOS = 1.618 Theta (ki=1.0) = 13.25 ***
Lambda = 0.235
Failure Surface Specified By 14 Coordinate Points

Point	X-Surf	Y-Surf

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.870	289.645
2	112.898	285.656
3	129.576	274.617
4	134.053	271.980
5	151.285	261.829
6	151.345	261.794
7	237.686	265.226
8	247.837	282.459
9	257.988	299.691
10	265.238	312.000
11	276.277	328.678
12	277.014	329.792
13	288.053	346.469
14	289.066	348.000

*** FOS = 1.618 Theta (ki=1.0) = 13.25 ***
Lambda = 0.235

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.870	289.645
2	112.898	285.656
3	129.576	274.617
4	134.053	271.980
5	151.285	261.829
6	151.345	261.794
7	237.686	265.226
8	247.837	282.459
9	257.988	299.691
10	265.238	312.000
11	276.277	328.678
12	277.014	329.792
13	288.053	346.469
14	289.066	348.000

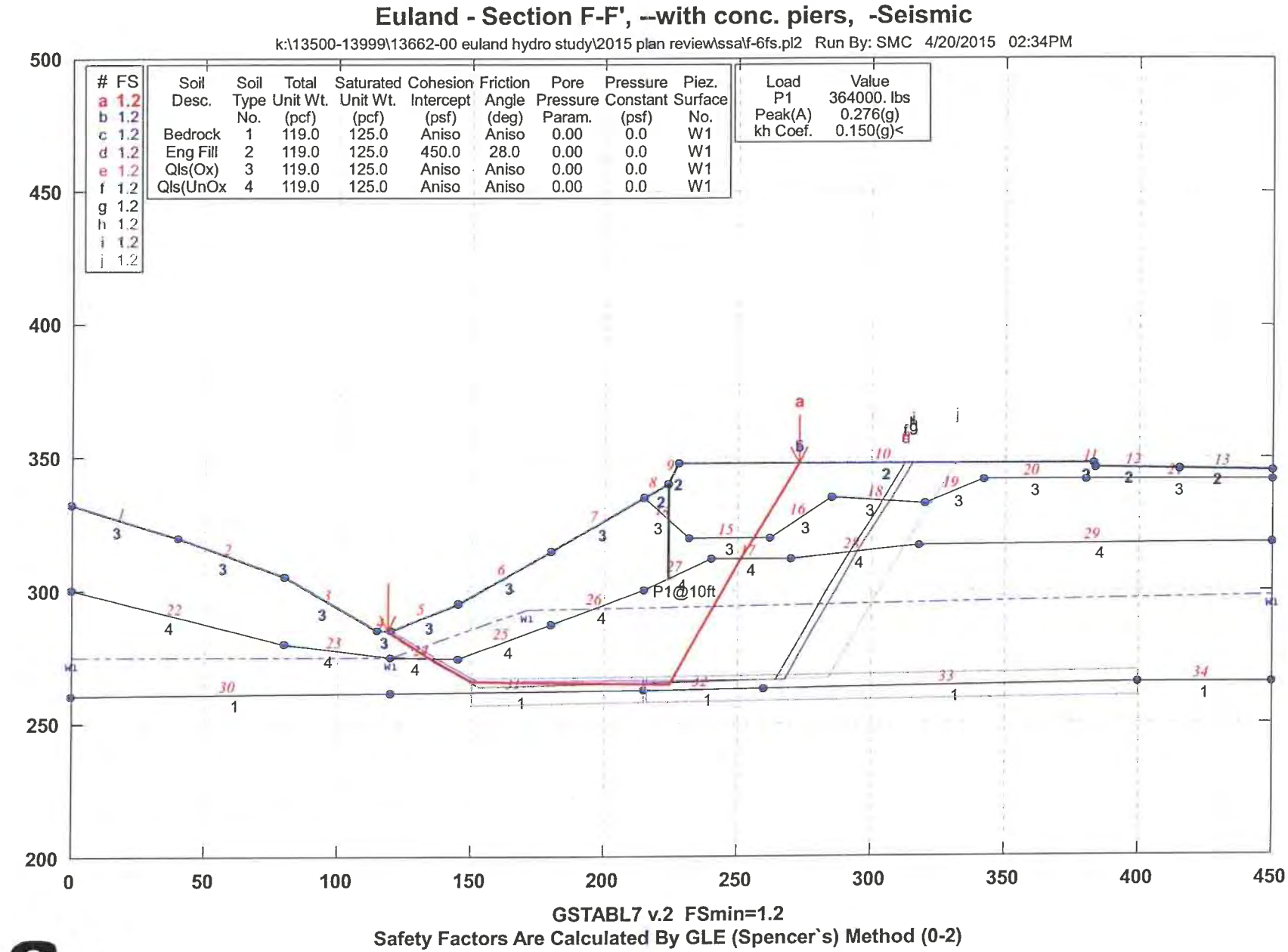
*** FOS = 1.618 Theta (ki=1.0) = 13.25 ***
Lambda = 0.235

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	111.794	286.832
2	113.615	285.627
3	130.292	274.588
4	134.708	271.987
5	151.941	261.836
6	153.059	261.178
7	218.100	264.581
8	228.251	281.814
9	238.402	299.046
10	246.032	312.000
11	251.327	320.000
12	261.925	336.961
13	268.823	348.000

*** FOS = 1.622 Theta (ki=1.0) = 14.86 ***
Lambda = 0.265

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


Euland - Section F-F', --with conc. piers, -Seismic
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FS
a 1.2
b 1.2
c 1.2
d 1.2
e 1.2
f 1.2
g 1.2
h 1.2
i 1.2
j 1.2
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Bedrock 1 119.0 125.0 Aniso Aniso 0.00 0.0 W1
Eng Fill 2 119.0 125.0 450.0 28.0 0.00 0.0 W1
Qls(Ox) 3 119.0 125.0 Aniso Aniso 0.00 0.0 W1
Qls(UnOx 4 119.0 125.0 Aniso Aniso 0.00 0.0 W1
Load P1 364000. lbs
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
P1@10ft
500
450
400
350
300
250
200
0
50
100
150
200
250
300
350
400
450
GSTABL7 v.2 FSmin=1.2
Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-40.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/20/2015
Time of Run: 02:34PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6fs.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6fs.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-6fs.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Seismic

BOUNDARY COORDINATES
13 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	415.00	345.50	2
13	415.00	345.50	450.00	345.00	2
14	215.00	335.00	232.00	320.00	3
15	232.00	320.00	262.00	320.00	3
16	262.00	320.00	285.00	335.00	3
17	240.00	312.00	270.00	312.00	4
18	285.00	335.00	320.00	333.00	3
19	320.00	333.00	342.00	342.00	3
20	342.00	342.00	380.00	342.00	3
21	380.00	342.00	450.00	342.00	3
22	0.00	300.00	80.00	280.00	4
23	80.00	280.00	120.00	275.00	4
24	120.00	275.00	145.00	274.00	4
25	145.00	274.00	180.00	287.00	4
26	180.00	287.00	215.00	300.00	4
27	215.00	300.00	240.00	312.00	4
28	270.00	312.00	318.00	317.00	4
29	318.00	317.00	450.00	318.00	4
30	0.00	260.00	120.00	261.50	1
31	120.00	261.50	215.00	262.50	1
32	215.00	262.50	260.00	263.00	1
33	260.00	263.00	400.00	265.00	1
34	400.00	265.00	450.00	265.50	1

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil	Total	Saturated	Cohesion	Friction	Pore	Pressure	Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

3 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	525.00	25.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 4 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	450.00	22.00

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	275.00
2	120.00	275.00
3	171.00	293.00
4	450.00	298.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

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	223.90	339.94	364000.0	10.0	90.00	35.0

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

Janbus Empirical Coef is being used for the case of c & phi both > 0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.

3000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of

Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	150.00	262.00	215.00	262.70	10.00
2	216.00	262.70	400.00	265.00	10.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.040	1.347	0.176
15.00	0.994	1.463	0.268
0.00	1.082	1.173	0.000
0.00	1.082	1.173	0.000
7.36	1.056	1.295	0.129
0.00	1.082	1.173	0.000
0.00	1.082	1.173	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000
0.00	-0.380	-0.059	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.90	285.00
2	135.57	274.38
3	140.23	271.74
4	157.63	261.90
5	165.50	257.44
6	328.07	264.90
7	337.92	282.31
8	347.77	299.72
9	357.61	317.12
10	357.72	317.30
11	368.46	334.17
12	373.45	342.00
13	377.06	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.359	1.989	0.176
15.00	1.337	2.285	0.268
0.00	1.350	1.566	0.000
0.00	1.350	1.566	0.000
7.36	1.362	1.859	0.129
0.00	1.350	1.566	0.000
0.00	1.350	1.566	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000

0.00	-0.603	0.000	0.000
0.00	-0.603	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	148.47	296.98
2	153.11	294.02
3	169.98	283.28
4	186.88	273.72
5	204.28	263.87
6	286.92	261.25
7	288.14	263.40
8	297.99	280.81
9	307.83	298.22
10	317.68	315.62
11	318.46	317.00
12	329.21	333.87
13	331.70	337.79
14	337.84	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.144	1.518	0.176
15.00	1.200	1.731	0.268
0.00	1.041	1.212	0.000
0.00	1.041	1.212	0.000
7.36	1.115	1.424	0.129
0.00	1.041	1.212	0.000
0.00	1.041	1.212	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000
0.00	-0.755	-0.040	0.000

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	132.17	289.87
2	135.76	287.58
3	152.63	276.83
4	161.24	271.97
5	178.64	262.12
6	181.12	260.72
7	231.40	262.27
8	231.63	262.68
9	241.48	280.09
10	251.33	297.50
11	259.53	312.00
12	266.50	322.94
13	276.80	340.08
14	281.56	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.334	2.056	0.176
15.00	1.303	2.348	0.268

0.00	1.346	1.634	0.000
0.00	1.346	1.634	0.000
7.36	1.343	1.927	0.129
0.00	1.346	1.634	0.000
0.00	1.346	1.634	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000
0.00	-1.650	-0.382	0.000

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.76	300.00
2	159.45	296.38
3	176.32	285.63
4	192.34	276.57
5	209.74	266.72
6	299.50	267.17
7	309.35	284.58
8	319.20	301.99
9	327.73	317.07
10	338.48	333.94
11	343.61	342.00
12	347.22	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.266	2.062	0.176
15.00	1.299	2.421	0.268
0.00	1.189	1.572	0.000
0.00	1.189	1.572	0.000
7.36	1.247	1.909	0.129
0.00	1.189	1.572	0.000
0.00	1.189	1.572	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000
0.00	-1.537	-0.053	0.000

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	146.02	295.58
2	150.18	292.93
3	167.05	282.19
4	167.27	282.06
5	184.68	272.21
6	202.09	262.36
7	208.92	258.50

8	261.23	260.59
9	262.61	263.04
10	272.46	280.44
11	282.31	297.85
12	291.58	314.25
13	302.33	331.12
14	304.11	333.91
15	312.58	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	0.964	1.316	0.176
15.00	0.970	1.455	0.268
0.00	0.942	1.108	0.000
0.00	0.942	1.108	0.000
7.36	0.960	1.253	0.129
0.00	0.942	1.108	0.000
0.00	0.942	1.108	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000
0.00	-0.352	0.006	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.89	286.56
2	126.64	284.81
3	143.51	274.06
4	144.98	273.23
5	162.39	263.38
6	254.58	261.75
7	255.26	262.95
8	265.10	280.35
9	274.95	297.76
10	283.82	313.44
11	294.57	330.31
12	297.12	334.31
13	305.35	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.242	1.640	0.176
15.00	1.295	1.859	0.268
0.00	1.144	1.324	0.000
0.00	1.144	1.324	0.000
7.36	1.215	1.543	0.129
0.00	1.144	1.324	0.000
0.00	1.144	1.324	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000

0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000
0.00	-0.723	-0.012	0.000

The Trial Failure Surface In Question Is Defined
By The Following 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	133.15	290.26
2	136.77	287.96
3	153.64	277.21
4	162.88	271.98
5	180.28	262.13
6	183.91	260.08
7	233.55	267.57
8	243.40	284.97
9	253.25	302.38
10	258.69	312.00
11	265.06	322.00
12	275.36	339.14
13	280.68	348.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.222	1.667	0.176
15.00	1.156	1.836	0.268
0.00	1.284	1.412	0.000
0.00	1.284	1.412	0.000
7.36	1.245	1.591	0.129
0.00	1.284	1.412	0.000
0.00	1.284	1.412	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000
0.00	-0.647	-0.205	0.000

The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	143.39	294.35
2	147.30	291.86
3	164.16	281.12
4	174.82	275.09
5	192.22	265.24
6	336.15	267.28
7	346.00	284.68
8	355.85	302.09
9	364.49	317.35
10	375.23	334.22
11	380.19	342.00
12	383.23	347.07

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
10.00	1.113	1.447	0.176
15.00	1.045	1.565	0.268

```
  0.00        1.179       1.262      0.000
  0.00        1.179       1.262      0.000
  7.36        1.137       1.392      0.129
  0.00        1.179       1.262      0.000
  0.00        1.179       1.262      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
  0.00       -0.647      -0.205      0.000
The Trial Failure Surface In Question Is Defined
By The Following 12 Coordinate Points
   Point       X-Surf       Y-Surf
    No.         (ft)         (ft)
     1         131.95       289.78
     2         135.53       287.49
     3         152.40       276.75
     4         153.68       276.03
     5         171.09       266.18
     6         332.38       265.50
     7         342.23       282.91
     8         352.08       300.32
     9         361.70       317.33
    10         372.45       334.20
    11         377.42       342.00
    12         381.03       348.00
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations
  Theta         FOS          FOS
  (deg)       (Moment)     (Force)
(ki=1.0)      (Equil.)     (Equil.)    Lambda
 10.00        -1.502        1.435      0.176
 15.00        -1.580        1.545      0.268
  0.00        -3.083       -0.485      0.000
  0.00        -3.083       -0.485      0.000
  7.36        -5.285        1.385      0.129
  0.00        -0.167       -0.485      0.000
  0.00        -0.167       -0.485      0.000
  ###################### SOME LINES SKIPPED ####################
      Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
      Selected ki function = Bi-linear
      Selected Lambda Coefficient =  1.00
      Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
      (if applicable) have been applied to the slice base(s)
      on which they intersect.
      Specified Tension Crack Water Force Factor =    0.000
      Total Number of Trial Surfaces Attempted =  3000
      WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
      Did Not Converge in 20 Iterations.
      Number of Trial Surfaces with Non-Converged FS =    66
      Number of Trial Surfaces With Valid FS = 2934
      Percentage of Trial Surfaces With Non-Valid FS Solutions
      of the Total Attempted =   2.2 %
      Statistical Data On All Valid FS Values:
         FS Max =  20.000   FS Min =   1.193   FS Ave =   1.620
         Standard Deviation =    0.502   Coefficient of Variation =   31.01 %
                 ((Simplified Janbu FS for Critical Surface =  1.073))
      Failure Surface Specified By 10 Coordinate Points
        Point       X-Surf       Y-Surf
```

No.	(ft)	(ft)
1	118.534	285.000
2	135.184	274.393
3	150.139	265.932
4	224.209	264.599
5	234.058	282.006
6	243.906	299.413
7	251.028	312.000
8	256.124	320.000
9	266.425	337.143
10	272.948	348.000

*** FOS = 1.193 Theta (ki=1.0) = 11.24 ***
Lambda = 0.199

Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.5	81.5	0.0	0.0	0.	0.	12.2	0.0	0.0
2	9.2	6192.4	0.0	0.0	0.	0.	928.9	0.0	0.0
3	6.0	9823.7	0.0	1256.5	0.	0.	1473.6	0.0	0.0
4	9.8	25604.9	0.0	6963.9	0.	0.	3840.7	0.0	0.0
5	5.1	18290.1	0.0	6036.5	0.	0.	2743.5	0.0	0.0
6	20.9	97501.1	0.0	28993.1	0.	0.	14625.2	0.0	0.0
7	9.0	51777.4	0.0	15503.2	0.	0.	7766.6	0.0	0.0
8	17.4	116474.3	0.0	30539.0	0.	0.	17471.1	0.0	0.0
9	17.6	139056.8	0.0	31476.8	0.	0.	20858.5	0.0	0.0
10	9.0	79562.1	0.0	16390.6	0.	0.	11934.3	0.0	0.0
11	0.2	1921.6	0.0	383.6	0.	0.	288.2	0.0	0.0
12	3.8	34991.2	0.0	12505.4	0.	0.	5248.7	0.0	0.0
13	4.0	35288.5	0.0	9742.6	0.	0.	5293.3	0.0	0.0
14	2.1	16778.9	0.0	3630.6	0.	0.	2516.8	0.0	0.0
15	5.9	43198.4	0.0	5214.3	0.	0.	6479.8	0.0	0.0
16	1.0	6424.5	0.0	108.1	0.	0.	963.7	0.0	0.0
17	2.9	17771.6	0.0	0.0	0.	0.	2665.7	0.0	0.0
18	7.1	35841.0	0.0	0.0	0.	0.	5376.2	0.0	0.0
19	5.1	19407.8	0.0	0.0	0.	0.	2911.2	0.0	0.0
20	10.3	23815.1	0.0	0.0	0.	0.	3572.3	0.0	0.0
21	6.5	4213.9	0.0	0.0	0.	0.	632.1	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.534	285.000
2	135.184	274.393
3	150.139	265.932
4	224.209	264.599
5	234.058	282.006
6	243.906	299.413
7	251.028	312.000
8	256.124	320.000
9	266.425	337.143
10	272.948	348.000

*** FOS = 1.193 Theta (ki=1.0) = 11.24 ***
Lambda = 0.199

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.534	285.000
2	135.184	274.393
3	150.139	265.932
4	224.209	264.599
5	234.058	282.006
6	243.906	299.413
7	251.028	312.000
8	256.124	320.000
9	266.425	337.143
10	272.948	348.000

*** FOS = 1.193 Theta (ki=1.0) = 11.24 ***
Lambda = 0.199

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.883	285.000
2	134.489	274.420
3	136.350	273.368
4	153.757	263.519
5	264.639	266.481
6	274.488	283.888
7	284.336	301.295
8	291.670	314.257
9	302.416	331.125
10	304.186	333.904
11	312.656	348.000

*** FOS = 1.212 Theta (ki=1.0) = 9.02 ***
Lambda = 0.159
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.883	285.000
2	134.489	274.420
3	136.350	273.368
4	153.757	263.519
5	264.639	266.481
6	274.488	283.888
7	284.336	301.295
8	291.670	314.257
9	302.416	331.125
10	304.186	333.904
11	312.656	348.000

*** FOS = 1.212 Theta (ki=1.0) = 9.02 ***
Lambda = 0.159
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.883	285.000
2	134.489	274.420
3	136.350	273.368
4	153.757	263.519
5	264.639	266.481
6	274.488	283.888
7	284.336	301.295
8	291.670	314.257
9	302.416	331.125
10	304.186	333.904
11	312.656	348.000

*** FOS = 1.212 Theta (ki=1.0) = 9.02 ***
Lambda = 0.159
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.398	285.159
2	120.571	285.048
3	137.439	274.302
4	152.297	265.896
5	267.694	266.490
6	277.542	283.897
7	287.391	301.304
8	294.910	314.595
9	305.656	331.463
10	307.105	333.737
11	315.675	348.000

*** FOS = 1.213 Theta (ki=1.0) = 9.23 ***
Lambda = 0.162
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.398	285.159
2	120.571	285.048
3	137.439	274.302
4	152.297	265.896

5	267.694	266.490
6	277.542	283.897
7	287.391	301.304
8	294.910	314.595
9	305.656	331.463
10	307.105	333.737
11	315.675	348.000

*** FOS = 1.213 Theta (ki=1.0) = 9.23 ***
Lambda = 0.162

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.398	285.159
2	120.571	285.048
3	137.439	274.302
4	152.297	265.896
5	267.694	266.490
6	277.542	283.897
7	287.391	301.304
8	294.910	314.595
9	305.656	331.463
10	307.105	333.737
11	315.675	348.000

*** FOS = 1.213 Theta (ki=1.0) = 9.23 ***
Lambda = 0.162

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.253	285.000
2	133.817	274.447
3	134.636	273.984
4	152.043	264.136
5	284.225	267.126
6	294.074	284.534
7	303.922	301.941
8	312.094	316.385
9	322.840	333.253
10	323.624	334.482
11	331.746	348.000

*** FOS = 1.213 Theta (ki=1.0) = 8.42 ***
Lambda = 0.148

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

Euland - Section G-G', Static, --2015 design

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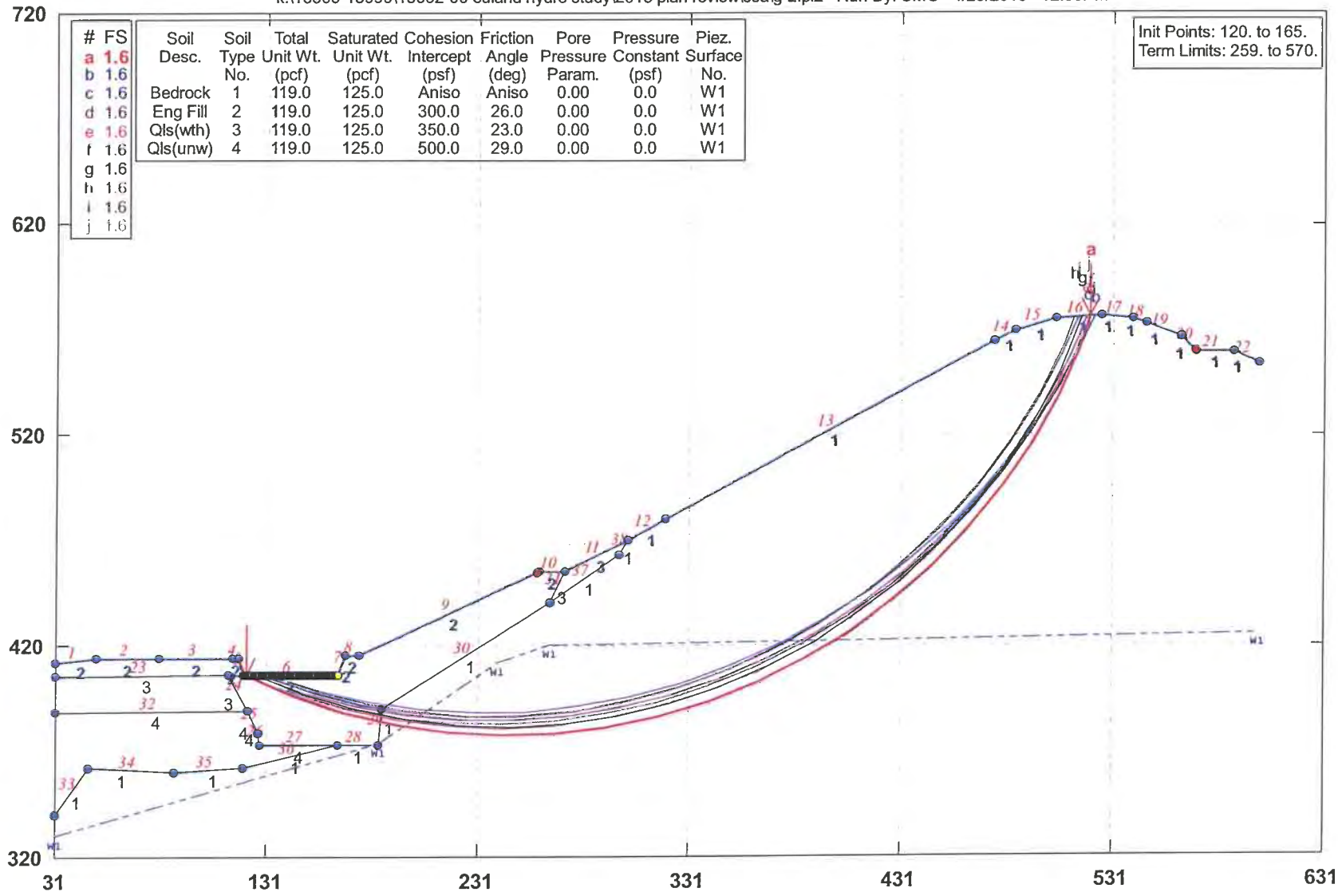

GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Euland - Section G-G', Static, --2015 design

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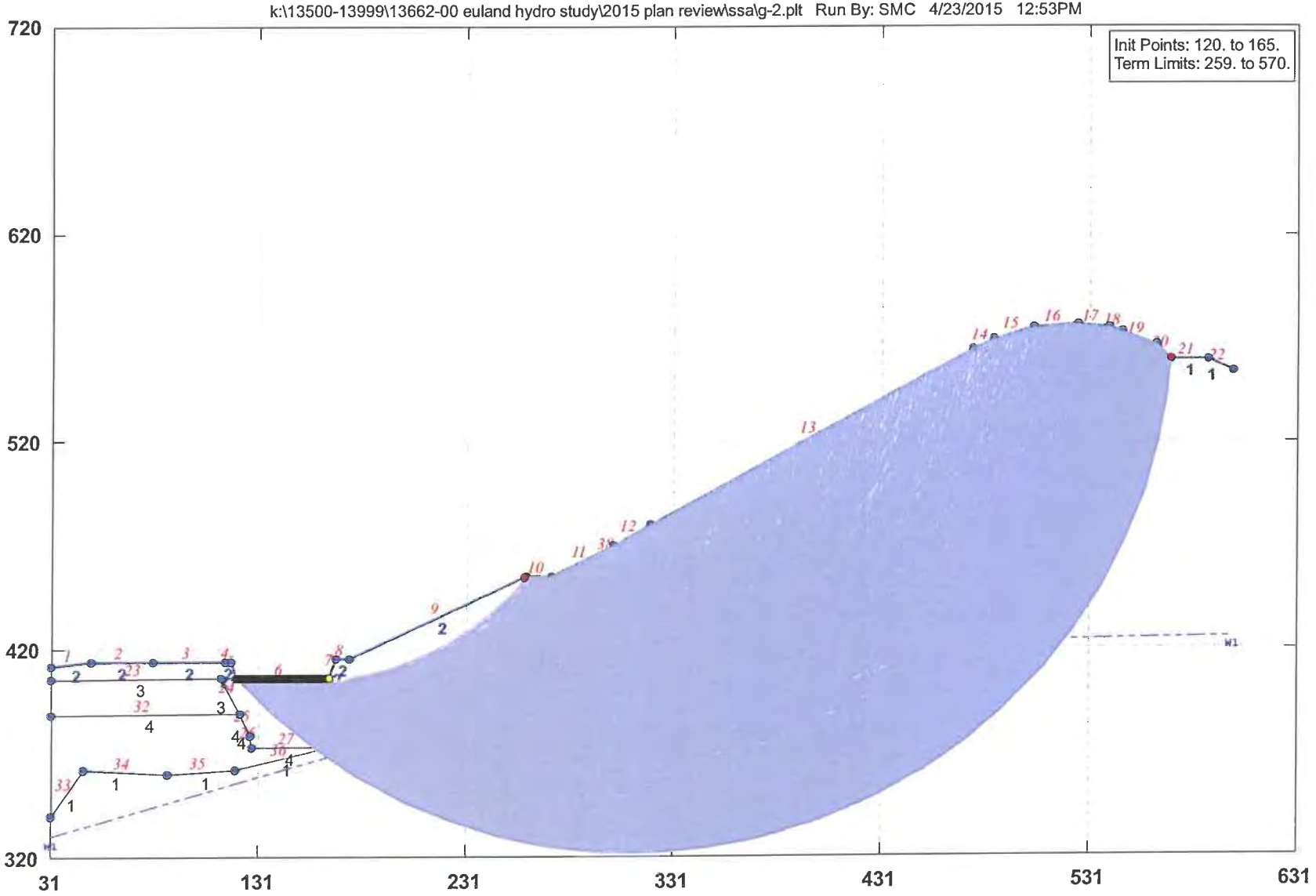


SMC

```
                                *** GSTABL7 ***
                        ** GSTABL7 by Garry H. Gregory, P.E. **
      ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
                    (All Rights Reserved-Unauthorized Use Prohibited)
   ********************************************************************************
                         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:        4/23/2015
    Time of Run:              12:53PM
    Run By:                   SMC
    Input Data Filename:      K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\
SSA\g-2.
    Output Filename:          K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\
SSA\g-2.OUT
    Unit System:              English
    Plotted Output Filename:  K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\
SSA\g-2.PLT
    PROBLEM DESCRIPTION:  Euland - Section G-G', Static,
                          --2015 design
    BOUNDARY COORDINATES
       22 Top   Boundaries
```

38 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	412.00	50.00	414.00	2
2	50.00	414.00	80.00	414.00	2
3	80.00	414.00	115.00	414.00	2
4	115.00	414.00	118.00	414.00	2
5	118.00	414.00	120.00	406.00	2
6	120.00	406.00	165.00	406.00	2
7	165.00	406.00	168.00	415.00	2
8	168.00	415.00	175.00	415.00	2
9	175.00	415.00	260.00	455.00	2
10	260.00	455.00	272.00	455.00	2
11	272.00	455.00	302.00	470.00	3
12	302.00	470.00	320.00	480.00	1
13	320.00	480.00	475.00	565.00	1
14	475.00	565.00	485.00	570.00	1
15	485.00	570.00	504.00	575.00	1
16	504.00	575.00	525.00	577.00	1
17	525.00	577.00	540.00	575.00	1
18	540.00	575.00	547.00	573.00	1
19	547.00	573.00	563.00	567.00	1
20	563.00	567.00	570.00	560.00	1
21	570.00	560.00	588.00	560.00	1
22	588.00	560.00	600.00	554.00	1
23	31.00	405.00	113.00	406.00	3
24	113.00	406.00	122.00	389.00	3
25	122.00	389.00	127.00	378.00	4
26	127.00	378.00	128.00	372.50	4
27	128.00	372.50	165.00	372.50	4
28	165.00	372.50	184.00	372.50	1
29	184.00	372.50	185.00	390.00	1
30	185.00	390.00	265.00	440.00	1
31	265.00	440.00	272.00	455.00	3
32	31.00	388.00	122.00	389.00	4
33	31.00	340.00	47.00	362.00	1
34	47.00	362.00	87.00	360.00	1
35	87.00	360.00	120.00	362.00	1
36	120.00	362.00	165.00	372.50	1
37	265.00	440.00	298.00	463.00	1
38	298.00	463.00	302.00	470.00	1

User Specified Y-Origin = 320.00(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.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS

1 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-7.0	750.00	29.00
2	-3.0	300.00	15.00
3	90.0	750.00	29.00

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 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	31.00	330.00
2	184.00	373.00
3	240.00	412.00
4	265.00	420.00
5	600.00	425.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
18400 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 92 Points Equally Spaced
Along The Ground Surface Between X = 120.00(ft)
and X = 165.00(ft)
Each Surface Terminates Between X = 259.00(ft)
and X = 570.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 320.00(ft)
25.00(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 = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.989	406.000
2	143.994	396.215
3	167.758	388.449
4	192.102	382.761
5	216.846	379.194
6	241.806	377.772
7	266.795	378.508
8	291.628	381.395
9	316.119	386.413
10	340.086	393.523
11	363.352	402.674
12	385.742	413.796
13	407.089	426.806
14	427.236	441.609
15	446.031	458.094
16	463.335	476.137
17	479.019	495.606
18	492.966	516.353
19	505.072	538.227
20	515.248	561.062
21	520.614	576.582

Factor of Safety
*** 1.559 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.385	406.000
2	154.269	398.614
3	178.666	393.156
4	203.420	389.660

5	228.374	388.147
6	253.370	388.629
7	278.247	391.101
8	302.848	395.548
9	327.017	401.942
10	350.599	410.242
11	373.444	420.395
12	395.408	432.337
13	416.349	445.991
14	436.136	461.272
15	454.642	478.080
16	471.750	496.310
17	487.350	515.846
18	501.343	536.563
19	513.640	558.329
20	522.180	576.731

Factor of Safety
*** 1.560 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	128.901	406.000
2	152.488	397.715
3	176.685	391.429
4	201.323	387.186
5	226.228	385.016
6	251.228	384.934
7	276.147	386.940
8	300.812	391.020
9	325.050	397.147
10	348.691	405.276
11	371.571	415.352
12	393.529	427.304
13	414.412	441.048
14	434.074	456.488
15	452.378	473.517
16	469.195	492.015
17	484.409	511.853
18	497.912	532.892
19	509.611	554.986
20	518.751	576.405

Factor of Safety
*** 1.560 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.945	406.000
2	148.532	397.715
3	172.720	391.393
4	197.344	387.076
5	222.240	384.793
6	247.239	384.560
7	272.172	386.379
8	296.873	390.237
9	321.174	396.107
10	344.911	403.952
11	367.925	413.717
12	390.061	425.337
13	411.168	438.733
14	431.106	453.816
15	449.739	470.483
16	466.943	488.623
17	482.600	508.113
18	496.606	528.821
19	508.866	550.608
20	519.298	573.328
21	520.475	576.569

Factor of Safety
*** 1.560 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.989	406.000
2	144.260	396.863
3	168.220	389.728
4	192.698	384.647
5	217.518	381.656
6	242.503	380.775
7	267.472	382.013
8	292.247	385.359
9	316.650	390.789
10	340.506	398.266
11	363.644	407.734
12	385.897	419.127
13	407.106	432.362
14	427.119	447.345
15	445.793	463.967
16	462.992	482.111
17	478.595	501.644
18	492.488	522.428
19	504.572	544.314
20	514.761	567.143
21	517.960	576.330

Factor of Safety
*** 1.560 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	406.000
2	143.431	397.283
3	167.500	390.524
4	192.043	385.768
5	216.895	383.047
6	241.886	382.381
7	266.847	383.773
8	291.609	387.214
9	316.004	392.681
10	339.867	400.136
11	363.035	409.530
12	385.351	420.798
13	406.665	433.864
14	426.831	448.640
15	445.714	465.025
16	463.184	482.908
17	479.123	502.167
18	493.424	522.673
19	505.989	544.286
20	516.733	566.859
21	520.406	576.562

Factor of Safety
*** 1.560 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	125.440	406.000
2	148.710	396.863
3	172.682	389.769
4	197.178	384.770
5	222.013	381.904
6	247.003	381.193
7	271.961	382.641
8	296.701	386.237
9	321.038	391.956
10	344.791	399.754
11	367.782	409.572
12	389.840	421.339
13	410.800	434.965
14	430.505	450.350
15	448.810	467.378
16	465.576	485.922

17	480.679	505.844
18	494.006	526.996
19	505.458	549.219
20	514.949	572.347
21	516.140	576.156

Factor of Safety
*** 1.560 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.374	406.000
2	155.053	397.981
3	179.326	391.999
4	204.020	388.096
5	228.955	386.302
6	253.953	386.628
7	278.834	389.073
8	303.417	393.618
9	327.526	400.232
10	350.988	408.866
11	373.633	419.458
12	395.299	431.932
13	415.828	446.199
14	435.074	462.154
15	452.898	479.685
16	469.172	498.663
17	483.777	518.953
18	496.609	540.408
19	507.576	562.874
20	512.585	575.818

Factor of Safety
*** 1.560 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	127.418	406.000
2	151.097	397.981
3	175.361	391.960
4	200.042	387.978
5	224.968	386.063
6	249.968	386.228
7	274.867	388.472
8	299.493	392.780
9	323.675	399.122
10	347.246	407.453
11	370.042	417.716
12	391.906	429.840
13	412.685	443.740
14	432.236	459.321
15	450.422	476.475
16	467.119	495.082
17	482.210	515.013
18	495.591	536.131
19	507.169	558.288
20	514.625	576.012

Factor of Safety
*** 1.560 ***

Failure Surface Specified By 21 Coordinate Points

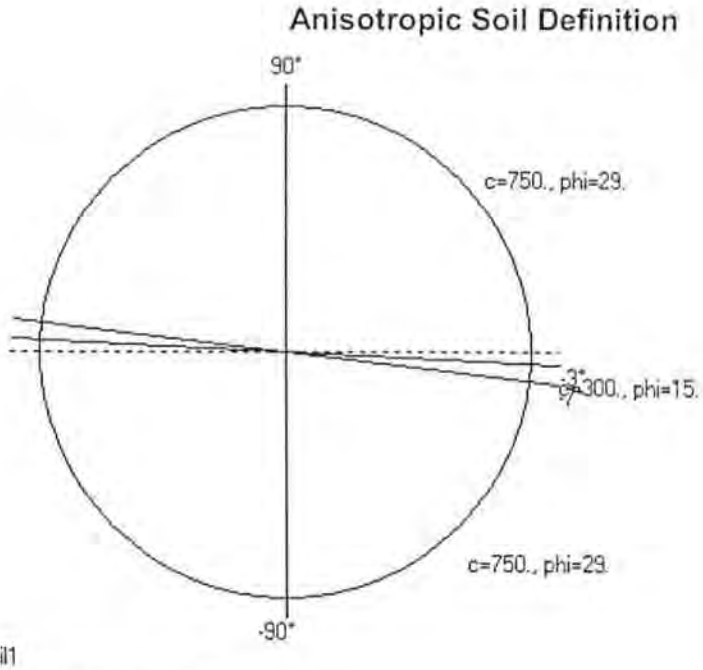
Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	406.000
2	142.836	395.825
3	166.476	387.692
4	190.738	381.662
5	215.435	377.783
6	240.377	376.083
7	265.372	376.576
8	290.228	379.259
9	314.753	384.110
10	338.758	391.093

11	362.058	400.153
12	384.475	411.220
13	405.835	424.211
14	425.974	439.023
15	444.737	455.545
16	461.979	473.647
17	477.569	493.191
18	491.384	514.027
19	503.320	535.994
20	513.285	558.922
21	519.133	576.441

Factor of Safety

*** 1.561 ***

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

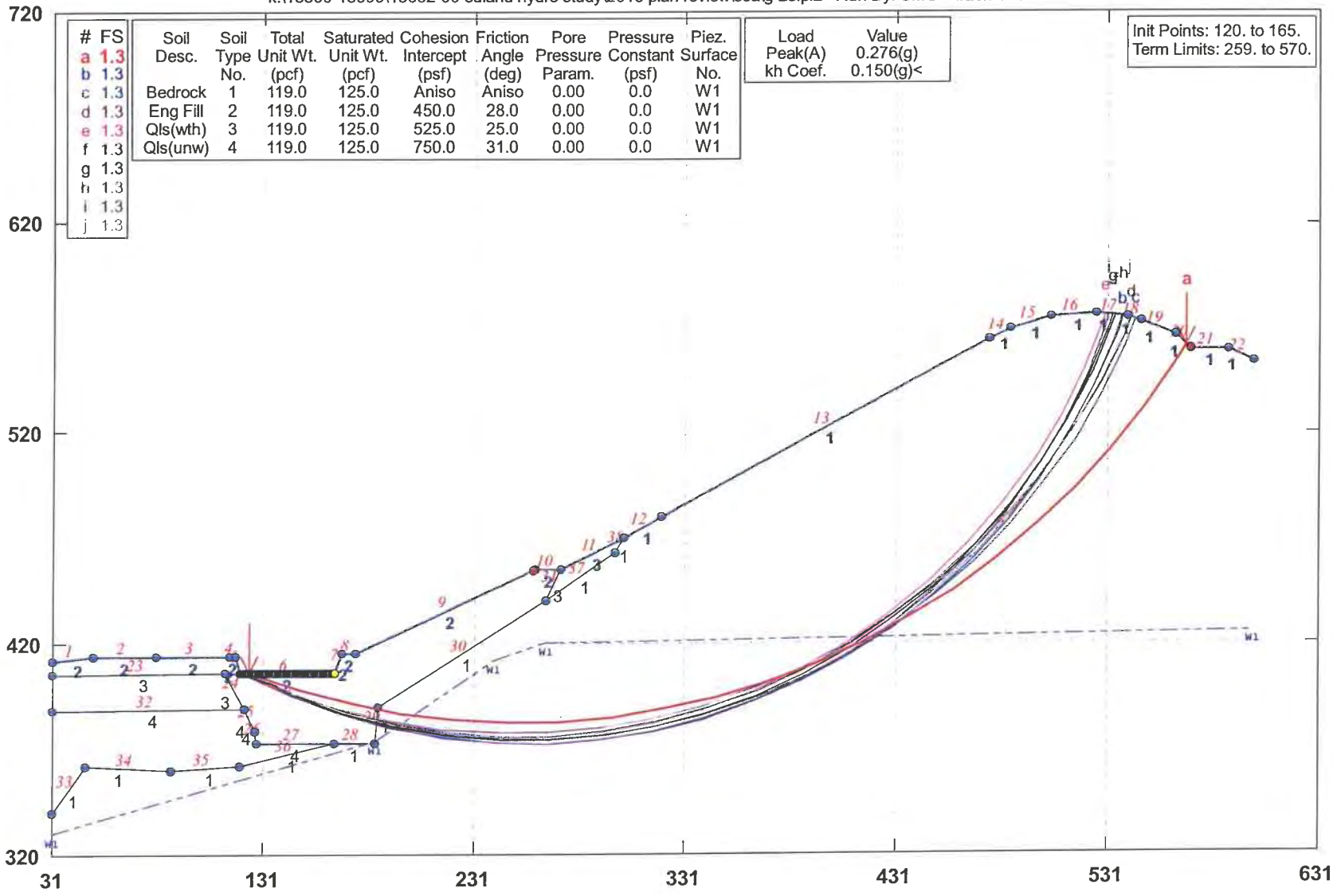


Soil1

Euland - Section G-G', Static,

Euland - Section G-G', Seismic, --2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\g-2s.pl2 Run By: SMC 4/23/2015 01:02PM



GSTABL7 v.2 FSmin=1.3

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 01:02PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-2s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-2s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-2s.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Seismic,
--2015 design

BOUNDARY COORDINATES
22 Top Boundaries
38 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	412.00	50.00	414.00	2
2	50.00	414.00	80.00	414.00	2
3	80.00	414.00	115.00	414.00	2
4	115.00	414.00	118.00	414.00	2
5	118.00	414.00	120.00	406.00	2
6	120.00	406.00	165.00	406.00	2
7	165.00	406.00	168.00	415.00	2
8	168.00	415.00	175.00	415.00	2
9	175.00	415.00	260.00	455.00	2
10	260.00	455.00	272.00	455.00	2
11	272.00	455.00	302.00	470.00	3
12	302.00	470.00	320.00	480.00	1
13	320.00	480.00	475.00	565.00	1
14	475.00	565.00	485.00	570.00	1
15	485.00	570.00	504.00	575.00	1
16	504.00	575.00	525.00	577.00	1
17	525.00	577.00	540.00	575.00	1
18	540.00	575.00	547.00	573.00	1
19	547.00	573.00	563.00	567.00	1
20	563.00	567.00	570.00	560.00	1
21	570.00	560.00	588.00	560.00	1
22	588.00	560.00	600.00	554.00	1
23	31.00	405.00	113.00	406.00	3
24	113.00	406.00	122.00	389.00	3
25	122.00	389.00	127.00	378.00	4
26	127.00	378.00	128.00	372.50	4
27	128.00	372.50	165.00	372.50	4
28	165.00	372.50	184.00	372.50	1
29	184.00	372.50	185.00	390.00	1
30	185.00	390.00	265.00	440.00	1
31	265.00	440.00	272.00	455.00	3
32	31.00	388.00	122.00	389.00	4
33	31.00	340.00	47.00	362.00	1
34	47.00	362.00	87.00	360.00	1
35	87.00	360.00	120.00	362.00	1
36	120.00	362.00	165.00	372.50	1
37	265.00	440.00	298.00	463.00	1
38	298.00	463.00	302.00	470.00	1

User Specified Y-Origin = 320.00(ft)

```
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  4 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.   (psf)     No.
   1   119.0    125.0    1125.0     31.0    0.00      0.0      1
   2   119.0    125.0     450.0     28.0    0.00      0.0      1
   3   119.0    125.0     525.0     25.0    0.00      0.0      1
   4   119.0    125.0     750.0     31.0    0.00      0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     1 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept      Angle
    No.            (deg)           (psf)         (deg)
     1             -7.0           1125.00         31.00
     2             -3.0            450.00         17.00
     3             90.0           1125.00         31.00
 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  5 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1         31.00      330.00
     2        184.00      373.00
     3        240.00      412.00
     4        265.00      420.00
     5        600.00      425.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.276(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 Janbus Empirical Coef. is being used for the case of  c & phi both > 0
18400 Trial Surfaces Have Been Generated.
  200 Surface(s) Initiate(s) From Each Of    92 Points Equally Spaced
 Along The Ground Surface Between  X = 120.00(ft)
                             and  X = 165.00(ft)
 Each Surface Terminates Between   X = 259.00(ft)
                            and    X = 570.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =    320.00(ft)
 25.00(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 =     0
       Number of Trial Surfaces With Valid FS =    0
       Statistical Data On All Valid FS Values:
          FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
          Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
       Failure Surface Specified By 22 Coordinate Points
         Point      X-Surf      Y-Surf
          No.         (ft)        (ft)
           1        123.956     406.000
           2        147.628     397.961
           3        171.795     391.560
```

4	196.342	386.825
5	221.156	383.778
6	246.120	382.435
7	271.117	382.801
8	296.031	384.875
9	320.745	388.646
10	345.143	394.098
11	369.112	401.205
12	392.539	409.933
13	415.314	420.242
14	437.332	432.084
15	458.489	445.403
16	478.686	460.136
17	497.829	476.216
18	515.828	493.566
19	532.599	512.106
20	548.064	531.748
21	562.150	552.402
22	567.859	562.141

Factor of Safety
*** 1.287 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.989	406.000
2	143.581	395.296
3	167.002	386.550
4	191.081	379.827
5	215.644	375.174
6	240.514	372.626
7	265.510	372.200
8	290.452	373.900
9	315.160	377.714
10	339.454	383.614
11	363.158	391.557
12	386.102	401.486
13	408.119	413.329
14	429.050	427.000
15	448.743	442.400
16	467.056	459.419
17	483.857	477.932
18	499.023	497.806
19	512.446	518.897
20	524.028	541.052
21	533.685	564.112
22	537.306	575.359

Factor of Safety
*** 1.293 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	406.000
2	142.833	395.820
3	166.419	387.530
4	190.601	381.187
5	215.218	376.831
6	240.109	374.491
7	265.107	374.184
8	290.047	375.911
9	314.764	379.660
10	339.095	385.407
11	362.877	393.114
12	385.954	402.730
13	408.172	414.190
14	429.385	427.420

15	449.451	442.331
16	468.239	458.825
17	485.622	476.792
18	501.487	496.113
19	515.728	516.661
20	528.250	538.298
21	538.971	560.883
22	543.893	573.888

Factor of Safety
*** 1.293 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	406.000
2	143.104	396.449
3	166.896	388.771
4	191.224	383.015
5	215.934	379.217
6	240.868	377.402
7	265.867	377.582
8	290.773	379.754
9	315.425	383.905
10	339.669	390.010
11	363.348	398.028
12	386.312	407.909
13	408.416	419.590
14	429.517	432.997
15	449.482	448.043
16	468.183	464.634
17	485.502	482.663
18	501.328	502.016
19	515.560	522.570
20	528.108	544.193
21	538.891	566.748
22	541.852	574.471

Factor of Safety
*** 1.294 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.495	406.000
2	143.295	395.747
3	166.888	387.478
4	191.101	381.254
5	215.757	377.120
6	240.676	375.107
7	265.675	375.229
8	290.573	377.485
9	315.188	381.859
10	339.339	388.319
11	362.850	396.818
12	385.549	407.293
13	407.272	419.669
14	427.858	433.854
15	447.157	449.745
16	465.029	467.226
17	481.344	486.169
18	495.981	506.436
19	508.834	527.879
20	519.809	550.341
21	528.825	573.659
22	529.620	576.384

Factor of Safety
*** 1.294 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.967	406.000
2	145.836	395.899
3	169.474	387.760

4	193.713	381.641
5	218.382	377.586
6	243.305	375.622
7	268.304	375.765
8	293.203	378.013
9	317.824	382.350
10	341.992	388.746
11	365.536	397.155
12	388.287	407.516
13	410.085	419.758
14	430.775	433.791
15	450.208	449.518
16	468.249	466.826
17	484.767	485.591
18	499.646	505.681
19	512.780	526.953
20	524.075	549.256
21	533.452	572.431
22	534.475	575.737

Factor of Safety

*** 1.294 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.967	406.000
2	145.664	395.519
3	169.177	387.027
4	193.333	380.586
5	217.953	376.243
6	242.855	374.032
7	267.855	373.968
8	292.768	376.051
9	317.410	380.267
10	341.599	386.584
11	365.156	394.956
12	387.906	405.320
13	409.682	417.601
14	430.323	431.706
15	449.675	447.532
16	467.597	464.963
17	483.955	483.868
18	498.629	504.109
19	511.510	525.535
20	522.502	547.988
21	531.525	571.303
22	532.878	575.950

Factor of Safety

*** 1.294 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.956	406.000
2	146.721	395.669
3	170.277	387.293
4	194.454	380.933
5	219.082	376.635
6	243.984	374.427
7	268.984	374.327
8	293.903	376.335
9	318.565	380.437
10	342.792	386.603
11	366.414	394.790
12	389.261	404.939
13	411.171	416.978
14	431.989	430.821
15	451.565	446.370
16	469.761	463.514
17	486.446	482.131
18	501.503	502.088
19	514.824	523.244

20	526.313	545.447
21	535.890	568.540
22	538.034	575.262

Factor of Safety
*** 1.294 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.967	406.000
2	145.490	395.151
3	168.877	386.315
4	192.947	379.560
5	217.516	374.937
6	242.395	372.482
7	267.393	372.215
8	292.319	374.136
9	316.982	378.231
10	341.191	384.470
11	364.761	392.803
12	387.511	403.168
13	409.267	415.483
14	429.862	429.656
15	449.137	445.577
16	466.945	463.123
17	483.148	482.161
18	497.623	502.544
19	510.259	524.116
20	520.958	546.711
21	529.638	570.156
22	531.281	576.163

Factor of Safety
*** 1.295 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.956	406.000
2	147.060	396.449
3	170.861	388.799
4	195.203	383.101
5	219.926	379.391
6	244.868	377.695
7	269.866	378.022
8	294.755	380.371
9	319.373	384.727
10	343.557	391.061
11	367.150	399.332
12	389.995	409.485
13	411.944	421.453
14	432.853	435.158
15	452.583	450.511
16	471.007	467.410
17	488.002	485.744
18	503.458	505.394
19	517.273	526.230
20	529.356	548.116
21	539.629	570.908
22	540.987	574.718

Factor of Safety
*** 1.295 ***

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

Euland - Section G-G', Static, --2015 design

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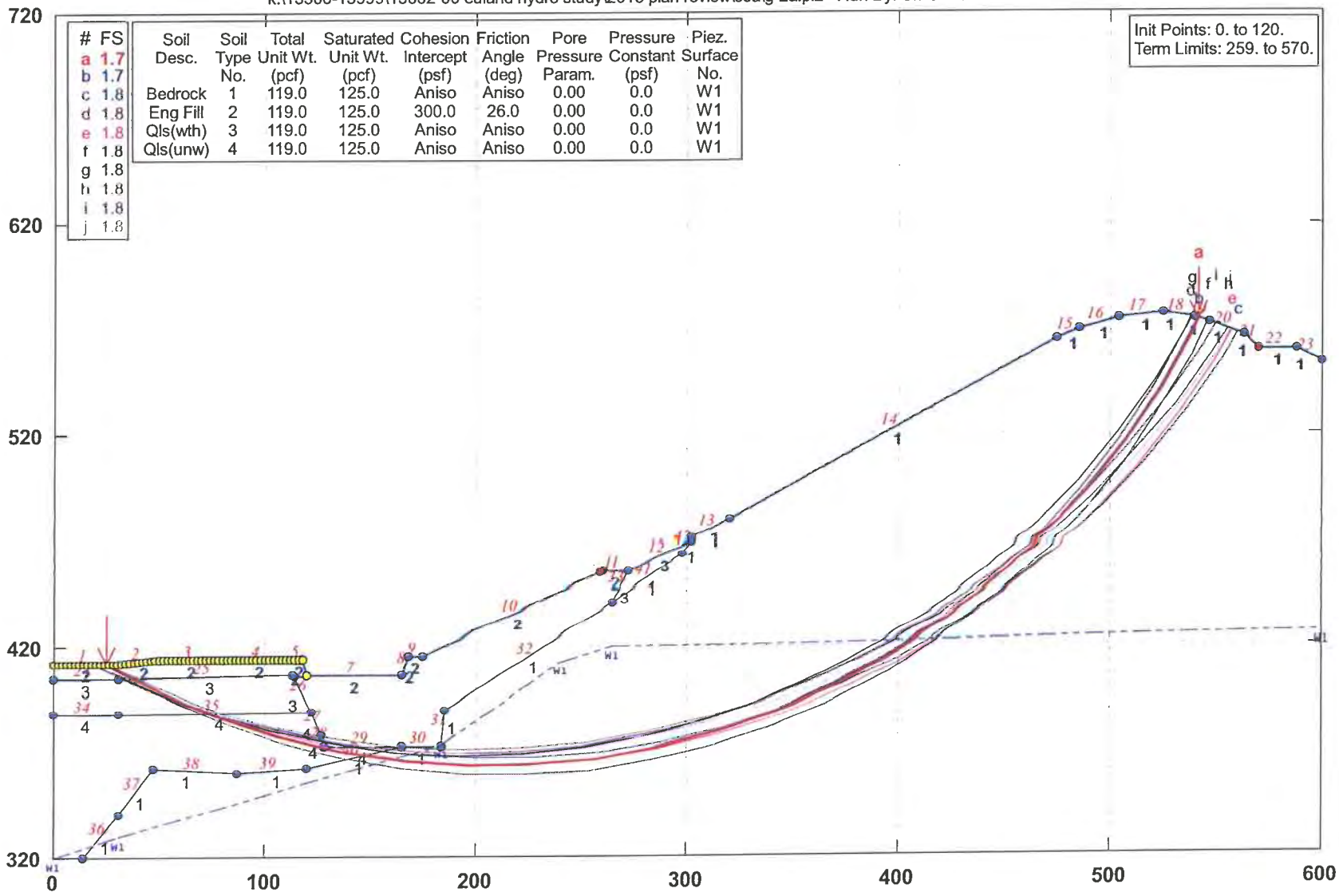

GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-42.1

Euland - Section G-G', Static, --2015 design

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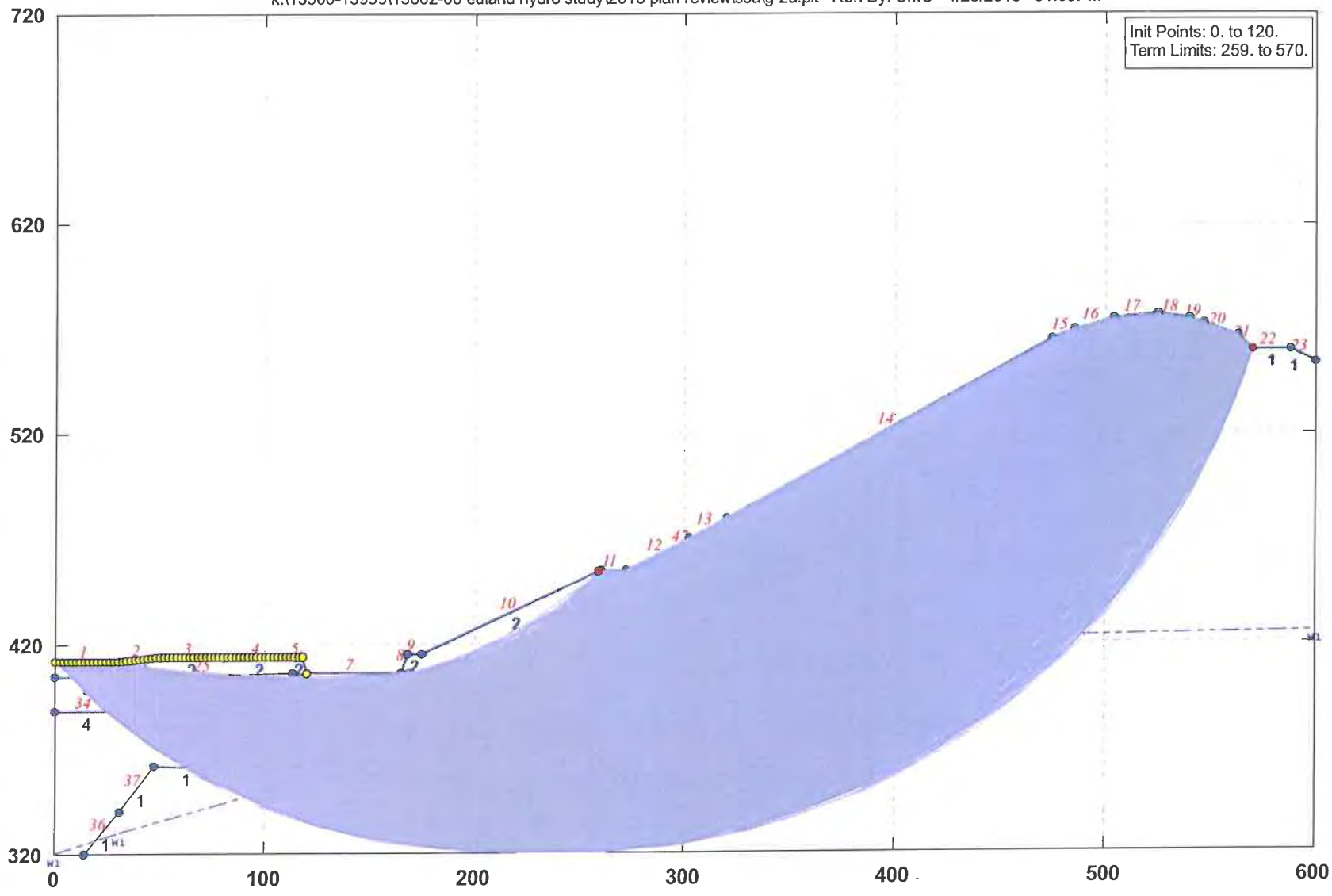

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/23/2015
Time of Run: 01:09PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-2a.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-2a.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-2a.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Static,
--2015 design

BOUNDARY COORDINATES

23 Top Boundaries
42 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	412.00	31.00	412.00	2
2	31.00	412.00	50.00	414.00	2
3	50.00	414.00	80.00	414.00	2
4	80.00	414.00	115.00	414.00	2
5	115.00	414.00	118.00	414.00	2
6	118.00	414.00	120.00	406.00	2
7	120.00	406.00	165.00	406.00	2
8	165.00	406.00	168.00	415.00	2
9	168.00	415.00	175.00	415.00	2
10	175.00	415.00	260.00	455.00	2
11	260.00	455.00	272.00	455.00	2
12	272.00	455.00	302.00	470.00	3
13	302.00	470.00	320.00	480.00	1
14	320.00	480.00	475.00	565.00	1
15	475.00	565.00	485.00	570.00	1
16	485.00	570.00	504.00	575.00	1
17	504.00	575.00	525.00	577.00	1
18	525.00	577.00	540.00	575.00	1
19	540.00	575.00	547.00	573.00	1
20	547.00	573.00	563.00	567.00	1
21	563.00	567.00	570.00	560.00	1
22	570.00	560.00	588.00	560.00	1
23	588.00	560.00	600.00	554.00	1
24	0.00	405.00	31.00	405.00	3
25	31.00	405.00	113.00	406.00	3
26	113.00	406.00	122.00	389.00	3
27	122.00	389.00	127.00	378.00	4
28	127.00	378.00	128.00	372.50	4
29	128.00	372.50	165.00	372.50	4
30	165.00	372.50	184.00	372.50	1
31	184.00	372.50	185.00	390.00	1
32	185.00	390.00	265.00	440.00	1
33	265.00	440.00	272.00	455.00	3
34	0.00	388.00	31.00	388.00	4
35	31.00	388.00	122.00	389.00	4
36	14.00	320.00	31.00	340.00	1
37	31.00	340.00	47.00	362.00	1
38	47.00	362.00	87.00	360.00	1
39	87.00	360.00	120.00	362.00	1

40	120.00	362.00	165.00	372.50	1
41	265.00	440.00	298.00	463.00	1
42	298.00	463.00	302.00	470.00	1

User Specified Y-Origin = 320.00(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.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-7.0	750.00	29.00
2	-3.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	325.00	23.00
2	3.0	300.00	15.00
3	90.0	325.00	23.00

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	3.0	250.00	12.50
3	90.0	500.00	29.00

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 6 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	320.00
2	31.00	330.00
3	184.00	373.00
4	240.00	412.00
5	265.00	420.00
6	600.00	425.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
24200 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 121 Points Equally Spaced
Along The Ground Surface Between X = 0.00(ft)
and X = 120.00(ft)
Each Surface Terminates Between X = 259.00(ft)
and X = 570.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation

At Which A Surface Extends Is Y = 320.00(ft)
30.00(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 = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.000	412.000
2	51.648	398.221
3	79.326	386.647
4	107.850	377.354
5	137.034	370.404
6	166.685	365.842
7	196.609	363.697
8	226.607	363.985
9	256.484	366.703
10	286.042	371.833
11	315.087	379.342
12	343.428	389.181
13	370.878	401.283
14	397.257	415.571
15	422.392	431.949
16	446.116	450.311
17	468.275	470.535
18	488.721	492.488
19	507.321	516.026
20	523.953	540.994
21	538.506	567.228
22	541.794	574.487

Factor of Safety
*** 1.747 ***
Individual data on the 56 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.0	1107.5	0.0	0.0	0.	0.	0.0	0.0	0.0
2	7.4	4727.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	11.6	15654.7	0.0	0.0	0.	0.	0.0	0.0	0.0
4	1.6	3011.7	0.0	0.0	0.	0.	0.0	0.0	0.0
5	23.3	57221.1	0.0	0.0	0.	0.	0.0	0.0	0.0
6	4.4	13808.7	0.0	0.0	0.	0.	0.0	0.0	0.0
7	0.7	2202.7	0.0	0.0	0.	0.	0.0	0.0	0.0
8	27.9	106415.6	0.0	0.0	0.	0.	0.0	0.0	0.0
9	5.1	22832.0	0.0	0.0	0.	0.	0.0	0.0	0.0
10	2.0	9070.2	0.0	0.0	0.	0.	0.0	0.0	0.0
11	3.0	13817.9	0.0	0.0	0.	0.	0.0	0.0	0.0
12	2.0	8401.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	2.0	7563.0	0.0	0.0	0.	0.	0.0	0.0	0.0
14	5.0	19403.4	0.0	0.0	0.	0.	0.0	0.0	0.0
15	1.0	3923.6	0.0	0.0	0.	0.	0.0	0.0	0.0
16	0.2	972.8	0.0	0.0	0.	0.	0.0	0.0	0.0
17	8.8	36180.8	0.0	0.0	0.	0.	0.0	0.0	0.0
18	11.4	49654.7	0.0	0.0	0.	0.	0.0	0.0	0.0
19	12.9	59062.4	0.0	0.0	0.	0.	0.0	0.0	0.0
20	3.6	16920.1	0.0	170.0	0.	0.	0.0	0.0	0.0
21	1.7	8553.3	0.0	197.4	0.	0.	0.0	0.0	0.0
22	1.3	7409.0	0.0	200.0	0.	0.	0.0	0.0	0.0
23	7.0	41397.8	0.0	1683.5	0.	0.	0.0	0.0	0.0
24	7.2	44706.9	0.0	2828.1	0.	0.	0.0	0.0	0.0
25	1.8	11547.6	0.0	867.0	0.	0.	0.0	0.0	0.0
26	0.0	194.7	0.0	13.1	0.	0.	0.0	0.0	0.0
27	1.0	6383.1	0.0	446.6	0.	0.	0.0	0.0	0.0

28	11.6	81363.7	0.0	8279.3	0.	0.	0.0	0.0	0.0
29	30.0	248401.9	0.0	44460.5	0.	0.	0.0	0.0	0.0
30	13.4	126935.6	0.0	30010.5	0.	0.	0.0	0.0	0.0
31	16.5	168408.8	0.0	47947.4	0.	0.	0.0	0.0	0.0
32	3.5	37494.9	0.0	10793.6	0.	0.	0.0	0.0	0.0
33	5.0	53387.2	0.0	15536.5	0.	0.	0.0	0.0	0.0
34	7.0	73966.8	0.0	22724.2	0.	0.	0.0	0.0	0.0
35	14.0	151049.7	0.0	44100.0	0.	0.	0.0	0.0	0.0
36	12.0	133766.7	0.0	36238.5	0.	0.	0.0	0.0	0.0
37	4.0	45615.4	0.0	11620.7	0.	0.	0.0	0.0	0.0
38	13.1	152856.3	0.0	36264.4	0.	0.	0.0	0.0	0.0
39	4.9	58750.4	0.0	13170.7	0.	0.	0.0	0.0	0.0
40	23.4	287484.8	0.0	55519.3	0.	0.	0.0	0.0	0.0
41	27.5	347762.3	0.0	48934.9	0.	0.	0.0	0.0	0.0
42	26.4	337079.1	0.0	24988.2	0.	0.	0.0	0.0	0.0
43	10.1	127375.9	0.0	2397.6	0.	0.	0.0	0.0	0.0
44	15.1	188364.5	0.0	0.0	0.	0.	0.0	0.0	0.0
45	23.7	286627.6	0.0	0.0	0.	0.	0.0	0.0	0.0
46	22.2	250007.8	0.0	0.0	0.	0.	0.0	0.0	0.0
47	6.7	71234.7	0.0	0.0	0.	0.	0.0	0.0	0.0
48	10.0	100407.2	0.0	0.0	0.	0.	0.0	0.0	0.0
49	3.7	35426.6	0.0	0.0	0.	0.	0.0	0.0	0.0
50	15.3	128787.7	0.0	0.0	0.	0.	0.0	0.0	0.0
51	3.3	24202.0	0.0	0.0	0.	0.	0.0	0.0	0.0
52	16.6	94202.0	0.0	0.0	0.	0.	0.0	0.0	0.0
53	1.0	4364.0	0.0	0.0	0.	0.	0.0	0.0	0.0
54	13.5	33821.9	0.0	0.0	0.	0.	0.0	0.0	0.0
55	1.5	1106.5	0.0	0.0	0.	0.	0.0	0.0	0.0
56	1.8	477.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.000	412.000
2	51.649	398.223
3	79.329	386.655
4	107.857	377.372
5	137.044	370.435
6	166.698	365.892
7	196.623	363.770
8	226.621	364.085
9	256.495	366.834
10	286.047	372.000
11	315.082	379.548
12	343.408	389.428
13	370.839	401.574
14	397.193	415.908
15	422.297	432.334
16	445.984	450.744
17	468.098	471.016
18	488.494	493.017
19	507.036	516.600
20	523.602	541.611
21	538.083	567.885
22	541.136	574.675

Factor of Safety

*** 1.747 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.000	412.000
2	52.138	399.212
3	80.149	388.470
4	108.879	379.835
5	138.171	373.353
6	167.862	369.061
7	197.790	366.981
8	227.789	367.126
9	257.696	369.494
10	287.344	374.072
11	316.572	380.836

12	345.218	389.748
13	373.124	400.759
14	400.137	413.808
15	426.109	428.824
16	450.896	445.723
17	474.362	464.414
18	496.378	484.793
19	516.823	506.748
20	535.584	530.158
21	552.558	554.894
22	560.214	568.045

Factor of Safety
*** 1.751 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.000	412.000
2	49.583	398.095
3	77.215	386.412
4	105.709	377.029
5	134.876	370.008
6	164.520	365.398
7	194.441	363.228
8	224.440	363.514
9	254.315	366.253
10	283.865	371.427
11	312.893	379.001
12	341.204	388.925
13	368.609	401.132
14	394.922	415.540
15	419.969	432.053
16	443.580	450.559
17	465.599	470.936
18	485.876	493.045
19	504.276	516.740
20	520.677	541.860
21	534.966	568.238
22	538.056	575.259

Factor of Safety
*** 1.754 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.000	412.000
2	50.880	398.678
3	78.697	387.443
4	107.289	378.361
5	136.490	371.484
6	166.130	366.852
7	196.037	364.492
8	226.037	364.419
9	255.955	366.632
10	285.618	371.119
11	314.852	377.853
12	343.489	386.795
13	371.360	397.894
14	398.305	411.084
15	424.166	426.289
16	448.793	443.421
17	472.043	462.380
18	493.780	483.056
19	513.879	505.328
20	532.222	529.067
21	548.702	554.135
22	557.053	569.230

Factor of Safety
*** 1.755 ***

Failure Surface Specified By 22 Coordinate Points

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

1	24.000	412.000
2	50.229	397.438
3	77.566	385.082
4	105.827	375.016
5	134.820	367.308
6	164.348	362.010
7	194.212	359.158
8	224.210	358.772
9	254.138	360.854
10	283.793	365.390
11	312.974	372.349
12	341.485	381.684
13	369.131	393.332
14	395.726	407.214
15	421.090	423.236
16	445.050	441.289
17	467.444	461.251
18	488.121	482.988
19	506.940	506.351
20	523.775	531.182
21	538.510	557.314
22	545.874	573.322

Factor of Safety
*** 1.755 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	19.000	412.000
2	46.106	399.144
3	74.130	388.437
4	102.903	379.943
5	132.249	373.714
6	161.991	369.787
7	191.948	368.187
8	221.939	368.923
9	251.782	371.990
10	281.295	377.370
11	310.301	385.031
12	338.622	394.926
13	366.087	406.995
14	392.530	421.164
15	417.790	437.348
16	441.714	455.449
17	464.157	475.356
18	484.983	496.950
19	504.065	520.099
20	521.288	544.663
21	536.547	570.492
22	538.833	575.156

Factor of Safety
*** 1.755 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.000	412.000
2	45.513	400.040
3	73.809	390.075
4	102.746	382.158
5	132.174	376.327
6	161.943	372.614
7	191.902	371.038
8	221.896	371.605
9	251.774	374.314
10	281.381	379.150
11	310.568	386.089
12	339.184	395.095
13	367.084	406.122
14	394.125	419.115
15	420.168	434.005
16	445.081	450.719

17	468.737	469.169
18	491.014	489.262
19	511.798	510.896
20	530.985	533.958
21	548.474	558.333
22	555.522	569.804

Factor of Safety
*** 1.755 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.000	412.000
2	44.338	399.646
3	72.513	389.340
4	101.369	381.137
5	130.752	375.083
6	160.501	371.209
7	190.454	369.537
8	220.449	370.076
9	250.323	372.823
10	279.914	377.763
11	309.060	384.869
12	337.603	394.104
13	365.389	405.415
14	392.266	418.743
15	418.088	434.015
16	442.715	451.147
17	466.013	470.047
18	487.856	490.611
19	508.124	512.729
20	526.708	536.279
21	543.507	561.135
22	549.724	571.978

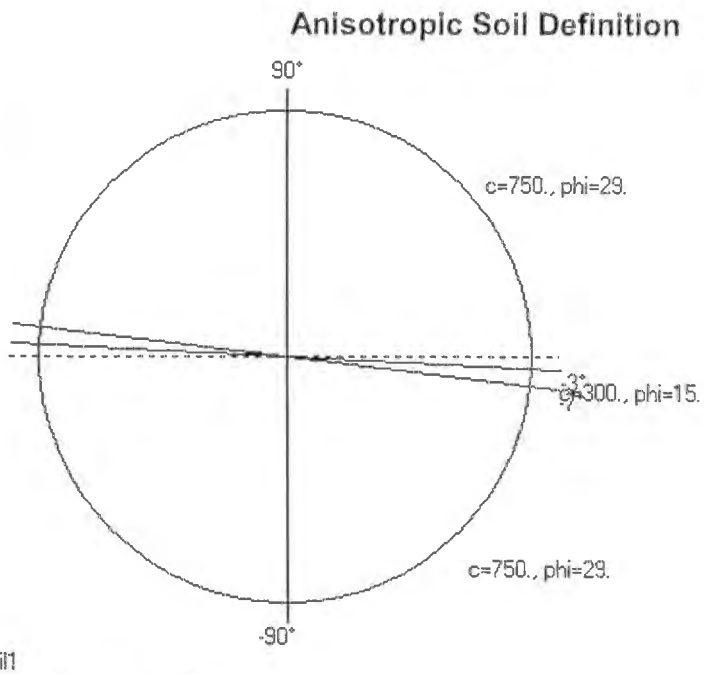
Factor of Safety
*** 1.756 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	19.000	412.000
2	46.358	399.690
3	74.536	389.393
4	103.385	381.164
5	132.754	375.045
6	162.490	371.069
7	192.435	369.256
8	222.433	369.617
9	252.326	372.149
10	281.957	376.839
11	311.170	383.662
12	339.813	392.583
13	367.735	403.554
14	394.789	416.519
15	420.834	431.408
16	445.731	448.145
17	469.352	466.640
18	491.571	486.797
19	512.272	508.510
20	531.347	531.665
21	548.695	556.141
22	556.695	569.364

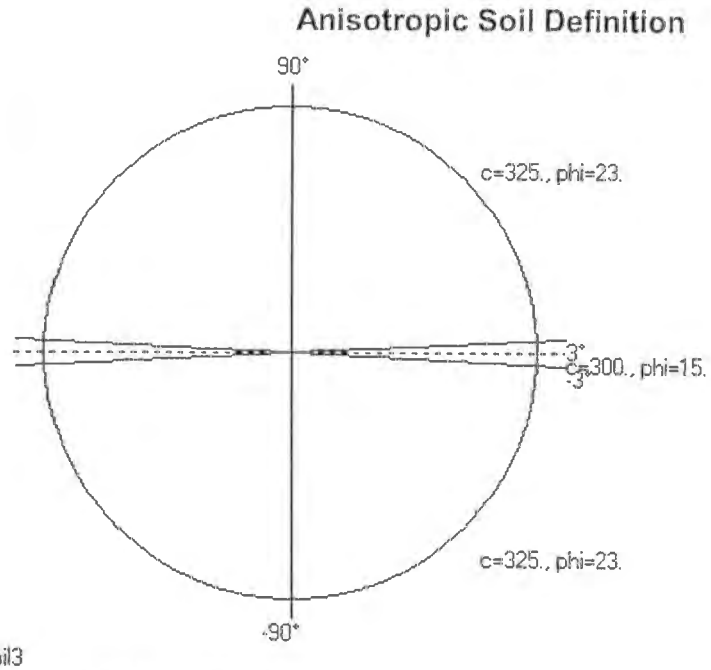
Factor of Safety
*** 1.756 ***

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



Soil1

Euland - Section G-G', Static,



Soil3

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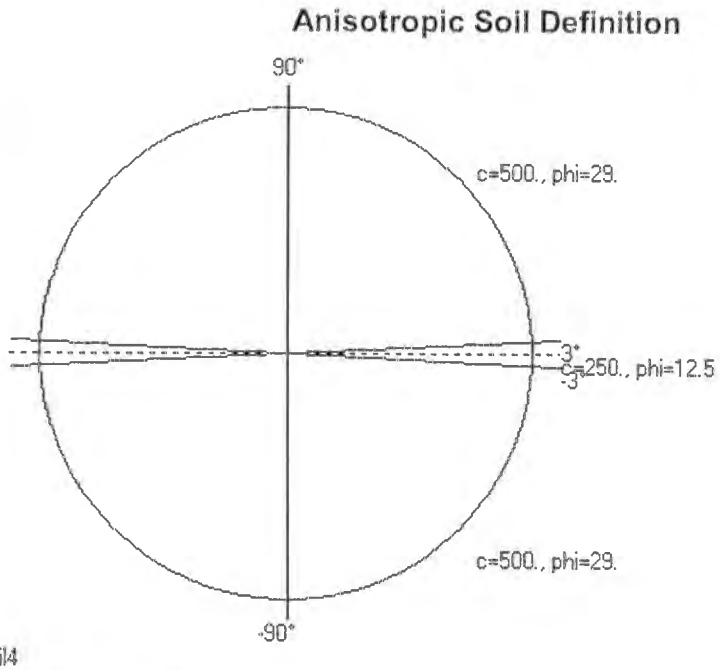

Soil4

Euland - Section G-G', Static,

Euland - Section G-G', Seismic, --2015 design

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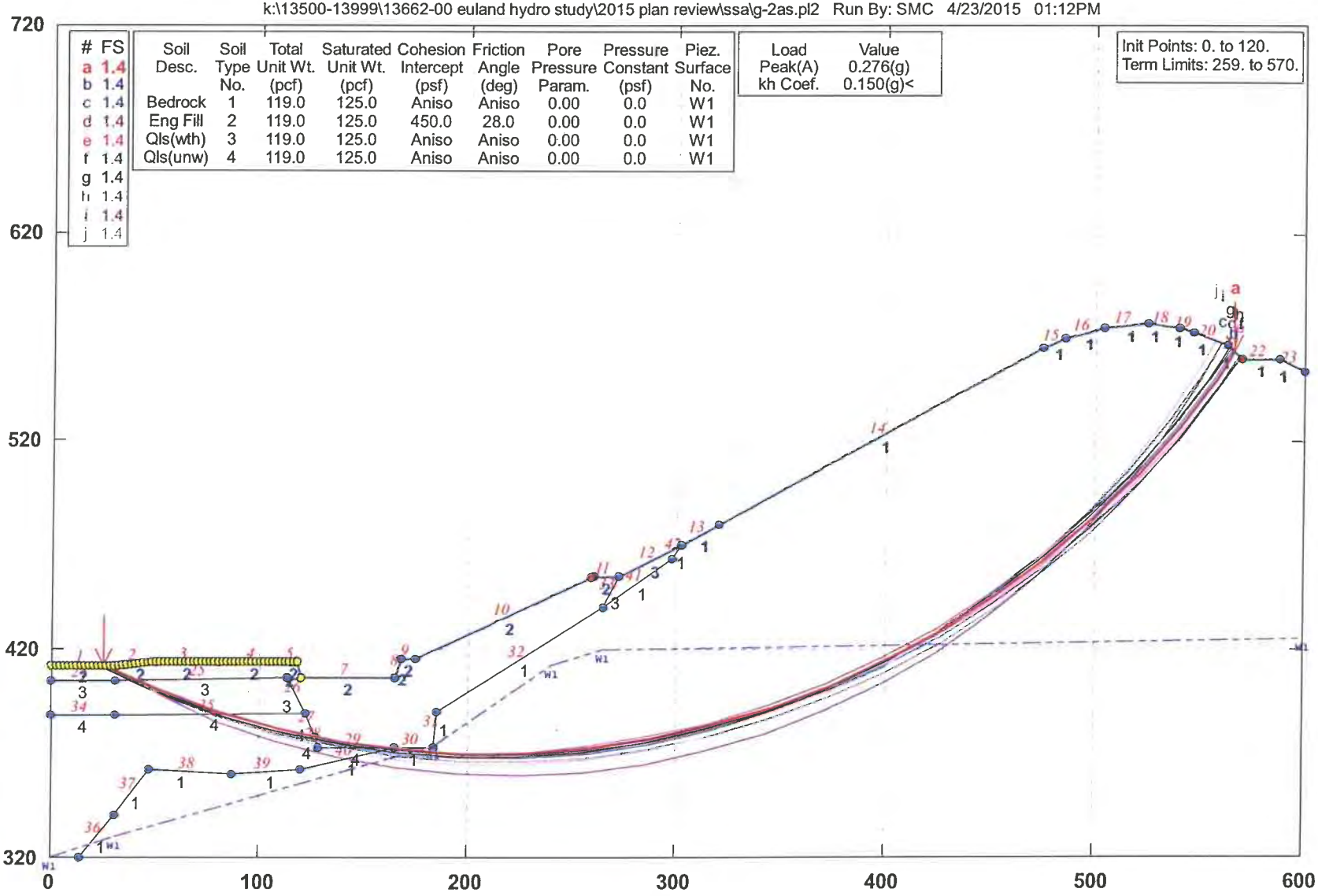

GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-42.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 01:12PM
Run By: SMC
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Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-2as.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Seismic, --2015 design

BOUNDARY COORDINATES
23 Top Boundaries
42 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	412.00	31.00	412.00	2
2	31.00	412.00	50.00	414.00	2
3	50.00	414.00	80.00	414.00	2
4	80.00	414.00	115.00	414.00	2
5	115.00	414.00	118.00	414.00	2
6	118.00	414.00	120.00	406.00	2
7	120.00	406.00	165.00	406.00	2
8	165.00	406.00	168.00	415.00	2
9	168.00	415.00	175.00	415.00	2
10	175.00	415.00	260.00	455.00	2
11	260.00	455.00	272.00	455.00	2
12	272.00	455.00	302.00	470.00	3
13	302.00	470.00	320.00	480.00	1
14	320.00	480.00	475.00	565.00	1
15	475.00	565.00	485.00	570.00	1
16	485.00	570.00	504.00	575.00	1
17	504.00	575.00	525.00	577.00	1
18	525.00	577.00	540.00	575.00	1
19	540.00	575.00	547.00	573.00	1
20	547.00	573.00	563.00	567.00	1
21	563.00	567.00	570.00	560.00	1
22	570.00	560.00	588.00	560.00	1
23	588.00	560.00	600.00	554.00	1
24	0.00	405.00	31.00	405.00	3
25	31.00	405.00	113.00	406.00	3
26	113.00	406.00	122.00	389.00	3
27	122.00	389.00	127.00	378.00	4
28	127.00	378.00	128.00	372.50	4
29	128.00	372.50	165.00	372.50	4
30	165.00	372.50	184.00	372.50	1
31	184.00	372.50	185.00	390.00	1
32	185.00	390.00	265.00	440.00	1
33	265.00	440.00	272.00	455.00	3
34	0.00	388.00	31.00	388.00	4
35	31.00	388.00	122.00	389.00	4
36	14.00	320.00	31.00	340.00	1
37	31.00	340.00	47.00	362.00	1
38	47.00	362.00	87.00	360.00	1
39	87.00	360.00	120.00	362.00	1

40	120.00	362.00	165.00	372.50	1
41	265.00	440.00	298.00	463.00	1
42	298.00	463.00	302.00	470.00	1

User Specified Y-Origin = 320.00(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.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-7.0	1125.00	31.00
2	-3.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	450.00	17.00
3	90.0	525.00	25.00

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	3.0	375.00	14.50
3	90.0	750.00	31.00

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 6 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	320.00
2	31.00	330.00
3	184.00	373.00
4	240.00	412.00
5	265.00	420.00
6	600.00	425.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
24200 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 121 Points Equally Spaced Along The Ground Surface Between X = 0.00(ft)

and X = 120.00(ft)
Each Surface Terminates Between X = 259.00(ft)
and X = 570.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 320.00(ft)
30.00(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 = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.000	412.000
2	52.458	399.914
3	80.699	389.792
4	109.582	381.685
5	138.966	375.633
6	168.702	371.667
7	198.645	369.806
8	228.643	370.059
9	258.550	372.425
10	288.216	376.892
11	317.493	383.438
12	346.236	392.031
13	374.302	402.628
14	401.552	415.175
15	427.850	429.612
16	453.065	445.865
17	477.073	463.855
18	499.754	483.491
19	520.994	504.677
20	540.690	527.307
21	558.741	551.268
22	566.604	563.396

Factor of Safety
*** 1.398 ***
Individual data on the 57 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.0	942.9	0.0	0.0	0.	0.	141.4	0.0	0.0
2	9.6	6041.5	0.0	0.0	0.	0.	906.2	0.0	0.0
3	9.4	11646.0	0.0	0.0	0.	0.	1746.9	0.0	0.0
4	2.5	3961.4	0.0	0.0	0.	0.	594.2	0.0	0.0
5	27.5	62345.8	0.0	0.0	0.	0.	9351.9	0.0	0.0
6	0.7	2001.8	0.0	0.0	0.	0.	300.3	0.0	0.0
7	4.3	12608.7	0.0	0.0	0.	0.	1891.3	0.0	0.0
8	24.6	84531.5	0.0	0.0	0.	0.	12679.7	0.0	0.0
9	3.4	13285.5	0.0	0.0	0.	0.	1992.8	0.0	0.0
10	2.0	7907.5	0.0	0.0	0.	0.	1186.1	0.0	0.0
11	3.0	12045.1	0.0	0.0	0.	0.	1806.8	0.0	0.0
12	2.0	7200.6	0.0	0.0	0.	0.	1080.1	0.0	0.0
13	2.0	6346.6	0.0	0.0	0.	0.	952.0	0.0	0.0
14	5.0	16132.7	0.0	0.0	0.	0.	2419.9	0.0	0.0
15	12.0	41647.8	0.0	0.0	0.	0.	6247.2	0.0	0.0
16	23.5	89270.3	0.0	0.0	0.	0.	13390.5	0.0	0.0
17	1.6	6469.9	0.0	0.0	0.	0.	970.5	0.0	0.0
18	0.9	3717.1	0.0	0.0	0.	0.	557.6	0.0	0.0
19	3.0	13758.5	0.0	0.0	0.	0.	2063.8	0.0	0.0
20	0.7	3617.7	0.0	0.0	0.	0.	542.7	0.0	0.0
21	6.3	32621.4	0.0	0.0	0.	0.	4893.2	0.0	0.0
22	2.3	12378.3	0.0	0.0	0.	0.	1856.7	0.0	0.0
23	4.9	26870.1	0.0	245.7	0.	0.	4030.5	0.0	0.0

24	1.8	10192.0	0.0	212.0	0.	0.	1528.8	0.0	0.0
25	0.0	172.2	0.0	3.6	0.	0.	25.8	0.0	0.0
26	1.0	5646.7	0.0	135.7	0.	0.	847.0	0.0	0.0
27	13.6	86109.9	0.0	5865.5	0.	0.	12916.5	0.0	0.0
28	30.0	229376.9	0.0	37141.1	0.	0.	34406.5	0.0	0.0
29	11.4	99994.5	0.0	22326.5	0.	0.	14999.2	0.0	0.0
30	18.6	177352.7	0.0	47916.8	0.	0.	26602.9	0.0	0.0
31	1.4	14549.1	0.0	3981.6	0.	0.	2182.4	0.0	0.0
32	5.0	50099.5	0.0	13894.0	0.	0.	7514.9	0.0	0.0
33	7.0	69474.4	0.0	20374.2	0.	0.	10421.2	0.0	0.0
34	16.2	165234.2	0.0	45585.7	0.	0.	24785.1	0.0	0.0
35	9.8	104450.8	0.0	26544.7	0.	0.	15667.6	0.0	0.0
36	4.0	43573.0	0.0	10484.0	0.	0.	6535.9	0.0	0.0
37	15.5	174335.8	0.0	38591.6	0.	0.	26150.4	0.0	0.0
38	2.5	29048.8	0.0	6039.8	0.	0.	4357.3	0.0	0.0
39	26.2	314525.4	0.0	56222.4	0.	0.	47178.8	0.0	0.0
40	28.1	353921.4	0.0	45096.5	0.	0.	53088.2	0.0	0.0
41	27.2	353460.9	0.0	24208.6	0.	0.	53019.1	0.0	0.0
42	12.9	167786.3	0.0	3138.7	0.	0.	25167.9	0.0	0.0
43	13.4	175278.0	0.0	0.0	0.	0.	26291.7	0.0	0.0
44	25.2	325027.4	0.0	0.0	0.	0.	48754.1	0.0	0.0
45	21.9	273817.9	0.0	0.0	0.	0.	41072.7	0.0	0.0
46	2.1	25272.1	0.0	0.0	0.	0.	3790.8	0.0	0.0
47	7.9	95020.3	0.0	0.0	0.	0.	14253.0	0.0	0.0
48	14.8	166503.4	0.0	0.0	0.	0.	24975.5	0.0	0.0
49	4.2	44888.2	0.0	0.0	0.	0.	6733.2	0.0	0.0
50	17.0	160991.9	0.0	0.0	0.	0.	24148.8	0.0	0.0
51	4.0	33286.7	0.0	0.0	0.	0.	4993.0	0.0	0.0
52	15.0	103713.8	0.0	0.0	0.	0.	15557.1	0.0	0.0
53	0.7	3937.8	0.0	0.0	0.	0.	590.7	0.0	0.0
54	6.3	31845.2	0.0	0.0	0.	0.	4776.8	0.0	0.0
55	11.7	38176.5	0.0	0.0	0.	0.	5726.5	0.0	0.0
56	4.3	6712.8	0.0	0.0	0.	0.	1006.9	0.0	0.0
57	3.6	1964.6	0.0	0.0	0.	0.	294.7	0.0	0.0

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.000	412.000
2	51.407	399.799
3	79.611	389.574
4	108.468	381.375
5	137.835	375.243
6	167.563	371.211
7	197.502	369.297
8	227.501	369.512
9	257.409	371.854
10	287.076	376.313
11	316.352	382.864
12	345.089	391.476
13	373.144	402.105
14	400.373	414.697
15	426.640	429.189
16	451.814	445.508
17	475.766	463.571
18	498.376	483.288
19	519.531	504.560
20	539.124	527.278
21	557.055	551.329
22	565.495	564.505

Factor of Safety

*** 1.400 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.000	412.000
2	52.138	399.212
3	80.149	388.470
4	108.879	379.835
5	138.171	373.353
6	167.862	369.061

7	197.790	366.981
8	227.789	367.126
9	257.696	369.494
10	287.344	374.072
11	316.572	380.836
12	345.218	389.748
13	373.124	400.759
14	400.137	413.808
15	426.109	428.824
16	450.896	445.723
17	474.362	464.414
18	496.378	484.793
19	516.823	506.748
20	535.584	530.158
21	552.558	554.894
22	560.214	568.045

Factor of Safety
*** 1.401 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	22.000	412.000
2	49.496	400.001
3	77.767	389.964
4	106.673	381.937
5	136.072	375.960
6	165.818	372.063
7	195.764	370.265
8	225.762	370.575
9	255.665	372.991
10	285.324	377.501
11	314.593	384.084
12	343.327	392.706
13	371.384	403.326
14	398.627	415.889
15	424.920	430.336
16	450.133	446.593
17	474.141	464.582
18	496.827	484.212
19	518.078	505.387
20	537.790	528.003
21	555.864	551.947
22	564.604	565.396

Factor of Safety
*** 1.402 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.000	412.000
2	50.514	400.042
3	78.788	390.014
4	107.688	381.965
5	137.075	375.933
6	166.809	371.947
7	196.748	370.026
8	226.748	370.180
9	256.665	372.407
10	286.356	376.698
11	315.680	383.030
12	344.496	391.375
13	372.667	401.692
14	400.056	413.931
15	426.534	428.035
16	451.974	443.936
17	476.253	461.557
18	499.256	480.815
19	520.873	501.616
20	541.000	523.863
21	559.541	547.448
22	568.854	561.146

Factor of Safety
*** 1.402 ***
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.000	412.000
2	51.394	399.770
3	79.577	389.489
4	108.411	381.207
5	137.755	374.965
6	167.463	370.793
7	197.391	368.712
8	227.391	368.732
9	257.316	370.853
10	287.019	375.065
11	316.354	381.346
12	345.177	389.667
13	373.346	399.986
14	400.724	412.252
15	427.175	426.406
16	452.571	442.377
17	476.785	460.088
18	499.699	479.451
19	521.201	500.372
20	541.185	522.747
21	559.553	546.466
22	569.156	560.844

Factor of Safety
*** 1.403 ***
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	22.000	412.000
2	49.312	399.588
3	77.442	389.163
4	106.247	380.778
5	135.578	374.478
6	165.284	370.293
7	195.214	368.245
8	225.214	368.346
9	255.130	370.593
10	284.808	374.977
11	314.096	381.474
12	342.844	390.051
13	370.904	400.665
14	398.132	413.259
15	424.388	427.771
16	449.539	444.125
17	473.454	462.238
18	496.011	482.016
19	517.094	503.359
20	536.595	526.156
21	554.414	550.290
22	564.220	565.780

Factor of Safety
*** 1.405 ***
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.000	412.000
2	51.135	399.205
3	79.119	388.394
4	107.808	379.623
5	137.054	372.938
6	166.704	368.372
7	196.606	365.950
8	226.605	365.683
9	256.546	367.575
10	286.272	371.614
11	315.632	377.779

12	344.472	386.040
13	372.644	396.353
14	400.002	408.664
15	426.403	422.910
16	451.712	439.018
17	475.798	456.903
18	498.535	476.474
19	519.806	497.629
20	539.501	520.258
21	557.519	544.245
22	568.582	561.418

Factor of Safety
*** 1.406 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.000	412.000
2	51.395	397.742
3	78.829	385.601
4	107.131	375.651
5	136.127	367.955
6	165.638	362.560
7	195.481	359.499
8	225.473	358.791
9	255.427	360.440
10	285.160	364.437
11	314.487	370.756
12	343.227	379.359
13	371.203	390.192
14	398.241	403.188
15	424.176	418.268
16	448.846	435.338
17	472.100	454.292
18	493.793	475.014
19	513.792	497.376
20	531.973	521.239
21	548.224	546.456
22	559.908	568.160

Factor of Safety
*** 1.406 ***

Failure Surface Specified By 22 Coordinate Points

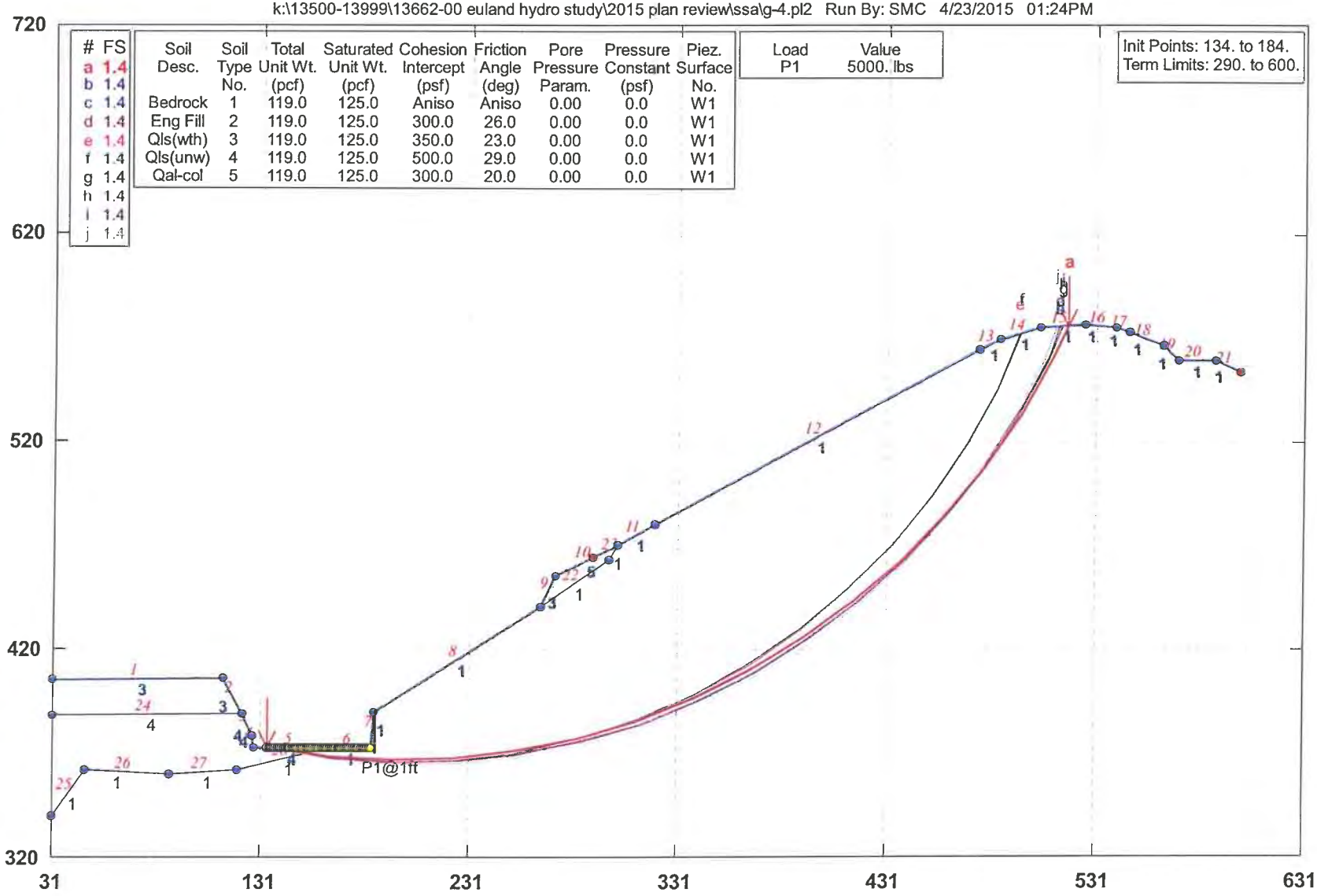
Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.000	412.000
2	50.880	398.678
3	78.697	387.443
4	107.289	378.361
5	136.490	371.484
6	166.130	366.852
7	196.037	364.492
8	226.037	364.419
9	255.955	366.632
10	285.618	371.119
11	314.852	377.853
12	343.489	386.795
13	371.360	397.894
14	398.305	411.084
15	424.166	426.289
16	448.793	443.421
17	472.043	462.380
18	493.780	483.056
19	513.879	505.328
20	532.222	529.067
21	548.702	554.135
22	557.053	569.230

Factor of Safety
*** 1.406 ***

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

Euland - Section G-G', Temp, --2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\g-4.pl2 Run By: SMC 4/23/2015 01:24PM

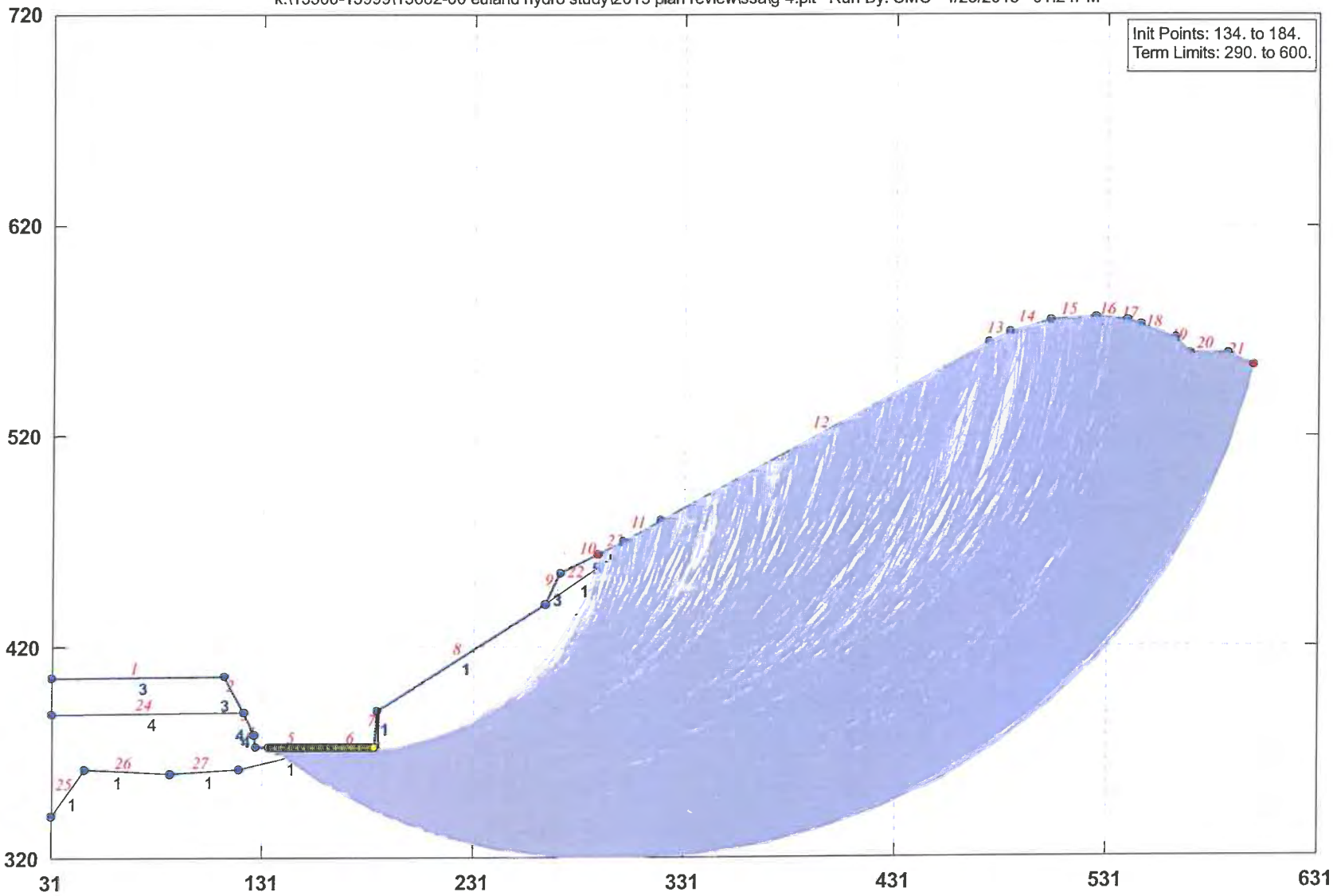


GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Euland - Section G-G', Temp, --2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\g-4.plt Run By: SMC 4/23/2015 01:24PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 01:24PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-4.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-4.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-4.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Temp,
--2015 design

BOUNDARY COORDINATES
21 Top Boundaries
28 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	405.00	113.00	406.00	3
2	113.00	406.00	122.00	389.00	3
3	122.00	389.00	127.00	378.00	4
4	127.00	378.00	128.00	372.50	4
5	128.00	372.50	165.00	372.50	4
6	165.00	372.50	184.00	372.50	1
7	184.00	372.50	185.00	390.00	1
8	185.00	390.00	265.00	440.00	1
9	265.00	440.00	272.00	455.00	3
10	272.00	455.00	302.00	470.00	5
11	302.00	470.00	320.00	480.00	1
12	320.00	480.00	475.00	565.00	1
13	475.00	565.00	485.00	570.00	1
14	485.00	570.00	504.00	575.00	1
15	504.00	575.00	525.00	577.00	1
16	525.00	577.00	540.00	575.00	1
17	540.00	575.00	547.00	573.00	1
18	547.00	573.00	563.00	567.00	1
19	563.00	567.00	570.00	560.00	1
20	570.00	560.00	588.00	560.00	1
21	588.00	560.00	600.00	554.00	1
22	265.00	440.00	298.00	463.00	1
23	298.00	463.00	302.00	470.00	1
24	31.00	388.00	122.00	389.00	4
25	31.00	340.00	47.00	362.00	1
26	47.00	362.00	87.00	360.00	1
27	87.00	360.00	120.00	362.00	1
28	120.00	362.00	165.00	372.50	1

User Specified Y-Origin = 320.00(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 No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1

4	119.0	125.0	500.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	20.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-7.0	750.00	29.00
2	-3.0	300.00	15.00
3	90.0	750.00	29.00

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 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	31.00	330.00
2	184.00	373.00
3	240.00	412.00
4	265.00	420.00
5	600.00	425.00

WATER SURFACE DATA HAS BEEN SUPPRESSED
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	186.00	390.62	5000.0	1.0	90.00	20.0

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.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
25500 Trial Surfaces Have Been Generated.
500 Surface(s) Initiate(s) From Each Of 51 Points Equally Spaced
Along The Ground Surface Between X = 134.00(ft)
and X = 184.00(ft)
Each Surface Terminates Between X = 290.00(ft)
and X = 600.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 320.00(ft)
30.00(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 = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	134.000	372.500
2	163.705	368.304
3	193.661	366.675
4	223.646	367.624
5	253.439	371.145
6	282.819	377.211
7	311.570	385.778

8	339.478	396.782
9	366.339	410.143
10	391.953	425.760
11	416.132	443.520
12	438.696	463.290
13	459.479	484.926
14	478.327	508.265
15	495.101	533.138
16	509.677	559.359
17	517.254	576.262

Factor of Safety
*** 1.397 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	137.000	372.500
2	166.619	367.736
3	196.547	365.661
4	226.541	366.291
5	256.355	369.622
6	285.748	375.626
7	314.481	384.254
8	342.319	395.437
9	369.036	409.083
10	394.414	425.081
11	418.247	443.301
12	440.342	463.595
13	460.517	485.797
14	478.610	509.727
15	494.472	535.191
16	507.975	561.980
17	513.482	575.903

Factor of Safety
*** 1.399 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	137.000	372.500
2	166.619	367.736
3	196.547	365.661
4	226.541	366.291
5	256.355	369.622
6	285.748	375.626
7	314.481	384.254
8	342.319	395.437
9	369.036	409.083
10	394.414	425.081
11	418.247	443.301
12	440.342	463.595
13	460.517	485.797
14	478.610	509.727
15	494.472	535.191
16	507.975	561.980
17	513.482	575.903

Factor of Safety
*** 1.399 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	137.000	372.500
2	166.619	367.736
3	196.547	365.660
4	226.541	366.290
5	256.355	369.620
6	285.748	375.624

7	314.481	384.253
8	342.319	395.435
9	369.036	409.081
10	394.414	425.079
11	418.247	443.299
12	440.342	463.593
13	460.517	485.796
14	478.609	509.726
15	494.472	535.190
16	507.975	561.979
17	513.482	575.903

Factor of Safety
*** 1.399 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	135.000	372.500
2	164.594	367.584
3	194.525	365.537
4	224.513	366.378
5	254.281	370.100
6	283.553	376.667
7	312.058	386.020
8	339.531	398.071
9	365.718	412.709
10	390.375	429.797
11	413.275	449.178
12	434.204	470.671
13	452.968	494.078
14	469.395	519.182
15	483.331	545.748
16	494.193	572.419

Factor of Safety
*** 1.399 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	134.000	372.500
2	163.598	367.608
3	193.529	365.566
4	223.517	366.393
5	253.290	370.082
6	282.573	376.599
7	311.100	385.884
8	338.610	397.853
9	364.849	412.395
10	389.580	429.378
11	412.574	448.646
12	433.622	470.023
13	452.531	493.313
14	469.129	518.304
15	483.262	544.766
16	494.803	572.457
17	494.844	572.590

Factor of Safety
*** 1.399 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	134.000	372.500
2	163.617	367.719
3	193.541	365.588
4	223.536	366.121
5	253.365	369.317
6	282.793	375.148
7	311.587	383.570
8	339.519	394.515
9	366.369	407.897
10	391.924	423.611
11	415.984	441.531

12	438.356	461.518
13	458.866	483.412
14	477.350	507.041
15	493.664	532.218
16	507.677	558.744
17	514.931	576.041

Factor of Safety
*** 1.401 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	134.000	372.500
2	163.617	367.719
3	193.541	365.588
4	223.536	366.122
5	253.365	369.317
6	282.793	375.148
7	311.587	383.570
8	339.519	394.515
9	366.369	407.897
10	391.924	423.611
11	415.984	441.532
12	438.356	461.518
13	458.866	483.412
14	477.351	507.041
15	493.664	532.218
16	507.677	558.744
17	514.931	576.041

Factor of Safety
*** 1.401 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	134.000	372.500
2	163.616	367.713
3	193.539	365.575
4	223.535	366.104
5	253.364	369.295
6	282.793	375.124
7	311.587	383.543
8	339.520	394.487
9	366.370	407.868
10	391.926	423.582
11	415.984	441.504
12	438.356	461.491
13	458.863	483.387
14	477.345	507.019
15	493.654	532.198
16	507.663	558.727
17	514.919	576.040

Factor of Safety
*** 1.401 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	136.000	372.500
2	165.520	367.155
3	195.408	364.566
4	225.408	364.754
5	255.261	367.717
6	284.712	373.430
7	313.507	381.845
8	341.401	392.889
9	368.152	406.466
10	393.532	422.462
11	417.323	440.737
12	439.321	461.136
13	459.336	483.483
14	477.196	507.587
15	492.750	533.240

```
16          505.862       560.223
17          511.694       575.733
    Factor of Safety
***     1.405    ***
     **** END OF GSTABL7 OUTPUT ****
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Euland - Section 13-13', -Static

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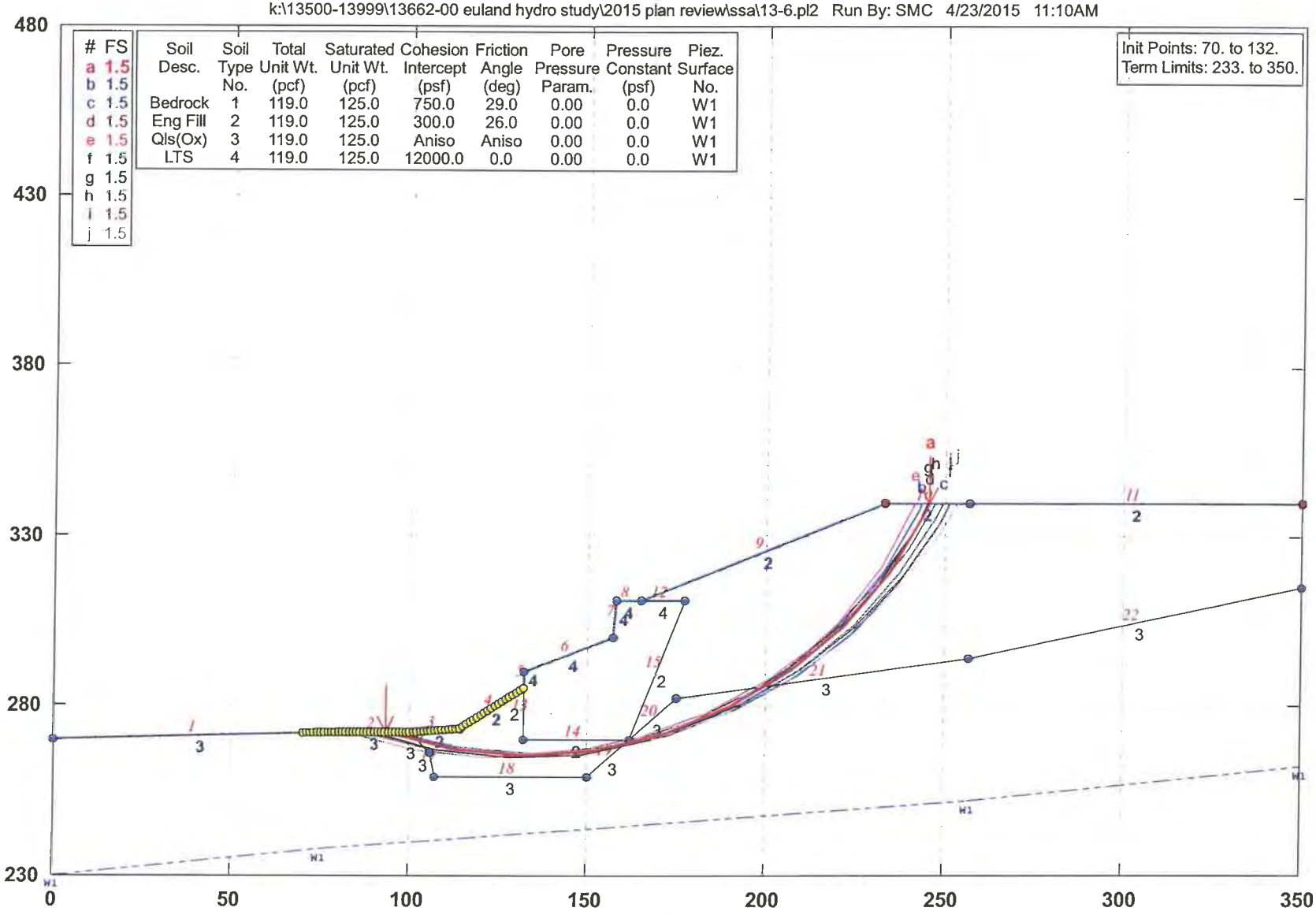

GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Modified Bishop Method

Figure E-44.1

Euland - Section 13-13', -Static

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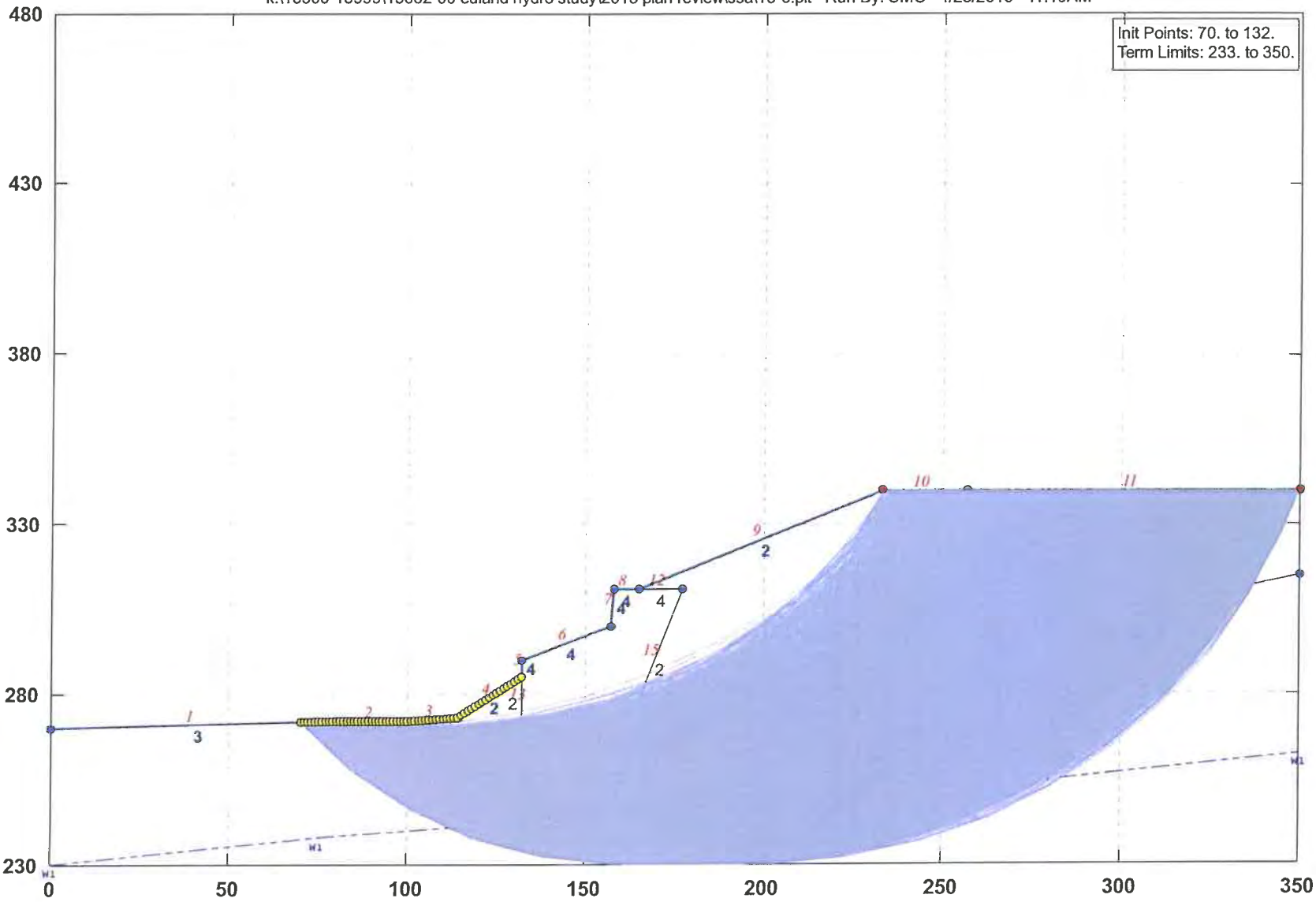

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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: 4/23/2015
Time of Run: 11:10AM
Run By: SMC
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Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-6.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-6.PLT
PROBLEM DESCRIPTION: Euland - Section 13-13',
-Static

BOUNDARY COORDINATES
11 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	270.00	80.00	272.00	3
2	80.00	272.00	100.00	272.00	3
3	100.00	272.00	114.00	273.00	2
4	114.00	273.00	132.00	285.00	2
5	132.00	285.00	132.10	290.00	4
6	132.10	290.00	157.00	300.00	4
7	157.00	300.00	158.00	311.00	4
8	158.00	311.00	165.00	311.00	4
9	165.00	311.00	233.00	340.00	2
10	233.00	340.00	257.00	340.00	2
11	257.00	340.00	350.00	340.00	2
12	165.00	311.00	177.00	311.00	4
13	132.00	285.00	132.10	270.00	2
14	132.10	270.00	162.00	270.00	2
15	162.00	270.00	177.00	311.00	2
16	100.00	272.00	106.00	266.00	3
17	106.00	266.00	107.00	259.00	3
18	107.00	259.00	150.00	259.00	3
19	150.00	259.00	162.00	270.00	3
20	162.00	270.00	175.00	282.00	3
21	175.00	282.00	257.00	294.00	3
22	257.00	294.00	350.00	315.00	3

User Specified Y-Origin = 230.00(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.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range	Counterclockwise Direction Limit	Cohesion Intercept	Friction Angle

No.	(deg)	(psf)	(deg)
1	-3.0	350.00	23.00
2	3.0	300.00	15.00
3	90.0	350.00	23.00

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	230.00
2	75.00	238.00
3	257.00	252.00
4	350.00	262.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
12600 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 63 Points Equally Spaced Along The Ground Surface Between X = 70.00(ft)
and X = 132.00(ft)
Each Surface Terminates Between X = 233.00(ft)
and X = 350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 230.00(ft)
20.00(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 = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.000	272.000
2	112.379	267.056
3	132.305	265.335
4	152.245	266.883
5	171.667	271.658
6	190.051	279.533
7	206.907	290.297
8	221.785	303.663
9	234.287	319.274
10	244.079	336.713
11	245.271	340.000

Circle Center At X = 132.837 ; Y = 387.707 ; and Radius = 122.373
Factor of Safety
*** 1.471 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.000	272.000
2	112.339	266.901
3	132.259	265.110
4	152.197	266.679

5	171.592	271.563
6	189.895	279.624
7	206.592	290.634
8	221.210	304.284
9	233.337	320.188
10	242.631	337.897
11	243.317	340.000

Circle Center At X = 132.921 ; Y = 384.183 ; and Radius = 119.074

Factor of Safety

*** 1.472 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	272.000
2	114.457	267.372
3	134.399	265.854
4	154.333	267.483
5	173.764	272.220
6	192.211	279.947
7	209.217	290.472
8	224.362	303.535
9	237.269	318.813
10	247.620	335.926
11	249.277	340.000

Circle Center At X = 134.045 ; Y = 392.932 ; and Radius = 127.079

Factor of Safety

*** 1.473 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.000	272.000
2	105.379	267.056
3	125.287	265.138
4	145.254	266.291
5	164.809	270.487
6	183.491	277.627
7	200.859	287.544
8	216.504	300.003
9	230.058	314.710
10	241.199	331.319
11	245.256	340.000

Circle Center At X = 127.788 ; Y = 395.355 ; and Radius = 130.241

Factor of Safety

*** 1.474 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.000	272.000
2	112.298	266.747
3	132.211	264.889
4	152.148	266.482
5	171.514	271.479
6	189.732	279.730
7	206.261	290.990
8	220.609	304.924
9	232.347	321.117
10	241.127	339.087
11	241.392	340.000

Circle Center At X = 132.981 ; Y = 380.799 ; and Radius = 115.912

Factor of Safety

*** 1.474 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	272.000
2	114.494	267.532
3	134.442	266.089
4	154.377	267.704
5	173.832	272.341
6	192.353	279.890

7	209.505	290.175
8	224.889	302.956
9	238.144	317.933
10	248.959	334.756
11	251.290	340.000

Circle Center At X = 133.877 ; Y = 396.856 ; and Radius = 130.768

Factor of Safety

*** 1.475 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.000	272.000
2	108.276	266.668
3	128.160	264.515
4	148.130	265.600
5	167.664	269.892
6	186.250	277.281
7	203.399	287.571
8	218.664	300.494
9	231.643	315.710
10	241.997	332.821
11	244.882	340.000

Circle Center At X = 131.469 ; Y = 388.013 ; and Radius = 123.542

Factor of Safety

*** 1.479 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.000	272.000
2	101.318	266.821
3	121.189	264.557
4	141.177	265.259
5	160.841	268.910
6	179.748	275.431
7	197.482	284.678
8	213.652	296.447
9	227.903	310.480
10	239.921	326.466
11	247.246	340.000

Circle Center At X = 126.468 ; Y = 399.243 ; and Radius = 134.789

Factor of Safety

*** 1.482 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.000	272.000
2	113.398	267.132
3	133.318	265.337
4	153.274	266.661
5	172.782	271.069
6	191.368	278.456
7	208.580	288.642
8	224.000	301.379
9	237.253	316.357
10	248.017	333.214
11	250.985	340.000

Circle Center At X = 134.833 ; Y = 393.626 ; and Radius = 128.297

Factor of Safety

*** 1.482 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.000	272.000
2	111.437	267.289
3	131.359	265.517
4	151.322	266.722
5	170.886	270.877
6	189.616	277.891
7	207.097	287.608
8	222.941	299.813

```
    9         236.798       314.234
   10         248.360       330.554
   11         253.127       340.000
Circle Center At X =   133.271 ; Y =   399.839 ; and Radius =   134.335
      Factor of Safety
     ***     1.484    ***
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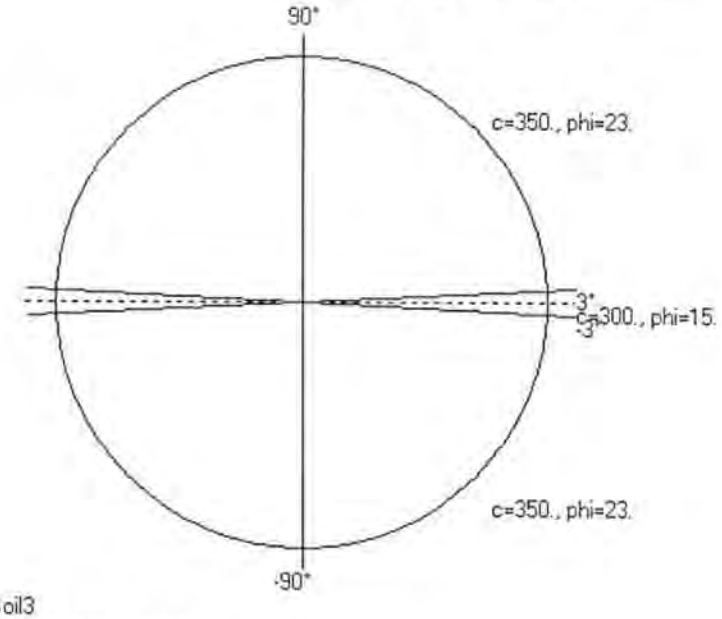
Anisotropic Soil Definition



Soil3

Euland - Section 13-13',

Euland - Section 13-13', -Seismic

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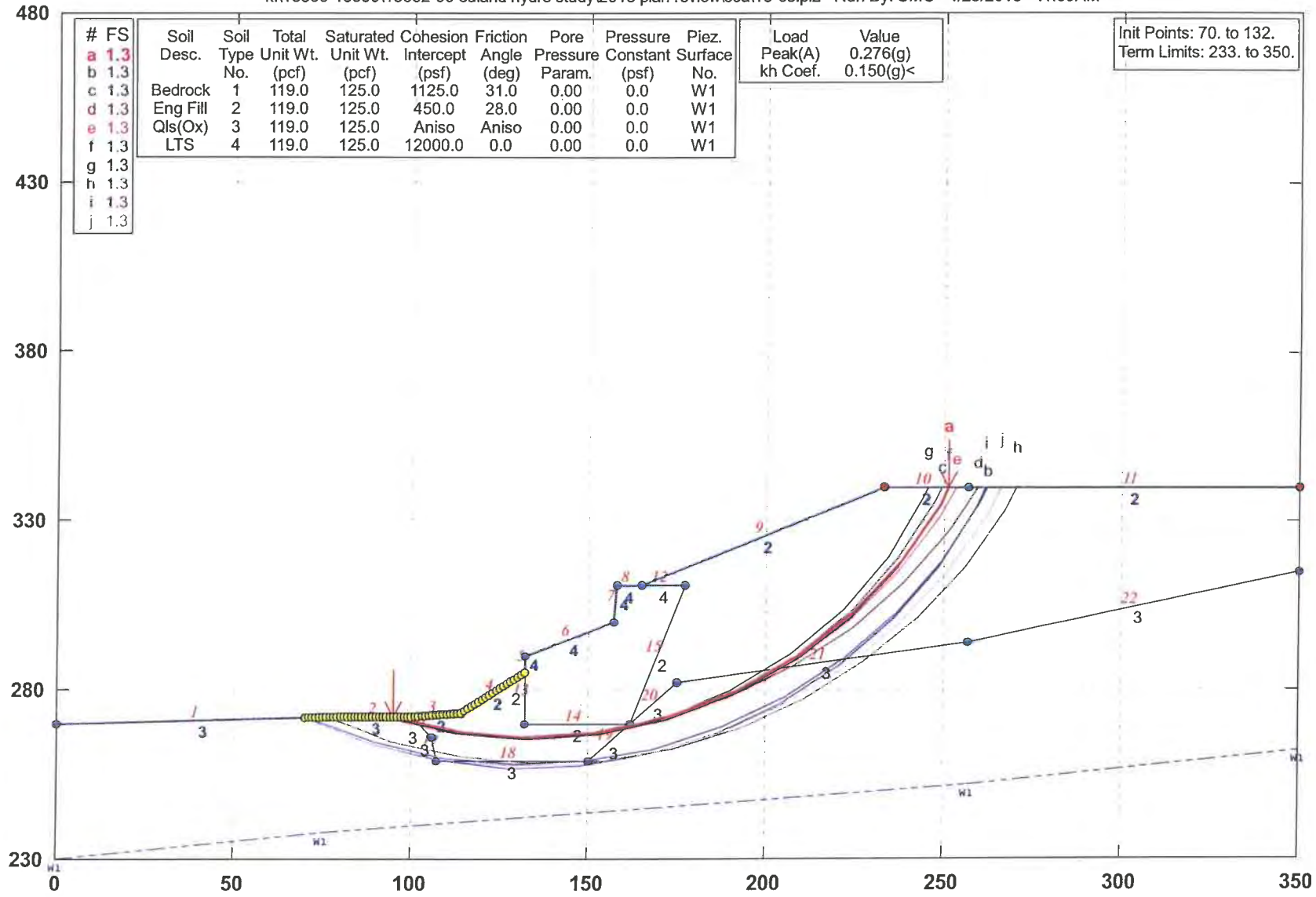

GSTABL7 v.2 FSmin=1.3

Safety Factors Are Calculated By The Modified Bishop Method

Figure E-44.2

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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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.

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Analysis Run Date: 4/23/2015
Time of Run: 11:09AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-6s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-6s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-6s.PLT
PROBLEM DESCRIPTION: Euland - Section 13-13',
-Seismic

BOUNDARY COORDINATES
11 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	270.00	80.00	272.00	3
2	80.00	272.00	100.00	272.00	3
3	100.00	272.00	114.00	273.00	2
4	114.00	273.00	132.00	285.00	2
5	132.00	285.00	132.10	290.00	4
6	132.10	290.00	157.00	300.00	4
7	157.00	300.00	158.00	311.00	4
8	158.00	311.00	165.00	311.00	4
9	165.00	311.00	233.00	340.00	2
10	233.00	340.00	257.00	340.00	2
11	257.00	340.00	350.00	340.00	2
12	165.00	311.00	177.00	311.00	4
13	132.00	285.00	132.10	270.00	2
14	132.10	270.00	162.00	270.00	2
15	162.00	270.00	177.00	311.00	2
16	100.00	272.00	106.00	266.00	3
17	106.00	266.00	107.00	259.00	3
18	107.00	259.00	150.00	259.00	3
19	150.00	259.00	162.00	270.00	3
20	162.00	270.00	175.00	282.00	3
21	175.00	282.00	257.00	294.00	3
22	257.00	294.00	350.00	315.00	3

User Specified Y-Origin = 230.00(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.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range	Counterclockwise Direction Limit	Cohesion Intercept	Friction Angle

No.	(deg)	(psf)	(deg)
1	-3.0	525.00	25.00
2	3.0	450.00	17.00
3	90.0	525.00	25.00

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	230.00
2	75.00	238.00
3	257.00	252.00
4	350.00	262.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
12600 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 63 Points Equally Spaced Along The Ground Surface Between X = 70.00(ft)
and X = 132.00(ft)
Each Surface Terminates Between X = 233.00(ft)
and X = 350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 230.00(ft)
20.00(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 = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	272.000
2	114.494	267.532
3	134.442	266.089
4	154.377	267.704
5	173.832	272.341
6	192.353	279.890
7	209.505	290.175
8	224.889	302.956
9	238.144	317.933
10	248.959	334.756
11	251.290	340.000

Circle Center At X = 133.877 ; Y = 396.856 ; and Radius = 130.768
Factor of Safety
*** 1.292 ***
Individual data on the 24 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	5.0	340.9	0.0	0.0	0.	0.	51.1	0.0	0.0
2	1.5	242.3	0.0	0.0	0.	0.	36.3	0.0	0.0
3	12.5	5172.9	0.0	0.0	0.	0.	775.9	0.0	0.0

4	0.5	328.1	0.0	0.0	0.	0.	49.2	0.0	0.0
5	17.5	25552.6	0.0	0.0	0.	0.	3832.9	0.0	0.0
6	0.1	252.8	0.0	0.0	0.	0.	37.9	0.0	0.0
7	2.3	6772.5	0.0	0.0	0.	0.	1015.9	0.0	0.0
8	19.9	66534.2	0.0	0.0	0.	0.	9980.1	0.0	0.0
9	2.6	9818.8	0.0	0.0	0.	0.	1472.8	0.0	0.0
10	1.0	4409.1	0.0	0.0	0.	0.	661.4	0.0	0.0
11	3.3	16478.2	0.0	0.0	0.	0.	2471.7	0.0	0.0
12	0.7	3492.7	0.0	0.0	0.	0.	523.9	0.0	0.0
13	3.0	14680.4	0.0	0.0	0.	0.	2202.1	0.0	0.0
14	8.8	43717.0	0.0	0.0	0.	0.	6557.6	0.0	0.0
15	1.2	5897.9	0.0	0.0	0.	0.	884.7	0.0	0.0
16	2.0	10107.1	0.0	0.0	0.	0.	1516.1	0.0	0.0
17	15.4	77883.7	0.0	0.0	0.	0.	11682.6	0.0	0.0
18	10.3	51125.9	0.0	0.0	0.	0.	7668.9	0.0	0.0
19	6.9	33153.8	0.0	0.0	0.	0.	4973.1	0.0	0.0
20	15.4	67175.6	0.0	0.0	0.	0.	10076.3	0.0	0.0
21	8.1	29663.1	0.0	0.0	0.	0.	4449.5	0.0	0.0
22	5.1	15285.8	0.0	0.0	0.	0.	2292.9	0.0	0.0
23	10.8	17575.7	0.0	0.0	0.	0.	2636.3	0.0	0.0
24	2.3	727.3	0.0	0.0	0.	0.	109.1	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.000	271.775
2	89.604	264.435
3	109.050	259.760
4	128.958	257.842
5	148.939	258.718
6	168.603	262.370
7	187.565	268.729
8	205.456	277.668
9	221.926	289.015
10	236.653	302.547
11	249.350	317.999
12	259.769	335.071
13	261.900	340.000

Circle Center At X = 132.697 ; Y = 400.906 ; and Radius = 143.113

Factor of Safety
*** 1.293 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	272.000
2	114.457	267.372
3	134.399	265.854
4	154.333	267.483
5	173.764	272.220
6	192.211	279.947
7	209.217	290.472
8	224.362	303.535
9	237.269	318.813
10	247.620	335.926
11	249.277	340.000

Circle Center At X = 134.045 ; Y = 392.932 ; and Radius = 127.079

Factor of Safety
*** 1.294 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.000	272.000
2	111.548	267.771
3	131.489	266.243
4	151.453	267.444
5	171.068	271.351
6	189.968	277.892
7	207.802	286.945
8	224.237	298.342
9	238.968	311.870
10	251.721	327.277

11	259.606	340.000

Circle Center At X = 132.692 ; Y = 412.815 ; and Radius = 146.576

Factor of Safety

*** 1.295 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.000	272.000
2	111.437	267.289
3	131.359	265.517
4	151.322	266.722
5	170.886	270.877
6	189.616	277.891
7	207.097	287.608
8	222.941	299.813
9	236.798	314.234
10	248.360	330.554
11	253.127	340.000

Circle Center At X = 133.271 ; Y = 399.839 ; and Radius = 134.335

Factor of Safety

*** 1.296 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.000	272.000
2	113.398	267.132
3	133.318	265.337
4	153.274	266.661
5	172.782	271.069
6	191.368	278.456
7	208.580	288.642
8	224.000	301.379
9	237.253	316.357
10	248.017	333.214
11	250.985	340.000

Circle Center At X = 134.833 ; Y = 393.626 ; and Radius = 128.297

Factor of Safety

*** 1.299 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.000	272.000
2	112.379	267.056
3	132.305	265.335
4	152.245	266.883
5	171.667	271.658
6	190.051	279.533
7	206.907	290.297
8	221.785	303.663
9	234.287	319.274
10	244.079	336.713
11	245.271	340.000

Circle Center At X = 132.837 ; Y = 387.707 ; and Radius = 122.373

Factor of Safety

*** 1.300 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.000	271.900
2	94.682	264.759
3	114.154	260.195
4	134.063	258.291
5	154.048	259.080
6	173.744	262.550
7	192.796	268.636
8	210.856	277.228
9	227.597	288.171
10	242.715	301.265
11	255.935	316.273
12	267.017	332.922

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   13        270.457      340.000
Circle Center At X =   138.209 ; Y =   406.647 ; and Radius =   148.414
       Factor of Safety
      ***    1.301   ***
Failure Surface Specified By 13 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         70.000      271.750
    2         88.470      264.079
    3        107.839      259.095
    4        127.719      256.900
    5        147.708      257.538
    6        167.407      260.995
    7        186.420      267.201
    8        204.364      276.034
    9        220.879      287.314
   10        235.634      300.816
   11        248.332      316.268
   12        258.718      333.360
   13        261.558      340.000
Circle Center At X =   133.228 ; Y =   397.912 ; and Radius =   141.119
       Factor of Safety
      ***    1.301   ***
Failure Surface Specified By 13 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         70.000      271.750
    2         88.577      264.341
    3        107.985      259.510
    4        127.867      257.346
    5        147.860      257.889
    6        167.596      261.129
    7        186.713      267.005
    8        204.861      275.412
    9        221.706      286.193
   10        236.940      299.152
   11        250.282      314.051
   12        261.490      330.616
   13        266.130      340.000
Circle Center At X =   133.865 ; Y =   404.887 ; and Radius =   147.662
       Factor of Safety
      ***    1.301   ***
         **** END OF GSTABL7 OUTPUT ****
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Euland - Section 13-13', -Static

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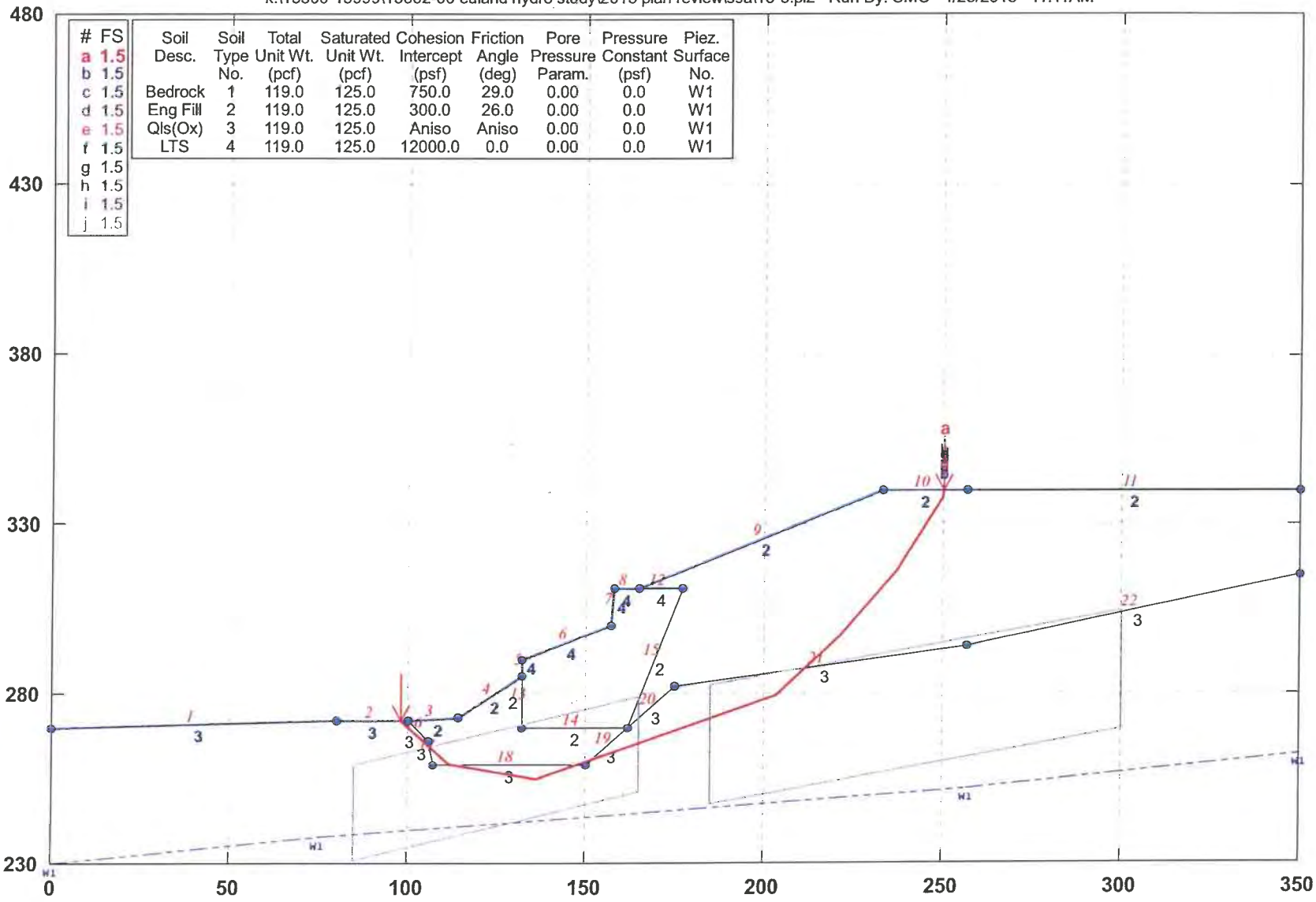


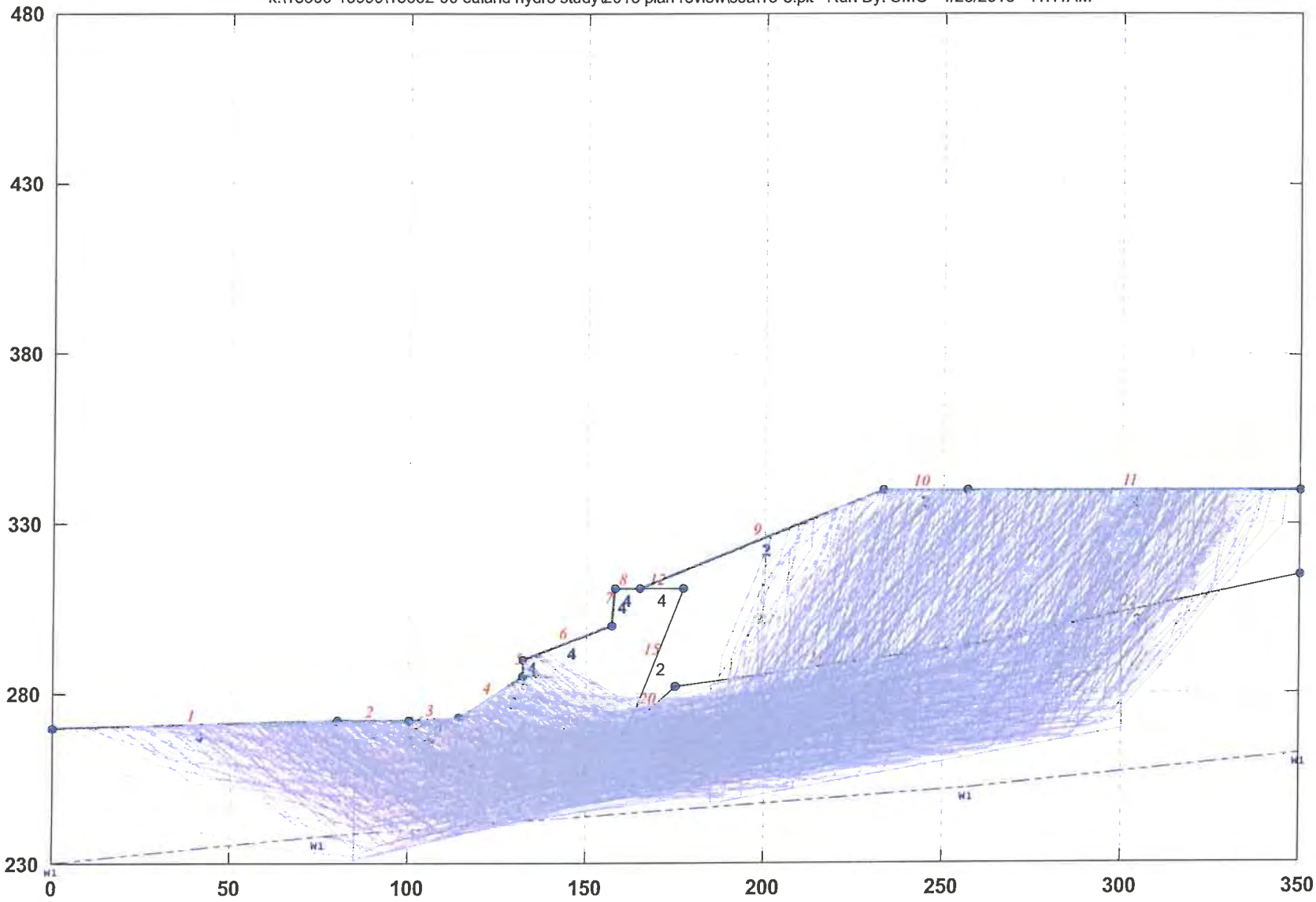
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-45.1

Euland - Section 13-13', -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\13-3.plt Run By: SMC 4/23/2015 11:11AM



*** GSTABL7 ***
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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.

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Analysis Run Date: 4/23/2015
Time of Run: 11:11AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-3.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-3.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-3.PLT
PROBLEM DESCRIPTION: Euland - Section 13-13',
-Static

BOUNDARY COORDINATES
11 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	270.00	80.00	272.00	3
2	80.00	272.00	100.00	272.00	3
3	100.00	272.00	114.00	273.00	2
4	114.00	273.00	132.00	285.00	2
5	132.00	285.00	132.10	290.00	4
6	132.10	290.00	157.00	300.00	4
7	157.00	300.00	158.00	311.00	4
8	158.00	311.00	165.00	311.00	4
9	165.00	311.00	233.00	340.00	2
10	233.00	340.00	257.00	340.00	2
11	257.00	340.00	350.00	340.00	2
12	165.00	311.00	177.00	311.00	4
13	132.00	285.00	132.10	270.00	2
14	132.10	270.00	162.00	270.00	2
15	162.00	270.00	177.00	311.00	2
16	100.00	272.00	106.00	266.00	3
17	106.00	266.00	107.00	259.00	3
18	107.00	259.00	150.00	259.00	3
19	150.00	259.00	162.00	270.00	3
20	162.00	270.00	175.00	282.00	3
21	175.00	282.00	257.00	294.00	3
22	257.00	294.00	350.00	315.00	3

User Specified Y-Origin = 230.00(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.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range	Counterclockwise Direction Limit	Cohesion Intercept	Friction Angle

No.	(deg)	(psf)	(deg)
1	-3.0	350.00	23.00
2	3.0	300.00	15.00
3	90.0	350.00	23.00

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	230.00
2	75.00	238.00
3	257.00	252.00
4	350.00	262.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
5000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	85.00	245.00	165.00	265.00	28.00
2	185.00	265.00	300.00	287.00	35.00

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 = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 8.535 FS Min = 1.450 FS Ave = 2.542
Standard Deviation = 1.012 Coefficient of Variation = 39.80 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.992	272.000
2	111.440	259.210
3	136.069	254.922
4	203.551	279.262
5	221.221	296.948
6	237.013	316.328
7	250.025	337.675
8	250.227	340.000

Factor of Safety
*** 1.450 ***

Individual data on the 24 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	2.0	228.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	6.0	3554.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.3	260.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	5.2	6748.1	0.0	0.0	0.	0.	0.0	0.0	0.0
5	1.2	1970.7	0.0	0.0	0.	0.	0.0	0.0	0.0
6	1.4	2270.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	18.0	46701.8	0.0	0.0	0.	0.	0.0	0.0	0.0
8	0.1	379.4	0.0	0.0	0.	0.	0.0	0.0	0.0
9	4.0	16782.5	0.0	0.0	0.	0.	0.0	0.0	0.0
10	11.3	49652.1	0.0	0.0	0.	0.	0.0	0.0	0.0

11	4.3	19166.0	0.0	0.0	0.	0.	0.0	0.0	0.0
12	5.3	23589.7	0.0	0.0	0.	0.	0.0	0.0	0.0
13	1.0	5098.9	0.0	0.0	0.	0.	0.0	0.0	0.0
14	4.0	22584.5	0.0	0.0	0.	0.	0.0	0.0	0.0
15	3.0	16487.7	0.0	0.0	0.	0.	0.0	0.0	0.0
16	10.0	54706.6	0.0	0.0	0.	0.	0.0	0.0	0.0
17	2.0	11035.2	0.0	0.0	0.	0.	0.0	0.0	0.0
18	26.6	149467.3	0.0	0.0	0.	0.	0.0	0.0	0.0
19	8.1	44163.1	0.0	0.0	0.	0.	0.0	0.0	0.0
20	9.6	46472.7	0.0	0.0	0.	0.	0.0	0.0	0.0
21	11.8	46694.0	0.0	0.0	0.	0.	0.0	0.0	0.0
22	4.0	12481.5	0.0	0.0	0.	0.	0.0	0.0	0.0
23	13.0	20126.6	0.0	0.0	0.	0.	0.0	0.0	0.0
24	0.2	27.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.992	272.000
2	111.440	259.210
3	136.069	254.922
4	203.551	279.262
5	221.221	296.948
6	237.013	316.328
7	250.025	337.675
8	250.227	340.000

Factor of Safety
*** 1.450 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.992	272.000
2	111.440	259.210
3	136.069	254.922
4	203.551	279.262
5	221.221	296.948
6	237.013	316.328
7	250.025	337.675
8	250.227	340.000

Factor of Safety
*** 1.450 ***

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Factor of Safety
*** 1.450 ***

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Point No.	X-Surf (ft)	Y-Surf (ft)
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3	136.069	254.922
4	203.551	279.262
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7	250.025	337.675
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Factor of Safety
*** 1.450 ***

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3	136.069	254.922
4	203.551	279.262
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Factor of Safety
*** 1.450 ***

Failure Surface Specified By 8 Coordinate Points

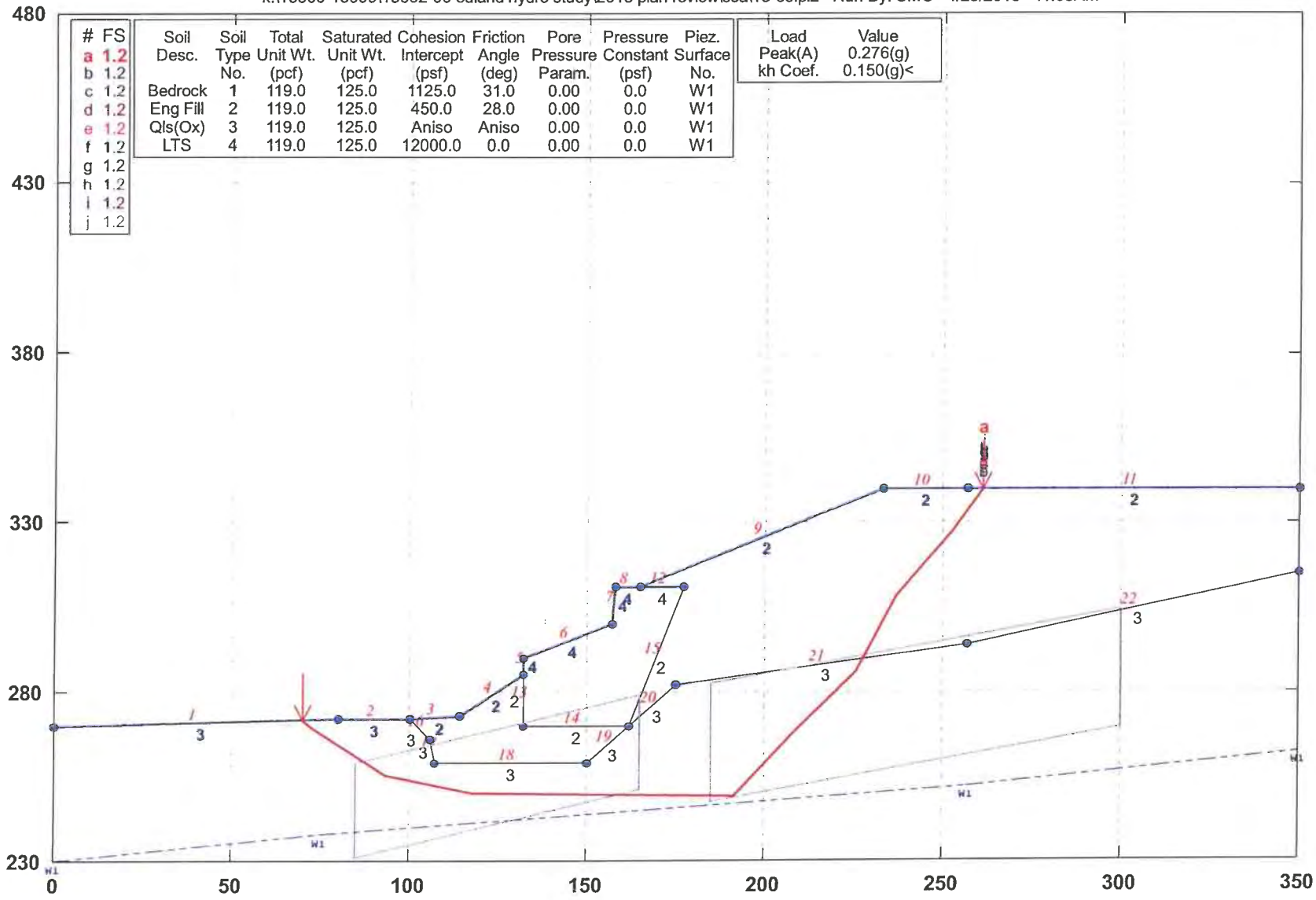
Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.992	272.000
2	111.440	259.210
3	136.069	254.922
4	203.551	279.262
5	221.221	296.948
6	237.013	316.328
7	250.025	337.675
8	250.227	340.000

Factor of Safety
*** 1.450 ***

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

Euland - Section 13-13', -seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\13-3s.pl2 Run By: SMC 4/23/2015 11:08AM



#	FS
a	1.2
b	1.2
c	1.2
d	1.2
e	1.2
f	1.2
g	1.2
h	1.2
i	1.2
j	1.2

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Bedrock	1	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Eng Fill	2	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls(Ox)	3	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
LTS	4	119.0	125.0	12000.0	0.0	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.2

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-45.2

Euland - Section 13-13', -seismic

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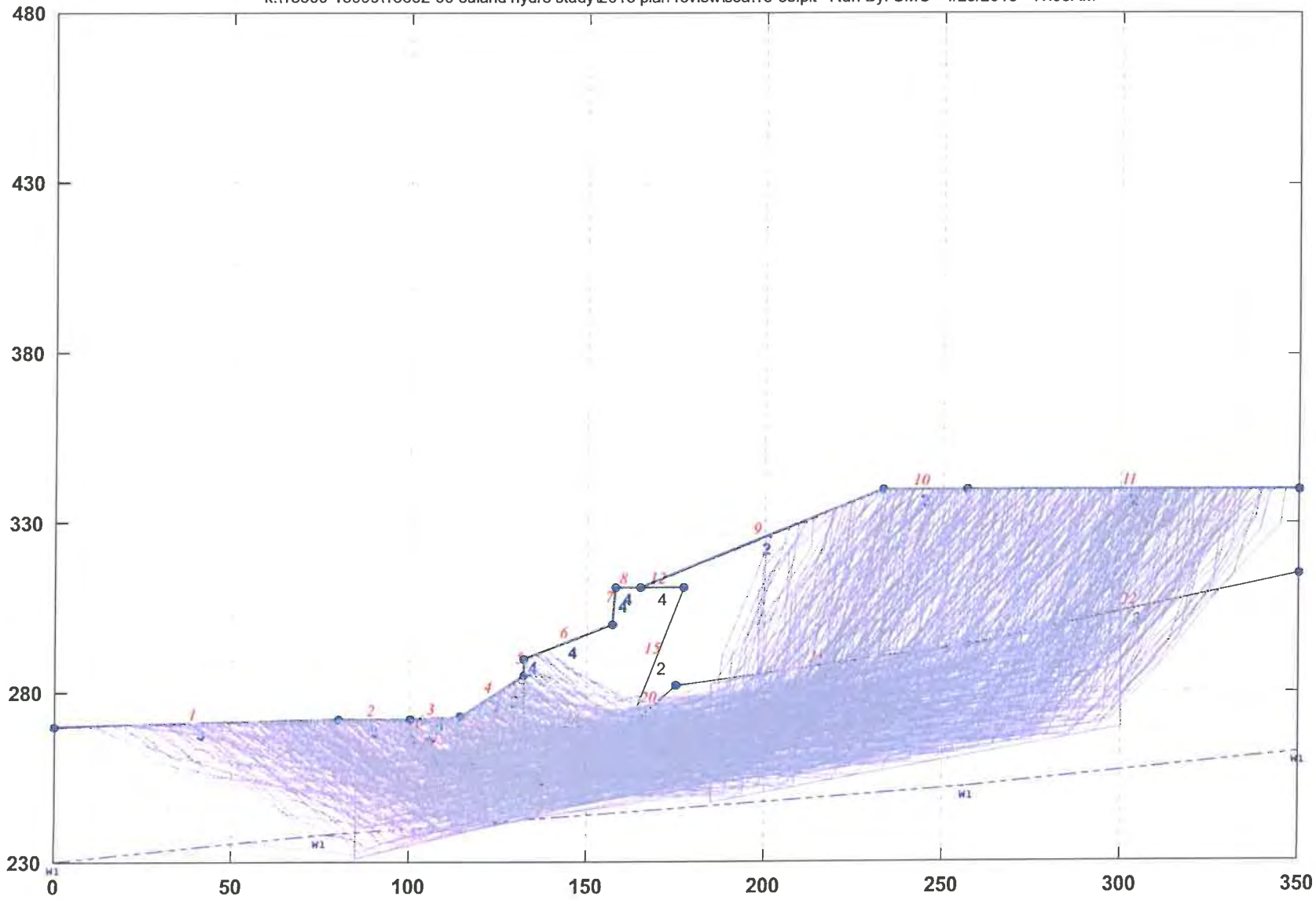

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price 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: 4/23/2015
Time of Run: 11:08AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-3s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-3s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\13-3s.PLT
PROBLEM DESCRIPTION: Euland - Section 13-13',
-seismic

BOUNDARY COORDINATES
11 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	270.00	80.00	272.00	3
2	80.00	272.00	100.00	272.00	3
3	100.00	272.00	114.00	273.00	2
4	114.00	273.00	132.00	285.00	2
5	132.00	285.00	132.10	290.00	4
6	132.10	290.00	157.00	300.00	4
7	157.00	300.00	158.00	311.00	4
8	158.00	311.00	165.00	311.00	4
9	165.00	311.00	233.00	340.00	2
10	233.00	340.00	257.00	340.00	2
11	257.00	340.00	350.00	340.00	2
12	165.00	311.00	177.00	311.00	4
13	132.00	285.00	132.10	270.00	2
14	132.10	270.00	162.00	270.00	2
15	162.00	270.00	177.00	311.00	2
16	100.00	272.00	106.00	266.00	3
17	106.00	266.00	107.00	259.00	3
18	107.00	259.00	150.00	259.00	3
19	150.00	259.00	162.00	270.00	3
20	162.00	270.00	175.00	282.00	3
21	175.00	282.00	257.00	294.00	3
22	257.00	294.00	350.00	315.00	3

User Specified Y-Origin = 230.00(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.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	12000.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range	Counterclockwise Direction Limit	Cohesion Intercept	Friction Angle

No.	(deg)	(psf)	(deg)
1	-3.0	525.00	25.00
2	3.0	450.00	17.00
3	90.0	525.00	25.00

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	230.00
2	75.00	238.00
3	257.00	252.00
4	350.00	262.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
5000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	85.00	245.00	165.00	265.00	28.00
2	185.00	265.00	300.00	287.00	35.00

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 = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 6.938 FS Min = 1.246 FS Ave = 1.929
Standard Deviation = 0.684 Coefficient of Variation = 35.46 %
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.997	271.750
2	72.549	269.298
3	93.242	255.270
4	117.729	250.234
5	191.787	249.335
6	208.245	268.153
7	225.891	285.863
8	237.186	308.166
9	252.869	327.635
10	261.272	340.000

Factor of Safety
*** 1.246 ***

Individual data on the 26 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Ver (lbs)	Surcharge Load (lbs)
1	2.6	382.0	0.0	0.0	0.	0.	57.3	0.0	0.0
2	7.5	4552.8	0.0	0.0	0.	0.	682.9	0.0	0.0
3	13.2	19290.3	0.0	0.0	0.	0.	2893.5	0.0	0.0
4	6.8	14013.6	0.0	0.0	0.	0.	2102.0	0.0	0.0

5	6.0	13531.1	0.0	0.0	0.	0.	2029.7	0.0	0.0
6	1.0	2370.6	0.0	0.0	0.	0.	355.6	0.0	0.0
7	7.0	17517.2	0.0	0.0	0.	0.	2627.6	0.0	0.0
8	3.7	10485.2	0.0	0.0	0.	0.	1572.8	0.0	0.0
9	14.3	51107.8	0.0	0.0	0.	0.	7666.2	0.0	0.0
10	0.1	445.6	0.0	0.0	0.	0.	66.8	0.0	0.0
11	17.9	92964.6	0.0	0.0	0.	0.	13944.7	0.0	0.0
12	7.0	40645.9	0.0	0.0	0.	0.	6096.9	0.0	0.0
13	1.0	6634.1	0.0	0.0	0.	0.	995.1	0.0	0.0
14	4.0	29168.9	0.0	0.0	0.	0.	4375.3	0.0	0.0
15	3.0	21891.8	0.0	0.0	0.	0.	3283.8	0.0	0.0
16	10.0	75604.3	0.0	0.0	0.	0.	11340.6	0.0	0.0
17	2.0	15747.2	0.0	0.0	0.	0.	2362.1	0.0	0.0
18	14.8	122908.8	0.0	0.0	0.	0.	18436.3	0.0	0.0
19	16.5	131589.3	0.0	0.0	0.	0.	19738.4	0.0	0.0
20	17.6	118007.5	0.0	0.0	0.	0.	17701.1	0.0	0.0
21	2.0	11570.0	0.0	0.0	0.	0.	1735.5	0.0	0.0
22	5.1	27007.6	0.0	0.0	0.	0.	4051.1	0.0	0.0
23	4.2	17914.7	0.0	0.0	0.	0.	2687.2	0.0	0.0
24	15.7	41245.4	0.0	0.0	0.	0.	6186.8	0.0	0.0
25	4.1	4584.5	0.0	0.0	0.	0.	687.7	0.0	0.0
26	4.3	1598.0	0.0	0.0	0.	0.	239.7	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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2	72.549	269.298
3	93.242	255.270
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Factor of Safety
*** 1.246 ***

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Factor of Safety
*** 1.246 ***

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Factor of Safety
*** 1.246 ***

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*** 1.246 ***

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Factor of Safety
*** 1.246 ***

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Factor of Safety
*** 1.246 ***

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3	93.242	255.270
4	117.729	250.234
5	191.787	249.335
6	208.245	268.153
7	225.891	285.863
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10	261.272	340.000

Factor of Safety
*** 1.246 ***

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1	69.997	271.750
2	72.549	269.298
3	93.242	255.270
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Factor of Safety
*** 1.246 ***

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5	191.787	249.335
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8	237.186	308.166
9	252.869	327.635
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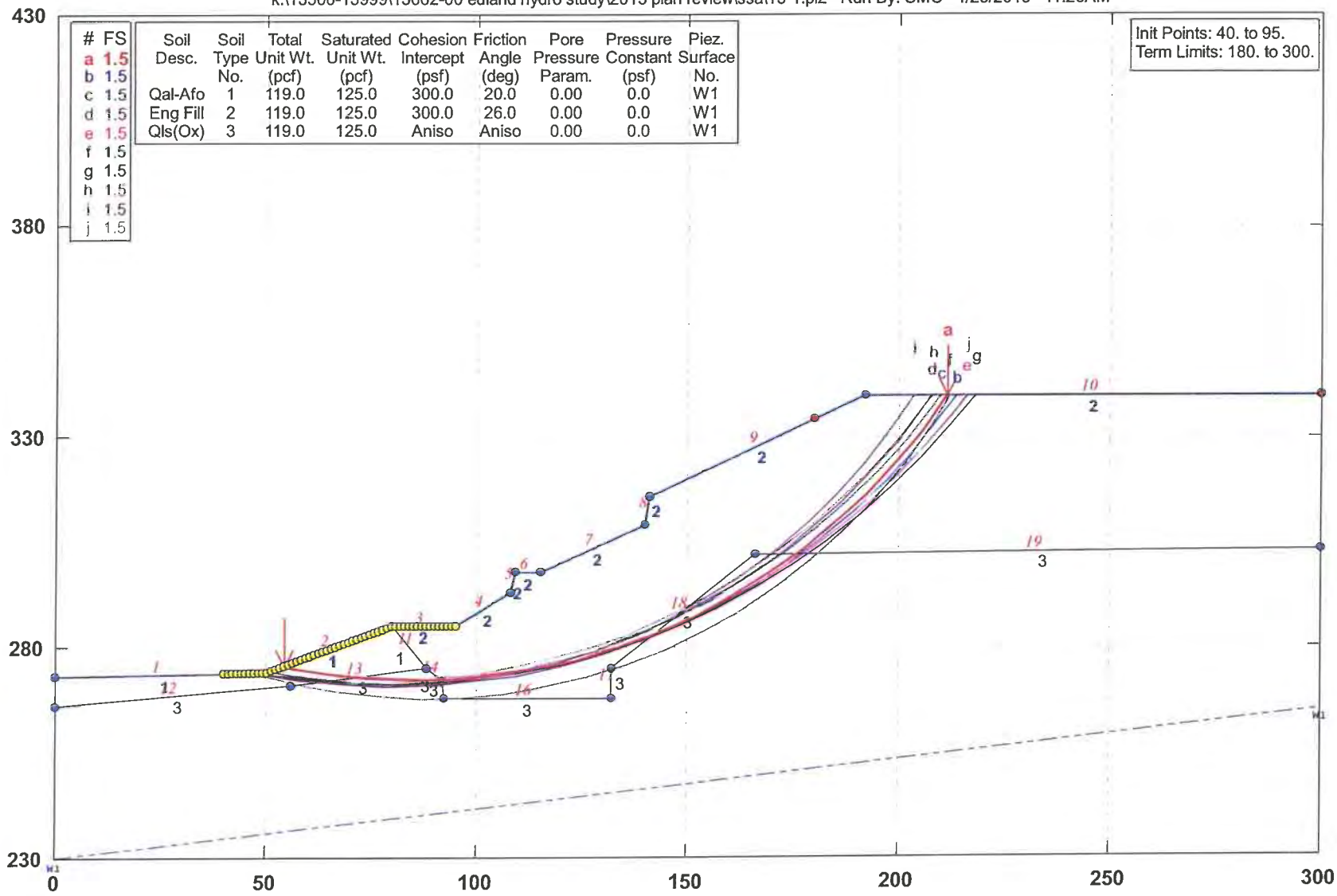
Factor of Safety
*** 1.246 ***

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

Euland - Section 15-15', , -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-1.pl2 Run By: SMC 4/23/2015 11:26AM



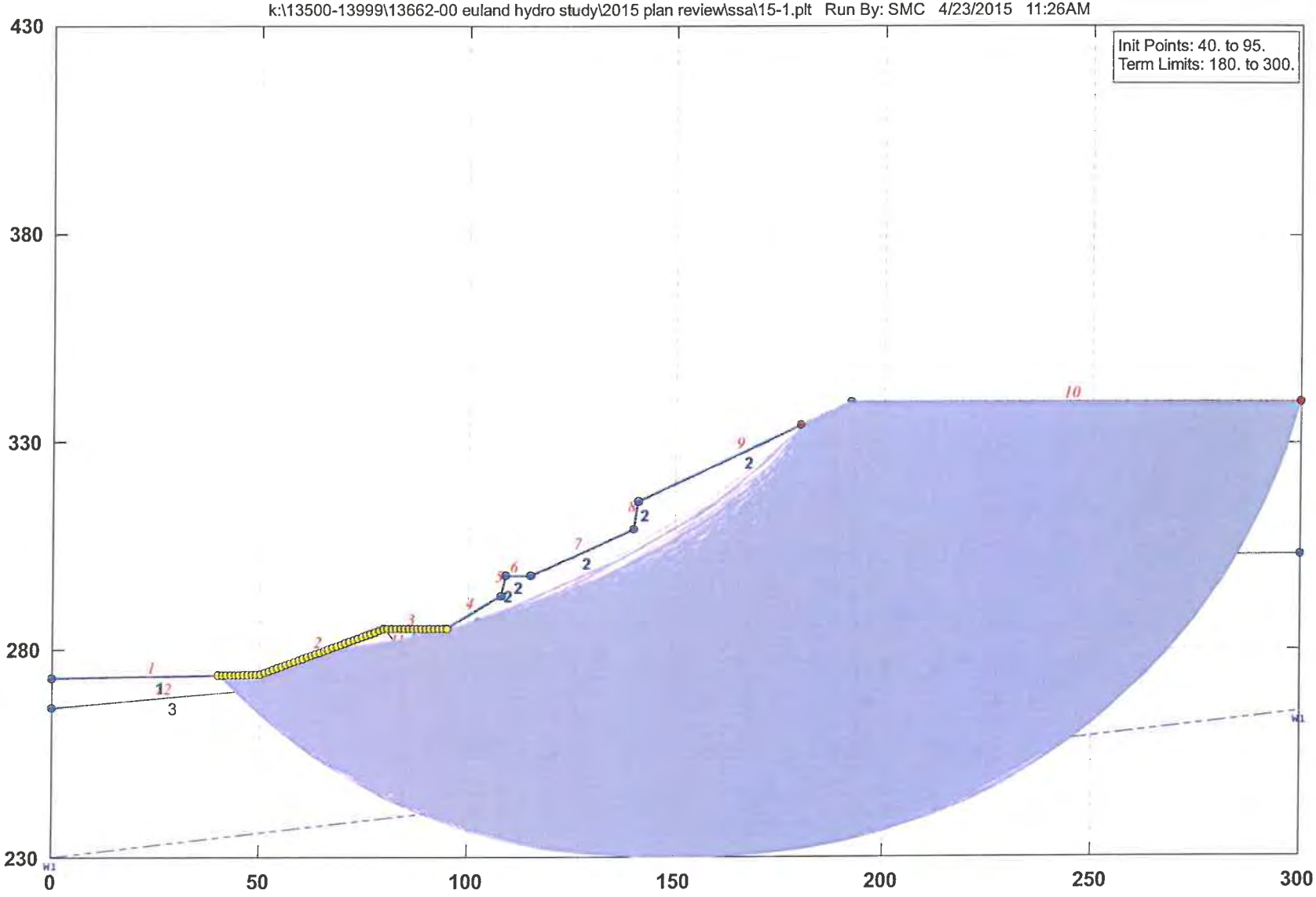
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Modified Bishop Method

Figure E-46.1

Euland - Section 15-15', , -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-1.plt Run By: SMC 4/23/2015 11:26AM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 11:26AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1.PLT
PROBLEM DESCRIPTION: Euland - Section 15-15',
, -Static

BOUNDARY COORDINATES
10 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	273.00	50.00	274.00	1
2	50.00	274.00	80.00	285.00	1
3	80.00	285.00	95.00	285.00	2
4	95.00	285.00	108.00	293.00	2
5	108.00	293.00	109.00	298.00	2
6	109.00	298.00	115.00	298.00	2
7	115.00	298.00	140.00	309.00	2
8	140.00	309.00	141.00	316.00	2
9	141.00	316.00	192.00	340.00	2
10	192.00	340.00	300.00	340.00	2
11	80.00	285.00	88.00	275.00	1
12	0.00	266.00	56.00	271.00	3
13	56.00	271.00	88.00	275.00	3
14	88.00	275.00	92.00	272.00	3
15	92.00	272.00	92.10	268.00	3
16	92.10	268.00	132.00	268.00	3
17	132.00	268.00	132.10	275.00	3
18	132.10	275.00	166.00	302.00	3
19	166.00	302.00	300.00	303.00	3

User Specified Y-Origin = 230.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	300.0	20.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	300.00	15.00

```
    3              90.0             350.00         23.00
 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  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1         0.00       230.00
     2       300.00       265.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
11000 Trial Surfaces Have Been Generated.
  200 Surface(s) Initiate(s) From Each Of    55 Points Equally Spaced
 Along The Ground Surface Between  X =  40.00(ft)
                                and  X =  95.00(ft)
 Each Surface Terminates Between   X = 180.00(ft)
                                and   X = 300.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =    230.00(ft)
 10.00(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 =     0
       Number of Trial Surfaces With Valid FS =     0
       Statistical Data On All Valid FS Values:
          FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
          Standard Deviation =    0.000   Coefficient of Variation =  NaN     %
       Failure Surface Specified By 20 Coordinate Points
         Point      X-Surf      Y-Surf
          No.         (ft)        (ft)
           1         54.259      275.562
           2         64.101      273.792
           3         74.039      272.679
           4         84.029      272.229
           5         94.027      272.443
           6        103.988      273.320
           7        113.870      274.857
           8        123.627      277.046
           9        133.218      279.878
          10        142.599      283.341
          11        151.730      287.419
          12        160.569      292.094
          13        169.079      297.346
          14        177.222      303.151
          15        184.961      309.484
          16        192.263      316.317
          17        199.094      323.619
          18        205.426      331.359
          19        211.230      339.502
          20        211.538      340.000
       Circle Center At X =    85.814 ; Y =   422.702 ; and Radius =   150.485
            Factor of Safety
           ***    1.491   ***
          Individual data on the     0  slices
                    Water  Water     Tie     Tie     Earthquake
                    Force  Force    Force   Force       Force   Surcharge
Slice  Width  Weight  Top    Bot     Norm    Tan     Hor     Ver     Load
 No.    (ft)   (lbs)  (lbs)  (lbs)   (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
       Failure Surface Specified By 20 Coordinate Points
         Point      X-Surf      Y-Surf
          No.         (ft)        (ft)
```

1	50.185	274.068
2	60.041	272.377
3	69.984	271.307
4	79.974	270.860
5	89.972	271.038
6	99.940	271.842
7	109.838	273.267
8	119.627	275.308
9	129.270	277.958
10	138.728	281.205
11	147.964	285.038
12	156.943	289.441
13	165.629	294.396
14	173.988	299.885
15	181.987	305.886
16	189.596	312.375
17	196.783	319.328
18	203.522	326.716
19	209.786	334.511
20	213.658	340.000

Circle Center At X = 82.136 ; Y = 430.471 ; and Radius = 159.634

Factor of Safety

*** 1.491 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.167	273.983
2	59.050	272.463
3	69.010	271.562
4	79.006	271.284
5	89.000	271.631
6	98.953	272.601
7	108.826	274.190
8	118.580	276.392
9	128.178	279.199
10	137.582	282.599
11	146.756	286.580
12	155.663	291.125
13	164.269	296.218
14	172.541	301.837
15	180.446	307.962
16	187.953	314.569
17	195.033	321.630
18	201.659	329.121
19	207.804	337.010
20	209.847	340.000

Circle Center At X = 78.474 ; Y = 431.203 ; and Radius = 159.928

Factor of Safety

*** 1.492 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.148	273.963
2	58.018	272.355
3	67.970	271.381
4	77.965	271.045
5	87.960	271.348
6	97.916	272.290
7	107.791	273.866
8	117.545	276.071
9	127.138	278.894
10	136.531	282.324
11	145.686	286.348
12	154.565	290.949
13	163.131	296.108
14	171.350	301.804
15	179.189	308.014
16	186.614	314.712
17	193.596	321.870
18	200.107	329.461

19	206.118	337.452
20	207.792	340.000

Circle Center At X = 78.238 ; Y = 427.208 ; and Radius = 156.171

Factor of Safety

*** 1.496 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	54.259	275.562
2	64.136	273.997
3	74.091	273.045
4	84.085	272.710
5	94.081	272.991
6	104.041	273.890
7	113.926	275.401
8	123.699	277.520
9	133.322	280.238
10	142.760	283.545
11	151.975	287.429
12	160.933	291.873
13	169.599	296.863
14	177.941	302.377
15	185.927	308.396
16	193.526	314.897
17	200.709	321.854
18	207.449	329.241
19	213.720	337.031
20	215.822	340.000

Circle Center At X = 84.541 ; Y = 434.397 ; and Radius = 161.696

Factor of Safety

*** 1.499 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.130	273.943
2	56.784	271.335
3	66.598	269.416
4	76.523	268.197
5	86.510	267.682
6	96.508	267.875
7	106.468	268.775
8	116.339	270.377
9	126.071	272.672
10	135.618	275.651
11	144.929	279.297
12	153.960	283.592
13	162.664	288.516
14	170.998	294.042
15	178.920	300.144
16	186.391	306.791
17	193.374	313.950
18	199.832	321.585
19	205.734	329.657
20	211.051	338.127
21	212.050	340.000

Circle Center At X = 88.783 ; Y = 408.976 ; and Radius = 141.312

Factor of Safety

*** 1.499 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.185	274.068
2	60.073	272.575
3	70.031	271.661
4	80.026	271.327
5	90.023	271.576
6	99.988	272.406
7	109.888	273.814
8	119.690	275.796
9	129.360	278.346

10	138.865	281.453
11	148.173	285.108
12	157.252	289.299
13	166.072	294.011
14	174.604	299.228
15	182.817	304.933
16	190.684	311.106
17	198.178	317.727
18	205.275	324.772
19	211.950	332.219
20	218.147	340.000

Circle Center At X = 80.756 ; Y = 443.097 ; and Radius = 171.772

Factor of Safety

*** 1.500 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.148	273.963
2	58.052	272.576
3	68.021	271.801
4	78.020	271.638
5	88.010	272.090
6	97.953	273.155
7	107.812	274.828
8	117.550	277.103
9	127.130	279.971
10	136.515	283.423
11	145.671	287.444
12	154.563	292.020
13	163.157	297.133
14	171.420	302.764
15	179.323	308.892
16	186.834	315.494
17	193.926	322.544
18	200.572	330.016
19	206.746	337.883
20	208.207	340.000

Circle Center At X = 75.682 ; Y = 434.219 ; and Radius = 162.604

Factor of Safety

*** 1.500 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.148	273.963
2	57.988	272.182
3	67.927	271.077
4	77.918	270.653
5	87.915	270.913
6	97.870	271.854
7	107.738	273.472
8	117.473	275.761
9	127.029	278.709
10	136.361	282.302
11	145.426	286.524
12	154.181	291.355
13	162.587	296.773
14	170.602	302.752
15	178.191	309.264
16	185.318	316.279
17	191.949	323.764
18	198.054	331.685
19	203.600	340.000

Circle Center At X = 79.123 ; Y = 417.035 ; and Radius = 146.386

Factor of Safety

*** 1.501 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.204	274.441
2	61.132	273.246

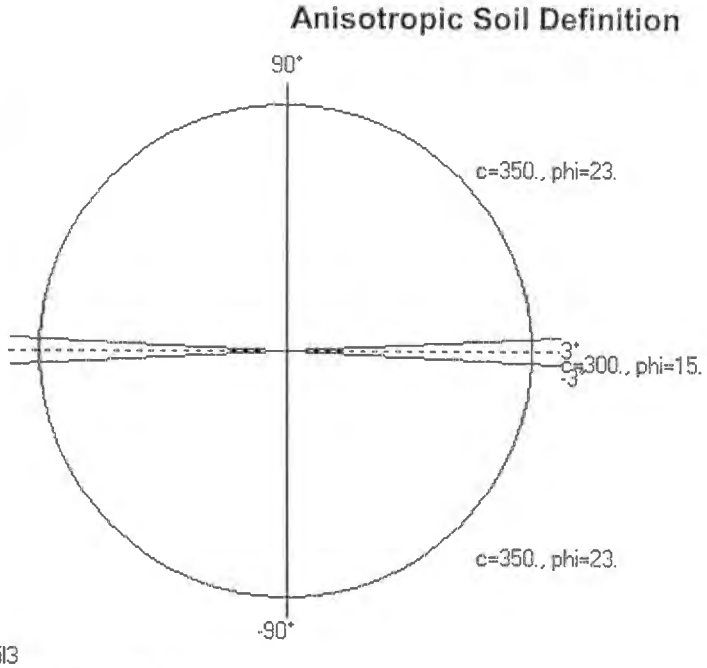
3	71.112	272.612
4	81.112	272.541
5	91.099	273.034
6	101.044	274.090
7	110.912	275.704
8	120.675	277.873
9	130.299	280.588
10	139.755	283.841
11	149.012	287.622
12	158.042	291.919
13	166.815	296.718
14	175.304	302.004
15	183.481	307.761
16	191.321	313.969
17	198.798	320.609
18	205.889	327.660
19	212.571	335.099
20	216.498	340.000

Circle Center At X = 77.387 ; Y = 449.583 ; and Radius = 177.088

Factor of Safety

*** 1.501 ***

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



Soil3

Euland - Section 15-15',

Euland - Section 15-15', , -Seismic

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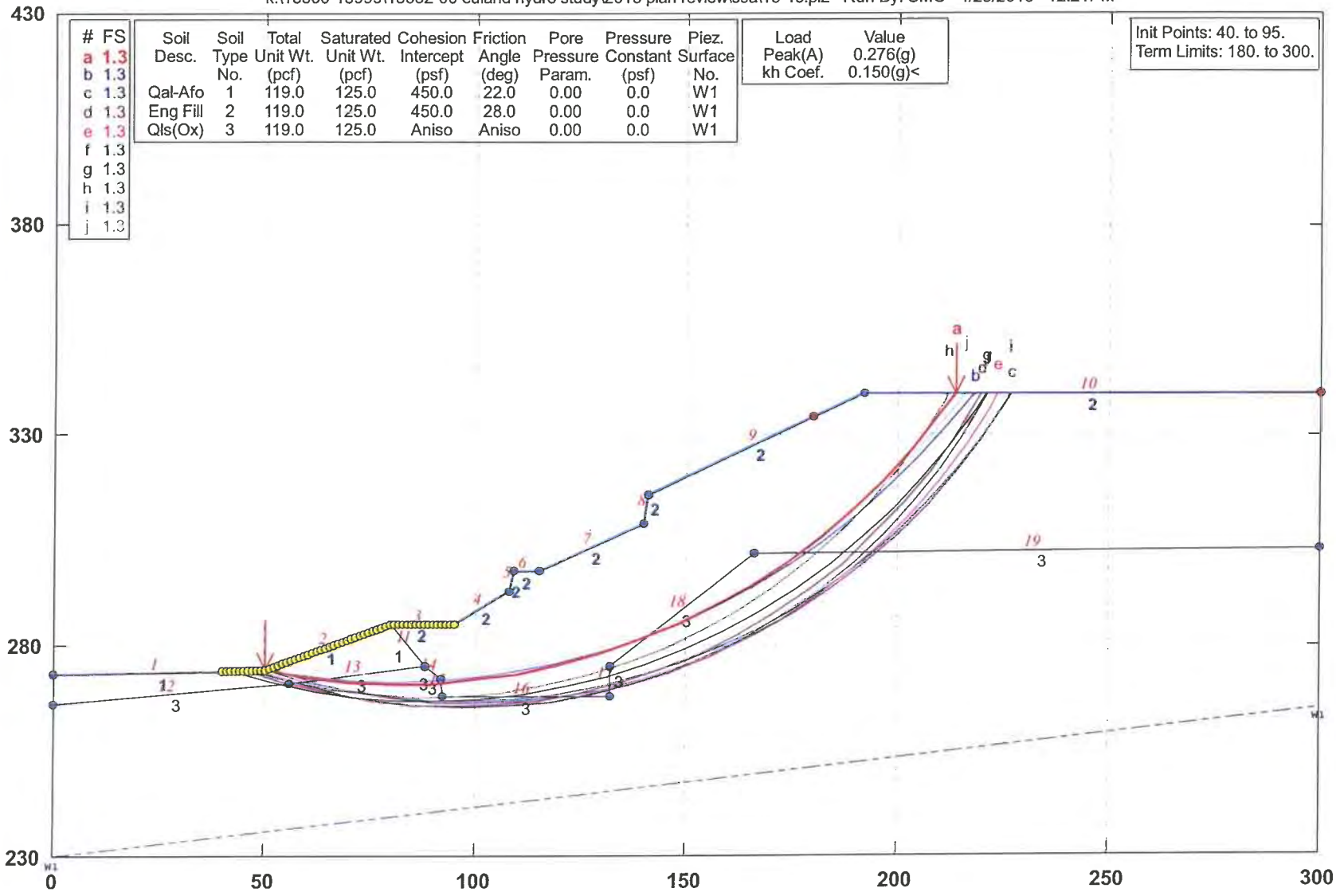

GSTABL7 v.2 FSmin=1.3

Safety Factors Are Calculated By The Modified Bishop Method

Figure E-46.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 12:21PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1s.PLT
PROBLEM DESCRIPTION: Euland - Section 15-15',
, -Seismic

BOUNDARY COORDINATES
10 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	273.00	50.00	274.00	1
2	50.00	274.00	80.00	285.00	1
3	80.00	285.00	95.00	285.00	2
4	95.00	285.00	108.00	293.00	2
5	108.00	293.00	109.00	298.00	2
6	109.00	298.00	115.00	298.00	2
7	115.00	298.00	140.00	309.00	2
8	140.00	309.00	141.00	316.00	2
9	141.00	316.00	192.00	340.00	2
10	192.00	340.00	300.00	340.00	2
11	80.00	285.00	88.00	275.00	1
12	0.00	266.00	56.00	271.00	3
13	56.00	271.00	88.00	275.00	3
14	88.00	275.00	92.00	272.00	3
15	92.00	272.00	92.10	268.00	3
16	92.10	268.00	132.00	268.00	3
17	132.00	268.00	132.10	275.00	3
18	132.10	275.00	166.00	302.00	3
19	166.00	302.00	300.00	303.00	3

User Specified Y-Origin = 230.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	450.0	22.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	450.00	17.00

```
    3             90.0             525.00         25.00
 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  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1         0.00       230.00
     2       300.00       265.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.276(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
11000 Trial Surfaces Have Been Generated.
  200 Surface(s) Initiate(s) From Each Of    55 Points Equally Spaced
 Along The Ground Surface Between  X =  40.00(ft)
                                and  X =  95.00(ft)
 Each Surface Terminates Between   X = 180.00(ft)
                                and   X = 300.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =    230.00(ft)
 10.00(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 =     0
       Number of Trial Surfaces With Valid FS =    0
       Statistical Data On All Valid FS Values:
          FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
          Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
       Failure Surface Specified By 20 Coordinate Points
         Point      X-Surf      Y-Surf
          No.         (ft)        (ft)
           1         50.185      274.068
           2         60.041      272.377
           3         69.984      271.307
           4         79.974      270.860
           5         89.972      271.038
           6         99.940      271.842
           7        109.838      273.267
           8        119.627      275.308
           9        129.270      277.958
          10        138.728      281.205
          11        147.964      285.038
          12        156.943      289.441
          13        165.629      294.396
          14        173.988      299.885
          15        181.987      305.886
          16        189.596      312.375
          17        196.783      319.328
          18        203.522      326.716
          19        209.786      334.511
          20        213.658      340.000
       Circle Center At X =    82.136 ; Y =   430.471 ; and Radius =   159.634
             Factor of Safety
            ***    1.304   ***
          Individual data on the     0  slices
                    Water  Water     Tie     Tie     Earthquake
                    Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight   Top    Bot     Norm    Tan     Hor     Ver    Load
```

No. (ft) (lbs) (lbs) (lbs) (lbs) (lbs) (lbs) (lbs) (lbs)

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.185	274.068
2	60.073	272.575
3	70.031	271.661
4	80.026	271.327
5	90.023	271.576
6	99.988	272.406
7	109.888	273.814
8	119.690	275.796
9	129.360	278.346
10	138.865	281.453
11	148.173	285.108
12	157.252	289.299
13	166.072	294.011
14	174.604	299.228
15	182.817	304.933
16	190.684	311.106
17	198.178	317.727
18	205.275	324.772
19	211.950	332.219
20	218.147	340.000

Circle Center At X = 80.756 ; Y = 443.097 ; and Radius = 171.772

Factor of Safety

*** 1.304 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.185	274.068
2	59.800	271.320
3	69.575	269.208
4	79.467	267.743
5	89.434	266.930
6	99.432	266.773
7	109.420	267.272
8	119.353	268.426
9	129.189	270.229
10	138.886	272.673
11	148.401	275.749
12	157.694	279.442
13	166.725	283.737
14	175.454	288.616
15	183.844	294.057
16	191.860	300.036
17	199.465	306.529
18	206.628	313.507
19	213.318	320.940
20	219.505	328.796
21	225.164	337.041
22	226.921	340.000

Circle Center At X = 96.830 ; Y = 418.877 ; and Radius = 152.136

Factor of Safety

*** 1.307 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.111	273.922
2	55.629	270.856
3	65.339	268.465
4	75.193	266.761
5	85.142	265.753
6	95.137	265.446
7	105.130	265.842
8	115.069	266.937
9	124.908	268.728
10	134.596	271.205
11	144.087	274.355
12	153.333	278.164

13	162.289	282.612
14	170.911	287.678
15	179.156	293.337
16	186.984	299.561
17	194.355	306.318
18	201.234	313.576
19	207.586	321.299
20	213.381	329.449
21	218.590	337.985
22	219.632	340.000

Circle Center At X = 94.509 ; Y = 407.702 ; and Radius = 142.266

Factor of Safety

*** 1.308 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.148	273.963
2	57.654	270.859
3	67.353	268.422
4	77.197	266.665
5	87.140	265.596
6	97.133	265.220
7	107.128	265.539
8	117.076	266.551
9	126.931	268.252
10	136.643	270.633
11	146.166	273.684
12	155.455	277.388
13	164.464	281.728
14	173.150	286.684
15	181.470	292.231
16	189.385	298.343
17	196.857	304.989
18	203.848	312.138
19	210.327	319.756
20	216.260	327.806
21	221.621	336.248
22	223.652	340.000

Circle Center At X = 97.542 ; Y = 408.924 ; and Radius = 143.716

Factor of Safety

*** 1.309 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.167	273.983
2	58.649	270.807
3	68.335	268.320
4	78.174	266.536
5	88.117	265.465
6	98.110	265.111
7	108.104	265.477
8	118.045	266.561
9	127.882	268.357
10	137.565	270.855
11	147.043	274.044
12	156.267	277.906
13	165.190	282.421
14	173.765	287.566
15	181.947	293.315
16	189.695	299.637
17	196.968	306.500
18	203.729	313.868
19	209.943	321.703
20	215.577	329.965
21	220.602	338.611
22	221.281	340.000

Circle Center At X = 98.025 ; Y = 403.974 ; and Radius = 138.869

Factor of Safety

*** 1.309 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.037	273.841
2	51.669	271.153
3	61.454	269.088
4	71.350	267.656
5	81.319	266.861
6	91.318	266.708
7	101.306	267.196
8	111.242	268.324
9	121.085	270.088
10	130.795	272.479
11	140.331	275.488
12	149.655	279.103
13	158.728	283.309
14	167.512	288.088
15	175.971	293.421
16	184.071	299.286
17	191.778	305.658
18	199.060	312.511
19	205.887	319.818
20	212.232	327.548
21	218.067	335.668
22	220.776	340.000

Circle Center At X = 88.710 ; Y = 422.271 ; and Radius = 155.596

Factor of Safety

*** 1.310 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.130	273.943
2	56.784	271.335
3	66.598	269.416
4	76.523	268.197
5	86.510	267.682
6	96.508	267.875
7	106.468	268.775
8	116.339	270.377
9	126.071	272.672
10	135.618	275.651
11	144.929	279.297
12	153.960	283.592
13	162.664	288.516
14	170.998	294.042
15	178.920	300.144
16	186.391	306.791
17	193.374	313.950
18	199.832	321.585
19	205.734	329.657
20	211.051	338.127
21	212.050	340.000

Circle Center At X = 88.783 ; Y = 408.976 ; and Radius = 141.312

Factor of Safety

*** 1.310 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.204	274.441
2	60.753	271.474
3	70.483	269.165
4	80.348	267.525
5	90.301	266.562
6	100.297	266.281
7	110.289	266.683
8	120.230	267.765
9	130.075	269.524
10	139.776	271.950
11	149.289	275.032
12	158.569	278.757
13	167.574	283.106

14	176.261	288.060
15	184.590	293.594
16	192.521	299.685
17	200.019	306.302
18	207.047	313.415
19	213.574	320.992
20	219.568	328.996
21	225.002	337.391
22	226.448	340.000

Circle Center At X = 99.416 ; Y = 412.568 ; and Radius = 146.299

Factor of Safety

*** 1.310 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	54.259	275.562
2	64.136	273.997
3	74.091	273.045
4	84.085	272.710
5	94.081	272.991
6	104.041	273.890
7	113.926	275.401
8	123.699	277.520
9	133.322	280.238
10	142.760	283.545
11	151.975	287.429
12	160.933	291.873
13	169.599	296.863
14	177.941	302.377
15	185.927	308.396
16	193.526	314.897
17	200.709	321.854
18	207.449	329.241
19	213.720	337.031
20	215.822	340.000

Circle Center At X = 84.541 ; Y = 434.397 ; and Radius = 161.696

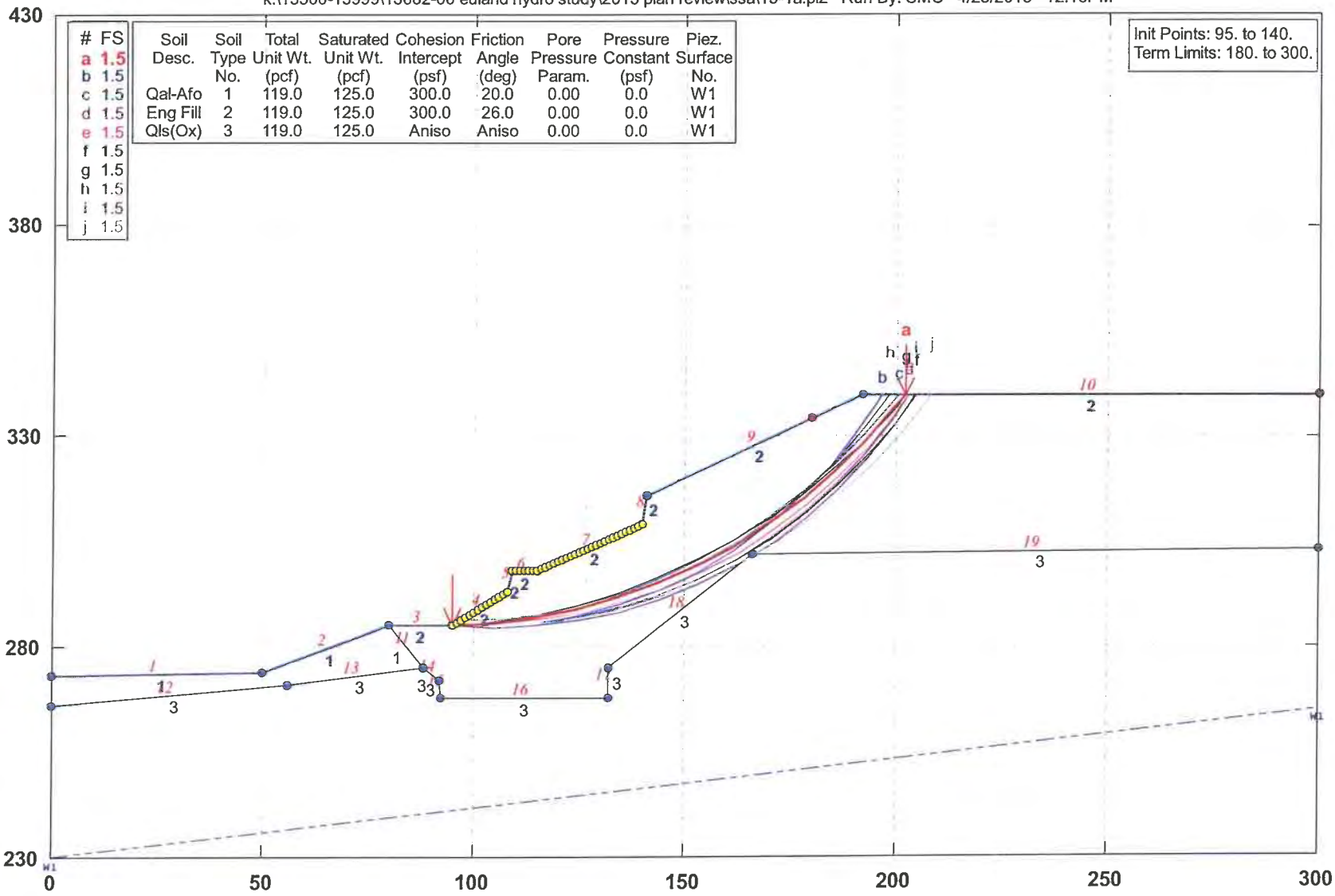
Factor of Safety

*** 1.310 ***

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

Euland - Section 15-15', , -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-1a.pl2 Run By: SMC 4/23/2015 12:16PM



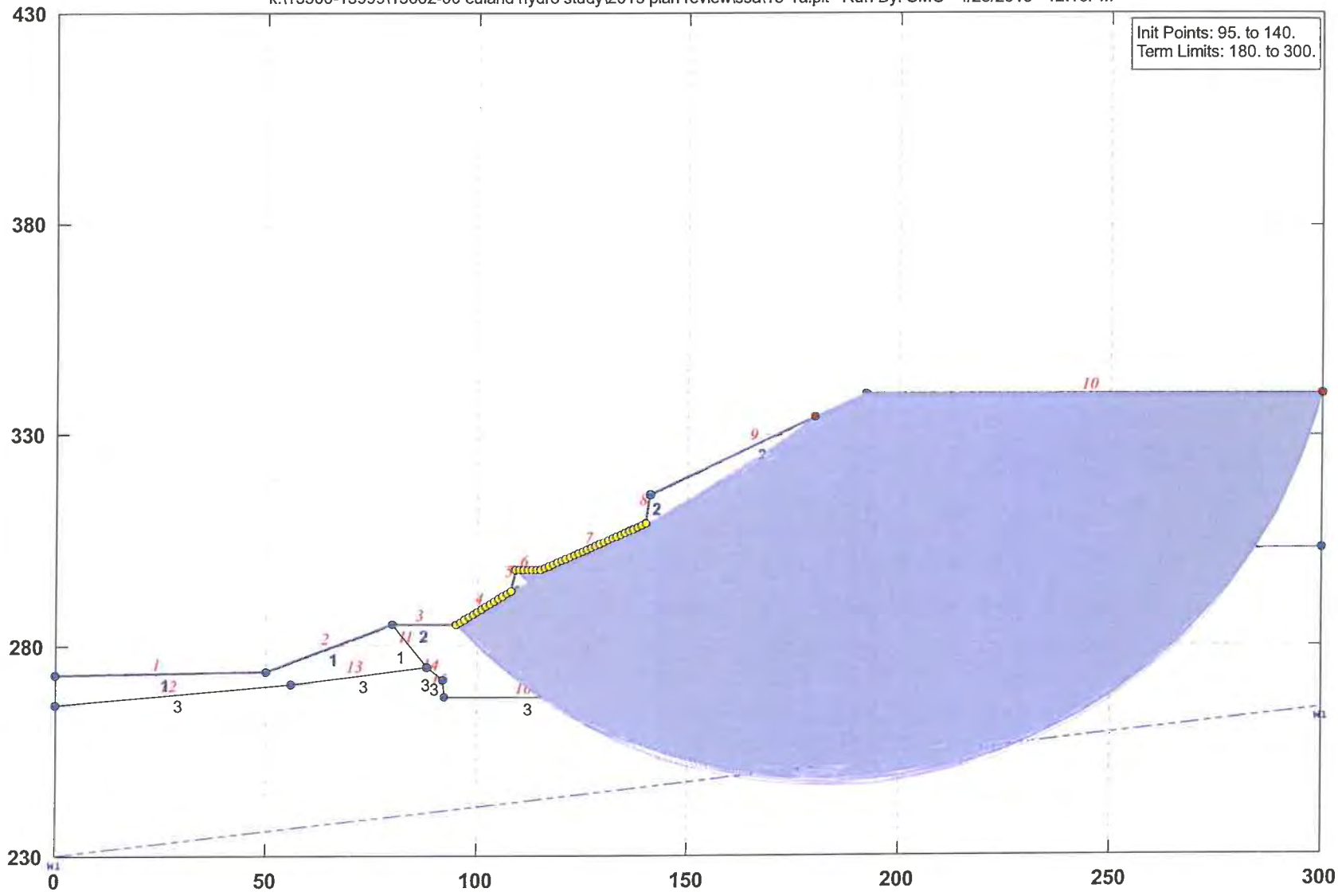
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Modified Bishop Method

Figure E-47.1

Euland - Section 15-15', , -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-1a.plt Run By: SMC 4/23/2015 12:16PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 12:16PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1a.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1a.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1a.PLT
PROBLEM DESCRIPTION: Euland - Section 15-15',
, -Static

BOUNDARY COORDINATES
10 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	273.00	50.00	274.00	1
2	50.00	274.00	80.00	285.00	1
3	80.00	285.00	95.00	285.00	2
4	95.00	285.00	108.00	293.00	2
5	108.00	293.00	109.00	298.00	2
6	109.00	298.00	115.00	298.00	2
7	115.00	298.00	140.00	309.00	2
8	140.00	309.00	141.00	316.00	2
9	141.00	316.00	192.00	340.00	2
10	192.00	340.00	300.00	340.00	2
11	80.00	285.00	88.00	275.00	1
12	0.00	266.00	56.00	271.00	3
13	56.00	271.00	88.00	275.00	3
14	88.00	275.00	92.00	272.00	3
15	92.00	272.00	92.10	268.00	3
16	92.10	268.00	132.00	268.00	3
17	132.00	268.00	132.10	275.00	3
18	132.10	275.00	166.00	302.00	3
19	166.00	302.00	300.00	303.00	3

User Specified Y-Origin = 230.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	300.0	20.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	300.00	15.00

```
    3              90.0             350.00         23.00
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  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00      230.00
    2        300.00      265.00
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
9200 Trial Surfaces Have Been Generated.
 200 Surface(s) Initiate(s) From Each Of    46 Points Equally Spaced
Along The Ground Surface Between  X =  95.00(ft)
                                 and  X = 140.00(ft)
Each Surface Terminates Between   X = 180.00(ft)
                                 and  X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =    230.00(ft)
10.00(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 =     0
      Number of Trial Surfaces With Valid FS =     0
      Statistical Data On All Valid FS Values:
         FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
         Standard Deviation =    0.000   Coefficient of Variation =  NaN     %
      Failure Surface Specified By 14 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1         95.000     285.000
          2        104.982     285.599
          3        114.895     286.919
          4        124.686     288.952
          5        134.304     291.688
          6        143.700     295.112
          7        152.823     299.207
          8        161.626     303.950
          9        170.064     309.318
         10        178.091     315.281
         11        185.666     321.810
         12        192.749     328.869
         13        199.302     336.422
         14        201.979     340.000
      Circle Center At X =    91.817 ; Y =   422.733 ; and Radius =   137.769
            Factor of Safety
          ***    1.472   ***
         Individual data on the     0  slices
                   Water  Water     Tie     Tie     Earthquake
                   Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot    Norm    Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)   (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
      Failure Surface Specified By 14 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1         95.000     285.000
          2        104.999     284.869
          3        114.969     285.648
          4        124.826     287.333
          5        134.489     289.908
          6        143.877     293.352
```

7	152.912	297.637
8	161.520	302.727
9	169.628	308.580
10	177.170	315.147
11	184.082	322.373
12	190.307	330.199
13	195.794	338.560
14	196.562	340.000

Circle Center At X = 101.485 ; Y = 394.295 ; and Radius = 109.488

Factor of Safety

*** 1.472 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.967	285.806
3	114.853	287.314
4	124.608	289.516
5	134.182	292.402
6	143.529	295.957
7	152.601	300.164
8	161.354	305.000
9	169.743	310.443
10	177.727	316.465
11	185.265	323.035
12	192.321	330.122
13	198.858	337.689
14	200.585	340.000

Circle Center At X = 88.686 ; Y = 425.969 ; and Radius = 141.110

Factor of Safety

*** 1.475 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.996	284.735
3	114.979	285.318
4	124.877	286.745
5	134.618	289.006
6	144.133	292.084
7	153.352	295.958
8	162.210	300.599
9	170.642	305.974
10	178.589	312.045
11	185.992	318.767
12	192.799	326.093
13	198.961	333.969
14	202.903	340.000

Circle Center At X = 103.175 ; Y = 402.308 ; and Radius = 117.592

Factor of Safety

*** 1.477 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.000	285.615
2	106.000	285.677
3	115.962	286.541
4	125.823	288.203
5	135.519	290.650
6	144.987	293.869
7	154.166	297.837
8	162.997	302.529
9	171.423	307.915
10	179.389	313.960
11	186.844	320.625
12	193.739	327.867
13	200.031	335.640
14	203.016	340.000

Circle Center At X = 100.315 ; Y = 409.606 ; and Radius = 124.066

Factor of Safety

*** 1.479 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.999	284.864
3	114.977	285.534
4	124.868	287.007
5	134.608	289.272
6	144.133	292.315
7	153.383	296.116
8	162.296	300.651
9	170.814	305.889
10	178.882	311.797
11	186.448	318.336
12	193.462	325.464
13	199.878	333.134
14	204.737	340.000

Circle Center At X = 101.724 ; Y = 408.560 ; and Radius = 123.743
Factor of Safety
*** 1.479 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.955	285.943
3	114.826	287.545
4	124.569	289.799
5	134.141	292.694
6	143.499	296.218
7	152.603	300.356
8	161.412	305.089
9	169.887	310.397
10	177.992	316.255
11	185.689	322.638
12	192.946	329.518
13	199.731	336.865
14	202.262	340.000

Circle Center At X = 85.906 ; Y = 434.827 ; and Radius = 150.103
Factor of Safety
*** 1.479 ***
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.000	286.231
2	106.995	286.562
3	116.927	287.719
4	126.730	289.695
5	136.336	292.475
6	145.678	296.042
7	154.693	300.370
8	163.319	305.429
9	171.496	311.185
10	179.169	317.598
11	186.284	324.625
12	192.793	332.217
13	198.419	340.000

Circle Center At X = 98.007 ; Y = 406.898 ; and Radius = 120.671
Factor of Safety
*** 1.481 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.989	284.541
3	114.981	284.941
4	124.902	286.197
5	134.679	288.299
6	144.239	291.232
7	153.512	294.975

8	162.430	299.499
9	170.927	304.772
10	178.940	310.755
11	186.411	317.402
12	193.283	324.666
13	199.507	332.493
14	204.489	340.000

Circle Center At X = 105.353 ; Y = 400.871 ; and Radius = 116.333

Factor of Safety

*** 1.482 ***

Failure Surface Specified By 15 Coordinate Points

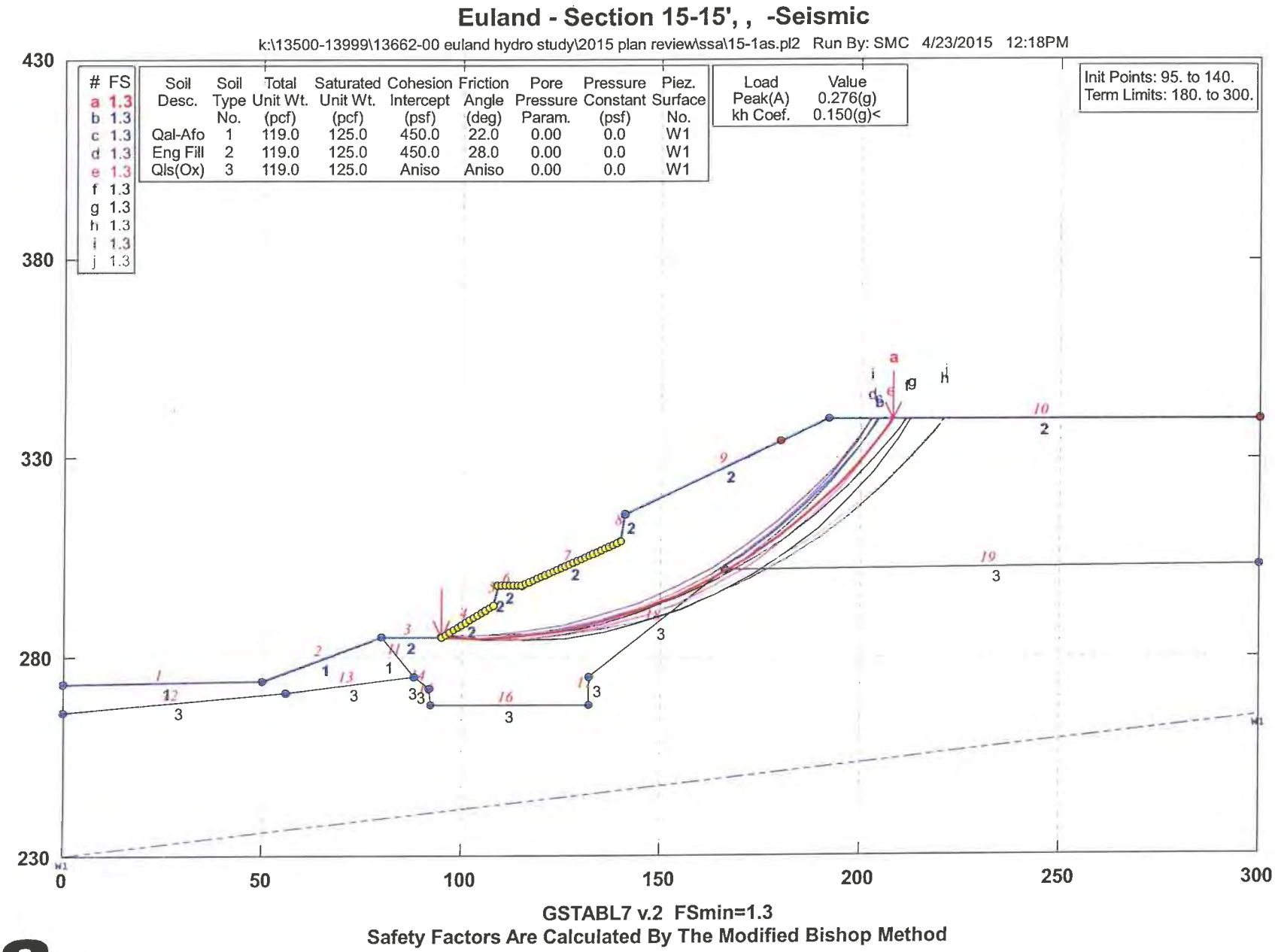
Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.998	284.797
3	114.981	285.371
4	124.890	286.720
5	134.664	288.835
6	144.244	291.702
7	153.572	295.306
8	162.592	299.624
9	171.249	304.630
10	179.490	310.293
11	187.267	316.580
12	194.531	323.452
13	201.240	330.869
14	207.351	338.784
15	208.148	340.000

Circle Center At X = 102.610 ; Y = 413.343 ; and Radius = 128.569

Factor of Safety

*** 1.489 ***

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


Euland - Section 15-15', , -Seismic
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FS
a 1.3
b 1.3
c 1.3
d 1.3
e 1.3
f 1.3
g 1.3
h 1.3
i 1.3
j 1.3
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Qal-Afo | 1 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Eng Fill | 2 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls(Ox) | 3 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load Peak(A) Value 0.276(g)
kh Coef. 0.150(g)<
Init Points: 95. to 140.
Term Limits: 180. to 300.
430
380
330
280
230
0
50
100
150
200
250
300
W1
GSTABL7 v.2 FSmin=1.3
Safety Factors Are Calculated By The Modified Bishop Method

Figure E-47.2

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 12:18PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1as.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1as.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-1as.PLT
PROBLEM DESCRIPTION: Euland - Section 15-15',
, -Seismic

BOUNDARY COORDINATES
10 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	273.00	50.00	274.00	1
2	50.00	274.00	80.00	285.00	1
3	80.00	285.00	95.00	285.00	2
4	95.00	285.00	108.00	293.00	2
5	108.00	293.00	109.00	298.00	2
6	109.00	298.00	115.00	298.00	2
7	115.00	298.00	140.00	309.00	2
8	140.00	309.00	141.00	316.00	2
9	141.00	316.00	192.00	340.00	2
10	192.00	340.00	300.00	340.00	2
11	80.00	285.00	88.00	275.00	1
12	0.00	266.00	56.00	271.00	3
13	56.00	271.00	88.00	275.00	3
14	88.00	275.00	92.00	272.00	3
15	92.00	272.00	92.10	268.00	3
16	92.10	268.00	132.00	268.00	3
17	132.00	268.00	132.10	275.00	3
18	132.10	275.00	166.00	302.00	3
19	166.00	302.00	300.00	303.00	3

User Specified Y-Origin = 230.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	450.0	22.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	450.00	17.00

```
    3              90.0             525.00         25.00
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  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00      230.00
    2        300.00      265.00
Specified Peak Ground Acceleration Coefficient (A) =   0.276(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
9200 Trial Surfaces Have Been Generated.
 200 Surface(s) Initiate(s) From Each Of    46 Points Equally Spaced
Along The Ground Surface Between  X =  95.00(ft)
                                and  X = 140.00(ft)
Each Surface Terminates Between   X = 180.00(ft)
                                and   X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =    230.00(ft)
10.00(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 =     0
      Number of Trial Surfaces With Valid FS =    0
      Statistical Data On All Valid FS Values:
         FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
         Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
      Failure Surface Specified By 15 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1         95.000      285.000
          2        104.998      284.797
          3        114.981      285.371
          4        124.890      286.720
          5        134.664      288.835
          6        144.244      291.702
          7        153.572      295.306
          8        162.592      299.624
          9        171.249      304.630
         10        179.490      310.293
         11        187.267      316.580
         12        194.531      323.452
         13        201.240      330.869
         14        207.351      338.784
         15        208.148      340.000
      Circle Center At X =   102.610 ; Y =   413.343 ; and Radius =   128.569
            Factor of Safety
           ***    1.332   ***
          Individual data on the     0  slices
                     Water  Water      Tie      Tie      Earthquake
                     Force  Force     Force    Force        Force   Surcharge
Slice  Width   Weight   Top    Bot      Norm     Tan      Hor      Ver     Load
 No.    (ft)    (lbs)  (lbs)  (lbs)    (lbs)   (lbs)    (lbs)    (lbs)   (lbs)
      Failure Surface Specified By 14 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1         95.000      285.000
```

2	104.999	284.864
3	114.977	285.534
4	124.868	287.007
5	134.608	289.272
6	144.133	292.315
7	153.383	296.116
8	162.296	300.651
9	170.814	305.889
10	178.882	311.797
11	186.448	318.336
12	193.462	325.464
13	199.878	333.134
14	204.737	340.000

Circle Center At X = 101.724 ; Y = 408.560 ; and Radius = 123.743

Factor of Safety

*** 1.334 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.989	284.541
3	114.981	284.941
4	124.902	286.197
5	134.679	288.299
6	144.239	291.232
7	153.512	294.975
8	162.430	299.499
9	170.927	304.772
10	178.940	310.755
11	186.411	317.402
12	193.283	324.666
13	199.507	332.493
14	204.489	340.000

Circle Center At X = 105.353 ; Y = 400.871 ; and Radius = 116.333

Factor of Safety

*** 1.334 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.996	284.735
3	114.979	285.318
4	124.877	286.745
5	134.618	289.006
6	144.133	292.084
7	153.352	295.958
8	162.210	300.599
9	170.642	305.974
10	178.589	312.045
11	185.992	318.767
12	192.799	326.093
13	198.961	333.969
14	202.903	340.000

Circle Center At X = 103.175 ; Y = 402.308 ; and Radius = 117.592

Factor of Safety

*** 1.336 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.000	285.615
2	105.965	284.778
3	115.965	284.825
4	125.921	285.756
5	135.756	287.565
6	145.393	290.237
7	154.755	293.752
8	163.769	298.080
9	172.366	303.190
10	180.476	309.039
11	188.037	315.584

12	194.990	322.772
13	201.279	330.546
14	206.855	338.847
15	207.490	340.000

Circle Center At X = 110.433 ; Y = 397.602 ; and Radius = 112.913

Factor of Safety

*** 1.337 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.000	285.615
2	105.996	285.345
3	115.984	285.833
4	125.907	287.075
5	135.707	289.065
6	145.328	291.790
7	154.716	295.237
8	163.816	299.383
9	172.575	304.207
10	180.945	309.680
11	188.876	315.770
12	196.323	322.444
13	203.244	329.662
14	209.599	337.383
15	211.439	340.000

Circle Center At X = 104.559 ; Y = 417.359 ; and Radius = 132.021

Factor of Safety

*** 1.337 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.000	285.615
2	105.941	284.530
3	115.938	284.302
4	125.918	284.935
5	135.807	286.423
6	145.531	288.756
7	155.019	291.915
8	164.200	295.879
9	173.006	300.617
10	181.373	306.094
11	189.237	312.270
12	196.542	319.100
13	203.233	326.532
14	209.260	334.511
15	212.708	340.000

Circle Center At X = 113.581 ; Y = 400.516 ; and Radius = 116.238

Factor of Safety

*** 1.340 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.982	284.406
3	114.982	284.517
4	124.948	285.333
5	134.833	286.849
6	144.586	289.059
7	154.158	291.951
8	163.504	295.510
9	172.575	299.719
10	181.326	304.557
11	189.715	310.000
12	197.699	316.021
13	205.239	322.590
14	212.297	329.674
15	218.838	337.238
16	220.905	340.000

Circle Center At X = 108.456 ; Y = 425.807 ; and Radius = 141.448

Factor of Safety

*** 1.341 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.000	285.615
2	106.000	285.677
3	115.962	286.541
4	125.823	288.203
5	135.519	290.650
6	144.987	293.869
7	154.166	297.837
8	162.997	302.529
9	171.423	307.915
10	179.389	313.960
11	186.844	320.625
12	193.739	327.867
13	200.031	335.640
14	203.016	340.000

Circle Center At X = 100.315 ; Y = 409.606 ; and Radius = 124.066
Factor of Safety
*** 1.342 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.000	285.000
2	104.996	284.725
3	114.989	285.111
4	124.934	286.155
5	134.789	287.853
6	144.510	290.198
7	154.055	293.180
8	163.383	296.784
9	172.452	300.997
10	181.224	305.799
11	189.660	311.169
12	197.723	317.084
13	205.378	323.518
14	212.591	330.444
15	219.332	337.831
16	221.064	340.000

Circle Center At X = 104.207 ; Y = 435.870 ; and Radius = 151.151
Factor of Safety
*** 1.342 ***
**** END OF GSTABL7 OUTPUT ****

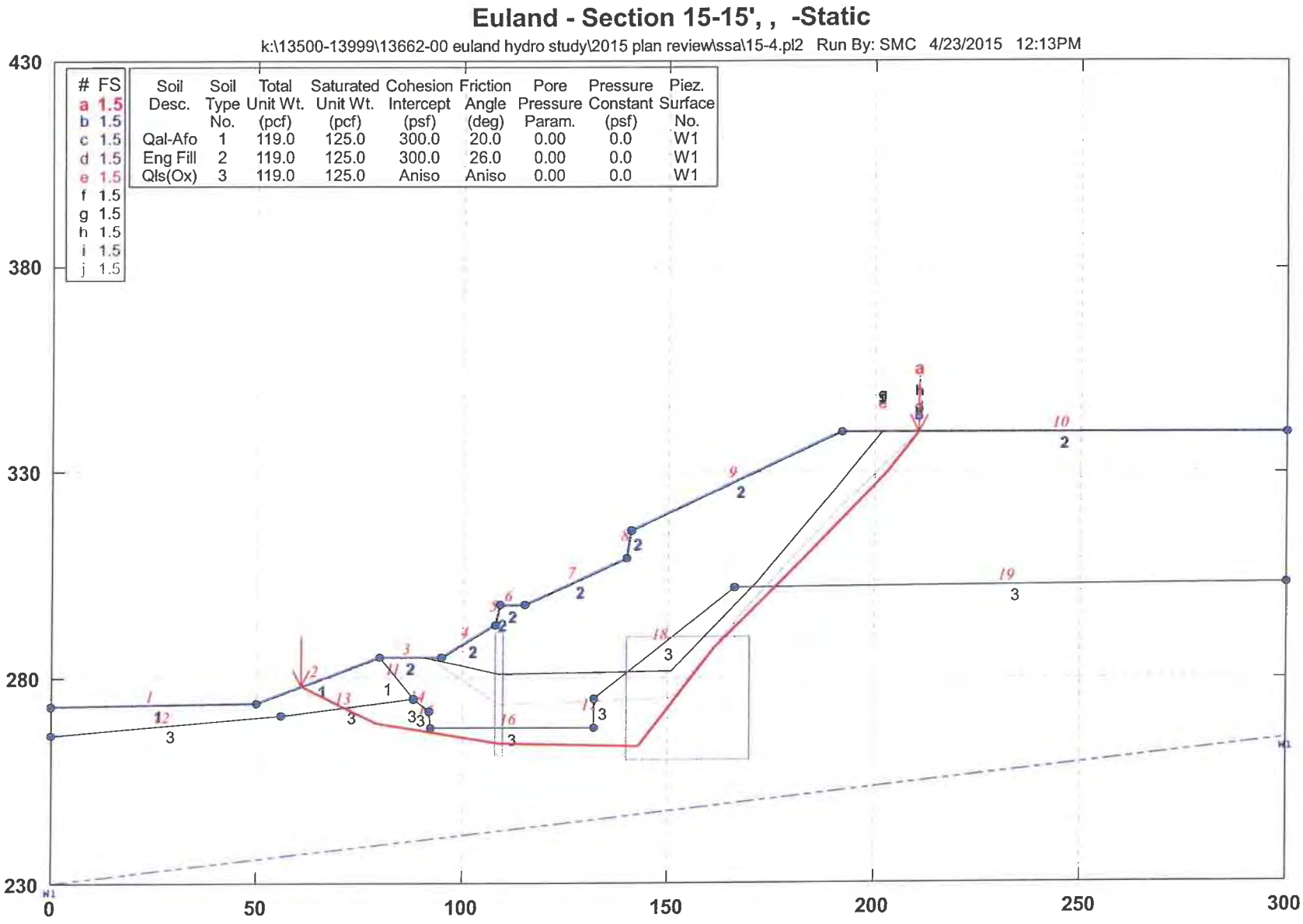
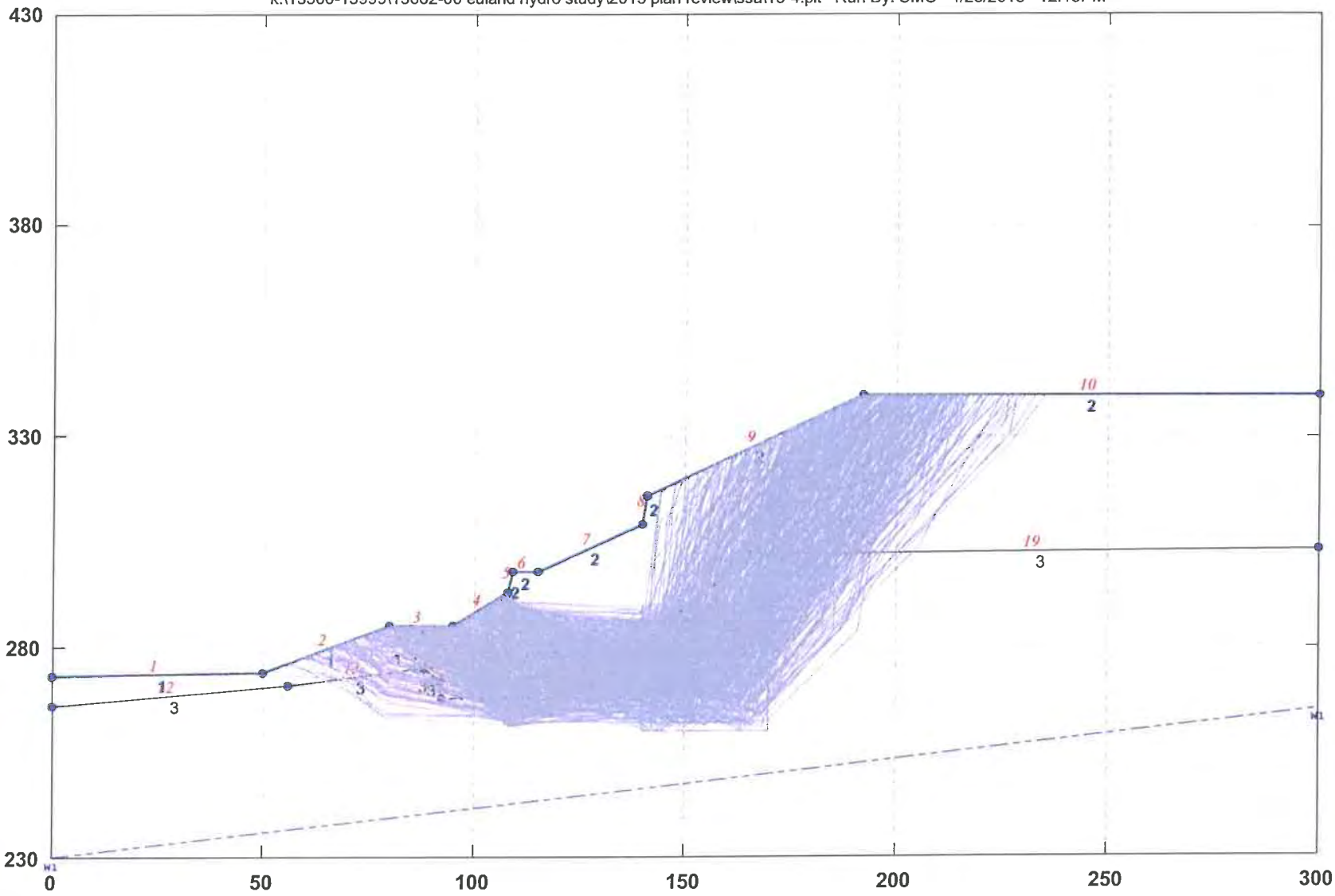

Euland - Section 15-15', , -Static
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-4.pl2 Run By: SMC 4/23/2015 12:13PM
FS
a 1.5
b 1.5
c 1.5
d 1.5
e 1.5
f 1.5
g 1.5
h 1.5
i 1.5
j 1.5
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Qal-Afo | 1 | 119.0 | 125.0 | 300.0 | 20.0 | 0.00 | 0.0 | W1
Eng Fill | 2 | 119.0 | 125.0 | 300.0 | 26.0 | 0.00 | 0.0 | W1
Qls(Ox) | 3 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
430
380
330
280
230
0
50
100
150
200
250
300
GSTABL7 v.2 FSmin=1.5
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-48.1

Euland - Section 15-15', , -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-4.plt Run By: SMC 4/23/2015 12:13PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 12:13PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-4.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-4.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-4.PLT
PROBLEM DESCRIPTION: Euland - Section 15-15',
, -Static

BOUNDARY COORDINATES
10 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	273.00	50.00	274.00	1
2	50.00	274.00	80.00	285.00	1
3	80.00	285.00	95.00	285.00	2
4	95.00	285.00	108.00	293.00	2
5	108.00	293.00	109.00	298.00	2
6	109.00	298.00	115.00	298.00	2
7	115.00	298.00	140.00	309.00	2
8	140.00	309.00	141.00	316.00	2
9	141.00	316.00	192.00	340.00	2
10	192.00	340.00	300.00	340.00	2
11	80.00	285.00	88.00	275.00	1
12	0.00	266.00	56.00	271.00	3
13	56.00	271.00	88.00	275.00	3
14	88.00	275.00	92.00	272.00	3
15	92.00	272.00	92.10	268.00	3
16	92.10	268.00	132.00	268.00	3
17	132.00	268.00	132.10	275.00	3
18	132.10	275.00	166.00	302.00	3
19	166.00	302.00	300.00	303.00	3

User Specified Y-Origin = 230.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	300.0	20.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	300.00	15.00

3	90.0	350.00	23.00

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 2 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	230.00
2	300.00	265.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	108.00	276.00	110.00	276.00	30.00
2	140.00	275.00	170.00	275.00	30.00

WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.34	283.66
2	80.54	279.81
3	109.49	271.95
4	142.81	273.51
5	142.86	303.51
6	144.19	317.50

Factor of Safety for the Preceding Surface is Between46.890 and45.741
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.52	285.93
2	108.90	276.60
3	162.73	267.79
4	162.93	297.79
5	167.02	327.51
6	167.24	328.35

Factor of Safety for the Preceding Surface is Between18.327 and18.311
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.44	285.00
2	108.15	278.14
3	147.89	273.50
4	148.07	303.50
5	169.00	324.99
6	176.21	332.57

Factor of Safety for the Preceding Surface is Between16.749 and16.677
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.71	283.06

2	80.01	277.96
3	109.12	270.71
4	160.23	268.23
5	160.34	298.23
6	175.51	324.11
7	176.88	332.88

Factor of Safety for the Preceding Surface is Between10.133 and10.079
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.68	289.11
2	109.90	282.78
3	163.40	260.61
4	163.47	290.61
5	172.17	319.32
6	190.01	339.06

Factor of Safety for the Preceding Surface is Between48.218 and47.872
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.50	291.46
2	109.73	287.63
3	152.84	261.59
4	153.02	291.59
5	174.19	312.86
6	195.34	334.13
7	200.38	340.00

Factor of Safety for the Preceding Surface is Between20.595 and20.564
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.56	286.57
2	109.65	275.05
3	147.56	262.09
4	147.80	292.08
5	159.85	319.56
6	165.50	327.53

Factor of Safety for the Preceding Surface is Between20.733 and20.720
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.34	283.66
2	80.54	279.81
3	109.49	271.95
4	142.81	273.51
5	142.86	303.51
6	144.19	317.50

Factor of Safety for the Preceding Surface is Between46.890 and45.741
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.52	285.93
2	108.90	276.60
3	162.73	267.79
4	162.93	297.79
5	167.02	327.51
6	167.24	328.35

Factor of Safety for the Preceding Surface is Between18.327 and18.311
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined

By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.44	285.00
2	108.15	278.14
3	147.89	273.50
4	148.07	303.50
5	169.00	324.99
6	176.21	332.57

Factor of Safety for the Preceding Surface is Between16.749 and16.677
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.71	283.06
2	80.01	277.96
3	109.12	270.71
4	160.23	268.23
5	160.34	298.23
6	175.51	324.11
7	176.88	332.88

Factor of Safety for the Preceding Surface is Between10.133 and10.079
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.68	289.11
2	109.90	282.78
3	163.40	260.61
4	163.47	290.61
5	172.17	319.32
6	190.01	339.06

Factor of Safety for the Preceding Surface is Between48.218 and47.872
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.50	291.46
2	109.73	287.63
3	152.84	261.59
4	153.02	291.59
5	174.19	312.86
6	195.34	334.13
7	200.38	340.00

Factor of Safety for the Preceding Surface is Between20.595 and20.564
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.56	286.57
2	109.65	275.05
3	147.56	262.09
4	147.80	292.08
5	159.85	319.56
6	165.50	327.53

Factor of Safety for the Preceding Surface is Between20.733 and20.720
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.34	283.66
2	80.54	279.81
3	109.49	271.95
4	142.81	273.51
5	142.86	303.51

6	144.19	317.50

Factor of Safety for the Preceding Surface is Between46.890 and45.741
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.52	285.93
2	108.90	276.60
3	162.73	267.79
4	162.93	297.79
5	167.02	327.51
6	167.24	328.35

Factor of Safety for the Preceding Surface is Between18.327 and18.311
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.44	285.00
2	108.15	278.14
3	147.89	273.50
4	148.07	303.50
5	169.00	324.99
6	176.21	332.57

Factor of Safety for the Preceding Surface is Between16.749 and16.677
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.71	283.06
2	80.01	277.96
3	109.12	270.71
4	160.23	268.23
5	160.34	298.23
6	175.51	324.11
7	176.88	332.88

Factor of Safety for the Preceding Surface is Between10.133 and10.079
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.68	289.11
2	109.90	282.78
3	163.40	260.61
4	163.47	290.61
5	172.17	319.32
6	190.01	339.06

Factor of Safety for the Preceding Surface is Between48.218 and47.872
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.50	291.46
2	109.73	287.63
3	152.84	261.59
4	153.02	291.59
5	174.19	312.86
6	195.34	334.13
7	200.38	340.00

Factor of Safety for the Preceding Surface is Between20.595 and20.564
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.56	286.57

2	109.65	275.05
3	147.56	262.09
4	147.80	292.08
5	159.85	319.56
6	165.50	327.53

Factor of Safety for the Preceding Surface is Between20.733 and20.720
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.34	283.66
2	80.54	279.81
3	109.49	271.95
4	142.81	273.51
5	142.86	303.51
6	144.19	317.50

Factor of Safety for the Preceding Surface is Between46.890 and45.741
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.52	285.93
2	108.90	276.60
3	162.73	267.79
4	162.93	297.79
5	167.02	327.51
6	167.24	328.35

Factor of Safety for the Preceding Surface is Between18.327 and18.311
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.44	285.00
2	108.15	278.14
3	147.89	273.50
4	148.07	303.50
5	169.00	324.99
6	176.21	332.57

Factor of Safety for the Preceding Surface is Between16.749 and16.677
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.71	283.06
2	80.01	277.96
3	109.12	270.71
4	160.23	268.23
5	160.34	298.23
6	175.51	324.11
7	176.88	332.88

Factor of Safety for the Preceding Surface is Between10.133 and10.079
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.68	289.11
2	109.90	282.78
3	163.40	260.61
4	163.47	290.61
5	172.17	319.32
6	190.01	339.06

Factor of Safety for the Preceding Surface is Between48.218 and47.872
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

###################### SOME LINES SKIPPED ######################
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 = 2000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 28
Number of Trial Surfaces With Valid FS = 1972
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 1.4 %
Statistical Data On All Valid FS Values:
FS Max = 21.062 FS Min = 1.454 FS Ave = 2.257
Standard Deviation = 1.285 Coefficient of Variation = 56.94 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.786	277.955
2	79.040	269.019
3	108.630	264.074
4	142.877	263.353
5	161.092	287.189
6	182.253	308.455
7	203.167	329.963
8	210.658	340.000

Factor of Safety
*** 1.454 ***
Individual data on the 23 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.3	5450.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	7.9	11525.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	1.0	1813.8	0.0	0.0	0.	0.	0.0	0.0	0.0
4	8.0	16003.2	0.0	0.0	0.	0.	0.0	0.0	0.0
5	4.0	8478.8	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.1	216.0	0.0	0.0	0.	0.	0.0	0.0	0.0
7	2.9	6351.9	0.0	0.0	0.	0.	0.0	0.0	0.0
8	13.0	36716.8	0.0	0.0	0.	0.	0.0	0.0	0.0
9	0.6	2283.6	0.0	0.0	0.	0.	0.0	0.0	0.0
10	0.4	1452.2	0.0	0.0	0.	0.	0.0	0.0	0.0
11	6.0	24273.6	0.0	0.0	0.	0.	0.0	0.0	0.0
12	17.0	76831.5	0.0	0.0	0.	0.	0.0	0.0	0.0
13	0.1	498.9	0.0	0.0	0.	0.	0.0	0.0	0.0
14	7.9	41143.9	0.0	0.0	0.	0.	0.0	0.0	0.0
15	1.0	5842.6	0.0	0.0	0.	0.	0.0	0.0	0.0
16	1.9	11851.1	0.0	0.0	0.	0.	0.0	0.0	0.0
17	18.2	99492.7	0.0	0.0	0.	0.	0.0	0.0	0.0
18	4.9	21581.8	0.0	0.0	0.	0.	0.0	0.0	0.0
19	9.9	38888.6	0.0	0.0	0.	0.	0.0	0.0	0.0
20	6.3	21651.2	0.0	0.0	0.	0.	0.0	0.0	0.0
21	9.7	28115.5	0.0	0.0	0.	0.	0.0	0.0	0.0
22	11.2	20969.5	0.0	0.0	0.	0.	0.0	0.0	0.0
23	7.5	4473.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.786	277.955
2	79.040	269.019
3	108.630	264.074
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6	182.253	308.455
7	203.167	329.963
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Factor of Safety
*** 1.454 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.786	277.955
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Factor of Safety
*** 1.454 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.786	277.955
2	79.040	269.019
3	108.630	264.074
4	142.877	263.353
5	161.092	287.189
6	182.253	308.455
7	203.167	329.963
8	210.658	340.000

Factor of Safety
*** 1.454 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.793	285.000
2	109.053	281.045
3	150.911	281.788
4	171.796	303.324
5	191.007	326.366
6	201.885	340.000

Factor of Safety
*** 1.456 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.793	285.000
2	109.053	281.045
3	150.911	281.788
4	171.796	303.324
5	191.007	326.366
6	201.885	340.000

Factor of Safety
*** 1.456 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.793	285.000
2	109.053	281.045
3	150.911	281.788
4	171.796	303.324
5	191.007	326.366
6	201.885	340.000

Factor of Safety
*** 1.456 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.848	285.000
2	108.672	273.669
3	150.889	275.174
4	170.148	298.176
5	190.672	320.057
6	210.614	340.000

Factor of Safety
*** 1.480 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.848	285.000
2	108.672	273.669
3	150.889	275.174
4	170.148	298.176
5	190.672	320.057
6	210.614	340.000

Factor of Safety
*** 1.480 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.848	285.000
2	108.672	273.669
3	150.889	275.174
4	170.148	298.176
5	190.672	320.057
6	210.614	340.000

Factor of Safety
*** 1.480 ***

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

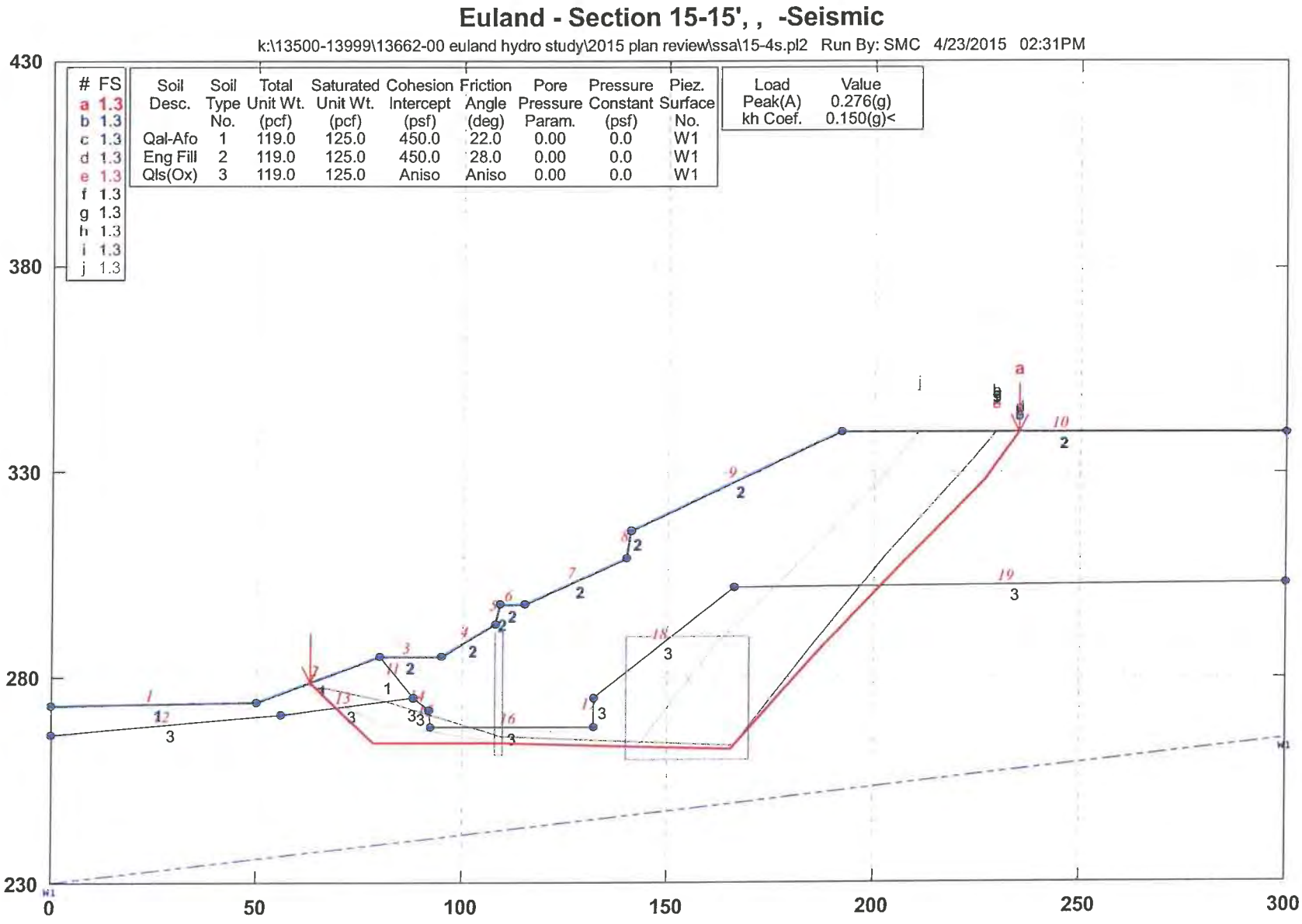
Euland - Section 15-15', , -Seismic
k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-4s.pl2 Run By: SMC 4/23/2015 02:31PM
FS
a 1.3
b 1.3
c 1.3
d 1.3
e 1.3
f 1.3
g 1.3
h 1.3
i 1.3
j 1.3
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No.
Qal-Afo | 1 | 119.0 | 125.0 | 450.0 | 22.0 | 0.00 | 0.0 | W1
Eng Fill | 2 | 119.0 | 125.0 | 450.0 | 28.0 | 0.00 | 0.0 | W1
Qls(Ox) | 3 | 119.0 | 125.0 | Aniso | Aniso | 0.00 | 0.0 | W1
Load
Peak(A) 0.276(g)
kh Coef. 0.150(g)<
430
380
330
280
230
0
50
100
150
200
250
300
GSTABL7 v.2 FSmin=1.3
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-48.2

Euland - Section 15-15', , -Seismic

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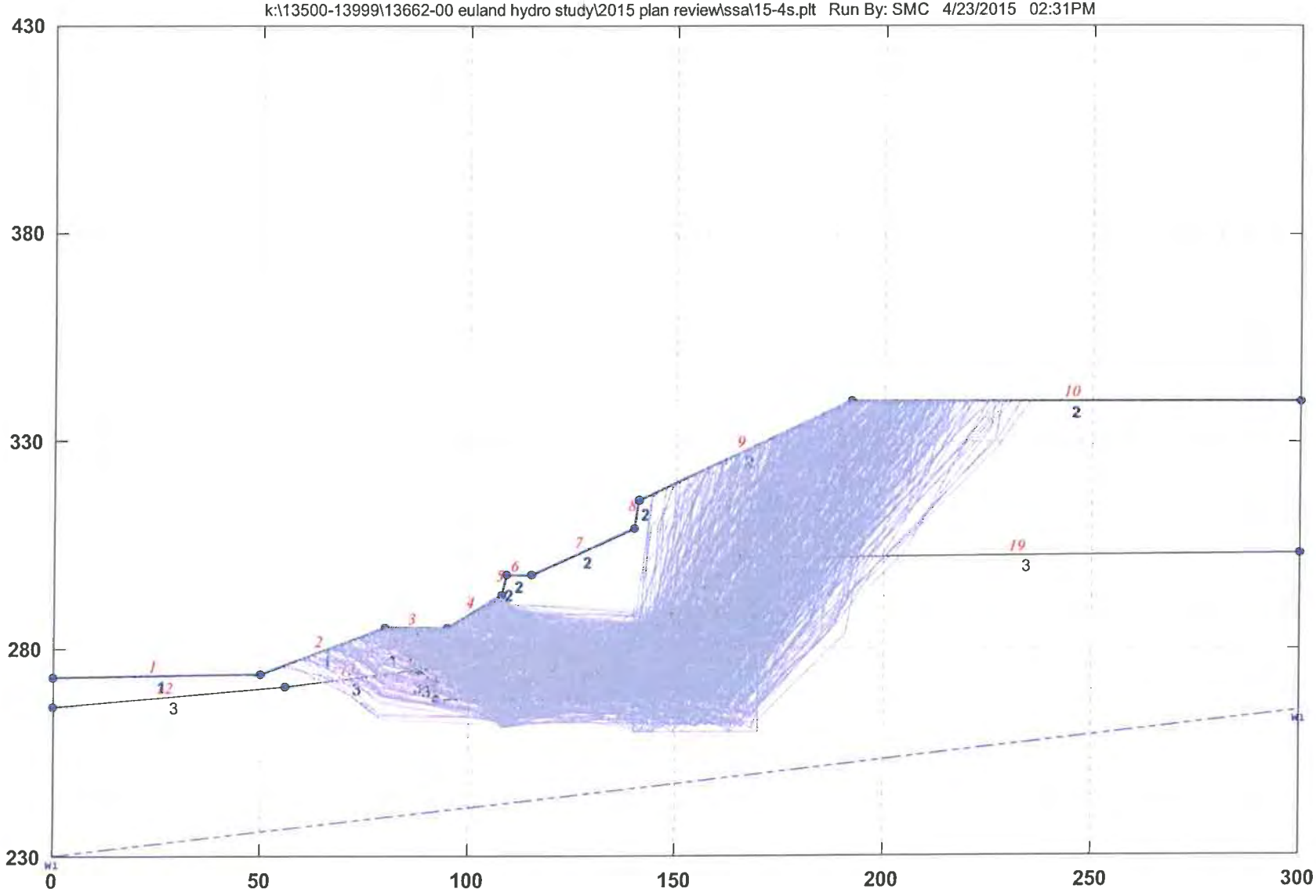

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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****

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: 4/23/2015
Time of Run: 02:31PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-4s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-4s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-4s.PLT
PROBLEM DESCRIPTION: Euland - Section 15-15',
, -Seismic

BOUNDARY COORDINATES
10 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	273.00	50.00	274.00	1
2	50.00	274.00	80.00	285.00	1
3	80.00	285.00	95.00	285.00	2
4	95.00	285.00	108.00	293.00	2
5	108.00	293.00	109.00	298.00	2
6	109.00	298.00	115.00	298.00	2
7	115.00	298.00	140.00	309.00	2
8	140.00	309.00	141.00	316.00	2
9	141.00	316.00	192.00	340.00	2
10	192.00	340.00	300.00	340.00	2
11	80.00	285.00	88.00	275.00	1
12	0.00	266.00	56.00	271.00	3
13	56.00	271.00	88.00	275.00	3
14	88.00	275.00	92.00	272.00	3
15	92.00	272.00	92.10	268.00	3
16	92.10	268.00	132.00	268.00	3
17	132.00	268.00	132.10	275.00	3
18	132.10	275.00	166.00	302.00	3
19	166.00	302.00	300.00	303.00	3

User Specified Y-Origin = 230.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	450.0	22.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	450.00	17.00

3	90.0	525.00	25.00

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 2 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	230.00
2	300.00	265.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	108.00	276.00	110.00	276.00	30.00
2	140.00	275.00	170.00	275.00	30.00

WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.34	283.66
2	80.54	279.81
3	109.49	271.95
4	142.81	273.51
5	142.86	303.51
6	144.19	317.50

Factor of Safety for the Preceding Surface is Between18.896 and18.521
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.52	285.93
2	108.90	276.60
3	162.73	267.79
4	162.93	297.79
5	167.02	327.51
6	167.24	328.35

Factor of Safety for the Preceding Surface is Between11.141 and11.127
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.44	285.00
2	108.15	278.14
3	147.89	273.50
4	148.07	303.50
5	169.00	324.99
6	176.21	332.57

Factor of Safety for the Preceding Surface is Between 9.262 and 9.227
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined

By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.68	289.11
2	109.90	282.78
3	163.40	260.61
4	163.47	290.61
5	172.17	319.32
6	190.01	339.06

Factor of Safety for the Preceding Surface is Between20.737 and20.535
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.50	291.46
2	109.73	287.63
3	152.84	261.59
4	153.02	291.59
5	174.19	312.86
6	195.34	334.13
7	200.38	340.00

Factor of Safety for the Preceding Surface is Between11.326 and11.304
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.56	286.57
2	109.65	275.05
3	147.56	262.09
4	147.80	292.08
5	159.85	319.56
6	165.50	327.53

Factor of Safety for the Preceding Surface is Between13.602 and13.583
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.34	283.66
2	80.54	279.81
3	109.49	271.95
4	142.81	273.51
5	142.86	303.51
6	144.19	317.50

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2	109.73	287.63
3	152.84	261.59
4	153.02	291.59
5	174.19	312.86
6	195.34	334.13
7	200.38	340.00

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By The Following 6 Coordinate Points

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3	147.56	262.09
4	147.80	292.08
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Point No.	X-Surf (ft)	Y-Surf (ft)
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4	142.81	273.51
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6	144.19	317.50

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4	163.47	290.61
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Point No.	X-Surf (ft)	Y-Surf (ft)
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2	109.73	287.63
3	152.84	261.59
4	153.02	291.59
5	174.19	312.86
6	195.34	334.13
7	200.38	340.00

Factor of Safety for the Preceding Surface is Between11.326 and11.304
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.56	286.57
2	109.65	275.05
3	147.56	262.09
4	147.80	292.08
5	159.85	319.56
6	165.50	327.53

Factor of Safety for the Preceding Surface is Between13.602 and13.583
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.34	283.66
2	80.54	279.81
3	109.49	271.95
4	142.81	273.51
5	142.86	303.51
6	144.19	317.50

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The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

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

1	93.44	285.00
2	108.15	278.14
3	147.89	273.50
4	148.07	303.50
5	169.00	324.99
6	176.21	332.57

Factor of Safety for the Preceding Surface is Between 9.262 and 9.227
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.68	289.11
2	109.90	282.78
3	163.40	260.61
4	163.47	290.61
5	172.17	319.32
6	190.01	339.06

Factor of Safety for the Preceding Surface is Between20.737 and20.535
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.50	291.46
2	109.73	287.63
3	152.84	261.59
4	153.02	291.59
5	174.19	312.86
6	195.34	334.13
7	200.38	340.00

Factor of Safety for the Preceding Surface is Between11.326 and11.304
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.56	286.57
2	109.65	275.05
3	147.56	262.09
4	147.80	292.08
5	159.85	319.56
6	165.50	327.53

Factor of Safety for the Preceding Surface is Between13.602 and13.583
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 = 2000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 24
Number of Trial Surfaces With Valid FS = 1976
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 1.2 %
Statistical Data On All Valid FS Values:
FS Max = 16.777 FS Min = 1.265 FS Ave = 1.969
Standard Deviation = 1.005 Coefficient of Variation = 51.03 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.913	278.735
2	78.511	264.113
3	108.511	263.950
4	165.399	262.466
5	185.074	285.113
6	205.747	306.853
7	226.803	328.223
8	234.947	340.000

Factor of Safety

*** 1.265 ***
Individual data on the 23 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.5	3245.2	0.0	0.0	0.	0.	486.8	0.0	0.0
2	9.1	15632.4	0.0	0.0	0.	0.	2344.9	0.0	0.0
3	1.5	3653.1	0.0	0.0	0.	0.	548.0	0.0	0.0
4	8.0	19912.5	0.0	0.0	0.	0.	2986.9	0.0	0.0
5	4.0	9971.8	0.0	0.0	0.	0.	1495.8	0.0	0.0
6	0.1	249.4	0.0	0.0	0.	0.	37.4	0.0	0.0
7	2.9	7236.3	0.0	0.0	0.	0.	1085.4	0.0	0.0
8	13.0	38693.5	0.0	0.0	0.	0.	5804.0	0.0	0.0
9	0.5	1842.7	0.0	0.0	0.	0.	276.4	0.0	0.0
10	0.5	1912.1	0.0	0.0	0.	0.	286.8	0.0	0.0
11	6.0	24376.8	0.0	0.0	0.	0.	3656.5	0.0	0.0
12	17.0	77240.2	0.0	0.0	0.	0.	11586.0	0.0	0.0
13	0.1	501.8	0.0	0.0	0.	0.	75.3	0.0	0.0
14	7.9	41392.8	0.0	0.0	0.	0.	6208.9	0.0	0.0
15	1.0	5876.7	0.0	0.0	0.	0.	881.5	0.0	0.0
16	24.4	171175.4	0.0	0.0	0.	0.	25676.3	0.0	0.0
17	0.6	4638.6	0.0	0.0	0.	0.	695.8	0.0	0.0
18	19.1	131911.1	0.0	0.0	0.	0.	19786.7	0.0	0.0
19	6.9	40894.1	0.0	0.0	0.	0.	6134.1	0.0	0.0
20	9.4	47643.9	0.0	0.0	0.	0.	7146.6	0.0	0.0
21	4.4	18405.3	0.0	0.0	0.	0.	2760.8	0.0	0.0
22	21.1	56280.9	0.0	0.0	0.	0.	8442.1	0.0	0.0
23	8.1	5707.4	0.0	0.0	0.	0.	856.1	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.913	278.735
2	78.511	264.113
3	108.511	263.950
4	165.399	262.466
5	185.074	285.113
6	205.747	306.853
7	226.803	328.223
8	234.947	340.000

Factor of Safety
*** 1.265 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.913	278.735
2	78.511	264.113
3	108.511	263.950
4	165.399	262.466
5	185.074	285.113
6	205.747	306.853
7	226.803	328.223
8	234.947	340.000

Factor of Safety
*** 1.265 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.913	278.735
2	78.511	264.113
3	108.511	263.950
4	165.399	262.466
5	185.074	285.113
6	205.747	306.853
7	226.803	328.223
8	234.947	340.000

Factor of Safety
*** 1.265 ***

Failure Surface Specified By 8 Coordinate Points

Point	X-Surf	Y-Surf

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.003	278.401
2	80.915	274.415
3	109.574	265.547
4	165.999	263.243
5	184.546	286.823
6	203.376	310.177
7	223.346	332.565
8	229.399	340.000

Factor of Safety
*** 1.271 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.003	278.401
2	80.915	274.415
3	109.574	265.547
4	165.999	263.243
5	184.546	286.823
6	203.376	310.177
7	223.346	332.565
8	229.399	340.000

Factor of Safety
*** 1.271 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.003	278.401
2	80.915	274.415
3	109.574	265.547
4	165.999	263.243
5	184.546	286.823
6	203.376	310.177
7	223.346	332.565
8	229.399	340.000

Factor of Safety
*** 1.271 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.003	278.401
2	80.915	274.415
3	109.574	265.547
4	165.999	263.243
5	184.546	286.823
6	203.376	310.177
7	223.346	332.565
8	229.399	340.000

Factor of Safety
*** 1.271 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.786	277.955
2	79.040	269.019
3	108.630	264.074
4	142.877	263.353
5	161.092	287.189
6	182.253	308.455
7	203.167	329.963
8	210.658	340.000

Factor of Safety
*** 1.281 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.786	277.955
2	79.040	269.019
3	108.630	264.074
4	142.877	263.353

```
    5         161.092      287.189
    6         182.253      308.455
    7         203.167      329.963
    8         210.658      340.000
      Factor of Safety
    ***     1.281    ***
        **** END OF GSTABL7 OUTPUT ****
```

Euland - Section 15-15', , -Static

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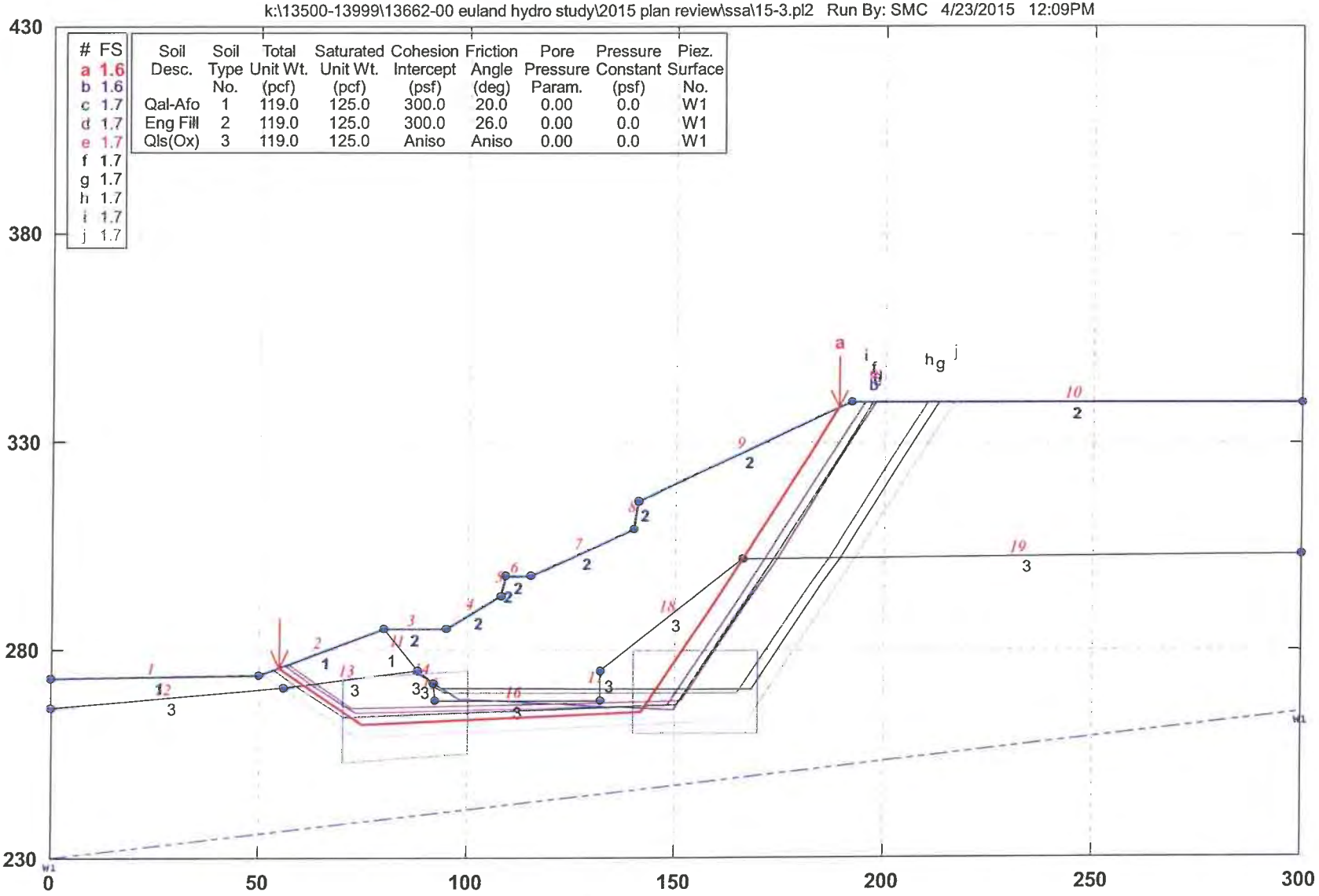

#	FS
a	1.6
b	1.6
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Qal-Afo	1	119.0	125.0	300.0	20.0	0.00	0.0	W1
Eng Fill	2	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls(Ox)	3	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-49.1

Euland - Section 15-15', , -Static

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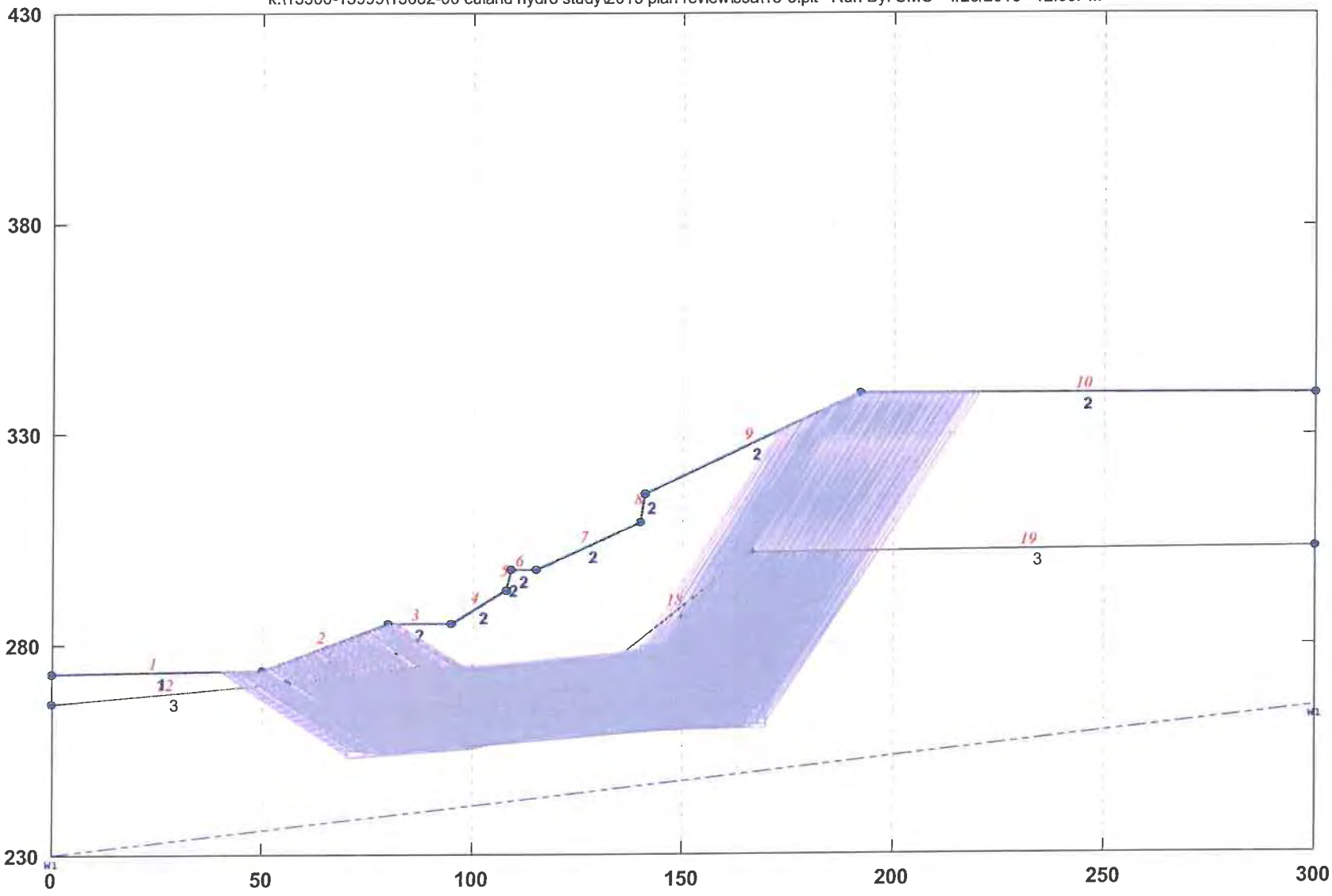

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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****

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: 4/23/2015
Time of Run: 12:09PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-3.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-3.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-3.PLT
PROBLEM DESCRIPTION: Euland - Section 15-15',
, -Static

BOUNDARY COORDINATES
10 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	273.00	50.00	274.00	1
2	50.00	274.00	80.00	285.00	1
3	80.00	285.00	95.00	285.00	2
4	95.00	285.00	108.00	293.00	2
5	108.00	293.00	109.00	298.00	2
6	109.00	298.00	115.00	298.00	2
7	115.00	298.00	140.00	309.00	2
8	140.00	309.00	141.00	316.00	2
9	141.00	316.00	192.00	340.00	2
10	192.00	340.00	300.00	340.00	2
11	80.00	285.00	88.00	275.00	1
12	0.00	266.00	56.00	271.00	3
13	56.00	271.00	88.00	275.00	3
14	88.00	275.00	92.00	272.00	3
15	92.00	272.00	92.10	268.00	3
16	92.10	268.00	132.00	268.00	3
17	132.00	268.00	132.10	275.00	3
18	132.10	275.00	166.00	302.00	3
19	166.00	302.00	300.00	303.00	3

User Specified Y-Origin = 230.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	300.0	20.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	3.0	300.00	15.00

3	90.0	350.00	23.00

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 2 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	230.00
2	300.00	265.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
2000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	70.00	263.00	100.00	265.00	20.00
2	140.00	270.00	170.00	270.00	20.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	1.473	1.221	0.149
12.75	1.502	1.280	0.226
55.10	4.756	-0.005	1.433
9.99	1.483	1.241	0.176
0.00	1.403	1.121	0.000
89.94	0.000	0.302	*****
57.89	6.935	0.001	1.593
88.16	0.283	0.277	*****
88.20	0.000	0.278	*****
0.00	-0.011	0.001	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000
0.00	-0.014	-0.002	0.000

The Trial Failure Surface In Question Is Defined By The Following 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.07	269.14
2	93.90	268.00
3	95.05	267.24
4	151.56	265.33
5	168.12	290.35
6	175.88	302.07
7	191.78	327.52
8	199.58	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta	FOS	FOS

(deg) (ki=1.0)	(Moment) (Equil.)	(Force) (Equil.)	Lambda
8.50	1.738	1.420	0.149
12.75	1.768	1.495	0.226
47.04	0.000	0.004	1.074
46.41	-0.007	-0.043	1.050
46.96	-0.016	0.000	1.071
46.73	-0.016	0.000	1.062
65.19	-0.036	0.000	2.163
26.34	-0.013	0.000	0.495
0.00	-0.029	-0.004	0.000
68.78	-0.017	0.000	2.575
89.94	124.390	0.360	*****
68.78	-0.031	0.000	2.576
61.73	-0.033	0.000	1.860
89.94	124.390	0.360	*****
61.74	-0.409	0.000	1.861
52.47	-0.128	0.000	1.302
43.77	-0.017	0.000	0.958
39.07	-0.016	0.000	0.812
0.00	-0.154	-0.006	0.000
58.47	16.434	0.000	1.630

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.04	270.57
2	93.47	269.67
3	157.95	266.93
4	174.51	291.95
5	181.24	302.11
6	197.13	327.56
7	204.91	340.00

The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	87.83	275.21
2	92.89	272.05
3	141.43	271.23
4	157.10	294.91
5	173.00	320.36
6	182.47	335.52

Factor Of Safety For The Preceding Specified Surface = 2.004
Theta (ki = 1.0) = 24.90 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.84	272.12
2	92.00	272.02
3	95.96	269.54
4	145.67	263.67
5	162.23	288.69
6	171.07	302.04
7	186.97	327.48
8	194.79	340.00

Factor Of Safety For The Preceding Specified Surface = 2.296
Theta (ki = 1.0) = 27.44 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.342	1.876	0.149
12.75	2.439	2.049	0.226
42.29	0.690	7.688	0.910
14.83	2.483	2.146	0.265

7.36	2.314	1.834	0.129
40.87	-0.051	6.571	0.865
10.38	2.386	1.949	0.183
2.74	2.197	1.683	0.048
70.80	-0.013	7.960	2.872
8.24	2.335	1.866	0.145
0.00	2.126	1.603	0.000
89.94	285.923	0.368	*****
0.00	2.126	1.603	0.000
0.00	2.126	1.603	0.000
29.18	2.559	3.255	0.558
16.69	2.518	2.241	0.300
17.26	2.528	2.272	0.311
26.47	2.596	2.952	0.498
22.39	2.592	2.601	0.412
20.90	2.579	2.495	0.382

The Trial Failure Surface In Question Is Defined
By The Following 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.23	281.42
2	80.70	274.09
3	88.78	268.73
4	145.76	261.31
5	162.32	286.32
6	172.73	302.05
7	188.63	327.49
8	196.44	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.720	2.097	0.149
12.75	2.855	2.321	0.226
46.43	-0.027	16.654	1.051
14.14	2.895	2.405	0.252
4.61	2.586	1.923	0.081
53.28	3.150	2.554	1.341
89.94	450.009	0.354	*****
53.21	3.126	2.538	1.337
40.91	1.213	7.896	0.866
51.89	2.701	2.242	1.275
50.94	2.462	2.069	1.232
43.23	1.393	1.248	0.940
34.65	2.126	0.837	0.691
47.54	1.854	1.611	1.093
51.53	2.605	2.173	1.258
40.72	0.946	1.098	0.861
40.87	1.210	1.106	0.865
40.79	1.205	1.101	0.863
33.35	2.592	0.794	0.658
43.87	-0.001	1.292	0.961

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.43	285.00
2	97.78	274.16
3	163.90	260.35
4	180.46	285.37
5	191.59	302.19
6	207.49	327.63
7	215.22	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	1.554	1.346	0.149

12.75	1.577	1.399	0.226
46.20	-0.019	0.001	1.043
41.74	0.181	0.157	0.892
43.55	-0.014	-0.006	0.951
42.93	-0.018	-0.009	0.930
51.65	-0.006	-0.001	1.264
63.94	-0.008	0.000	2.045
28.26	0.000	0.001	0.538
11.19	0.002	0.009	0.198
37.20	-0.003	0.000	0.759
71.87	-0.002	0.000	3.055
89.94	2.126	0.837	*****
71.90	-0.002	0.000	3.059
65.90	-0.012	0.000	2.236
74.81	-0.002	-0.001	3.683
75.96	0.004	-0.006	4.000
74.95	-0.002	-0.001	3.720
74.73	-0.002	-0.001	3.664
77.79	0.002	0.000	4.622

The Trial Failure Surface In Question Is Defined
By The Following 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.08	268.77
2	93.31	268.00
3	96.34	266.00
4	151.91	275.88
5	168.47	300.89
6	169.22	302.02
7	185.12	327.47
8	192.95	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	1.642	1.391	0.149
12.75	1.659	1.441	0.226
50.15	-0.010	-0.002	1.198
48.44	-0.008	-0.002	1.128
35.57	-0.004	-0.002	0.715
24.95	-0.001	-0.001	0.465
18.95	0.000	-0.001	0.343
22.58	-0.001	-0.001	0.416
23.03	-0.001	-0.001	0.425
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424
22.96	-0.001	-0.001	0.424

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.04	270.28
2	92.97	269.70
3	154.40	275.58
4	170.96	300.60
5	171.92	302.04
6	187.82	327.49
7	195.64	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta	FOS	FOS

(deg) (ki=1.0)	(Moment) (Equil.)	(Force) (Equil.)	Lambda
8.50	1.647	1.372	0.149
12.75	1.672	1.425	0.226
63.74	-0.003	-0.001	2.027
63.08	0.000	-0.001	1.969
62.99	0.107	-0.001	1.962
63.11	0.109	-0.001	1.972
56.80	9.847	0.001	1.528
65.31	12449.709	-0.001	2.175
56.79	9.826	0.002	1.528
53.94	-0.046	-0.002	1.373
53.01	-0.048	-0.002	1.328
77.66	0.675	0.002	4.572
55.12	-0.074	-0.003	1.435
50.47	-0.064	-0.002	1.212
1.15	-0.060	-0.007	0.020
0.00	-0.017	-0.006	0.000
0.00	-0.017	-0.006	0.000
30.61	-0.008	-0.001	0.592
89.47	1.027	0.596	*****
31.80	-0.003	-0.002	0.620

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.08	268.96
2	92.77	268.53
3	144.12	272.09
4	160.68	297.11
5	161.60	298.50
6	177.50	323.94
7	185.68	337.02

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	1.561	1.339	0.149
12.75	1.585	1.396	0.226
45.12	-0.006	0.000	1.004
43.69	-0.028	0.000	0.955
46.17	-0.002	0.000	1.042
46.39	-0.007	0.000	1.050
46.08	-0.002	0.000	1.039
45.86	0.000	0.000	1.030
45.83	0.000	0.000	1.029
45.82	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029
45.81	0.000	0.000	1.029

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.08	268.69
2	93.19	268.00
3	98.13	264.73
4	155.81	277.77
5	171.88	302.04
6	187.77	327.49
7	195.59	340.00

The Factor Of Safety For The Trial Failure Surface Defined

By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.05	269.99
2	92.48	269.72
3	150.86	264.24
4	167.42	289.25
5	175.90	302.07
6	191.80	327.52
7	199.60	340.00

Factor Of Safety For The Preceding Specified Surface = 2.131
Theta (ki = 1.0) = 29.05 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	1.626	1.351	0.149
12.75	1.653	1.405	0.226
67.47	94.303	-0.002	2.410
12.56	1.652	1.402	0.223
0.00	1.559	1.255	0.000
89.94	0.821	0.608	*****
89.94	0.821	0.608	*****
0.00	1.559	1.255	0.000
89.94	0.821	0.608	*****
89.94	0.821	0.608	*****
0.00	1.559	1.255	0.000
89.94	0.821	0.608	*****
89.94	0.821	0.608	*****
0.00	1.559	1.255	0.000
89.94	0.821	0.608	*****
89.94	0.821	0.608	*****
0.00	1.559	1.255	0.000
89.94	0.821	0.608	*****
89.94	0.821	0.608	*****
0.00	1.559	1.255	0.000

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.09	268.27
2	92.52	268.00
3	93.56	267.31
4	140.93	271.29
5	155.97	294.01
6	171.87	319.45
7	181.67	335.14

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.321	1.896	0.149
12.75	2.435	2.078	0.226
42.40	0.000	8.579	0.913
14.33	2.475	2.155	0.255
6.32	2.261	1.814	0.111
44.08	1.418	11.230	0.968
8.51	2.321	1.897	0.150
0.00	2.086	1.612	0.000
89.94	318.054	0.373	*****
0.00	2.086	1.612	0.000
0.00	2.086	1.612	0.000
34.82	2.551	4.434	0.695
9.34	2.344	1.930	0.165
6.97	2.279	1.838	0.122
59.25	4.567	0.000	1.681
0.00	2.086	1.612	0.000

```
  0.00        2.086       1.612      0.000
 30.41        2.689       3.556      0.587
 14.35        2.476       2.156      0.256
 14.77        2.486       2.177      0.264
The Trial Failure Surface In Question Is Defined
By The Following  8 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1          73.00       282.43
    2          84.28       274.54
    3          91.48       269.77
    4         143.77       261.54
    5         160.33       286.56
    6         170.57       302.03
    7         186.47       327.48
    8         194.30       340.00
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By  8 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
  ###################### SOME LINES SKIPPED ####################
      Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
      Selected ki function = Bi-linear
      Selected Lambda Coefficient =  1.00
      Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
      (if applicable) have been applied to the slice base(s)
      on which they intersect.
      Specified Tension Crack Water Force Factor =   0.000
      Total Number of Trial Surfaces Attempted =  2000
      WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
      Did Not Converge in 20 Iterations.
      Number of Trial Surfaces with Non-Converged FS =   96
      Number of Trial Surfaces with Misleading FS =   43
      Number of Trial Surfaces With Valid FS = 1861
      Percentage of Trial Surfaces With Non-Valid FS Solutions
      of the Total Attempted =   6.9 %
      Statistical Data On All Valid FS Values:
         FS Max =   3.225   FS Min =   1.609   FS Ave =   2.087
         Standard Deviation =    0.213   Coefficient of Variation =   10.20 %
                 ((Simplified Janbu FS for Critical Surface =  1.197))
      Failure Surface Specified By  8 Coordinate Points
        Point       X-Surf       Y-Surf
         No.         (ft)         (ft)
          1         54.775       275.751
          2         60.717       271.590
          3         74.605       262.398
          4        141.895       265.292
          5        158.453       290.308
          6        166.193       302.001
          7        182.090       327.443
          8        189.078       338.625
      ***  FOS =     1.609   Theta (ki=1.0) =    12.34  ***
                          Lambda =   0.219
           Individual data on the    20  slices
                     Water  Water     Tie      Tie      Earthquake
                     Force  Force     Force    Force       Force    Surcharge
Slice  Width   Weight  Top    Bot     Norm     Tan      Hor     Ver     Load
 No.    (ft)    (lbs)  (lbs)  (lbs)    (lbs)   (lbs)    (lbs)   (lbs)   (lbs)
  1      5.9    2241.7    0.0    0.0       0.      0.      0.0     0.0     0.0
  2     13.9   22281.2    0.0    0.0       0.      0.      0.0     0.0     0.0
  3      5.4   13801.1    0.0    0.0       0.      0.      0.0     0.0     0.0
  4      8.0   21132.8    0.0    0.0       0.      0.      0.0     0.0     0.0
  5      4.0   10443.6    0.0    0.0       0.      0.      0.0     0.0     0.0
  6      0.1     260.0    0.0    0.0       0.      0.      0.0     0.0     0.0
  7      2.9    7518.9    0.0    0.0       0.      0.      0.0     0.0     0.0
  8     13.0   39364.4    0.0    0.0       0.      0.      0.0     0.0     0.0
```

9	1.0	3765.7	0.0	0.0	0.	0.	0.0	0.0	0.0
10	6.0	24271.8	0.0	0.0	0.	0.	0.0	0.0	0.0
11	17.0	75335.3	0.0	0.0	0.	0.	0.0	0.0	0.0
12	0.1	483.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	7.9	39692.5	0.0	0.0	0.	0.	0.0	0.0	0.0
14	1.0	5624.9	0.0	0.0	0.	0.	0.0	0.0	0.0
15	0.9	5426.0	0.0	0.0	0.	0.	0.0	0.0	0.0
16	16.6	83776.5	0.0	0.0	0.	0.	0.0	0.0	0.0
17	7.5	26923.7	0.0	0.0	0.	0.	0.0	0.0	0.0
18	0.2	595.3	0.0	0.0	0.	0.	0.0	0.0	0.0
19	15.9	31922.1	0.0	0.0	0.	0.	0.0	0.0	0.0
20	7.0	3281.8	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	87.158	274.895
2	92.003	271.867
3	97.750	268.276
4	149.571	265.565
5	166.129	290.582
6	173.725	302.058
7	189.622	327.499
8	197.434	340.000

*** FOS = 1.612 Theta (ki=1.0) = 16.22 ***
Lambda = 0.291

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.819	276.500
2	63.360	271.920
3	72.232	266.048
4	151.475	267.694
5	168.033	292.711
6	174.222	302.061
7	190.120	327.503
8	197.929	340.000

*** FOS = 1.650 Theta (ki=1.0) = 18.24 ***
Lambda = 0.330

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.819	276.500
2	63.360	271.920
3	72.232	266.048
4	151.475	267.694
5	168.033	292.711
6	174.222	302.061
7	190.120	327.503
8	197.929	340.000

*** FOS = 1.669 Theta (ki=1.0) = 18.93 ***
Lambda = 0.343

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.363	275.233
2	58.892	271.361
3	70.328	263.792
4	150.274	266.659
5	166.832	291.676
6	173.704	302.057
7	189.601	327.499
8	197.413	340.000

*** FOS = 1.670 Theta (ki=1.0) = 18.50 ***
Lambda = 0.335

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.363	275.233
2	58.892	271.361
3	70.328	263.792

4	150.274	266.659
5	166.832	291.676
6	173.704	302.057
7	189.601	327.499
8	197.413	340.000

*** FOS = 1.670 Theta (ki=1.0) = 18.50 ***
Lambda = 0.335

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.003	271.883
2	93.677	270.837
3	168.233	270.428
4	184.791	295.445
5	189.245	302.173
6	205.142	327.615
7	212.881	340.000

*** FOS = 1.675 Theta (ki=1.0) = 22.59 ***
Lambda = 0.416

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.021	271.149
2	94.468	269.620
3	165.040	269.628
4	181.598	294.644
5	186.568	302.154
6	202.466	327.595
7	210.217	340.000

*** FOS = 1.689 Theta (ki=1.0) = 23.70 ***
Lambda = 0.439

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.138	276.250
2	62.479	271.810
3	73.023	264.831
4	148.282	266.893
5	164.840	291.910
6	171.546	302.041
7	187.443	327.483
8	195.265	340.000

*** FOS = 1.695 Theta (ki=1.0) = 18.44 ***
Lambda = 0.333

Failure Surface Specified By 8 Coordinate Points

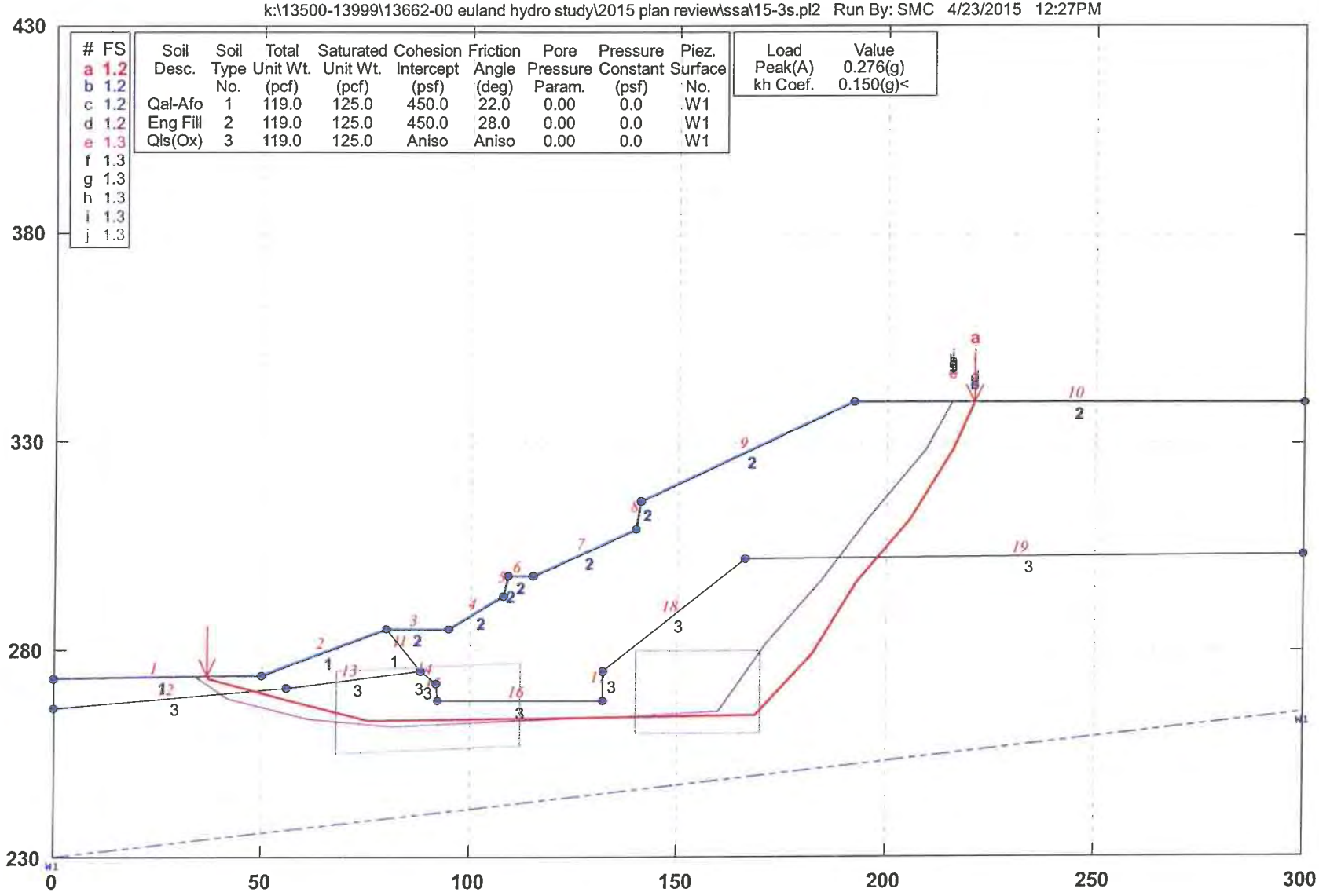
Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.636	274.233
2	55.338	270.941
3	73.492	258.925
4	167.501	263.456
5	184.059	288.472
6	193.147	302.203
7	209.044	327.644
8	216.765	340.000

*** FOS = 1.699 Theta (ki=1.0) = 16.72 ***
Lambda = 0.300

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

Euland - Section 15-15', , -Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-3s.pl2 Run By: SMC 4/23/2015 12:27PM



#	FS
a	1.2
b	1.2
c	1.2
d	1.2
e	1.3
f	1.3
g	1.3
h	1.3
i	1.3
j	1.3

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Qal-Afo	1	119.0	125.0	450.0	22.0	0.00	0.0	W1
Eng Fill	2	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls(Ox)	3	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

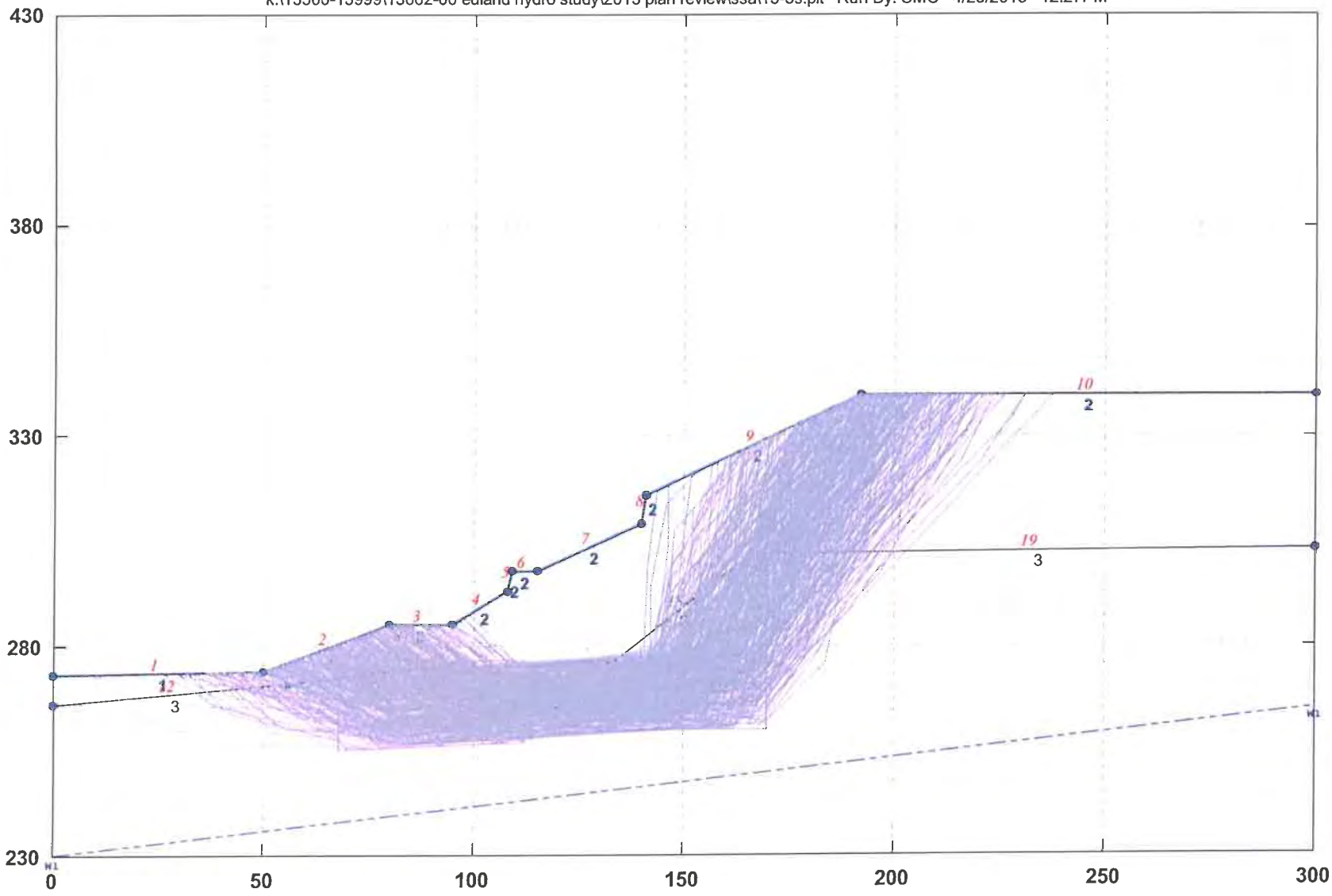
GSTABL7 v.2 FSmin=1.2

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-49.2

Euland - Section 15-15', , -Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\15-3s.plt Run By: SMC 4/23/2015 12:27PM



*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
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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: 4/23/2015
Time of Run: 12:27PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-3s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-3s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\15-3s.PLT
PROBLEM DESCRIPTION: Euland - Section 15-15',
, -Seismic

BOUNDARY COORDINATES
10 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	273.00	50.00	274.00	1
2	50.00	274.00	80.00	285.00	1
3	80.00	285.00	95.00	285.00	2
4	95.00	285.00	108.00	293.00	2
5	108.00	293.00	109.00	298.00	2
6	109.00	298.00	115.00	298.00	2
7	115.00	298.00	140.00	309.00	2
8	140.00	309.00	141.00	316.00	2
9	141.00	316.00	192.00	340.00	2
10	192.00	340.00	300.00	340.00	2
11	80.00	285.00	88.00	275.00	1
12	0.00	266.00	56.00	271.00	3
13	56.00	271.00	88.00	275.00	3
14	88.00	275.00	92.00	272.00	3
15	92.00	272.00	92.10	268.00	3
16	92.10	268.00	132.00	268.00	3
17	132.00	268.00	132.10	275.00	3
18	132.10	275.00	166.00	302.00	3
19	166.00	302.00	300.00	303.00	3

User Specified Y-Origin = 230.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	119.0	125.0	450.0	22.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	3.0	450.00	17.00

3 90.0 525.00 25.00

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 2 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	230.00
2	300.00	265.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	68.00	265.00	112.00	267.00	20.00
2	140.00	270.00	170.00	270.00	20.00

The Factor Of Safety For The Trial Failure Surface Defined By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.52	279.69
2	73.07	273.57
3	149.59	269.97
4	153.30	289.63
5	167.35	303.86
6	181.49	318.01
7	195.53	332.25
8	199.53	340.00

Factor Of Safety For The Preceding Specified Surface = 2.007
Theta (ki = 1.0) = 23.81 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	3.260	3.488	0.149
12.75	3.324	3.766	0.226
2.46	3.171	3.211	0.043
0.00	3.136	3.125	0.000
0.00	3.136	3.125	0.000
19.11	3.413	4.417	0.347
0.28	3.140	3.134	0.005
0.00	3.136	3.125	0.000
0.79	3.147	3.151	0.014
0.51	3.143	3.141	0.009
0.51	3.143	3.142	0.009
33.71	3.226	11.728	0.667
0.52	3.143	3.142	0.009
0.00	3.136	3.125	0.000
0.78	3.147	3.151	0.014
0.51	3.143	3.142	0.009
0.52	3.143	3.142	0.009
31.54	3.369	8.911	0.614

0.53	3.143	3.142	0.009
0.00	3.136	3.125	0.000

The Trial Failure Surface In Question Is Defined
By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.66	279.01
2	68.21	274.69
3	83.21	261.46
4	140.57	279.27
5	141.22	299.26
6	143.62	317.23

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.266	1.875	0.149
12.75	2.371	2.038	0.226
45.26	3.991	-0.002	1.009
8.80	2.274	1.886	0.155
0.00	2.035	1.623	0.000
89.94	29.210	150.555	*****
0.41	2.047	1.634	0.007
0.00	2.035	1.623	0.000
0.00	-0.002	-0.001	0.000
24.83	2.546	2.864	0.463
0.00	-0.003	-0.002	0.000
0.00	-0.003	-0.002	0.000
0.00	-0.003	-0.002	0.000
0.00	-0.003	-0.002	0.000
0.00	-0.003	-0.002	0.000
0.00	-0.003	-0.002	0.000
0.00	-0.003	-0.002	0.000
0.00	-0.003	-0.002	0.000
0.00	-0.003	-0.002	0.000

The Trial Failure Surface In Question Is Defined
By The Following 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.12	283.58
2	76.23	283.53
3	90.43	269.44
4	147.37	263.18
5	152.19	282.59
6	165.72	297.31
7	179.71	311.61
8	190.76	328.28
9	201.16	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	3.234	2.486	0.149
12.75	3.282	2.598	0.226
73.07	23.942	8.155	3.285
9.11	3.242	2.501	0.160
0.00	3.093	2.287	0.000
89.94	20.214	-0.553	*****
0.00	3.093	2.287	0.000
0.00	3.093	2.287	0.000
0.00	0.010	0.000	0.000
24.83	3.350	2.973	0.463
0.00	0.000	0.001	0.000
0.00	0.003	0.000	0.000
0.00	0.000	0.001	0.000
0.00	0.002	0.001	0.000
0.00	0.000	0.001	0.000

0.00	0.005	0.000	0.000
0.00	0.000	0.001	0.000
0.00	0.002	0.001	0.000
0.00	0.000	0.001	0.000
0.00	0.005	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	54.40	275.61
2	56.60	273.88
3	76.57	272.86
4	147.18	264.96
5	148.02	284.95
6	162.17	299.09
7	171.82	316.61
8	181.98	333.83
9	182.12	335.35

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.960	2.489	0.149
12.75	3.229	2.802	0.226
67.78	0.000	6.140	2.448
17.52	3.565	3.256	0.316
3.98	2.697	2.219	0.070
55.00	-0.010	-0.003	1.428
53.97	-0.010	-0.003	1.375
0.00	0.000	-0.005	0.000
11.43	0.000	-0.005	0.202
89.94	0.000	-0.062	*****
2.75	0.000	-0.004	0.048
0.00	0.000	-0.004	0.000
89.94	0.000	-0.062	*****
0.00	0.000	-0.004	0.000
0.00	0.000	-0.004	0.000
0.00	0.000	-0.004	0.000
0.00	0.000	-0.004	0.000
0.00	0.000	-0.004	0.000
0.00	0.000	-0.004	0.000
0.00	0.000	-0.004	0.000

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.69	286.65
2	110.49	275.80
3	147.69	267.85
4	152.74	287.20
5	163.68	303.94
6	171.48	322.36
7	172.55	330.85

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.041	1.714	0.149
12.75	2.093	1.804	0.226
55.64	-0.004	0.000	1.463
54.79	0.104	0.000	1.417
55.59	0.006	0.000	1.460
55.65	0.006	0.000	1.463
54.52	0.001	0.000	1.403
53.88	0.001	0.000	1.370
57.01	0.000	0.000	1.541
55.60	0.006	0.000	1.460
56.83	0.000	0.000	1.530

56.64	-0.001	0.000	1.519
58.20	0.000	0.000	1.613
60.53	0.000	0.000	1.769
60.53	0.000	0.000	1.769
60.53	0.003	0.000	1.769
0.00	0.004	0.000	0.000
89.94	17.084	0.000	*****
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000

The Trial Failure Surface In Question Is Defined
By The Following 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.62	283.40
2	92.51	274.66
3	152.19	270.26
4	157.82	289.45
5	170.85	304.62
6	184.99	318.77
7	198.06	333.90
8	204.08	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.100	2.298	0.149
12.75	2.162	2.472	0.226
0.00	2.020	2.056	0.000
0.00	2.021	2.056	0.000
18.79	2.300	2.838	0.340
0.00	2.020	2.056	0.000
0.00	2.020	2.056	0.000
72.43	-0.005	0.000	3.158
88.38	0.000	-0.032	*****
75.31	1.665	1.471	3.816
89.94	1.911	-34.693	*****
75.21	1.666	1.469	3.788
70.19	-0.004	0.000	2.777
68.66	-0.004	0.000	2.560
43.78	-0.001	0.000	0.958
22.46	0.008	0.000	0.413
40.34	-0.001	0.000	0.849
38.49	0.000	0.000	0.795
33.08	0.001	0.001	0.651
31.33	0.003	0.000	0.609

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.32	282.18
2	82.63	278.14
3	97.26	264.50
4	145.23	274.02
5	159.21	288.31
6	160.86	308.25
7	161.10	325.46

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	1.854	1.626	0.149
12.75	1.978	1.799	0.226
33.66	3.109	6.366	0.666
14.21	2.027	1.872	0.253
8.90	1.864	1.640	0.157
31.62	2.974	4.895	0.616
12.07	1.957	1.767	0.214
7.89	1.838	1.605	0.139

37.70	-0.005	0.000	0.773
36.86	-0.004	0.000	0.750
31.94	0.000	0.000	0.624
30.74	0.000	0.000	0.595
29.37	0.001	0.000	0.563
31.36	0.000	0.000	0.609
31.51	0.000	0.000	0.613
31.48	0.000	0.000	0.612
31.47	-0.002	0.000	0.612
41.45	-0.001	-0.001	0.883
41.09	0.000	-0.001	0.872
41.59	-0.003	-0.001	0.888

The Trial Failure Surface In Question Is Defined
By The Following 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.14	281.39
2	85.25	272.66
3	99.41	258.54
4	141.54	273.28
5	155.67	287.43
6	168.67	302.63
7	182.69	316.88
8	196.73	331.13
9	205.43	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.082	1.865	0.149
12.75	2.193	2.065	0.226
20.98	2.402	2.658	0.383
16.42	2.289	2.284	0.295
15.00	2.252	2.193	0.268
17.04	2.305	2.328	0.307
16.28	2.285	2.275	0.292
16.34	2.287	2.279	0.293
34.88	-0.047	-0.001	0.697
19.92	2.377	2.558	0.362
46.56	-0.115	0.000	1.056
89.94	33.393	0.439	*****
46.77	6.909	0.000	1.064
17.10	-0.009	-0.006	0.308
7.23	-0.007	-0.005	0.127
0.00	-0.006	-0.005	0.000
0.00	-0.006	-0.005	0.000
51.94	0.004	0.003	1.277
24.88	-0.012	-0.008	0.464
46.26	0.000	0.000	1.045

The Trial Failure Surface In Question Is Defined
By The Following 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.99	285.00
2	92.75	283.69
3	107.09	269.74
4	152.34	261.12
5	165.63	276.07
6	175.10	293.69
7	180.67	312.89
8	194.39	327.45
9	203.70	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	2.098	1.788	0.149
12.75	2.213	1.954	0.226

41.28	-0.014	-0.003	0.878
39.75	-0.014	0.000	0.832
49.88	-0.009	0.000	1.187
74.08	0.000	0.000	3.505
74.81	-0.001	0.000	3.684
73.57	0.000	0.000	3.392
72.90	0.000	0.000	3.251
72.15	0.000	0.000	3.105
72.01	0.000	0.000	3.079
71.96	0.000	0.000	3.070
71.94	0.000	0.000	3.067
71.94	0.000	0.000	3.066
71.94	0.000	0.000	3.066
71.94	0.000	0.000	3.066
71.94	0.000	0.000	3.066
71.93	0.000	0.000	3.066
71.93	0.000	0.000	3.066
71.93	0.000	0.000	3.066

The Trial Failure Surface In Question Is Defined
By The Following 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.01	285.00
2	94.56	275.47
3	146.26	261.25
4	156.93	278.17
5	166.90	295.50
6	178.42	311.85
7	192.55	326.01
8	198.27	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	5.001	3.974	0.149
12.75	5.226	4.330	0.226
51.35	15.806	-0.001	1.251
9.66	5.065	4.066	0.170
0.00	4.464	3.392	0.000
89.94	24.263	29.893	*****
19.17	5.527	5.002	0.348
3.62	4.712	3.622	0.063
43.59	0.000	20.149	0.952
6.36	4.879	3.813	0.111
0.00	4.464	3.392	0.000
89.94	31.516	41.534	*****
11.59	5.167	4.227	0.205
0.00	4.464	3.392	0.000
89.94	24.255	31.021	*****
16.40	5.403	4.687	0.294
1.26	4.555	3.470	0.022
60.54	83.290	0.000	1.771
0.22	4.480	3.405	0.004
0.00	4.464	3.392	0.000

The Trial Failure Surface In Question Is Defined
By The Following 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.95	282.41
2	84.31	272.89
3	149.47	264.99
4	150.05	284.98
5	158.87	302.93
6	161.93	322.69
7	167.12	328.29

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg)	FOS (Moment)	FOS (Force)

(ki=1.0)	(Equil.)	(Equil.)	Lambda
8.50	5.524	3.713	0.149
12.75	5.973	4.052	0.226
0.00	0.004	0.000	0.000
0.00	0.004	0.000	0.000
22.60	6.736	5.049	0.416
0.00	0.002	0.000	0.000
0.00	0.002	0.000	0.000
33.60	6.593	6.943	0.665
0.25	0.000	0.000	0.004
0.00	0.007	0.000	0.000
0.24	0.006	-0.001	0.004
2.93	0.001	-0.003	0.051
8.04	0.002	-0.005	0.141
0.00	0.000	0.000	0.000
0.00	0.000	0.000	0.000
0.00	0.007	0.000	0.000
31.24	6.776	6.409	0.607
0.00	0.007	0.000	0.000
0.00	0.007	0.000	0.000
0.00	4.498	3.135	0.000

The Trial Failure Surface In Question Is Defined
By The Following 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.66	285.00
2	111.80	275.17
3	164.64	268.79
4	165.19	288.78
5	169.07	308.41
6	182.47	323.25
7	196.60	337.40
8	197.61	340.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations
##################### SOME LINES SKIPPED ####################
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 2000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 195
Number of Trial Surfaces with Misleading FS = 34
Number of Trial Surfaces With Valid FS = 1771
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 11.4 %
Statistical Data On All Valid FS Values:
FS Max = 5.644 FS Min = 1.185 FS Ave = 1.930
Standard Deviation = 0.442 Coefficient of Variation = 22.93 %
((Simplified Janbu FS for Critical Surface = 1.197))
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.683	273.734
2	37.218	273.268
3	56.452	267.788
4	75.914	263.181
5	168.702	264.491
6	182.278	279.177
7	192.766	296.207
8	205.675	311.482
9	215.998	328.613

10 220.716 340.000

*** FOS = 1.185 Theta (ki=1.0) = 7.90 ***

Lambda = 0.139

Individual data on the 27 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.5	15.1	0.0	0.0	0.	0.	2.3	0.0	0.0
2	10.5	2614.2	0.0	0.0	0.	0.	392.1	0.0	0.0
3	2.2	1074.2	0.0	0.0	0.	0.	161.1	0.0	0.0
4	6.0	4518.2	0.0	0.0	0.	0.	677.7	0.0	0.0
5	0.5	453.8	0.0	0.0	0.	0.	68.1	0.0	0.0
6	19.5	33464.1	0.0	0.0	0.	0.	5019.6	0.0	0.0
7	4.1	10230.2	0.0	0.0	0.	0.	1534.5	0.0	0.0
8	8.0	20663.2	0.0	0.0	0.	0.	3099.5	0.0	0.0
9	4.0	10291.3	0.0	0.0	0.	0.	1543.7	0.0	0.0
10	0.1	256.9	0.0	0.0	0.	0.	38.5	0.0	0.0
11	2.9	7443.9	0.0	0.0	0.	0.	1116.6	0.0	0.0
12	13.0	39383.4	0.0	0.0	0.	0.	5907.5	0.0	0.0
13	1.0	3791.2	0.0	0.0	0.	0.	568.7	0.0	0.0
14	6.0	24497.1	0.0	0.0	0.	0.	3674.6	0.0	0.0
15	17.0	76645.9	0.0	0.0	0.	0.	11496.9	0.0	0.0
16	0.1	494.2	0.0	0.0	0.	0.	74.1	0.0	0.0
17	7.9	40642.5	0.0	0.0	0.	0.	6096.4	0.0	0.0
18	1.0	5760.5	0.0	0.0	0.	0.	864.1	0.0	0.0
19	25.0	171378.0	0.0	0.0	0.	0.	25706.7	0.0	0.0
20	2.7	20553.8	0.0	0.0	0.	0.	3083.1	0.0	0.0
21	13.6	97574.5	0.0	0.0	0.	0.	14636.2	0.0	0.0
22	9.7	58589.4	0.0	0.0	0.	0.	8788.4	0.0	0.0
23	0.8	4049.9	0.0	0.0	0.	0.	607.5	0.0	0.0
24	5.1	24732.5	0.0	0.0	0.	0.	3709.9	0.0	0.0
25	7.8	30809.1	0.0	0.0	0.	0.	4621.4	0.0	0.0
26	10.3	24508.6	0.0	0.0	0.	0.	3676.3	0.0	0.0
27	4.7	3197.1	0.0	0.0	0.	0.	479.6	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.683	273.734
2	37.218	273.268
3	56.452	267.788
4	75.914	263.181
5	168.702	264.491
6	182.278	279.177
7	192.766	296.207
8	205.675	311.482
9	215.998	328.613
10	220.716	340.000

*** FOS = 1.234 Theta (ki=1.0) = 13.54 ***

Lambda = 0.241

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.683	273.734
2	37.218	273.268
3	56.452	267.788
4	75.914	263.181
5	168.702	264.491
6	182.278	279.177
7	192.766	296.207
8	205.675	311.482
9	215.998	328.613
10	220.716	340.000

*** FOS = 1.237 Theta (ki=1.0) = 13.87 ***

Lambda = 0.247

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.683	273.734
2	37.218	273.268

3	56.452	267.788
4	75.914	263.181
5	168.702	264.491
6	182.278	279.177
7	192.766	296.207
8	205.675	311.482
9	215.998	328.613
10	220.716	340.000

*** FOS = 1.241 Theta (ki=1.0) = 14.30 ***
Lambda = 0.255

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.226	273.685
2	41.699	268.298
3	61.113	263.491
4	81.017	261.533
5	159.935	265.228
6	171.359	281.644
7	184.398	296.809
8	196.532	312.708
9	209.250	328.144
10	215.607	340.000

*** FOS = 1.255 Theta (ki=1.0) = 14.67 ***
Lambda = 0.262

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.226	273.685
2	41.699	268.298
3	61.113	263.491
4	81.017	261.533
5	159.935	265.228
6	171.359	281.644
7	184.398	296.809
8	196.532	312.708
9	209.250	328.144
10	215.607	340.000

*** FOS = 1.255 Theta (ki=1.0) = 14.68 ***
Lambda = 0.262

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.226	273.685
2	41.699	268.298
3	61.113	263.491
4	81.017	261.533
5	159.935	265.228
6	171.359	281.644
7	184.398	296.809
8	196.532	312.708
9	209.250	328.144
10	215.607	340.000

*** FOS = 1.255 Theta (ki=1.0) = 14.68 ***
Lambda = 0.262

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.226	273.685
2	41.699	268.298
3	61.113	263.491
4	81.017	261.533
5	159.935	265.228
6	171.359	281.644
7	184.398	296.809
8	196.532	312.708
9	209.250	328.144
10	215.607	340.000

*** FOS = 1.256 Theta (ki=1.0) = 14.73 ***
Lambda = 0.263

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.226	273.685
2	41.699	268.298
3	61.113	263.491
4	81.017	261.533
5	159.935	265.228
6	171.359	281.644
7	184.398	296.809
8	196.532	312.708
9	209.250	328.144
10	215.607	340.000

*** FOS = 1.256 Theta (ki=1.0) = 14.74 ***
Lambda = 0.263

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.683	273.734
2	37.218	273.268
3	56.452	267.788
4	75.914	263.181
5	168.702	264.491
6	182.278	279.177
7	192.766	296.207
8	205.675	311.482
9	215.998	328.613
10	220.716	340.000

*** FOS = 1.263 Theta (ki=1.0) = 16.62 ***
Lambda = 0.299

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

FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRECISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

EXISTING SINGLE FAMILY RESIDENTIAL

AVENIDA DEL CABALLO

LOMA VISTA

OPEN SPACE

N 144,596.06
E 126,086.16

N 143,985.7
E 126,931.5

N 143,669.62
E 126,070.46

LOT "A"
LOT "B"
LOT "C"
LOT "D"
LOT "E"
LOT "F"
LOT "G"

PROPERTY LINE

NATURAL SLOPE

MERCEDES-BENZ OF LAGUNA NIGUEL

EXPLANATION

UNITS

Ef	ENGINEERED FILL (COMPACTED FILL PLACED DURING GRADING FOR MERCEDES-BENZ OF LAGUNA NIGUEL DEALERSHIP)
Af	ARTIFICIAL FILL (UNCONTROLLED DURING GRADING FOR MERCEDES BENZ OF LAGUNA NIGUEL DEALERSHIP)
Afo	OLDER ARTIFICIAL FILL PLACED DURING GRADING FOR TRACT 6341 AND THE TENTATIVE TRACT 16808
Qcol	COLLUVIUM - CIRCLED WHERE BURIED BY FILL SOILS
Qac	ALLUVIUM/COLLUVIUM UNDIFFERENTIATED
Qls	ANCIENT LANDSLIDE DEBRIS - CIRCLED WHERE BURIED BY FILL SOILS AND/OR ALLUVIUM OR COLLUVIUM
Qlsr	RECENT LANDSLIDE DEBRIS
Tc	BEDROCK: CAPISTRANO FORMATION, SILTSTONE, CLAYSTONE AND MINOR SANDSTONE

SYMBOLS

- APPROXIMATE LOCATION OF GEOLOGIC CONTACT; DASHED WHERE APPROXIMATE; QUERIED WHERE UNCERTAIN; DOTTED WHERE BURIED UNDER COLLUVIUM, ALLUVIUM, AND FILL SOILS PLACED DURING PREVIOUS GRADING
  NOTE: FILL SOILS BLANKET GRADED AREAS OF SITE
- APPROXIMATE LOCATION OF CUT/FILL/NATURAL CONTACT
- STRIKE AND DIP OF BEDDING
- STRIKE AND DIP OF JOINT AND/OR FRACTURE
- STRIKE OF VERTICAL JOINT AND FRACTURE
- STRIKE AND DIP OF SHEAR OR LANDSLIDE RUPTURE SURFACE WITH DIRECTION AND DIP OF STRIAE
- APPROXIMATE LIMITS OF SURFICIAL FAILURE
- APPROXIMATE LIMITS OF ANCIENT LANDSLIDE DEBRIS; LINE SOLID WHERE BOUNDARY IS WELL DEFINED; DASHED WHERE APPROXIMATELY LOCATED AND DOTTED WHERE CONCEALED OR BURIED BY FILL SOILS; ARROWS INDICATE DIRECTION OF MOVEMENT
- APPROXIMATE DEPTH OF EXISTING ENGINEERED FILL (IN FEET)
- LOCATION OF GEOLOGIC CROSS SECTION
- NOT A PART OF PROPOSED DEVELOPMENT
- APPROXIMATE LOCATION OF KEYWAY WITH BACKDRAIN ALL BACKDRAINS TO OUTLET TO 6- AND 8-INCH OUTLET PIPE WHERE POSSIBLE
- APPROXIMATE ELEVATION AT BOTTOM OF KEYWAY (ACTUAL ELEVATION TO BE DETERMINED BY ENGINEERING GEOLOGIST DURING GRADING)
- APPROXIMATE LOCATION OF GEOTECHNICAL CROSS SECTION
- APPROXIMATE LOCATION OF GROUNDWATER MONITORING WELL
- APPROXIMATE LOCATION OF STORM CAPTURE MODULES
- APPROXIMATE LOCATION OF 30-INCH DIAMETER CONCRETE PIER, 30 FEET DEEP, 10-FOOT ON CENTER
- APPROXIMATE LOCATION OF 36-INCH DIAMETER CONCRETE PIER, 30 FEET DEEP, 10-FOOT ON CENTER
- APPROXIMATE LIMITS OF CHIMNEY DRAIN, SEE FIGURE 9A
- APPROXIMATE LOCATION OF 6-INCH/8-INCH DIAMETER OUTLET PIPE (DRAIN AT MINIMUM 0.5% TO STORM CAPTURE BOX)
- POSSIBLE SLOTCUTS OR TEMPORARY SHORING

BORINGS AND TEST PITS

- APPROXIMATE LOCATION OF EXPLORATORY CONE PENETROMETER TEST COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 1/12/16
- APPROXIMATE LOCATION OF EXPLORATORY TEST PIT COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 8/15/84
- APPROXIMATE LOCATION OF EXPLORATORY BUCKET AUGER BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 9/7/84 THROUGH 8/8/84
- APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 3/24/86 THROUGH 3/28/86
- APPROXIMATE LOCATION OF EXPLORATORY HOLLOW STEM AUGER BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 8/24/91
- APPROXIMATE LOCATION OF EXPLORATORY HOLLOW STEM AUGER BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 4/16/97 THROUGH 4/18/97
- APPROXIMATE LOCATION OF EXPLORATORY ROTARY WASH BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 1/29/91 THROUGH 2/6/91
- APPROXIMATE LOCATION OF EXPLORATORY BUCKET OR HOLLOW STEM AUGER BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 11/16/88 THROUGH 11/23/88
- APPROXIMATE LOCATION OF EXPLORATORY CONE PENETROMETER TEST COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 12/28/88
- APPROXIMATE LOCATION OF EXPLORATORY TEST PIT COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 3/14/84
- APPROXIMATE LOCATION OF EXPLORATORY ROTARY WASH BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 10/21/84 THROUGH 10/22/84
- APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY LEROY CRANDELL AND ASSOCIATES, INC. AND LOGGED BY STONEY-MILLER CONSULTANTS, INC. FROM 5/28/98 THROUGH 6/2/98
- APPROXIMATE LOCATION OF EXPLORATORY BUCKET AUGER BORING COMPLETED BY BYRNE CONSULTING GROUP FROM 5/28/98 THROUGH 7/16/98
- APPROXIMATE LOCATION OF EXPLORATORY HOLLOW STEM AUGER BORING COMPLETED BY BYRNE CONSULTING GROUP FROM 8/23/98 THROUGH 8/25/98
- APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY PETRA GEOTECHNICAL, INC. FROM 11/4/99 THROUGH 11/17/99
- APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY LEIGHTON AND ASSOCIATES, INC. FROM 10/21/97 THROUGH 11/4/97
- APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY MIDDLEBROOK, WORSWICK AND ASSOCIATES, INC. FROM 9/8/98 THROUGH 10/13/98

T.D. INDICATES TOTAL DEPTH

GEOTECHNICAL MAP
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

STONEY-MILLER CONSULTANTS, INC.

JOB NO.	REPORT NO.	DATE	PLATE
13002-05	15-13951	APRIL 2015	2

GEOTECHNICAL CROSS SECTIONS A-A' & B-B'
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

STONEY-MILLER CONSULTANTS, INC.

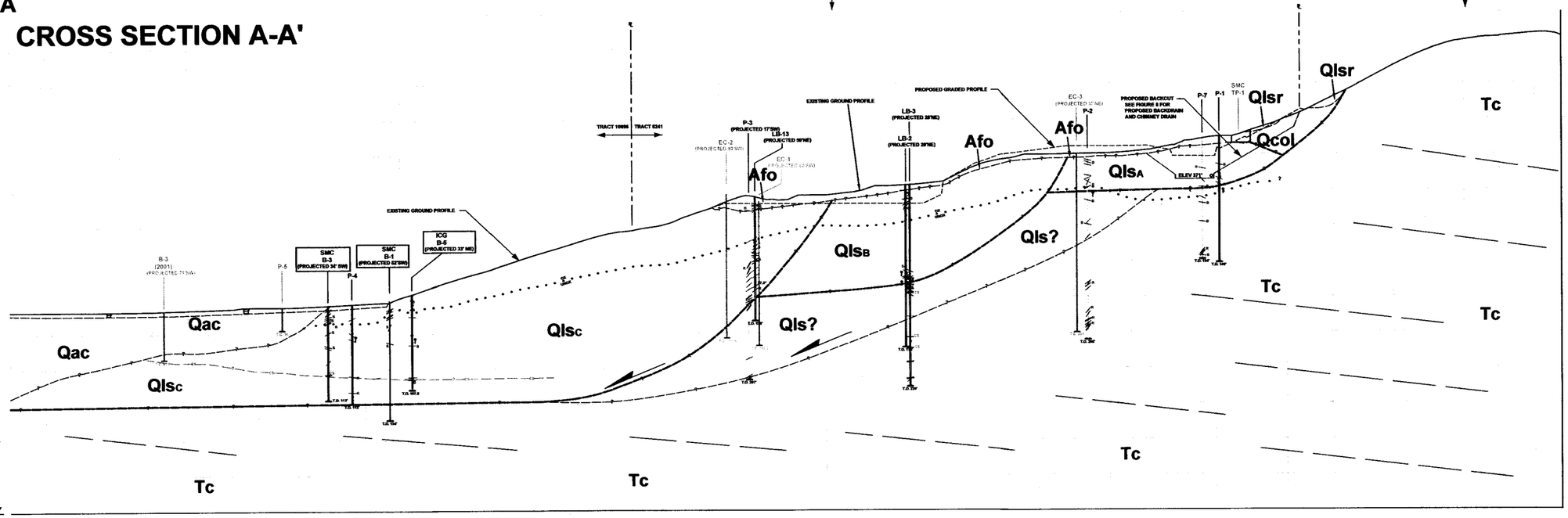
JOB NO.	REPORT NO.		PLATE
13082-05	15-13051	APRIL 2015	3

A

CROSS SECTION A-A'

N72°W

A'



DATUM ELEV 0.00
GROUP ORIGINAL SECTION A-A'

HORIZONTAL AND VERTICAL SCALE: 1 INCH = 80 FEET

FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRECISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

B - BEDDING

R - RUPTURE

CS - CLAYSEAM

S - SHEAR

FRACTURE AND JOINT

BORING
- BLACK LETTERS IN BOX — DOWNHOLE LOGGED OR CONTINUOUS CORING BY SMC PERSONNEL
- BLACK LETTERS — SECOND ORDER - AS FIRST ORDER BUT BY OTHERS
- GRAY SCALE — THIRD ORDER - OTHER BORINGS

LANDSLIDE DEPOSITS

POSSIBLE BEDROCK DEPOSITS

BEDROCK

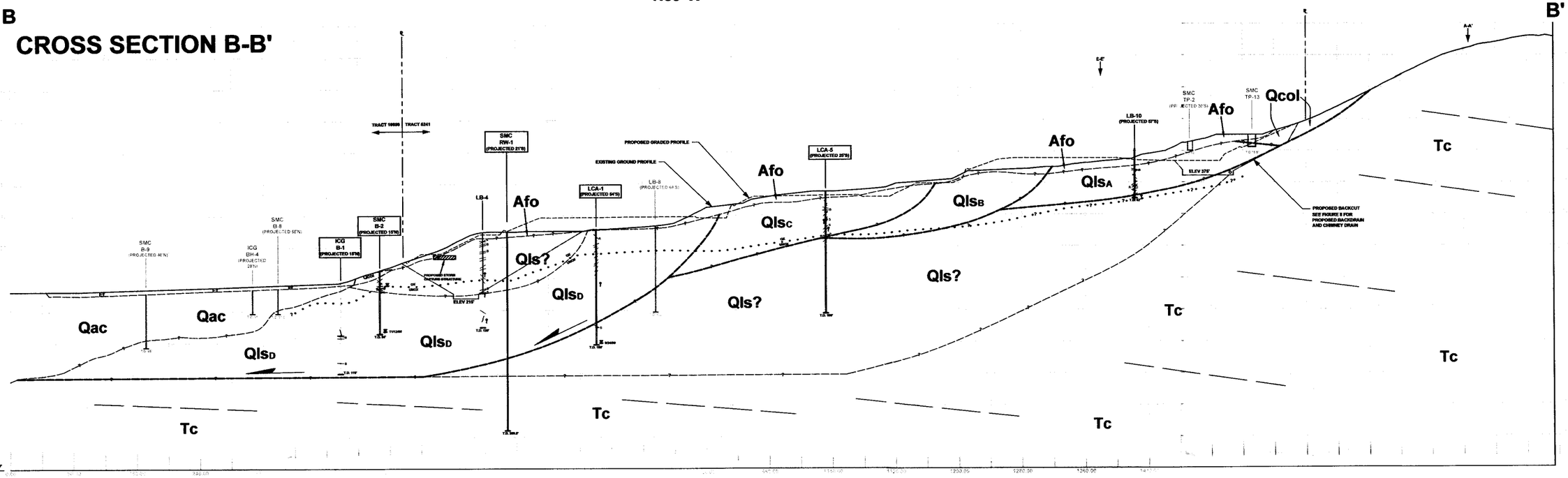
T.D. = TOTAL DEPTH

B

CROSS SECTION B-B'

N89°W

B'

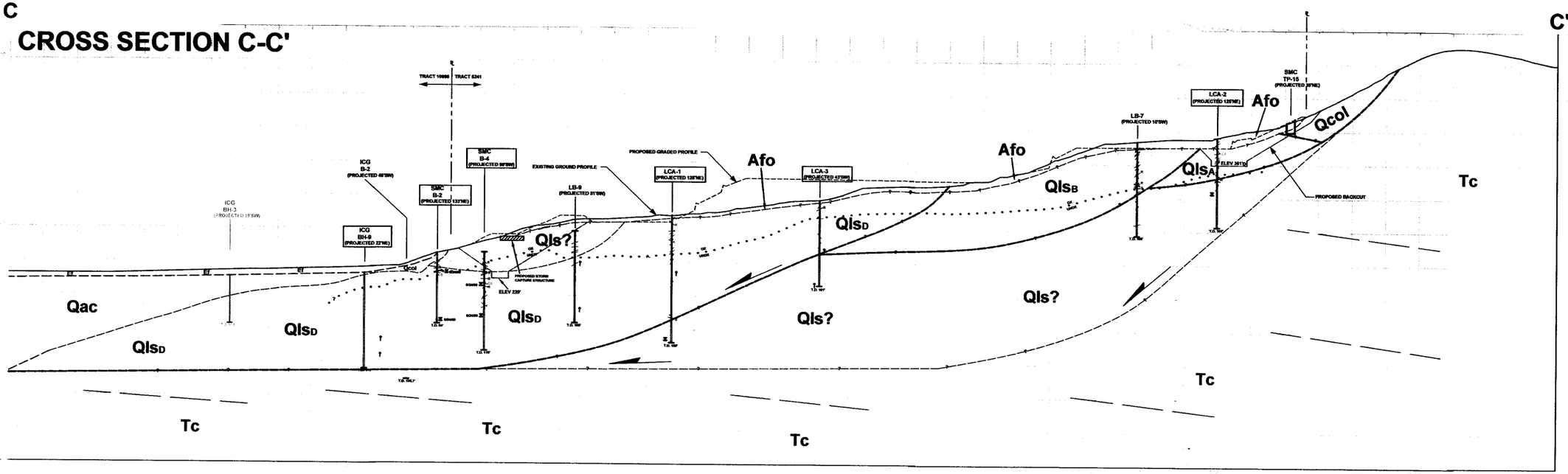


DATUM ELEV 0.00
GROUP ORIGINAL SECTION B-B'

N76°W

C

CROSS SECTION C-C'

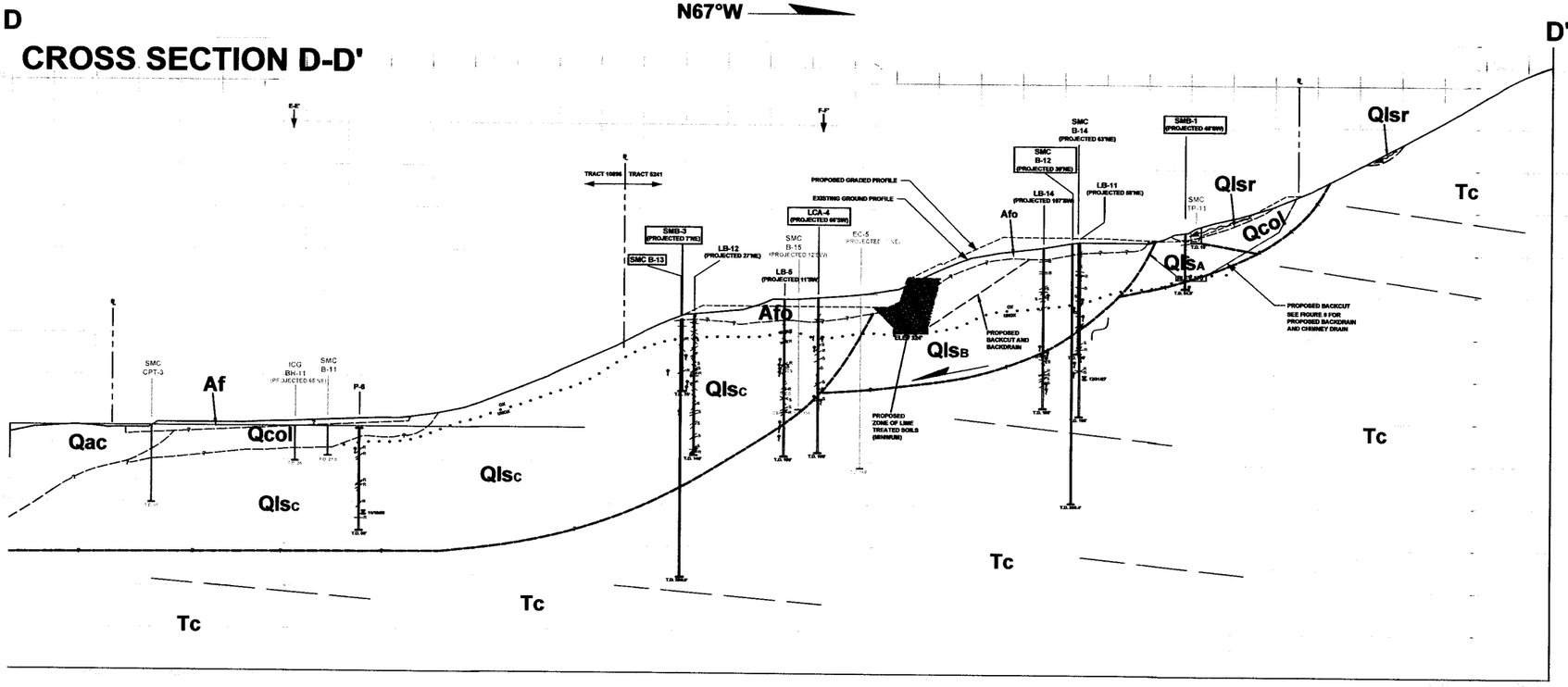


DATUM ELEV 0.00
GROUP ORIGINAL SECTION C-C'

N67°W

D

CROSS SECTION D-D'



DATUM ELEV 0.00
GROUP ORIGINAL SECTION D-D'

BORING
- BLACK LETTERS IN BOX — DOWNHOLE LOGGED OR CONTINUOUS CORING BY SMC PERSONNEL
- BLACK LETTERS — SECOND ORDER - AS FIRST ORDER BUT BY OTHERS
- GRAY SCALE — THIRD ORDER - OTHER BORINGS

LANDSLIDE DEPOSITS

POSSIBLE BEDROCK DEPOSITS

BEDROCK

T.D. = TOTAL DEPTH

B - BEDDING

R - RUPTURE

CS - CLAYSEAM

S - SHEAR

FRACTURE AND JOINT

FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRESCISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

HORIZONTAL AND VERTICAL SCALE: 1 INCH = 80 FEET

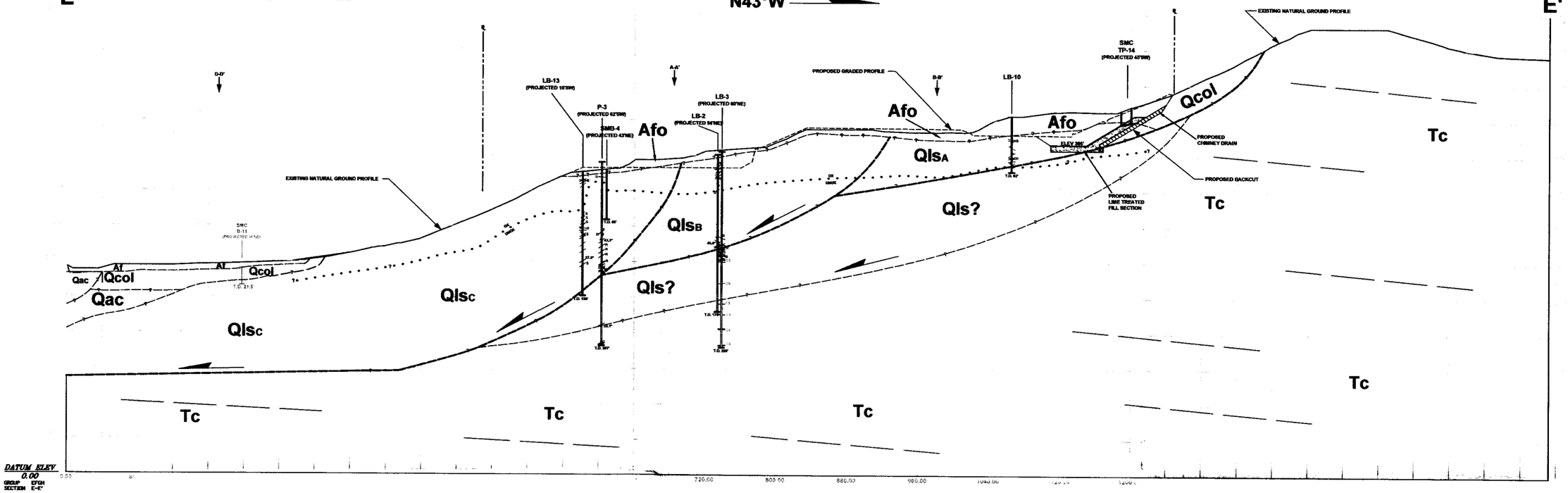
0 80 160 FEET

GEOTECHNICAL CROSS SECTIONS C-C' & D-D'
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

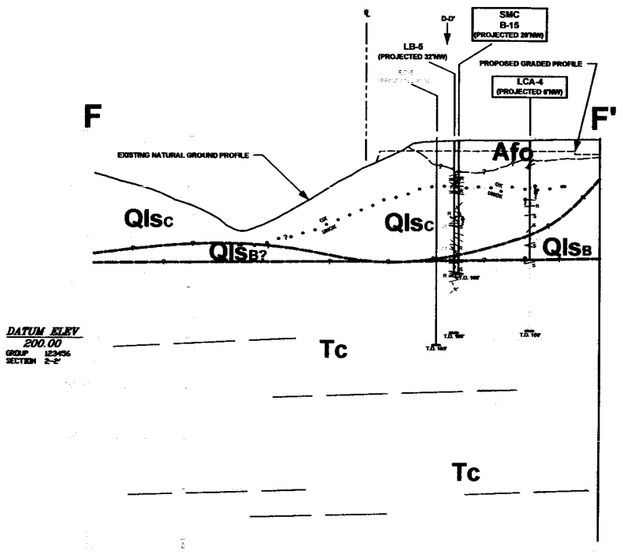
STONEY-MILLER CONSULTANTS, INC.

JOB NO.	REPORT NO.		PLATE
13062-05	15-13851	APRIL 2015	4

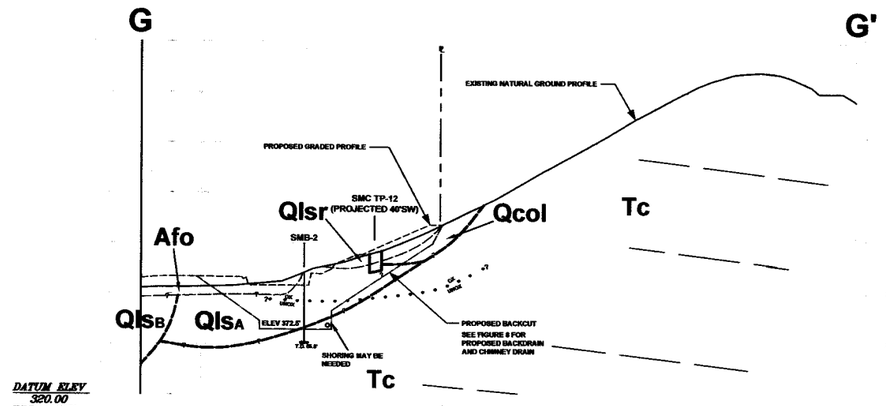
CROSS SECTION E-E'



CROSS SECTION F-F'



CROSS SECTION G-G'



BORING

- BLACK LETTERS IN BOX — DOWNHOLE LOGGED OR CONTINUOUS CORING BY SMC PERSONNEL
- BLACK LETTERS — SECOND ORDER - AS FIRST ORDER BUT BY OTHERS
- GRAY SCALE — THIRD ORDER - OTHER BORINGS

LANDSLIDE DEPOSITS

POSSIBLE BEDROCK DEPOSITS

BEDROCK

T.D. = TOTAL DEPTH

B - BEDDING

R - RUPTURE

CS - CLAYSEAM

S - SHEAR

FRACTURE AND JOINT

HORIZONTAL AND VERTICAL SCALE: 1 INCH = 40 FEET

0 40 80 FEET

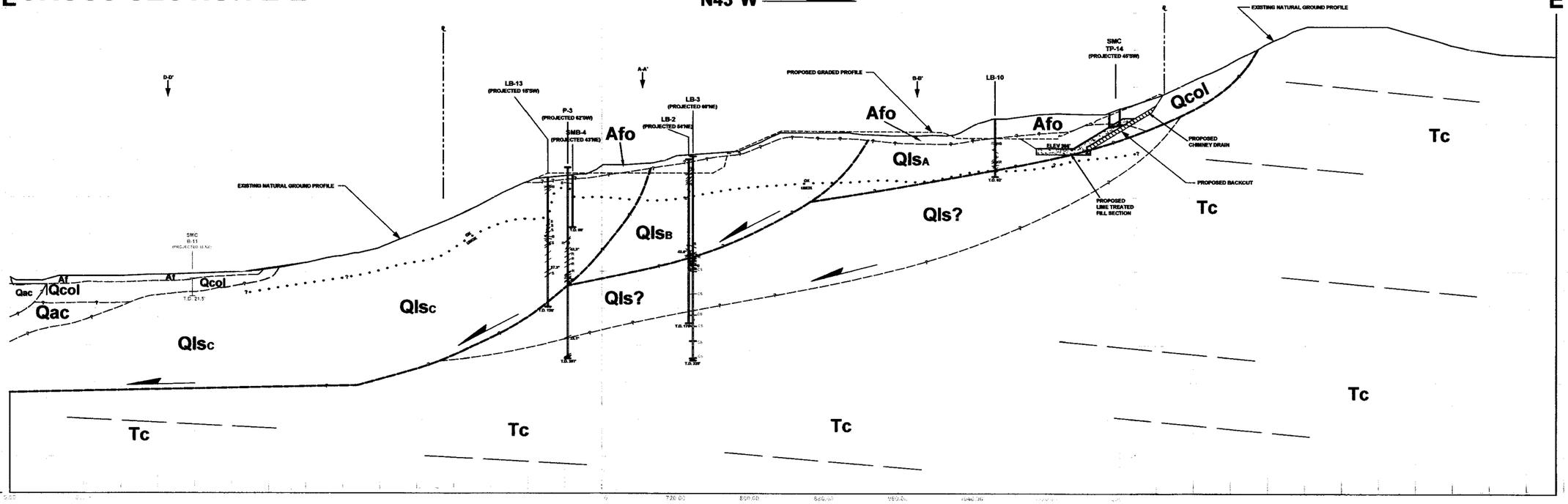
FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRECISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

GEOTECHNICAL CROSS SECTIONS
E-E', F-F', & G-G'
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

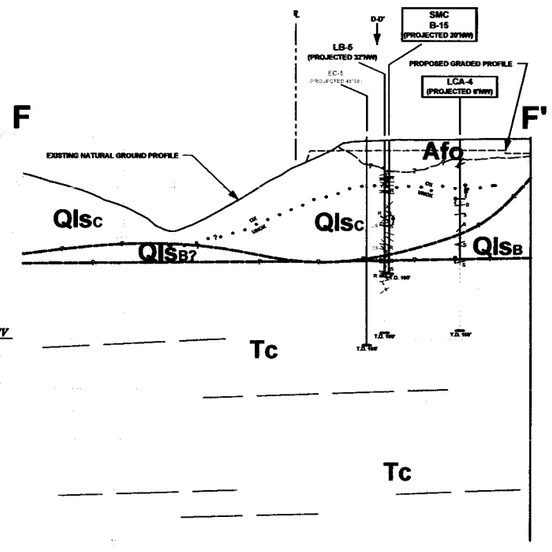
STONEY-MILLER CONSULTANTS, INC.

JOB NO.	REPORT NO.		PLATE
13062-05	15-13051	APRIL 2015	5

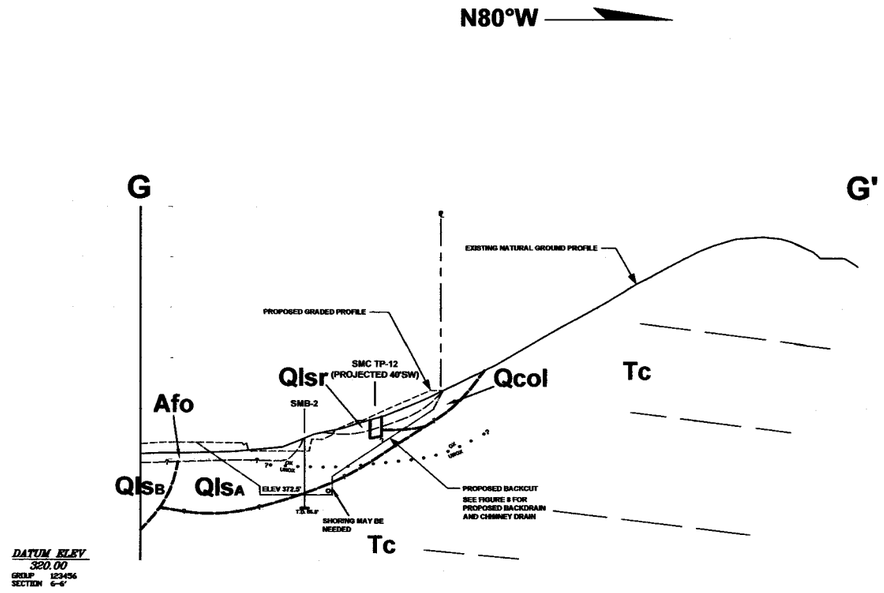
ECROSS SECTION E-E'



CROSS SECTION F-F'



CROSS SECTION G-G'



BORING
- BLACK LETTERS IN BOX — DOWNHOLE LOGGED OR CONTINUOUS CORING BY SMC PERSONNEL
- BLACK LETTERS — SECOND ORDER - AS FIRST ORDER BUT BY OTHERS
- GRAY SCALE — THIRD ORDER - OTHER BORINGS

LANDSLIDE DEPOSITS

POSSIBLE BEDROCK DEPOSITS

BEDROCK

T.D. = TOTAL DEPTH

B - BEDDING

R - RUPTURE

CS - CLAYSEAM

S - SHEAR

FRACTURE AND JOINT

HORIZONTAL AND VERTICAL SCALE: 1 INCH = 40 FEET

0 40 80
FEET

FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRECISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

GEOTECHNICAL CROSS SECTIONS
E-E', F-F', & G-G'
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

STONEY-MILLER CONSULTANTS, INC.

JOB NO.	REPORT NO.		PLATE
13082-05	15-13851	APRIL 2015	5